

PIC18 Peripheral Library Help Document

Made with **Doc-O-Matic**.

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Index

a

1 PIC18 Peripheral Library



Peripheral Library Support

for the

PIC18 Microcontroller Family

2 Introduction

PIC18 MCU Peripheral Library

Introduction

2

The PIC18 MCU Peripheral Library provides a set of functions for setting up and controlling the operation of all the peripheral modules available in the PIC18 devices, as well as functions for interfacing with an external LCD, Software implemented communication modules. The Peripheral Library serves as a convenient layer of abstraction over the specific details of the peripherals and their associated control and status registers. The Peripheral Library supports the following hardware peripheral modules:

1. 10-bit A/D Converter
2. 12-bit A/D Converter
3. Analog Comparator
4. timers
5. Input Capture
6. Output Compare
7. Charge Time Measurement Unit (CTMU)
8. Deep Sleep
9. Internal EEPROM
10. Power Control PWM (PCPWM)
11. PWM
12. Programmable Motor Control Technology (ProMPT™)
13. Real Time Clock & Calendar (RTCC)
14. Software RTCC
15. I/O Ports and External Interrupts
16. Reset
17. Usart
18. SPI
19. I²C™
20. MWIRE
21. CAN2510
22. Parallel Master Port (PMP)
23. Functions for controlling an external LCD through configurable I/O Port pins are also provided
24. Software I2C
25. Software SPI
26. Software UART
27. FLASH

Features

Key features of the PIC18 MCU Peripheral Library include:

- Free library included with MCC18 compiler release
- The Peripheral Library contains a library file for each individual device from the PIC218 MCU family. The library file for each device includes functions corresponding to peripherals present in that particular device.
- The Peripheral Library also contains C include files that enable a user to take advantage of pre-defined constants for passing parameters to various library functions. There is an include file for each peripheral module.
- Since the functions are in the form of pre-compiled libraries, they may be called from a user application program written in either MCC18 or 8-bit PIC18 assembly language.
- The C source code is also included, so users can customize the functions to suit their specific application requirements if needed.
- The pre-defined constants in the C include files eliminates the need to refer to the details and structure of every Special Function Register while initializing peripherals or checking status bits.
- Library is developed considering the aspect of optimization, which upholds the ambit for the users effectively develop the application
- Library facilitates the easy integration of all peripheral module support in a single application
- Library cogitates the migration possibility among the PIC MCU with least possible or no modifications to the application layer.
- Comprehensive code examples making use of peripheral library support in application layer, to facilitate the use of peripheral library

Resource Requirements

Program Memory: The Peripheral Library functions have been optimized for reduced Program Memory usage. Since the functions are in the form of libraries, the actual Program Memory requirements depend on the functions being called by the application, as well as on the specific PIC18 device being used.

Data Memory: The vast majority of the functions do not use RAM at all. Each of the remaining functions uses less than 10 bytes of RAM.

Peripheral modules: Makes use of any other peripherals that are required to work in conjunction with the peripheral module in use as depicted in module architecture available in device data sheet.

3 SW Licence Agreement

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4 Release Notes

Introduction ([see page 2](#))

This chapter gives an overview of the MCC18 library files and pre compiled object files that can be included in an application.

Overview

A library is a collection of functions grouped for reference and ease of linking. The MCC18 libraries are included in the lib subdirectory of the installation. These can be linked directly into an application using the MPLINK linker.

These files were pre compiled in the ..\MCC18\lib directory at Microchip. The directory ..\MCC18\src\pmc_common..\ contains the library files.

Devices ([see page 11](#)) Supported

The following PIC18 devices are supported:

PIC18C242 ([see page 258](#)) PIC18C252 ([see page 257](#)) PIC18C442 ([see page 256](#)) PIC18C452 ([see page 255](#))
PIC18F242 ([see page 254](#)) PIC18F252 ([see page 253](#)) PIC18F442 ([see page 252](#)) PIC18F452 ([see page 251](#))
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PIC18F64J15 (see page 122) PIC18F84J15 (see page 121)
PIC18F8723 (see page 119) PIC18F6723 (see page 120)
PIC18F8493 (see page 117) PIC18F8393 (see page 117) PIC18F6493 (see page 118) PIC18F6393 (see page 119)
PIC18F8628 (see page 120) PIC18F6628 (see page 121)
PIC18F2458 (see page 116) PIC18F2553 (see page 116) PIC18F4458 (see page 115) PIC18F4553 (see page 115)
PIC18F13K50 (see page 109) PIC18F14K50 (see page 108) PIC18LF13K50 (see page 111) PIC18LF14K50 (see page 110)
PIC18F13K22 (see page 112) PIC18F14K22 (see page 111) PIC18LF13K22 (see page 114) PIC18LF14K22 (see page 113)
PIC18F24J50 (see page 84) PIC18F25J50 (see page 83) PIC18F26J50 (see page 82) PIC18F44J50 (see page 80)
PIC18F45J50 (see page 79) PIC18F46J50 (see page 78)
PIC18LF24J50 (see page 92) PIC18LF25J50 (see page 90) PIC18LF26J50 (see page 89) PIC18LF44J50 (see page 88)
PIC18LF45J50 (see page 87) PIC18LF46J50 (see page 85)

PIC18F25J11 (see page 98) PIC18F24J11 (see page 99) PIC18F26J11 (see page 97) PIC18F45J11 (see page 94)
PIC18F44J11 (see page 96) PIC18F46J11 (see page 93)

PIC18LF25J11 (see page 106) PIC18LF24J11 (see page 107) PIC18LF26J11 (see page 104) PIC18LF45J11 (see page 102)
PIC18LF44J11 (see page 103) PIC18LF46J11 (see page 101)

PIC18F66J90 (see page 76) PIC18F67J90 (see page 75) PIC18F86J90 (see page 73) PIC18F87J90 (see page 72)

PIC18F66J93 (see page 70) PIC18F67J93 (see page 69) PIC18F86J93 (see page 67) PIC18F87J93 (see page 66)

PIC18F87K90 (see page 58) PIC18F86K95 (see page 59) PIC18F86K90 (see page 60) PIC18F85K90 (see page 61)

PIC18F67K90 (see page 62) PIC18F66K95 (see page 63) PIC18F66K90 (see page 64) PIC18F65K90 (see page 65)

PIC18F87K22 (see page 44) PIC18F86K27 (see page 46) PIC18F86K22 (see page 45) PIC18F85K22 (see page 47)

PIC18F67K22 (see page 48) PIC18F66K27 (see page 50) PIC18F66K22 (see page 49) PIC18F65K22 (see page 51)

PIC18F86J72 (see page 56) PIC18F87J72 (see page 55) PIC18F96J72 (see page 53) PIC18F97J72 (see page 52)

PIC18F26J53 (see page 37) PIC18F27J53 (see page 36) PIC18F46J53 (see page 35) PIC18F47J53 (see page 34)

PIC18F66K80 (see page 22) PIC18F65K80 (see page 23) PIC18F46K80 (see page 24) PIC18F45K80 (see page 25)
PIC18F26K80 (see page 26) PIC18F25K80 (see page 27)

PIC18LF66K80 (see page 28) PIC18LF65K80 (see page 29) PIC18LF46K80 (see page 30) PIC18LF45K80 (see page 31)
PIC18LF26K80 (see page 32) PIC18LF25K80 (see page 33)

Installation

Peripheral Library comes along with MCC18 Compiler. No separate installation required for library.

What's New in this Release.

This support update to version 2.0.0 includes 12 new devices.

PIC18F26K22 (see page 267) PIC18F25K22 (see page 269) PIC18F24K22 (see page 271) PIC18F23K22 (see page 273)
PIC18LF26K22 (see page 268) PIC18LF25K22 (see page 270) PIC18LF24K22 (see page 272)
PIC18LF23K22 (see page 274)

PIC18F46K22 (see page 265) PIC18F45K22 (see page 259) PIC18F44K22 (see page 261) PIC18F43K22 (see page 263)
PIC18LF46K22 (see page 266) PIC18LF45K22 (see page 260) PIC18LF44K22 (see page 262)
PIC18LF43K22 (see page 264)

Migrating to Version 2.0.0

Existing projects can be migrated without modification.

Fixed Issues

- Flash (see page 1196) buffer window length in library

- PIC18F14K22 (see page 111)/50 Family ADC channel select macros

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. Technical support is available through the web site at: <http://support.microchip.com>

Microchip Technology Inc.

www.microchip.com

Voice: (480) 792-7200

Fax: (480) 792-7277

Microchip Technical Support : <http://support.microchip.com>

5 Getting Started

Using the Peripheral Libraries - PIC18 Family

These libraries provide a set of common interface functions to initialize and use peripheral modules on Microchip 8-bit microcontrollers. The libraries have been optimized for code size efficiency.

Building a Project with the Peripheral Library

Building an application which utilizes the 8-bit peripheral library support, requires the library file ".lib" file specific to device under use and a header file for each peripheral module. The archived library file contains all the individual object files for each library function. For each peripheral, the corresponding header file provides all the function prototypes, macros and typedefs used in the library.

The library files are of the form p18wxyz.lib or p18wxyz_e.lib (depending on executable/object file format selected during the compile operation). The library supports all the variants of PIC18 devices as given under the "Devices (see page 11)" heading.

The header files are of the form peripheral.h, where peripheral is the name of the particular peripheral being used (e.g., adc.h (see page 1207) for ADC Module). When linking an application, the library file (p18wxyz.lib or p18wxyz_e.lib) must be provided as an input to the linker (using the --library or -l linker switch) such that the functions used by the application may be linked into the application. The .lib file to be added to the Project window under Library files. When compiling an application, each header file must be referenced (using #include) by all source files which call a function in the library or use its symbols or typedefs.

5

Library Function Calling Convention

The peripheral library contains some functions that do not require any input arguments, some that require single values or variables as arguments, and some whose arguments can be expressed as a logical AND/AND-OR of several constants that are pre-defined in the header file.

Each constant included in any of these AND-ed expressions corresponds to the 8-bit mask for a possible selection for a certain bit or bit-field in a Special Function Register (SFR). Each argument, in turn, typically corresponds to the value written to an entire SFR. Thus, by logically combining chosen values for every bit-field in the SFR, the complete initialization value of the SFR is obtained.

To use the OR mask setting, you will need to define the macro (#define USE_OR_MASKS) at the beginning of application code prior to inclusion of respective peripheral header files using #include. In addition, the peripheral.h file provides macros xxx_MASK for each bitfield in an SFR. During runtime these macros can be used to clear bitfields. To clear a bitfield , bitwise AND the xxx_MASK with the current contents of the respective register.

Example: Use of xxx_MASK

```
AD1CON &= ADC_TAD_MASK; /* To Clear the bit field */  
AD1CON |= ADC_48_TAD; /* To Set the bit field to new value */
```

Note:

- To avoid inadvertently setting a register bit to an undesired state, please select one (and only one) constant from each group in the logical expression that generates the argument.
- While using the AND_MASK to pass the value to argument of a function, it is necessary to add the macros of all selection/settings with necessary configuration associated with that parameter

Rebuilding the Peripheral Library

The batch file makeall.bat may be used to remake the libraries. The default behavior is to build peripheral libraries for all supported target processors; however, you may select a particular processor to build by adding the device names under the list in the batch file.

For example:

1. At DOS prompt, go to the src directory (by default, it is ..\MCC18\src)
2. Edit the processor list for which the library has to be rebuilt.
3. Type makeall.bat
4. After execution, process ends with the text Build Successful.
5. After successful build it generates p18_____lib or p18_____e.lib files in the ..\MCC18\lib folder.

6 Devices

Devices with the Peripheral Library Support

PIC18F45K22_Family

PIC18F46K22 ([see page 258](#))

PIC18LF46K22 ([see page 258](#))

PIC18F45K22 ([see page 258](#))

PIC18LF45K22 ([see page 258](#))

PIC18F44K22 ([see page 258](#))

PIC18LF44K22 ([see page 258](#))

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PIC18F24K22 ([see page 258](#))

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PIC18F23K22 ([see page 258](#))

PIC18LF23K22 ([see page 258](#))

PIC18F66K80_Family

PIC18F66k80 ([see page 21](#))

PIC18F65k80 ([see page 21](#))

PIC18F46k80 ([see page 21](#))

PIC18F45k80 ([see page 21](#))

PIC18F26k80 ([see page 21](#))

PIC18F25k80 ([see page 21](#))

PIC18LF66k80 ([see page 21](#))

PIC18LF65k80 ([see page 21](#))

PIC18LF46k80 ([see page 21](#))

PIC18LF45k80 ([see page 21](#))

PIC18LF26k80 ([see page 21](#))

PIC18LF25k80 ([see page 21](#))

PIC18LF47J53_Family

PIC18LF26J53 (see page 287)
PIC18LF27J53 (see page 287)
PIC18LF46J53 (see page 299)
PIC18LF47J53 (see page 299)

PIC18F47J13_Family

PIC18F26J13 (see page 287)
PIC18F27J13 (see page 287)
PIC18F46J13 (see page 299)
PIC18F47J13 (see page 299)

PIC18F47J53_Family

PIC18F26J53 (see page 287)
PIC18F27J53 (see page 287)
PIC18F46J53 (see page 299)
PIC18F47J53 (see page 299)

PIC18F87K22_Family

PIC18F87K22 (see page 44)
PIC18F86K22 (see page 44)
PIC18F86K27 (see page 44)
PIC18F85K22 (see page 44)
PIC18F67K22 (see page 44)
PIC18F66K22 (see page 44)
PIC18F66K27 (see page 44)
PIC18F65K22 (see page 44)

PIC18F97J72_Family

PIC18F86J72 (see page 52)
PIC18F87J72 (see page 52)
PIC18F96J72 (see page 52)
PIC18F97J72 (see page 52)

PIC18F87K90_Family

PIC18F87K90 (see page 58)

PIC18F86K90 (see page 58)

PIC18F86K95 (see page 58)

PIC18F85K90 (see page 58)

PIC18F67K90 (see page 58)

PIC18F66K90 (see page 58)

PIC18F66K95 (see page 58)

PIC18F65K90 (see page 58)

PIC18F87J90_Family

PIC18F66J90 (see page 72)

PIC18F67J90 (see page 72)

PIC18F86J90 (see page 72)

PIC18F87J90 (see page 72)

PIC18F46J50_Family

PIC18F24J50 (see page 405)

PIC18F25J50 (see page 405)

PIC18F26J50 (see page 405)

PIC18F44J50 (see page 417)

PIC18F45J50 (see page 417)

PIC18F46J50 (see page 417)

PIC18LF46J50_Family

PIC18LF24J50 (see page 405)

PIC18LF25J50 (see page 405)

PIC18LF26J50 (see page 405)

PIC18LF44J50 (see page 417)

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PIC18F46J11_Family

PIC18F24J11 ([see page 431](#))

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PIC18F46J11 ([see page 443](#))

PIC18LF46J11_Family

PIC18LF24J11 ([see page 431](#))

PIC18LF25J11 ([see page 431](#))

PIC18LF26J11 ([see page 431](#))

PIC18LF44J11 ([see page 443](#))

PIC18LF45J11 ([see page 443](#))

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PIC18LF14K22_Family

PIC18LF13K22 ([see page 114](#))

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PIC18F14K22_Family

PIC18F13K22 ([see page 112](#))

PIC18F14K22 ([see page 111](#))

PIC18LF14K50_Family

PIC18LF13K50 ([see page 111](#))

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PIC18F13K50 ([see page 109](#))

PIC18F14K50 ([see page 108](#))

PIC18F4553_Family

PIC18F2458 ([see page 115](#))

PIC18F2553 ([see page 115](#))

PIC18F4458 (see page 115)

PIC18F4553 (see page 115)

PIC18F8493_Family

PIC18F6393 (see page 117)

PIC18F6493 (see page 117)

PIC18F8393 (see page 117)

PIC18F8493 (see page 117)

PIC18F8723_Family

PIC18F6628 (see page 119)

PIC18F6723 (see page 119)

PIC18F8628 (see page 119)

PIC18F8723 (see page 119)

PIC18F84J15_Family

PIC18F64J15 (see page 121)

PIC18F84J15 (see page 121)

PIC18F87J50_Family

PIC18F65J50 (see page 122)

PIC18F66J50 (see page 122)

PIC18F66J55 (see page 122)

PIC18F67J50 (see page 122)

PIC18F85J50 (see page 122)

PIC18F86J50 (see page 122)

PIC18F86J55 (see page 122)

PIC18F87J50 (see page 122)

PIC18F87J11_Family

PIC18F66J11 (see page 128)

PIC18F66J16 (see page 128)

PIC18F67J11 (see page 128)

PIC18F86J11 (see page 128)

PIC18F86J16 (see page 128)

PIC18F87J11 (see page 128)

PIC18F46K20_Family

PIC18F23K20 (see page 133)

PIC18F24K20 (see page 133)

PIC18F25K20 (see page 133)

PIC18F26K20 (see page 133)

PIC18F43K20 (see page 133)

PIC18F44K20 (see page 133)

PIC18F45K20 (see page 133)

PIC18F46K20 (see page 133)

PIC18F4431_Family

PIC18F2331 (see page 819)

PIC18F2431 (see page 819)

PIC18F4331 (see page 811)

PIC18F4431 (see page 811)

PIC18F97J60_Family

PIC18F66J60 (see page 143)

PIC18F66J65 (see page 143)

PIC18F67J60 (see page 143)

PIC18F86J60 (see page 143)

PIC18F86J65 (see page 143)

PIC18F87J60 (see page 143)

PIC18F96J60 (see page 143)

PIC18F96J65 (see page 143)

PIC18F97J60 (see page 143)

PIC18F87J10_Family

PIC18F65J10 (see page 150)

PIC18F65J15 (see page 150)

PIC18F66J10 (see page 150)

PIC18F66J15 (see page 150)

PIC18F67J10 (see page 150)

PIC18F85J10 (see page 150)

PIC18F85J15 (see page 150)

PIC18F86J10 (see page 150)

PIC18F86J15 (see page 150)

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PIC18F85J90_Family

PIC18F63J90 (see page 163)

PIC18F64J90 (see page 162)

PIC18F65J90 (see page 161)

PIC18F83J90 (see page 160)

PIC18F84J90 (see page 159)

PIC18F85J90 (see page 158)

PIC18F85J11_Family

PIC18F63J11 (see page 168)

PIC18F64J11 (see page 167)

PIC18F65J11 (see page 166)

PIC18F83J11 (see page 165)

PIC18F84J11 (see page 164)

PIC18F85J11 (see page 164)

PIC18F45J10_Family

PIC18F24J10 (see page 798)

PIC18F25J10 (see page 798)

PIC18F44J10 (see page 789)

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PIC18F8621_Family

PIC18F6525 (see page 172)

PIC18F6621 (see page 172)

PIC18F8525 (see page 172)

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PIC18F8680_Family

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PIC18F8585 (see page 176)

PIC18F8680 (see page 176)

PIC18F8722_Family

PIC18F6527 (see page 180)

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PIC18F6627 (see page 180)

PIC18F6722 (see page 180)

PIC18F8527 (see page 180)

PIC18F8622 (see page 180)

PIC18F8627 (see page 180)

PIC18F8722 (see page 180)

PIC18F8490_Family

PIC18F6390 (see page 186)

PIC18F6490 (see page 186)

PIC18F8390 (see page 186)

PIC18F8490 (see page 186)

PIC18F8410_Family

PIC18F6310 (see page 188)

PIC18F6410 (see page 188)

PIC18F8310 (see page 188)

PIC18F8410 (see page 188)

PIC18F4321_Family

PIC18F2221 (see page 643)

PIC18F2321 (see page 643)

PIC18F4221 (see page 635)

PIC18F4321 (see page 635)

PIC18F4685_Family

PIC18F2682 (see page 660)

PIC18F2685 (see page 660)

PIC18F4682 (see page 652)

PIC18F4685 (see page 652)

PIC18F4680_Family

PIC18F2585 (see page 660)

PIC18F2680 (see page 660)

PIC18F4585 (see page 652)

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PIC18F4620_Family

PIC18F2525 (see page 691)

PIC18F2620 (see page 691)

PIC18F4525 (see page 683)

PIC18F4620 (see page 683)

PIC18F4610_Family

PIC18F2410 (see page 675)

PIC18F2510 (see page 675)

PIC18F2515 (see page 675)

PIC18F2610 (see page 675)

PIC18F4410 (see page 668)

PIC18F4510 (see page 668)

PIC18F4515 (see page 668)

PIC18F4610 (see page 668)

PIC18F4580_Family

PIC18F2480 (see page 660)

PIC18F2580 (see page 660)

PIC18F4480 (see page 652)

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PIC18F4550_Family

PIC18F2455 (see page 217)

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PIC18F4455 (see page 215)

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PIC18F4450_Family

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PIC18F4523_Family

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PIC18F2523 (█ see page 222)

PIC18F4423 (█ see page 221)

PIC18F4523 (█ see page 220)

PIC18F4520_Family

PIC18F2420 (█ see page 227)

PIC18F2520 (█ see page 226)

PIC18F4420 (█ see page 225)

PIC18F4520 (█ see page 224)

PIC18F4320_Family

PIC18F2220 (█ see page 228)

PIC18F2320 (█ see page 228)

PIC18F4220 (█ see page 228)

PIC18F4320 (█ see page 228)

PIC18F1330_Family

PIC18F1230 (█ see page 230)

PIC18F1330 (█ see page 230)

PIC18F1320_Family

PIC18F1220 (█ see page 232)

PIC18F1320 (█ see page 232)

PIC18F8720_Family

PIC18F6520 (█ see page 233)

PIC18F6620 (█ see page 233)

PIC18F6720 (█ see page 233)

PIC18F8520 (█ see page 233)

PIC18F8620 (█ see page 233)

PIC18F8720 (█ see page 233)

PIC18C858_Family

PIC18C658 (see page 239)

PIC18C858 (see page 239)

PIC18C801_Family

PIC18C601 (see page 241)

PIC18C801 (see page 241)

PIC18F4539_Family

PIC18F2439 (see page 243)

PIC18F2539 (see page 243)

PIC18F4439 (see page 243)

PIC18F4539 (see page 243)

PIC18F458_Family

PIC18F248 (see page 768)

PIC18F258 (see page 768)

PIC18F448 (see page 776)

PIC18F458 (see page 776)

PIC18F452_Family

PIC18F242 (see page 251)

PIC18F252 (see page 251)

PIC18F442 (see page 251)

PIC18F452 (see page 251)

PIC18C452_Family

PIC18C242 (see page 254)

PIC18C252 (see page 254)

PIC18C442 (see page 254)

PIC18C452 (see page 254)

6.1 PIC18F66K80 Family

6.1.1 PIC18F66K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.2 PIC18F65K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.3 PIC18F46K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.4 PIC18F45K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.5 PIC18F26K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.6 PIC18F25K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.7 PIC18LF66K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.8 PIC18LF65K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.9 PIC18LF46K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.10 PIC18LF45K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.11 PIC18LF26K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.1.12 PIC18LF25K80

[CLICK HERE](#) (see page 275) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.2 PIC18F47Jx3 Family

6.2.1 PIC18F47J53

[CLICK HERE](#) (see page 299) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.2.2 PIC18F46J53

[CLICK HERE](#) (see page 299) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.2.3 PIC18F27J53

[CLICK HERE](#) (see page 287) for the Peripheral Library Support Details for this Device

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Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
- programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Master Synchronous Serial Port (MSSP) modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6

6.2.4 PIC18F26J53

[CLICK HERE](#) (see page 287) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.2.5 PIC18F47J13

[CLICK HERE](#) (see page 299) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.2.6 PIC18F46J13

[CLICK HERE](#) (see page 299) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.2.7 PIC18F26J13

[CLICK HERE](#) (see page 287) for the Peripheral Library Support Details for this Device

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Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
- programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Master Synchronous Serial Port (MSSP) modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6

6.2.8 PIC18F27J13

[CLICK HERE](#) (see page 287) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.3 PIC18F87K22 Family

6.3.1 PIC18F87K22

[CLICK HERE](#) (see page 356) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support

- Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.3.2 PIC18F86K22

[CLICK HERE](#) (see page 356) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
- Auto-Baud Detect (ABD)

- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.3.3 PIC18F86K27

[CLICK HERE](#) (see page 356) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:

- Auto-acquisition and Sleep operation

6.3.4 PIC18F85K22

[CLICK HERE](#) (see page 370) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.3.5 PIC18F67K22

[CLICK HERE](#) (see page 326) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
 - High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.3.6 PIC18F66K22

[CLICK HERE](#) (see page 326) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
 - High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.3.7 PIC18F66K27

[CLICK HERE](#) (see page 326) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
 - Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.3.8 PIC18F65K22

[CLICK HERE](#) (see page 342) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
 - High-current sink/source 25 mA/25 mA (PORTB and PORTC)
 - Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.4 PIC18F97J72 Family

6.4.1 PIC18F97J72

CLICK HERE ( see page 315) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)

Internal Oscillator Block with PLL:

- Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
- Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode

- One addressable USART module
- One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two analog comparators
- Programmable Reference Voltage for Comparators
- Hardware Real-Time Clock and Calendar (RTCC)
with Clock, Calendar and Alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ([see page 1196](#)) program memory, typical
- Flash ([see page 1196](#)) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash ([see page 1196](#)) program memory
for data EEPROM emulators

6.4.2 PIC18F96J72

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[CLICK HERE](#) ([see page 315](#)) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Low-Power Features:**

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz

- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
 - Up to four external interrupts
 - Four 8-Bit/16-Bit Timer/Counter modules
 - Two Capture/Compare/PWM (CCP) modules
 - Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
 - One addressable USART module
 - One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two analog comparators
 - Programmable Reference Voltage for Comparators
 - Hardware Real-Time Clock and Calendar (RTCC) with Clock, Calendar and Alarm functions
 - Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution
- Special Microcontroller Features:**
- 10,000 erase/write cycle Flash (see page 1196) program memory, typical

- Flash (see page 1196) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash (see page 1196) program memory
for data EEPROM emulators

6.4.3 PIC18F87J72

[CLICK HERE](#) (see page 315) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

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Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module
with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode

- One addressable USART module
- One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two analog comparators
- Programmable Reference Voltage for Comparators
- Hardware Real-Time Clock and Calendar (RTCC)
with Clock, Calendar and Alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ([see page 1196](#)) program memory, typical
- Flash ([see page 1196](#)) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash ([see page 1196](#)) program memory
for data EEPROM emulators

6.4.4 PIC18F86J72

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[CLICK HERE](#) ([see page 315](#)) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Low-Power Features:**

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz

- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
 - Up to four external interrupts
 - Four 8-Bit/16-Bit Timer/Counter modules
 - Two Capture/Compare/PWM (CCP) modules
 - Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
 - One addressable USART module
 - One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two analog comparators
 - Programmable Reference Voltage for Comparators
 - Hardware Real-Time Clock and Calendar (RTCC) with Clock, Calendar and Alarm functions
 - Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution
- Special Microcontroller Features:**
- 10,000 erase/write cycle Flash (see page 1196) program memory, typical

- Flash (see page 1196) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash (see page 1196) program memory
for data EEPROM emulators

6.5 PIC18F87K90 Family

6.5.1 PIC18F87K90

CLICK HERE (see page 356) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:

- 3/4-wire SPI (supports all four SPI modes)
- I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
- LIN/J2602 support
- Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.5.2 PIC18F86K95

[CLICK HERE](#) (see page 356) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)

- I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
- LIN/J2602 support
- Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.5.3 PIC18F86K90

[CLICK HERE](#) (see page 356) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode

- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.5.4 PIC18F85K90

[CLICK HERE](#) (see page 370) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:

- LIN/J2602 support
- Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.5.5 PIC18F67K90

[CLICK HERE](#) (see page 326) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support

- Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.5.6 PIC18F66K95

[CLICK HERE](#) (see page 326) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
- Auto-Baud Detect (ABD)

- 10-bit A/D converter with up to 24 channels:
 - Auto-acquisition and Sleep operation

6.5.7 PIC18F66K90

[CLICK HERE](#) (see page 326) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
 - Seven Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:

- Auto-acquisition and Sleep operation
-

6.5.8 PIC18F65K90

[CLICK HERE](#) (see page 342) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- Ten CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3,5,7 – 16-bit timer/counter
 - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three analog comparators
- Configurable reference clock output
- Hardware Real-Time Clock and Calendar (RTCC) module with clock, calendar and alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 10-bit A/D converter with up to 24 channels:
- Auto-acquisition and Sleep operation

6.6 PIC18F87J93 Family

6.6.1 PIC18F87J93

CLICK HERE ( see page 394) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)

Internal Oscillator Block with PLL:

- Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
- Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode

- One addressable USART module
- One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two analog comparators
- Programmable Reference Voltage for Comparators
- Hardware Real-Time Clock and Calendar (RTCC)
with Clock, Calendar and Alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ([see page 1196](#)) program memory, typical
- Flash ([see page 1196](#)) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash ([see page 1196](#)) program memory
for data EEPROM emulators

6.6.2 PIC18F86J93

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[CLICK HERE](#) ([see page 394](#)) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Low-Power Features:**

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz

- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
 - Up to four external interrupts
 - Four 8-Bit/16-Bit Timer/Counter modules
 - Two Capture/Compare/PWM (CCP) modules
 - Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
 - One addressable USART module
 - One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two analog comparators
 - Programmable Reference Voltage for Comparators
 - Hardware Real-Time Clock and Calendar (RTCC) with Clock, Calendar and Alarm functions
 - Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution
- Special Microcontroller Features:**
- 10,000 erase/write cycle Flash (see page 1196) program memory, typical

- Flash (see page 1196) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash (see page 1196) program memory
for data EEPROM emulators

6.6.3 PIC18F67J93

[CLICK HERE](#) (see page 394) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

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Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module
with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode

- One addressable USART module
- One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two analog comparators
- Programmable Reference Voltage for Comparators
- Hardware Real-Time Clock and Calendar (RTCC)
with Clock, Calendar and Alarm functions
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ([see page 1196](#)) program memory, typical
- Flash ([see page 1196](#)) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash ([see page 1196](#)) program memory
for data EEPROM emulators

6.6.4 PIC18F66J93

6

[CLICK HERE](#) ([see page 394](#)) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Low-Power Features:**

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz

- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
 - Up to four external interrupts
 - Four 8-Bit/16-Bit Timer/Counter modules
 - Two Capture/Compare/PWM (CCP) modules
 - Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
 - One addressable USART module
 - One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two analog comparators
 - Programmable Reference Voltage for Comparators
 - Hardware Real-Time Clock and Calendar (RTCC) with Clock, Calendar and Alarm functions
 - Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1 ns typical resolution
- Special Microcontroller Features:**
- 10,000 erase/write cycle Flash (see page 1196) program memory, typical

- Flash (see page 1196) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash (see page 1196) program memory
for data EEPROM emulators

6.7 PIC18F87J90 Family

6.7.1 PIC18F87J90

CLICK HERE (see page 384) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules

- Master Synchronous Serial Port (MSSP) module

with two modes of operation:

- 3-wire/4-wire SPI (supports all four SPI modes)

- I²C™ Master and Slave mode

- One addressable USART module

- One enhanced addressable USART module:

- LIN/J2602 support

- Auto-wake-up on Start bit and Break character

- Auto-Baud Detect (ABD)

- 10-Bit, up to 12-Channel A/D Converter:

- Auto-acquisition

- Conversion available during Sleep

- Two analog comparators

- Programmable Reference Voltage for Comparators

- Hardware Real-Time Clock and Calendar (RTCC)

with Clock, Calendar and Alarm functions

- Charge Time Measurement Unit (CTMU):

- Capacitance measurement

- Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ( see page 1196) program memory, typical

- Flash ( see page 1196) retention 20 years, minimum

- Self-programmable under software control

- Word write capability for Flash ( see page 1196) program memory for data EEPROM emulators

6.7.2 PIC18F86J90

CLICK HERE ( see page 384) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on

- Idle: CPU off, peripherals on

- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
- Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
 - One addressable USART module
 - One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two analog comparators
 - Programmable Reference Voltage for Comparators
 - Hardware Real-Time Clock and Calendar (RTCC) with Clock, Calendar and Alarm functions
 - Charge Time Measurement Unit (CTMU):
 - Capacitance measurement

- Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash (see page 1196) program memory, typical
- Flash (see page 1196) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash (see page 1196) program memory for data EEPROM emulators

6.7.3 PIC18F67J90

CLICK HERE (see page 384) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Low-Power Features:**

- Run: CPU on, peripherals on
- Idle: CPU off, peripherals on
- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
 - Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules

- Master Synchronous Serial Port (MSSP) module

with two modes of operation:

- 3-wire/4-wire SPI (supports all four SPI modes)

- I²C™ Master and Slave mode

- One addressable USART module

- One enhanced addressable USART module:

- LIN/J2602 support

- Auto-wake-up on Start bit and Break character

- Auto-Baud Detect (ABD)

- 10-Bit, up to 12-Channel A/D Converter:

- Auto-acquisition

- Conversion available during Sleep

- Two analog comparators

- Programmable Reference Voltage for Comparators

- Hardware Real-Time Clock and Calendar (RTCC)

with Clock, Calendar and Alarm functions

- Charge Time Measurement Unit (CTMU):

- Capacitance measurement

- Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ( see page 1196) program memory, typical

- Flash ( see page 1196) retention 20 years, minimum

- Self-programmable under software control

- Word write capability for Flash ( see page 1196) program memory for data EEPROM emulators

6.7.4 PIC18F66J90

CLICK HERE ( see page 384) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Low-Power Features:

- Run: CPU on, peripherals on

- Idle: CPU off, peripherals on

- Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Two Crystal modes, 4-25 MHz
- Two External Clock modes, Up to 48 MHz
- 4x Phase Lock Loop (PLL)
- Internal Oscillator Block with PLL:
- Eight user-selectable frequencies from 31.25 kHz to 8 MHz
- Secondary Oscillator using Timer1 at 32 kHz
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if peripheral clock fails

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire/4-wire SPI (supports all four SPI modes)
 - I²C™ Master and Slave mode
 - One addressable USART module
 - One enhanced addressable USART module:
 - LIN/J2602 support
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect (ABD)
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two analog comparators
 - Programmable Reference Voltage for Comparators
 - Hardware Real-Time Clock and Calendar (RTCC) with Clock, Calendar and Alarm functions
 - Charge Time Measurement Unit (CTMU):
 - Capacitance measurement

- Time measurement with 1 ns typical resolution

Special Microcontroller Features:

- 10,000 erase/write cycle Flash ([see page 1196](#)) program memory, typical
- Flash ([see page 1196](#)) retention 20 years, minimum
- Self-programmable under software control
- Word write capability for Flash ([see page 1196](#)) program memory for data EEPROM emulators

6.8 PIC18F46J50 Family

6.8.1 PIC18F46J50

[CLICK HERE](#) ([see page 417](#)) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers, programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash ([see page 1196](#)) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash ([see page 1196](#)) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts

- Four Input Change Interrupts

- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine

- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.8.2 PIC18F45J50

6

[CLICK HERE](#) (see page 417) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)
modules Supporting Three-Wire SPI (all four
modes) and I²C™ Master and Slave modes
- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel
Slave Port
- Two-Rail – Rail Analog Comparators with Input
Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.3 PIC18F44J50

CLICK HERE (see page 417) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.4 PIC18F26J50

[CLICK HERE](#) (see page 405) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write
Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)
modules:
 - Two Master Synchronous Serial Port (MSSP)
modules Supporting Three-Wire SPI (all four

modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port
- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module
- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.5 PIC18F25J50

[CLICK HERE](#) (see page 405) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers, programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts

- Four Input Change Interrupts

- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four

modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine

- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.8.6 PIC18F24J50

6

[CLICK HERE](#) (see page 405) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.7 PIC18LF46J50

CLICK HERE (see page 417) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.8 PIC18LF45J50

[CLICK HERE](#) (see page 417) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write
Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)
modules:
 - Two Master Synchronous Serial Port (MSSP)
modules Supporting Three-Wire SPI (all four

modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine

- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.8.9 PIC18LF44J50

[CLICK HERE](#) (see page 417) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts

- Four Input Change Interrupts

- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine

- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.8.10 PIC18LF26J50

6

[CLICK HERE](#) (see page 405) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.11 PIC18LF25J50

CLICK HERE (see page 405) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6.8.12 PIC18LF24J50

[CLICK HERE](#) (see page 405) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write
Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)
modules:
 - Two Master Synchronous Serial Port (MSSP)
modules Supporting Three-Wire SPI (all four

modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine

- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9 PIC18F46J11 Family

6.9.1 PIC18F46J11

CLICK HERE ([***see page 443\)*** *for the Peripheral Library Support Details for this Device*](#)

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash ([\(see page 1196\)](#) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.2 PIC18F45J11

[CLICK HERE](#) (see page 443) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.3 PIC18F44J11

[CLICK HERE](#) (see page 443) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.4 PIC18F26J11

[CLICK HERE](#) (see page 431) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.5 PIC18F25J11

[CLICK HERE](#) (see page 431) for the Peripheral Library Support Details for this Device

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Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers, programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Master Synchronous Serial Port (MSSP) modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6

6.9.6 PIC18F24J11

[CLICK HERE](#) (see page 431) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.7 PIC18LF46J11

[CLICK HERE](#) (see page 443) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.8 PIC18LF45J11

[CLICK HERE](#) (see page 443) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.9 PIC18LF44J11

[CLICK HERE](#) (see page 443) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
- programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Master Synchronous Serial Port (MSSP) modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input Multiplexing
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
- Two Enhanced USART modules:
- Auto-Baud Detect

6

6.9.10 PIC18LF26J11

[CLICK HERE](#) (see page 431) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**nanoWatt XLP™ for Extreme Low-Power:**

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.11 PIC18LF25J11

[CLICK HERE](#) (see page 431) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,
- Able to wake-up on external triggers,
programmable WDT or RTCC alarm
- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)
- Low-Power, High-Speed CMOS Flash (see page 1196) Technology
- C Compiler Optimized Architecture for Re-entrant Code
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:
- Hardware Real-Time Clock and Calendar (RTCC):
- High-Current Sink/Source 25 mA/25 mA
(PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four
modes) and I2C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.9.12 PIC18LF24J11

[CLICK HERE](#) (see page 431) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

nanoWatt XLP™ for Extreme Low-Power:

- Deep Sleep mode: CPU off, Peripherals off,

- Able to wake-up on external triggers,

programmable WDT or RTCC alarm

- Ultra Low-Power Wake-up (ULPWU)

Special Microcontroller Features:

- 5.5V Tolerant Inputs (digital only pins)

- Low-Power, High-Speed CMOS Flash (see page 1196) Technology

- C Compiler Optimized Architecture for Re-entrant Code

- Priority Levels for Interrupts

- Self-Programmable under Software Control

- 8 x 8 Single-Cycle Hardware Multiplier

- Extended Watchdog Timer (WDT):

- Flash (see page 1196) Program Memory of 10,000 Erase/Write

Cycles Minimum and 20-Year Data Retention

Peripheral Highlights:

- Peripheral Pin Select:

- Hardware Real-Time Clock and Calendar (RTCC):

- High-Current Sink/Source 25 mA/25 mA

(PORTB and PORTC)

- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Enhanced Capture/Compare/PWM (ECCP)

modules:

- Two Master Synchronous Serial Port (MSSP)

modules Supporting Three-Wire SPI (all four modes) and I²C™ Master and Slave modes

- Full-Duplex Master/Slave SPI DMA Engine
- 8-Bit Parallel Master Port/Enhanced Parallel

Slave Port

- Two-Rail – Rail Analog Comparators with Input

Multiplexing

- 10-Bit, up to 13-Channel Analog-to-Digital (A/D)

Converter module

- High/Low-Voltage Detect module

- Charge Time Measurement Unit (CTMU):

- Two Enhanced USART modules:

- Auto-Baud Detect

6.10 PIC18F1xK50 Family

6.10.1 PIC18F14K50

[CLICK HERE](#) (see page 457) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module

- Enhanced Capture/Compare/PWM (ECCP)

module:

- Master Synchronous Serial Port (MSSP) module

supporting 3-wire SPI (all 4 modes) and I₂C™

Master and Slave modes with address mask

- Enhanced Addressable USART module

- 10-bit, up to 9-channel Analog-to-Digital

Converter module (ADC)

- Dual analog comparators

- Programmable On-Chip Voltage Reference

(CVREF) module (% of VDD) or 1.024V Fixed

Voltage Reference (FVR)

- On-chip 3.2V LDO Regulator (PIC18F1XK50

devices only)

6.10.2 PIC18F13K50

[CLICK HERE](#) (see page 457) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA

- Three programmable external interrupts

- 7 independent input-change interrupts

- 7 independent weak pull-ups

- Programmable slew rate

- Capture/Compare/PWM (CCP) module

- Enhanced Capture/Compare/PWM (ECCP)

module:

- Master Synchronous Serial Port (MSSP) module

supporting 3-wire SPI (all 4 modes) and I₂C™

Master and Slave modes with address mask

- Enhanced Addressable USART module

- 10-bit, up to 9-channel Analog-to-Digital

Converter module (ADC)

- Dual analog comparators
- Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
- On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.10.3 PIC18LF14K50

[CLICK HERE](#) (see page 457) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I₂C™ Master and Slave modes with address mask
 - Enhanced Addressable USART module
 - 10-bit, up to 9-channel Analog-to-Digital Converter module (ADC)
 - Dual analog comparators
 - Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
 - On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.10.4 PIC18LF13K50

[CLICK HERE](#) (see page 457) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes with address mask
 - Enhanced Addressable USART module
 - 10-bit, up to 9-channel Analog-to-Digital Converter module (ADC)
 - Dual analog comparators
 - Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
 - On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.11 PIC18F1xK22 Family

6.11.1 PIC18F14K22

[CLICK HERE](#) (see page 465) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I₂C™ Master and Slave modes with address mask
 - Enhanced Addressable USART module
 - 10-bit, up to 9-channel Analog-to-Digital Converter module (ADC)
 - Dual analog comparators
 - Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
 - On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.11.2 PIC18F13K22

[CLICK HERE](#) (see page 465) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups

- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module:
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes with address mask
- Enhanced Addressable USART module
- 10-bit, up to 9-channel Analog-to-Digital Converter module (ADC)
- Dual analog comparators
- Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
- On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.11.3 PIC18LF14K22

[CLICK HERE](#) (see page 465) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module:
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes with address mask
- Enhanced Addressable USART module

- 10-bit, up to 9-channel Analog-to-Digital Converter module (ADC)
- Dual analog comparators
- Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
- On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.11.4 PIC18LF13K22

[CLICK HERE](#) (see page 465) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- 7 independent input-change interrupts
- 7 independent weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP)

module:

- Master Synchronous Serial Port (MSSP) module

supporting 3-wire SPI (all 4 modes) and I²C™

Master and Slave modes with address mask

- Enhanced Addressable USART module
- 10-bit, up to 9-channel Analog-to-Digital

Converter module (ADC)

- Dual analog comparators
- Programmable On-Chip Voltage Reference (CVREF) module (% of VDD) or 1.024V Fixed Voltage Reference (FVR)
- On-chip 3.2V LDO Regulator (PIC18F1XK50 devices only)

6.12 PIC18F4553 Family

6.12.1 PIC18F4553

[CLICK HERE](#) (see page 474) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
- Enhanced Capture/Compare/PWM (ECCP) module:
- Enhanced USART module:
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I2C?
- Master and Slave modes
- 12-Bit, up to 13-Channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.12.2 PIC18F4458

[CLICK HERE](#) (see page 474) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
- Enhanced Capture/Compare/PWM (ECCP) module:

- Enhanced USART module:
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I2C?
- Master and Slave modes
- 12-Bit, up to 13-Channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.12.3 PIC18F2553

[CLICK HERE](#) (see page 474) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
- Enhanced Capture/Compare/PWM (ECCP) module:
- Enhanced USART module:
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I2C?
- Master and Slave modes
- 12-Bit, up to 13-Channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.12.4 PIC18F2458

[CLICK HERE](#) (see page 474) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)

- Up to 2 Capture/Compare/PWM (CCP) modules:
- Enhanced Capture/Compare/PWM (ECCP) module:
- Enhanced USART module:
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I2C?
 - Master and Slave modes
 - 12-Bit, up to 13-Channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
 - Dual Analog Comparators with Input Multiplexing

6.13 PIC18F8493 Family

6.13.1 PIC18F8493

CLICK HERE ( see page 482) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- 12-Bit, Up to 12-Channel Analog-to-Digital (A/D) Converter module:
- High-Current Sink/Source 25 mA/25 mA
- Four External Interrupts
- Four Input Change Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Real-Time Clock (RTC) Software module:
- Up to Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module Supporting Three-Wire SPI (all four modes) and I2C? Master and Slave modes
- Addressable USART module:
- Enhanced Addressable USART module:
- Dual Analog Comparators with Input Multiplexing

6.13.2 PIC18F8393

[CLICK HERE](#) (see page 482) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- 12-Bit, Up to 12-Channel Analog-to-Digital (A/D) Converter module:
- High-Current Sink/Source 25 mA/25 mA
- Four External Interrupts
- Four Input Change Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Real-Time Clock (RTC) Software module:
- Up to Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module

Supporting Three-Wire SPI (all four modes) and

I2C? Master and Slave modes

- Addressable USART module:
- Enhanced Addressable USART module:
- Dual Analog Comparators with Input Multiplexing

6.13.3 PIC18F6493

[CLICK HERE](#) (see page 482) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- 12-Bit, Up to 12-Channel Analog-to-Digital (A/D) Converter module:
- High-Current Sink/Source 25 mA/25 mA
- Four External Interrupts
- Four Input Change Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Real-Time Clock (RTC) Software module:
- Up to Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module

Supporting Three-Wire SPI (all four modes) and

I2C? Master and Slave modes

- Addressable USART module:
- Enhanced Addressable USART module:
- Dual Analog Comparators with Input Multiplexing

6.13.4 PIC18F6393

[CLICK HERE](#) (see page 482) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- 12-Bit, Up to 12-Channel Analog-to-Digital (A/D) Converter module:
- High-Current Sink/Source 25 mA/25 mA
- Four External Interrupts
- Four Input Change Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Real-Time Clock (RTC) Software module:
- Up to Two Capture/Compare/PWM (CCP) modules
- Master Synchronous Serial Port (MSSP) module

Supporting Three-Wire SPI (all four modes) and

I2C? Master and Slave modes

- Addressable USART module:
- Enhanced Addressable USART module:
- Dual Analog Comparators with Input Multiplexing

6.14 PIC18F8723 Family

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6.14.1 PIC18F8723

[CLICK HERE](#) (see page 491) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- 12-Bit, Up to 16-Channel Analog-to-Digital
- Converter module (A/D):
- Two Master Synchronous Serial Port (MSSP) modules supporting 2/3/4-Wire SPI (all four modes) and I2C Master and Slave modes
- Two Capture/Compare/PWM (CCP) modules

- Three Enhanced Capture/Compare/PWM (ECCP) modules:
- Two Enhanced Addressable USART modules:
- Dual Analog Comparators with Input Multiplexing
- High-Current Sink/Source 25 mA/25 mA
- Four Programmable External Interrupts
- Four Input Change Interrupts

6.14.2 PIC18F8628

[CLICK HERE \(see page 491\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-**Peripheral Highlights:**

- 12-Bit, Up to 16-Channel Analog-to-Digital
- Converter module (A/D):
- Two Master Synchronous Serial Port (MSSP) modules supporting 2/3/4-Wire SPI (all four modes) and I2C Master and Slave modes
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
- Two Enhanced Addressable USART modules:
- Dual Analog Comparators with Input Multiplexing
- High-Current Sink/Source 25 mA/25 mA
- Four Programmable External Interrupts
- Four Input Change Interrupts

6.14.3 PIC18F6723

[CLICK HERE \(see page 491\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-**Peripheral Highlights:**

- 12-Bit, Up to 16-Channel Analog-to-Digital
- Converter module (A/D):
- Two Master Synchronous Serial Port (MSSP) modules supporting 2/3/4-Wire SPI (all four modes) and I2C Master and Slave modes
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:

- Two Enhanced Addressable USART modules:
- Dual Analog Comparators with Input Multiplexing
- High-Current Sink/Source 25 mA/25 mA
- Four Programmable External Interrupts
- Four Input Change Interrupts

6.14.4 PIC18F6628

[CLICK HERE](#) (see page 491) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- 12-Bit, Up to 16-Channel Analog-to-Digital
- Converter module (A/D):
- Two Master Synchronous Serial Port (MSSP) modules supporting 2/3/4-Wire SPI (all four modes) and I2C Master and Slave modes
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
- Two Enhanced Addressable USART modules:
- Dual Analog Comparators with Input Multiplexing
- High-Current Sink/Source 25 mA/25 mA
- Four Programmable External Interrupts
- Four Input Change Interrupts

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6.15 PIC18F84J15 Family

6.15.1 PIC18F84J15

[CLICK HERE](#) (see page 501) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
(PORTB and PORTC)

- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²CTM Master and Slave modes
- Two Enhanced Addressable USART modules
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
- Dual analog comparators with input multiplexing

6.15.2 PIC18F64J15

[CLICK HERE](#) (see page 501) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
(PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²CTM Master and Slave modes
- Two Enhanced Addressable USART modules
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
- Dual analog comparators with input multiplexing

6.16 PIC18F87J50 Family

6.16.1 PIC18F87J50

[CLICK HERE \(see page 511\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.16.2 PIC18F86J55

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[CLICK HERE \(see page 511\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs

- Selectable polarity
- Programmable dead time
- Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect

6.16.3 PIC18F86J50

[CLICK HERE](#) (see page 511) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:

- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect

6.16.4 PIC18F85J50

[CLICK HERE](#) (see page 511) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.16.5 PIC18F67J50

[CLICK HERE](#) (see page 511) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.16.6 PIC18F66J55

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[CLICK HERE](#) (see page 511) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time

- Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect

6.16.7 PIC18F66J50

[CLICK HERE](#) (see page 511) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
- One, two or four PWM outputs
- Selectable polarity
- Programmable dead time
- Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit

- Auto-Baud Detect

6.16.8 PIC18F65J50

CLICK HERE ( see page 511) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.17 PIC18F87J11 Family

6.17.1 PIC18F87J11

[CLICK HERE \(see page 522\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.17.2 PIC18F86J16

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[CLICK HERE \(see page 522\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs

- Selectable polarity
- Programmable dead time
- Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect

6.17.3 PIC18F86J11

[CLICK HERE](#) (see page 522) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:

- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect

6.17.4 PIC18F67J11

[CLICK HERE](#) (see page 522) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.17.5 PIC18F66J16

[CLICK HERE](#) (see page 522) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect

6.17.6 PIC18F66J11

6

[CLICK HERE](#) (see page 522) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25mA (PORTB and PORTC)
- Four Programmable External Interrupts
- Four Input Change Interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time

- Auto-shutdown and auto-restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-Wire SPI (all 4 modes) and I2C? Master and Slave modes
- 8-Bit Parallel Master Port/Enhanced Parallel Slave Port with 16 Address Lines
- Dual Analog Comparators with Input Multiplexing Peripheral Highlights (continued):
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect

6.18 PIC18F46K20 Family

6.18.1 PIC18F46K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
- One, two or four PWM outputs
- Selectable polarity
- Programmable dead time
- Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)

- I²C™ Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
- Supports RS-485, RS-232 and LIN
- RS-232 operation using internal oscillator
- Auto-Wake-up on Break
- Auto-Baud Detect

6.18.2 PIC18F45K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
- One, two or four PWM outputs
- Selectable polarity
- Programmable dead time
- Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²C™ Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
- Supports RS-485, RS-232 and LIN
- RS-232 operation using internal oscillator
- Auto-Wake-up on Break
- Auto-Baud Detect

6.18.3 PIC18F44K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²C™ Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
 - Supports RS-485, RS-232 and LIN
 - RS-232 operation using internal oscillator
 - Auto-Wake-up on Break
 - Auto-Baud Detect

6.18.4 PIC18F43K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²CTM Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
 - Supports RS-485, RS-232 and LIN
 - RS-232 operation using internal oscillator
 - Auto-Wake-up on Break
 - Auto-Baud Detect

6.18.5 PIC18F26K20

6

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
 - One, two or four PWM outputs

- Selectable polarity
- Programmable dead time
- Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²CTM Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
- Supports RS-485, RS-232 and LIN
- RS-232 operation using internal oscillator
- Auto-Wake-up on Break
- Auto-Baud Detect

6.18.6 PIC18F25K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
- One, two or four PWM outputs
- Selectable polarity
- Programmable dead time
- Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²CTM Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
- Supports RS-485, RS-232 and LIN
- RS-232 operation using internal oscillator

- Auto-Wake-up on Break
 - Auto-Baud Detect
-

6.18.7 PIC18F24K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²CTM Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
 - Supports RS-485, RS-232 and LIN
 - RS-232 operation using internal oscillator
- Auto-Wake-up on Break
- Auto-Baud Detect

6.18.8 PIC18F23K20

[CLICK HERE](#) (see page 533) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- Up to 35 I/O pins plus 1 input-only pin:
- High-Current Sink/Source 25 mA/25 mA
- Three programmable external interrupts
- Four programmable interrupt-on-change
- Eight programmable weak pull-ups
- Programmable slew rate
- Capture/Compare/PWM (CCP) module
- Enhanced CCP (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module
- 3-wire SPI (supports all 4 modes)
- I²C™ Master and Slave modes with address mask
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART) module:
 - Supports RS-485, RS-232 and LIN
 - RS-232 operation using internal oscillator
 - Auto-Wake-up on Break
 - Auto-Baud Detect

6.19 PIC18F4431 Family

6.19.1 PIC18F4431

[CLICK HERE](#) (see page 811) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Two Capture/Compare/PWM (CCP) modules:

- Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
- Compare is 16-bit, max. resolution 100 ns (TCY)
- PWM output: PWM resolution is 1 to 10 bits
- Enhanced USART module:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect
- RS-232 Operation using Internal Oscillator Block
(no external crystal required)

High-Speed, 200 kspS 10-Bit A/D Converter:

- Up to 9 Channels
- Simultaneous, Two-Channel Sampling
- Sequential Sampling: 1, 2 or 4 Selected Channels
- Auto-Conversion Capability
- 4-Word FIFO with Selectable Interrupt Frequency
- Selectable External Conversion Triggers
- Programmable Acquisition Time

14-Bit Power Control PWM Module:

- Up to 4 Channels with Complementary Outputs
- Edge or Center-Aligned Operation
- Flexible Dead-Band Generator
- Hardware Fault Protection Inputs
- Simultaneous Update of Duty Cycle and Period:
- Flexible Special Event Trigger output

6.19.2 PIC18F4331

[CLICK HERE](#) (see page 811) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)

- PWM output: PWM resolution is 1 to 10 bits
- Enhanced USART module:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect
- RS-232 Operation using Internal Oscillator Block
(no external crystal required)

High-Speed, 200 ksps 10-Bit A/D Converter:

- Up to 9 Channels
- Simultaneous, Two-Channel Sampling
- Sequential Sampling: 1, 2 or 4 Selected Channels
- Auto-Conversion Capability
- 4-Word FIFO with Selectable Interrupt Frequency
- Selectable External Conversion Triggers
- Programmable Acquisition Time

14-Bit Power Control PWM Module:

- Up to 4 Channels with Complementary Outputs
- Edge or Center-Aligned Operation
- Flexible Dead-Band Generator
- Hardware Fault Protection Inputs
- Simultaneous Update of Duty Cycle and Period:
 - Flexible Special Event Trigger output

6.19.3 PIC18F2431

6

[CLICK HERE](#) (see page 819) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10 bits
- Enhanced USART module:

- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect
- RS-232 Operation using Internal Oscillator Block
(no external crystal required)

High-Speed, 200 ksps 10-Bit A/D Converter:

- Up to 9 Channels
- Simultaneous, Two-Channel Sampling
- Sequential Sampling: 1, 2 or 4 Selected Channels
- Auto-Conversion Capability
- 4-Word FIFO with Selectable Interrupt Frequency
- Selectable External Conversion Triggers
- Programmable Acquisition Time

14-Bit Power Control PWM Module:

- Up to 4 Channels with Complementary Outputs
- Edge or Center-Aligned Operation
- Flexible Dead-Band Generator
- Hardware Fault Protection Inputs
- Simultaneous Update of Duty Cycle and Period:
 - Flexible Special Event Trigger output

6.19.4 PIC18F2331

6

[CLICK HERE](#) (see page 819) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10 bits
- Enhanced USART module:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit

- Auto-Baud Detect
- RS-232 Operation using Internal Oscillator Block
(no external crystal required)

High-Speed, 200 ksps 10-Bit A/D Converter:

- Up to 9 Channels
- Simultaneous, Two-Channel Sampling
- Sequential Sampling: 1, 2 or 4 Selected Channels
- Auto-Conversion Capability
- 4-Word FIFO with Selectable Interrupt Frequency
- Selectable External Conversion Triggers
- Programmable Acquisition Time

14-Bit Power Control PWM Module:

- Up to 4 Channels with Complementary Outputs
- Edge or Center-Aligned Operation
- Flexible Dead-Band Generator
- Hardware Fault Protection Inputs
- Simultaneous Update of Duty Cycle and Period:
 - Flexible Special Event Trigger output

6.20 PIC18F97J60 Family

6.20.1 PIC18F97J60

6

[CLICK HERE](#) (see page 560) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity

- Programmable dead time
- Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-wake-up on Start bit
- Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
(100-pin devices only)

6.20.2 PIC18F96J65

[CLICK HERE](#) (see page 560) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)

- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
 - (100-pin devices only)

6.20.3 PIC18F96J60

[CLICK HERE](#) (see page 560) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
 - (100-pin devices only)

6.20.4 PIC18F87J60

[CLICK HERE](#) (see page 551) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
 - (100-pin devices only)

6.20.5 PIC18F86J65

[CLICK HERE](#) (see page 551) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
 - (100-pin devices only)

6.20.6 PIC18F86J60

6

[CLICK HERE](#) (see page 551) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs

- Selectable polarity
- Programmable dead time
- Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
 - (100-pin devices only)

6.20.7 PIC18F67J60

[CLICK HERE](#) (see page 542) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit

- Auto-Baud Detect (ABD)
 - 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
 - Parallel Slave Port (PSP) module
- (100-pin devices only)

6.20.8 PIC18F66J65

[CLICK HERE](#) (see page 542) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
 - Five Timer modules (Timer0 to Timer4)
 - Four External Interrupt pins
 - Two Capture/Compare/PWM (CCP) modules
 - Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
 - Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
 - Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
 - 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
 - Parallel Slave Port (PSP) module
- (100-pin devices only)

6.20.9 PIC18F66J60

[CLICK HERE](#) (see page 542) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA on PORTB and PORTC
- Five Timer modules (Timer0 to Timer4)
- Four External Interrupt pins
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to Two Master Synchronous Serial Port (MSSP) modules supporting SPI (all 4 modes) and I²C™ Master and Slave modes
- Up to Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-wake-up on Start bit
 - Auto-Baud Detect (ABD)
- 10-Bit, Up to 16-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Parallel Slave Port (PSP) module
 - (100-pin devices only)

6

6.21 PIC18F87J10 Family

6.21.1 PIC18F87J10

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.2 PIC18F86J15

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.3 PIC18F86J10

6

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time

- Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
- Supports RS-485, RS-232 and LIN 1.2
- Auto-Wake-up on Start bit
- Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
- Auto-acquisition capability
- Conversion available during Sleep
- Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.4 PIC18F85J15

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability

- Conversion available during Sleep
- Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.5 PIC18F85J10

[CLICK HERE \(see page 570\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.6 PIC18F67J10

[CLICK HERE \(see page 570\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-**Peripheral Highlights:**

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.7 PIC18F66J15

6

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:

- One, two or four PWM outputs
- Selectable polarity
- Programmable dead time
- Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.8 PIC18F66J10

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit

- Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
- Auto-acquisition capability
- Conversion available during Sleep
- Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.9 PIC18F65J15

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
- Auto-acquisition capability
- Conversion available during Sleep
- Self-calibration feature
- Dual analog comparators with input multiplexing

6.21.10 PIC18F65J10

[CLICK HERE](#) (see page 570) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Self-calibration feature
- Dual analog comparators with input multiplexing

6.22 PIC18F85J90 Family

6.22.1 PIC18F85J90

[CLICK HERE \(see page 580\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²CTM Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.22.2 PIC18F84J90

6

[CLICK HERE \(see page 580\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA

- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.22.3 PIC18F83J90

6

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)

- PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
- 3-wire/4-wire SPI (supports all 4 SPI modes)
- I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
- Supports LIN 1.2
- Auto-wake-up on Start bit and Break character
- Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
- Auto-acquisition
- Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.22.4 PIC18F65J90

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
- 3-wire/4-wire SPI (supports all 4 SPI modes)
- I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:

- Supports LIN 1.2
- Auto-wake-up on Start bit and Break character
- Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
- Auto-acquisition
- Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.22.5 PIC18F64J90

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²CTM Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep

- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.22.6 PIC18F63J90

CLICK HERE ( see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.23 PIC18F85J11 Family

6.23.1 PIC18F85J11

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²CTM Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.23.2 PIC18F84J11

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.23.3 PIC18F83J11

6

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules

- Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.23.4 PIC18F65J11

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
- Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:

- 3-wire/4-wire SPI (supports all 4 SPI modes)
- I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.23.5 PIC18F64J11

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character

- Auto-Baud Detect
 - 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
 - Two Analog Comparators
 - Programmable Reference Voltage for Comparators
-

6.23.6 PIC18F63J11

[CLICK HERE](#) (see page 580) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.24 PIC18F45J10 Family

6.24.1 PIC18F45J10

[CLICK HERE](#) (see page 789) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²CTM Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.24.2 PIC18F44J10

[CLICK HERE](#) (see page 789) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²CTM Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.24.3 PIC18F25J10

[CLICK HERE](#) (see page 798) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules
 - Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.24.4 PIC18F24J10

[CLICK HERE](#) (see page 798) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source: 25 mA/25 mA (PORTB and PORTC)
- Sleep current as low as 100nA
- Up to Four External Interrupts
- Four 8-Bit/16-Bit Timer/Counter modules

- Uses Timer1
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is up to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of Operation:
 - 3-wire/4-wire SPI (supports all 4 SPI modes)
 - I²C™ Master and Slave mode
- One Addressable USART module
- One Enhanced USART module:
 - Supports LIN 1.2
 - Auto-wake-up on Start bit and Break character
 - Auto-Baud Detect
- 10-Bit, up to 12-Channel A/D Converter:
 - Auto-acquisition
 - Conversion available during Sleep
- Two Analog Comparators
- Programmable Reference Voltage for Comparators

6.25 PIC18F8621 Family

6.25.1 PIC18F8621

6

[CLICK HERE](#) (see page 589) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter

- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.25.2 PIC18F8525

6

[CLICK HERE](#) (see page 589) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter

- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.25.3 PIC18F6621

6

[CLICK HERE](#) (see page 589) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3

- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.25.4 PIC18F6525

6

[CLICK HERE](#) ( see page 589) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:

- Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
- Compare is 16-bit, max. resolution 100 ns (TCY)
- PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.26 PIC18F8680 Family

6.26.1 PIC18F8680

6

[CLICK HERE](#) (see page 599) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter

- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.26.2 PIC18F8585

6

[CLICK HERE](#) (see page 599) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter

- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.26.3 PIC18F6680

6

[CLICK HERE](#) (see page 599) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter

- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.26.4 PIC18F6585

6

[CLICK HERE](#) (see page 599) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter

- Secondary oscillator clock option – Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: 1 to 10-bit PWM resolution
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
 - Same Capture/Compare features as CCP
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown on external event
 - Auto-Restart
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 2/3/4-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced USART modules:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Rate Detect
- Parallel Slave Port (PSP) module

6.27 PIC18F8722 Family

6.27.1 PIC18F8722

[CLICK HERE](#) (see page 607) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):

- One, two or four PWM outputs
- Programmable dead time
- Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.2 PIC18F8627

[CLICK HERE](#) (see page 607) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.3 PIC18F8622

[CLICK HERE \(see page 607\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²CTM Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.4 PIC18F8527

[CLICK HERE \(see page 607\) for the Peripheral Library Support Details for this Device](#)

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):

- One, two or four PWM outputs
- Programmable dead time
- Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.5 PIC18F6722

[CLICK HERE](#) (see page 607) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.6 PIC18F6627

[CLICK HERE](#) (see page 607) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²CTM Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.7 PIC18F6622

[CLICK HERE](#) (see page 607) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):

- One, two or four PWM outputs
- Programmable dead time
- Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.27.8 PIC18F6527

[CLICK HERE](#) (see page 607) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module

6.28 PIC18F8490 Family

6.28.1 PIC18F8490

[CLICK HERE](#) (see page 618) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.28.2 PIC18F8390

[CLICK HERE](#) (see page 618) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA

- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.28.3 PIC18F6490

[CLICK HERE](#) (see page 618) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep

- Dual Analog Comparators with Input Multiplexing
-

6.28.4 PIC18F6390

[CLICK HERE](#) (see page 618) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6

6.29 PIC18F8410 Family

6.29.1 PIC18F8410

[CLICK HERE](#) (see page 626) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.29.2 PIC18F8310

[CLICK HERE](#) (see page 626) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:

- Conversion available during Sleep
 - Dual Analog Comparators with Input Multiplexing
-

6.29.3 PIC18F6410

[CLICK HERE](#) (see page 626) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.29.4 PIC18F6310

[CLICK HERE](#) (see page 626) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts

- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.30 PIC18F4321 Family

6.30.1 PIC18F4321

[CLICK HERE](#) (see page 635) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- Four input change interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.2

- RS-232 operation using internal oscillator block (no external crystal required)
- Auto-Wake-up on Start bit
- Auto-Baud Detect
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
 - Dual analog comparators with input multiplexing
 - Programmable 16-level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.30.2 PIC18F4221

[CLICK HERE](#) (see page 635) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- Four input change interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²CTM Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.2
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep

- Dual analog comparators with input multiplexing

- Programmable 16-level High/Low-Voltage

Detection (HLVD) module:

- Supports interrupt on High/Low-Voltage Detection

6.30.3 PIC18F2321

[CLICK HERE](#) (see page 643) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA

- Three programmable external interrupts

- Four input change interrupts

- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)

- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):

- One, two or four PWM outputs

- Selectable polarity

- Programmable dead time

- Auto-Shutdown and Auto-Restart

- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes

- Enhanced Addressable USART module:

- Supports RS-485, RS-232 and LIN 1.2

- RS-232 operation using internal oscillator block (no external crystal required)

- Auto-Wake-up on Start bit

- Auto-Baud Detect

- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D):

- Auto-acquisition capability

- Conversion available during Sleep

- Dual analog comparators with input multiplexing

- Programmable 16-level High/Low-Voltage

Detection (HLVD) module:

- Supports interrupt on High/Low-Voltage Detection

6.30.4 PIC18F2221

[CLICK HERE](#) (see page 643) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA
- Three programmable external interrupts
- Four input change interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.2
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual analog comparators with input multiplexing
- Programmable 16-level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6

6.31 PIC18F4685 Family

6.31.1 PIC18F4685

[CLICK HERE](#) (see page 652) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.31.2 PIC18F4682

[CLICK HERE](#) (see page 652) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts

- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.31.3 PIC18F2685

[CLICK HERE](#) (see page 660) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)

- Auto-wake-up on Start bit
- Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 kspS:
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.31.4 PIC18F2682

[CLICK HERE](#) (see page 660) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 kspS:
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.32 PIC18F4680 Family

6.32.1 PIC18F4680

[CLICK HERE](#) (see page 652) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.32.2 PIC18F4585

[CLICK HERE](#) (see page 652) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts

- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.32.3 PIC18F2680

[CLICK HERE](#) (see page 660) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)

- Auto-wake-up on Start bit
- Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 kspS:
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.32.4 PIC18F2585

[CLICK HERE](#) (see page 660) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 kspS:
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.33 PIC18F4620 Family

6.33.1 PIC18F4620

[CLICK HERE](#) (see page 683) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.33.2 PIC18F4525

[CLICK HERE](#) (see page 683) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.33.3 PIC18F2620

6

[CLICK HERE](#) (see page 691) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts

- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage

Detection (HLVD) module:

- Supports interrupt on High/Low-Voltage Detection

6.33.4 PIC18F2525

6

[CLICK HERE](#) (see page 691) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity

- Programmable dead time
- Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage

Detection (HLVD) module:

- Supports interrupt on High/Low-Voltage Detection

6.34 PIC18F4610 Family

6.34.1 PIC18F4610

6

[CLICK HERE](#) ( see page 668) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time

- Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I₂C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.34.2 PIC18F4515

[CLICK HERE](#) (see page 668) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I₂C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602

- RS-232 operation using internal oscillator block (no external crystal required)
- Auto-wake-up on Start bit
- Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.34.3 PIC18F4510

CLICK HERE (see page 668) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
- Supports RS-485, RS-232 and LIN/J2602
- RS-232 operation using internal oscillator block (no external crystal required)
- Auto-wake-up on Start bit
- Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
- Auto-acquisition capability

- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.34.4 PIC18F4410

[CLICK HERE](#) (see page 668) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²CTM Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.34.5 PIC18F2610

[CLICK HERE](#) (see page 675) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.34.6 PIC18F2515

[CLICK HERE](#) (see page 675) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
 - Supports interrupt on High/Low-Voltage Detection

6.34.7 PIC18F2510

6

[CLICK HERE](#) (see page 675) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts

- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage

Detection (HLVD) module:

- Supports interrupt on High/Low-Voltage Detection

6.34.8 PIC18F2410

6

[CLICK HERE](#) (see page 675) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Input Change Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules, one with Auto-Shutdown (28-pin devices)
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity

- Programmable dead time
- Auto-shutdown and auto-restart

Peripheral Highlights (Continued):

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN/J2602
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 13-Channel Analog-to-Digital (A/D) Converter module:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing
- Programmable 16-Level High/Low-Voltage

Detection (HLVD) module:

- Supports interrupt on High/Low-Voltage Detection

6.35 PIC18F4580 Family

6.35.1 PIC18F4580

6

[CLICK HERE](#) (see page 652) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I₂C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.35.2 PIC18F4480

[CLICK HERE](#) (see page 652) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I₂C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.35.3 PIC18F2580

[CLICK HERE](#) (see page 660) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.35.4 PIC18F2480

[CLICK HERE](#) (see page 660) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/source 25 mA/25 mA
- Three External Interrupts

- One Capture/Compare/PWM (CCP1) module
- Enhanced Capture/Compare/PWM (ECCP1) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter module (A/D), up to 100 ksps:
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.36 PIC18F4550 Family

6.36.1 PIC18F4550

6

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:

- Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.36.2 PIC18F4455

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA

- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.36.3 PIC18F2550

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)

- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.36.4 PIC18F2455

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)

- Compare is 16-bit, max. resolution 83.3 ns (TCY)
- PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.37 PIC18F4450 Family

6.37.1 PIC18F4450

[CLICK HERE](#) (see page 708) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)

- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.37.2 PIC18F2450

[CLICK HERE](#) (see page 708) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)

- Compare is 16-bit, max. resolution 83.3 ns (TCY)
- PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.38 PIC18F4523 Family

6.38.1 PIC18F4523

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)

- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.38.2 PIC18F4423

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)

- Compare is 16-bit, max. resolution 83.3 ns (TCY)
- PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.38.3 PIC18F2523

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit

- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.38.4 PIC18F2423

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes

- Selectable polarity
- Programmable dead time
- Auto-shutdown and auto-restart
- Enhanced USART module:
- LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.39 PIC18F4520 Family

6.39.1 PIC18F4520

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit

- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:
 - LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.39.2 PIC18F4420

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes

- Selectable polarity
- Programmable dead time
- Auto-shutdown and auto-restart
- Enhanced USART module:
- LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.39.3 PIC18F2520

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time

- Auto-shutdown and auto-restart
- Enhanced USART module:
- LIN bus support
- Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
- 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
- Dual Analog Comparators with Input Multiplexing

6.39.4 PIC18F2420

[CLICK HERE](#) (see page 699) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- Four Crystal modes, including High Precision PLL for USB
- Two External Clock modes, up to 48 MHz
- Internal Oscillator Block:
 - 8 user-selectable frequencies, from 31 kHz to 8 MHz
 - User-tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @32 kHz
- Dual Oscillator options allow microcontroller and USB module to run at different clock speeds
- Fail-Safe Clock Monitor:
 - Allows for safe shutdown if any clock stops
- High-Current Sink/Source: 25 mA/25 mA
- Three External Interrupts
- Four Timer modules (Timer0 to Timer3)
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 5.2 ns (TCY/16)
 - Compare is 16-bit, max. resolution 83.3 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - Multiple output modes
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Enhanced USART module:

- LIN bus support
 - Master Synchronous Serial Port (MSSP) module supporting 3-wire SPI (all 4 modes) and I²C™ Master and Slave modes
 - 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with Programmable Acquisition Time
 - Dual Analog Comparators with Input Multiplexing
-

6.40 PIC18F4320 Family

6.40.1 PIC18F4320

[CLICK HERE](#) (see page 713) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution is 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution is 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Compatible 10-Bit, Up to 13-Channel Analog-to-Digital Converter (A/D) module with Programmable Acquisition Time
- Dual Analog Comparators
- Addressable USART module:
 - RS-232 operation using internal oscillator block (no external crystal required)

6.40.2 PIC18F4220

[CLICK HERE](#) (see page 713) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution is 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution is 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Compatible 10-Bit, Up to 13-Channel Analog-to-Digital Converter (A/D) module with Programmable Acquisition Time
- Dual Analog Comparators
- Addressable USART module:
 - RS-232 operation using internal oscillator block (no external crystal required)

6.40.3 PIC18F2320

[CLICK HERE](#) (see page 713) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution is 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution is 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Compatible 10-Bit, Up to 13-Channel Analog-to-Digital Converter (A/D) module with Programmable Acquisition Time

- Dual Analog Comparators
- Addressable USART module:
 - RS-232 operation using internal oscillator block (no external crystal required)

6.40.4 PIC18F2220

[CLICK HERE](#) (see page 713) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- Up to 2 Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution is 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution is 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Enhanced Capture/Compare/PWM (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
- Compatible 10-Bit, Up to 13-Channel Analog-to-Digital Converter (A/D) module with Programmable Acquisition Time
- Dual Analog Comparators
- Addressable USART module:
 - RS-232 operation using internal oscillator block (no external crystal required)

6.41 PIC18F1330 Family

6.41.1 PIC18F1330

[CLICK HERE](#) (see page 806) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Up to 4 Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.2
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 4-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep
- Up to 3 Analog Comparators
- Programmable Reference Voltage for Comparators
- Programmable, 15-Level Low-Voltage Detection (LVD) module:
 - Supports interrupt on Low-Voltage Detection

6.41.2 PIC18F1230

[CLICK HERE](#) (see page 806) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Up to 4 Programmable External Interrupts
- Four Input Change Interrupts
- Enhanced Addressable USART module:
 - Supports RS-485, RS-232 and LIN 1.2
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 4-Channel Analog-to-Digital Converter module (A/D):
 - Auto-acquisition capability
 - Conversion available during Sleep

- Up to 3 Analog Comparators
- Programmable Reference Voltage for Comparators
- Programmable, 15-Level Low-Voltage Detection (LVD) module:
 - Supports interrupt on Low-Voltage Detection

6.42 PIC18F1320 Family

6.42.1 PIC18F1320

[CLICK HERE](#) (see page 784) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupts
- Enhanced Capture/Compare/PWM (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
 - Capture is 16-bit, max resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max resolution 100 ns (TCY)
- Compatible 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with programmable acquisition time
- Enhanced USART module:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect

6.42.2 PIC18F1220

[CLICK HERE](#) (see page 784) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High current sink/source 25 mA/25 mA
- Three external interrupts
- Enhanced Capture/Compare/PWM (ECCP) module:
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-Shutdown and Auto-Restart
 - Capture is 16-bit, max resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max resolution 100 ns (TCY)
- Compatible 10-bit, up to 13-channel Analog-to-Digital Converter module (A/D) with programmable acquisition time
- Enhanced USART module:
 - Supports RS-485, RS-232 and LIN 1.2
 - Auto-Wake-up on Start bit
 - Auto-Baud Detect

6.43 PIC18F8720 Family

6.43.1 PIC18F8720

6

[CLICK HERE](#) (see page 722) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter

- Secondary oscillator clock option – Timer1/Timer3
- Five Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Addressable USART modules:
- Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- 10-bit, up to 16-channel Analog-to-Digital Converter (A/D):
 - Conversion available during Sleep
- Programmable 16-level Low-Voltage Detection

(LVD) module:

- Supports interrupt on Low-Voltage Detection
- Programmable Brown-out Reset (PBOR)
- Dual analog comparators:
 - Programmable input/output configuration

6.43.2 PIC18F8620

6

[CLICK HERE](#) (see page 722) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3

- Five Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Addressable USART modules:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- 10-bit, up to 16-channel Analog-to-Digital Converter (A/D):
 - Conversion available during Sleep
- Programmable 16-level Low-Voltage Detection

(LVD) module:

- Supports interrupt on Low-Voltage Detection
- Programmable Brown-out Reset (PBOR)
- Dual analog comparators:
 - Programmable input/output configuration

6.43.3 PIC18F8520

[CLICK HERE](#) (see page 722) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Five Capture/Compare/PWM (CCP) modules:

- Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
- Compare is 16-bit, max. resolution 100 ns (TCY)
- PWM output: PWM resolution is 1 to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
- 3-wire SPI™ (supports all 4 SPI modes)
- I2C™ Master and Slave mode
- Two Addressable USART modules:
- Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- 10-bit, up to 16-channel Analog-to-Digital Converter (A/D):
- Conversion available during Sleep
- Programmable 16-level Low-Voltage Detection

(LVD) module:

- Supports interrupt on Low-Voltage Detection
- Programmable Brown-out Reset (PBOR)
- Dual analog comparators:
- Programmable input/output configuration

6.43.4 PIC18F6720

[CLICK HERE](#) (see page 722) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Five Capture/Compare/PWM (CCP) modules:
- Capture is 16-bit, max. resolution 6.25 ns (TCY/16)

- Compare is 16-bit, max. resolution 100 ns (TCY)
- PWM output: PWM resolution is 1 to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
- 3-wire SPI™ (supports all 4 SPI modes)
- I2C™ Master and Slave mode
- Two Addressable USART modules:
- Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- 10-bit, up to 16-channel Analog-to-Digital Converter (A/D):
- Conversion available during Sleep
- Programmable 16-level Low-Voltage Detection

(LVD) module:

- Supports interrupt on Low-Voltage Detection
- Programmable Brown-out Reset (PBOR)
- Dual analog comparators:
- Programmable input/output configuration

6.43.5 PIC18F6620

[CLICK HERE](#) (see page 722) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Five Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)

- PWM output: PWM resolution is 1 to 10-bit
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
- 3-wire SPI™ (supports all 4 SPI modes)
- I2C™ Master and Slave mode
- Two Addressable USART modules:
- Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- 10-bit, up to 16-channel Analog-to-Digital Converter (A/D):

- Conversion available during Sleep

- Programmable 16-level Low-Voltage Detection

(LVD) module:

- Supports interrupt on Low-Voltage Detection

- Programmable Brown-out Reset (PBOR)

- Dual analog comparators:

- Programmable input/output configuration

6.43.6 PIC18F6520

[CLICK HERE](#) (see page 722) for the Peripheral Library Support Details for this Device

6

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Four external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Timer4 module: 8-bit timer/counter
- Secondary oscillator clock option – Timer1/Timer3
- Five Capture/Compare/PWM (CCP) modules:
 - Capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1 to 10-bit

- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Two Addressable USART modules:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- 10-bit, up to 16-channel Analog-to-Digital Converter (A/D):
 - Conversion available during Sleep
- Programmable 16-level Low-Voltage Detection

(LVD) module:

- Supports interrupt on Low-Voltage Detection
- Programmable Brown-out Reset (PBOR)
- Dual analog comparators:
 - Programmable input/output configuration

6.44 PIC18C858 Family

6.44.1 PIC18C858

6

[CLICK HERE](#) (see page 731) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Up to 76 I/O with individual direction control
- Four external interrupt pins
- Timer0module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1module: 16-bit timer/counter
- Timer2module: 8-bit timer/counter with 8-bit period register (time base for PWM)
- Timer3module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules CCP pins can be configured as:

- Capture input: 16-bit, max resolution 6.25 ns
- Compare is 16-bit, max resolution 100 ns (TCY)
- PWM output: PWM resolution is 1- to 10-bit.
Max. PWM freq. @:8-bit resolution = 156 kHz
10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) with two modes of operation:
 - 3-wire SPI™ (Supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module: Supports Interrupt on Address bit Advanced Analog Features:
- 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
 - Up to 16 channels available
- Analog Comparator Module:
 - 2 Comparators
 - Programmable input and output multiplexing
- Comparator Voltage Reference Module
- Programmable Low Voltage Detection (LVD) module
- Supports interrupt on low voltage detection
- Programmable Brown-out Reset (BOR)

6.44.2 PIC18C658

6

[CLICK HERE](#) (see page 731) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Up to 76 I/O with individual direction control
- Four external interrupt pins
- Timer0module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1module: 16-bit timer/counter
- Timer2module: 8-bit timer/counter with 8-bit period register (time base for PWM)
- Timer3module: 16-bit timer/counter

- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules CCP pins can be configured as:
 - Capture input: 16-bit, max resolution 6.25 ns
 - Compare is 16-bit, max resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit.
- Max. PWM freq. @:8-bit resolution = 156 kHz
- 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) with two modes of operation:
 - 3-wire SPI™ (Supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module: Supports Interrupt on Address bit Advanced Analog Features:
- 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
 - Up to 16 channels available
- Analog Comparator Module:
 - 2 Comparators
 - Programmable input and output multiplexing
- Comparator Voltage Reference Module
- Programmable Low Voltage Detection (LVD) module
 - Supports interrupt on low voltage detection
- Programmable Brown-out Reset (BOR)

6.45 PIC18C801 Family

6.45.1 PIC18C801

[CLICK HERE](#) (see page 738) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA

- Up to 76 I/O with individual direction control
- Four external interrupt pins
- Timer0module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1module: 16-bit timer/counter
- Timer2module: 8-bit timer/counter with 8-bit period register (time base for PWM)
- Timer3module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules CCP pins can be configured as:
 - Capture input: 16-bit, max resolution 6.25 ns
 - Compare is 16-bit, max resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit.

Max. PWM freq. @:8-bit resolution = 156 kHz

10-bit resolution = 39 kHz

- Master Synchronous Serial Port (MSSP) with two modes of operation:
 - 3-wire SPI™ (Supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module: Supports Interrupt on Address bit Advanced Analog Features:
- 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
 - Up to 16 channels available
- Analog Comparator Module:
 - 2 Comparators
 - Programmable input and output multiplexing
- Comparator Voltage Reference Module
- Programmable Low Voltage Detection (LVD) module
 - Supports interrupt on low voltage detection
- Programmable Brown-out Reset (BOR)

6.45.2 PIC18C601

[CLICK HERE](#) (see page 738) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Up to 76 I/O with individual direction control
- Four external interrupt pins
- Timer0module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1module: 16-bit timer/counter
- Timer2module: 8-bit timer/counter with 8-bit period register (time base for PWM)
- Timer3module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules CCP pins can be configured as:
 - Capture input: 16-bit, max resolution 6.25 ns
 - Compare is 16-bit, max resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit.

Max. PWM freq. @:8-bit resolution = 156 kHz

10-bit resolution = 39 kHz

- Master Synchronous Serial Port (MSSP) with two modes of operation:
 - 3-wire SPI™ (Supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module: Supports Interrupt on Address bit Advanced Analog Features:
- 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
 - Up to 16 channels available
- Analog Comparator Module:
 - 2 Comparators
 - Programmable input and output multiplexing
- Comparator Voltage Reference Module
- Programmable Low Voltage Detection (LVD) module
 - Supports interrupt on low voltage detection
- Programmable Brown-out Reset (BOR)

6.46 PIC18F4539 Family

6.46.1 PIC18F4539

[CLICK HERE](#) (see page 746) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
- Programmable Low Voltage Detection (PLVD)
- Supports interrupt on Low Voltage Detection
- Programmable Brown-out Reset (BOR)

Peripheral Features:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two PWM modules:
 - Resolution is 1- to 10-bit,
Max. PWM freq. @ 8-bit resolution = 156 kHz
 - 10-bit resolution = 39 kHz
- Single Phase Induction Motor Control kernel
 - Programmable Motor Control Technology (ProMPT™) provides open loop Variable Frequency (VF) control
 - User programmable Voltage vs. Frequency curve
 - Most suitable for shaded pole and permanent split capacitor type motors
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

6.46.2 PIC18F4439

[CLICK HERE](#) (see page 746) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
- Programmable Low Voltage Detection (PLVD)
- Supports interrupt on Low Voltage Detection
- Programmable Brown-out Reset (BOR)

Peripheral Features:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two PWM modules:
 - Resolution is 1- to 10-bit,
Max. PWM freq. @ 8-bit resolution = 156 kHz
 - 10-bit resolution = 39 kHz
- Single Phase Induction Motor Control kernel
 - Programmable Motor Control Technology (ProMPT™) provides open loop Variable Frequency (VF) control
 - User programmable Voltage vs. Frequency curve
 - Most suitable for shaded pole and permanent split capacitor type motors
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

6.46.3 PIC18F2539

[CLICK HERE](#) (see page 746) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
- Programmable Low Voltage Detection (PLVD)
- Supports interrupt on Low Voltage Detection
- Programmable Brown-out Reset (BOR)

Peripheral Features:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two PWM modules:
 - Resolution is 1- to 10-bit,
Max. PWM freq. @ 8-bit resolution = 156 kHz
 - 10-bit resolution = 39 kHz
- Single Phase Induction Motor Control kernel
 - Programmable Motor Control Technology (ProMPT™) provides open loop Variable Frequency (VF) control
 - User programmable Voltage vs. Frequency curve
 - Most suitable for shaded pole and permanent split capacitor type motors
- Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

6.46.4 PIC18F2439

[CLICK HERE](#) (see page 746) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - DNL = ± 1 LSb, INL = ± 1 LSb
- Programmable Low Voltage Detection (PLVD)
- Supports interrupt on Low Voltage Detection
- Programmable Brown-out Reset (BOR)

Peripheral Features:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two PWM modules:
 - Resolution is 1- to 10-bit,
Max. PWM freq. @ 8-bit resolution = 156 kHz
10-bit resolution = 39 kHz
 - Single Phase Induction Motor Control kernel
 - Programmable Motor Control Technology (ProMPT™) provides open loop Variable Frequency (VF) control
 - User programmable Voltage vs. Frequency curve
 - Most suitable for shaded pole and permanent split capacitor type motors
 - Master Synchronous Serial Port (MSSP) module with two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
 - Addressable USART module:
 - Supports RS-485 and RS-232
 - Parallel Slave Port (PSP) module

6.47 PIC18F458 Family

6.47.1 PIC18F458

[CLICK HERE](#) (see page 776) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module
- Supports RS-485, RS-232 and LIN 1.3
- RS-232 operation using internal oscillator block (no external crystal required)
- Auto-wake-up on Start bit
- Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter (A/D) module, up to 100 ksps
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.47.2 PIC18F448

[CLICK HERE](#) (see page 776) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I2C™ Master and Slave modes
- Enhanced Addressable USART module
- Supports RS-485, RS-232 and LIN 1.3
- RS-232 operation using internal oscillator block (no external crystal required)
- Auto-wake-up on Start bit
- Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter (A/D) module, up to 100 ksps
- Auto-acquisition capability
- Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.47.3 PIC18F258

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[CLICK HERE](#) (see page 768) for the Peripheral Library Support Details for this Device

Micro Controller Features:-**Peripheral Highlights:**

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart

- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter (A/D) module, up to 100 kspS
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.47.4 PIC18F248

[CLICK HERE](#) (see page 768) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three External Interrupts
- One Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module (40/44-pin devices only):
 - One, two or four PWM outputs
 - Selectable polarity
 - Programmable dead time
 - Auto-shutdown and auto-restart
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I²C™ Master and Slave modes
- Enhanced Addressable USART module
 - Supports RS-485, RS-232 and LIN 1.3
 - RS-232 operation using internal oscillator block (no external crystal required)
 - Auto-wake-up on Start bit
 - Auto-Baud Detect
- 10-Bit, up to 11-Channel Analog-to-Digital Converter (A/D) module, up to 100 kspS
 - Auto-acquisition capability
 - Conversion available during Sleep
- Dual Analog Comparators with Input Multiplexing

6.48 PIC18F452 Family

6.48.1 PIC18F452

[CLICK HERE](#) (see page 753) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection

- Programmable Brown-out Reset (BOR)

6.48.2 PIC18F442

CLICK HERE ( see page 753) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

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Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.48.3 PIC18F252

[CLICK HERE](#) (see page 753) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.48.4 PIC18F242

[CLICK HERE](#) (see page 753) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.49 PIC18C452 Family

6.49.1 PIC18C452

[CLICK HERE](#) (see page 761) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.49.2 PIC18C442

[CLICK HERE](#) (see page 761) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.49.3 PIC18C252

[CLICK HERE](#) (see page 761) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.49.4 PIC18C242

[CLICK HERE](#) (see page 761) for the Peripheral Library Support Details for this Device

Micro Controller Features:-

Peripheral Highlights:

- High current sink/source 25 mA/25 mA
- Three external interrupt pins
- Timer0 module: 8-bit/16-bit timer/counter with 8-bit programmable prescaler
- Timer1 module: 16-bit timer/counter
- Timer2 module: 8-bit timer/counter with 8-bit period register (time-base for PWM)
- Timer3 module: 16-bit timer/counter
- Secondary oscillator clock option - Timer1/Timer3
- Two Capture/Compare/PWM (CCP) modules. CCP pins that can be configured as:
 - Capture input: capture is 16-bit, max. resolution 6.25 ns (TCY/16)
 - Compare is 16-bit, max. resolution 100 ns (TCY)
 - PWM output: PWM resolution is 1- to 10-bit, max. PWM freq. @: 8-bit resolution = 156 kHz 10-bit resolution = 39 kHz
- Master Synchronous Serial Port (MSSP) module, Two modes of operation:
 - 3-wire SPI™ (supports all 4 SPI modes)
 - I2C™ Master and Slave mode
- Addressable USART module:
 - Supports RS-485 and RS-232
- Parallel Slave Port (PSP) module

Analog Features:

- Compatible 10-bit Analog-to-Digital Converter module (A/D) with:
 - Fast sampling rate
 - Conversion available during SLEEP
 - Linearity = 1 LSb
- Programmable Low Voltage Detection (PLVD)
 - Supports interrupt on-Low Voltage Detection
- Programmable Brown-out Reset (BOR)

6.50 PIC18F45K22 Family

6.50.1 PIC18F45K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.2 PIC18LF45K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.3 PIC18F44K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.4 PIC18LF44K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.5 PIC18F43K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.6 PIC18LF43K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I2C™ Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.7 PIC18F46K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.8 PIC18LF46K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.9 PIC18F26K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.10 PIC18LF26K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.11 PIC18F25K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.12 PIC18LF25K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.13 PIC18F24K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.14 PIC18LF24K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.15 PIC18F23K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

6.50.16 PIC18LF23K22

[CLICK HERE](#) (see page 827) for the Peripheral Library Support Details for this Device

Peripheral Highlights:

- 1/4 CCP/ECCP modules
- Seven Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules
- 5 8/16-bit timer/counter modules:
 - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
 - Timer1,3 – 16-bit timer/counter
 - Timer2,4 – 8-bit timer/counter
- Two analog comparators
- Configurable reference clock output
- Charge Time Measurement Unit (CTMU):
 - Capacitance measurement
 - Time measurement with 1-ns typical resolution
- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Up to four external interrupts
- One Master Synchronous Serial Port (MSSP) modules:
 - 3/4-wire SPI (supports all four SPI modes)
 - I²CTM Master and Slave mode
- Two Enhanced Addressable USART modules:
 - LIN/J2602 support
 - Auto-Baud Detect (ABD)
- 12-bit A/D converter with up to 14 channels:
 - Auto-acquisition and Sleep operation

7 Device Modules

Device Families with Peripheral Library support

7.1 18F66K80 Family

PIC18F25K80 (see page 27) \ PIC18LF25K80 (see page 33) \ PIC18F26K80 (see page 26) \ PIC18LF26K80 (see page 32)

PIC18F45K80 (see page 25) \ PIC18LF45K80 (see page 31) \ PIC18F46K80 (see page 24) \ PIC18LF46K80 (see page 30)

PIC18F65K80 (see page 23) \ PIC18LF65K80 (see page 29) \ PIC18F66K80 (see page 22) \ PIC18LF66K80 (see page 28)

7.1.1 ADC (66K80 Set)

This peripheral module supports functionalities:

- Up to 32 analog input pins, designated AN0 through AN31, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 876)

SetChanADC (see page 889)

SelChanConvADC (see page 896)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

```

ADC_INT_ENABLE
ADC_INT_DISABLE
* ENABLE_AN0_DIG()
* ENABLE_AN0_ANA()
* ENABLE_AN1_DIG()
* ENABLE_AN1_ANA()
* ENABLE_AN2_DIG()
* ENABLE_AN2_ANA()
* ENABLE_AN3_DIG()
* ENABLE_AN3_ANA()
* ENABLE_AN4_DIG()
* ENABLE_AN4_ANA()
* ENABLE_AN5_DIG()
* ENABLE_AN5_ANA()
* ENABLE_AN6_DIG()
* ENABLE_AN6_ANA()
* ENABLE_AN7_DIG()
* ENABLE_AN7_ANA()
* ENABLE_ALL_ANA_0_7()
* ENABLE_ALL_DIG_0_7()

* ENABLE_AN8_DIG()
* ENABLE_AN8_ANA()
* ENABLE_AN9_DIG()
* ENABLE_AN9_ANA()
* ENABLE_AN10_DIG()
* ENABLE_AN10_ANA()

```

ADC Examples ( see page 898)

7.1.2 Analog Comparator (66K80 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

```

Open_ancomp1 ( see page 907)
Open_ancomp2 ( see page 915)
Close_ancomp1 ( see page 923)
Close_ancomp2 ( see page 923)

```

Macros

Config_CVREF

Comparator Examples ([see page 924](#))

7.1.3 CTMU (66K80 Set)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

FunctionsOpenCTMU ([see page 925](#))CurrentControlCTMU ([see page 927](#))CloseCTMU ([see page 927](#))**Macros**

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples ([see page 928](#))

7.1.4 Input Capture (66K80 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECapture1 (see page 969)

OpenCapture2 (see page 956)

OpenCapture3 (see page 958)

OpenCapture4 (see page 962)

OpenCapture5 (see page 965)

ReadECapture1 (see page 986)

ReadCapture2 (see page 984)

ReadCapture3 (see page 984)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

CloseECapture1 (see page 990)

CloseCapture2 (see page 987)

CloseCapture3 (see page 988)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

Input Capture Examples (see page 991)

7.1.5 Output Compare (66K80 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECompare1 (see page 1006)

OpenCompare2 (see page 994)

OpenCompare3 (see page 996)

OpenCompare4 (see page 999)

OpenCompare5 (see page 1002)

CloseECompare1 (see page 1024)

CloseCompare2 (see page 1022)

CloseCompare3 (see page 1022)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.1.6 PWM (66K80 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenEPWM1 (see page 1036)

OpenPWM2 (see page 1030)

OpenPWM3 (see page 1028)

OpenPWM4 (see page 1029)

OpenPWM5 (see page 1029)

SetDCEPWM1 (see page 1054)

SetDCPWM2 (see page 1048)

SetDCPWM3 (see page 1048)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetOutputEPWM1 (see page 1045)

CloseEPWM1 (see page 1059)

ClosePWM2 (see page 1056)

ClosePWM3 (see page 1056)

ClosePWM4 (see page 1057)

ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.1.7 I2C (66K80 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenI2C ([see page 1063](#))Writel2C ([see page 1066](#))Readl2C ([see page 1067](#))putsl2C ([see page 1068](#))getsl2C ([see page 1070](#))IdleI2C ([see page 1072](#))CloseI2C ([see page 1071](#))**Macros**

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putcl2C

getcl2C

putcl2C

I2C Examples ([see page 1072](#))

7.1.8 I2C EEPROM (66K80 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

FunctionsOpenI2C ([see page 1063](#))EEAckPolling ([see page 1075](#))

EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples (see page 1088)

7.1.9 EEP (66K80 Set)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions
Write_b_eep (see page 1061)
Read_b_eep (see page 1061)
Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.1.10 IO Ports (66K80 Set)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros
EnablePullups

DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.1.11 MWIRE (66K80 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros
CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7

7.1.12 SPI (66K80 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenSPI ([see page 1108](#))WriteSPI ([see page 1111](#))ReadSPI ([see page 1113](#))putsSPI ([see page 1114](#))getsSPI ([see page 1115](#))**Macros**

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.1.13 SW_RTCC (66K80 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

FunctionsOpen_RTCC ([see page 1106](#))update_RTCC ([see page 1106](#))Close_RTCC ([see page 1106](#))SW_RTCC Examples ([see page 1107](#))

7.1.14 Timers (66K80 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers

- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5 are 16 bit timers/counters
- Timer2/4/6/8 are 8 bit timers

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1121](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1125](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

OpenTimer4 ([see page 1130](#))

CloseTimer4 ([see page 1144](#))

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

Timers Examples ([see page 1146](#))

7.1.15 Flash (66K80 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash

- Loading table pointers and performing table-read operation

Functions

ReadFlash (█ see page 1198)
 EraseFlash (█ see page 1196)
 WriteBlockFlash (█ see page 1200)
 WriteWordFlash (█ see page 1202)
 WriteBytesFlash (█ see page 1203)

Macros

LoadFlashAddr
 TableRead

Flash Examples (█ see page 1204)

7.1.16 USART (66K80 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (█ see page 1148)
 Write1USART (█ see page 1154)
 baud1USART (█ see page 1155)
 gets1USART (█ see page 1159)
 putrs1USART (█ see page 1160)
 puts1USART (█ see page 1162)
 Read1USART (█ see page 1163)
 Open2USART (█ see page 1150)
 Write2USART (█ see page 1155)
 baud2USART (█ see page 1157)
 gets2USART (█ see page 1159)
 putrs2USART (█ see page 1161)
 puts2USART (█ see page 1162)
 Read2USART (█ see page 1163)

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ( see page 1164)

7.1.17 Deep Sleep (66K80 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

FunctionsULPWakeUpEnable ( see page 931)

7.2 18F47J53 Family

PIC18F26J53 / PIC18F27J53 / PIC18F46J53 / PIC18F47J53

7

PIC18LF26J53 / PIC18LF27J53 / PIC18LF46J53 / PIC18LF47J53**PIC18F26J13 / PIC18F27J13 / PIC18F46J13 / PIC18F47J13****PIC18LF26J13 / PIC18LF27J13 / PIC18LF46J13 / PIC18LF47J13**

7.2.1 PIC18F2xJ53 Set

PIC18F26J53 ([see page 37](#)) / **PIC18F27J53** ([see page 36](#))

PIC18LF26J53 / **PIC18LF27J53**

PIC18F26J13 ([see page 41](#)) / **PIC18F27J13** ([see page 42](#))

PIC18LF26J13 / **PIC18LF27J13**

7.2.1.1 ADC (2xJ53 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 873](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CALIB

ADC_NO_CALIB

ADC Examples ([see page 898](#))

7.2.1.2 Analog Comparator (2xJ53 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 918)

Open_ancomp2 (see page 920)

Open_ancomp3 (see page 921)

Close_ancomp1 (see page 923)

Close_ancomp2 (see page 923)

Close_ancomp3 (see page 923)

Macros

Config_CVREF

Comparator Examples (see page 924)

7.2.1.3 CTMU (2xJ53 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)

CurrentControlCTMU (see page 927)

CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples (see page 928)

7.2.1.4 PPS (2xJ53 Family)

This peripheral library module provides:

- Assign given pin as input or output pin.
- Provides macros to Lock and unlock the PPS

Macros

iPPSInput ([see page 947](#))

PPSInput ([see page 948](#))

iPPSOOutput ([see page 950](#))

PPSOOutput ([see page 951](#))

PPS Examples ([see page 953](#))

7.2.1.5 Deep Sleep (2xJ53 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

Functions

DeepSleepWakeUpSource ([see page 930](#))

GotoDeepSleep ([see page 930](#))

IsResetFromDeepSleep ([see page 931](#))

ReadDSGPR ([see page 931](#))

ULPWakeUpEnable ([see page 931](#))

Macros

ReleaseDeepSleep

Write_DSGPR

Deep Sleep Examples ([see page 932](#))

7.2.1.6 Input Capture (2xJ53 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECapture1 (see page 968)

OpenECapture2 (see page 971)

OpenECapture3 (see page 972)

OpenCapture4 (see page 960)

OpenCapture5 (see page 964)

OpenCapture6 (see page 973)

OpenCapture7 (see page 974)

OpenCapture8 (see page 976)

ReadECapture1 (see page 986)

ReadECapture2 (see page 986)

ReadECapture3 (see page 987)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

ReadCapture6 (see page 985)

ReadCapture7 (see page 985)

ReadCapture8 (see page 985)

CloseECapture1 (see page 990)

CloseECapture2 (see page 990)

CloseECapture3 (see page 991)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

CloseCapture6 (see page 989)

CloseCapture7 (see page 989)

CloseCapture8 (see page 989)

Input Capture Examples (see page 991)

7.2.1.7 Output Compare (2xJ53 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECompare1 (see page 1005)

OpenECompare2 (see page 1008)

OpenECompare3 (see page 1009)

OpenCompare4 (see page 998)

OpenCompare5 (see page 1001)

OpenCompare6 (see page 1010)

OpenCompare7 (see page 1011)

OpenCompare8 (see page 1013)

CloseECompare1 (see page 1024)

CloseECompare2 (see page 1024)

CloseECompare3 (see page 1025)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

CloseCompare6 (see page 1023)

CloseCompare7 (see page 1023)

CloseCompare8 (see page 1023)

Output Compare Examples (see page 1025)

7.2.1.8 PWM (2xJ53 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenEPWM1 (see page 1037)

OpenEPWM2 (see page 1038)

OpenEPWM3 (see page 1039)

OpenPWM4 (see page 1029)

OpenPWM5 (see page 1029)

OpenPWM6 (see page 1032)

OpenPWM7 (see page 1033)

OpenPWM8 (see page 1034)

SetDCEPWM1 (see page 1054)

SetDCEPWM2 (see page 1054)

SetDCEPWM3 (see page 1055)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetDCPWM6 (see page 1050)

SetDCPWM7 (see page 1051)

SetDCPWM8 (see page 1052)

[SetOutputEPWM1](#) (see page 1045)

[SetOutputEPWM2](#) (see page 1046)

[SetOutputEPWM3](#) (see page 1046)

[CloseEPWM1](#) (see page 1059)

[CloseEPWM2](#) (see page 1059)

[CloseEPWM3](#) (see page 1059)

[ClosePWM4](#) (see page 1057)

[ClosePWM5](#) (see page 1057)

[ClosePWM6](#) (see page 1057)

[ClosePWM7](#) (see page 1057)

[ClosePWM8](#) (see page 1058)

PWM Examples (see page 1060)

7.2.1.9 I2C EEPROM (2xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C1](#) (see page 1064)

[EEAckPolling1](#) (see page 1076)

[EEByteWrite1](#) (see page 1080)

[EECurrentAddRead1](#) (see page 1078)

[EEPageWrite1](#) (see page 1082)

[EERandomRead1](#) (see page 1086)

[EESequentialRead1](#) (see page 1084)

[OpenI2C2](#) (see page 1065)

[EEAckPolling2](#) (see page 1076)

[EEByteWrite2](#) (see page 1080)

[EECurrentAddRead2](#) (see page 1078)

[EEPageWrite2](#) (see page 1083)

[EERandomRead2](#) (see page 1087)

[EESequentialRead2](#) (see page 1085)

I2C EEPROM Examples (see page 1088)

7.2.1.10 SPI (2xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))

WriteSPI1 ([see page 1112](#))

ReadSPI1 ([see page 1113](#))

putsSPI1 ([see page 1114](#))

getsSPI1 ([see page 1115](#))

OpenSPI2 ([see page 1110](#))

WriteSPI2 ([see page 1112](#))

ReadSPI2 ([see page 1113](#))

putsSPI2 ([see page 1114](#))

getsSPI2 ([see page 1116](#))

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.2.1.11 IO Ports (2xJ53 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.2.1.12 RTCC (2xJ53 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions
RtcclnItClock (see page 1095)
RtcclWriteTime (see page 1099)

RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync

mRtccWrOff

RTCC Examples ([see page 1104](#))

7.2.1.13 SW_RTCC (2xJ53 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) ([see page 1106](#))

[update_RTCC](#) ([see page 1106](#))

[Close_RTCC](#) ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.2.1.14 Timers (2xJ53 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5 are 16 bit timers/counters
- Timer2/4/6/8 are 8 bit timers

Functions

[OpenTimer0](#) ([see page 1119](#))

[ReadTimer0](#) ([see page 1137](#))

[WriteTimer0](#) ([see page 1139](#))

[CloseTimer0](#) ([see page 1143](#))

[OpenTimer1](#) ([see page 1121](#))

[ReadTimer1](#) ([see page 1138](#))

[WriteTimer1](#) ([see page 1140](#))

[CloseTimer1](#) ([see page 1143](#))

[OpenTimer2](#) ([see page 1123](#))

[CloseTimer2](#) ([see page 1144](#))

[OpenTimer3](#) ([see page 1125](#))

[ReadTimer3](#) ([see page 1138](#))

[WriteTimer3](#) ([see page 1140](#))

[CloseTimer3](#) ([see page 1144](#))

OpenTimer4 (see page 1130)

CloseTimer4 (see page 1144)

OpenTimer5 (see page 1129)

ReadTimer5 (see page 1139)

WriteTimer5 (see page 1140)

CloseTimer5 (see page 1144)

OpenTimer6 (see page 1131)

CloseTimer6 (see page 1145)

OpenTimer8 (see page 1134)

CloseTimer8 (see page 1145)

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

WriteTimer6

ReadTimer6

WriteTimer8

ReadTimer8

Timers Examples (see page 1146)

7.2.1.15 USART (2xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)

Write1USART (see page 1154)

baud1USART (see page 1155)

gets1USART (see page 1159)

putrs1USART (see page 1160)

puts1USART (see page 1162)

Read1USART (see page 1163)

Open2USART (see page 1150)

Write2USART ([see page 1155](#))

baud2USART ([see page 1157](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.2.1.16 MWIRE (2xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 ([see page 1166](#))

ReadMwire1 ([see page 1170](#))

WriteMwire1 ([see page 1169](#))

getsMwire1 ([see page 1167](#))

OpenMwire2 ([see page 1166](#))

ReadMwire2 ([see page 1171](#))

WriteMwire2 ([see page 1169](#))

getsMwire2 ([see page 1168](#))

Macros

CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.2.1.17 Flash (2xJ53 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))
EraseFlash ([see page 1196](#))
WriteBlockFlash ([see page 1200](#))
WriteWordFlash ([see page 1202](#))
WriteBytesFlash ([see page 1203](#))

Macros

LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.2.2 PIC18F4xJ53 Set

PIC18F46J53 ([see page 35](#)) / **PIC18F47J53** ([see page 34](#))

PIC18LF46J53 / **PIC18LF47J53**

PIC18F46J13 ([see page 40](#)) / **PIC18F47J13** ([see page 39](#))

PIC18LF46J13 / PIC18LF47J13

7.2.2.1 ADC (4xJ53 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 873)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CALIB

ADC_NO_CALIB

ADC Examples (see page 898)

7.2.2.2 Analog Comparator (4xJ53 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 918)

Open_ancomp2 (see page 920)

Open_ancomp3 (see page 921)

Close_ancomp1 (see page 923)

Close_ancomp2 (see page 923)

Close_ancomp3 (see page 923)

Macros

Config_CVREF

Comparator Examples (see page 924)

7.2.2.3 CTMU (4xJ53 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)

CurrentControlCTMU (see page 927)

CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples (see page 928)

7.2.2.4 PPS (4xJ53 Family)

This peripheral library module provides:

- Assign given pin as input or output pin.
- Provides macros to Lock and unlock the PPS

MacrosiPPSInput ( see page 947)PPSInput ( see page 948)iPPSOOutput ( see page 950)PPSOOutput ( see page 951)PPS Examples ( see page 953)

7.2.2.5 Deep Sleep (4xJ53 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

FunctionsDeepSleepWakeUpSource ( see page 930)GotoDeepSleep ( see page 930)IsResetFromDeepSleep ( see page 931)ReadDSGPR ( see page 931)ULPWakeUpEnable ( see page 931)**Macros**

ReleaseDeepSleep

Write_DSGPR

Deep Sleep Examples ( see page 932)

7.2.2.6 Input Capture (4xJ53 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

FunctionsOpenECapture1 ( see page 968)OpenECapture2 ( see page 971)OpenECapture3 ( see page 972)

OpenCapture4 (█ see page 960)

OpenCapture5 (█ see page 964)

OpenCapture6 (█ see page 973)

OpenCapture7 (█ see page 974)

OpenCapture8 (█ see page 976)

ReadECapture1 (█ see page 986)

ReadECapture2 (█ see page 986)

ReadECapture3 (█ see page 987)

ReadCapture4 (█ see page 984)

ReadCapture5 (█ see page 984)

ReadCapture6 (█ see page 985)

ReadCapture7 (█ see page 985)

ReadCapture8 (█ see page 985)

CloseECapture1 (█ see page 990)

CloseECapture2 (█ see page 990)

CloseECapture3 (█ see page 991)

CloseCapture4 (█ see page 988)

CloseCapture5 (█ see page 988)

CloseCapture6 (█ see page 989)

CloseCapture7 (█ see page 989)

CloseCapture8 (█ see page 989)

Input Capture Examples (█ see page 991)

7.2.2.7 Output Compare (4xJ53 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECompare1 (█ see page 1005)

OpenECompare2 (█ see page 1008)

OpenECompare3 (█ see page 1009)

OpenCompare4 (█ see page 998)

OpenCompare5 (█ see page 1001)

OpenCompare6 (█ see page 1010)

OpenCompare7 (█ see page 1011)

OpenCompare8 (see page 1013)
CloseECompare1 (see page 1024)
CloseECompare2 (see page 1024)
CloseECompare3 (see page 1025)
CloseCompare4 (see page 1022)
CloseCompare5 (see page 1022)
CloseCompare6 (see page 1023)
CloseCompare7 (see page 1023)
CloseCompare8 (see page 1023)

Output Compare Examples (see page 1025)

7.2.2.8 PWM (4xJ53 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenEPWM1 (see page 1037)
OpenEPWM2 (see page 1038)
OpenEPWM3 (see page 1039)
OpenPWM4 (see page 1029)
OpenPWM5 (see page 1029)
OpenPWM6 (see page 1032)
OpenPWM7 (see page 1033)
OpenPWM8 (see page 1034)
SetDCEPWM1 (see page 1054)
SetDCEPWM2 (see page 1054)
SetDCEPWM3 (see page 1055)
SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)
SetDCPWM6 (see page 1050)
SetDCPWM7 (see page 1051)
SetDCPWM8 (see page 1052)
SetOutputEPWM1 (see page 1045)
SetOutputEPWM2 (see page 1046)
SetOutputEPWM3 (see page 1046)
CloseEPWM1 (see page 1059)
CloseEPWM2 (see page 1059)

CloseEPWM3 (see page 1059)
ClosePWM4 (see page 1057)
ClosePWM5 (see page 1057)
ClosePWM6 (see page 1057)
ClosePWM7 (see page 1057)
ClosePWM8 (see page 1058)

PWM Examples (see page 1060)

7.2.2.9 I2C (4xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)
WritelI2C1 (see page 1066)
ReadlI2C1 (see page 1067)
putsI2C1 (see page 1069)
getsI2C1 (see page 1070)
OpenI2C2 (see page 1065)
WritelI2C2 (see page 1067)
ReadlI2C2 (see page 1068)
putsI2C2 (see page 1069)
getsI2C2 (see page 1071)

Macros

EnableIntI2C1
DisableIntI2C1
SetPriorityIntI2C1
I2C1_Clear_Intr_Status_Bit
I2C1_Intr_Status
StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1

DataRdyI2C1
IdleI2C1
CloseI2C1
putI2C1
getI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.2.2.10 I2C EEPROM (4xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)

EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples (see page 1088)

7.2.2.11 SPI (4xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 (see page 1109)
WriteSPI1 (see page 1112)
ReadSPI1 (see page 1113)
putsSPI1 (see page 1114)
getsSPI1 (see page 1115)
OpenSPI2 (see page 1110)
WriteSPI2 (see page 1112)
ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

EnableIntSPI2
DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ( see page 1116)

7.2.2.12 IO Ports (4xJ53 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ( see page 1089)
OpenRB0INT ( see page 1089)
OpenRB1INT ( see page 1090)
OpenRB2INT ( see page 1091)
OpenRB3INT ( see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ( see page 1093)

7.2.2.13 RTCC (4xJ53 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

RtccInitClock (see page 1095)
RtccWriteTime (see page 1099)
RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync

mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.2.2.14 SW_RTCC (4xJ53 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.2.2.15 Timers (4xJ53 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5 are 16 bit timers/counters
- Timer2/4/6/8 are 8 bit timers

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1121)
ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1125)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
OpenTimer5 (see page 1129)
ReadTimer5 (see page 1139)
WriteTimer5 (see page 1140)
CloseTimer5 (see page 1144)
OpenTimer6 (see page 1131)
CloseTimer6 (see page 1145)
OpenTimer8 (see page 1134)
CloseTimer8 (see page 1145)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4
WriteTimer6
ReadTimer6
WriteTimer8
ReadTimer8

Timers Examples (see page 1146)

7.2.2.16 USART (4xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpen1USART ([see page 1148](#))Write1USART ([see page 1154](#))baud1USART ([see page 1155](#))gets1USART ([see page 1159](#))putrs1USART ([see page 1160](#))puts1USART ([see page 1162](#))Read1USART ([see page 1163](#))Open2USART ([see page 1150](#))Write2USART ([see page 1155](#))baud2USART ([see page 1157](#))gets2USART ([see page 1159](#))putrs2USART ([see page 1161](#))puts2USART ([see page 1162](#))Read2USART ([see page 1163](#))**Macros**

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.2.2.17 MWIRE (4xJ53 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire1 ([see page 1166](#))

[ReadMwire1](#) (see page 1170)

[WriteMwire1](#) (see page 1169)

[getsMwire1](#) (see page 1167)

[OpenMwire2](#) (see page 1166)

[ReadMwire2](#) (see page 1171)

[WriteMwire2](#) (see page 1169)

[getsMwire2](#) (see page 1168)

Macros

[CloseMwire1](#)

[getcMwire1](#)

[putcMwire1](#)

[DataRdyMwire1](#)

[CloseMwire2](#)

[getcMwire2](#)

[putcMwire2](#)

[DataRdyMwire2](#)

MWIRE Examples (see page 1172)

7.2.2.18 Flash (4xJ53 Set)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)

[EraseFlash](#) (see page 1196)

[WriteBlockFlash](#) (see page 1200)

[WriteWordFlash](#) (see page 1202)

[WriteBytesFlash](#) (see page 1203)

Macros

[LoadFlashAddr](#)

[TableRead](#)

Flash Examples ([see page 1204](#))

7.2.2.19 PMP (4xJ53 Family)

This peripheral library module:

- Is a parallel 8-bit I/O module. PMP stands for Parallel Master Port module.
- Is specifically designed to communicate with a wide variety of parallel devices, such as communications peripherals, LCDs, external memory devices and microcontrollers.
- Is highly configurable, since the interface to parallel peripherals varies significantly.

Functions

PMPOpen (see page 1187)
PMPIsBufferNEmpty (see page 1189)
PMPIsBufferNFull (see page 1189)
PMPMasterRead (see page 1188)
PMPMasterWrite (see page 1189)
PMPSetAddress (see page 1187)
PMPSlaveReadBufferN (see page 1190)
PMPSlaveReadBuffers (see page 1190)
PMPSlaveWriteBufferN (see page 1191)
PMPSlaveWriteBuffers (see page 1191)
PMPClose (see page 1192)

Macros

mPMPIsBufferFull
mPMPSetWriteStrobePolarity
mPMPSetWriteStrobeEnable
mPMPSetWaitEnd
mPMPSetWaitMiddle
mPMPIsBufferOverflow
mPMPSetWaitBegin
mPMPSetReadStrobePolarity
mPMPSetReadStrobeEnable
mPMPSetPortPins
mPMPSetPortMode
mPMPSetPortEnable
mPMPSetAddrLatchPolarity
mPMPSetInterruptMode
mPMPClearBufferOverflow
mPMPSetIdle

mPMP_Clear_Intr_Status_Bit
mPMPSetInterruptPriority
mPMPSetInterruptEnable
mPMPSetDataMode
mPMPClearBufferUnderflow
mPMPSetChipSelect2Polarity
mPMPSetChipSelect2Enable
mPMPSetChipSelect1Polarity
mPMPSetChipSelect1Enable
mPMPSetChipSelectMode
mPMPSetByteEnable
mPMPSetByteEnablePolarity
mPMPIsBufferEmpty
mPMPIsBufferUnderflow
mPMPSetAddrIncMode
mPMPSetAddrMux

PMP Examples (see page 1192)

7.3 18F97J72 Family

PIC18F86J72 / PIC18F87J72 / PIC18F96J72 / PIC18F97J72

7.3.1 ADC (97J72 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions
OpenADC (see page 862)
SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE
ADC_CALIB
ADC_NO_CALIB

ADC Examples (see page 898)

7.3.2 Analog Comparator (97J72 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)
Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.3.3 CTMU (97J72 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)
CurrentControlCTMU (see page 927)
CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2
Disbl_CTMUEdge1
Disbl_CTMUEdge2
CTMUEdge1_Status
CTMUEdge2_Status
CTMU_INT_ENABLE
CTMU_INT_DISABLE
CTMU_Clear_Intr_Status_Bit
CTMU_Intr_Status

CTMU Examples ([see page 928](#))

7.3.4 Input Capture (97J72 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)
OpenCapture2 (see page 955)
ReadCapture1 (see page 983)
ReadCapture2 (see page 984)
CloseCapture1 (see page 987)
CloseCapture2 (see page 987)

Input Capture Examples ([see page 991](#))

7.3.5 Output Compare (97J72 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 (see page 992)
OpenCompare2 (see page 993)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

Output Compare Examples (see page 1025)

7.3.6 PWM (97J72 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.3.7 I2C (97J72 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenI2C (see page 1063)
WriteI2C (see page 1066)
ReadI2C (see page 1067)
putslI2C (see page 1068)
getslI2C (see page 1070)
IdleI2C (see page 1072)
CloseI2C (see page 1071)

Macros

EnableI2C
 DisableI2C
 SetPriorityI2C
 I2C_Clear_Intr_Status_Bit
 I2C_Intr_Status
 StopI2C
 StartI2C
 RestartI2C
 NotAckI2C
 AckI2C
 DataRdyI2C
 putI2C
 getI2C
 putI2C

I2C Examples ([see page 1072](#))

7.3.8 I2C EEPROM (97J72 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))
 EEAckPolling ([see page 1075](#))
 EEByteWrite ([see page 1079](#))
 EECurrentAddRead ([see page 1077](#))
 EEPageWrite ([see page 1081](#))
 EERandomRead ([see page 1086](#))
 EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.3.9 IO Ports (97J72 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

`OpenRB3INT` (see page 1092)

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples (see page 1093)

7.3.10 RTCC (97J72 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

`RtccInitClock` (see page 1095)

`RtccWriteTime` (see page 1099)

`RtccWriteDate` (see page 1100)

`RtccWriteAlrmTimeDate` (see page 1101)

RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.3.11 SW_RTCC (97J72 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.3.12 SPI (97J72 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros
EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI

getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.3.13 Timers (97J72 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

7

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.3.14 USART (97J72 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))

Write1USART ([see page 1154](#))

baud1USART ([see page 1155](#))

gets1USART ([see page 1159](#))

putrs1USART ([see page 1160](#))

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Open2USART ([see page 1150](#))

Write2USART ([see page 1155](#))

baud2USART ([see page 1157](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.3.15 MWIRE (97J72 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.3.16 Flash (97J72 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1198](#))

WriteWordFlash ([see page 1202](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.4 18F87K90/22 Family

PIC18F87K90 ([see page 58](#)) \ **PIC18F86K95** ([see page 59](#)) \ **PIC18F86K90** ([see page 60](#)) \ **PIC18F85K90** ([see page 61](#))

PIC18F67K90 ([see page 62](#)) \ **PIC18F66K95** ([see page 63](#)) \ **PIC18F66K90** ([see page 64](#)) \ **PIC18F65K90** ([see page 65](#))

PIC18F87K22 ([see page 44](#)) \ **PIC18F86K27** ([see page 46](#)) \ **PIC18F86K22** ([see page 45](#)) \ **PIC18F85K22** ([see page 47](#))

PIC18F67K22 ([see page 48](#)) \ **PIC18F66K27** ([see page 50](#)) \ **PIC18F66K22** ([see page 49](#)) \ **PIC18F65K22** ([see page 51](#))

7.4.1 PIC18F6xK90 Set

PIC18F67K90 ([see page 62](#)) \ **PIC18F66K95** ([see page 63](#)) \ **PIC18F66K90** ([see page 64](#)) \ **PIC18F65K90** ([see page 65](#))

7.4.1.1 PIC18F6xK90_non_32

PIC18F67K90 ([see page 62](#)) \ **PIC18F66K95** ([see page 63](#)) \ **PIC18F66K90** ([see page 64](#))

7.4.1.1.1 ADC (6xK90 Set)

This peripheral module supports functionalities:

- Up to 32 analog input pins, designated AN0 through AN31, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ([see page 867](#))SetChanADC ([see page 887](#))SelChanConvADC ([see page 894](#))

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

```
* ENABLE_AN0_DIG()
* ENABLE_AN0_ANA()
* ENABLE_AN1_DIG()
* ENABLE_AN1_ANA()
* ENABLE_AN2_DIG()
* ENABLE_AN2_ANA()
* ENABLE_AN3_DIG()
* ENABLE_AN3_ANA()
* ENABLE_AN4_DIG()
* ENABLE_AN4_ANA()
* ENABLE_AN5_DIG()
* ENABLE_AN5_ANA()
* ENABLE_AN6_DIG()
* ENABLE_AN6_ANA()
* ENABLE_AN7_DIG()
* ENABLE_AN7_ANA()
* ENABLE_ALL_ANA_0_7()
* ENABLE_ALL_DIG_0_7()

* ENABLE_AN8_DIG()
* ENABLE_AN8_ANA()
* ENABLE_AN9_DIG()
* ENABLE_AN9_ANA()
* ENABLE_AN10_DIG()
* ENABLE_AN10_ANA()
* ENABLE_AN11_DIG()
* ENABLE_AN11_ANA()
* ENABLE_ALL_ANA_8_15()
* ENABLE_ALL_DIG_8_15()

* ENABLE_AN16_DIG()
* ENABLE_AN16_ANA()
* ENABLE_AN17_DIG()
* ENABLE_AN17_ANA()
* ENABLE_AN18_DIG()
* ENABLE_AN18_ANA()
* ENABLE_AN19_DIG()
* ENABLE_AN19_ANA()
* ENABLE_ALL_ANA_16_23()
* ENABLE_ALL_DIG_16_23()
```

ADC Examples (see page 898)

7.4.1.1.2 Analog Comparator (6xK50 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 907)

Open_ancomp2 (see page 915)

Open_ancomp3 (see page 917)

Close_ancomp1 (see page 923)

Close_ancomp2 (see page 923)

Close_ancomp3 (see page 923)

Macros

Config_CVREF

Comparator Examples (see page 924)

7.4.1.1.3 CTMU (6xK90 Set)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)

CurrentControlCTMU (see page 927)

CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples (see page 928)

7.4.1.1.4 Input Capture (6xK90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECapture1 (see page 967)

OpenECapture2 (see page 970)

OpenECapture3 (see page 972)

OpenCapture4 (see page 960)

OpenCapture5 (see page 964)

OpenCapture6 (see page 973)

OpenCapture7 (see page 974)

OpenCapture8 (see page 975)

OpenCapture9 (see page 977)

OpenCapture10 (see page 978)

ReadECapture1 (see page 986)

ReadECapture2 (see page 986)

ReadECapture3 (see page 987)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

ReadCapture6 (see page 985)

ReadCapture7 (see page 985)

ReadCapture8 (see page 985)

ReadCapture9 (see page 986)

ReadCapture10 (see page 986)

CloseECapture1 (see page 990)

CloseECapture2 (see page 990)

CloseECapture3 (see page 991)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

CloseCapture6 (see page 989)

CloseCapture7 (see page 989)

CloseCapture8 (see page 989)

CloseCapture9 (see page 989)

CloseCapture10 (see page 990)

Input Capture Examples (see page 991)

7.4.1.1.5 Output Compare (6xK90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

[OpenECompare1](#) (see page 1004)

[OpenECompare2](#) (see page 1007)

[OpenECompare3](#) (see page 1009)

[OpenCompare4](#) (see page 998)

[OpenCompare5](#) (see page 1001)

[OpenCompare6](#) (see page 1010)

[OpenCompare7](#) (see page 1011)

[OpenCompare8](#) (see page 1012)

[OpenCompare9](#) (see page 1014)

[OpenCompare10](#) (see page 1015)

[CloseECompare1](#) (see page 1024)

[CloseECompare2](#) (see page 1024)

[CloseECompare3](#) (see page 1025)

[CloseCompare4](#) (see page 1022)

[CloseCompare5](#) (see page 1022)

[CloseCompare6](#) (see page 1023)

[CloseCompare7](#) (see page 1023)

[CloseCompare8](#) (see page 1023)

[CloseCompare9](#) (see page 1024)

[CloseCompare10](#) (see page 1024)

Output Compare Examples (see page 1025)

7.4.1.1.6 PWM (6xK90 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenEPWM1](#) (see page 1036)

[OpenEPWM2](#) (see page 1038)

OpenEPWM3 (see page 1039)

OpenPWM4 (see page 1029)

OpenPWM5 (see page 1029)

OpenPWM6 (see page 1032)

OpenPWM7 (see page 1033)

OpenPWM8 (see page 1033)

OpenPWM9 (see page 1035)

OpenPWM10 (see page 1035)

SetDCEPWM1 (see page 1054)

SetDCEPWM2 (see page 1054)

SetDCEPWM3 (see page 1055)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetDCPWM6 (see page 1050)

SetDCPWM7 (see page 1051)

SetDCPWM8 (see page 1052)

SetDCPWM9 (see page 1052)

SetDCPWM10 (see page 1053)

SetOutputEPWM1 (see page 1045)

SetOutputEPWM2 (see page 1046)

SetOutputEPWM3 (see page 1046)

CloseEPWM1 (see page 1059)

CloseEPWM2 (see page 1059)

CloseEPWM3 (see page 1059)

ClosePWM4 (see page 1057)

ClosePWM5 (see page 1057)

ClosePWM6 (see page 1057)

ClosePWM7 (see page 1057)

ClosePWM8 (see page 1058)

ClosePWM9 (see page 1058)

ClosePWM10 (see page 1058)

PWM Examples (see page 1060)

7.4.1.1.7 I2C (6xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 ( see page 1064)

Writel2C1 ( see page 1066)

Readl2C1 ( see page 1067)

putsl2C1 ( see page 1069)

getsl2C1 ( see page 1070)

OpenI2C2 ( see page 1065)

Writel2C2 ( see page 1067)

Readl2C2 ( see page 1068)

putsl2C2 ( see page 1069)

getsl2C2 ( see page 1071)

Macros

EnableIntI2C1

DisableIntI2C1

SetPriorityIntI2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

Closel2C1

putcl2C1

getcl2C1

EnableIntI2C2

DisableIntI2C2

SetPriorityIntI2C2

I2C2_Clear_Intr_Status_Bit

I2C2_Intr_Status

StopI2C2

StartI2C2

RestartI2C2

NotAckI2C2

AckI2C2

DataRdyI2C2

IdleI2C2

Closel2C2
putl2C2
getl2C2

I2C Examples ([see page 1072](#))

7.4.1.1.8 I2C EEPROM (6xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.4.1.1.9 EEP (6xK90 Set)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions
Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.4.1.1.10 IO Ports (6xK90 Set)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.4.1.1.11 MWIRE (6xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 (see page 1166)

ReadMwire1 (see page 1170)

[WriteMwire1](#) (see page 1169)

[getsMwire1](#) (see page 1167)

[OpenMwire2](#) (see page 1166)

[ReadMwire2](#) (see page 1171)

[WriteMwire2](#) (see page 1169)

[getsMwire2](#) (see page 1168)

Macros

`CloseMwire1`

`getcMwire1`

`putcMwire1`

`DataRdyMwire1`

`CloseMwire2`

`getcMwire2`

`putcMwire2`

`DataRdyMwire2`

MWIRE Examples (see page 1172)

7.4.1.1.12 RTCC (6xK90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

`RtccInitClock` (see page 1095)

`RtccWriteTime` (see page 1099)

`RtccWriteDate` (see page 1100)

`RtccWriteAlrmTimeDate` (see page 1101)

`RtccWriteAlrmTime` (see page 1101)

`RtccWriteAlrmDate` (see page 1102)

`RtccSetChimeEnable` (see page 1103)

`RtccSetCalibration` (see page 1103)

`RtccSetAlarmRptCount` (see page 1104)

`RtccSetAlarmRptCount` (see page 1104)

`RtccSetAlarmRpt` (see page 1098)

`RtccReadTimeDate` (see page 1097)

`RtccReadTime` (see page 1097)

RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.4.1.1.13 SW_RTCC (6xK90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))

update_RTCC (see page 1106)

Close_RTCC (see page 1106)
--

SW_RTCC Examples ([see page 1107](#))

7.4.1.1.14 SPI (6xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 (see page 1109)
--

WriteSPI1 (see page 1112)

ReadSPI1 (see page 1113)
--

putsSPI1 (see page 1114)
--

getsSPI1 (see page 1115)
--

OpenSPI2 (see page 1110)
--

WriteSPI2 (see page 1112)

ReadSPI2 (see page 1113)
--

putsSPI2 (see page 1114)
--

getsSPI2 (see page 1116)
--

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.4.1.1.15 USART (6xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
baud1USART (see page 1155)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
baud2USART (see page 1157)
gets2USART (see page 1159)
putrs2USART (see page 1161)
puts2USART (see page 1162)
Read2USART (see page 1163)

Macros

DataRdy1USART
Close1USART
Busy1USART
putc1USART
getc1USART
DataRdy2USART

Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.4.1.1.16 Timers (6xK90 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5/7 are 16 bit timers/counters
- Timer2/4/6/8/10/12 are 8 bit timers

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1121)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1125)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
OpenTimer5 (see page 1129)
ReadTimer5 (see page 1139)
WriteTimer5 (see page 1140)
CloseTimer5 (see page 1144)
OpenTimer6 (see page 1131)
CloseTimer6 (see page 1145)
OpenTimer7 (see page 1132)

ReadTimer7 (see page 1139)

WriteTimer7 (see page 1141)

CloseTimer7 (see page 1145)

OpenTimer8 (see page 1134)

CloseTimer8 (see page 1145)

OpenTimer10 (see page 1135)

CloseTimer10 (see page 1146)

OpenTimer12 (see page 1136)

CloseTimer12 (see page 1146)

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

WriteTimer6

ReadTimer6

WriteTimer8

ReadTimer8

WriteTimer10

ReadTimer10

WriteTimer12

ReadTimer12

Timers Examples (see page 1146)

7.4.1.1.17 Flash (6xK90)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1200)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples ( see page 1204)

7.4.1.2 PIC18F6xK90_32

PIC18F65K90 ( see page 65)

7.4.1.2.1 ADC (65K90 Set)

This peripheral module supports functionalities:

- Up to 32 analog input pins, designated AN0 through AN31, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ( see page 867)SetChanADC ( see page 887)SelChanConvADC ( see page 894)ConvertADC ( see page 896)BusyADC ( see page 897)ReadADC ( see page 897)CloseADC ( see page 897)**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

```
* ENABLE_AN0_DIG()
* ENABLE_AN0_ANA()
* ENABLE_AN1_DIG()
* ENABLE_AN1_ANA()
* ENABLE_AN2_DIG()
* ENABLE_AN2_ANA()
* ENABLE_AN3_DIG()
* ENABLE_AN3_ANA()
* ENABLE_AN4_DIG()
* ENABLE_AN4_ANA()
* ENABLE_AN5_DIG()
* ENABLE_AN5_ANA()
* ENABLE_AN6_DIG()
* ENABLE_AN6_ANA()
* ENABLE_AN7_DIG()
* ENABLE_AN7_ANA()
* ENABLE_ALL_ANA_0_7()
* ENABLE_ALL_DIG_0_7()

* ENABLE_AN8_DIG()
* ENABLE_AN8_ANA()
* ENABLE_AN9_DIG()
* ENABLE_AN9_ANA()
* ENABLE_AN10_DIG()
* ENABLE_AN10_ANA()
* ENABLE_AN11_DIG()
* ENABLE_AN11_ANA()
* ENABLE_ALL_ANA_8_15()
* ENABLE_ALL_DIG_8_15()

* ENABLE_AN16_DIG()
* ENABLE_AN16_ANA()
* ENABLE_AN17_DIG()
* ENABLE_AN17_ANA()
* ENABLE_AN18_DIG()
* ENABLE_AN18_ANA()
* ENABLE_AN19_DIG()
* ENABLE_AN19_ANA()
* ENABLE_ALL_ANA_16_23()
* ENABLE_ALL_DIG_16_23()
```

ADC Examples (see page 898)

7.4.1.2.2 Analog Comparator (65K90 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 907)

Open_ancomp2 (see page 915)

Open_ancomp3 (see page 917)

Close_ancomp1 (see page 923)

Close_ancomp2 (see page 923)

Close_ancomp3 (see page 923)

Macros

Config_CVREF

Comparator Examples (see page 924)

7.4.1.2.3 CTMU (65K90 Set)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)

CurrentControlCTMU (see page 927)

CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples (see page 928)

7.4.1.2.4 Input Capture (65K90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECapture1 (see page 968)

OpenECapture2 (see page 971)

OpenECapture3 (see page 972)

OpenCapture4 (see page 960)

OpenCapture5 (see page 964)

OpenCapture6 (see page 973)

OpenCapture7 (see page 974)

OpenCapture8 (see page 976)

ReadECapture1 (see page 986)

ReadECapture2 (see page 986)

ReadECapture3 (see page 987)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

ReadCapture6 (see page 985)

ReadCapture7 (see page 985)

ReadCapture8 (see page 985)

CloseECapture1 (see page 990)

CloseECapture2 (see page 990)

CloseECapture3 (see page 991)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

CloseCapture6 (see page 989)

CloseCapture7 (see page 989)

CloseCapture8 (see page 989)

Input Capture Examples (see page 991)

7.4.1.2.5 Output Compare (65K90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available

- Configurable interrupt generation

Functions

OpenECompare1 (see page 1005)

OpenECompare2 (see page 1008)

OpenECompare3 (see page 1009)

OpenCompare4 (see page 998)

OpenCompare5 (see page 1001)

OpenCompare6 (see page 1010)

OpenCompare7 (see page 1011)

OpenCompare8 (see page 1013)

CloseECompare1 (see page 1024)

CloseECompare2 (see page 1024)

CloseECompare3 (see page 1025)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

CloseCompare6 (see page 1023)

CloseCompare7 (see page 1023)

CloseCompare8 (see page 1023)

Output Compare Examples (see page 1025)

7.4.1.2.6 PWM (65K90 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenEPWM1 (see page 1037)

OpenEPWM2 (see page 1038)

OpenEPWM3 (see page 1039)

OpenPWM4 (see page 1029)

OpenPWM5 (see page 1029)

OpenPWM6 (see page 1032)

OpenPWM7 (see page 1033)

OpenPWM8 (see page 1034)

SetDCEPWM1 (see page 1054)

SetDCEPWM2 (see page 1054)

SetDCEPWM3 (see page 1055)

SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)
SetDCPWM6 (see page 1050)
SetDCPWM7 (see page 1051)
SetDCPWM8 (see page 1052)
SetOutputEPWM1 (see page 1045)
SetOutputEPWM2 (see page 1046)
SetOutputEPWM3 (see page 1046)
CloseEPWM1 (see page 1059)
CloseEPWM2 (see page 1059)
CloseEPWM3 (see page 1059)
ClosePWM4 (see page 1057)
ClosePWM5 (see page 1057)
ClosePWM6 (see page 1057)
ClosePWM7 (see page 1057)
ClosePWM8 (see page 1058)

PWM Examples (see page 1060)

7.4.1.2.7 I2C (65K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)
WritelI2C1 (see page 1066)
ReadlI2C1 (see page 1067)
putslI2C1 (see page 1069)
getslI2C1 (see page 1070)
OpenI2C2 (see page 1065)
WritelI2C2 (see page 1067)
ReadlI2C2 (see page 1068)
putslI2C2 (see page 1069)
getslI2C2 (see page 1071)

Macros

EnableI2C1
DisableI2C1
SetPriorityI2C1
I2C1_Clear_Intr_Status_Bit
I2C1_Intr_Status
StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putclI2C1
getclI2C1
EnableI2C2
DisableI2C2
SetPriorityI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putclI2C2
getclI2C2

I2C Examples (see page 1072)

7.4.1.2.8 I2C EEPROM (65K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C1](#) (see page 1064)
[EEAckPolling1](#) (see page 1076)
[EEByteWrite1](#) (see page 1080)
[EECurrentAddRead1](#) (see page 1078)
[EEPageWrite1](#) (see page 1082)
[EERandomRead1](#) (see page 1086)
[EESequentialRead1](#) (see page 1084)
[OpenI2C2](#) (see page 1065)
[EEAckPolling2](#) (see page 1076)
[EEByteWrite2](#) (see page 1080)
[EECurrentAddRead2](#) (see page 1078)
[EEPageWrite2](#) (see page 1083)
[EERandomRead2](#) (see page 1087)
[EESequentialRead2](#) (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.4.1.2.9 EEP (65K90 Set)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

[Write_b_eep](#) (see page 1061)
[Read_b_eep](#) (see page 1061)
[Busy_eep](#) (see page 1062)

EEP Examples ([see page 1062](#))

7.4.1.2.10 IO Ports (65K90 Set)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples (see page 1093)

7.4.1.2.11 MWIRE (65K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 (see page 1166)
ReadMwire1 (see page 1170)
WriteMwire1 (see page 1169)
getsMwire1 (see page 1167)
OpenMwire2 (see page 1166)
ReadMwire2 (see page 1171)
WriteMwire2 (see page 1169)
getsMwire2 (see page 1168)

Macros

CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1

CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.4.1.2.12 RTCC (65K90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

RtccInitClock (see page 1095)
RtccWriteTime (see page 1099)
RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr

mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.4.1.2.13 SW_RTCC (65K90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.4.1.2.14 SPI (65K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 (see page 1109)

WriteSPI1 (see page 1112)

ReadSPI1 (see page 1113)

putsSPI1 (see page 1114)

getsSPI1 (see page 1115)

OpenSPI2 (see page 1110)

WriteSPI2 (see page 1112)

ReadSPI2 (see page 1113)

putsSPI2 (see page 1114)

getsSPI2 (see page 1116)

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2

putcSPI2

SPI Examples (see page 1116)

7.4.1.2.15 USART (65K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[Open1USART](#) (see page 1148)

[Write1USART](#) (see page 1154)

[baud1USART](#) (see page 1155)

[gets1USART](#) (see page 1159)

[putrs1USART](#) (see page 1160)

[puts1USART](#) (see page 1162)

[Read1USART](#) (see page 1163)

[Open2USART](#) (see page 1150)

[Write2USART](#) (see page 1155)

[baud2USART](#) (see page 1157)

[gets2USART](#) (see page 1159)

[putrs2USART](#) (see page 1161)

[puts2USART](#) (see page 1162)

[Read2USART](#) (see page 1163)

Macros

`DataRdy1USART`

`Close1USART`

`Busy1USART`

`putc1USART`

`getc1USART`

`DataRdy2USART`

`Close2USART`

`Busy2USART`

`putc2USART`

`getc2USART`

USART Examples (see page 1164)

7.4.1.2.16 Timers (65K90 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5 are 16 bit timers/counters
- Timer2/4/6/8 are 8 bit timers

Functions

OpenTimer0 (█ see page 1119)

ReadTimer0 (█ see page 1137)

WriteTimer0 (█ see page 1139)

CloseTimer0 (█ see page 1143)

OpenTimer1 (█ see page 1121)

ReadTimer1 (█ see page 1138)

WriteTimer1 (█ see page 1140)

CloseTimer1 (█ see page 1143)

OpenTimer2 (█ see page 1123)

CloseTimer2 (█ see page 1144)

OpenTimer3 (█ see page 1125)

ReadTimer3 (█ see page 1138)

WriteTimer3 (█ see page 1140)

CloseTimer3 (█ see page 1144)

OpenTimer4 (█ see page 1130)

CloseTimer4 (█ see page 1144)

OpenTimer5 (█ see page 1129)

ReadTimer5 (█ see page 1139)

WriteTimer5 (█ see page 1140)

CloseTimer5 (█ see page 1144)

OpenTimer6 (█ see page 1131)

CloseTimer6 (█ see page 1145)

OpenTimer8 (█ see page 1134)

CloseTimer8 (█ see page 1145)

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

WriteTimer6

ReadTimer6

WriteTimer8

ReadTimer8

Timers Examples (█ see page 1146)

7.4.1.2.17 Flash (65K90 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) ([see page 1198](#))

[EraseFlash](#) ([see page 1196](#))

[WriteBlockFlash](#) ([see page 1200](#))

[WriteBytesFlash](#) ([see page 1202](#))

Macros

[LoadFlashAddr](#)

[TableRead](#)

[Flash Examples](#) ([see page 1204](#))

7.4.2 PIC18F8xK90 Set

[PIC18F87K90](#) ([see page 58](#)) \ [PIC18F86K95](#) ([see page 59](#)) \ [PIC18F86K90](#) ([see page 60](#)) \ [PIC18F85K90](#) ([see page 61](#))

7.4.2.1 PIC18F8xK90_non_32

[PIC18F87K90](#) ([see page 58](#)) \ [PIC18F86K95](#) ([see page 59](#)) \ [PIC18F86K90](#) ([see page 60](#))

7.4.2.1.1 ADC (8xK90 Set)

This peripheral module supports functionalities:

- Up to 32 analog input pins, designated AN0 through AN31, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) ([see page 870](#))

SetChanADC (see page 887)
SelChanConvADC (see page 895)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

7.4.2.1.2 Analog Comparator (8xK90 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 907)
Open_ancomp2 (see page 915)
Open_ancomp3 (see page 917)
Close_ancomp1 (see page 923)
Close_ancomp2 (see page 923)
Close_ancomp3 (see page 923)

Macros

Config_CVREF

Comparator Examples (see page 924)

7.4.2.1.3 CTMU (8xK90 Set)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)
 CurrentControlCTMU (see page 927)
 CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1
 Enbl_CTMUEdge2
 Disbl_CTMUEdge1
 Disbl_CTMUEdge2
 CTMUEdge1_Status
 CTMUEdge2_Status
 CTMU_INT_ENABLE
 CTMU_INT_DISABLE
 CTMU_Clear_Intr_Status_Bit
 CTMU_Intr_Status

CTMU Examples (see page 928)

7.4.2.1.4 Input Capture (8xK90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECapture1 (see page 967)
 OpenECapture2 (see page 970)
 OpenECapture3 (see page 972)
 OpenCapture4 (see page 960)
 OpenCapture5 (see page 964)
 OpenCapture6 (see page 973)
 OpenCapture7 (see page 974)
 OpenCapture8 (see page 975)
 OpenCapture9 (see page 977)
 OpenCapture10 (see page 978)
 ReadECapture1 (see page 986)
 ReadECapture2 (see page 986)

ReadECapture3 (see page 987)
ReadCapture4 (see page 984)
ReadCapture5 (see page 984)
ReadCapture6 (see page 985)
ReadCapture7 (see page 985)
ReadCapture8 (see page 985)
ReadCapture9 (see page 986)
ReadCapture10 (see page 986)
CloseECapture1 (see page 990)
CloseECapture2 (see page 990)
CloseECapture3 (see page 991)
CloseCapture4 (see page 988)
CloseCapture5 (see page 988)
CloseCapture6 (see page 989)
CloseCapture7 (see page 989)
CloseCapture8 (see page 989)
CloseCapture9 (see page 989)
CloseCapture10 (see page 990)

Input Capture Examples (see page 991)

7.4.2.1.5 Output Compare (8xK90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECompare1 (see page 1004)
OpenECompare2 (see page 1007)
OpenECompare3 (see page 1009)
OpenCompare4 (see page 998)
OpenCompare5 (see page 1001)
OpenCompare6 (see page 1010)
OpenCompare7 (see page 1011)
OpenCompare8 (see page 1012)
OpenCompare9 (see page 1014)
OpenCompare10 (see page 1015)
CloseECompare1 (see page 1024)

CloseECompare2 (see page 1024)
CloseECompare3 (see page 1025)
CloseCompare4 (see page 1022)
CloseCompare5 (see page 1022)
CloseCompare6 (see page 1023)
CloseCompare7 (see page 1023)
CloseCompare8 (see page 1023)
CloseCompare9 (see page 1024)
CloseCompare10 (see page 1024)

Output Compare Examples (see page 1025)

7.4.2.1.6 PWM (8xK90 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenEPWM1 (see page 1036)
OpenEPWM2 (see page 1038)
OpenEPWM3 (see page 1039)
OpenPWM4 (see page 1029)
OpenPWM5 (see page 1029)
OpenPWM6 (see page 1032)
OpenPWM7 (see page 1033)
OpenPWM8 (see page 1033)
OpenPWM9 (see page 1035)
OpenPWM10 (see page 1035)
SetDCEPWM1 (see page 1054)
SetDCEPWM2 (see page 1054)
SetDCEPWM3 (see page 1055)
SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)
SetDCPWM6 (see page 1050)
SetDCPWM7 (see page 1051)
SetDCPWM8 (see page 1052)
SetDCPWM9 (see page 1052)
SetDCPWM10 (see page 1053)
SetOutputEPWM1 (see page 1045)
SetOutputEPWM2 (see page 1046)

[SetOutputEPWM3](#) (see page 1046)

[CloseEPWM1](#) (see page 1059)

[CloseEPWM2](#) (see page 1059)

[CloseEPWM3](#) (see page 1059)

[ClosePWM4](#) (see page 1057)

[ClosePWM5](#) (see page 1057)

[ClosePWM6](#) (see page 1057)

[ClosePWM7](#) (see page 1057)

[ClosePWM8](#) (see page 1058)

[ClosePWM9](#) (see page 1058)

[ClosePWM10](#) (see page 1058)

PWM Examples (see page 1060)

7.4.2.1.7 I2C (8xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C1](#) (see page 1064)

[Writel2C1](#) (see page 1066)

[Readl2C1](#) (see page 1067)

[putsl2C1](#) (see page 1069)

[getsl2C1](#) (see page 1070)

[OpenI2C2](#) (see page 1065)

[Writel2C2](#) (see page 1067)

[Readl2C2](#) (see page 1068)

[putsl2C2](#) (see page 1069)

[getsl2C2](#) (see page 1071)

Macros

[EnableIntI2C1](#)

[DisableIntI2C1](#)

[SetPriorityIntI2C1](#)

[I2C1_Clear_Intr_Status_Bit](#)

[I2C1_Intr_Status](#)

StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putclI2C1
getclI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putclI2C2
getclI2C2

I2C Examples ([see page 1072](#))

7.4.2.1.8 I2C EEPROM (8xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

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Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)

EECurrentAddRead1 (see page 1078)
EEPAGEWRITE1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPAGEWRITE2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

7.4.2.1.9 EEP (8xK90 Set)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions
Write_b_eep (see page 1061)
Read_b_eep (see page 1061)
Busy_eep (see page 1062)

7.4.2.1.10 IO Ports (8xK90 Set)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.4.2.1.11 MWIRE (8xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire1 ([see page 1166](#))ReadMwire1 ([see page 1170](#))WriteMwire1 ([see page 1169](#))getsMwire1 ([see page 1167](#))OpenMwire2 ([see page 1166](#))ReadMwire2 ([see page 1171](#))WriteMwire2 ([see page 1169](#))getsMwire2 ([see page 1168](#))**Macros**

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2

putcMwire2

DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.4.2.1.12 RTCC (8xK90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

RtccInitClock (see page 1095)
RtccWriteTime (see page 1099)
RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe

mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.4.2.1.13 SW_RTCC (8xK90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.4.2.1.14 SPI (8xK90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

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Functions
OpenSPI1 (see page 1109)
WriteSPI1 (see page 1112)
ReadSPI1 (see page 1113)
putsSPI1 (see page 1114)
getsSPI1 (see page 1115)

OpenSPI2 (see page 1110)
WriteSPI2 (see page 1112)
ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

Macros

EnableIntSPI1
DisableIntSPI1
SetPriorityIntSPI1
SPI1_Clear_Intr_Status_Bit
SPI1_Intr_Status
SPI1_Clear_Recv_OV
CloseSPI1
DataRdySPI1
getcSPI1
putcSPI1
EnableIntSPI2
DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.4.2.1.15 USART (8xK90 Set)

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This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpen1USART ([see page 1148](#))Write1USART ([see page 1154](#))baud1USART ([see page 1155](#))gets1USART ([see page 1159](#))putrs1USART ([see page 1160](#))puts1USART ([see page 1162](#))Read1USART ([see page 1163](#))Open2USART ([see page 1150](#))Write2USART ([see page 1155](#))baud2USART ([see page 1157](#))gets2USART ([see page 1159](#))putrs2USART ([see page 1161](#))puts2USART ([see page 1162](#))Read2USART ([see page 1163](#))**Macros**

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.4.2.1.16 Timers (8xK90 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5/7 are 16 bit timers/counters
- Timer2/4/6/8/10/12 are 8 bit timers

Functions

OpenTimer0 (see page 1119)

ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1121)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1125)

ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)

CloseTimer3 (see page 1144)

OpenTimer4 (see page 1130)

CloseTimer4 (see page 1144)

OpenTimer5 (see page 1129)

ReadTimer5 (see page 1139)

WriteTimer5 (see page 1140)

CloseTimer5 (see page 1144)

OpenTimer6 (see page 1131)

CloseTimer6 (see page 1145)

OpenTimer7 (see page 1132)

ReadTimer7 (see page 1139)

WriteTimer7 (see page 1141)

CloseTimer7 (see page 1145)

OpenTimer8 (see page 1134)

CloseTimer8 (see page 1145)

OpenTimer10 (see page 1135)

CloseTimer10 (see page 1146)

OpenTimer12 (see page 1136)

CloseTimer12 (see page 1146)

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

WriteTimer6

ReadTimer6
WriteTimer8
ReadTimer8
WriteTimer10
ReadTimer10
WriteTimer12
ReadTimer12

Timers Examples ([see page 1146](#))

7.4.2.1.17 Flash (8xK90 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.4.2.2 PIC18F8xK90_32

PIC18F85K90 ([see page 61](#))

7.4.2.2.1 ADC (85K90 Set)

This peripheral module supports functionalities:

- Up to 32 analog input pins, designated AN0 through AN31, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 870)
 SetChanADC (see page 887)
 SelChanConvADC (see page 895)
 ConvertADC (see page 896)
 BusyADC (see page 897)
 ReadADC (see page 897)
 CloseADC (see page 897)

Macros

ADC_INT_ENABLE
 ADC_INT_DISABLE

7.4.2.2.2 Analog Comparator (85K90 Set)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 907)
 Open_ancomp2 (see page 915)
 Open_ancomp3 (see page 917)
 Close_ancomp1 (see page 923)
 Close_ancomp2 (see page 923)
 Close_ancomp3 (see page 923)

Macros

Config_CVREF

Comparator Examples (see page 924)

7.4.2.2.3 CTMU (85K90 Set)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)

CurrentControlCTMU (see page 927)

CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples (see page 928)

7.4.2.2.4 Input Capture (85K90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECapture1 (see page 968)

OpenECapture2 (see page 971)

OpenECapture3 (see page 972)

OpenCapture4 (see page 960)

OpenCapture5 (see page 964)

OpenCapture6 (see page 973)

OpenCapture7 (see page 974)

OpenCapture8 (see page 976)

ReadECapture1 (see page 986)

ReadECapture2 (see page 986)

ReadECapture3 (see page 987)

ReadCapture4 (see page 984)
ReadCapture5 (see page 984)
ReadCapture6 (see page 985)
ReadCapture7 (see page 985)
ReadCapture8 (see page 985)
CloseECapture1 (see page 990)
CloseECapture2 (see page 990)
CloseECapture3 (see page 991)
CloseCapture4 (see page 988)
CloseCapture5 (see page 988)
CloseCapture6 (see page 989)
CloseCapture7 (see page 989)
CloseCapture8 (see page 989)

Input Capture Examples (see page 991)

7.4.2.2.5 Output Compare (85K90 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenECompare1 (see page 1005)
OpenECompare2 (see page 1008)
OpenECompare3 (see page 1009)
OpenCompare4 (see page 998)
OpenCompare5 (see page 1001)
OpenCompare6 (see page 1010)
OpenCompare7 (see page 1011)
OpenCompare8 (see page 1013)
CloseECompare1 (see page 1024)
CloseECompare2 (see page 1024)
CloseECompare3 (see page 1025)
CloseCompare4 (see page 1022)
CloseCompare5 (see page 1022)
CloseCompare6 (see page 1023)
CloseCompare7 (see page 1023)
CloseCompare8 (see page 1023)

Output Compare Examples ([see page 1025](#))

7.4.2.2.6 PWM (85K90 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenEPWM1 ([see page 1037](#))

OpenEPWM2 ([see page 1038](#))

OpenEPWM3 ([see page 1039](#))

OpenPWM4 ([see page 1029](#))

OpenPWM5 ([see page 1029](#))

OpenPWM6 ([see page 1032](#))

OpenPWM7 ([see page 1033](#))

OpenPWM8 ([see page 1034](#))

SetDCEPWM1 ([see page 1054](#))

SetDCEPWM2 ([see page 1054](#))

SetDCEPWM3 ([see page 1055](#))

SetDCPWM4 ([see page 1049](#))

SetDCPWM5 ([see page 1050](#))

SetDCPWM6 ([see page 1050](#))

SetDCPWM7 ([see page 1051](#))

SetDCPWM8 ([see page 1052](#))

SetOutputEPWM1 ([see page 1045](#))

SetOutputEPWM2 ([see page 1046](#))

SetOutputEPWM3 ([see page 1046](#))

CloseEPWM1 ([see page 1059](#))

CloseEPWM2 ([see page 1059](#))

CloseEPWM3 ([see page 1059](#))

ClosePWM4 ([see page 1057](#))

ClosePWM5 ([see page 1057](#))

ClosePWM6 ([see page 1057](#))

ClosePWM7 ([see page 1057](#))

ClosePWM8 ([see page 1058](#))

PWM Examples ([see page 1060](#))

7.4.2.2.7 I2C (85K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 ( see page 1064)

Writel2C1 ( see page 1066)

Readl2C1 ( see page 1067)

putsl2C1 ( see page 1069)

getsl2C1 ( see page 1070)

OpenI2C2 ( see page 1065)

Writel2C2 ( see page 1067)

Readl2C2 ( see page 1068)

putsl2C2 ( see page 1069)

getsl2C2 ( see page 1071)

Macros

EnableIntl2C1

DisableIntl2C1

SetPriorityIntl2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

Closel2C1

putcl2C1

getcl2C1

EnableIntl2C2

DisableIntl2C2

SetPriorityIntl2C2

I2C2_Clear_Intr_Status_Bit

I2C2_Intr_Status

StopI2C2

StartI2C2

RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.4.2.2.8 I2C EEPROM (85K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.4.2.2.9 EEP (85K90 Set)

This peripheral library module:

- Byte Read from the specified location in EEPROM

- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

[Write_b_eep](#) (see page 1061)

[Read_b_eep](#) (see page 1061)

[Busy_eep](#) (see page 1062)

EEP Examples (see page 1062)

7.4.2.2.10 IO Ports (85K90 Set)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

[EnablePullups](#)

[DisablePullups](#)

[ClosePORTB](#)

[CloseRB0INT](#)

[CloseRB1INT](#)

[CloseRB2INT](#)

[CloseRB3INT](#)

IO Ports Examples (see page 1093)

7.4.2.2.11 MWIRE (85K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions[OpenMwire1](#) (see page 1166)[ReadMwire1](#) (see page 1170)[WriteMwire1](#) (see page 1169)[getsMwire1](#) (see page 1167)[OpenMwire2](#) (see page 1166)[ReadMwire2](#) (see page 1171)[WriteMwire2](#) (see page 1169)[getsMwire2](#) (see page 1168)**Macros**[CloseMwire1](#)[getcMwire1](#)[putcMwire1](#)[DataRdyMwire1](#)[CloseMwire2](#)[getcMwire2](#)[putcMwire2](#)[DataRdyMwire2](#)[MWIRE Examples](#) (see page 1172)

7.4.2.2.12 RTCC (85K90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions[RtccInitClock](#) (see page 1095)[RtccWriteTime](#) (see page 1099)[RtccWriteDate](#) (see page 1100)[RtccWriteAlrmTimeDate](#) (see page 1101)[RtccWriteAlrmTime](#) (see page 1101)[RtccWriteAlrmDate](#) (see page 1102)[RtccSetChimeEnable](#) (see page 1103)[RtccSetCalibration](#) (see page 1103)[RtccSetAlarmRptCount](#) (see page 1104)

RtccSetAlarmRptCount (see page 1104)

RtccSetAlarmRpt (see page 1098)

RtccReadTimeDate (see page 1097)

RtccReadTime (see page 1097)

RtccReadDate (see page 1096)

RtccReadAlrmTimeDate (see page 1096)

RtccReadAlrmTime (see page 1096)

RtccReadAlrmDate (see page 1095)

RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit

mRtccAlrmDisable

mRtccAlrmEnable

mRtccClearAlrmPtr

mRtccClearRtcPtr

mRtccGetAlarmRpt

mRtccGetAlarmRptCount

mRtccGetCalibration

mRtccGetChimeEnable

mRtccGetClockOe

mRtccls2ndHalfSecond

mRtcclsAlrmEnabled

mRtcclsOn

mRtcclsSync

mRtcclsWrEn

mRtccOff

mRtccOn

mRtccSetAlrmPtr

mRtccSetClockOe

mRtccSetInt

mRtccSetRtcPtr

mRtccWaitSync

mRtccWrOff

RTCC Examples (see page 1104)

7.4.2.2.13 SW_RTCC (85K90 Set)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)

update_RTCC (see page 1106)

Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.4.2.2.14 SPI (853K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 (see page 1109)

WriteSPI1 (see page 1112)

ReadSPI1 (see page 1113)

putsSPI1 (see page 1114)

getsSPI1 (see page 1115)

OpenSPI2 (see page 1110)

WriteSPI2 (see page 1112)

ReadSPI2 (see page 1113)

putsSPI2 (see page 1114)

getsSPI2 (see page 1116)

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.4.2.2.15 USART (85K90 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
baud1USART (see page 1155)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
baud2USART (see page 1157)
gets2USART (see page 1159)
putrs2USART (see page 1161)
puts2USART (see page 1162)
Read2USART (see page 1163)

Macros

DataRdy1USART
Close1USART
Busy1USART

putc1USART
getc1USART
DataRdy2USART
Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.4.2.2.16 Timers (85K90 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5 are 16 bit timers/counters
- Timer2/4/6/8 are 8 bit timers

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1121)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1125)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
OpenTimer5 (see page 1129)
ReadTimer5 (see page 1139)
WriteTimer5 (see page 1140)
CloseTimer5 (see page 1144)

OpenTimer6 (see page 1131)
CloseTimer6 (see page 1145)
OpenTimer8 (see page 1134)
CloseTimer8 (see page 1145)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4
WriteTimer6
ReadTimer6
WriteTimer8
ReadTimer8

Timers Examples (see page 1146)

7.4.2.2.17 Flash (85K90 Set)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.5 18F87J90 Family

PIC18F66J90 / PIC18F67J90 / PIC18F86J90 / PIC18F87J90

7.5.1 ADC (87J90 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ( see page 862)

SetChanADC ( see page 882)

SelChanConvADC ( see page 889)

ConvertADC ( see page 896)

BusyADC ( see page 897)

ReadADC ( see page 897)

CloseADC ( see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CALIB

ADC_NO_CALIB

ADC Examples ( see page 898)

7.5.2 Analog Comparator (87J90 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.5.3 CTMU (87J90 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)

CurrentControlCTMU (see page 927)

CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1

Enbl_CTMUEdge2

Disbl_CTMUEdge1

Disbl_CTMUEdge2

CTMUEdge1_Status

CTMUEdge2_Status

CTMU_INT_ENABLE

CTMU_INT_DISABLE

CTMU_Clear_Intr_Status_Bit

CTMU_Intr_Status

CTMU Examples (see page 928)

7.5.4 Input Capture (87J90 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions[OpenCapture1](#) (see page 954)[OpenCapture2](#) (see page 955)[ReadCapture1](#) (see page 983)[ReadCapture2](#) (see page 984)[CloseCapture1](#) (see page 987)[CloseCapture2](#) (see page 987)[Input Capture Examples](#) (see page 991)

7.5.5 Output Compare (87J90 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions[OpenCompare1](#) (see page 992)[OpenCompare2](#) (see page 993)[CloseCompare1](#) (see page 1021)[CloseCompare2](#) (see page 1022)[Output Compare Examples](#) (see page 1025)

7.5.6 PWM (87J90 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions[OpenPWM1](#) (see page 1026)[OpenPWM2](#) (see page 1027)[SetDCPWM1](#) (see page 1047)[SetDCPWM2](#) (see page 1048)[SetOutputPWM1](#) (see page 1043)[ClosePWM1](#) (see page 1056)

[ClosePWM2](#) (see page 1056)

[PWM Examples](#) (see page 1060)

7.5.7 I2C (87J90 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C](#) (see page 1063)

[WriteI2C](#) (see page 1066)

[ReadI2C](#) (see page 1067)

[putslI2C](#) (see page 1068)

[getslI2C](#) (see page 1070)

[IdleI2C](#) (see page 1072)

[CloseI2C](#) (see page 1071)

Macros

[EnableIntI2C](#)

[DisableIntI2C](#)

[SetPriorityIntI2C](#)

[I2C_Clear_Intr_Status_Bit](#)

[I2C_Intr_Status](#)

[StopI2C](#)

[StartI2C](#)

[RestartI2C](#)

[NotAckI2C](#)

[AckI2C](#)

[DataRdyI2C](#)

[putclI2C](#)

[getclI2C](#)

[putclI2C](#)

[I2C Examples](#) (see page 1072)

7.5.8 I2C EEPROM (87J90 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

`OpenI2C` (see page 1063)

`EEAckPolling` (see page 1075)

`EEByteWrite` (see page 1079)

`EECurrentAddRead` (see page 1077)

`EEPageWrite` (see page 1081)

`EERandomRead` (see page 1086)

`EESequentialRead` (see page 1083)

I2C EEPROM Examples (see page 1088)

7.5.9 IO Ports (87J90 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

`OpenRB3INT` (see page 1092)

Macros

`EnablePullups`

`DisablePullups`

ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.5.10 RTCC (87J90 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

RtccInitClock (see page 1095)
RtccWriteTime (see page 1099)
RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

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Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable

mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.5.11 SW_RTCC (87J90 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.5.12 SPI (87J90 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenSPI ([see page 1108](#))WriteSPI ([see page 1111](#))ReadSPI ([see page 1113](#))putsSPI ([see page 1114](#))getsSPI ([see page 1115](#))**Macros**

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.5.13 Timers (87J90 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

FunctionsOpenTimer0 ([see page 1119](#))ReadTimer0 ([see page 1137](#))WriteTimer0 ([see page 1139](#))CloseTimer0 ([see page 1143](#))

OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.5.14 USART (87J90 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
baud1USART (see page 1155)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
baud2USART (see page 1157)

gets2USART (see page 1159)
putrs2USART (see page 1161)
puts2USART (see page 1162)
Read2USART (see page 1163)

Macros

DataRdy1USART
Close1USART
Busy1USART
putc1USART
getc1USART
DataRdy2USART
Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.5.15 MWIRE (87J90 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ( see page 1172)

7.5.16 Flash (87J90 Family)

This peripheral module supports functionalities:

- Erasing Flash ( see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ( see page 1198)

EraseFlash ( see page 1196)

WriteBlockFlash ( see page 1200)

WriteWordFlash ( see page 1202)

WriteBytesFlash ( see page 1203)

Macros

LoadFlashAddr

TableRead

Flash Examples ( see page 1204)

7.6 18F87J93 Family

PIC18F66J93 / PIC18F67J93 / PIC18F86J93 / PIC18F87J93

7.6.1 ADC (87J93 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ( see page 862)
 SetChanADC ( see page 882)
 SelChanConvADC ( see page 889)
 ConvertADC ( see page 896)
 BusyADC ( see page 897)
 ReadADC ( see page 897)
 CloseADC ( see page 897)

Macros

ADC_INT_ENABLE
 ADC_INT_DISABLE
 ADC_CALIB
 ADC_NO_CALIB

ADC Examples ( see page 898)

7.6.2 Analog Comparator (87J93 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ( see page 899)
 Close_ancomp ( see page 923)

Comparator Examples ( see page 924)

7.6.3 CTMU (87J93 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

[OpenCTMU](#) (see page 925)
[CurrentControlCTMU](#) (see page 927)
[CloseCTMU](#) (see page 927)

Macros

Enbl_CTMUEdge1
 Enbl_CTMUEdge2
 Disbl_CTMUEdge1
 Disbl_CTMUEdge2
 CTMUEdge1_Status
 CTMUEdge2_Status
 CTMU_INT_ENABLE
 CTMU_INT_DISABLE
 CTMU_Clear_Intr_Status_Bit
 CTMU_Intr_Status

[CTMU Examples](#) (see page 928)

7.6.4 Input Capture (87J93 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

[OpenCapture1](#) (see page 954)
[OpenCapture2](#) (see page 955)
[ReadCapture1](#) (see page 983)
[ReadCapture2](#) (see page 984)
[CloseCapture1](#) (see page 987)
[CloseCapture2](#) (see page 987)

[Input Capture Examples](#) (see page 991)

7.6.5 Output Compare (87J93 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions
OpenCompare1 (see page 992)
OpenCompare2 (see page 993)
CloseCompare1 (see page 1021)
CloseCompare2 (see page 1022)

Output Compare Examples ([see page 1025](#))

7.6.6 PWM (87J93 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)

PWM Examples ([see page 1060](#))

7.6.7 I2C (87J93 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.

- Provides simple interface macros to enable/disable interrupts

Functions

`OpenI2C` (see page 1063)

`WritelI2C` (see page 1066)

`ReadlI2C` (see page 1067)

`putslI2C` (see page 1068)

`getslI2C` (see page 1070)

`IdleI2C` (see page 1072)

`CloselI2C` (see page 1071)

Macros

`EnableIntI2C`

`DisableIntI2C`

`SetPriorityIntI2C`

`I2C_Clear_Intr_Status_Bit`

`I2C_Intr_Status`

`StopI2C`

`StartI2C`

`RestartI2C`

`NotAckI2C`

`AckI2C`

`DataRdyI2C`

`putclI2C`

`getclI2C`

`putcl2C`

I2C Examples (see page 1072)

7.6.8 I2C EEPROM (87J93 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C](#) (see page 1063)
[EEAckPolling](#) (see page 1075)
[EEByteWrite](#) (see page 1079)
[EECurrentAddRead](#) (see page 1077)
[EEPageWrite](#) (see page 1081)
[EERandomRead](#) (see page 1086)
[EESequentialRead](#) (see page 1083)

I2C EEPROM Examples (see page 1088)

7.6.9 SPI (87J93 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenSPI](#) (see page 1108)
[WriteSPI](#) (see page 1111)
[ReadSPI](#) (see page 1113)
[putsSPI](#) (see page 1114)
[getsSPI](#) (see page 1115)

Macros

[EnableIntSPI](#)
[DisableIntSPI](#)
[SetPriorityIntSPI](#)
[SPI_Clear_Intr_Status_Bit](#)
[SPI_Intr_Status](#)
[SPI_Clear_Recv_OV](#)
[CloseSPI](#)
[DataRdySPI](#)
[getcSPI](#)
[putcSPI](#)

SPI Examples (see page 1116)

7.6.10 IO Ports (87J93 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` ([see page 1089](#))

`OpenRB0INT` ([see page 1089](#))

`OpenRB1INT` ([see page 1090](#))

`OpenRB2INT` ([see page 1091](#))

`OpenRB3INT` ([see page 1092](#))

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples ([see page 1093](#))

7.6.11 RTCC (87J93 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

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Functions

`RtccInitClock` ([see page 1095](#))

`RtccWriteTime` ([see page 1099](#))

`RtccWriteDate` ([see page 1100](#))

`RtccWriteAlrmTimeDate` ([see page 1101](#))

RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.6.12 SW_RTCC (87J93 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.6.13 Timers (87J93 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.6.14 USART (87J93 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))
Write1USART ([see page 1154](#))
baud1USART ([see page 1155](#))
gets1USART ([see page 1159](#))
putrs1USART ([see page 1160](#))
puts1USART ([see page 1162](#))
Read1USART ([see page 1163](#))
Open2USART ([see page 1150](#))
Write2USART ([see page 1155](#))
baud2USART ([see page 1157](#))
gets2USART ([see page 1159](#))
putrs2USART ([see page 1161](#))
puts2USART ([see page 1162](#))
Read2USART ([see page 1163](#))

Macros

DataRdy1USART
Close1USART
Busy1USART
putc1USART
getc1USART

DataRdy2USART
Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.6.15 MWIRE (87J93 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros
CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

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7.6.16 Flash (87J93 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ( see page 1198)
EraseFlash ( see page 1196)
WriteBlockFlash ( see page 1200)
WriteWordFlash ( see page 1202)
WriteBytesFlash ( see page 1203)

Macros

LoadFlashAddr
TableRead

Flash Examples ( see page 1204)

7.7 18F/LF46J50 Family

PIC18F24J50 / PIC18F25J50 / PIC18F26J50

PIC18F44J50 / PIC18F45J50 / PIC18F46J50

PIC18LF24J50 / PIC18LF25J50 / PIC18LF26J50

PIC18LF44J50 / PIC18LF45J50 / PIC18LF46J50

7.7.1 PIC18F/LF26J50 Set

PIC18F24J50 / PIC18F25J50 / PIC18F26J50

PIC18LF24J50 / PIC18LF25J50 / PIC18LF26J50

7.7.1.1 ADC (2xJ50 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.

- Voltage reference inputs that may be shared with other analog input pins

Functions

`OpenADC` (see page 860)

`SetChanADC` (see page 884)

`SelChanConvADC` (see page 891)

`ConvertADC` (see page 896)

`BusyADC` (see page 897)

`ReadADC` (see page 897)

`CloseADC` (see page 897)

Macros

`ADC_INT_ENABLE`

`ADC_INT_DISABLE`

`ADC_CALIB`

`ADC_NO_CALIB`

ADC Examples (see page 898)

7.7.1.2 Analog Comparator (2xJ50 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

`Open_ancomp1` (see page 906)

`Open_ancomp2` (see page 914)

`Close_ancomp1` (see page 923)

`Close_ancomp2` (see page 923)

Comparator Examples (see page 924)

7.7.1.3 CTMU (2xJ50 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU ([see page 925](#))
 CurrentControlCTMU ([see page 927](#))
 CloseCTMU ([see page 927](#))

Macros

Enbl_CTMUEdge1
 Enbl_CTMUEdge2
 Disbl_CTMUEdge1
 Disbl_CTMUEdge2
 CTMUEdge1_Status
 CTMUEdge2_Status
 CTMU_INT_ENABLE
 CTMU_INT_DISABLE
 CTMU_Clear_Intr_Status_Bit
 CTMU_Intr_Status

CTMU Examples ([see page 928](#))

7.7.1.4 Deep Sleep (2xJ50 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

Functions

DeepSleepWakeUpSource ([see page 930](#))
 GotoDeepSleep ([see page 930](#))
 IsResetFromDeepSleep ([see page 931](#))
 ReadDSGPR ([see page 931](#))
 ULPWakeUpEnable ([see page 931](#))

Macros

ReleaseDeepSleep
 Write_DSGPR

Deep Sleep Examples ([see page 932](#))

7.7.1.5 PPS (2xJ50 Family)

This peripheral library module provides:

- Assign given pin as input or output pin.
- Provides macros to Lock and unlock the PPS

Macros

iPPSInput ([see page 936](#))

PPSInput ([see page 935](#))

iPPSOOutput ([see page 944](#))

PPSOOutput ([see page 941](#))

PPS Examples ([see page 953](#))

7.7.1.6 Input Capture (2xJ50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

OpenCapture2 ([see page 955](#))

ReadCapture1 ([see page 983](#))

ReadCapture2 ([see page 984](#))

CloseCapture1 ([see page 987](#))

CloseCapture2 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.7.1.7 Output Compare (2xJ50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

OpenCompare2 (see page 993)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

Output Compare Examples (see page 1025)

7.7.1.8 PWM (2xJ50 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.7.1.9 I2C (2xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)

WriteI2C1 (see page 1066)

ReadI2C1 (see page 1067)

putslI2C1 (see page 1069)

getslI2C1 (see page 1070)

Macros

EnableIntI2C1

DisableI2C1
SetPriorityI2C1
I2C1_Clear_Intr_Status_Bit
I2C1_Intr_Status
StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putclI2C1
getclI2C1

I2C Examples ([see page 1072](#))

7.7.1.10 I2C EEPROM (2xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)

I2C EEPROM Examples ([see page 1088](#))

7.7.1.11 SPI (2xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))

WriteSPI1 ([see page 1112](#))

ReadSPI1 ([see page 1113](#))

putsSPI1 ([see page 1114](#))

getsSPI1 ([see page 1115](#))

OpenSPI2 ([see page 1110](#))

WriteSPI2 ([see page 1112](#))

ReadSPI2 ([see page 1113](#))

putsSPI2 ([see page 1114](#))

getsSPI2 ([see page 1116](#))

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2

putcSPI2

SPI Examples ([see page 1116](#))

7.7.1.12 IO Ports (2xJ50 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

`OpenRB3INT` (see page 1092)

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples (see page 1093)

7.7.1.13 RTCC (2xJ50 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

`RtccInitClock` (see page 1095)

`RtccWriteTime` (see page 1099)

`RtccWriteDate` (see page 1100)

`RtccWriteAlrmTimeDate` (see page 1101)

`RtccWriteAlrmTime` (see page 1101)

`RtccWriteAlrmDate` (see page 1102)

RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples (see page 1104)

7.7.1.14 SW_RTCC (2xJ50 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) (see page 1106)

[update_RTCC](#) (see page 1106)

[Close_RTCC](#) (see page 1106)

[SW_RTCC Examples](#) (see page 1107)

7.7.1.15 Timers (2xJ50 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1121)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1125)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[OpenTimer4](#) (see page 1130)

[CloseTimer4](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples ([see page 1146](#))

7.7.1.16 USART (2xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))
Write1USART ([see page 1154](#))
baud1USART ([see page 1155](#))
gets1USART ([see page 1159](#))
putrs1USART ([see page 1160](#))
puts1USART ([see page 1162](#))
Read1USART ([see page 1163](#))
Open2USART ([see page 1150](#))
Write2USART ([see page 1155](#))
baud2USART ([see page 1157](#))
gets2USART ([see page 1159](#))
putrs2USART ([see page 1161](#))
puts2USART ([see page 1162](#))
Read2USART ([see page 1163](#))

Macros

DataRdy1USART
Close1USART
Busy1USART
putc1USART
getc1USART
DataRdy2USART
Close2USART

Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.7.1.17 MWIRE (2xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire1 (see page 1166)
ReadMwire1 (see page 1170)
WriteMwire1 (see page 1169)
getsMwire1 (see page 1167)
OpenMwire2 (see page 1166)
ReadMwire2 (see page 1171)
WriteMwire2 (see page 1169)
getsMwire2 (see page 1168)

Macros
CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.7.1.18 Flash (2xJ50 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))

- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteWordFlash (see page 1202)
WriteBytesFlash (see page 1203)

Macros

LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.7.2 PIC18F/LF46J50 Set

PIC18F44J50 / PIC18F45J50 / PIC18F46J50

PIC18LF44J50 / PIC18LF45J50 / PIC18LF46J50

7.7.2.1 ADC (4xJ50 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 860)
SetChanADC (see page 884)
SelChanConvADC (see page 891)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)

[CloseADC](#) (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE
ADC_CALIB
ADC_NO_CALIB

[ADC Examples](#) (see page 898)

7.7.2.2 Analog Comparator (4xJ50 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

[Open_ancomp1](#) (see page 906)
[Open_ancomp2](#) (see page 914)
[Close_ancomp1](#) (see page 923)
[Close_ancomp2](#) (see page 923)

[Comparator Examples](#) (see page 924)

7.7.2.3 CTMU (4xJ50 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

[OpenCTMU](#) (see page 925)
[CurrentControlCTMU](#) (see page 927)
[CloseCTMU](#) (see page 927)

Macros

[Enbl_CTMUEdge1](#)

Enbl_CTMUEdge2
Disbl_CTMUEdge1
Disbl_CTMUEdge2
CTMUEdge1_Status
CTMUEdge2_Status
CTMU_INT_ENABLE
CTMU_INT_DISABLE
CTMU_Clear_Intr_Status_Bit
CTMU_Intr_Status

CTMU Examples ([see page 928](#))

7.7.2.4 Deep Sleep (4xJ50 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

Functions

DeepSleepWakeUpSource (see page 930)
GotoDeepSleep (see page 930)
IsResetFromDeepSleep (see page 931)
ReadDSGPR (see page 931)
ULPWakeUpEnable (see page 931)

Macros

ReleaseDeepSleep
Write_DSGPR

Deep Sleep Examples ([see page 932](#))

7.7.2.5 PPS (4xJ50 Family)

This peripheral library module provides:

- Assign given pin as input or output pin.
- Provides macros to Lock and unlock the PPS

Macros

iPPSInput (see page 936)
--

PPSInput (see page 935)

iPPSOOutput (see page 945)

PPSOOutput (see page 942)

PPS Examples (see page 953)

7.7.2.6 Input Capture (4xJ50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenCapture2 (see page 955)

ReadCapture1 (see page 983)

ReadCapture2 (see page 984)

CloseCapture1 (see page 987)

CloseCapture2 (see page 987)

Input Capture Examples (see page 991)

7.7.2.7 Output Compare (4xJ50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

OpenCompare2 (see page 993)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

Output Compare Examples (see page 1025)

7.7.2.8 PWM (4xJ50 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)
[OpenPWM2](#) (see page 1027)
[SetDCPWM1](#) (see page 1047)
[SetDCPWM2](#) (see page 1048)
[SetOutputPWM1](#) (see page 1043)
[ClosePWM1](#) (see page 1056)
[ClosePWM2](#) (see page 1056)

PWM Examples ([see page 1060](#))

7.7.2.9 I2C (4xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C1](#) (see page 1064)
[WriteI2C1](#) (see page 1066)
[ReadI2C1](#) (see page 1067)
[putslI2C1](#) (see page 1069)
[getslI2C1](#) (see page 1070)
[OpenI2C2](#) (see page 1065)
[WriteI2C2](#) (see page 1067)
[ReadI2C2](#) (see page 1068)
[putslI2C2](#) (see page 1069)
[getslI2C2](#) (see page 1071)

Macros

[EnableIntI2C1](#)
[DisableIntI2C1](#)
[SetPriorityIntI2C1](#)
[I2C1_Clear_Intr_Status_Bit](#)
[I2C1_Intr_Status](#)

StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putI2C1
getI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.7.2.10 I2C EEPROM (4xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

7

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)

EECurrentAddRead1 (see page 1078)

EEPAGEWRITE1 (see page 1082)

EERandomRead1 (see page 1086)

EESequentialRead1 (see page 1084)

OpenI2C2 (see page 1065)

EEAckPolling2 (see page 1076)

EEByteWrite2 (see page 1080)

EECurrentAddRead2 (see page 1078)

EEPAGEWRITE2 (see page 1083)

EERandomRead2 (see page 1087)

EESequentialRead2 (see page 1085)

I2C EEPROM Examples (see page 1088)

7.7.2.11 IO Ports (4xJ50 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.7.2.12 RTCC (4xJ50 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

RtccInitClock (see page 1095)
RtccWriteTime (see page 1099)
RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe

mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff
mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.7.2.13 SW_RTCC (4xJ50 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.7.2.14 SPI (4xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI1 (see page 1109)
WriteSPI1 (see page 1112)
ReadSPI1 (see page 1113)
putsSPI1 (see page 1114)

getsSPI1 (see page 1115)
OpenSPI2 (see page 1110)
WriteSPI2 (see page 1112)
ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

Macros

EnableIntSPI1
DisableIntSPI1
SetPriorityIntSPI1
SPI1_Clear_Intr_Status_Bit
SPI1_Intr_Status
SPI1_Clear_Recv_OV
CloseSPI1
DataRdySPI1
getcSPI1
putcSPI1
EnableIntSPI2
DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples (see page 1116)

7.7.2.15 Timers (4xJ50 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)
[ReadTimer0](#) (see page 1137)
[WriteTimer0](#) (see page 1139)
[CloseTimer0](#) (see page 1143)
[OpenTimer1](#) (see page 1121)
[ReadTimer1](#) (see page 1138)
[WriteTimer1](#) (see page 1140)
[CloseTimer1](#) (see page 1143)
[OpenTimer2](#) (see page 1123)
[CloseTimer2](#) (see page 1144)
[OpenTimer3](#) (see page 1125)
[ReadTimer3](#) (see page 1138)
[WriteTimer3](#) (see page 1140)
[CloseTimer3](#) (see page 1144)
[OpenTimer4](#) (see page 1130)
[CloseTimer4](#) (see page 1144)
[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)
[ReadTimer2](#)
[WriteTimer4](#)
[ReadTimer4](#)

Timers Examples (see page 1146)

7.7.2.16 USART (4xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[Open1USART](#) (see page 1148)
[Write1USART](#) (see page 1154)
[baud1USART](#) (see page 1155)
[gets1USART](#) (see page 1159)

`putrs1USART` (see page 1160)

`puts1USART` (see page 1162)

`Read1USART` (see page 1163)

`Open2USART` (see page 1150)

`Write2USART` (see page 1155)

`baud2USART` (see page 1157)

`gets2USART` (see page 1159)

`putrs2USART` (see page 1161)

`puts2USART` (see page 1162)

`Read2USART` (see page 1163)

Macros

`DataRdy1USART`

`Close1USART`

`Busy1USART`

`putc1USART`

`getc1USART`

`DataRdy2USART`

`Close2USART`

`Busy2USART`

`putc2USART`

`getc2USART`

USART Examples (see page 1164)

7.7.2.17 PMP (4xJ50 Family)

This peripheral library module:

- Is a parallel 8-bit I/O module. PMP stands for Parallel Master Port module.
- Is specifically designed to communicate with a wide variety of parallel devices, such as communications peripherals, LCDs, external memory devices and microcontrollers.
- Is highly configurable, since the interface to parallel peripherals varies significantly.

Functions

`PMPOpen` (see page 1187)

`PMPIsBufferNEmpty` (see page 1189)

`PMPIsBufferNFull` (see page 1189)

`PMPMasterRead` (see page 1188)

`PMPMasterWrite` (see page 1189)

`PMPSetAddress` (see page 1187)

PMPSlaveReadBufferN (see page 1190)
PMPSlaveReadBuffers (see page 1190)
PMPSlaveWriteBufferN (see page 1191)
PMPSlaveWriteBuffers (see page 1191)
PMPClose (see page 1192)

Macros

mPMPIsBufferFull
mPMPSetWriteStrobePolarity
mPMPSetWriteStrobeEnable
mPMPSetWaitEnd
mPMPSetWaitMiddle
mPMPIsBufferOverflow
mPMPSetWaitBegin
mPMPSetReadStrobePolarity
mPMPSetReadStrobeEnable
mPMPSetPort Pins
mPMPSetPortMode
mPMPSetPortEnable
mPMPSetAddrLatchPolarity
mPMPSetInterruptMode
mPMPClearBufferOverflow
mPMPSetIdle
mPMP_Clear_Intr_Status_Bit
mPMPSetInterruptPriority
mPMPSetInterruptEnable
mPMPSetDataMode
mPMPClearBufferUnderflow
mPMPSetChipSelect2Polarity
mPMPSetChipSelect2Enable
mPMPSetChipSelect1Polarity
mPMPSetChipSelect1Enable
mPMPSetChipSelectMode
mPMPSetByteEnable
mPMPSetByteEnablePolarity
mPMPIsBufferEmpty
mPMPIsBufferUnderflow
mPMPSetAddrIncMode
mPMPSetAddrMux

PMP Examples ([see page 1192](#))

7.7.2.18 MWIRE (4xJ50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`OpenMwire1` ([see page 1166](#))

`ReadMwire1` ([see page 1170](#))

`WriteMwire1` ([see page 1169](#))

`getsMwire1` ([see page 1167](#))

`OpenMwire2` ([see page 1166](#))

`ReadMwire2` ([see page 1171](#))

`WriteMwire2` ([see page 1169](#))

`getsMwire2` ([see page 1168](#))

Macros

`CloseMwire1`

`getcMwire1`

`putcMwire1`

`DataRdyMwire1`

`CloseMwire2`

`getcMwire2`

`putcMwire2`

`DataRdyMwire2`

MWIRE Examples ([see page 1172](#))

7.7.2.19 Flash (4xJ50 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ( see page 1198)
EraseFlash ( see page 1196)
WriteBlockFlash ( see page 1200)
WriteWordFlash ( see page 1202)
WriteBytesFlash ( see page 1203)

Macros

LoadFlashAddr
TableRead

Flash Examples ( see page 1204)

7.8 18F/LF46J11 Family

PIC18F24J11 / PIC18F25J11 / PIC18F26J11

PIC18F44J11 / PIC18F45J11 / PIC18F46J11

PIC18LF24J11 / PIC18LF25J11 / PIC18LF26J11

PIC18LF44J11 / PIC18LF45J11 / PIC18LF46J11

7.8.1 PIC18F/LF26J11 Set

PIC18F24J11 / PIC18F25J11 / PIC18F26J11

PIC18LF24J11 / PIC18LF25J11 / PIC18LF26J11

7.8.1.1 ADC (2xJ11 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.

- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 860](#))

SetChanADC ([see page 884](#))

SelChanConvADC ([see page 891](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CALIB

ADC_NO_CALIB

ADC Examples ([see page 898](#))

7.8.1.2 Analog Comparator (2xJ11 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 ([see page 906](#))

Open_ancomp2 ([see page 914](#))

Close_ancomp1 ([see page 923](#))

Close_ancomp2 ([see page 923](#))

Comparator Examples ([see page 924](#))

7.8.1.3 CTMU (2xJ11 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

[OpenCTMU](#) (see page 925)
[CurrentControlCTMU](#) (see page 927)
[CloseCTMU](#) (see page 927)

Macros

Enbl_CTMUEdge1
 Enbl_CTMUEdge2
 Disbl_CTMUEdge1
 Disbl_CTMUEdge2
 CTMUEdge1_Status
 CTMUEdge2_Status
 CTMU_INT_ENABLE
 CTMU_INT_DISABLE
 CTMU_Clear_Intr_Status_Bit
 CTMU_Intr_Status

[CTMU Examples](#) (see page 928)

7.8.1.4 Deep Sleep (2xJ11 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

Functions

[DeepSleepWakeUpSource](#) (see page 930)
[GotoDeepSleep](#) (see page 930)
[IsResetFromDeepSleep](#) (see page 931)
[ReadDSGPR](#) (see page 931)
[ULPWakeUpEnable](#) (see page 931)

Macros

[ReleaseDeepSleep](#)
[Write_DSGPR](#)

[Deep Sleep Examples](#) (see page 932)

7.8.1.5 PPS (2xJ11 Family)

This peripheral library module provides:

- Assign given pin as input or output pin.
- Provides macros to Lock and unlock the PPS

Macros

iPPSInput ([see page 938](#))

PPSInput ([see page 939](#))

iPPSOOutput ([see page 944](#))

PPSOOutput ([see page 941](#))

PPS Examples ([see page 953](#))

7.8.1.6 Input Capture (2xJ11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

OpenCapture2 ([see page 955](#))

ReadCapture1 ([see page 983](#))

ReadCapture2 ([see page 984](#))

CloseCapture1 ([see page 987](#))

CloseCapture2 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.8.1.7 Output Compare (2xJ11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

OpenCompare2 (see page 993)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

Output Compare Examples (see page 1025)

7.8.1.8 PWM (2xJ11 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.8.1.9 I2C (2xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)

WriteI2C1 (see page 1066)

ReadI2C1 (see page 1067)

putslI2C1 (see page 1069)

getslI2C1 (see page 1070)

Macros

EnableIntI2C1

DisableI2C1
SetPriorityI2C1
I2C1_Clear_Intr_Status_Bit
I2C1_Intr_Status
StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putclI2C1
getclI2C1

I2C Examples ([see page 1072](#))

7.8.1.10 I2C EEPROM (2xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)

I2C EEPROM Examples ([see page 1088](#))

7.8.1.11 IO Ports (2xJ11 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.

- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

`OpenRB3INT` (see page 1092)

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples (see page 1093)

7.8.1.12 RTCC (2xJ11 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no intervention from the CPU.
- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

`RtccInitClock` (see page 1095)

`RtccWriteTime` (see page 1099)

`RtccWriteDate` (see page 1100)

`RtccWriteAlrmTimeDate` (see page 1101)

`RtccWriteAlrmTime` (see page 1101)

`RtccWriteAlrmDate` (see page 1102)

`RtccSetChimeEnable` (see page 1103)

`RtccSetCalibration` (see page 1103)

`RtccSetAlarmRptCount` (see page 1104)

`RtccSetAlarmRptCount` (see page 1104)

`RtccSetAlarmRpt` (see page 1098)

RtccReadTimeDate (see page 1097)

RtccReadTime (see page 1097)

RtccReadDate (see page 1096)

RtccReadAlrmTimeDate (see page 1096)

RtccReadAlrmTime (see page 1096)

RtccReadAlrmDate (see page 1095)

RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit

mRtccAlrmDisable

mRtccAlrmEnable

mRtccClearAlrmPtr

mRtccClearRtcPtr

mRtccGetAlarmRpt

mRtccGetAlarmRptCount

mRtccGetCalibration

mRtccGetChimeEnable

mRtccGetClockOe

mRtccls2ndHalfSecond

mRtcclsAlrmEnabled

mRtcclsOn

mRtcclsSync

mRtcclsWrEn

mRtccOff

mRtccOn

mRtccSetAlrmPtr

mRtccSetClockOe

mRtccSetInt

mRtccSetRtcPtr

mRtccWaitSync

mRtccWrOff

RTCC Examples (see page 1104)

7.8.1.13 SW_RTCC (2xJ11 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions[Open_RTCC](#) (see page 1106)[update_RTCC](#) (see page 1106)[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.8.1.14 SPI (2xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions[OpenSPI1](#) (see page 1109)[WriteSPI1](#) (see page 1112)[ReadSPI1](#) (see page 1113)[putsSPI1](#) (see page 1114)[getsSPI1](#) (see page 1115)[OpenSPI2](#) (see page 1110)[WriteSPI2](#) (see page 1112)[ReadSPI2](#) (see page 1113)[putsSPI2](#) (see page 1114)[getsSPI2](#) (see page 1116)**Macros**[EnableIntSPI1](#)[DisableIntSPI1](#)[SetPriorityIntSPI1](#)[SPI1_Clear_Intr_Status_Bit](#)[SPI1_Intr_Status](#)[SPI1_Clear_Recv_OV](#)[CloseSPI1](#)[DataRdySPI1](#)[getcSPI1](#)[putcSPI1](#)[EnableIntSPI2](#)[DisableIntSPI2](#)

SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.8.1.15 Timers (2xJ11 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1121)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1125)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2

ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples ([see page 1146](#))

7.8.1.16 USART (2xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
--

Write1USART (see page 1154)

baud1USART (see page 1155)
--

gets1USART (see page 1159)
--

putrs1USART (see page 1160)

puts1USART (see page 1162)
--

Read1USART (see page 1163)
--

Open2USART (see page 1150)
--

Write2USART (see page 1155)

baud2USART (see page 1157)
--

gets2USART (see page 1159)
--

putrs2USART (see page 1161)

puts2USART (see page 1162)
--

Read2USART (see page 1163)
--

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.8.1.17 MWIRE (2xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire1 (see page 1166)
ReadMwire1 (see page 1170)
WriteMwire1 (see page 1169)
getsMwire1 (see page 1167)
OpenMwire2 (see page 1166)
ReadMwire2 (see page 1171)
WriteMwire2 (see page 1169)
getsMwire2 (see page 1168)

Macros
CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.8.1.18 Flash (2xJ11 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteWordFlash (see page 1202)
WriteBytesFlash (see page 1203)

Macros

LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.8.2 PIC18F/LF46J11 Set

PIC18F44J11 / PIC18F45J11 / PIC18F46J11

PIC18LF44J11 / PIC18LF45J11 / PIC18LF46J11

7.8.2.1 ADC (4xJ11 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

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Functions

OpenADC (see page 860)
SetChanADC (see page 884)
SelChanConvADC (see page 891)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE
ADC_CALIB
ADC_NO_CALIB

ADC Examples ([see page 898](#))

7.8.2.2 Analog Comparator (4xJ11 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 ([see page 906](#))
Open_ancomp2 ([see page 914](#))
Close_ancomp1 ([see page 923](#))
Close_ancomp2 ([see page 923](#))

Comparator Examples ([see page 924](#))

7.8.2.3 CTMU (4xJ11 Family)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU ([see page 925](#))
CurrentControlCTMU ([see page 927](#))
CloseCTMU ([see page 927](#))

Macros

Enbl_CTMUEdge1
Enbl_CTMUEdge2
Disbl_CTMUEdge1
Disbl_CTMUEdge2

CTMUEdge1_Status
CTMUEdge2_Status
CTMU_INT_ENABLE
CTMU_INT_DISABLE
CTMU_Clear_Intr_Status_Bit
CTMU_Intr_Status

CTMU Examples ([see page 928](#))

7.8.2.4 Deep Sleep (4xJ11 Family)

This peripheral library module:

- Functions to configure Deep Sleep.
- Function to put device to Deep Sleep & check the wake up source.
- Provides macros to write to deep sleep GPR and Release from Deep Sleep.

Functions

DeepSleepWakeUpSource (see page 930)
GotoDeepSleep (see page 930)
IsResetFromDeepSleep (see page 931)
ReadDSGPR (see page 931)
ULPWakeUpEnable (see page 931)

Macros

ReleaseDeepSleep
Write_DSGPR

Deep Sleep Examples ([see page 932](#))

7.8.2.5 PPS (4xJ11 Family)

This peripheral library module provides:

- Assign given pin as input or output pin.
- Provides macros to Lock and unlock the PPS

Macros

iPPSInput (see page 938)
PPSInput (see page 939)
iPPSOOutput (see page 945)
PPSOOutput (see page 942)

PPS Examples ([see page 953](#))

7.8.2.6 Input Capture (4xJ11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

OpenCapture2 ([see page 955](#))

ReadCapture1 ([see page 983](#))

ReadCapture2 ([see page 984](#))

CloseCapture1 ([see page 987](#))

CloseCapture2 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.8.2.7 Output Compare (4xJ11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

OpenCompare2 ([see page 993](#))

CloseCompare1 ([see page 1021](#))

CloseCompare2 ([see page 1022](#))

Output Compare Examples ([see page 1025](#))

7.8.2.8 PWM (4xJ11 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)
 OpenPWM2 (see page 1027)
 SetDCPWM1 (see page 1047)
 SetDCPWM2 (see page 1048)
 SetOutputPWM1 (see page 1043)
 ClosePWM1 (see page 1056)
 ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.8.2.9 I2C (4xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)
 Writel2C1 (see page 1066)
 Readl2C1 (see page 1067)
 putsI2C1 (see page 1069)
 getsI2C1 (see page 1070)
 OpenI2C2 (see page 1065)
 Writel2C2 (see page 1067)
 Readl2C2 (see page 1068)
 putsI2C2 (see page 1069)
 getsI2C2 (see page 1071)

Macros

EnableIntI2C1
 DisableIntI2C1
 SetPriorityIntI2C1
 I2C1_Clear_Intr_Status_Bit
 I2C1_Intr_Status
 StopI2C1
 StartI2C1
 RestartI2C1

NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putI2C1
getI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.8.2.10 I2C EEPROM (4xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)

[EESequentialRead1](#) (see page 1084)

[OpenI2C2](#) (see page 1065)

[EEAckPolling2](#) (see page 1076)

[EEByteWrite2](#) (see page 1080)

[EECurrentAddRead2](#) (see page 1078)

[EEPageWrite2](#) (see page 1083)

[EERandomRead2](#) (see page 1087)

[EESequentialRead2](#) (see page 1085)

I2C EEPROM Examples (see page 1088)

7.8.2.11 IO Ports (4xJ11 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

[EnablePullups](#)

[DisablePullups](#)

[ClosePORTB](#)

[CloseRB0INT](#)

[CloseRB1INT](#)

[CloseRB2INT](#)

[CloseRB3INT](#)

IO Ports Examples (see page 1093)

7.8.2.12 RTCC (4xJ11 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function.
- Is intended for applications where accurate time must be maintained for extended periods of time with minimum to no

intervention from the CPU.

- Is optimized for low-power usage in order to provide extended battery lifetime while keeping track of time

Functions

RtccInitClock (see page 1095)
RtccWriteTime (see page 1099)
RtccWriteDate (see page 1100)
RtccWriteAlrmTimeDate (see page 1101)
RtccWriteAlrmTime (see page 1101)
RtccWriteAlrmDate (see page 1102)
RtccSetChimeEnable (see page 1103)
RtccSetCalibration (see page 1103)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRptCount (see page 1104)
RtccSetAlarmRpt (see page 1098)
RtccReadTimeDate (see page 1097)
RtccReadTime (see page 1097)
RtccReadDate (see page 1096)
RtccReadAlrmTimeDate (see page 1096)
RtccReadAlrmTime (see page 1096)
RtccReadAlrmDate (see page 1095)
RtccWrOn (see page 1098)

Macros

mRtcc_Clear_Intr_Status_Bit
mRtccAlrmDisable
mRtccAlrmEnable
mRtccClearAlrmPtr
mRtccClearRtcPtr
mRtccGetAlarmRpt
mRtccGetAlarmRptCount
mRtccGetCalibration
mRtccGetChimeEnable
mRtccGetClockOe
mRtccls2ndHalfSecond
mRtcclsAlrmEnabled
mRtcclsOn
mRtcclsSync
mRtcclsWrEn
mRtccOff

mRtccOn
mRtccSetAlrmPtr
mRtccSetClockOe
mRtccSetInt
mRtccSetRtcPtr
mRtccWaitSync
mRtccWrOff

RTCC Examples ([see page 1104](#))

7.8.2.13 SW_RTCC (4xJ11 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.8.2.14 SPI (4xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI1 (see page 1109)
WriteSPI1 (see page 1112)
ReadSPI1 (see page 1113)
putsSPI1 (see page 1114)
getsSPI1 (see page 1115)
OpenSPI2 (see page 1110)
WriteSPI2 (see page 1112)
ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

Macros

EnableIntSPI1
 DisableIntSPI1
 SetPriorityIntSPI1
 SPI1_Clear_Intr_Status_Bit
 SPI1_Intr_Status
 SPI1_Clear_Recv_OV
 CloseSPI1
 DataRdySPI1
 getcSPI1
 putcSPI1
 EnableIntSPI2
 DisableIntSPI2
 SetPriorityIntSPI2
 SPI2_Clear_Intr_Status_Bit
 SPI2_Intr_Status
 SPI2_Clear_Recv_OV
 CloseSPI2
 DataRdySPI2
 getcSPI2
 putcSPI2

SPI Examples ([see page 1116](#))

7.8.2.15 Timers (4xJ11 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

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Functions

OpenTimer0 ([see page 1119](#))
 ReadTimer0 ([see page 1137](#))
 WriteTimer0 ([see page 1139](#))
 CloseTimer0 ([see page 1143](#))
 OpenTimer1 ([see page 1121](#))
 ReadTimer1 ([see page 1138](#))
 WriteTimer1 ([see page 1140](#))

CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1125)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples (see page 1146)

7.8.2.16 USART (4xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
baud1USART (see page 1155)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
baud2USART (see page 1157)
gets2USART (see page 1159)
putrs2USART (see page 1161)

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.8.2.17 PMP (4xJ11 Family)

This peripheral library module:

- Is a parallel 8-bit I/O module. PMP stands for Parallel Master Port module.
- Is specifically designed to communicate with a wide variety of parallel devices, such as communications peripherals, LCDs, external memory devices and microcontrollers.
- Is highly configurable, since the interface to parallel peripherals varies significantly.

Functions

PMPOpen ([see page 1187](#))

PMPIsBufferNEmpty ([see page 1189](#))

PMPIsBufferNFull ([see page 1189](#))

PMPMasterRead ([see page 1188](#))

PMPMasterWrite ([see page 1189](#))

PMPSetAddress ([see page 1187](#))

PMPSlaveReadBufferN ([see page 1190](#))

PMPSlaveReadBuffers ([see page 1190](#))

PMPSlaveWriteBufferN ([see page 1191](#))

PMPSlaveWriteBuffers ([see page 1191](#))

PMPClose ([see page 1192](#))

Macros

mPMPIsBufferFull
mPMPSetWriteStrobePolarity
mPMPSetWriteStrobeEnable
mPMPSetWaitEnd
mPMPSetWaitMiddle
mPMPIsBufferOverflow
mPMPSetWaitBegin
mPMPSetReadStrobePolarity
mPMPSetReadStrobeEnable
mPMPSetPortPins
mPMPSetPortMode
mPMPSetPortEnable
mPMPSetAddrLatchPolarity
mPMPSetInterruptMode
mPMPClearBufferOverflow
mPMPSetIdle
mPMP_Clear_Intr_Status_Bit
mPMPSetInterruptPriority
mPMPSetInterruptEnable
mPMPSetDataMode
mPMPClearBufferUnderflow
mPMPSetChipSelect2Polarity
mPMPSetChipSelect2Enable
mPMPSetChipSelect1Polarity
mPMPSetChipSelect1Enable
mPMPSetChipSelectMode
mPMPSetByteEnable
mPMPSetByteEnablePolarity
mPMPIsBufferEmpty
mPMPIsBufferUnderflow
mPMPSetAddrIncMode
mPMPSetAddrMux

PMP Examples (see page 1192)

7.8.2.18 MWIRE (4xJ11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 ([see page 1166](#))

ReadMwire1 ([see page 1170](#))

WriteMwire1 ([see page 1169](#))

getsMwire1 ([see page 1167](#))

OpenMwire2 ([see page 1166](#))

ReadMwire2 ([see page 1171](#))

WriteMwire2 ([see page 1169](#))

getsMwire2 ([see page 1168](#))

Macros

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2

putcMwire2

DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.8.2.19 Flash (4xJ11 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1200](#))

WriteWordFlash ([see page 1202](#))

WriteBytesFlash ([see page 1203](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ( see page 1204)

7.9 18F/LF14K50 Family

PIC18F13K50 / PIC18F14K50**PIC18LF13K50 / PIC18LF14K50**

7.9.1 ADC (14K50 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ( see page 858)SetChanADC ( see page 883)SelChanConvADC ( see page 890)ConvertADC ( see page 896)BusyADC ( see page 897)ReadADC ( see page 897)CloseADC ( see page 897)**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ( see page 898)

7.9.2 Analog Comparator (14K50 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 ( see page 900)

Close_ancomp1 ( see page 923)

Open_ancomp2 ( see page 912)

Close_ancomp2 ( see page 923)

Comparator Examples ( see page 924)

7.9.3 Input Capture (14K50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)

ReadCapture1 ( see page 983)

CloseCapture1 ( see page 987)

Input Capture Examples ( see page 991)

7.9.4 Output Compare (14K50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.9.5 PWM (14K50 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

PWM Examples (see page 1060)

7.9.6 I2C (14K50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)

WriteI2C (see page 1066)

ReadI2C (see page 1067)

putslI2C (see page 1068)

getslI2C (see page 1070)

IdleI2C (see page 1072)

CloseI2C (see page 1071)

Macros

EnableIntI2C
 DisableIntI2C
 SetPriorityIntI2C
 I2C_Clear_Intr_Status_Bit
 I2C_Intr_Status
 StopI2C
 StartI2C
 RestartI2C
 NotAckI2C
 AckI2C
 DataRdyI2C
 putclI2C
 getclI2C
 putclI2C

I2C Examples ([see page 1072](#))

7.9.7 I2C EEPROM (14K50 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))
 EEAckPolling ([see page 1075](#))
 EEByteWrite ([see page 1079](#))
 EECurrentAddRead ([see page 1077](#))
 EEPageWrite ([see page 1081](#))
 EERandomRead ([see page 1086](#))
 EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.9.8 EEP (14K50 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions
Write_b_eep (see page 1061)
Read_b_eep (see page 1061)
Busy_eep (see page 1062)

EEP Examples ([see page 1062](#))

7.9.9 IO Ports (14K50 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)

Macros
EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.9.10 SW_RTCC (14K50 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

7.9.11 SPI (14K50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros
EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.9.12 Timers (14K50 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) ([see page 1119](#))

[ReadTimer0](#) ([see page 1137](#))

[WriteTimer0](#) ([see page 1139](#))

[CloseTimer0](#) ([see page 1143](#))

[OpenTimer1](#) ([see page 1120](#))

[ReadTimer1](#) ([see page 1138](#))

[WriteTimer1](#) ([see page 1140](#))

[CloseTimer1](#) ([see page 1143](#))

[OpenTimer2](#) ([see page 1123](#))

[CloseTimer2](#) ([see page 1144](#))

[OpenTimer3](#) ([see page 1124](#))

[ReadTimer3](#) ([see page 1138](#))

[WriteTimer3](#) ([see page 1140](#))

[CloseTimer3](#) ([see page 1144](#))

[SetTmrCCPSrc](#) ([see page 1141](#))

Macros

[WriteTimer2](#)

[ReadTimer2](#)

[T3_OSC1EN_ON](#)

[T3_OSC1EN_OFF](#)

Timers Examples ([see page 1146](#))

7.9.13 USART (14K50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))

WriteUSART ([see page 1155](#))

baudUSART ([see page 1158](#))

getsUSART ([see page 1160](#))

putrsUSART ([see page 1161](#))

putsUSART ([see page 1163](#))

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.9.14 MWIRE (14K50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.9.15 Flash (14K50 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1198](#))

WriteBytesFlash ([see page 1202](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.10 18F/LF14K22 Family

PIC18F13K22 / PIC18F14K22 / PIC18LF13K22 / PIC18LF14K22

7.10.1 ADC (14K22 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 858)

[SetChanADC](#) (see page 883)

[SelChanConvADC](#) (see page 890)

[ConvertADC](#) (see page 896)

[BusyADC](#) (see page 897)

[ReadADC](#) (see page 897)

[CloseADC](#) (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.10.2 Analog Comparator (14K22 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

[Open_ancomp1](#) (see page 900)

[Close_ancomp1](#) (see page 923)

[Open_ancomp2](#) (see page 912)

[Close_ancomp2](#) (see page 923)

Comparator Examples (see page 924)

7.10.3 Input Capture (14K22 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions
OpenCapture1 (see page 954)
ReadCapture1 (see page 983)
CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.10.4 Output Compare (14K22 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions
OpenCompare1 (see page 992)
CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.10.5 PWM (14K22 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
SetDCPWM1 (see page 1047)
SetOutputPWM1 (see page 1043)

[ClosePWM1](#) (see page 1056)

[PWM Examples](#) (see page 1060)

7.10.6 I2C (14K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C](#) (see page 1063)

[WriteI2C](#) (see page 1066)

[ReadI2C](#) (see page 1067)

[putslI2C](#) (see page 1068)

[getslI2C](#) (see page 1070)

[IdleI2C](#) (see page 1072)

[CloseI2C](#) (see page 1071)

Macros

[EnableIntI2C](#)

[DisableIntI2C](#)

[SetPriorityIntI2C](#)

[I2C_Clear_Intr_Status_Bit](#)

[I2C_Intr_Status](#)

[StopI2C](#)

[StartI2C](#)

[RestartI2C](#)

[NotAckI2C](#)

[AckI2C](#)

[DataRdyI2C](#)

[putclI2C](#)

[getclI2C](#)

[putclI2C](#)

[I2C Examples](#) (see page 1072)

7.10.7 I2C EEPROM (14K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

7.10.8 EEP (14K22 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions
Write_b_eep (see page 1061)
Read_b_eep (see page 1061)
Busy_eep (see page 1062)

7.10.9 IO Ports (14K22 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ([see page 1089](#))

OpenRB0INT ([see page 1089](#))

OpenRB1INT ([see page 1090](#))

OpenRB2INT ([see page 1091](#))

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.10.10 SW_RTCC (14K22 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))

update_RTCC ([see page 1106](#))

Close_RTCC ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.10.11 SPI (14K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenSPI ([see page 1108](#))WriteSPI ([see page 1111](#))ReadSPI ([see page 1113](#))putsSPI ([see page 1114](#))getsSPI ([see page 1115](#))**Macros**

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.10.12 Timers (14K22 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

FunctionsOpenTimer0 ([see page 1119](#))ReadTimer0 ([see page 1137](#))WriteTimer0 ([see page 1139](#))CloseTimer0 ([see page 1143](#))OpenTimer1 ([see page 1120](#))ReadTimer1 ([see page 1138](#))WriteTimer1 ([see page 1140](#))CloseTimer1 ([see page 1143](#))

OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.10.13 USART (14K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART (see page 1152)
WriteUSART (see page 1155)
baudUSART (see page 1158)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

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Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.10.14 MWIRE (14K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.10.15 Flash (14K22 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash (see page 1198)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.11 18F4553 Family

PIC18F2458 / PIC18F2553 / PIC18F4458 / PIC18F4553

7.11.1 ADC (4553 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.11.2 Analog Comparator (4553 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ( see page 899)

Close_ancomp ( see page 923)

Comparator Examples ( see page 924)

7.11.3 Input Capture (4553 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)

ReadCapture1 ( see page 983)

CloseCapture1 ( see page 987)

Input Capture Examples ( see page 991)

7.11.4 Output Compare (4553 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ( see page 992)

CloseCompare1 ( see page 1021)

Output Compare Examples ([see page 1025](#))

7.11.5 PWM (4553 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
SetDCPWM1 (see page 1047)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
OpenPWM2 (see page 1027)
SetDCPWM2 (see page 1048)
ClosePWM2 (see page 1056)

PWM Examples ([see page 1060](#))

7.11.6 I2C (4553 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenI2C (see page 1063)
WriteI2C (see page 1066)
ReadI2C (see page 1067)
putslI2C (see page 1068)
getslI2C (see page 1070)
IdleI2C (see page 1072)
CloseI2C (see page 1071)

Macros
EnableIntI2C

DisableIntI2C
SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putclI2C
getclI2C
putclI2C

I2C Examples ([see page 1072](#))

7.11.7 I2C EEPROM (4553 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.11.8 EEP (4553 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep ( see page 1061)

Read_b_eep ( see page 1061)

Busy_eep ( see page 1062)

EEP Examples ( see page 1062)

7.11.9 IO Ports (4553 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ( see page 1089)

OpenRB0INT ( see page 1089)

OpenRB1INT ( see page 1090)

OpenRB2INT ( see page 1091)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

IO Ports Examples ( see page 1093)

7.11.10 SW_RTCC (4553 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions[Open_RTCC](#) (see page 1106)[update_RTCC](#) (see page 1106)[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.11.11 SPI (4553 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions[OpenSPI](#) (see page 1108)[WriteSPI](#) (see page 1111)[ReadSPI](#) (see page 1113)[putsSPI](#) (see page 1114)[getsSPI](#) (see page 1115)**Macros**[EnableIntSPI](#)[DisableIntSPI](#)[SetPriorityIntSPI](#)[SPI_Clear_Intr_Status_Bit](#)[SPI_Intr_Status](#)[SPI_Clear_Recv_OV](#)[CloseSPI](#)[DataRdySPI](#)[getcSPI](#)[putcSPI](#)

SPI Examples (see page 1116)

7.11.12 Timers (4553 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)

ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1120)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)

CloseTimer3 (see page 1144)

SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.11.13 USART (4553 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))

WriteUSART ([see page 1155](#))

baudUSART ([see page 1158](#))

getsUSART ([see page 1160](#))

putrsUSART ([see page 1161](#))

putsUSART ([see page 1163](#))

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.11.14 MWIRE (4553 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.11.15 Flash (4553 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1199)
WriteBytesFlash (see page 1202)

Macros
LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.12 18F8493 Family

PIC18F8493 / PIC18F8393 / PIC18F6493 / PIC18F6393

7.12.1 ADC (8493 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.

- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.12.2 Analog Comparator (8493 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.12.3 Input Capture (8493 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

ReadCapture1 (see page 983)

CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.12.4 Output Compare (8493 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.12.5 PWM (8493 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

OpenPWM2 (see page 1027)

SetDCPWM2 (see page 1048)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.12.6 I2C (8493 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ([see page 1063](#))

WritelI2C ([see page 1066](#))

ReadlI2C ([see page 1067](#))

putslI2C ([see page 1068](#))

getslI2C ([see page 1070](#))

IdleI2C ([see page 1072](#))

CloselI2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putclI2C

getclI2C

putclI2C

I2C Examples ([see page 1072](#))

7.12.7 I2C EEPROM (8493 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C](#) (see page 1063)

[EEAckPolling](#) (see page 1075)

[EEByteWrite](#) (see page 1079)

[EECurrentAddRead](#) (see page 1077)

[EEPageWrite](#) (see page 1081)

[EERandomRead](#) (see page 1086)

[EESequentialRead](#) (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.12.8 IO Ports (8493 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

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Macros

EnablePullups

DisablePullups

[ClosePORTB](#)

[CloseRB0INT](#)

[CloseRB1INT](#)

[CloseRB2INT](#)

[CloseRB3INT](#)

IO Ports Examples ([see page 1093](#))

7.12.9 SW_RTCC (8493 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.12.10 SPI (8493 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros
EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI

getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.12.11 Timers (8493 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros
WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

7.12.12 USART (8493 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ( see page 1148)

Write1USART ( see page 1154)

baud1USART ( see page 1155)

gets1USART ( see page 1159)

putrs1USART ( see page 1160)

puts1USART ( see page 1162)

Read1USART ( see page 1163)

Open2USART ( see page 1150)

Write2USART ( see page 1155)

gets2USART ( see page 1159)

putrs2USART ( see page 1161)

puts2USART ( see page 1162)

Read2USART ( see page 1163)

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ( see page 1164)

7.12.13 MWIRE (8493 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.12.14 Flash (8493 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

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Functions

ReadFlash ([see page 1198](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.13 18F8723 Family

PIC18F8723 / PIC18F8628 / PIC18F6723 / PIC18F6628

7.13.1 ADC (8723 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.13.2 Analog Comparator (8723 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.13.3 Input Capture (8723 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenCapture2 (see page 955)

OpenCapture3 (see page 957)

OpenCapture4 (see page 959)

OpenCapture5 (see page 963)

ReadCapture1 (see page 983)

ReadCapture2 (see page 984)

ReadCapture3 (see page 984)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

CloseCapture1 (see page 987)

CloseCapture2 (see page 987)

CloseCapture3 (see page 988)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

Input Capture Examples (see page 991)

7.13.4 Output Compare (8723 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

OpenCompare2 (see page 993)

OpenCompare3 (see page 995)

OpenCompare4 (see page 997)

OpenCompare5 (see page 1000)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

CloseCompare3 (see page 1022)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.13.5 PWM (8723 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.13.6 I2C (8723 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 ([see page 1064](#))

WriteI2C1 ([see page 1066](#))

ReadI2C1 ([see page 1067](#))

putslI2C1 ([see page 1069](#))

getslI2C1 ([see page 1070](#))

OpenI2C2 ([see page 1065](#))

WriteI2C2 ([see page 1067](#))

ReadI2C2 ([see page 1068](#))

putslI2C2 ([see page 1069](#))

getslI2C2 ([see page 1071](#))

Macros

EnableIntI2C1

DisableIntI2C1

SetPriorityIntI2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

CloseI2C1

putclI2C1

getclI2C1

EnableIntI2C2

DisableIntI2C2

SetPriorityIntI2C2

I2C2_Clear_Intr_Status_Bit

I2C2_Intr_Status

StopI2C2

StartI2C2

RestartI2C2

NotAckI2C2

AckI2C2

DataRdyI2C2

IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.13.7 I2C EEPROM (8723 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.13.8 EEP (8723 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM

- Function to check the status of the EEPROM

Functions

`Write_b_eep` ([see page 1061](#))

`Read_b_eep` ([see page 1061](#))

`Busy_eep` ([see page 1062](#))

EEP Examples ([see page 1062](#))

7.13.9 IO Ports (8723 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` ([see page 1089](#))

`OpenRB0INT` ([see page 1089](#))

`OpenRB1INT` ([see page 1090](#))

`OpenRB2INT` ([see page 1091](#))

`OpenRB3INT` ([see page 1092](#))

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples ([see page 1093](#))

7.13.10 SW_RTCC (8723 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

FunctionsOpen_RTCC ([see page 1106](#))update_RTCC ([see page 1106](#))Close_RTCC ([see page 1106](#))SW_RTCC Examples ([see page 1107](#))

7.13.11 SPI (8723 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenSPI1 ([see page 1109](#))WriteSPI1 ([see page 1112](#))ReadSPI1 ([see page 1113](#))putsSPI1 ([see page 1114](#))getsSPI1 ([see page 1115](#))OpenSPI2 ([see page 1110](#))WriteSPI2 ([see page 1112](#))ReadSPI2 ([see page 1113](#))putsSPI2 ([see page 1114](#))getsSPI2 ([see page 1116](#))**Macros**

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.13.12 Timers (8723 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples ([see page 1146](#))

7.13.13 USART (8723 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))
Write1USART ([see page 1154](#))
baud1USART ([see page 1155](#))
gets1USART ([see page 1159](#))
putrs1USART ([see page 1160](#))
puts1USART ([see page 1162](#))
Read1USART ([see page 1163](#))
Open2USART ([see page 1150](#))
Write2USART ([see page 1155](#))
baud2USART ([see page 1157](#))
gets2USART ([see page 1159](#))
putrs2USART ([see page 1161](#))
puts2USART ([see page 1162](#))
Read2USART ([see page 1163](#))

Macros

DataRdy1USART
Close1USART
Busy1USART
putc1USART
getc1USART
DataRdy2USART

Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.13.14 MWIRE (8723 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire1 (see page 1166)
ReadMwire1 (see page 1170)
WriteMwire1 (see page 1169)
getsMwire1 (see page 1167)
OpenMwire2 (see page 1166)
ReadMwire2 (see page 1171)
WriteMwire2 (see page 1169)
getsMwire2 (see page 1168)

Macros
CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.13.15 Flash (8723 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1200)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.14 18F84J15 Family

PIC18F84J15 / PIC18F64J15

7.14.1 ADC (84J15 Family)

7

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.14.2 Analog Comparator (84J15 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.14.3 Input Capture (84J15 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenCapture2 (see page 955)

OpenCapture3 (see page 957)

OpenCapture4 (see page 959)

OpenCapture5 (see page 963)

ReadCapture1 (see page 983)

ReadCapture2 (see page 984)

ReadCapture3 (see page 984)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

CloseCapture1 (see page 987)

CloseCapture2 (see page 987)

CloseCapture3 (see page 988)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

Input Capture Examples (see page 991)

7.14.4 Output Compare (84J15 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

OpenCompare2 (see page 993)

OpenCompare3 (see page 995)

OpenCompare4 (see page 997)

OpenCompare5 (see page 1000)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

CloseCompare3 (see page 1022)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.14.5 PWM (84J15 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)
[OpenPWM2](#) (see page 1027)
[SetDCPWM1](#) (see page 1047)
[SetDCPWM2](#) (see page 1048)
[SetOutputPWM1](#) (see page 1043)
[ClosePWM1](#) (see page 1056)
[ClosePWM2](#) (see page 1056)

PWM Examples (see page 1060)

7.14.6 I2C (84J15 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C1](#) (see page 1064)
[WriteI2C1](#) (see page 1066)
[ReadI2C1](#) (see page 1067)
[putsI2C1](#) (see page 1069)
[getsI2C1](#) (see page 1070)
[OpenI2C2](#) (see page 1065)
[WriteI2C2](#) (see page 1067)
[ReadI2C2](#) (see page 1068)
[putsI2C2](#) (see page 1069)
[getsI2C2](#) (see page 1071)

Macros

[EnableIntI2C1](#)
[DisableIntI2C1](#)
[SetPriorityIntI2C1](#)
[I2C1_Clear_Intr_Status_Bit](#)
[I2C1_Intr_Status](#)

StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putI2C1
getI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.14.7 I2C EEPROM (84J15 Family)

7

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 ([see page 1064](#))

EEAckPolling1 ([see page 1076](#))

EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples (see page 1088)

7.14.8 IO Ports (84J15 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples (see page 1093)

7.14.9 SW_RTCC (84J15 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

7.14.10 SPI (84J15 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI1 (see page 1109)
WriteSPI1 (see page 1112)
ReadSPI1 (see page 1113)
putsSPI1 (see page 1114)
getsSPI1 (see page 1115)
OpenSPI2 (see page 1110)
WriteSPI2 (see page 1112)
ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

Macros
EnableIntSPI1
DisableIntSPI1
SetPriorityIntSPI1
SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status
SPI1_Clear_Recv_OV
CloseSPI1
DataRdySPI1
getcSPI1
putcSPI1
EnableIntSPI2
DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.14.11 Timers (84J15 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples (see page 1146)

7.14.12 USART (84J15 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
baud1USART (see page 1155)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
baud2USART (see page 1157)
gets2USART (see page 1159)
putrs2USART (see page 1161)
puts2USART (see page 1162)
Read2USART (see page 1163)

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.14.13 MWIRE (84J15 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire1 ([see page 1166](#))ReadMwire1 ([see page 1170](#))WriteMwire1 ([see page 1169](#))getsMwire1 ([see page 1167](#))OpenMwire2 ([see page 1166](#))ReadMwire2 ([see page 1171](#))WriteMwire2 ([see page 1169](#))getsMwire2 ([see page 1168](#))**Macros**

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.14.14 Flash (84J15 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteBytesFlash (see page 1203)

Macros
LoadFlashAddr
TableRead

7.15 18F87J50 Family

PIC18F65J50 / PIC18F66J50 / PIC18F66J55 / PIC18F67J50

PIC18F85J50 / PIC18F86J50 / PIC18F86J55 / PIC18F87J50

7.15.1 ADC (87J50 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions[OpenADC](#) (see page 865)[SetChanADC](#) (see page 882)[SelChanConvADC](#) (see page 889)[ConvertADC](#) (see page 896)[BusyADC](#) (see page 897)[ReadADC](#) (see page 897)[CloseADC](#) (see page 897)**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CALIB

ADC_NO_CALIB

ADC Examples (see page 898)

7.15.2 Analog Comparator (87J50 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions[Open_ancomp1](#) (see page 902)[Open_ancomp2](#) (see page 911)[Close_ancomp1](#) (see page 923)[Close_ancomp2](#) (see page 923)

Comparator Examples (see page 924)

7.15.3 Input Capture (87J50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

OpenCapture2 ([see page 955](#))

OpenCapture3 ([see page 957](#))

OpenCapture4 ([see page 959](#))

OpenCapture5 ([see page 963](#))

ReadCapture1 ([see page 983](#))

ReadCapture2 ([see page 984](#))

ReadCapture3 ([see page 984](#))

ReadCapture4 ([see page 984](#))

ReadCapture5 ([see page 984](#))

CloseCapture1 ([see page 987](#))

CloseCapture2 ([see page 987](#))

CloseCapture3 ([see page 988](#))

CloseCapture4 ([see page 988](#))

CloseCapture5 ([see page 988](#))

Input Capture Examples ([see page 991](#))

7.15.4 Output Compare (87J50 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

OpenCompare2 ([see page 993](#))

OpenCompare3 ([see page 995](#))

OpenCompare4 ([see page 997](#))

OpenCompare5 (see page 1000)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

CloseCompare3 (see page 1022)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.15.5 PWM (87J50 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

OpenPWM3 (see page 1027)

OpenPWM4 (see page 1028)

OpenPWM5 (see page 1030)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetDCPWM3 (see page 1048)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetOutputPWM1 (see page 1043)

SetOutputPWM2 (see page 1043)

SetOutputPWM3 (see page 1044)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

ClosePWM3 (see page 1056)

ClosePWM4 (see page 1057)

ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.15.6 I2C (87J50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenI2C1 (see page 1064)
Writel2C1 (see page 1066)
Readl2C1 (see page 1067)
putsl2C1 (see page 1069)
getsl2C1 (see page 1070)
OpenI2C2 (see page 1065)
Writel2C2 (see page 1067)
Readl2C2 (see page 1068)
putsl2C2 (see page 1069)
getsl2C2 (see page 1071)

Macros
EnableIntI2C1
DisableIntI2C1
SetPriorityIntI2C1
I2C1_Clear_Intr_Status_Bit
I2C1_Intr_Status
StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
Closel2C1
putcl2C1
getcl2C1
EnableIntI2C2
DisableIntI2C2

SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloselI2C2
putclI2C2
getclI2C2

I2C Examples ([see page 1072](#))

7.15.7 I2C EEPROM (87J50 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.15.8 IO Ports (87J50 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` ([see page 1089](#))

`OpenRB0INT` ([see page 1089](#))

`OpenRB1INT` ([see page 1090](#))

`OpenRB2INT` ([see page 1091](#))

`OpenRB3INT` ([see page 1092](#))

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples ([see page 1093](#))

7.15.9 SW_RTCC (87J50 Family)

7

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

`Open_RTCC` ([see page 1106](#))

`update_RTCC` ([see page 1106](#))

`Close_RTCC` ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.15.10 SPI (87J50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 (↗ see page 1109)

WriteSPI1 (↗ see page 1112)

ReadSPI1 (↗ see page 1113)

putsSPI1 (↗ see page 1114)

getsSPI1 (↗ see page 1115)

OpenSPI2 (↗ see page 1110)

WriteSPI2 (↗ see page 1112)

ReadSPI2 (↗ see page 1113)

putsSPI2 (↗ see page 1114)

getsSPI2 (↗ see page 1116)

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.15.11 Timers (87J50 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros
WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples ([see page 1146](#))

7.15.12 USART (87J50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[Open1USART](#) ([see page 1148](#))

[Write1USART](#) ([see page 1154](#))

[baud1USART](#) ([see page 1155](#))

[gets1USART](#) ([see page 1159](#))

[putrs1USART](#) ([see page 1160](#))

[puts1USART](#) ([see page 1162](#))

[Read1USART](#) ([see page 1163](#))

[Open2USART](#) ([see page 1150](#))

[Write2USART](#) ([see page 1155](#))

[baud2USART](#) ([see page 1157](#))

[gets2USART](#) ([see page 1159](#))

[putrs2USART](#) ([see page 1161](#))

[puts2USART](#) ([see page 1162](#))

[Read2USART](#) ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.15.13 MWIRE (87J50 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 (↗ see page 1166)

ReadMwire1 (↗ see page 1170)

WriteMwire1 (↗ see page 1169)

getsMwire1 (↗ see page 1167)

OpenMwire2 (↗ see page 1166)

ReadMwire2 (↗ see page 1171)

WriteMwire2 (↗ see page 1169)

getsMwire2 (↗ see page 1168)

Macros

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2

putcMwire2

DataRdyMwire2

MWIRE Examples (↗ see page 1172)

7.15.14 Flash (87J50 Family)

This peripheral module supports functionalities:

- Erasing Flash (↗ see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash

- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)
[EraseFlash](#) (see page 1196)
[WriteBlockFlash](#) (see page 1200)
[WriteBytesFlash](#) (see page 1203)

Macros

[LoadFlashAddr](#)
[TableRead](#)

[Flash Examples](#) (see page 1204)

7.16 18F87J11 Family

[PIC18F65J11](#) / [PIC18F66J11](#) / [PIC18F66J16](#) / [PIC18F67J11](#)

[PIC18F85J11](#) / [PIC18F86J11](#) / [PIC18F86J16](#) / [PIC18F87J11](#)

7.16.1 ADC (87J11 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 865)
[SetChanADC](#) (see page 882)
[SelChanConvADC](#) (see page 889)
[ConvertADC](#) (see page 896)
[BusyADC](#) (see page 897)
[ReadADC](#) (see page 897)
[CloseADC](#) (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE
ADC_CALIB
ADC_NO_CALIB

ADC Examples ([see page 898](#))

7.16.2 Analog Comparator (87J11 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 ([see page 902](#))
Open_ancomp2 ([see page 911](#))
Close_ancomp1 ([see page 923](#))
Close_ancomp2 ([see page 923](#))

Comparator Examples ([see page 924](#))

7.16.3 Input Capture (87J11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
OpenCapture2 ([see page 955](#))
OpenCapture3 ([see page 957](#))
OpenCapture4 ([see page 959](#))
OpenCapture5 ([see page 963](#))
ReadCapture1 ([see page 983](#))

ReadCapture2 (█ see page 984)

ReadCapture3 (█ see page 984)

ReadCapture4 (█ see page 984)

ReadCapture5 (█ see page 984)

CloseCapture1 (█ see page 987)

CloseCapture2 (█ see page 987)

CloseCapture3 (█ see page 988)

CloseCapture4 (█ see page 988)

CloseCapture5 (█ see page 988)

Input Capture Examples (█ see page 991)

7.16.4 Output Compare (87J11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (█ see page 992)

OpenCompare2 (█ see page 993)

OpenCompare3 (█ see page 995)

OpenCompare4 (█ see page 997)

OpenCompare5 (█ see page 1000)

CloseCompare1 (█ see page 1021)

CloseCompare2 (█ see page 1022)

CloseCompare3 (█ see page 1022)

CloseCompare4 (█ see page 1022)

CloseCompare5 (█ see page 1022)

Output Compare Examples (█ see page 1025)

7.16.5 PWM (87J11 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)
 OpenPWM2 (see page 1027)
 OpenPWM3 (see page 1027)
 OpenPWM4 (see page 1028)
 OpenPWM5 (see page 1030)
 SetDCPWM1 (see page 1047)
 SetDCPWM2 (see page 1048)
 SetDCPWM3 (see page 1048)
 SetDCPWM4 (see page 1049)
 SetDCPWM5 (see page 1050)
 SetOutputPWM1 (see page 1043)
 SetOutputPWM2 (see page 1043)
 SetOutputPWM3 (see page 1044)
 ClosePWM1 (see page 1056)
 ClosePWM2 (see page 1056)
 ClosePWM3 (see page 1056)
 ClosePWM4 (see page 1057)
 ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.16.6 I2C (87J11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)
 WriteI2C1 (see page 1066)
 ReadI2C1 (see page 1067)
 putsI2C1 (see page 1069)
 getsI2C1 (see page 1070)
 OpenI2C2 (see page 1065)
 WriteI2C2 (see page 1067)
 ReadI2C2 (see page 1068)
 putsI2C2 (see page 1069)

getI2C2 ([see page 1071](#))

Macros

EnableIntI2C1
DisableIntI2C1
SetPriorityIntI2C1
I2C1_Clear_Intr_Status_Bit
I2C1_Intr_Status
StopI2C1
StartI2C1
RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putI2C1
getI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.16.7 I2C EEPROM (87J11 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C1](#) (see page 1064)

[EEAckPolling1](#) (see page 1076)

[EEByteWrite1](#) (see page 1080)

[EECurrentAddRead1](#) (see page 1078)

[EEPageWrite1](#) (see page 1082)

[EERandomRead1](#) (see page 1086)

[EESequentialRead1](#) (see page 1084)

[OpenI2C2](#) (see page 1065)

[EEAckPolling2](#) (see page 1076)

[EEByteWrite2](#) (see page 1080)

[EECurrentAddRead2](#) (see page 1078)

[EEPageWrite2](#) (see page 1083)

[EERandomRead2](#) (see page 1087)

[EESequentialRead2](#) (see page 1085)

I2C EEPROM Examples (see page 1088)

7.16.8 IO Ports (87J11 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.16.9 SW_RTCC (87J11 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))
update_RTCC ([see page 1106](#))
Close_RTCC ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.16.10 SPI (87J11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))
WriteSPI1 ([see page 1112](#))
ReadSPI1 ([see page 1113](#))
putsSPI1 ([see page 1114](#))
getsSPI1 ([see page 1115](#))
OpenSPI2 ([see page 1110](#))
WriteSPI2 ([see page 1112](#))

ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

Macros

EnableIntSPI1
DisableIntSPI1
SetPriorityIntSPI1
SPI1_Clear_Intr_Status_Bit
SPI1_Intr_Status
SPI1_Clear_Recv_OV
CloseSPI1
DataRdySPI1
getcSPI1
putcSPI1
EnableIntSPI2
DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.16.11 Timers (87J11 Family)

7

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1120)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)

CloseTimer3 (see page 1144)

OpenTimer4 (see page 1130)

CloseTimer4 (see page 1144)

SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

Timers Examples (see page 1146)

7.16.12 USART (87J11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)

Write1USART (see page 1154)

baud1USART (see page 1155)

gets1USART (see page 1159)

putrs1USART (see page 1160)

puts1USART (see page 1162)

Read1USART (see page 1163)

Open2USART (see page 1150)

Write2USART (see page 1155)

baud2USART (see page 1157)

gets2USART (see page 1159)

putrs2USART (see page 1161)

puts2USART (see page 1162)

Read2USART (see page 1163)

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples (see page 1164)

7.16.13 MWIRE (87J11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 (see page 1166)

ReadMwire1 (see page 1170)

WriteMwire1 (see page 1169)

getsMwire1 (see page 1167)

OpenMwire2 (see page 1166)

ReadMwire2 (see page 1171)

WriteMwire2 (see page 1169)

getsMwire2 (see page 1168)
--

Macros

CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.16.14 Flash (87J11 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteBytesFlash (see page 1203)

7

Macros

LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.17 18F46K20 Family

PIC18F23K20 / PIC18F24K20 / PIC18F25K20 / PIC18F26K20

PIC18F43K20 / PIC18F44K20 / PIC18F45K20 / PIC18F46K20

7.17.1 ADC (46K20 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 851](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CALIB

ADC_NO_CALIB

ADC Examples ([see page 898](#))

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7.17.2 Analog Comparator (46K20 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 900)

Open_ancomp2 (see page 909)

Close_ancomp1 (see page 923)

Close_ancomp2 (see page 923)

Comparator Examples (see page 924)

7.17.3 Input Capture (46K20 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

ReadCapture1 (see page 983)

CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.17.4 Output Compare (46K20 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.17.5 PWM (46K20 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)

[OpenPWM2](#) (see page 1027)

[SetDCPWM1](#) (see page 1047)

[SetDCPWM2](#) (see page 1048)

[SetOutputPWM1](#) (see page 1043)

[ClosePWM1](#) (see page 1056)

[ClosePWM2](#) (see page 1056)

PWM Examples ([see page 1060](#))

7.17.6 I2C (46K20 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C](#) (see page 1063)

[WriteI2C](#) (see page 1066)

[ReadI2C](#) (see page 1067)

[putslI2C](#) (see page 1068)

[getslI2C](#) (see page 1070)

[IdleI2C](#) (see page 1072)

[CloseI2C](#) (see page 1071)

Macros

[EnableIntI2C](#)

[DisableIntI2C](#)

SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putclI2C
getclI2C
putclI2C

I2C Examples ([see page 1072](#))

7.17.7 I2C EEPROM (46K20 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

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7.17.8 EEP (46K20 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM

- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.17.9 IO Ports (46K20 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

IO Ports Examples (see page 1093)

7.17.10 SW_RTCC (46K20 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions[Open_RTCC](#) (see page 1106)[update_RTCC](#) (see page 1106)[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.17.11 SPI (46K20 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions[OpenSPI](#) (see page 1108)[WriteSPI](#) (see page 1111)[ReadSPI](#) (see page 1113)[putsSPI](#) (see page 1114)[getsSPI](#) (see page 1115)**Macros**[EnableIntSPI](#)[DisableIntSPI](#)[SetPriorityIntSPI](#)[SPI_Clear_Intr_Status_Bit](#)[SPI_Intr_Status](#)[SPI_Clear_Recv_OV](#)[CloseSPI](#)[DataRdySPI](#)[getcSPI](#)[putcSPI](#)

SPI Examples (see page 1116)

7.17.12 Timers (46K20 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.17.13 USART (46K20 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenUSART ([see page 1152](#))WriteUSART ([see page 1155](#))baudUSART ([see page 1158](#))getsUSART ([see page 1160](#))putrsUSART ([see page 1161](#))putsUSART ([see page 1163](#))ReadUSART ([see page 1164](#))**Macros**

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.17.14 MWIRE (46K20 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.17.15 Flash (46K20 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1199)
WriteBytesFlash (see page 1202)

Macros
LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.18 18F97J60 Family

PIC18F66J60 / PIC18F66J65 / PIC18F67J60

PIC18F86J60 / PIC18F86J65 / PIC18F87J60

PIC18F96J60 / PIC18F96J65 / PIC18F97J60

7.18.1 PIC18F67J60 Set

PIC18F66J60 / PIC18F66J65 / PIC18F67J60

7.18.1.1 ADC (67J60 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.18.1.2 Analog Comparator (67J60 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

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Functions

Open_ancomp ([see page 899](#))

Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.18.1.3 Input Capture (67J60 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

OpenCapture2 ([see page 955](#))

OpenCapture3 ([see page 957](#))

OpenCapture4 ([see page 959](#))

OpenCapture5 ([see page 963](#))

ReadCapture1 ([see page 983](#))

ReadCapture2 ([see page 984](#))

ReadCapture3 ([see page 984](#))

ReadCapture4 ([see page 984](#))

ReadCapture5 ([see page 984](#))

CloseCapture1 ([see page 987](#))

CloseCapture2 ([see page 987](#))

CloseCapture3 ([see page 988](#))

CloseCapture4 ([see page 988](#))

CloseCapture5 ([see page 988](#))

Input Capture Examples ([see page 991](#))

7.18.1.4 Output Compare (67J60 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

CloseCompare1 ([see page 1021](#))

Output Compare Examples ([see page 1025](#))

7.18.1.5 PWM (67J60 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 ([see page 1026](#))

OpenPWM2 ([see page 1027](#))

OpenPWM3 ([see page 1027](#))

OpenPWM4 ([see page 1028](#))

OpenPWM5 ([see page 1030](#))

SetDCPWM1 ([see page 1047](#))

SetDCPWM2 ([see page 1048](#))

SetDCPWM3 ([see page 1048](#))

SetDCPWM4 ([see page 1049](#))

SetDCPWM5 ([see page 1050](#))

SetOutputPWM1 ([see page 1043](#))

SetOutputPWM2 ([see page 1043](#))

SetOutputPWM3 ([see page 1044](#))

ClosePWM1 ([see page 1056](#))

ClosePWM2 ([see page 1056](#))

ClosePWM3 ([see page 1056](#))

ClosePWM4 ([see page 1057](#))

ClosePWM5 ([see page 1057](#))

PWM Examples ([see page 1060](#))

7.18.1.6 I2C (67J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 ([see page 1064](#))

WritelI2C1 ([see page 1066](#))

ReadlI2C1 ([see page 1067](#))

putsI2C1 (see page 1069)
--

| getsl2C1 ([see page 1070](#)) |

Macros

| EnableIntI2C1 |
| DisableIntI2C1 |
| SetPriorityIntI2C1 |
| I2C1_Clear_Intr_Status_Bit |
| I2C1_Intr_Status |
| StopI2C1 |
| StartI2C1 |
| RestartI2C1 |
| NotAckI2C1 |
| AckI2C1 |
| DataRdyI2C1 |
| IdleI2C1 |
| CloseI2C1 |
| putcl2C1 |
| getcl2C1 |

I2C Examples ([see page 1072](#))

7.18.1.7 I2C EEPROM (67J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

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Functions

| OpenI2C1 ([see page 1064](#)) |
| EEAckPolling1 ([see page 1076](#)) |
| EEByteWrite1 ([see page 1080](#)) |
| EECurrentAddRead1 ([see page 1078](#)) |
| EEPageWrite1 ([see page 1082](#)) |
| EERandomRead1 ([see page 1086](#)) |
| EESequentialRead1 ([see page 1084](#)) |

I2C EEPROM Examples ([see page 1088](#))

7.18.1.8 IO Ports (67J60 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) ([see page 1089](#))

[OpenRB0INT](#) ([see page 1089](#))

[OpenRB1INT](#) ([see page 1090](#))

[OpenRB2INT](#) ([see page 1091](#))

[OpenRB3INT](#) ([see page 1092](#))

Macros

[EnablePullups](#)

[DisablePullups](#)

[ClosePORTB](#)

[CloseRB0INT](#)

[CloseRB1INT](#)

[CloseRB2INT](#)

[CloseRB3INT](#)

IO Ports Examples ([see page 1093](#))

7.18.1.9 SW_RTCC (67J60 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) ([see page 1106](#))

[update_RTCC](#) ([see page 1106](#))

[Close_RTCC](#) ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.18.1.10 SPI (67J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))

WriteSPI1 ([see page 1112](#))

ReadSPI1 ([see page 1113](#))

putsSPI1 ([see page 1114](#))

getsSPI1 ([see page 1115](#))

OpenSPI2 ([see page 1110](#))

WriteSPI2 ([see page 1112](#))

ReadSPI2 ([see page 1113](#))

putsSPI2 ([see page 1114](#))

getsSPI2 ([see page 1116](#))

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.18.1.11 Timers (67J60 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

OpenTimer4 ([see page 1130](#))

CloseTimer4 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

Timers Examples ([see page 1146](#))

7.18.1.12 USART (67J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))

Write1USART ([see page 1154](#))

baud1USART ([see page 1155](#))

gets1USART ([see page 1159](#))

putrs1USART ([see page 1160](#))

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

USART Examples ([see page 1164](#))

7.18.1.13 MWIRE (67J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 ([see page 1166](#))

ReadMwire1 ([see page 1170](#))

WriteMwire1 ([see page 1169](#))

getsMwire1 ([see page 1167](#))

OpenMwire2 (see page 1166)
ReadMwire2 (see page 1171)
WriteMwire2 (see page 1169)
getsMwire2 (see page 1168)

Macros

CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples (see page 1172)

7.18.1.14 Flash (67J60 Set)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteBytesFlash (see page 1203)

Macros

LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.18.2 PIC18F87J60 Set

PIC18F86J60 / PIC18F86J65 / PIC18F87J60

7.18.2.1 ADC (87J60 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 848)

[SetChanADC](#) (see page 882)

[SelChanConvADC](#) (see page 889)

[ConvertADC](#) (see page 896)

[BusyADC](#) (see page 897)

[ReadADC](#) (see page 897)

[CloseADC](#) (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.18.2.2 Analog Comparator (87J60 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

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Functions

[Open_ancomp](#) (see page 899)

[Close_ancomp](#) (see page 923)

Comparator Examples (see page 924)

7.18.2.3 Input Capture (87J60 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

OpenCapture2 ([see page 955](#))

OpenCapture3 ([see page 957](#))

OpenCapture4 ([see page 959](#))

OpenCapture5 ([see page 963](#))

ReadCapture1 ([see page 983](#))

ReadCapture2 ([see page 984](#))

ReadCapture3 ([see page 984](#))

ReadCapture4 ([see page 984](#))

ReadCapture5 ([see page 984](#))

CloseCapture1 ([see page 987](#))

CloseCapture2 ([see page 987](#))

CloseCapture3 ([see page 988](#))

CloseCapture4 ([see page 988](#))

CloseCapture5 ([see page 988](#))

Input Capture Examples ([see page 991](#))

7.18.2.4 Output Compare (87J60 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

CloseCompare1 ([see page 1021](#))

Output Compare Examples ([see page 1025](#))

7.18.2.5 PWM (87J60 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
OpenPWM3 (see page 1027)
OpenPWM4 (see page 1028)
OpenPWM5 (see page 1030)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetDCPWM3 (see page 1048)
SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)
SetOutputPWM1 (see page 1043)
SetOutputPWM2 (see page 1043)
SetOutputPWM3 (see page 1044)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)
ClosePWM3 (see page 1056)
ClosePWM4 (see page 1057)
ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.18.2.6 I2C (87J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)
WritelI2C1 (see page 1066)
ReadlI2C1 (see page 1067)

putsI2C1 ([see page 1069](#))

getsl2C1 ([see page 1070](#))

Macros

EnableI2C1

DisableI2C1

SetPriorityI2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

CloseI2C1

putcl2C1

getcl2C1

I2C Examples ([see page 1072](#))

7.18.2.7 I2C EEPROM (87J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

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Functions

OpenI2C1 ([see page 1064](#))

EEAckPolling1 ([see page 1076](#))

EEByteWrite1 ([see page 1080](#))

EECurrentAddRead1 ([see page 1078](#))

EEPageWrite1 ([see page 1082](#))

EERandomRead1 ([see page 1086](#))

EESequentialRead1 ([see page 1084](#))

I2C EEPROM Examples ([see page 1088](#))

7.18.2.8 IO Ports (87J60 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) ([see page 1089](#))

[OpenRB0INT](#) ([see page 1089](#))

[OpenRB1INT](#) ([see page 1090](#))

[OpenRB2INT](#) ([see page 1091](#))

[OpenRB3INT](#) ([see page 1092](#))

Macros

[EnablePullups](#)

[DisablePullups](#)

[ClosePORTB](#)

[CloseRB0INT](#)

[CloseRB1INT](#)

[CloseRB2INT](#)

[CloseRB3INT](#)

IO Ports Examples ([see page 1093](#))

7.18.2.9 SW_RTCC (87J60 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) ([see page 1106](#))

[update_RTCC](#) ([see page 1106](#))

[Close_RTCC](#) ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.18.2.10 SPI (87J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))

WriteSPI1 ([see page 1112](#))

ReadSPI1 ([see page 1113](#))

putsSPI1 ([see page 1114](#))

getsSPI1 ([see page 1115](#))

OpenSPI2 ([see page 1110](#))

WriteSPI2 ([see page 1112](#))

ReadSPI2 ([see page 1113](#))

putsSPI2 ([see page 1114](#))

getsSPI2 ([see page 1116](#))

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.18.2.11 Timers (87J60 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

OpenTimer4 ([see page 1130](#))

CloseTimer4 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

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Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

Timers Examples ([see page 1146](#))

7.18.2.12 USART (87J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))

Write1USART ([see page 1154](#))

baud1USART ([see page 1155](#))

gets1USART ([see page 1159](#))

putrs1USART ([see page 1160](#))

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Open2USART ([see page 1150](#))

Write2USART ([see page 1155](#))

baud2USART ([see page 1157](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.18.2.13 MWIRE (87J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 ([see page 1166](#))

ReadMwire1 ([see page 1170](#))

WriteMwire1 ([see page 1169](#))

getsMwire1 ([see page 1167](#))

OpenMwire2 ([see page 1166](#))

ReadMwire2 ([see page 1171](#))

WriteMwire2 ([see page 1169](#))

getsMwire2 ([see page 1168](#))

Macros

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2

putcMwire2

DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.18.2.14 Flash (87J60 Set)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)
[EraseFlash](#) (see page 1196)
[WriteBlockFlash](#) (see page 1200)
[WriteBytesFlash](#) (see page 1203)

Macros

[LoadFlashAddr](#)
[TableRead](#)

Flash Examples (see page 1204)

7.18.3 PIC18F97J60 Set

PIC18F96J60 / PIC18F96J65 / PIC18F97J60

7.18.3.1 ADC (97J60 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 848)
[SetChanADC](#) (see page 882)
[SelChanConvADC](#) (see page 889)
[ConvertADC](#) (see page 896)
[BusyADC](#) (see page 897)
[ReadADC](#) (see page 897)
[CloseADC](#) (see page 897)

Macros

[ADC_INT_ENABLE](#)
[ADC_INT_DISABLE](#)

ADC Examples (see page 898)

7.18.3.2 Analog Comparator (97J60 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.18.3.3 Input Capture (97J60 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenCapture2 (see page 955)

OpenCapture3 (see page 957)

OpenCapture4 (see page 959)

OpenCapture5 (see page 963)

ReadCapture1 (see page 983)

ReadCapture2 (see page 984)

ReadCapture3 (see page 984)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

CloseCapture1 (see page 987)

CloseCapture2 (see page 987)

CloseCapture3 (see page 988)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

Input Capture Examples (see page 991)

7.18.3.4 Output Compare (97J60 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.18.3.5 PWM (97J60 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

OpenPWM3 (see page 1027)

OpenPWM4 (see page 1028)

OpenPWM5 (see page 1030)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetDCPWM3 (see page 1048)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetOutputPWM1 (see page 1043)

SetOutputPWM2 (see page 1043)

SetOutputPWM3 (see page 1044)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

ClosePWM3 (see page 1056)

ClosePWM4 (see page 1057)

ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.18.3.6 I2C (97J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 ([see page 1064](#))

Writel2C1 ([see page 1066](#))

ReadI2C1 ([see page 1067](#))

putslI2C1 ([see page 1069](#))

getslI2C1 ([see page 1070](#))

OpenI2C2 ([see page 1065](#))

Writel2C2 ([see page 1067](#))

Readl2C2 ([see page 1068](#))

putslI2C2 ([see page 1069](#))

getslI2C2 ([see page 1071](#))

Macros

EnableIntI2C1

DisableIntI2C1

SetPriorityIntI2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

CloseI2C1

putclI2C1

getclI2C1

EnableIntI2C2

DisableIntI2C2

SetPriorityIntI2C2

I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putclI2C2
getclI2C2

I2C Examples ([see page 1072](#))

7.18.3.7 I2C EEPROM (97J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.18.3.8 IO Ports (97J60 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` ([see page 1089](#))

`OpenRB0INT` ([see page 1089](#))

`OpenRB1INT` ([see page 1090](#))

`OpenRB2INT` ([see page 1091](#))

`OpenRB3INT` ([see page 1092](#))

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

`CloseRB3INT`

IO Ports Examples ([see page 1093](#))

7.18.3.9 SW_RTCC (97J60 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

7

Functions

`Open_RTCC` ([see page 1106](#))

`update_RTCC` ([see page 1106](#))

`Close_RTCC` ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.18.3.10 SPI (97J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ( see page 1109)

WriteSPI1 ( see page 1112)

ReadSPI1 ( see page 1113)

putsSPI1 ( see page 1114)

getsSPI1 ( see page 1115)

OpenSPI2 ( see page 1110)

WriteSPI2 ( see page 1112)

ReadSPI2 ( see page 1113)

putsSPI2 ( see page 1114)

getsSPI2 ( see page 1116)

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2

putcSPI2

SPI Examples ( see page 1116)

7.18.3.11 Timers (97J60 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

OpenTimer4 ([see page 1130](#))

CloseTimer4 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

Timers Examples ([see page 1146](#))

7.18.3.12 USART (97J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))

Write1USART ([see page 1154](#))

baud1USART ([see page 1155](#))

gets1USART ([see page 1159](#))

putrs1USART ([see page 1160](#))

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Open2USART ([see page 1150](#))

Write2USART ([see page 1155](#))

baud2USART ([see page 1157](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.18.3.13 MWIRE (97J60 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.

- Provides simple interface macros to enable/disable interrupts

Functions

[OpenMwire1](#) (see page 1166)

[ReadMwire1](#) (see page 1170)

[WriteMwire1](#) (see page 1169)

[getsMwire1](#) (see page 1167)

[OpenMwire2](#) (see page 1166)

[ReadMwire2](#) (see page 1171)

[WriteMwire2](#) (see page 1169)

[getsMwire2](#) (see page 1168)

Macros

[CloseMwire1](#)

[getcMwire1](#)

[putcMwire1](#)

[DataRdyMwire1](#)

[CloseMwire2](#)

[getcMwire2](#)

[putcMwire2](#)

[DataRdyMwire2](#)

MWIRE Examples (see page 1172)

7.18.3.14 Flash (97J60 Set)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)

[EraseFlash](#) (see page 1196)

[WriteBlockFlash](#) (see page 1200)

[WriteBytesFlash](#) (see page 1203)

Macros

LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.19 18F87J10 Family

PIC18F65J10 / PIC18F65J15 / PIC18F66J10 / PIC18F66J15 / PIC18F67J10

PIC18F85J10 / PIC18F85J15 / PIC18F86J10 / PIC18F86J15 / PIC18F87J10

7.19.1 ADC (87J10 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))
SetChanADC ([see page 882](#))
SelChanConvADC ([see page 889](#))
ConvertADC ([see page 896](#))
BusyADC ([see page 897](#))
ReadADC ([see page 897](#))
CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.19.2 Analog Comparator (87J10 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.19.3 Input Capture (87J10 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenCapture2 (see page 955)

OpenCapture3 (see page 957)

OpenCapture4 (see page 959)

OpenCapture5 (see page 963)

ReadCapture1 (see page 983)

ReadCapture2 (see page 984)

ReadCapture3 (see page 984)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

CloseCapture1 (see page 987)

CloseCapture2 (see page 987)

CloseCapture3 (see page 988)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

Input Capture Examples ([see page 991](#))

7.19.4 Output Compare (87J10 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions
OpenCompare1 (see page 992)
OpenCompare2 (see page 993)
OpenCompare3 (see page 995)
OpenCompare4 (see page 997)
OpenCompare5 (see page 1000)
CloseCompare1 (see page 1021)
CloseCompare2 (see page 1022)
CloseCompare3 (see page 1022)
CloseCompare4 (see page 1022)
CloseCompare5 (see page 1022)

7.19.5 PWM (87J10 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
OpenPWM3 (see page 1027)
OpenPWM4 (see page 1028)
OpenPWM5 (see page 1030)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetDCPWM3 (see page 1048)
SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)

[SetOutputPWM1](#) (see page 1043)

[SetOutputPWM2](#) (see page 1043)

[SetOutputPWM3](#) (see page 1044)

[ClosePWM1](#) (see page 1056)

[ClosePWM2](#) (see page 1056)

[ClosePWM3](#) (see page 1056)

[ClosePWM4](#) (see page 1057)

[ClosePWM5](#) (see page 1057)

PWM Examples (see page 1060)

7.19.6 I2C (87J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C1](#) (see page 1064)

[WritelI2C1](#) (see page 1066)

[ReadlI2C1](#) (see page 1067)

[putslI2C1](#) (see page 1069)

[getslI2C1](#) (see page 1070)

[OpenI2C2](#) (see page 1065)

[WritelI2C2](#) (see page 1067)

[ReadlI2C2](#) (see page 1068)

[putslI2C2](#) (see page 1069)

[getslI2C2](#) (see page 1071)

Macros

[EnableIntI2C1](#)

[DisableIntI2C1](#)

[SetPriorityIntI2C1](#)

[I2C1_Clear_Intr_Status_Bit](#)

[I2C1_Intr_Status](#)

[StopI2C1](#)

[StartI2C1](#)

RestartI2C1
NotAckI2C1
AckI2C1
DataRdyI2C1
IdleI2C1
CloseI2C1
putI2C1
getI2C1
EnableIntI2C2
DisableIntI2C2
SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloseI2C2
putI2C2
getI2C2

I2C Examples ([see page 1072](#))

7.19.7 I2C EEPROM (87J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)

EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples (see page 1088)

7.19.8 IO Ports (87J10 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples (see page 1093)

7.19.9 SW_RTCC (87J10 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.19.10 SPI (87J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI1 (see page 1109)
WriteSPI1 (see page 1112)
ReadSPI1 (see page 1113)
putsSPI1 (see page 1114)
getsSPI1 (see page 1115)
OpenSPI2 (see page 1110)
WriteSPI2 (see page 1112)
ReadSPI2 (see page 1113)
putsSPI2 (see page 1114)
getsSPI2 (see page 1116)

Macros
EnableIntSPI1
DisableIntSPI1
SetPriorityIntSPI1
SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status
SPI1_Clear_Recv_OV
CloseSPI1
DataRdySPI1
getcSPI1
putcSPI1
EnableIntSPI2
DisableIntSPI2
SetPriorityIntSPI2
SPI2_Clear_Intr_Status_Bit
SPI2_Intr_Status
SPI2_Clear_Recv_OV
CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.19.11 Timers (87J10 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples (see page 1146)

7.19.12 USART (87J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
baud1USART (see page 1155)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
baud2USART (see page 1157)
gets2USART (see page 1159)
putrs2USART (see page 1161)
puts2USART (see page 1162)
Read2USART (see page 1163)

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.19.13 MWIRE (87J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire1 ([see page 1166](#))ReadMwire1 ([see page 1170](#))WriteMwire1 ([see page 1169](#))getsMwire1 ([see page 1167](#))OpenMwire2 ([see page 1166](#))ReadMwire2 ([see page 1171](#))WriteMwire2 ([see page 1169](#))getsMwire2 ([see page 1168](#))**Macros**

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.19.14 Flash (87J10 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1200)
WriteBytesFlash (see page 1203)

Macros
LoadFlashAddr
TableRead

7.20 18F85J90/11 Family

PIC18F63J90 / PIC18F64J90 / PIC18F65J90

PIC18F83J90 / PIC18F84J90 / PIC18F85J90

PIC18F63J11 / PIC18F64J11 / PIC18F65J11

PIC18F83J11 / PIC18F84J11 / PIC18F85J11

7.20.1 ADC (85J90/11 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.20.2 Analog Comparator (85J90/11 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))

Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.20.3 Input Capture (85J90/11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions
OpenCapture1 (see page 954)
OpenCapture2 (see page 955)
ReadCapture1 (see page 983)
ReadCapture2 (see page 984)
CloseCapture1 (see page 987)
CloseCapture2 (see page 987)

Input Capture Examples (see page 991)

7.20.4 Output Compare (85J90/11 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions
OpenCompare1 (see page 992)
OpenCompare2 (see page 993)
CloseCompare1 (see page 1021)
CloseCompare2 (see page 1022)

Output Compare Examples (see page 1025)

7.20.5 PWM (85J90/11 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)
[OpenPWM2](#) (see page 1027)
[SetDCPWM1](#) (see page 1047)
[SetDCPWM2](#) (see page 1048)
[SetOutputPWM1](#) (see page 1043)
[ClosePWM1](#) (see page 1056)
[ClosePWM2](#) (see page 1056)

[PWM Examples](#) (see page 1060)

7.20.6 I2C (85J90/11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C](#) (see page 1063)
[WriteI2C](#) (see page 1066)
[ReadI2C](#) (see page 1067)
[putslI2C](#) (see page 1068)
[getslI2C](#) (see page 1070)
[IdleI2C](#) (see page 1072)
[CloseI2C](#) (see page 1071)

Macros

[EnableIntI2C](#)
[DisableIntI2C](#)
[SetPriorityIntI2C](#)
[I2C_Clear_Intr_Status_Bit](#)
[I2C_Intr_Status](#)
[StopI2C](#)
[StartI2C](#)
[RestartI2C](#)
[NotAckI2C](#)

AckI2C
DataRdyI2C
putcl2C
getcl2C
putcl2C

I2C Examples ([see page 1072](#))

7.20.7 I2C EEPROM (85J90/11 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.20.8 IO Ports (85J90/11 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.20.9 SW_RTCC (85J90/11 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) (see page 1106)

[update_RTCC](#) (see page 1106)

[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.20.10 SPI (85J90/11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenSPI](#) (see page 1108)

[WriteSPI](#) (see page 1111)

[ReadSPI](#) (see page 1113)

putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.20.11 Timers (85J90/11 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)

[CloseTimer3](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

[Timers Examples](#) (see page 1146)

7.20.12 USART (85J90/11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[Open1USART](#) (see page 1148)

[Write1USART](#) (see page 1154)

[baud1USART](#) (see page 1155)

[gets1USART](#) (see page 1159)

[putrs1USART](#) (see page 1160)

[puts1USART](#) (see page 1162)

[Read1USART](#) (see page 1163)

[Open2USART](#) (see page 1150)

[Write2USART](#) (see page 1155)

[gets2USART](#) (see page 1159)

[putrs2USART](#) (see page 1161)

[puts2USART](#) (see page 1162)

[Read2USART](#) (see page 1163)

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART
getc1USART
DataRdy2USART
Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.20.13 MWIRE (85J90/11 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros
CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.20.14 Flash (85J90/11 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (█ see page 1198)
 EraseFlash (█ see page 1196)
 WriteBlockFlash (█ see page 1200)
 WriteBytesFlash (█ see page 1203)

Macros

LoadFlashAddr
 TableRead

Flash Examples (█ see page 1204)

7.21 18F8621 Family

PIC18F6525 / PIC18F6621

PIC18F8525 / PIC18F8621

7.21.1 ADC (8621 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (█ see page 848)
 SetChanADC (█ see page 882)
 SelChanConvADC (█ see page 889)
 ConvertADC (█ see page 896)
 BusyADC (█ see page 897)
 ReadADC (█ see page 897)
 CloseADC (█ see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.21.2 Analog Comparator (8621 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

FunctionsOpen_ancomp ([see page 899](#))Close_ancomp ([see page 923](#))Comparator Examples ([see page 924](#))

7.21.3 Input Capture (8621 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

FunctionsOpenCapture1 ([see page 954](#))OpenCapture2 ([see page 955](#))OpenCapture3 ([see page 957](#))OpenCapture4 ([see page 959](#))OpenCapture5 ([see page 963](#))ReadCapture1 ([see page 983](#))ReadCapture2 ([see page 984](#))ReadCapture3 ([see page 984](#))ReadCapture4 ([see page 984](#))ReadCapture5 ([see page 984](#))

CloseCapture1 (see page 987)
CloseCapture2 (see page 987)
CloseCapture3 (see page 988)
CloseCapture4 (see page 988)
CloseCapture5 (see page 988)

Input Capture Examples (see page 991)

7.21.4 Output Compare (8621 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions
OpenCompare1 (see page 992)
OpenCompare2 (see page 993)
OpenCompare3 (see page 995)
OpenCompare4 (see page 997)
OpenCompare5 (see page 1000)
CloseCompare1 (see page 1021)
CloseCompare2 (see page 1022)
CloseCompare3 (see page 1022)
CloseCompare4 (see page 1022)
CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.21.5 PWM (8621 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
OpenPWM3 (see page 1027)
OpenPWM4 (see page 1028)

OpenPWM5 (see page 1030)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetDCPWM3 (see page 1048)
SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)
SetOutputPWM1 (see page 1043)
SetOutputPWM2 (see page 1043)
SetOutputPWM3 (see page 1044)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)
ClosePWM3 (see page 1056)
ClosePWM4 (see page 1057)
ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.21.6 I2C (8621 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)
Writel2C (see page 1066)
Readl2C (see page 1067)
putsl2C (see page 1068)
getsl2C (see page 1070)
IdleI2C (see page 1072)
Closel2C (see page 1071)

7

Macros

EnableIntI2C
DisableIntI2C
SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit

I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putcl2C
getcl2C
putcl2C

I2C Examples ([see page 1072](#))

7.21.7 I2C EEPROM (8621 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.21.8 EEP (8621 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.21.9 IO Ports (8621 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.21.10 SW_RTCC (8621 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions[Open_RTCC](#) (see page 1106)[update_RTCC](#) (see page 1106)[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.21.11 SPI (8621 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions[OpenSPI](#) (see page 1108)[WriteSPI](#) (see page 1111)[ReadSPI](#) (see page 1113)[putsSPI](#) (see page 1114)[getsSPI](#) (see page 1115)**Macros**[EnableIntSPI](#)[DisableIntSPI](#)[SetPriorityIntSPI](#)[SPI_Clear_Intr_Status_Bit](#)[SPI_Intr_Status](#)[SPI_Clear_Recv_OV](#)[CloseSPI](#)[DataRdySPI](#)[getcSPI](#)[putcSPI](#)

SPI Examples (see page 1116)

7.21.12 Timers (8621 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

OpenTimer4 ([see page 1130](#))

CloseTimer4 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

WriteTimer4

ReadTimer4

Timers Examples ([see page 1146](#))

7.21.13 USART (8621 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))

Write1USART ([see page 1154](#))

baud1USART ([see page 1155](#))

gets1USART ([see page 1159](#))

putrs1USART ([see page 1160](#))

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Open2USART ([see page 1150](#))

Write2USART ([see page 1155](#))

baud2USART ([see page 1157](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.21.14 MWIRE (8621 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.21.15 Flash (8621Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1198](#))

WriteBytesFlash ([see page 1202](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.22 18F8680 Family

PIC18F6585 / PIC18F6680**PIC18F8585 / PIC18F8680**

7.22.1 ADC (8680 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ([see page 848](#))SetChanADC ([see page 882](#))SelChanConvADC ([see page 889](#))ConvertADC ([see page 896](#))BusyADC ([see page 897](#))ReadADC ([see page 897](#))CloseADC ([see page 897](#))**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.22.2 Analog Comparator (8680 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ( see page 899)

Close_ancomp ( see page 923)

Comparator Examples ( see page 924)

7.22.3 Input Capture (8680 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)

ReadCapture1 ( see page 983)

CloseCapture1 ( see page 987)

Input Capture Examples ( see page 991)

7.22.4 Output Compare (8680 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ( see page 992)

CloseCompare1 ( see page 1021)

Output Compare Examples ([see page 1025](#))

7.22.5 PWM (8680 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)

PWM Examples ([see page 1060](#))

7.22.6 I2C (8680 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenI2C (see page 1063)
WriteI2C (see page 1066)
ReadI2C (see page 1067)
putslI2C (see page 1068)
getslI2C (see page 1070)
IdleI2C (see page 1072)
CloseI2C (see page 1071)

Macros
EnableIntI2C

DisableI2C
SetPriorityI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putcl2C
getcl2C
putcl2C

I2C Examples ([see page 1072](#))

7.22.7 I2C EEPROM (8680 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.22.8 SPI (8680 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenSPI ([see page 1108](#))WriteSPI ([see page 1111](#))ReadSPI ([see page 1113](#))putsSPI ([see page 1114](#))getsSPI ([see page 1115](#))**Macros**

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.22.9 EEP (8680 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

7

FunctionsWrite_b_eep ([see page 1061](#))Read_b_eep ([see page 1061](#))Busy_eep ([see page 1062](#))EEP Examples ([see page 1062](#))

7.22.10 SW_RTCC (8680 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.22.11 IO Ports (8680 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

OpenPORTB ([see page 1089](#))
OpenRB0INT ([see page 1089](#))
OpenRB1INT ([see page 1090](#))
OpenRB2INT ([see page 1091](#))
OpenRB3INT ([see page 1092](#))

Macros
EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.22.12 Timers (8680 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.22.13 USART (8680 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenUSART ( see page 1152)WriteUSART ( see page 1155)baudUSART ( see page 1158)getsUSART ( see page 1160)putrsUSART ( see page 1161)putsUSART ( see page 1163)ReadUSART ( see page 1164)**Macros**

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ( see page 1164)

7.22.14 MWIRE (8680 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ( see page 1167)ReadMwire ( see page 1171)WriteMwire ( see page 1170)getsMwire ( see page 1168)**Macros**

CloseMwire

getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.22.15 Flash (8680 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1198)
WriteBytesFlash (see page 1202)

Macros
LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.23 18F8722 Family

PIC18F66J90 / PIC18F67J90 / PIC18F86J90 / PIC18F87J90

7.23.1 ADC (8722 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.

- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.23.2 Analog Comparator (8722 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.23.3 Input Capture (8722 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenCapture2 (see page 955)

OpenCapture3 (see page 957)

OpenCapture4 (see page 959)

OpenCapture5 (see page 963)

ReadCapture1 (see page 983)

ReadCapture2 (see page 984)

ReadCapture3 (see page 984)

ReadCapture4 (see page 984)

ReadCapture5 (see page 984)

CloseCapture1 (see page 987)

CloseCapture2 (see page 987)

CloseCapture3 (see page 988)

CloseCapture4 (see page 988)

CloseCapture5 (see page 988)

Input Capture Examples (see page 991)

7.23.4 Output Compare (8722 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

OpenCompare2 (see page 993)

OpenCompare3 (see page 995)

OpenCompare4 (see page 997)

OpenCompare5 (see page 1000)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

CloseCompare3 (see page 1022)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.23.5 PWM (8722 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
OpenPWM3 (see page 1027)
OpenPWM4 (see page 1028)
OpenPWM5 (see page 1030)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetDCPWM3 (see page 1048)
SetDCPWM4 (see page 1049)
SetDCPWM5 (see page 1050)
SetOutputPWM1 (see page 1043)
SetOutputPWM2 (see page 1043)
SetOutputPWM3 (see page 1044)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)
ClosePWM3 (see page 1056)
ClosePWM4 (see page 1057)
ClosePWM5 (see page 1057)

7.23.6 I2C (8722 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenI2C1 (see page 1064)

Writel2C1 (see page 1066)

Readl2C1 (see page 1067)

putsl2C1 (see page 1069)

getsl2C1 (see page 1070)

Openl2C2 (see page 1065)

Writel2C2 (see page 1067)

Readl2C2 (see page 1068)

putsl2C2 (see page 1069)

getsl2C2 (see page 1071)

Macros

EnableIntl2C1

DisableIntl2C1

SetPriorityIntl2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

Closel2C1

putcl2C1

getcl2C1

EnableIntl2C2

DisableIntl2C2

SetPriorityIntl2C2

I2C2_Clear_Intr_Status_Bit

I2C2_Intr_Status

StopI2C2

StartI2C2

RestartI2C2

NotAckI2C2

AckI2C2

DataRdyI2C2

IdleI2C2

Closel2C2

putcl2C2

getI2C2

I2C Examples ([see page 1072](#))

7.23.7 I2C EEPROM (8722 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7

7.23.8 SPI (8722 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 (↗ see page 1109)

WriteSPI1 (↗ see page 1112)

ReadSPI1 (↗ see page 1113)

putsSPI1 (↗ see page 1114)

getsSPI1 (↗ see page 1115)

OpenSPI2 (↗ see page 1110)

WriteSPI2 (↗ see page 1112)

ReadSPI2 (↗ see page 1113)

putsSPI2 (↗ see page 1114)

getsSPI2 (↗ see page 1116)

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2

putcSPI2

SPI Examples (↗ see page 1116)

7.23.9 EEP (8722 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep ( see page 1061)

Read_b_eep ( see page 1061)

Busy_eep ( see page 1062)

EEP Examples ( see page 1062)

7.23.10 IO Ports (8722 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ( see page 1089)

OpenRB0INT ( see page 1089)

OpenRB1INT ( see page 1090)

OpenRB2INT ( see page 1091)

OpenRB3INT ( see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples ( see page 1093)

7.23.11 SW_RTCC (8722 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) (see page 1106)

[update_RTCC](#) (see page 1106)

[Close_RTCC](#) (see page 1106)

[SW_RTCC Examples](#) (see page 1107)

7.23.12 Timers (8722 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1124)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[OpenTimer4](#) (see page 1130)

[CloseTimer4](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)

[ReadTimer2](#)

[WriteTimer4](#)

ReadTimer4

Timers Examples ([see page 1146](#))

7.23.13 USART (8722 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART ([see page 1148](#))

Write1USART ([see page 1154](#))

baud1USART ([see page 1155](#))

gets1USART ([see page 1159](#))

putrs1USART ([see page 1160](#))

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Open2USART ([see page 1150](#))

Write2USART ([see page 1155](#))

baud2USART ([see page 1157](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.23.14 MWIRE (8722 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenMwire1](#) ([see page 1166](#))

[ReadMwire1](#) ([see page 1170](#))

[WriteMwire1](#) ([see page 1169](#))

[getsMwire1](#) ([see page 1167](#))

[OpenMwire2](#) ([see page 1166](#))

[ReadMwire2](#) ([see page 1171](#))

[WriteMwire2](#) ([see page 1169](#))

[getsMwire2](#) ([see page 1168](#))

Macros

[CloseMwire1](#)

[getcMwire1](#)

[putcMwire1](#)

[DataRdyMwire1](#)

[CloseMwire2](#)

[getcMwire2](#)

[putcMwire2](#)

[DataRdyMwire2](#)

MWIRE Examples ([see page 1172](#))

7.23.15 Flash (8722 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (█ see page 1198)
 EraseFlash (█ see page 1196)
 WriteBlockFlash (█ see page 1200)
 WriteBytesFlash (█ see page 1202)

Macros

LoadFlashAddr
 TableRead

Flash Examples (█ see page 1204)

7.24 18F8490 Family

PIC18F6390 / PIC18F6490

PIC18F8390 / PIC18F8490

7.24.1 ADC (8490 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (█ see page 848)
 SetChanADC (█ see page 882)
 SelChanConvADC (█ see page 889)
 ConvertADC (█ see page 896)
 BusyADC (█ see page 897)
 ReadADC (█ see page 897)
 CloseADC (█ see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.24.2 Analog Comparator (8490 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))
Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.24.3 Input Capture (8490 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
ReadCapture1 ([see page 983](#))
CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.24.4 Output Compare (8490 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ( see page 992)

CloseCompare1 ( see page 1021)

Output Compare Examples ( see page 1025)

7.24.5 PWM (8490 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 ( see page 1026)

OpenPWM2 ( see page 1027)

SetDCPWM1 ( see page 1047)

SetDCPWM2 ( see page 1048)

SetOutputPWM1 ( see page 1043)

ClosePWM1 ( see page 1056)

ClosePWM2 ( see page 1056)

PWM Examples ( see page 1060)

7.24.6 I2C (8490 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ( see page 1063)

WritelI2C ( see page 1066)

ReadlI2C ( see page 1067)

putsI2C ( see page 1068)

getslI2C ( see page 1070)

[IdleI2C](#) (see page 1072)

[CloseI2C](#) (see page 1071)

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putclI2C

getclI2C

putclI2C

I2C Examples (see page 1072)

7.24.7 I2C EEPROM (8490 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C](#) (see page 1063)

[EEAckPolling](#) (see page 1075)

[EEByteWrite](#) (see page 1079)

[EECurrentAddRead](#) (see page 1077)

[EEPageWrite](#) (see page 1081)

[EERandomRead](#) (see page 1086)

[EESequentialRead](#) (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.24.8 SPI (8490 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros
EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.24.9 SW_RTCC (8490 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)

update_RTCC (see page 1106)

Close_RTCC (see page 1106)
--

SW_RTCC Examples ([see page 1107](#))

7.24.10 IO Ports (8490 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)
--

OpenRB1INT (see page 1090)
--

OpenRB2INT (see page 1091)
--

OpenRB3INT (see page 1092)
--

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.24.11 Timers (8490 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)
[ReadTimer0](#) (see page 1137)
[WriteTimer0](#) (see page 1139)
[CloseTimer0](#) (see page 1143)
[OpenTimer1](#) (see page 1120)
[ReadTimer1](#) (see page 1138)
[WriteTimer1](#) (see page 1140)
[CloseTimer1](#) (see page 1143)
[OpenTimer2](#) (see page 1123)
[CloseTimer2](#) (see page 1144)
[OpenTimer3](#) (see page 1124)
[ReadTimer3](#) (see page 1138)
[WriteTimer3](#) (see page 1140)
[CloseTimer3](#) (see page 1144)
[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)
[ReadTimer2](#)
[T3_OSC1EN_ON](#)
[T3_OSC1EN_OFF](#)

Timers Examples (see page 1146)

7.24.12 USART (8490 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[Open1USART](#) (see page 1148)
[Write1USART](#) (see page 1154)
[baud1USART](#) (see page 1155)
[gets1USART](#) (see page 1159)
[putrs1USART](#) (see page 1160)

puts1USART ([see page 1162](#))

Read1USART ([see page 1163](#))

Open2USART ([see page 1150](#))

Write2USART ([see page 1155](#))

gets2USART ([see page 1159](#))

putrs2USART ([see page 1161](#))

puts2USART ([see page 1162](#))

Read2USART ([see page 1163](#))

Macros

DataRdy1USART

Close1USART

Busy1USART

putc1USART

getc1USART

DataRdy2USART

Close2USART

Busy2USART

putc2USART

getc2USART

USART Examples ([see page 1164](#))

7.24.13 MWIRE (8490 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

7

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ( see page 1172)

7.24.14 Flash (8490 Family)

This peripheral module supports functionalities:

- Reading data from flash
- Loading table pointers and performing table-read operation

FunctionsReadFlash ( see page 1198)**Macros**

LoadFlashAddr

TableRead

Flash Examples ( see page 1204)

7.25 18F8410 Family

PIC18F6310 / PIC18F6410**PIC18F8310 / PIC18F8410**

7.25.1 ADC (8410 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))
SetChanADC ([see page 882](#))
SelChanConvADC ([see page 889](#))
ConvertADC ([see page 896](#))
BusyADC ([see page 897](#))
ReadADC ([see page 897](#))
CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.25.2 Analog Comparator (8410 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))
Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.25.3 Input Capture (8410 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions[OpenCapture1](#) (see page 954)[OpenCapture2](#) (see page 955)[OpenCapture3](#) (see page 957)[ReadCapture1](#) (see page 983)[ReadCapture2](#) (see page 984)[ReadCapture3](#) (see page 984)[CloseCapture1](#) (see page 987)[CloseCapture2](#) (see page 987)[CloseCapture3](#) (see page 988)[Input Capture Examples](#) (see page 991)

7.25.4 Output Compare (8410 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions[OpenCompare1](#) (see page 992)[OpenCompare2](#) (see page 993)[OpenCompare3](#) (see page 995)[CloseCompare1](#) (see page 1021)[CloseCompare2](#) (see page 1022)[CloseCompare3](#) (see page 1022)[Output Compare Examples](#) (see page 1025)

7.25.5 PWM (8410 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions[OpenPWM1](#) (see page 1026)[OpenPWM2](#) (see page 1027)

OpenPWM3 (see page 1027)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetDCPWM3 (see page 1048)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)
ClosePWM3 (see page 1056)

PWM Examples (see page 1060)

7.25.6 I2C (8410 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)
WriteI2C (see page 1066)
ReadI2C (see page 1067)
putsI2C (see page 1068)
getsI2C (see page 1070)
IdleI2C (see page 1072)
CloseI2C (see page 1071)

Macros

EnableIntI2C
DisableIntI2C
SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C

DataRdyI2C
putI2C
getI2C
putI2C

I2C Examples ([see page 1072](#))

7.25.7 I2C EEPROM (8410 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.25.8 SPI (8410 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)

putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.25.9 IO Ports (8410 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.25.10 SW_RTCC (8410 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))

update_RTCC ([see page 1106](#))

Close_RTCC ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.25.11 Timers (8410 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

`SetTmrCCPSrc` ([see page 1141](#))

Macros

`WriteTimer2`
`ReadTimer2`
`T3_OSC1EN_ON`
`T3_OSC1EN_OFF`

`Timers Examples` ([see page 1146](#))

7.25.12 USART (8410 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`Open1USART` ([see page 1148](#))
`Write1USART` ([see page 1154](#))
`baud1USART` ([see page 1155](#))
`gets1USART` ([see page 1159](#))
`putrs1USART` ([see page 1160](#))
`puts1USART` ([see page 1162](#))
`Read1USART` ([see page 1163](#))
`Open2USART` ([see page 1150](#))
`Write2USART` ([see page 1155](#))
`gets2USART` ([see page 1159](#))
`putrs2USART` ([see page 1161](#))
`puts2USART` ([see page 1162](#))
`Read2USART` ([see page 1163](#))

Macros

`DataRdy1USART`
`Close1USART`
`Busy1USART`
`putc1USART`

getc1USART
DataRdy2USART
Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.25.13 MWIRE (8410 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros
CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7

7.25.14 Flash (8410 Family)

This peripheral module supports functionalities:

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.26 18F4321 Family

PIC18F2221 / PIC18F2321**PIC18F4221 / PIC18F4321**

7.26.1 PIC18F4x21 Set

PIC18F4221 / PIC18F4321

7.26.1.1 ADC (4x21 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.26.1.2 Analog Comparator (4x21 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))
Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.26.1.3 Input Capture (4x21 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
ReadCapture1 ([see page 983](#))
CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.26.1.4 Output Compare (4x21 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.26.1.5 PWM (4x21 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.26.1.6 I2C (4x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)

WriteI2C (see page 1066)

ReadI2C (see page 1067)

putslI2C (see page 1068)

getslI2C (see page 1070)

IdleI2C (see page 1072)

CloseI2C (see page 1071)

Macros

EnableI2C
 DisableI2C
 SetPriorityI2C
 I2C_Clear_Intr_Status_Bit
 I2C_Intr_Status
 StopI2C
 StartI2C
 RestartI2C
 NotAckI2C
 AckI2C
 DataRdyI2C
 putcl2C
 getcl2C
 putcl2C

I2C Examples ([see page 1072](#))

7.26.1.7 I2C EEPROM (4x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))
 EEAckPolling ([see page 1075](#))
 EEByteWrite ([see page 1079](#))
 EECurrentAddRead ([see page 1077](#))
 EEPageWrite ([see page 1081](#))
 EERandomRead ([see page 1086](#))
 EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.26.1.8 SPI (4x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`OpenSPI` (see page 1108)

`WriteSPI` (see page 1111)

`ReadSPI` (see page 1113)

`putsSPI` (see page 1114)

`getsSPI` (see page 1115)

Macros

`EnableIntSPI`

`DisableIntSPI`

`SetPriorityIntSPI`

`SPI_Clear_Intr_Status_Bit`

`SPI_Intr_Status`

`SPI_Clear_Recv_OV`

`CloseSPI`

`DataRdySPI`

`getcSPI`

`putcSPI`

SPI Examples (see page 1116)

7.26.1.9 IO Ports (4x21 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.26.1.10 SW_RTCC (4x21 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))
update_RTCC ([see page 1106](#))
Close_RTCC ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.26.1.11 EEP (4x21 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep ([see page 1061](#))
Read_b_eep ([see page 1061](#))
Busy_eep ([see page 1062](#))

7.26.1.12 Timers (4x21 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)

ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1120)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)

CloseTimer3 (see page 1144)

SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.26.1.13 USART (4x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART (see page 1152)

WriteUSART (see page 1155)

baudUSART (see page 1158)

getsUSART (see page 1160)

putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.26.1.14 MWIRE (4x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.26.1.15 Flash (4x21 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))

- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ( see page 1198)
EraseFlash ( see page 1196)
WriteBlockFlash ( see page 1198)
WriteBytesFlash ( see page 1202)

Macros

LoadFlashAddr
TableRead

Flash Examples ( see page 1204)

7.26.2 PIC18F2x21 Set

PIC18F2221 / PIC18F2321

7.26.2.1 ADC (2x21 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ( see page 848)
SetChanADC ( see page 882)
SelChanConvADC ( see page 889)
ConvertADC ( see page 896)
BusyADC ( see page 897)
ReadADC ( see page 897)
CloseADC ( see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.26.2.2 Analog Comparator (2x21 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))
Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.26.2.3 Input Capture (2x21 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
ReadCapture1 ([see page 983](#))
CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.26.2.4 Output Compare (2x21 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.26.2.5 PWM (2x21 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.26.2.6 I2C (2x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)

WriteI2C (see page 1066)

ReadI2C (see page 1067)

putslI2C (see page 1068)

getslI2C (see page 1070)

IdleI2C (see page 1072)

CloseI2C (see page 1071)

Macros

EnableI2C
 DisableI2C
 SetPriorityI2C
 I2C_Clear_Intr_Status_Bit
 I2C_Intr_Status
 StopI2C
 StartI2C
 RestartI2C
 NotAckI2C
 AckI2C
 DataRdyI2C
 putcl2C
 getcl2C
 putcl2C

I2C Examples ([see page 1072](#))

7.26.2.7 I2C EEPROM (2x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))
 EEAckPolling ([see page 1075](#))
 EEByteWrite ([see page 1079](#))
 EECurrentAddRead ([see page 1077](#))
 EEPageWrite ([see page 1081](#))
 EERandomRead ([see page 1086](#))
 EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.26.2.8 SPI (2x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`OpenSPI` (see page 1108)

`WriteSPI` (see page 1111)

`ReadSPI` (see page 1113)

`putsSPI` (see page 1114)

`getsSPI` (see page 1115)

Macros

`EnableIntSPI`

`DisableIntSPI`

`SetPriorityIntSPI`

`SPI_Clear_Intr_Status_Bit`

`SPI_Intr_Status`

`SPI_Clear_Recv_OV`

`CloseSPI`

`DataRdySPI`

`getcSPI`

`putcSPI`

SPI Examples (see page 1116)

7.26.2.9 IO Ports (2x21 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.26.2.10 EEP (2x21 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep ([see page 1061](#))
Read_b_eep ([see page 1061](#))
Busy_eep ([see page 1062](#))

EEP Examples ([see page 1062](#))

7.26.2.11 SW_RTCC (2x21 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))
update_RTCC ([see page 1106](#))
Close_RTCC ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.26.2.12 Timers (2x21 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.

- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1124)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)

[ReadTimer2](#)

[T3_OSC1EN_ON](#)

[T3_OSC1EN_OFF](#)

Timers Examples (see page 1146)

7.26.2.13 USART (2x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenUSART](#) (see page 1152)

[WriteUSART](#) (see page 1155)

[baudUSART](#) (see page 1158)

getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.26.2.14 MWIRE (2x21 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.26.2.15 Flash (2x21 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1198)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.27 18F4x80/5 Family

PIC18F2682 / PIC18F2685

PIC18F4682 / PIC18F4685

PIC18F2585 / PIC18F2680

PIC18F4585 / PIC18F4680

PIC18F2480 / PIC18F2580

PIC18F4480 / PIC18F4580

7.27.1 PIC18F4x80/5 Set

PIC18F4682 / PIC18F4685

PIC18F4585 / PIC18F4680

PIC18F4480 / PIC18F4580

7.27.1.1 ADC (4x8x Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.27.1.2 Analog Comparator (4x8x Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.27.1.3 Input Capture (4x8x Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

OpenECapture1 (see page 966)

ReadCapture1 (see page 983)

ReadECapture1 (see page 986)

CloseCapture1 (see page 987)

CloseECapture1 (see page 990)

Input Capture Examples (see page 991)

7.27.1.4 Output Compare (4x8x Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

OpenECompare1 (see page 1003)

CloseCompare1 (see page 1021)

CloseECompare1 (see page 1024)

Output Compare Examples (see page 1025)

7.27.1.5 PWM (4x8x Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

`OpenPWM1` ([see page 1026](#))

`OpenEPWM1` ([see page 1036](#))

`SetDCPWM1` ([see page 1047](#))

`SetDCEPWM1` ([see page 1054](#))

`SetOutputPWM1` ([see page 1043](#))

`SetOutputEPWM1` ([see page 1045](#))

`ClosePWM1` ([see page 1056](#))

`CloseEPWM1` ([see page 1059](#))

PWM Examples ([see page 1060](#))

7.27.1.6 I2C (4x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`OpenI2C` ([see page 1063](#))

`WriteI2C` ([see page 1066](#))

`ReadI2C` ([see page 1067](#))

`putslI2C` ([see page 1068](#))

`getslI2C` ([see page 1070](#))

`IdleI2C` ([see page 1072](#))

`Closel2C` ([see page 1071](#))

Macros

`EnableIntI2C`

`DisableIntI2C`

`SetPriorityIntI2C`

`I2C_Clear_Intr_Status_Bit``I2C_Intr_Status``StopI2C``StartI2C``RestartI2C``NotAckI2C``AckI2C``DataRdyI2C``putclI2C``getclI2C``putclI2C`

I2C Examples ([see page 1072](#))

7.27.1.7 I2C EEPROM (4x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

`OpenI2C` ([see page 1063](#))`EEAckPolling` ([see page 1075](#))`EEByteWrite` ([see page 1079](#))`EECurrentAddRead` ([see page 1077](#))`EEPageWrite` ([see page 1081](#))`EERandomRead` ([see page 1086](#))`EESequentialRead` ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.27.1.8 SPI (4x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenSPI ([see page 1108](#))WriteSPI ([see page 1111](#))ReadSPI ([see page 1113](#))putsSPI ([see page 1114](#))getsSPI ([see page 1115](#))**Macros**

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.27.1.9 EEP (4x8x Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

FunctionsWrite_b_eep ([see page 1061](#))Read_b_eep ([see page 1061](#))Busy_eep ([see page 1062](#))EEP Examples ([see page 1062](#))

7.27.1.10 SW_RTCC (4x8x Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions[Open_RTCC](#) (see page 1106)[update_RTCC](#) (see page 1106)[Close_RTCC](#) (see page 1106)SW_RTCC Examples ([see page 1107](#))

7.27.1.11 IO Ports (4x8x Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions[OpenPORTB](#) (see page 1089)[OpenRB0INT](#) (see page 1089)[OpenRB1INT](#) (see page 1090)[OpenRB2INT](#) (see page 1091)**Macros**[EnablePullups](#)[DisablePullups](#)[ClosePORTB](#)[CloseRB0INT](#)[CloseRB1INT](#)[CloseRB2INT](#)IO Ports Examples ([see page 1093](#))

7.27.1.12 Timers (4x8x Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions[OpenTimer0](#) (see page 1119)

ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.27.1.13 USART (4x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

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Functions

OpenUSART (see page 1152)
WriteUSART (see page 1155)
baudUSART (see page 1158)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.27.1.14 MWIRE (4x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.27.1.15 Flash (4x80/5 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (█ see page 1198)
 EraseFlash (█ see page 1196)
 WriteBlockFlash (█ see page 1200)
 WriteBytesFlash (█ see page 1202)

Macros

LoadFlashAddr
 TableRead

Flash Examples (█ see page 1204)

7.27.2 PIC18F2x80/5 Set

PIC18F2682 / PIC18F2685

PIC18F2585 / PIC18F2680

PIC18F2480 / PIC18F2580

7.27.2.1 ADC (2x8x Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (█ see page 848)
 SetChanADC (█ see page 882)
 SelChanConvADC (█ see page 889)
 ConvertADC (█ see page 896)
 BusyADC (█ see page 897)
 ReadADC (█ see page 897)
 CloseADC (█ see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ( see page 898)

7.27.2.2 Input Capture (2x8x Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)
ReadCapture1 ( see page 983)
CloseCapture1 ( see page 987)

Input Capture Examples ( see page 991)

7.27.2.3 Output Compare (2x8x Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 ( see page 992)
CloseCompare1 ( see page 1021)

Output Compare Examples ( see page 1025)

7.27.2.4 PWM (2x8x Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)
[SetDCPWM1](#) (see page 1047)
[SetOutputPWM1](#) (see page 1043)
[ClosePWM1](#) (see page 1056)

PWM Examples ([see page 1060](#))

7.27.2.5 I2C (2x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C](#) (see page 1063)
[WriteI2C](#) (see page 1066)
[ReadI2C](#) (see page 1067)
[putslI2C](#) (see page 1068)
[getslI2C](#) (see page 1070)
[IdleI2C](#) (see page 1072)
[CloseI2C](#) (see page 1071)

Macros

[EnableIntI2C](#)
[DisableIntI2C](#)
[SetPriorityIntI2C](#)
[I2C_Clear_Intr_Status_Bit](#)
[I2C_Intr_Status](#)
[StopI2C](#)
[StartI2C](#)
[RestartI2C](#)
[NotAckI2C](#)
[AckI2C](#)
[DataRdyI2C](#)
[putclI2C](#)
[getclI2C](#)
[putclI2C](#)

I2C Examples ([see page 1072](#))

7.27.2.6 I2C EEPROM (2x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))

EEAckPolling ([see page 1075](#))

EEByteWrite ([see page 1079](#))

EECurrentAddRead ([see page 1077](#))

EEPageWrite ([see page 1081](#))

EERandomRead ([see page 1086](#))

EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.27.2.7 SPI (2x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI ([see page 1108](#))

WriteSPI ([see page 1111](#))

ReadSPI ([see page 1113](#))

putsSPI ([see page 1114](#))

getsSPI ([see page 1115](#))

Macros

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.27.2.8 EEP (2x8x Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)
Read_b_eep (see page 1061)
Busy_eep (see page 1062)

EEP Examples ([see page 1062](#))

7.27.2.9 IO Ports (2x8x Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)

Macros

EnablePullups

DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.27.2.10 SW_RTCC (2x8x Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.27.2.11 Timers (2x8x Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.27.2.12 USART (2x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART (see page 1152)
WriteUSART (see page 1155)
baudUSART (see page 1158)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples (see page 1164)

7.27.2.13 MWIRE (2x8x Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.27.2.14 Flash (2x80/5 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1200](#))

WriteBytesFlash ([see page 1202](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ( see page 1204)

7.28 18F4610 Family

PIC18F2410 / PIC18F2510 / PIC18F2515 / PIC18F2610**PIC18F4410 / PIC18F4510 / PIC18F4515 / PIC18F4610**

7.28.1 PIC18F4610 Set

PIC18F4410 / PIC18F4510 / PIC18F4515 / PIC18F4610

7.28.1.1 ADC (4610 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ( see page 848)SetChanADC ( see page 882)SelChanConvADC ( see page 889)ConvertADC ( see page 896)BusyADC ( see page 897)ReadADC ( see page 897)CloseADC ( see page 897)**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ( see page 898)

7.28.1.2 Analog Comparator (4610 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)

Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.28.1.3 Input Capture (4610 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

ReadCapture1 (see page 983)

CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.28.1.4 Output Compare (4610 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.28.1.5 PWM (4610 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)

[SetDCPWM1](#) (see page 1047)

[SetOutputPWM1](#) (see page 1043)

[ClosePWM1](#) (see page 1056)

[OpenPWM2](#) (see page 1027)

[SetDCPWM2](#) (see page 1048)

[ClosePWM2](#) (see page 1056)

[PWM Examples](#) (see page 1060)

7.28.1.6 I2C (4610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C](#) (see page 1063)

[WriteI2C](#) (see page 1066)

[ReadI2C](#) (see page 1067)

[putslI2C](#) (see page 1068)

[getslI2C](#) (see page 1070)

[IdleI2C](#) (see page 1072)

[CloseI2C](#) (see page 1071)

Macros

`EnableIntI2C`

`DisableIntI2C`

`SetPriorityIntI2C`

`I2C_Clear_Intr_Status_Bit`

I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putcl2C
getcl2C
putcl2C

I2C Examples ([see page 1072](#))

7.28.1.7 I2C EEPROM (4610 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.28.1.8 SPI (4610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI (see page 1108)

WriteSPI (see page 1111)

ReadSPI (see page 1113)

putsSPI (see page 1114)

getsSPI (see page 1115)

Macros

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples (see page 1116)

7.28.1.9 IO Ports (4610 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.28.1.10 SW_RTCC (4610 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.28.1.11 Timers (4610 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)

[CloseTimer3](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

[Timers Examples](#) (see page 1146)

7.28.1.12 USART (4610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenUSART](#) (see page 1152)

[WriteUSART](#) (see page 1155)

[baudUSART](#) (see page 1158)

[getsUSART](#) (see page 1160)

[putrsUSART](#) (see page 1161)

[putsUSART](#) (see page 1163)

[ReadUSART](#) (see page 1164)

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

[USART Examples](#) (see page 1164)

7.28.1.13 MWIRE (4610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)

ReadMwire (see page 1171)

WriteMwire (see page 1170)

getsMwire (see page 1168)

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples (see page 1172)

7.28.1.14 Flash (4610Family)

This peripheral module supports functionalities:

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.28.2 PIC18F2610 Set

PIC18F2410 / PIC18F2510 / PIC18F2515 / PIC18F2610

7.28.2.1 ADC (2610 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 848)

[SetChanADC](#) (see page 882)

[SelChanConvADC](#) (see page 889)

[ConvertADC](#) (see page 896)

[BusyADC](#) (see page 897)

[ReadADC](#) (see page 897)

[CloseADC](#) (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples (see page 898)

7.28.2.2 Analog Comparator (2610 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

[Open_ancomp](#) (see page 899)

[Close_ancomp](#) (see page 923)

Comparator Examples (see page 924)

7.28.2.3 Input Capture (2610 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules

- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

ReadCapture1 (see page 983)

CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.28.2.4 Output Compare (2610 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.28.2.5 PWM (2610 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.28.2.6 I2C (2610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ([see page 1063](#))

WritelI2C ([see page 1066](#))

ReadlI2C ([see page 1067](#))

putslI2C ([see page 1068](#))

getslI2C ([see page 1070](#))

IdleI2C ([see page 1072](#))

CloseI2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putclI2C

getclI2C

putclI2C

I2C Examples ([see page 1072](#))

7.28.2.7 I2C EEPROM (2610 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

[OpenI2C](#) (see page 1063)
[EEAckPolling](#) (see page 1075)
[EEByteWrite](#) (see page 1079)
[EECurrentAddRead](#) (see page 1077)
[EEPagineWrite](#) (see page 1081)
[EERandomRead](#) (see page 1086)
[EESequentialRead](#) (see page 1083)

I2C EEPROM Examples (see page 1088)

7.28.2.8 SPI (2610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenSPI](#) (see page 1108)
[WriteSPI](#) (see page 1111)
[ReadSPI](#) (see page 1113)
[putsSPI](#) (see page 1114)
[getsSPI](#) (see page 1115)

Macros

[EnableIntSPI](#)
[DisableIntSPI](#)
[SetPriorityIntSPI](#)
[SPI_Clear_Intr_Status_Bit](#)
[SPI_Intr_Status](#)
[SPI_Clear_Recv_OV](#)
[CloseSPI](#)
[DataRdySPI](#)
[getcSPI](#)

putcSPI

SPI Examples ([see page 1116](#))

7.28.2.9 IO Ports (2610 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ([see page 1089](#))

OpenRB0INT ([see page 1089](#))

OpenRB1INT ([see page 1090](#))

OpenRB2INT ([see page 1091](#))

OpenRB3INT ([see page 1092](#))

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.28.2.10 SW_RTCC (2610 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC ([see page 1106](#))

update_RTCC ([see page 1106](#))

Close_RTCC ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.28.2.11 Timers (2610 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

`OpenTimer0` ([see page 1119](#))

`ReadTimer0` ([see page 1137](#))

`WriteTimer0` ([see page 1139](#))

`CloseTimer0` ([see page 1143](#))

`OpenTimer1` ([see page 1120](#))

`ReadTimer1` ([see page 1138](#))

`WriteTimer1` ([see page 1140](#))

`CloseTimer1` ([see page 1143](#))

`OpenTimer2` ([see page 1123](#))

`CloseTimer2` ([see page 1144](#))

`OpenTimer3` ([see page 1124](#))

`ReadTimer3` ([see page 1138](#))

`WriteTimer3` ([see page 1140](#))

`CloseTimer3` ([see page 1144](#))

`SetTmrCCPSrc` ([see page 1141](#))

Macros

`WriteTimer2`

`ReadTimer2`

`T3_OSC1EN_ON`

`T3_OSC1EN_OFF`

Timers Examples ([see page 1146](#))

7.28.2.12 USART (2610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.

- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))

WriteUSART ([see page 1155](#))

baudUSART ([see page 1158](#))

getsUSART ([see page 1160](#))

putrsUSART ([see page 1161](#))

putsUSART ([see page 1163](#))

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.28.2.13 MWIRE (2610 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ( see page 1172)

7.28.2.14 Flash (2610 Family)

This peripheral module supports functionalities:

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash ( see page 1198)

Macros
LoadFlashAddr
TableRead

Flash Examples ( see page 1204)

7.29 18F4620 Family

PIC18F2525 / PIC18F2620

PIC18F4525 / PIC18F4620

7.29.1 PIC18F4620 Set

PIC18F4525 / PIC18F4620

7.29.1.1 ADC (4620 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions
OpenADC ( see page 848)

SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples (see page 898)

7.29.1.2 Analog Comparator (4620 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp (see page 899)
Close_ancomp (see page 923)

Comparator Examples (see page 924)

7.29.1.3 Input Capture (4620 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)
ReadCapture1 (see page 983)
CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.29.1.4 Output Compare (4620 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.29.1.5 PWM (4620 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

OpenPWM2 (see page 1027)

SetDCPWM2 (see page 1048)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.29.1.6 I2C (4620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)

WriteI2C (see page 1066)

ReadI2C (see page 1067)
putsl2C (see page 1068)
getsl2C (see page 1070)
IdleI2C (see page 1072)
Closel2C (see page 1071)

Macros

EnableIntI2C
DisableIntI2C
SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putcl2C
getcl2C
putcl2C

I2C Examples ([see page 1072](#))

7.29.1.7 I2C EEPROM (4620 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

7

Functions

OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)

[EESequentialRead](#) (see page 1083)

[I2C EEPROM Examples](#) (see page 1088)

7.29.1.8 SPI (4620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenSPI](#) (see page 1108)

[WriteSPI](#) (see page 1111)

[ReadSPI](#) (see page 1113)

[putsSPI](#) (see page 1114)

[getsSPI](#) (see page 1115)

Macros

[EnableIntSPI](#)

[DisableIntSPI](#)

[SetPriorityIntSPI](#)

[SPI_Clear_Intr_Status_Bit](#)

[SPI_Intr_Status](#)

[SPI_Clear_Recv_OV](#)

[CloseSPI](#)

[DataRdySPI](#)

[getcSPI](#)

[putcSPI](#)

[SPI Examples](#) (see page 1116)

7.29.1.9 EEP (4620 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.29.1.10 IO Ports (4620 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.29.1.11 SW_RTCC (4620 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)

update_RTCC (see page 1106)

[Close_RTCC](#) (see page 1106)

[SW_RTCC Examples](#) (see page 1107)

7.29.1.12 Timers (4620 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1124)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)

[ReadTimer2](#)

[T3_OSC1EN_ON](#)

[T3_OSC1EN_OFF](#)

[Timers Examples](#) (see page 1146)

7.29.1.13 USART (4620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenUSART ([see page 1152](#))WriteUSART ([see page 1155](#))baudUSART ([see page 1158](#))getsUSART ([see page 1160](#))putrsUSART ([see page 1161](#))putsUSART ([see page 1163](#))ReadUSART ([see page 1164](#))**Macros**

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.29.1.14 MWIRE (4620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.29.1.15 Flash (4620Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)
--

WriteBlockFlash (see page 1200)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.29.2 PIC18F2620 Set

PIC18F2525 / PIC18F2620

7.29.2.1 ADC (2620 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))
 SetChanADC ([see page 882](#))
 SelChanConvADC ([see page 889](#))
 ConvertADC ([see page 896](#))
 BusyADC ([see page 897](#))
 ReadADC ([see page 897](#))
 CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE
 ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.29.2.2 Analog Comparator (2620 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))
 Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.29.2.3 Input Capture (2620 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
 ReadCapture1 ([see page 983](#))
 CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.29.2.4 Output Compare (2620 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

CloseCompare1 ([see page 1021](#))

Output Compare Examples ([see page 1025](#))

7.29.2.5 I2C (2620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ([see page 1063](#))

WriteI2C ([see page 1066](#))

ReadI2C ([see page 1067](#))

putslI2C ([see page 1068](#))

getslI2C ([see page 1070](#))

IdleI2C ([see page 1072](#))

CloseI2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C
AckI2C
DataRdyI2C
putclI2C
getclI2C
putclI2C

I2C Examples ([see page 1072](#))

7.29.2.6 I2C EEPROM (2620 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.29.2.7 SPI (2620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)

putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.29.2.8 PWM (2620 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)
OpenPWM2 (see page 1027)
SetDCPWM1 (see page 1047)
SetDCPWM2 (see page 1048)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
ClosePWM2 (see page 1056)

PWM Examples ([see page 1060](#))

7.29.2.9 EEP (2620 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.29.2.10 IO Ports (2620 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.29.2.11 SW_RTCC (2620 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)

update_RTCC (see page 1106)

Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.29.2.12 Timers (2620 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)

ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1120)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)

CloseTimer3 (see page 1144)

SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.29.2.13 USART (2620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))

WriteUSART ([see page 1155](#))

baudUSART ([see page 1158](#))

getsUSART ([see page 1160](#))

putrsUSART ([see page 1161](#))

putsUSART ([see page 1163](#))

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.29.2.14 MWIRE (2620 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ( see page 1172)

7.29.2.15 Flash (2620 Family)

This peripheral module supports functionalities:

- Erasing Flash ( see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ( see page 1198)
EraseFlash ( see page 1196)
WriteBlockFlash ( see page 1200)
WriteBytesFlash ( see page 1202)

Macros

LoadFlashAddr
TableRead

Flash Examples ( see page 1204)

7.30 18F4550/23/20 Family

PIC18F2455 / PIC18F2550

PIC18F4455 / PIC18F4550

PIC18F2423 / PIC18F2523**PIC18F4423 / PIC18F4523****PIC18F2420 / PIC18F2520****PIC18F4420 / PIC18F4520**

7.30.1 ADC (45xx Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ( see page 848)SetChanADC ( see page 882)SelChanConvADC ( see page 889)ConvertADC ( see page 896)BusyADC ( see page 897)ReadADC ( see page 897)CloseADC ( see page 897)**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ( see page 898)

7.30.2 Analog Comparator (45xx Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.

- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ( see page 899)

Close_ancomp ( see page 923)

Comparator Examples ( see page 924)

7.30.3 Input Capture (45xx Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)

ReadCapture1 ( see page 983)

CloseCapture1 ( see page 987)

Input Capture Examples ( see page 991)

7.30.4 Output Compare (45xx Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ( see page 992)

CloseCompare1 ( see page 1021)

Output Compare Examples ( see page 1025)

7.30.5 PWM (45xx Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
SetDCPWM1 (see page 1047)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
OpenPWM2 (see page 1027)
SetDCPWM2 (see page 1048)
ClosePWM2 (see page 1056)

7.30.6 I2C (45xx Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenI2C (see page 1063)
WriteI2C (see page 1066)
ReadI2C (see page 1067)
putslI2C (see page 1068)
getslI2C (see page 1070)
IdleI2C (see page 1072)
CloseI2C (see page 1071)

Macros
EnableIntI2C
DisableIntI2C

SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putclI2C
getclI2C
putclI2C

I2C Examples ([see page 1072](#))

7.30.7 I2C EEPROM (45xx Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.30.8 SPI (45xx Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenSPI](#) (see page 1108)

[WriteSPI](#) (see page 1111)

[ReadSPI](#) (see page 1113)

[putsSPI](#) (see page 1114)

[getsSPI](#) (see page 1115)

Macros

[EnableIntSPI](#)

[DisableIntSPI](#)

[SetPriorityIntSPI](#)

[SPI_Clear_Intr_Status_Bit](#)

[SPI_Intr_Status](#)

[SPI_Clear_Recv_OV](#)

[CloseSPI](#)

[DataRdySPI](#)

[getcSPI](#)

[putcSPI](#)

SPI Examples (see page 1116)

7.30.9 IO Ports (45xx Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.30.10 EEP (45xx Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

FunctionsWrite_b_eep ([see page 1061](#))Read_b_eep ([see page 1061](#))Busy_eep ([see page 1062](#))EEP Examples ([see page 1062](#))

7.30.11 SW_RTCC (45xx Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

FunctionsOpen_RTCC ([see page 1106](#))update_RTCC ([see page 1106](#))Close_RTCC ([see page 1106](#))SW_RTCC Examples ([see page 1107](#))

7.30.12 Timers (45xx Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.30.13 USART (45xx Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenUSART ([see page 1152](#))WriteUSART ([see page 1155](#))baudUSART ([see page 1158](#))getsUSART ([see page 1160](#))putrsUSART ([see page 1161](#))putsUSART ([see page 1163](#))ReadUSART ([see page 1164](#))**Macros**

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.30.14 MWIRE (45xx Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.30.15 Flash (45xx Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1199)
WriteBytesFlash (see page 1202)

Macros
LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.31 18F4450 Family

PIC18F2450

PIC18F4450

7.31.1 ADC (4450 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

FunctionsOpenADC ([see page 848](#))SetChanADC ([see page 882](#))SelChanConvADC ([see page 889](#))ConvertADC ([see page 896](#))BusyADC ([see page 897](#))ReadADC ([see page 897](#))CloseADC ([see page 897](#))**Macros**

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.31.2 Input Capture (4450 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

FunctionsOpenCapture1 ([see page 954](#))ReadCapture1 ([see page 983](#))CloseCapture1 ([see page 987](#))Input Capture Examples ([see page 991](#))

7.31.3 Output Compare (4450 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.

- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.31.4 PWM (4450 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

PWM Examples (see page 1060)

7.31.5 IO Ports (4450 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.31.6 SW_RTCC (4450 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.31.7 Timers (4450 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)

CloseTimer2 ([see page 1144](#))

Macros

WriteTimer2

ReadTimer2

7.31.8 USART (4450 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))

WriteUSART ([see page 1155](#))

baudUSART ([see page 1158](#))

getsUSART ([see page 1160](#))

putrsUSART ([see page 1161](#))

putsUSART ([see page 1163](#))

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.31.9 Flash (4450 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data

- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1199)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.32 18F4320 Family

PIC18F2450

PIC18F4450

7.32.1 ADC (4320 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.32.2 Analog Comparator (4320 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))

Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.32.3 Input Capture (4320 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

7

Functions

OpenCapture1 ([see page 954](#))

ReadCapture1 ([see page 983](#))

CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.32.4 Output Compare (4320 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions
OpenCompare1 (see page 992)
CloseCompare1 (see page 1021)

Output Compare Examples ([see page 1025](#))

7.32.5 PWM (4320 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
SetDCPWM1 (see page 1047)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
OpenPWM2 (see page 1027)
SetDCPWM2 (see page 1048)
ClosePWM2 (see page 1056)

PWM Examples ([see page 1060](#))

7.32.6 I2C (4320 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenI2C ([see page 1063](#))Writel2C ([see page 1066](#))Readl2C ([see page 1067](#))putsl2C ([see page 1068](#))getsl2C ([see page 1070](#))IdleI2C ([see page 1072](#))CloseI2C ([see page 1071](#))**Macros**

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putcl2C

getcl2C

putcl2C

I2C Examples ([see page 1072](#))

7.32.7 I2C EEPROM (4320 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

FunctionsOpenI2C ([see page 1063](#))EEAckPolling ([see page 1075](#))

EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples (see page 1088)

7.32.8 SPI (4320 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples (see page 1116)

7.32.9 IO Ports (4320 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

[EnablePullups](#)

[DisablePullups](#)

[ClosePORTB](#)

[CloseRB0INT](#)

[CloseRB1INT](#)

[CloseRB2INT](#)

[CloseRB3INT](#)

IO Ports Examples (see page 1093)

7.32.10 EEP (4320 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

[Write_b_eep](#) (see page 1061)

[Read_b_eep](#) (see page 1061)

[Busy_eep](#) (see page 1062)

EEP Examples (see page 1062)

7.32.11 SW_RTCC (4320 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.32.12 Timers (4320 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.32.13 USART (4320 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))
WriteUSART ([see page 1155](#))
getsUSART ([see page 1160](#))
putrsUSART ([see page 1161](#))
putsUSART ([see page 1163](#))
ReadUSART ([see page 1164](#))

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.32.14 MWIRE (4320 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.32.15 Flash (4320 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

FunctionsReadFlash ([see page 1198](#))EraseFlash ([see page 1196](#))WriteBlockFlash ([see page 1198](#))WriteBytesFlash ([see page 1202](#))**Macros**

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.33 18F8720 Family

PIC18F6520 / PIC18F6620 / PIC18F6720

PIC18F8520 / PIC18F8620 / PIC18F8720

7.33.1 ADC (8720 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions
OpenADC (see page 842)
SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros
ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.33.2 Analog Comparator (8720 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions[Open_ancomp](#) (see page 899)[Close_ancomp](#) (see page 923)

Comparator Examples (see page 924)

7.33.3 Input Capture (8720 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions[OpenCapture1](#) (see page 954)[OpenCapture2](#) (see page 955)[OpenCapture3](#) (see page 957)[OpenCapture4](#) (see page 959)[OpenCapture5](#) (see page 963)[ReadCapture1](#) (see page 983)[ReadCapture2](#) (see page 984)[ReadCapture3](#) (see page 984)[ReadCapture4](#) (see page 984)[ReadCapture5](#) (see page 984)[CloseCapture1](#) (see page 987)[CloseCapture2](#) (see page 987)[CloseCapture3](#) (see page 988)[CloseCapture4](#) (see page 988)[CloseCapture5](#) (see page 988)

Input Capture Examples (see page 991)

7.33.4 Output Compare (8720 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions

OpenCompare1 (see page 992)

OpenCompare2 (see page 993)

OpenCompare3 (see page 995)

OpenCompare4 (see page 997)

OpenCompare5 (see page 1000)

CloseCompare1 (see page 1021)

CloseCompare2 (see page 1022)

CloseCompare3 (see page 1022)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.33.5 PWM (8720 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenPWM2 (see page 1027)

OpenPWM3 (see page 1027)

OpenPWM4 (see page 1028)

OpenPWM5 (see page 1030)

SetDCPWM1 (see page 1047)

SetDCPWM2 (see page 1048)

SetDCPWM3 (see page 1048)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

ClosePWM2 (see page 1056)

ClosePWM3 (see page 1056)

ClosePWM4 (see page 1057)

ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.33.6 I2C (8720 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ([see page 1063](#))

WritelI2C ([see page 1066](#))

ReadlI2C ([see page 1067](#))

putslI2C ([see page 1068](#))

getslI2C ([see page 1070](#))

IdleI2C ([see page 1072](#))

CloselI2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putclI2C

getclI2C

putclI2C

I2C Examples ([see page 1072](#))

7.33.7 I2C EEPROM (8720 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))

EEAckPolling ([see page 1075](#))

EEByteWrite ([see page 1079](#))

EECurrentAddRead ([see page 1077](#))

EEPageWrite ([see page 1081](#))

EERandomRead ([see page 1086](#))

EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.33.8 SPI (8720 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI ([see page 1108](#))

WriteSPI ([see page 1111](#))

ReadSPI ([see page 1113](#))

putsSPI ([see page 1114](#))

getsSPI ([see page 1115](#))

Macros

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples (see page 1116)

7.33.9 IO Ports (8720 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros
EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples (see page 1093)

7.33.10 EEP (8720 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.33.11 SW_RTCC (8720 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)

update_RTCC (see page 1106)

Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.33.12 Timers (8720 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)

ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1120)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1124)

ReadTimer3 (see page 1138)

WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
OpenTimer4 (see page 1130)
CloseTimer4 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
WriteTimer4
ReadTimer4

Timers Examples (see page 1146)

7.33.13 USART (8720 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

Open1USART (see page 1148)
Write1USART (see page 1154)
gets1USART (see page 1159)
putrs1USART (see page 1160)
puts1USART (see page 1162)
Read1USART (see page 1163)
Open2USART (see page 1150)
Write2USART (see page 1155)
gets2USART (see page 1159)
putrs2USART (see page 1161)
puts2USART (see page 1162)
Read2USART (see page 1163)

Macros

DataRdy1USART

Close1USART
Busy1USART
putc1USART
getc1USART
DataRdy2USART
Close2USART
Busy2USART
putc2USART
getc2USART

USART Examples ([see page 1164](#))

7.33.14 MWIRE (8720 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.33.15 Flash (8720 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))

- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1198)
WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.34 18C858 Family

PIC18C658 / PIC18C858

7.34.1 ADC (858 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

7

Functions

OpenADC (see page 842)
SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.34.2 Analog Comparator (858 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))
Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.34.3 Input Capture (858 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
ReadCapture1 ([see page 983](#))
CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.34.4 Output Compare (858 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.34.5 PWM (858 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

OpenPWM2 (see page 1027)

SetDCPWM2 (see page 1048)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.34.6 I2C (858 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)

Writel2C (see page 1066)

Readl2C (see page 1067)

putsI2C (see page 1068)

`getI2C` (see page 1070)

`IdleI2C` (see page 1072)

`CloseI2C` (see page 1071)

Macros

`EnableIntl2C`

`DisableIntl2C`

`SetPriorityIntl2C`

`I2C_Clear_Intr_Status_Bit`

`I2C_Intr_Status`

`StopI2C`

`StartI2C`

`RestartI2C`

`NotAckI2C`

`AckI2C`

`DataRdyI2C`

`putcl2C`

`getcl2C`

`putcl2C`

I2C Examples (see page 1072)

7.34.7 I2C EEPROM (858 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

`OpenI2C` (see page 1063)

`EEAckPolling` (see page 1075)

`EEByteWrite` (see page 1079)

`EECurrentAddRead` (see page 1077)

`EEPageWrite` (see page 1081)

`EERandomRead` (see page 1086)

`EESequentialRead` (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.34.8 SPI (858 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros
EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7

7.34.9 IO Ports (858 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions[OpenPORTB](#) (see page 1089)[OpenRB0INT](#) (see page 1089)[OpenRB1INT](#) (see page 1090)[OpenRB2INT](#) (see page 1091)[OpenRB3INT](#) (see page 1092)**Macros**

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.34.10 SW_RTCC (858 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions[Open_RTCC](#) (see page 1106)[update_RTCC](#) (see page 1106)[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.34.11 Timers (858 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)
[ReadTimer0](#) (see page 1137)
[WriteTimer0](#) (see page 1139)
[CloseTimer0](#) (see page 1143)
[OpenTimer1](#) (see page 1120)
[ReadTimer1](#) (see page 1138)
[WriteTimer1](#) (see page 1140)
[CloseTimer1](#) (see page 1143)
[OpenTimer2](#) (see page 1123)
[CloseTimer2](#) (see page 1144)
[OpenTimer3](#) (see page 1124)
[ReadTimer3](#) (see page 1138)
[WriteTimer3](#) (see page 1140)
[CloseTimer3](#) (see page 1144)
[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)
[ReadTimer2](#)
[T3_OSC1EN_ON](#)
[T3_OSC1EN_OFF](#)

Timers Examples (see page 1146)

7.34.12 USART (858 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenUSART](#) (see page 1152)
[WriteUSART](#) (see page 1155)
[getsUSART](#) (see page 1160)
[putrsUSART](#) (see page 1161)
[putsUSART](#) (see page 1163)

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.34.13 MWIRE (858 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.35 18C801 Family

PIC18C601 / PIC18C801

7.35.1 ADC (801 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ( see page 842)

SetChanADC ( see page 882)

SelChanConvADC ( see page 889)

ConvertADC ( see page 896)

BusyADC ( see page 897)

ReadADC ( see page 897)

CloseADC ( see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ( see page 898)

7.35.2 Input Capture (801 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)

ReadCapture1 ( see page 983)

CloseCapture1 ( see page 987)

Input Capture Examples ( see page 991)

7.35.3 Output Compare (801 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger-sync sources available

Functions
OpenCompare1 (see page 992)
CloseCompare1 (see page 1021)

Output Compare Examples ([see page 1025](#))

7.35.4 PWM (801 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
SetDCPWM1 (see page 1047)
SetOutputPWM1 (see page 1043)
ClosePWM1 (see page 1056)
OpenPWM2 (see page 1027)
SetDCPWM2 (see page 1048)
ClosePWM2 (see page 1056)

PWM Examples ([see page 1060](#))

7

7.35.5 I2C (801 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenI2C ( see page 1063)Writel2C ( see page 1066)Readl2C ( see page 1067)putsl2C ( see page 1068)getsl2C ( see page 1070)IdleI2C ( see page 1072)CloseI2C ( see page 1071)**Macros**

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putcl2C

getcl2C

putcl2C

I2C Examples ( see page 1072)

7.35.6 I2C EEPROM (801 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

FunctionsOpenI2C ( see page 1063)EEAckPolling ( see page 1075)

EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples (see page 1088)

7.35.7 SPI (801 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples (see page 1116)

7.35.8 IO Ports (801 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.35.9 SW_RTCC (801 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)

update_RTCC (see page 1106)

Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.35.10 Timers (801 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

OpenTimer3 ([see page 1124](#))

ReadTimer3 ([see page 1138](#))

WriteTimer3 ([see page 1140](#))

CloseTimer3 ([see page 1144](#))

SetTmrCCPSrc ([see page 1141](#))

Macros

WriteTimer2

ReadTimer2

T3_OSC1EN_ON

T3_OSC1EN_OFF

7.35.11 USART (801 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ( see page 1152)

WriteUSART ( see page 1155)

getsUSART ( see page 1160)

putrsUSART ( see page 1161)

putsUSART ( see page 1163)

ReadUSART ( see page 1164)

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ( see page 1164)

7.35.12 MWIRE (801 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ( see page 1167)

ReadMwire ( see page 1171)

WriteMwire ( see page 1170)

getsMwire ( see page 1168)

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.36 18F4539 Family

PIC18F2439 / PIC18F2539

PIC18F4439 / PIC18F4539

7.36.1 ADC (4539 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 840](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.36.2 I2C (4539 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ( see page 1063)

Writel2C ( see page 1066)

Readl2C ( see page 1067)

putsl2C ( see page 1068)

getsl2C ( see page 1070)

IdleI2C ( see page 1072)

Closel2C ( see page 1071)

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putcl2C

getcl2C

putcl2C

I2C Examples ( see page 1072)

7

7.36.3 I2C EEPROM (4539 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))
EEAckPolling ([see page 1075](#))
EEByteWrite ([see page 1079](#))
EECurrentAddRead ([see page 1077](#))
EEPageWrite ([see page 1081](#))
EERandomRead ([see page 1086](#))
EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.36.4 SPI (4539 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI ([see page 1108](#))
WriteSPI ([see page 1111](#))
ReadSPI ([see page 1113](#))
putsSPI ([see page 1114](#))
getsSPI ([see page 1115](#))

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.36.5 IO Ports (4539 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.36.6 EEPROM (4539 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

7.36.7 SW_RTCC (4539 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)
SW_RTCC Examples (see page 1107)

7.36.8 Timers (4539 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.36.9 USART (4539 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))
WriteUSART ([see page 1155](#))
getsUSART ([see page 1160](#))
putrsUSART ([see page 1161](#))
putsUSART ([see page 1163](#))
ReadUSART ([see page 1164](#))

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.36.10 MWIRE (4539 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.36.11 Flash (4539 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

FunctionsReadFlash ([see page 1198](#))EraseFlash ([see page 1196](#))WriteBlockFlash ([see page 1198](#))WriteBytesFlash ([see page 1202](#))**Macros**

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.37 18F452 Family

PIC18F242 / PIC18F252

PIC18F442 / PIC18F452

7.37.1 ADC (F452 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions
OpenADC (see page 840)
SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros
ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.37.2 Input Capture (F452 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)

ReadCapture1 (see page 983)

CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.37.3 Output Compare (F452 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)

CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.37.4 PWM (F452 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)

OpenPWM2 (see page 1027)

SetDCPWM2 (see page 1048)

ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.37.5 I2C (F452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ([see page 1063](#))

Writel2C ([see page 1066](#))

Readl2C ([see page 1067](#))

putsl2C ([see page 1068](#))

getsl2C ([see page 1070](#))

IdleI2C ([see page 1072](#))

Closel2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C

NotAckI2C

AckI2C

DataRdyI2C

putcl2C

getcl2C

putcl2C

I2C Examples ([see page 1072](#))

7.37.6 I2C EEPROM (F452 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))

EEAckPolling ([see page 1075](#))

EEByteWrite ([see page 1079](#))

EECurrentAddRead ([see page 1077](#))

EEPageWrite ([see page 1081](#))

EERandomRead ([see page 1086](#))

EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.37.7 SPI (F452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI ([see page 1108](#))

WriteSPI ([see page 1111](#))

ReadSPI ([see page 1113](#))

putsSPI ([see page 1114](#))

getsSPI ([see page 1115](#))

Macros

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.37.8 IO Ports (F452 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.37.9 EEPROM (F452 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep (see page 1061)

Read_b_eep (see page 1061)

Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.37.10 SW_RTCC (F452 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)

update_RTCC (see page 1106)

Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.37.11 Timers (F452 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 (see page 1119)

ReadTimer0 (see page 1137)

WriteTimer0 (see page 1139)

CloseTimer0 (see page 1143)

OpenTimer1 (see page 1120)

ReadTimer1 (see page 1138)

WriteTimer1 (see page 1140)

CloseTimer1 (see page 1143)

OpenTimer2 (see page 1123)

CloseTimer2 (see page 1144)

OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.37.12 USART (F452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART (see page 1152)
WriteUSART (see page 1155)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples (see page 1164)

7.37.13 MWIRE (F452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.37.14 Flash (F452 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1198](#))

WriteBytesFlash ([see page 1202](#))

Macros

LoadFlashAddr
TableRead

Flash Examples ([see page 1204](#))

7.38 18C452 Family

PIC18C242 / PIC18C252

PIC18C442 / PIC18C452

7.38.1 ADC (C452 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 840](#))
SetChanADC ([see page 882](#))
SelChanConvADC ([see page 889](#))
ConvertADC ([see page 896](#))
BusyADC ([see page 897](#))
ReadADC ([see page 897](#))
CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.38.2 Input Capture (C452 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions
OpenCapture1 (see page 954)
ReadCapture1 (see page 983)
CloseCapture1 (see page 987)

7.38.3 Output Compare (C452 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions
OpenCompare1 (see page 992)
CloseCompare1 (see page 1021)

7.38.4 PWM (C452 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions
OpenPWM1 (see page 1026)
SetDCPWM1 (see page 1047)
SetOutputPWM1 (see page 1043)

ClosePWM1 (see page 1056)
OpenPWM2 (see page 1027)
SetDCPWM2 (see page 1048)
ClosePWM2 (see page 1056)

PWM Examples (see page 1060)

7.38.5 I2C (C452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)
WriteI2C (see page 1066)
ReadI2C (see page 1067)
putslI2C (see page 1068)
getslI2C (see page 1070)
IdleI2C (see page 1072)
CloseI2C (see page 1071)

Macros

EnableIntI2C
DisableIntI2C
SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
StopI2C
StartI2C
RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putclI2C
getclI2C
putclI2C

I2C Examples ([see page 1072](#))

7.38.6 I2C EEPROM (C452 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

7.38.7 SPI (C452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
 DisableIntSPI
 SetPriorityIntSPI
 SPI_Clear_Intr_Status_Bit
 SPI_Intr_Status
 SPI_Clear_Recv_OV
 CloseSPI
 DataRdySPI
 getcSPI
 putcSPI

SPI Examples ( see page 1116)

7.38.8 IO Ports (C452 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ( see page 1089)
 OpenRB0INT ( see page 1089)
 OpenRB1INT ( see page 1090)
 OpenRB2INT ( see page 1091)
 OpenRB3INT ( see page 1092)

Macros

EnablePullups
 DisablePullups
 ClosePORTB
 CloseRB0INT
 CloseRB1INT
 CloseRB2INT
 CloseRB3INT

IO Ports Examples ( see page 1093)

7.38.9 SW_RTCC (C452 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) (see page 1106)

[update_RTCC](#) (see page 1106)

[Close_RTCC](#) (see page 1106)

[SW_RTCC Examples](#) (see page 1107)

7.38.10 Timers (C452 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1124)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples ([see page 1146](#))

7.38.11 USART (C452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))
WriteUSART ([see page 1155](#))
getsUSART ([see page 1160](#))
putrsUSART ([see page 1161](#))
putsUSART ([see page 1163](#))
ReadUSART ([see page 1164](#))

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.38.12 MWIRE (C452 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)

ReadMwire (see page 1171)

WriteMwire (see page 1170)

getsMwire (see page 1168)

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples (see page 1172)

7.39 18F458 Family

PIC18F248 / PIC18F258

PIC18F448 / PIC18F458

7.39.1 PIC18F258 Set

PIC18F248 / PIC18F258

7.39.1.1 ADC (258 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 840)

SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE

ADC Examples (see page 898)

7.39.1.2 Input Capture (258 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 (see page 954)
ReadCapture1 (see page 983)
CloseCapture1 (see page 987)

Input Capture Examples (see page 991)

7.39.1.3 Output Compare (258 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 (see page 992)
CloseCompare1 (see page 1021)

Output Compare Examples (see page 1025)

7.39.1.4 PWM (258 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 ([see page 1026](#))

SetDCPWM1 ([see page 1047](#))

SetOutputPWM1 ([see page 1043](#))

ClosePWM1 ([see page 1056](#))

PWM Examples ([see page 1060](#))

7.39.1.5 I2C (258 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C ([see page 1063](#))

WriteI2C ([see page 1066](#))

ReadI2C ([see page 1067](#))

putslI2C ([see page 1068](#))

getslI2C ([see page 1070](#))

IdleI2C ([see page 1072](#))

CloseI2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

StopI2C

StartI2C

RestartI2C
NotAckI2C
AckI2C
DataRdyI2C
putI2C
getI2C
putI2C

I2C Examples ([see page 1072](#))

7.39.1.6 I2C EEPROM (258 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions
OpenI2C (see page 1063)
EEAckPolling (see page 1075)
EEByteWrite (see page 1079)
EECurrentAddRead (see page 1077)
EEPageWrite (see page 1081)
EERandomRead (see page 1086)
EESequentialRead (see page 1083)

I2C EEPROM Examples ([see page 1088](#))

7.39.1.7 SPI (258 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)

ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

Macros

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.39.1.8 IO Ports (258 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros

EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.39.1.9 EEP (258 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

[Write_b_eep](#) ([see page 1061](#))

[Read_b_eep](#) ([see page 1061](#))

[Busy_eep](#) ([see page 1062](#))

EEP Examples ([see page 1062](#))

7.39.1.10 SW_RTCC (258 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) ([see page 1106](#))

[update_RTCC](#) ([see page 1106](#))

[Close_RTCC](#) ([see page 1106](#))

SW_RTCC Examples ([see page 1107](#))

7.39.1.11 Timers (258 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) ([see page 1119](#))

[ReadTimer0](#) ([see page 1137](#))

WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.39.1.12 USART (258 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART (see page 1152)
WriteUSART (see page 1155)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.39.1.13 MWIRE (258 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))
ReadMwire ([see page 1171](#))
WriteMwire ([see page 1170](#))
getsMwire ([see page 1168](#))

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.39.1.14 Flash (258 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)
[EraseFlash](#) (see page 1196)
[WriteBlockFlash](#) (see page 1198)
[WriteBytesFlash](#) (see page 1202)

Macros

[LoadFlashAddr](#)
[TableRead](#)

Flash Examples (see page 1204)

7.39.2 PIC18F458 Set

PIC18F448 / PIC18F458

7.39.2.1 ADC (458 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 840)
[SetChanADC](#) (see page 882)
[SelChanConvADC](#) (see page 889)
[ConvertADC](#) (see page 896)
[BusyADC](#) (see page 897)
[ReadADC](#) (see page 897)
[CloseADC](#) (see page 897)

Macros

[ADC_INT_ENABLE](#)
[ADC_INT_DISABLE](#)

ADC Examples (see page 898)

7.39.2.2 Analog Comparator (258 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ( see page 899)

Close_ancomp ( see page 923)

Comparator Examples ( see page 924)

7.39.2.3 Input Capture (458 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ( see page 954)

OpenECapture1 ( see page 966)

ReadCapture1 ( see page 983)

ReadECapture1 ( see page 986)

CloseCapture1 ( see page 987)

CloseECapture1 ( see page 990)

Input Capture Examples ( see page 991)

7.39.2.4 Output Compare (458 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ( see page 992)

OpenECompare1 ( see page 1003)

CloseCompare1 (see page 1021)

CloseECompare1 (see page 1024)

Output Compare Examples (see page 1025)

7.39.2.5 PWM (458 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

OpenEPWM1 (see page 1036)

SetDCPWM1 (see page 1047)

SetDCEPWM1 (see page 1054)

SetOutputPWM1 (see page 1043)

SetOutputEPWM1 (see page 1045)

ClosePWM1 (see page 1056)

CloseEPWM1 (see page 1059)

PWM Examples (see page 1060)

7.39.2.6 I2C (458 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C (see page 1063)

WriteI2C (see page 1066)

ReadI2C (see page 1067)

putslI2C (see page 1068)

getslI2C (see page 1070)

IdleI2C (see page 1072)

CloseI2C (see page 1071)

Macros

EnableIntI2C
 DisableIntI2C
 SetPriorityIntI2C
 I2C_Clear_Intr_Status_Bit
 I2C_Intr_Status
 StopI2C
 StartI2C
 RestartI2C
 NotAckI2C
 AckI2C
 DataRdyI2C
 putclI2C
 getclI2C
 putclI2C

I2C Examples ([see page 1072](#))

7.39.2.7 I2C EEPROM (458 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C ([see page 1063](#))
 EEAckPolling ([see page 1075](#))
 EEByteWrite ([see page 1079](#))
 EECurrentAddRead ([see page 1077](#))
 EEPageWrite ([see page 1081](#))
 EERandomRead ([see page 1086](#))
 EESequentialRead ([see page 1083](#))

I2C EEPROM Examples ([see page 1088](#))

7.39.2.8 SPI (458 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenSPI](#) (see page 1108)

[WriteSPI](#) (see page 1111)

[ReadSPI](#) (see page 1113)

[putsSPI](#) (see page 1114)

[getsSPI](#) (see page 1115)

Macros

`EnableIntSPI`

`DisableIntSPI`

`SetPriorityIntSPI`

`SPI_Clear_Intr_Status_Bit`

`SPI_Intr_Status`

`SPI_Clear_Recv_OV`

`CloseSPI`

`DataRdySPI`

`getcSPI`

`putcSPI`

SPI Examples ([see page 1116](#))

7.39.2.9 IO Ports (458 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

[OpenPORTB](#) (see page 1089)

[OpenRB0INT](#) (see page 1089)

[OpenRB1INT](#) (see page 1090)

[OpenRB2INT](#) (see page 1091)

[OpenRB3INT](#) (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.39.2.10 EEP (458 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

FunctionsWrite_b_eep ([see page 1061](#))Read_b_eep ([see page 1061](#))Busy_eep ([see page 1062](#))EEP Examples ([see page 1062](#))

7.39.2.11 SW_RTCC (458 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

FunctionsOpen_RTCC ([see page 1106](#))update_RTCC ([see page 1106](#))Close_RTCC ([see page 1106](#))SW_RTCC Examples ([see page 1107](#))

7.39.2.12 Timers (458 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers

- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1124)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[SetTmrCCPSrc](#) (see page 1141)

Macros

[WriteTimer2](#)

[ReadTimer2](#)

[T3_OSC1EN_ON](#)

[T3_OSC1EN_OFF](#)

Timers Examples (see page 1146)

7.39.2.13 USART (458 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenUSART](#) (see page 1152)

[WriteUSART](#) (see page 1155)

getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.39.2.14 MWIRE (458 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire (see page 1167)
ReadMwire (see page 1171)
WriteMwire (see page 1170)
getsMwire (see page 1168)

Macros

CloseMwire
getcMwire
putcMwire
DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.39.2.15 Flash (458 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1198)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.40 18F1320 Family

PIC18F1220 / PIC18F1320

7.40.1 ADC (1320 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 844)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC (see page 897)

CloseADC (see page 897)

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.40.2 Input Capture (1320 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

FunctionsOpenCapture1 ([see page 954](#))ReadCapture1 ([see page 983](#))CloseCapture1 ([see page 987](#))Input Capture Examples ([see page 991](#))

7.40.3 Output Compare (1320 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

FunctionsOpenCompare1 ([see page 992](#))CloseCompare1 ([see page 1021](#))Output Compare Examples ([see page 1025](#))

7.40.4 PWM (1320 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenPWM1 (see page 1026)

SetDCPWM1 (see page 1047)

ClosePWM1 (see page 1056)

PWM Examples (see page 1060)

7.40.5 IO Ports (1320 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB (see page 1089)

OpenRB0INT (see page 1089)

OpenRB1INT (see page 1090)

OpenRB2INT (see page 1091)

OpenRB3INT (see page 1092)

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

CloseRB3INT

IO Ports Examples (see page 1093)

7.40.6 EEP (1320 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM

- Function to check the status of the EEPROM

Functions

[Write_b_eep](#) (see page 1061)

[Read_b_eep](#) (see page 1061)

[Busy_eep](#) (see page 1062)

EEP Examples (see page 1062)

7.40.7 SW_RTCC (1320 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) (see page 1106)

[update_RTCC](#) (see page 1106)

[Close_RTCC](#) (see page 1106)

SW_RTCC Examples (see page 1107)

7.40.8 Timers (1320 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

CloseTimer2 (see page 1144)
OpenTimer3 (see page 1124)
ReadTimer3 (see page 1138)
WriteTimer3 (see page 1140)
CloseTimer3 (see page 1144)
SetTmrCCPSrc (see page 1141)

Macros

WriteTimer2
ReadTimer2
T3_OSC1EN_ON
T3_OSC1EN_OFF

Timers Examples (see page 1146)

7.40.9 USART (1320 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART (see page 1152)
WriteUSART (see page 1155)
baudUSART (see page 1158)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples (see page 1164)

7.40.10 Flash (1320 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1198)

WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.41 18F45J10 Family

PIC18F24J10 / PIC18F25J10

PIC18F44J10 / PIC18F45J10

7.41.1 PIC18F45J10 Set

PIC18F44J10 / PIC18F45J10

7.41.1.1 ADC (45J10 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular

device pinout.

- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 848](#))

SetChanADC ([see page 882](#))

SelChanConvADC ([see page 889](#))

ConvertADC ([see page 896](#))

BusyADC ([see page 897](#))

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.41.1.2 Analog Comparator (45J10 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))

Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.41.1.3 Input Capture (45J10 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions[OpenCapture1](#) (see page 954)[ReadCapture1](#) (see page 983)[CloseCapture1](#) (see page 987)Input Capture Examples ([see page 991](#))

7.41.1.4 Output Compare (45J10 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions[OpenCompare1](#) (see page 992)[CloseCompare1](#) (see page 1021)Output Compare Examples ([see page 1025](#))

7.41.1.5 PWM (45J10 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions[OpenPWM1](#) (see page 1026)[OpenPWM2](#) (see page 1027)[SetDCPWM1](#) (see page 1047)[SetDCPWM2](#) (see page 1048)[SetOutputPWM1](#) (see page 1043)[ClosePWM1](#) (see page 1056)[ClosePWM2](#) (see page 1056)PWM Examples ([see page 1060](#))

7.41.1.6 I2C (45J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 ([see page 1064](#))

Writel2C1 ([see page 1066](#))

Readl2C1 ([see page 1067](#))

putsl2C1 ([see page 1069](#))

getsl2C1 ([see page 1070](#))

OpenI2C2 ([see page 1065](#))

Writel2C2 ([see page 1067](#))

Readl2C2 ([see page 1068](#))

putsl2C2 ([see page 1069](#))

getsl2C2 ([see page 1071](#))

Macros

EnableIntI2C1

DisableIntI2C1

SetPriorityIntI2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

CloseI2C1

putcl2C1

getcl2C1

EnableIntI2C2

DisableIntI2C2

SetPriorityIntI2C2

I2C2_Clear_Intr_Status_Bit

I2C2_Intr_Status

StopI2C2

StartI2C2

RestartI2C2

NotAckI2C2

AckI2C2
DataRdyI2C2
IdleI2C2
Closel2C2
putl2C2
getl2C2

I2C Examples ([see page 1072](#))

7.41.1.7 I2C EEPROM (45J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.41.1.8 SPI (45J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.

- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))

WriteSPI1 ([see page 1112](#))

ReadSPI1 ([see page 1113](#))

putsSPI1 ([see page 1114](#))

getsSPI1 ([see page 1115](#))

OpenSPI2 ([see page 1110](#))

WriteSPI2 ([see page 1112](#))

ReadSPI2 ([see page 1113](#))

putsSPI2 ([see page 1114](#))

getsSPI2 ([see page 1116](#))

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2

putcSPI2

SPI Examples ([see page 1116](#))

7.41.1.9 IO Ports (45J10 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

`OpenPORTB` (see page 1089)

`OpenRB0INT` (see page 1089)

`OpenRB1INT` (see page 1090)

`OpenRB2INT` (see page 1091)

Macros

`EnablePullups`

`DisablePullups`

`ClosePORTB`

`CloseRB0INT`

`CloseRB1INT`

`CloseRB2INT`

IO Ports Examples (see page 1093)

7.41.1.10 SW_RTCC (45J10 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

`Open_RTCC` (see page 1106)

`update_RTCC` (see page 1106)

`Close_RTCC` (see page 1106)

SW_RTCC Examples (see page 1107)

7.41.1.11 Timers (45J10 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.

- Timer1 oscillator acts as low power oscillator

Functions

OpenTimer0 ([see page 1119](#))

ReadTimer0 ([see page 1137](#))

WriteTimer0 ([see page 1139](#))

CloseTimer0 ([see page 1143](#))

OpenTimer1 ([see page 1120](#))

ReadTimer1 ([see page 1138](#))

WriteTimer1 ([see page 1140](#))

CloseTimer1 ([see page 1143](#))

OpenTimer2 ([see page 1123](#))

CloseTimer2 ([see page 1144](#))

Macros

WriteTimer2

ReadTimer2

Timers Examples ([see page 1146](#))

7.41.1.12 USART (45J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenUSART ([see page 1152](#))

WriteUSART ([see page 1155](#))

baudUSART ([see page 1158](#))

getsUSART ([see page 1160](#))

putrsUSART ([see page 1161](#))

putsUSART ([see page 1163](#))

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.41.1.13 MWIRE (45J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 ([see page 1166](#))
ReadMwire1 ([see page 1170](#))
WriteMwire1 ([see page 1169](#))
getsMwire1 ([see page 1167](#))
OpenMwire2 ([see page 1166](#))
ReadMwire2 ([see page 1171](#))
WriteMwire2 ([see page 1169](#))
getsMwire2 ([see page 1168](#))

Macros

CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2
DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.41.1.14 Flash (45J10 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)

EraseFlash (see page 1196)

WriteBlockFlash (see page 1200)

WriteBytesFlash (see page 1203)

Macros

LoadFlashAddr

TableRead

Flash Examples (see page 1204)

7.41.2 PIC18F25J10 Set

PIC18F24J10 / PIC18F25J10

7.41.2.1 ADC (25J10 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC (see page 848)

SetChanADC (see page 882)

SelChanConvADC (see page 889)

ConvertADC (see page 896)

BusyADC (see page 897)

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC Examples ([see page 898](#))

7.41.2.2 Analog Comparator (25J10 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp ([see page 899](#))

Close_ancomp ([see page 923](#))

Comparator Examples ([see page 924](#))

7.41.2.3 Input Capture (25J10 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

ReadCapture1 ([see page 983](#))

CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.41.2.4 Output Compare (25J10 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

[OpenCompare1](#) (see page 992)

[CloseCompare1](#) (see page 1021)

[Output Compare Examples](#) (see page 1025)

7.41.2.5 PWM (25J10 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)

[OpenPWM2](#) (see page 1027)

[SetDCPWM1](#) (see page 1047)

[SetDCPWM2](#) (see page 1048)

[SetOutputPWM1](#) (see page 1043)

[ClosePWM1](#) (see page 1056)

[ClosePWM2](#) (see page 1056)

[PWM Examples](#) (see page 1060)

7.41.2.6 I2C (25J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenI2C1](#) (see page 1064)

[WriteI2C1](#) (see page 1066)

[ReadI2C1](#) (see page 1067)

[putslI2C1](#) (see page 1069)

[getslI2C1](#) (see page 1070)

Macros

EnableI2C1
 DisableI2C1
 SetPriorityI2C1
 I2C1_Clear_Intr_Status_Bit
 I2C1_Intr_Status
 StopI2C1
 StartI2C1
 RestartI2C1
 NotAckI2C1
 AckI2C1
 DataRdyI2C1
 IdleI2C1
 CloseI2C1
 putclI2C1
 getclI2C1

I2C Examples ([see page 1072](#))

7.41.2.7 I2C EEPROM (25J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 ([see page 1064](#))
 EEAckPolling1 ([see page 1076](#))
 EEByteWrite1 ([see page 1080](#))
 EECurrentAddRead1 ([see page 1078](#))
 EEPageWrite1 ([see page 1082](#))
 EERandomRead1 ([see page 1086](#))
 EESequentialRead1 ([see page 1084](#))

I2C EEPROM Examples ([see page 1088](#))

7.41.2.8 SPI (25J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI1 ([see page 1109](#))

WriteSPI1 ([see page 1112](#))

ReadSPI1 ([see page 1113](#))

putsSPI1 ([see page 1114](#))

getsSPI1 ([see page 1115](#))

OpenSPI2 ([see page 1110](#))

WriteSPI2 ([see page 1112](#))

ReadSPI2 ([see page 1113](#))

putsSPI2 ([see page 1114](#))

getsSPI2 ([see page 1116](#))

Macros

EnableIntSPI1

DisableIntSPI1

SetPriorityIntSPI1

SPI1_Clear_Intr_Status_Bit

SPI1_Intr_Status

SPI1_Clear_Recv_OV

CloseSPI1

DataRdySPI1

getcSPI1

putcSPI1

EnableIntSPI2

DisableIntSPI2

SetPriorityIntSPI2

SPI2_Clear_Intr_Status_Bit

SPI2_Intr_Status

SPI2_Clear_Recv_OV

CloseSPI2

DataRdySPI2

getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.41.2.9 IO Ports (25J10 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)

Macros
EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.41.2.10 SW_RTCC (25J10 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.41.2.11 Timers (25J10 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions

`OpenTimer0` (see page 1119)

`ReadTimer0` (see page 1137)

`WriteTimer0` (see page 1139)

`CloseTimer0` (see page 1143)

`OpenTimer1` (see page 1120)

`ReadTimer1` (see page 1138)

`WriteTimer1` (see page 1140)

`CloseTimer1` (see page 1143)

`OpenTimer2` (see page 1123)

`CloseTimer2` (see page 1144)

Macros

`WriteTimer2`

`ReadTimer2`

Timers Examples (see page 1146)

7.41.2.12 USART (25J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`OpenUSART` (see page 1152)

`WriteUSART` (see page 1155)

`baudUSART` (see page 1158)

`getsUSART` (see page 1160)

putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros

DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.41.2.13 MWIRE (25J10 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 (see page 1166)
ReadMwire1 (see page 1170)
WriteMwire1 (see page 1169)
getsMwire1 (see page 1167)
OpenMwire2 (see page 1166)
ReadMwire2 (see page 1171)
WriteMwire2 (see page 1169)
getsMwire2 (see page 1168)

Macros

CloseMwire1
getcMwire1
putcMwire1
DataRdyMwire1
CloseMwire2
getcMwire2
putcMwire2

DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.41.2.14 Flash (25J10 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash ([see page 1198](#))

EraseFlash ([see page 1196](#))

WriteBlockFlash ([see page 1200](#))

WriteBytesFlash ([see page 1203](#))

Macros

LoadFlashAddr

TableRead

Flash Examples ([see page 1204](#))

7.42 18F1330 Family

PIC18F1230 / PIC18F1330

7

7.42.1 ADC (1330 Family)

This peripheral module supports functionalities:

- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 846](#))

SetChanADC (see page 882)
SelChanConvADC (see page 889)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE
ADC_SEVT_ENABLE
ADC_SEVT_DISABLE

ADC Examples (see page 898)

7.42.2 PCPWM (1330 Family)

This peripheral module supports functionalities:

- Up to eight PWM I/O pins with four duty cycle generators. Pins can be paired to get a complete half-bridge control.
- Up to 14-bit resolution, depending upon the PWM period.
- On-the-fly PWM frequency changes.

Functions

Openpc pwm (see page 1174)
Setdc0pc pwm (see page 1182)
Setdc1pc pwm (see page 1182)
Setdc2pc pwm (see page 1183)
pc pwm_OVD_CTRL (see page 1184)
pc pwm_OVD_IO_STA (see page 1184)
pc pwm_dt_clk_source (see page 1185)
pc pwm_dt_assignment (see page 1185)
Closepc pwm (see page 1186)

Macros

PCPWM_TMR_INT_EN
PCPWM_TMR_INT_DIS
BRK_FLT_EN
BRK_FLT_DIS

FLT_A_CY_CY
FLT_A_CATAS
FLT_A_EN
FLT_A_DIS

7.42.3 EEPROM (1330 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions
Write_b_eep (see page 1061)
Read_b_eep (see page 1061)
Busy_eep (see page 1062)

EEP Examples (see page 1062)

7.42.4 IO Ports (1330 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)
OpenRB3INT (see page 1092)

Macros
EnablePullups
DisablePullups
ClosePORTB

CloseRB0INT
CloseRB1INT
CloseRB2INT
CloseRB3INT

IO Ports Examples ([see page 1093](#))

7.42.5 SW_RTCC (1330 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions
Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples ([see page 1107](#))

7.42.6 Timers (1330 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions
OpenTimer0 (see page 1119)
ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)

Timers Examples ([see page 1146](#))

7.42.7 USART (1330 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenUSART (see page 1152)
WriteUSART (see page 1155)
baudUSART (see page 1158)
getsUSART (see page 1160)
putrsUSART (see page 1161)
putsUSART (see page 1163)
ReadUSART (see page 1164)

Macros
DataRdyUSART
CloseUSART
BusyUSART
putcUSART
getcUSART

USART Examples ([see page 1164](#))

7.42.8 Flash (1330 Family)

7

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions
ReadFlash (see page 1198)

EraseFlash (see page 1196)
WriteBlockFlash (see page 1198)
WriteBytesFlash (see page 1202)

Macros
LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.43 18F4431 Family

PIC18F2331 / PIC18F2431

PIC18F4331 / PIC18F4431

7.43.1 PIC18F4431 Set

PIC18F4331 / PIC18F4431

7.43.1.1 ADC (4431 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions
OpenADC (see page 854)
SetChanADC (see page 885)
SelChanConvADC (see page 892)
ConvertADC (see page 896)
BusyADC (see page 897)
ReadADC (see page 897)
CloseADC (see page 897)

Macros

ADC_INT_ENABLE
 ADC_INT_DISABLE
 ADC_CH_GRA_AN0()
 ADC_CH_GRA_AN4()
 ADC_CH_GRA_AN8()
 ADC_CH_GRB_AN1()
 ADC_CH_GRB_AN5()
 ADC_CH_GRC_AN2()
 ADC_CH_GRC_AN6()
 ADC_CH_GRD_AN3()
 ADC_CH_GRD_AN7()
 ALL_CH_DIGITAL()

ADC Examples ([see page 898](#))

7.43.1.2 Input Capture (4431 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))
 ReadCapture1 ([see page 983](#))
 CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.43.1.3 Output Compare (4431 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))
 CloseCompare1 ([see page 1021](#))

Output Compare Examples ([see page 1025](#))

7.43.1.4 PWM (4431 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) ([see page 1026](#))

[OpenPWM2](#) ([see page 1027](#))

[SetDCPWM1](#) ([see page 1047](#))

[SetDCPWM2](#) ([see page 1048](#))

[SetOutputPWM1](#) ([see page 1043](#))

[ClosePWM1](#) ([see page 1056](#))

[ClosePWM2](#) ([see page 1056](#))

PWM Examples ([see page 1060](#))

7.43.1.5 PCPWM (4431 Family)

This peripheral module supports functionalities:

- Up to eight PWM I/O pins with four duty cycle generators. Pins can be paired to get a complete half-bridge control.
- Up to 14-bit resolution, depending upon the PWM period.
- On-the-fly PWM frequency changes.

Functions

[Openpcpwm](#) ([see page 1178](#))

[Setdc0pcpwm](#) ([see page 1182](#))

[Setdc1pcpwm](#) ([see page 1182](#))

[Setdc2pcpwm](#) ([see page 1183](#))

[Setdc3pcpwm](#) ([see page 1183](#))

[pcpwm_OVD_CTRL](#) ([see page 1184](#))

[pcpwm_OVD_IO_STA](#) ([see page 1184](#))

[pcpwm_dt_clk_source](#) ([see page 1185](#))

[pcpwm_dt_assignment](#) ([see page 1185](#))

[Closepcpwm](#) ([see page 1186](#))

Macros

[PCPWM_TMR_INT_EN](#)

PCPWM_TMR_INT_DIS
BRK_FLT_EN
BRK_FLT_DIS
FLT_A_CY_CY
FLT_A_CATAS
FLT_A_EN
FLT_A_DIS
FLT_B_CY_CY
FLT_B_CATAS
FLT_B_EN
FLT_B_DIS
FLT_AB_DEACT_ALL
FLT_AB_DEACT_0TO5

7.43.1.6 I2C (4431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Supports only **slave mode** in SSP Module.
- Master mode can be implemented in Firmware.

Functions

OpenI2C ( see page 1063)
WriteI2C ( see page 1066)
ReadI2C ( see page 1067)
putsl2C ( see page 1068)
IdleI2C ( see page 1072)
CloseI2C ( see page 1071)

7

Macros

EnableIntI2C
DisableIntI2C
SetPriorityIntI2C
I2C_Clear_Intr_Status_Bit
I2C_Intr_Status
putcl2C

getI2C

I2C Examples ([see page 1072](#))

7.43.1.7 SPI (4431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions
OpenSPI (see page 1108)
WriteSPI (see page 1111)
ReadSPI (see page 1113)
putsSPI (see page 1114)
getsSPI (see page 1115)

EnableIntSPI
DisableIntSPI
SetPriorityIntSPI
SPI_Clear_Intr_Status_Bit
SPI_Intr_Status
SPI_Clear_Recv_OV
CloseSPI
DataRdySPI
getcSPI
putcSPI

SPI Examples ([see page 1116](#))

7.43.1.8 IO Ports (4431 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions[OpenPORTB](#) (see page 1089)[OpenRB0INT](#) (see page 1089)[OpenRB1INT](#) (see page 1090)[OpenRB2INT](#) (see page 1091)**Macros**

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

IO Ports Examples (see page 1093)

7.43.1.9 EEP (4431 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions[Write_b_eep](#) (see page 1061)[Read_b_eep](#) (see page 1061)[Busy_eep](#) (see page 1062)

EEP Examples (see page 1062)

7.43.1.10 Timers (4431 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator

Functions[OpenTimer0](#) (see page 1119)

ReadTimer0 (see page 1137)
WriteTimer0 (see page 1139)
CloseTimer0 (see page 1143)
OpenTimer1 (see page 1120)
ReadTimer1 (see page 1138)
WriteTimer1 (see page 1140)
CloseTimer1 (see page 1143)
OpenTimer2 (see page 1123)
CloseTimer2 (see page 1144)
OpenTimer5 (see page 1127)
ReadTimer5 (see page 1139)
WriteTimer5 (see page 1140)
CloseTimer5 (see page 1144)

Macros

WriteTimer2
ReadTimer2

Timers Examples (see page 1146)

7.43.1.11 SW_RTCC (4431 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

Open_RTCC (see page 1106)
update_RTCC (see page 1106)
Close_RTCC (see page 1106)

SW_RTCC Examples (see page 1107)

7.43.1.12 USART (4431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenUSART ([see page 1152](#))WriteUSART ([see page 1155](#))baudUSART ([see page 1158](#))getsUSART ([see page 1160](#))putrsUSART ([see page 1161](#))putsUSART ([see page 1163](#))ReadUSART ([see page 1164](#))**Macros**

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.43.1.13 MWIRE (4431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

FunctionsOpenMwire ([see page 1167](#))ReadMwire ([see page 1171](#))WriteMwire ([see page 1170](#))getsMwire ([see page 1168](#))**Macros**

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.43.1.14 Flash (4431 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)

[EraseFlash](#) (see page 1196)

[WriteBlockFlash](#) (see page 1198)

[WriteBytesFlash](#) (see page 1202)

Macros

[LoadFlashAddr](#)

[TableRead](#)

[Flash Examples](#) (see page 1204)

7.43.2 PIC18F2431 Set

PIC18F2331 / PIC18F2431

7.43.2.1 ADC (2431 Family)

This peripheral module supports functionalities:

- Up to 16 analog input pins, designated AN0 through AN15, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

[OpenADC](#) (see page 855)

[SetChanADC](#) (see page 886)

[SelChanConvADC](#) (see page 893)

[ConvertADC](#) (see page 896)

[BusyADC](#) (see page 897)

ReadADC ([see page 897](#))

CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE

ADC_INT_DISABLE

ADC_CH_GRA_AN0()

ADC_CH_GRA_AN4()

ADC_CH_GRB_AN1()

ADC_CH_GRC_AN2()

ADC_CH_GRD_AN3()

ADC Examples ([see page 898](#))

7.43.2.2 Input Capture (2431 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

OpenCapture1 ([see page 954](#))

ReadCapture1 ([see page 983](#))

CloseCapture1 ([see page 987](#))

Input Capture Examples ([see page 991](#))

7.43.2.3 Output Compare (2431 Family)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available

Functions

OpenCompare1 ([see page 992](#))

CloseCompare1 ([see page 1021](#))

Output Compare Examples ([see page 1025](#))

7.43.2.4 PWM (2431 Family)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

[OpenPWM1](#) (see page 1026)

[OpenPWM2](#) (see page 1027)

[SetDCPWM1](#) (see page 1047)

[SetDCPWM2](#) (see page 1048)

[SetOutputPWM1](#) (see page 1043)

[ClosePWM1](#) (see page 1056)

[ClosePWM2](#) (see page 1056)

[PWM Examples](#) (see page 1060)

7.43.2.5 PCPWM (2431 Family)

This peripheral module supports functionalities:

- Up to eight PWM I/O pins with four duty cycle generators. Pins can be paired to get a complete half-bridge control.
- Up to 14-bit resolution, depending upon the PWM period.
- On-the-fly PWM frequency changes.

Functions

[Openpcpwm](#) (see page 1178)

[Setdc0pcpwm](#) (see page 1182)

[Setdc1pcpwm](#) (see page 1182)

[Setdc2pcpwm](#) (see page 1183)

[pcpwm_OVD_CTRL](#) (see page 1184)

[pcpwm_OVD_IO_STA](#) (see page 1184)

[pcpwm_dt_clk_source](#) (see page 1185)

[pcpwm_dt_assignment](#) (see page 1185)

[Closepcpwm](#) (see page 1186)

Macros

PCPWM_TMR_INT_EN

PCPWM_TMR_INT_DIS

BRK_FLT_EN

BRK_FLT_DIS
FLT_A_CY_CY
FLT_A_CATAS
FLT_A_EN
FLT_A_DIS

7.43.2.6 I2C (2431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Supports only **slave mode** in SSP Module.
- Master mode can be implemented in Firmware.

Functions

OpenI2C ([see page 1063](#))

WriteI2C ([see page 1066](#))

ReadI2C ([see page 1067](#))

putslI2C ([see page 1068](#))

IdleI2C ([see page 1072](#))

CloselI2C ([see page 1071](#))

Macros

EnableIntI2C

DisableIntI2C

SetPriorityIntI2C

I2C_Clear_Intr_Status_Bit

I2C_Intr_Status

putclI2C

getclI2C

I2C Examples ([see page 1072](#))

7.43.2.7 SPI (2431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.

- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenSPI ([see page 1108](#))

WriteSPI ([see page 1111](#))

ReadSPI ([see page 1113](#))

putsSPI ([see page 1114](#))

getsSPI ([see page 1115](#))

Macros

EnableIntSPI

DisableIntSPI

SetPriorityIntSPI

SPI_Clear_Intr_Status_Bit

SPI_Intr_Status

SPI_Clear_Recv_OV

CloseSPI

DataRdySPI

getcSPI

putcSPI

SPI Examples ([see page 1116](#))

7.43.2.8 IO Ports (2431 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions

OpenPORTB ([see page 1089](#))

OpenRB0INT ([see page 1089](#))

OpenRB1INT ([see page 1090](#))

OpenRB2INT ([see page 1091](#))

Macros

EnablePullups

DisablePullups

ClosePORTB

CloseRB0INT

CloseRB1INT

CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.43.2.9 EEP (2431 Family)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

FunctionsWrite_b_eep ([see page 1061](#))Read_b_eep ([see page 1061](#))Busy_eep ([see page 1062](#))EEP Examples ([see page 1062](#))

7.43.2.10 SW_RTCC (2431 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

FunctionsOpen_RTCC ([see page 1106](#))update_RTCC ([see page 1106](#))Close_RTCC ([see page 1106](#))SW_RTCC Examples ([see page 1107](#))

7.43.2.11 Timers (2431 Family)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.

- Timer1 oscillator acts as low power oscillator

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1120)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer5](#) (see page 1127)

[ReadTimer5](#) (see page 1139)

[WriteTimer5](#) (see page 1140)

[CloseTimer5](#) (see page 1144)

Macros

[WriteTimer2](#)

[ReadTimer2](#)

Timers Examples (see page 1146)

7.43.2.12 USART (2431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[OpenUSART](#) (see page 1152)

[WriteUSART](#) (see page 1155)

[baudUSART](#) (see page 1158)

[getsUSART](#) (see page 1160)

[putrsUSART](#) (see page 1161)

[putsUSART](#) (see page 1163)

ReadUSART ([see page 1164](#))

Macros

DataRdyUSART

CloseUSART

BusyUSART

putcUSART

getcUSART

USART Examples ([see page 1164](#))

7.43.2.13 MWIRE (2431 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire ([see page 1167](#))

ReadMwire ([see page 1171](#))

WriteMwire ([see page 1170](#))

getsMwire ([see page 1168](#))

Macros

CloseMwire

getcMwire

putcMwire

DataRdyMwire

MWIRE Examples ([see page 1172](#))

7.43.2.14 Flash (2431 Family)

This peripheral module supports functionalities:

- Erasing Flash ([see page 1196](#))
- Writing blocks of data
- Writing a word

- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

ReadFlash (see page 1198)
EraseFlash (see page 1196)
WriteBlockFlash (see page 1198)
WriteBytesFlash (see page 1202)

Macros

LoadFlashAddr
TableRead

Flash Examples (see page 1204)

7.44 18F45K22 Family

PIC18F23K22 (see page 273) \ PIC18LF23K22 (see page 274) \ PIC18F24K22 (see page 271) \ PIC18LF24K22 (see page 272)

PIC18F25K22 (see page 269) \ PIC18LF25K22 (see page 270) \ PIC18F26K22 (see page 267) \ PIC18LF26K22 (see page 268)

PIC18F43K22 (see page 263) \ PIC18LF43K22 (see page 264) \ PIC18F44K22 (see page 261) \ PIC18LF44K22 (see page 262)

PIC18F45K22 (see page 259) \ PIC18LF45K22 (see page 260) \ PIC18F46K22 (see page 265) \ PIC18LF46K22 (see page 266)

7.44.1 ADC (45K22 Set)

7

This peripheral module supports functionalities:

- Up to 32 analog input pins, designated AN0 through AN31, on the 10-bit A/D converter, depending on the particular device pinout.
- Two analog input pins for external voltage reference connections.
- Voltage reference inputs that may be shared with other analog input pins

Functions

OpenADC ([see page 879](#))
SetChanADC ([see page 889](#))
SelChanConvADC ([see page 896](#))
ConvertADC ([see page 896](#))
BusyADC ([see page 897](#))
ReadADC ([see page 897](#))
CloseADC ([see page 897](#))

Macros

ADC_INT_ENABLE
ADC_INT_DISABLE
* ENABLE_AN0_DIG()
* ENABLE_AN0_ANA()
* ENABLE_AN1_DIG()
* ENABLE_AN1_ANA()
* ENABLE_AN2_DIG()
* ENABLE_AN2_ANA()
* ENABLE_AN3_DIG()
* ENABLE_AN3_ANA()
* ENABLE_AN4_DIG()
* ENABLE_AN4_ANA()
* ENABLE_AN5_DIG()
* ENABLE_AN5_ANA()
* ENABLE_AN6_DIG()
* ENABLE_AN6_ANA()
* ENABLE_AN7_DIG()
* ENABLE_AN7_ANA()
* ENABLE_ALL_ANA_0_7()
* ENABLE_ALL_DIG_0_7()

* ENABLE_AN8_DIG()
* ENABLE_AN8_ANA()
* ENABLE_AN9_DIG()
* ENABLE_AN9_ANA()
* ENABLE_AN10_DIG()
* ENABLE_AN10_ANA()

ADC Examples ([see page 898](#))

7.44.2 Analog Comparator (45K22 Family)

This peripheral library module:

- Provides two ranges of output voltage, each with 16 distinct levels.
- Can come from either VDD and VSS, or the external VREF+ and VREF-.

Note: The settling time of the comparator voltage reference must be considered when changing the CVREF output

Functions

Open_ancomp1 (see page 900)
 Close_ancomp1 (see page 923)
 Open_ancomp2 (see page 912)
 Close_ancomp2 (see page 923)

Comparator Examples (see page 924)

7.44.3 CTMU (45K22 Set)

This peripheral library module:

- Functions to configure CTMU.
- Function to control current.
- Provides macros to control edge sequence and to configure interrupt.

Functions

OpenCTMU (see page 925)
 CurrentControlCTMU (see page 927)
 CloseCTMU (see page 927)

Macros

Enbl_CTMUEdge1
 Enbl_CTMUEdge2
 Disbl_CTMUEdge1
 Disbl_CTMUEdge2
 CTMUEdge1_Status
 CTMUEdge2_Status
 CTMU_INT_ENABLE
 CTMU_INT_DISABLE
 CTMU_Clear_Intr_Status_Bit
 CTMU_Intr_Status

CTMU Examples (see page 928)

7.44.4 Input Capture (45K22 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

[OpenECapture1](#) (see page 979)

[OpenECapture2](#) (see page 980)

[OpenECapture3](#) (see page 981)

[OpenCapture4](#) (see page 961)

[OpenCapture5](#) (see page 982)

[ReadECapture1](#) (see page 986)

[ReadECapture2](#) (see page 986)

[ReadECapture3](#) (see page 987)

[ReadCapture4](#) (see page 984)

[ReadCapture5](#) (see page 984)

[CloseECapture1](#) (see page 990)

[CloseECapture2](#) (see page 990)

[CloseECapture3](#) (see page 991)

[CloseCapture4](#) (see page 988)

[CloseCapture5](#) (see page 988)

[Input Capture Examples](#) (see page 991)

7.44.5 Output Compare (45K22 Set)

This peripheral library module provides:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
- Synchronous and Trigger modes of output compare operation, with many user-selectable trigger-sync sources available
- Configurable interrupt generation

Functions

[OpenECompare1](#) (see page 1016)

[OpenECompare2](#) (see page 1017)

OpenECompare3 (see page 1018)

OpenCompare4 (see page 1019)

OpenCompare5 (see page 1020)

CloseECompare1 (see page 1024)

CloseECompare2 (see page 1024)

CloseECompare3 (see page 1025)

CloseCompare4 (see page 1022)

CloseCompare5 (see page 1022)

Output Compare Examples (see page 1025)

7.44.6 PWM (45K22 Set)

This peripheral library module:

- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

Functions

OpenEPWM1 (see page 1040)

OpenEPWM2 (see page 1040)

OpenEPWM3 (see page 1041)

OpenPWM4 (see page 1041)

OpenPWM5 (see page 1042)

SetDCEPWM1 (see page 1054)

SetDCEPWM2 (see page 1054)

SetDCEPWM3 (see page 1055)

SetDCPWM4 (see page 1049)

SetDCPWM5 (see page 1050)

SetOutputEPWM1 (see page 1045)

SetOutputEPWM2 (see page 1046)

SetOutputEPWM3 (see page 1046)

CloseEPWM1 (see page 1059)

CloseEPWM2 (see page 1059)

CloseEPWM3 (see page 1059)

ClosePWM4 (see page 1057)

ClosePWM5 (see page 1057)

PWM Examples (see page 1060)

7.44.7 I2C (45K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenI2C1 (see page 1064)

Writel2C1 (see page 1066)

Readl2C1 (see page 1067)

putsI2C1 (see page 1069)

getsI2C1 (see page 1070)

OpenI2C2 (see page 1065)

Writel2C2 (see page 1067)

Readl2C2 (see page 1068)

putsI2C2 (see page 1069)

getsI2C2 (see page 1071)

Macros

EnableIntI2C1

DisableIntI2C1

SetPriorityIntI2C1

I2C1_Clear_Intr_Status_Bit

I2C1_Intr_Status

StopI2C1

StartI2C1

RestartI2C1

NotAckI2C1

AckI2C1

DataRdyI2C1

IdleI2C1

Closel2C1

putcl2C1

getcl2C1

EnableIntI2C2

DisableIntI2C2

SetPriorityIntI2C2
I2C2_Clear_Intr_Status_Bit
I2C2_Intr_Status
StopI2C2
StartI2C2
RestartI2C2
NotAckI2C2
AckI2C2
DataRdyI2C2
IdleI2C2
CloselI2C2
putclI2C2
getclI2C2

I2C Examples ([see page 1072](#))

7.44.8 I2C EEPROM (44K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception to I2C EEPROM.
- Incorporates multiple BYTE transmission and reception in a single function call to EEPROM.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts
- Provides ACK polling sequence

Functions

OpenI2C1 (see page 1064)
EEAckPolling1 (see page 1076)
EEByteWrite1 (see page 1080)
EECurrentAddRead1 (see page 1078)
EEPageWrite1 (see page 1082)
EERandomRead1 (see page 1086)
EESequentialRead1 (see page 1084)
OpenI2C2 (see page 1065)
EEAckPolling2 (see page 1076)
EEByteWrite2 (see page 1080)
EECurrentAddRead2 (see page 1078)
EEPageWrite2 (see page 1083)
EERandomRead2 (see page 1087)
EESequentialRead2 (see page 1085)

I2C EEPROM Examples ([see page 1088](#))

7.44.9 SPI (45K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

`OpenSPI1` ([see page 1109](#))

`WriteSPI1` ([see page 1112](#))

`ReadSPI1` ([see page 1113](#))

`putsSPI1` ([see page 1114](#))

`getsSPI1` ([see page 1115](#))

`OpenSPI2` ([see page 1110](#))

`WriteSPI2` ([see page 1112](#))

`ReadSPI2` ([see page 1113](#))

`putsSPI2` ([see page 1114](#))

`getsSPI2` ([see page 1116](#))

Macros

`EnableIntSPI1`

`DisableIntSPI1`

`SetPriorityIntSPI1`

`SPI1_Clear_Intr_Status_Bit`

`SPI1_Intr_Status`

`SPI1_Clear_Recv_OV`

`CloseSPI1`

`DataRdySPI1`

`getcSPI1`

`putcSPI1`

`EnableIntSPI2`

`DisableIntSPI2`

`SetPriorityIntSPI2`

`SPI2_Clear_Intr_Status_Bit`

`SPI2_Intr_Status`

`SPI2_Clear_Recv_OV`

CloseSPI2
DataRdySPI2
getcSPI2
putcSPI2

SPI Examples ([see page 1116](#))

7.44.10 IO Ports (45K22 Family)

For this peripheral library:

- A parallel I/O port that shares a pin with a peripheral is, in general, subservient to the peripheral.
- When a peripheral is enabled and the peripheral is actively driving an associated pin, the use of the pin as a general purpose output pin is disabled.

Functions
OpenPORTB (see page 1089)
OpenRB0INT (see page 1089)
OpenRB1INT (see page 1090)
OpenRB2INT (see page 1091)

Macros
EnablePullups
DisablePullups
ClosePORTB
CloseRB0INT
CloseRB1INT
CloseRB2INT

IO Ports Examples ([see page 1093](#))

7.44.11 EEP (45K22 Set)

This peripheral library module:

- Byte Read from the specified location in EEPROM
- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

Functions

Write_b_eep ([see page 1061](#))

Read_b_eep ([see page 1061](#))

Busy_eep ([see page 1062](#))

EEP Examples ([see page 1062](#))

7.44.12 MWIRE (45K22 Family)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

OpenMwire1 ([see page 1166](#))

ReadMwire1 ([see page 1170](#))

WriteMwire1 ([see page 1169](#))

getsMwire1 ([see page 1167](#))

OpenMwire2 ([see page 1166](#))

ReadMwire2 ([see page 1171](#))

WriteMwire2 ([see page 1169](#))

getsMwire2 ([see page 1168](#))

Macros

CloseMwire1

getcMwire1

putcMwire1

DataRdyMwire1

CloseMwire2

getcMwire2

putcMwire2

DataRdyMwire2

MWIRE Examples ([see page 1172](#))

7.44.13 SW_RTCC (45K22 Family)

This peripheral library module:

- Provides a Real-Time Clock and Calendar (RTCC) function simulated using Timer1.

Functions

[Open_RTCC](#) (see page 1106)

[update_RTCC](#) (see page 1106)

[Close_RTCC](#) (see page 1106)

[SW_RTCC Examples](#) (see page 1107)

7.44.14 Timers (45K22 Set)

For this peripheral library module:

- The Timer module is a 8/16-bit timer , with one 8 bit timer and three 16 bit timers
- Timer 1 operates in CPU Idle modes and Sleep modes.
- Timer1 oscillator acts as low power oscillator
- Timer1/3/5 are 16 bit timers/counters
- Timer2/4/6/8 are 8 bit timers

Functions

[OpenTimer0](#) (see page 1119)

[ReadTimer0](#) (see page 1137)

[WriteTimer0](#) (see page 1139)

[CloseTimer0](#) (see page 1143)

[OpenTimer1](#) (see page 1121)

[ReadTimer1](#) (see page 1138)

[WriteTimer1](#) (see page 1140)

[CloseTimer1](#) (see page 1143)

[OpenTimer2](#) (see page 1123)

[CloseTimer2](#) (see page 1144)

[OpenTimer3](#) (see page 1125)

[ReadTimer3](#) (see page 1138)

[WriteTimer3](#) (see page 1140)

[CloseTimer3](#) (see page 1144)

[OpenTimer4](#) (see page 1130)

[CloseTimer4](#) (see page 1144)

[OpenTimer5](#) (see page 1129)

[ReadTimer5](#) (see page 1139)

[WriteTimer5](#) (see page 1140)

[CloseTimer5](#) (see page 1144)

[OpenTimer6](#) (see page 1131)

[CloseTimer6](#) (see page 1145)

Macros

[WriteTimer2](#)

[ReadTimer2](#)

[WriteTimer4](#)

[ReadTimer4](#)

[WriteTimer6](#)

[ReadTimer6](#)

[Timers Examples](#) (see page 1146)

7.44.15 Flash (45K22 Family)

This peripheral module supports functionalities:

- Erasing Flash (see page 1196)
- Writing blocks of data
- Writing a word
- Reading data from flash
- Loading table pointers and performing table-read operation

Functions

[ReadFlash](#) (see page 1198)

[EraseFlash](#) (see page 1196)

[WriteBlockFlash](#) (see page 1200)

[WriteWordFlash](#) (see page 1202)

[WriteBytesFlash](#) (see page 1203)

Macros

[LoadFlashAddr](#)

[TableRead](#)

Flash Examples ([see page 1204](#))

7.44.16 USART (45K22 Set)

This peripheral library module:

- Supports BYTE transmission and reception.
- Incorporates multiple BYTE transmission and reception in a single function call.
- Provides simple functions to read from and write to the buffers.
- Provides simple interface macros to enable/disable interrupts

Functions

[Open1USART](#) ([see page 1148](#))

[Write1USART](#) ([see page 1154](#))

[baud1USART](#) ([see page 1155](#))

[gets1USART](#) ([see page 1159](#))

[putrs1USART](#) ([see page 1160](#))

[puts1USART](#) ([see page 1162](#))

[Read1USART](#) ([see page 1163](#))

[Open2USART](#) ([see page 1150](#))

[Write2USART](#) ([see page 1155](#))

[baud2USART](#) ([see page 1157](#))

[gets2USART](#) ([see page 1159](#))

[putrs2USART](#) ([see page 1161](#))

[puts2USART](#) ([see page 1162](#))

[Read2USART](#) ([see page 1163](#))

Macros

`DataRdy1USART`

`Close1USART`

`Busy1USART`

`putc1USART`

`getc1USART`

`DataRdy2USART`

`Close2USART`

`Busy2USART`

`putc2USART`

`getc2USART`

USART Examples ([see page 1164](#))

8 Modules

The PIC18F peripheral library supports the hardware and software peripheral modules.

8.1 A/D Converter (ADC)

The 10 bit A/D Converter has the following key features:

- Successive Approximation (SAR) conversion
- Conversion speeds of up to 500 ksps
- up to 16 analog input pins
- External voltage reference input pins
- Internal band gap reference inputs
- Selectable conversion trigger source
- Selectable Buffer Fill modes
- Two result alignment options

8.1.1 ADC Functions

8.1.1.1 Open_ADC

8.1.1.1.1 OpenADC_Page1

```
void OpenADC( unsigned char config, unsigned char config2)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ADCON1 register as defined below</p> <ul style="list-style-type: none"> A/D clock source <ul style="list-style-type: none"> * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK A/D result justification <ul style="list-style-type: none"> * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK A/D voltage reference source <ul style="list-style-type: none"> * ADC_8ANA_0REF * ADC_7ANA_1REF * ADC_6ANA_2REF * ADC_6ANA_0REF * ADC_5ANA_1REF * ADC_5ANA_0REF * ADC_4ANA_2REF * ADC_4ANA_1REF * ADC_3ANA_2REF * ADC_3ANA_0REF * ADC_2ANA_2REF * ADC_2ANA_1REF * ADC_1ANA_2REF * ADC_1ANA_0REF * ADC_0ANA_0REF * ADC_CONFIG_MASK

config2	This contains the parameters to be configured in the ADCON0 register as defined below
	Channel
	* ADC_CH0
	* ADC_CH1
	* ADC_CH2
	* ADC_CH3
	* ADC_CH4
	* ADC_CH5
	* ADC_CH6
	* ADC_CH7
	A/D Interrupts
	* ADC_INT_ON
	* ADC_INT_OFF
	* ADC_INT_MASK

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.2 OpenADC_Page2

```
void OpenADC( unsigned char config, unsigned char config2)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ADCON1 register as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D port configuration * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA * ADC_12ANA * ADC_13ANA * ADC_14ANA * ADC_15ANA * ADC_CONFIG_MASK</p>

config2	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH13 * ADC_CH14 * ADC_CH15</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
---------	--

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.3 OpenADC_Page3

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	This contains the parameters to be configured in the as defined below A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK

config2	<p>This contains the parameters to be configured in the as defined below</p> <p>Channel * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA</p>

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.4 OpenADC_Page4

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	<p>This contains the parameters to be configured in the as defined below</p> <p>Channel * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA</p>

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.5 OpenADC_Page5

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH5
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH11
- * ADC_CH12
- * ADC_CH13
- * ADC_CH14
- * ADC_CH15

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

A/D Vref configuration

- * ADC_REF_VDD_VREFMINUS
- * ADC_REF_VREFPLUS_VREFMINUS
- * ADC_REF_VREFPLUS_VSS
- * ADC_REF_VDD_VSS
- * ADC_REF_MASK

portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration</p> <ul style="list-style-type: none"> * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA * ADC_12ANA * ADC_13ANA * ADC_14ANA * ADC_15ANA
------------	---

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.6 OpenADC_Page6

```
void OpenADC( unsigned char config, unsigned char config2, unsigned int portconfig )
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	<p>This contains the parameters to be configured in the as defined below</p> <p>Channel * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA * ADC_12ANA * ADC_13ANA</p>

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.7 OpenADC_Page7

```
void OpenADC( unsigned char config1, unsigned char config2, unsigned char config3)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config1	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D conversion type * ADC_CONV_CONTINUOUS * ADC_CONV_SINGLE_SHOT</p> <p>A/D conversion mode * ADC_MODE_MULTI_CH * ADC_MODE_SINGLE_CH</p> <p>A/D conversion sequence select * ADC_CONV_SEQ_SEQM1 * ADC_CONV_SEQ_SEQM2 * ADC_CONV_SEQ_STNM1 * ADC_CONV_SEQ_STNM2</p> <p>A/D result buffer depth Interrupt select control * INT_EACH_WR_BUF * INT_2_4_WR_BUF * INT_4_WR_BUF</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF</p>

config2	This contains the parameters to be configured in the as defined below A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK A/D FIFO buffer control * ADC_FIFO_EN * ADC_FIFO_DIS A/D Trigger Source * ADC_TRIG_EXT_INT0 * ADC_TRIG_TMR_5 * ADC_TRIG_INP_CAP * ADC_TRIG_CCP2_COM * ADC_TRIG_PCPWM
---------	---

8.1.1.1.8 OpenADC_Page8

```
void OpenADC( unsigned char config1, unsigned char config2, unsigned char config3)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config1	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D conversion type * ADC_CONV_CONTINUOUS * ADC_CONV_SINGLE_SHOT</p> <p>A/D conversion mode * ADC_MODE_MULTI_CH * ADC_MODE_SINGLE_CH</p> <p>A/D conversion sequence select * ADC_CONV_SEQ_SEQM1 * ADC_CONV_SEQ_SEQM2 * ADC_CONV_SEQ_STNM1 * ADC_CONV_SEQ_STNM2</p> <p>A/D result buffer depth Interrupt select control * INT_EACH_WR_BUF * INT_2_4_WR_BUF * INT_4_WR_BUF</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF</p>
config2	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS</p> <p>A/D FIFO buffer control * ADC_FIFO_EN * ADC_FIFO_DIS</p> <p>A/D Trigger Source * ADC_TRIG_EXT_INT0 * ADC_TRIG_TMR_5 * ADC_TRIG_INP_CAP * ADC_TRIG_CCP2_COM * ADC_TRIG_PCPWM</p>

config3	This contains the parameters to be configured in the as defined below A/D result justification * ADC_RIGHT JUST * ADC_LEFT JUST A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_10_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_24_TAD * ADC_28_TAD * ADC_32_TAD * ADC_36_TAD * ADC_40_TAD * ADC_48_TAD * ADC_64_TAD A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC A/D Channel selection Channel from group A * ADC_CH_GRA_AN0() * ADC_CH_GRA_AN4() Channel from group B * ADC_CH_GRB_AN1() Channel from group C * ADC_CH_GRC_AN2() Channel from group D * ADC_CH_GRD_AN3()
---------	---

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.1.9 OpenADC_Page9

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char config3, unsigned int portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT JUST * ADC_LEFT JUST * ADC_RESULT MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	<p>This contains the parameters to be configured in the as defined below</p> <p>Channel * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * FVR1 * DAC1</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p>
config3	<p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA</p> <p>Below macros are applicable only to F1xK50 Family * ADC_0ANA * ADC_1ANA * ADC_2ANA</p>

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.10 OpenADC_Page10

```
void OpenADC( unsigned char config, unsigned char config2, unsigned int portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT JUST * ADC_LEFT JUST * ADC_RESULT MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH11
- * ADC_CH12
- * ADC_CH_CTMU
- * ADC_CH_VDDCORE
- * ADC_CH_VBG

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

A/D Vref configuration

- * ADC_REF_VDD_VREFMINUS
- * ADC_REF_VREFPLUS_VREFMINUS
- * ADC_REF_VREFPLUS_VSS
- * ADC_REF_VDD_VSS
- * ADC_REF_MASK

portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration</p> <ul style="list-style-type: none"> * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA * ADC_12ANA * ADC_13ANA <p>Band Gap selection:</p> <ul style="list-style-type: none"> * ADC_VBG_ON * ADC_VBG_OFF
------------	--

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.11 OpenADC_Page11

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char portconfig )
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	<p>This contains the parameters to be configured in the as defined below</p> <p>Channel * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA</p> <p>Special Trigger configuration * ADC_TRIG_CTMU * ADC_TRIG_CCP2</p>

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.12 OpenADC_Page12

```
void OpenADC( unsigned char config, unsigned char config2, unsigned int portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT JUST * ADC_LEFT JUST * ADC_RESULT MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH5
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH11
- * ADC_CH12
- * ADC_CH13
- * ADC_CH14
- * ADC_CH15

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

A/D Vref configuration

- * ADC_REF_VDD_VREFMINUS
- * ADC_REF_VREFPLUS_VREFMINUS
- * ADC_REF_VREFPLUS_VSS
- * ADC_REF_VDD_VSS
- * ADC_REF_MASK

portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration</p> <ul style="list-style-type: none"> * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA * ADC_12ANA * ADC_13ANA * ADC_14ANA * ADC_15ANA
------------	---

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.13 OpenADC_Page13

```
void OpenADC( unsigned char config, unsigned char config2, unsigned int portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH5
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH11
- * ADC_CH16
- * ADC_CH17
- * ADC_CH18
- * ADC_CH19
- * ADC_CH30
- * ADC_CH31

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

config3	<p>This contains the parameters to be configured in the as defined below</p> <p>Special Trigger Select * ADC_TRIG_RTCC * ADC_TRIG_TIMER1 * ADC_TRIG_CTMU * ADC_TRIG CCP2</p> <p>Analog Negative Channel Select * ADC_NEG_CH0 * ADC_NEG_CH1 * ADC_NEG_CH2 * ADC_NEG_CH3 * ADC_NEG_CH4 * ADC_NEG_CH5 * ADC_NEG_CH6 * ADC_NEG_CH7</p> <p>A/D VREF+ Configuration * ADC_REF_VDD_VDD * ADC_REF_VDD_VREFPLUS * ADC_REF_VDD_INT_VREF_2 * ADC_REF_VDD_INT_VREF_4</p> <p>A/D VREF- Configuration * ADC_REF_VDD_VSS * ADC_REF_VDD_VREFMINUS</p>
---------	---

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.14 OpenADC_Page14

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char config3)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH5
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH11
- * ADC_CH12
- * ADC_CH13
- * ADC_CH14
- * ADC_CH15
- * ADC_CH16
- * ADC_CH17
- * ADC_CH18
- * ADC_CH19
- * ADC_CH20
- * ADC_CH21
- * ADC_CH22
- * ADC_CH23
- * ADC_CH28
- * ADC_CH29
- * ADC_CH30
- * ADC_CH31

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

config3	<p>This contains the parameters to be configured in the as defined below</p> <p>Special Trigger Select * ADC_TRIG_RTCC * ADC_TRIG_TIMER1 * ADC_TRIG_CTMU * ADC_TRIG_CCP2</p> <p>Analog Negative Channel Select * ADC_NEG_CH0 * ADC_NEG_CH1 * ADC_NEG_CH2 * ADC_NEG_CH3 * ADC_NEG_CH4 * ADC_NEG_CH5 * ADC_NEG_CH6 * ADC_NEG_CH7</p> <p>A/D VREF+ Configuration * ADC_REF_VDD_VDD * ADC_REF_VDD_VREFPLUS * ADC_REF_VDD_INT_VREF_2 * ADC_REF_VDD_INT_VREF_4</p> <p>A/D VREF- Configuration * ADC_REF_VDD_VSS * ADC_REF_VDD_VREFMINUS</p>
---------	---

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.15 OpenADC_Page15

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char config3, unsigned int portconfig)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	<p>This contains the parameters to be configured in the as defined below</p> <p>Channel * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH_CTMU * ADC_CH_VDDCORE * ADC_CH_VBG</p> <p>A/D Interrupts * ADC_INT_ON * ADC_INT_OFF * ADC_INT_MASK</p> <p>A/D Vref configuration * ADC_REF_VDD_VREFMINUS * ADC_REF_VREFPLUS_VREFMINUS * ADC_REF_VREFPLUS_VSS * ADC_REF_VDD_VSS * ADC_REF_MASK</p>
config3	Special Trigger Select bit * ADC_TRIG_RTCC * ADC_TRIG_TIMER1 * ADC_TRIG_CTMU * ADC_TRIG_CCP2

portconfig	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D port configuration</p> <ul style="list-style-type: none"> * ADC_0ANA * ADC_1ANA * ADC_2ANA * ADC_3ANA * ADC_4ANA * ADC_5ANA * ADC_6ANA * ADC_7ANA * ADC_8ANA * ADC_9ANA * ADC_10ANA * ADC_11ANA * ADC_12ANA * ADC_13ANA <p>Band Gap selection:</p> <ul style="list-style-type: none"> * ADC_VBG_ON * ADC_VBG_OFF
------------	--

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.16 OpenADC_Page16

```
void OpenADC( unsigned char config, unsigned char config2, unsigned char config3)
```

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH5
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH29
- * ADC_CH30
- * ADC_CH31

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

config3	<p>This contains the parameters to be configured in the as defined below</p> <p>Special Trigger Select * ADC_TRIG_RTCC * ADC_TRIG_TIMER1 * ADC_TRIG_CTMU * ADC_TRIG_CCP2</p> <p>Analog Negative Channel Select * ADC_NEG_CH0 * ADC_NEG_CH1 * ADC_NEG_CH2 * ADC_NEG_CH3 * ADC_NEG_CH4 * ADC_NEG_CH5 * ADC_NEG_CH6</p> <p>A/D VREF+ Configuration * ADC_REF_VDD_VDD * ADC_REF_VDD_VREFPLUS * ADC_REF_VDD_INT_VREF_2 * ADC_REF_VDD_INT_VREF_4</p> <p>A/D VREF- Configuration * ADC_REF_VDD_VSS * ADC_REF_VDD_VREFMINUS</p>
---------	--

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.17 OpenADC_Page17

void OpenADC(unsigned char config, unsigned char config2, unsigned char config3)
--

This function configures A/D & starts the conversion.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the as defined below</p> <p>A/D clock source * ADC_FOSC_2 * ADC_FOSC_4 * ADC_FOSC_8 * ADC_FOSC_16 * ADC_FOSC_32 * ADC_FOSC_64 * ADC_FOSC_RC * ADC_FOSC_MASK</p> <p>A/D result justification * ADC_RIGHT_JUST * ADC_LEFT_JUST * ADC_RESULT_MASK</p> <p>A/D acquisition time select * ADC_0_TAD * ADC_2_TAD * ADC_4_TAD * ADC_6_TAD * ADC_8_TAD * ADC_12_TAD * ADC_16_TAD * ADC_20_TAD * ADC_TAD_MASK</p>

config2	This contains the parameters to be configured in the as defined below
---------	---

Channel

- * ADC_CH0
- * ADC_CH1
- * ADC_CH2
- * ADC_CH3
- * ADC_CH4
- * ADC_CH5
- * ADC_CH6
- * ADC_CH7
- * ADC_CH8
- * ADC_CH9
- * ADC_CH10
- * ADC_CH11
- * ADC_CH12
- * ADC_CH13
- * ADC_CH14
- * ADC_CH15
- * ADC_CH16
- * ADC_CH17
- * ADC_CH18
- * ADC_CH19
- * ADC_CH20
- * ADC_CH21
- * ADC_CH22
- * ADC_CH23
- * ADC_CH24
- * ADC_CH25
- * ADC_CH26
- * ADC_CH27
- * ADC_CH_CTMU
- * ADC_CH_DAC
- * ADC_CH_FRV

A/D Interrupts

- * ADC_INT_ON
- * ADC_INT_OFF
- * ADC_INT_MASK

config3	<p>This contains the parameters to be configured in the as defined below</p> <p>Special Trigger Select * ADC_TRIG_CTMU * ADC_TRIG_CCP5</p> <p>A/D VREF+ Configuration * ADC_REF_VDD_VDD * ADC_REF_VDD_VREFPLUS * ADC_REF_FVR_BUF</p> <p>A/D VREF- Configuration * ADC_REF_VDD_VSS * ADC_REF_VDD_VREFMINUS</p>
---------	--

Returns

None

Remarks

This function configures the ADC for the following parameters: Operating mode, Data o/p format, Sample Clk Source, VREF source, No of samples/int, sample mode, Conv clock source, Conv Clock Select bits, Port Config Control bits.

8.1.1.2 SetChan_ADC

8.1.1.2.1 SetChanADC_Page1

```
void SetChanADC(unsigned char channel)
```

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH13 * ADC_CH14 * ADC_CH15

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.2 SetChanADC_Page2

```
void SetChanADC(unsigned char channel)
```

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * DAC1 * FVR1

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.3 SetChanADC_Page3

void SetChanADC(unsigned char channel)

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH_CTMU * ADC_CH_VDDCORE * ADC_CH_VBG

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.4 SetChanADC_Page4

```
void SetChanADC(unsigned char channel)
```

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH_GRA_AN0() * ADC_CH_GRA_AN4() * ADC_CH_GRB_AN1() * ADC_CH_GRC_AN2() * ADC_CH_GRD_AN3() * ADC_CH_GRB_AN5() * ADC_CH_GRC_AN6() * ADC_CH_GRD_AN7() * ADC_CH_GRA_AN8() * ALL_CH_DIGITAL()

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.5 SetChanADC_Page5

void SetChanADC(unsigned char channel)

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH_GRA_AN0() * ADC_CH_GRA_AN4() * ADC_CH_GRB_AN1() * ADC_CH_GRC_AN2() * ADC_CH_GRD_AN3()

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.6 SetChanADC_Page6

void SetChanADC(unsigned char channel)

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH16 * ADC_CH17 * ADC_CH18 * ADC_CH19 * ADC_CH30 * ADC_CH31

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.7 SetChanADC_Page7

void SetChanADC(unsigned char channel)

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH13 * ADC_CH14 * ADC_CH15 * ADC_CH16 * ADC_CH17 * ADC_CH18 * ADC_CH19 * ADC_CH20 * ADC_CH21 * ADC_CH22 * ADC_CH23 * ADC_CH28 * ADC_CH29 * ADC_CH30 * ADC_CH31

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.2.8 SetChanADC_Page8

```
void SetChanADC(unsigned char channel)
```

This function Select the channel used as input to the A/D converter.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH29 * ADC_CH30 * ADC_CH31

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter.

8.1.1.3 SelChanConv_ADC

8.1.1.3.1 SelChanConvADC_Page1

```
void SelChanConvADC(unsigned char channel)
```

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH13 * ADC_CH14 * ADC_CH15

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.2 SelChanConvADC_Page2

void SelChanConvADC(unsigned char channel)

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * DAC1 * FVR1

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.3 SelChanConvADC_Page3

void SelChanConvADC(unsigned char channel)

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH_CTMU * ADC_CH_VDDCORE * ADC_CH_VBG

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.4 SelChanConvADC_Page4

void SelChanConvADC(unsigned char channel)

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH_GRA_AN0() * ADC_CH_GRA_AN4() * ADC_CH_GRB_AN1() * ADC_CH_GRC_AN2() * ADC_CH_GRD_AN3() * ADC_CH_GRB_AN5() * ADC_CH_GRC_AN6() * ADC_CH_GRD_AN7() * ADC_CH_GRA_AN8() * ALL_CH_DIGITAL()

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.5 SelChanConvADC_Page5

void SelChanConvADC(unsigned char channel)

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH_GRA_AN0() * ADC_CH_GRA_AN4() * ADC_CH_GRB_AN1() * ADC_CH_GRC_AN2() * ADC_CH_GRD_AN3()

Returns
None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.6 SelChanConvADC_Page6

void SelChanConvADC(unsigned char channel)

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH16 * ADC_CH17 * ADC_CH18 * ADC_CH19 * ADC_CH30 * ADC_CH31

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.7 SelChanConvADC_Page7

void SelChanConvADC(unsigned char channel)

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH11 * ADC_CH12 * ADC_CH13 * ADC_CH14 * ADC_CH15 * ADC_CH16 * ADC_CH17 * ADC_CH18 * ADC_CH19 * ADC_CH20 * ADC_CH21 * ADC_CH22 * ADC_CH23 * ADC_CH28 * ADC_CH29 * ADC_CH30 * ADC_CH31

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.3.8 SelChanConvADC_Page8

```
void SelChanConvADC(unsigned char channel)
```

This function Select the channel used as input to the A/D converter and starts the A/D conversion process.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
channel	<p>This contains the parameters to be configured in the ADCON0 register as defined below</p> <p>Channel Select</p> <ul style="list-style-type: none"> * ADC_CH0 * ADC_CH1 * ADC_CH2 * ADC_CH3 * ADC_CH4 * ADC_CH5 * ADC_CH6 * ADC_CH7 * ADC_CH8 * ADC_CH9 * ADC_CH10 * ADC_CH29 * ADC_CH30 * ADC_CH31

Returns

None

Remarks

Selects the pin that will be used as input to the A/D converter, and starts an A/D conversion. The BusyADC() function or A/D interrupt may be used to detect completion of the conversion.

8.1.1.4 Convert_ADC

```
void ConvertADC(void)
```

This function starts the A/D conversion.

Returns

None

Remarks

This function sets the ADCON0<GO> bit and thus starts conversion.

8.1.1.5 Busy_ADC

char BusyADC(void)

This function returns the ADC conversion status

Returns

If the value of GO is '1', then '1' is returned, indicating that the ADC is busy in conversion. If the value of GO is '0', then '0' is returned, indicating that the ADC has completed conversion.

Remarks

This function returns the complement of the ADCON0 <GO/~DONE> bit status which indicates whether the ADC is busy in conversion.

8.1.1.6 Read_ADC

int ReadADC(void)

This function reads the ADC Buffer register which contains the conversion value.

Returns

Returns the ADC Buffer value

Remarks

None

8.1.1.7 Close_ADC

void CloseADC(void)

This function turns off the ADC module and disables the ADC interrupts

Returns

None

Remarks

This function first disables the ADC interrupt and then turns off the ADC module. The Interrupt Flag bit (ADIF) is also cleared.

8.1.2 ADC Structs,Records,Enums

8.1.3 ADC Macros

8.1.4 ADC Examples

8.1.4.1 ADC Example 1

Example Source Code demonstrating peripheral library usage

```
/*****************************************************************************  
* NOTES:  
* Code uses the Peripheral library support available with MCC18 Compiler  
* Code Tested on:  
* PicDem2+ demo board with PIC18F4685 controller  
*  
* signal to be converted is fed to AN0 channel.  
*****/  
  
#define USE_OR_MASKS  
#include <p18cxx.h>  
#include "adc.h"  
  
unsigned int ADCResult=0;  
float voltage=0;  
  
void main(void)  
{  
    unsigned char channel=0x00,config1=0x00,config2=0x00,config3=0x00,portconfig=0x00,i=0;  
  
    /*-- clear adc interrupt and turn off adc if in case was on previously---  
    CloseADC();  
  
    //---initialize adc---  
    **** ADC configured for:  
    * FOSC/2 as conversion clock  
    * Result is right justified  
    * Aquisition time of 2 AD  
    * Channel 1 for sampling  
    * ADC interrupt on  
    * ADC reference voltage from VDD & VSS  
*/  
    config1 = ADC_FOSC_2 | ADC_RIGHT JUST | ADC_2_TAD ;  
    config2 = ADC_CH0 | ADC_INT_ON | ADC_REF_VDD_VSS ;  
    portconfig = ADC_15ANA ;  
    OpenADC(config1,config2,portconfig);
```

```

//---initialize the adc interrupt and enable them---
ADC_INT_ENABLE();

//---sample and convert---
for(i=0;i<16;i++)
{
ConvertADC();
while(BusyADC());
ADCResult += (unsigned int) ReadADC();
}
ADCResult /= 16;
voltage = (ADCResult*5.0)/1024; // convert ADC count into voltage

CloseADC();           //turn off ADC
while(1);            //End of program
}

```

8.2 Analog Comparator (ANCOMP)

Analog Comparators with Programmable Input/Output Configuration. The comparator module provides dual input comparators. The inputs to the comparator can be configured to use any one of four external analog inputs as well, as a voltage reference input from either the internal band gap reference divided by two (VBG/2) or the comparator voltage reference generator.

8.2.1 Comparator Functions

8.2.1.1 Open_ANCOMP

```
void Open_ancomp(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator Output Inversion: * COMP_1_2_OP_INV * COMP_1_OP_INV * COMP_2_OP_INV * COMP_OP_INV_NONE * COMP_OP_MASK</p> <p>Comparator Mode Select: * COMP_1_2_INDP * COMP_1_2_INDP_OP * COMP_1_2_COMM_REF * COMP_1_2_COMM_REF_OP * COMP_1_INDP_OP * COMP_INT_REF_SAME_IP * COMP_INT_REF_MUX_IP * COMP_SELECT_MASK</p> <p>Comparator Interrupts: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p>

Returns
None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.2 Open_ancomp1_Page1

```
void Open_ancomp1(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator1 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator1 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator1 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator1 Ref (C1VREF)select: * COMP_REF_FVR * COMP_REF_CVREF * COMP_REF_MASK</p> <p>Comparator1 Speed/Power select: * COMP_HSPEED * COMP_LSPEED * COMP_HSPEED_MASK</p> <p>Comparator1 Ref (C1VIN+) select: * COMP_VINP_PIN * COMP_VINP_VREF * COMP_VINP_MASK</p> <p>Comparator1 channel select: * COMP_VINM_IN0 * COMP_VINM_IN1 * COMP_VINM_IN2 * COMP_VINM_IN3 * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.3 Open_ancomp1_Page2

```
void Open_ancomp1(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator1 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator1 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator1 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator1 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator1 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator1 channel select: * COMP_VINM_VIRV * COMP_VINM_CIND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.4 Open_ancomp1_Page3

```
void Open_ancomp1(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator1 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator1 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator1 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator1 Ref (C1VREF)select: * COMP_REF_FVR * COMP_REF_DAC * COMP_REF_MASK</p> <p>Comparator1 Speed/Power select: * COMP_HSPEED * COMP_LSPEED * COMP_HSPEED_MASK</p> <p>Comparator1 Ref (C1VP) select: * COMP_C1VP_VREF * COMP_C1VP_PIN * COMP_C1VP_MASK</p> <p>Comparator1 channel select: * COMP_VINM_GND * COMP_VINM_IN1 * COMP_VINM_IN2 * COMP_VINM_IN3 * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.5 Open_ancomp1_Page4

```
void Open_ancomp1(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator1 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator1 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator1 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator1 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator1 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator1 channel select: * COMP_VINM_VBG * COMP_VINM_CM1_C2INB * COMP_VINM_GND * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.6 Open_ancomp1_Page5

void Open_ancomp1(unsigned char config)

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator1 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator1 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator1 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator1 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator1 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator1 channel select: * COMP_VINM_VBG * COMP_VINM_CM1_CM3_C2INB * COMP_VINM_CM2_C2IND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.7 Open_amcomp2_Page1

```
void Open_ancomp2(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator2 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator2 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator2 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator2 Ref (C1VREF)select: * COMP_REF_FVR * COMP_REF_CVREF * COMP_REF_MASK</p> <p>Comparator2 Speed/Power select: * COMP_HSPEED * COMP_LSPEED * COMP_HSPEED_MASK</p> <p>Comparator2 Ref (C1VIN+) select: * COMP_VINP_PIN * COMP_VINP_VREF * COMP_VINP_MASK</p> <p>Comparator2 channel select: * COMP_VINM_IN0 * COMP_VINM_IN1 * COMP_VINM_IN2 * COMP_VINM_IN3 * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.8 Open_ancomp2_Page2

```
void Open_ancomp2(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator2 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator2 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator2 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator2 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator2 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator2 channel select: * COMP_VINM_VIRV * COMP_VINM_CIND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.9 Open_ancomp2_Page3

void Open_ancomp2(unsigned char config)

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator2 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator2 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator2 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator2 Ref (C1VREF)select: * COMP_REF_FVR * COMP_REF_DAC * COMP_REF_MASK</p> <p>Comparator2 Speed/Power select: * COMP_HSPEED * COMP_LSPEED * COMP_HSPEED_MASK</p> <p>Comparator2 Ref (C1VP) select: * COMP_C1VP_VREF * COMP_C1VP_PIN * COMP_C1VP_MASK</p> <p>Comparator2 channel select: * COMP_VINM_GND * COMP_VINM_IN1 * COMP_VINM_IN2 * COMP_VINM_IN3 * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.10 Open_ancomp2_Page4

```
void Open_ancomp2(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator2 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator2 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator2 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator2 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator2 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator2 channel select: * COMP_VINM_VBG * COMP_VINM_CM1_C2INB * COMP_VINM_GND * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.11 Open_ancomp2_Page5

void Open_ancomp2(unsigned char config)

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator2 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator2 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator2 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator2 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator2 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator2 channel select: * COMP_VINM_VBG * COMP_VINM_CM1_CM3_C2INB * COMP_VINM_CM2_C2IND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.12 Open_ancomp3_Page1

```
void Open_ancomp3(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator3 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator3 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator3 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator3 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator3 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator3 channel select: * COMP_VINM_VBG * COMP_VINM_CM1_CM3_C2INB * COMP_VINM_CM2_C2IND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.13 Open_ancomp1_Page6

void Open_ancomp1(unsigned char config)

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator1 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator1 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator1 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator1 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator1 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator1 channel select: * COMP_VINM_VIRV * COMP_VINM_CIND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns
None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.14 Open_ancomp2_Page6

```
void Open_ancomp2(unsigned char config)
```

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator2 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator2 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator2 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator2 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator2 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator2 channel select: * COMP_VINM_VIRV * COMP_VINM_CIND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns

None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.1.15 Open_ancomp3_Page2

void Open_ancomp3(unsigned char config)

This routine configures Reference Voltage level and Comparator module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CVRCON & CMxCON Registers.</p> <p>Comparator3 Interrupt: * COMP_INT_EN * COMP_INT_DIS * COMP_INT_MASK</p> <p>Comparator3 Output enable: * COMP_OP_EN * COMP_OP_DIS * COMP_OP_MASK</p> <p>Comparator3 output polarity select: * COMP_OP_INV * COMP_OP_NINV * COMP_OP_INV_MASK</p> <p>Comparator3 Interrupt polarity select: * COMP_INT_ALL_EDGE * COMP_INT_FALL_EDGE * COMP_INT_RISE_EDGE * COMP_INT_NOGEN * COMP_INT_EDGE_MASK</p> <p>Comparator3 Ref (C1VIN+)select: * COMP_REF_CVREF * COMP_REF_CINA * COMP_REF_MASK</p> <p>Comparator3 channel select: * COMP_VINM_VIRV * COMP_VINM_CIND * COMP_VINM_CINC * COMP_VINM_CINB * COMP_VINM_MASK</p>

Returns
None

Remarks

This function configures comparator with channel of selection for positive and negative input terminals, configures interrupts, reference voltage module is configured based on input parameters.

8.2.1.2 Close_ANCOMP

8.2.1.2.1 Close_ancomp_Page1

```
void Close_ancomp(void)
```

This function turns off the Comparator module and disables the Comparator interrupts

Returns
None

Remarks

This function first disables the Comparator interrupt and then turns off the Comparator module. The Interrupt Flag bit (CMIF) is also cleared.

8.2.1.2.2 Close_ancomp1_Page1

```
void Close_ancomp1(void)
```

This function turns off the Comparator module and disables the Comparator interrupts

Returns
None

Remarks

This function first disables the Comparator interrupt and then turns off the Comparator module. The Interrupt Flag bit (CM1IF) is also cleared.

8.2.1.2.3 Close_ancomp2_Page1

```
void Close_ancomp2(void)
```

This function turns off the Comparator module and disables the Comparator interrupts

Returns
None

Remarks

This function first disables the Comparator interrupt and then turns off the Comparator module. The Interrupt Flag bit (CM2IF) is also cleared.

8.2.1.2.4 Close_ancomp3_Page1

```
void Close_ancomp3(void)
```

This function turns off the Comparator module and disables the Comparator interrupts

Returns

None

Remarks

This function first disables the Comparator interrupt and then turns off the Comparator module. The Interrupt Flag bit (CM3IF) is also cleared.

8.2.2 Comparator Macros

8.2.3 Comparator Examples

8.2.3.1 Comparator Example1

Example Source Code demonstrating peripheral library usage

```
*****
*
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
* signal to be compared are applied to CxIN+ & CxIN- and output is tapped at CxOUT
*****/
```

```
#define USE_OR_MASKS
#include <p18cxx.h>
#include "ancomp.h"

unsigned char CMPResult;

void main(void)
{
    unsigned char config=0x00;

//*****Configure Analog Comparator *****
/** Analog comparator is configured for:
 * Output is non-inverted
 * comparator 1 & 2 are configured as independent comparators
 * comparator interrupt is enabled
*/
    config = COMP_OP_INV_NONE | COMP_1_2_IND | COMP_INT_EN ;
    Open_ancomp(config);

    while(1)
    {
        if( (CMCON&0x40) ) //check for the comparator output status or comparator
interrupt flag status
            CMPResult=1; //flag the logic 1 status of comparator output
        else
            CMPResult=0; // flag the logic 0 status of comparator output
    }
    //--- Turn off comparator ---
}
```

```
Close_ancomp();  
while(1);  
}  
  
//End of program
```

8.3 Charge Time Measurement Unit (CTMU)

The Charge Time Measurement Unit is a flexible analog module that provides accurate differential time measurement between pulse sources, as well as asynchronous pulse generation. Its key features include:

- Four edge input trigger sources
- Polarity control for each edge source
- Control of edge sequence
- Control of response to edges
- Time measurement resolution of 1 nanosecond
- Accurate current source suitable for capacitive measurement

Together with other on-chip analog modules, the CTMU can be used to precisely measure time, measure capacitance, measure relative changes in capacitance, or generate output pulses that are independent of the system clock. The CTMU module is ideal for interfacing with capacitive-based sensors.

8.3.1 CTMU Functions

8.3.1.1 Open_CTMU

```
void OpenCTMU(unsigned char config1, unsigned char config2, unsigned char config3)
```

This function configures the CTMU.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing bitwise OR operation ('|'), configurable in the way shown in the examples

Input Parameters	Description
config1	config1 - This contains the parameters to be configured in the CTMUCONH register as defined below
	Enable/Disable bit *CTMU_ENABLE *CTMU_DISABLE
	Idle Mode bit *CTMU_IDLE_STOP *CTMU_IDLE_CONTINUE
	Time Generation Enable bit *CTMU_TIME_GEN_ENABLE *CTMU_TIME_GEN_DISABLE
	Edge Enable bit *CTMU_EDGE_ENABLE *CTMU_EDGE_DISABLE
	Edge sequence Enable bit *CTMU_EDGE_SEQUENCE_ON *CTMU_EDGE_SEQUENCE_OFF
	Analog Current Source Control bit *CTMU_ANA_CURR_SOURCE_GND *CTMU_ANA_CURR_SOURCE_NOT_GND
	Trigger Control bit *CTMU_TRIG_OUTPUT_ENABLE *CTMU_TRIG_OUTPUT_DISABLE
	Enable/Disable Interrupt *CTMU_INT_ON *CTMU_INT_OFF

config2	<p>This contains the parameters to be configured in the CTMUCONL register as defined below</p> <p>Edge2 Polarity select bit *CTMU_EDGE2_POLARITY_POS *CTMU_EDGE2_POLARITY_NEG</p> <p>Edge2 Source Select bit *CTMU_EDGE2_SOURCE_CTED1 *CTMU_EDGE2_SOURCE_CTED2 *CTMU_EDGE2_SOURCE_OC1 *CTMU_EDGE2_SOURCE_TIMER1</p> <p>Edge1 Polarity Select bit *CTMU_EDGE1_POLARITY_POS *CTMU_EDGE1_POLARITY_NEG</p> <p>Edge1 Source Select bits *CTMU_EDGE1_SOURCE_CTED1 *CTMU_EDGE1_SOURCE_CTED2 *CTMU_EDGE1_SOURCE_OC1 *CTMU_EDGE1_SOURCE_TIMER1</p>
---------	---

8.3.1.2 CurrentControl_CTMU

void CurrentControlCTMU(unsigned char config)
--

This function selects the current source range and trims the current source of CTMU.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing bitwise OR operation ('|'), configurable in the way shown in the examples

Input Parameters	Description
------------------	-------------

8.3.1.3 Close_CTMU

void CloseCTMU (void)

This function turns off the CTMU module and disables the CTMU interrupts.

Returns

None

Remarks

This function first disables the CTMU interrupt and then turns off the CTMU module. The Interrupt Flag bit is also cleared.

8.3.2 CTMU Macros

8.3.3 CTMU Examples

8.3.3.1 CTMU Example1

Example Source Code demonstrating peripheral library usage

```
*****
*
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PIC18F46J50 controller
*
* Capacitor(for capacitance measurement) is connected on AN7.
* "capacitance" variable contains the final measured value of capacitance.
*****/
```

```
#include "p18cxx.h"
#define USE_OR_MASKS
#include "adc.h"
#include "ctmu.h"
#include "delays.h"

float voltage,current, capacitance,time;

void main(void)
{
    unsigned char ctmucon1=0,ctmucon2=0,ctmuicon=0,config1=0,config2=0,config3=0,i=0;
    unsigned int adccount=0;

    // current = 0.000055 ; // 55uA - 100_BASE_CURR
    //current = 0.0000055 ; // 5.5uA - 10_BASE_CURR
    current = 0.00000055 ; // 0.55uA - BASE_CURR

    TRISB= TRISB | 0x0002; //Configure RB1 as input pin

    /*Configure ADC to read channel 1*/
    //---initialize adc---
    **** ADC configured for:
        * FOSC-RC as source of conversion clock
        * Result is right justified
        * Aquisition time of 2 AD
        * Channel 7 for sampling
        * ADC interrupt off
        * ADC reference voltage from VDD & VSS
    */
    config1 = ADC_FOSC_RC | ADC_RIGHT JUST | ADC_2_TAD ;
    config2 = ADC_CH7 | ADC_INT_OFF | ADC_REF_VDD_VSS ;
    config3 = ADC_13ANA | ADC_VBG_OFF;
    OpenADC(config1,config2,config3);
    ADRESH=0;           //clear the ADC result register
    ADRESL=0;           //clear the ADC result register
```

```

/*Configure the CTMU*/
//-----
***** CTMU configured for:
 * Edge 1 programmed for a positive edge response
 * Edge 2 programmed for a positive edge response
 * CTED1 is a source select for Edge
 * trigger output disaled
 * Edge sequence of CTMU disabled
 * no edge delay generation
 * CTMU edges blocked
 * Current of 0.55uA
*/
ctmucon2 = CTMU_EDGE1_POLARITY_POS | CTMU_EDGE2_POLARITY_POS | CTMU_EDGE1_SOURCE_CTED1
           | CTMU_EDGE2_SOURCE_CTED1 ;
ctmucon1 = CTMU_TRIG_OUTPUT_DISABLE | CTMU_EDGE_SEQUENCE_OFF | CTMU_TIME_GEN_DISABLE
           | CTMU_EDGE_DISABLE ;
ctmuicon = CTMU_NOMINAL_CURRENT | CTMU_CURR_RANGE_BASE_CURR;
OpenCTMU(ctmucon1,ctmucon2,ctmuicon);

Enbl_CTMUEdge1;      //Enable current source

/* Wait for 50 usec*/
Delay10TCYx(0x05);

Disbl_CTMUEdge1;      //Disable current source

PIR1bits.ADIF=0;      //clear the ADC interrupt

/* Read ADC*/
ConvertADC();          // stop sampling and starts adc conversion
while(BusyADC());     //wait untill the conversion is completed
adccount = ReadADC(); //read the result of conversion
/* Capacitance calculation */
time = 0.00005;
voltage = (adccount*3.3)/1024; // convert ADC count into voltage
capacitance = (current * time)/voltage; // calculate the Capacitance value

CloseADC();            // disable ADC
CloseCTMU();           //disable CTMU

while(1);              //End of program
}

```

8.4 Deep Sleep (DPSLP)

Deep Sleep mode brings the device into its lowest power consumption state without requiring the use of external switches to remove power from the device. During deep sleep, the on-chip VDDCORE voltage regulator is powered down, effectively disconnecting power to the core logic of the microcontroller.

8.4.1 Deep Sleep Functions

8.4.1.1 Goto_DeepSleep

```
void gotoDeepSleep( unsigned int config )
```

This function saves content to DPGPRx registers, enables the sources of deep sleep wake up and puts the device to deep sleep.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing bitwise OR operation ('|'), configurable as shown in the examples

Input Parameters	Description
config	<p>contains parameters to configure the deep sleep wake up sources</p> <p>Deep Sleep Ultra Low Power Wake Up *DPSLP_ULPWU_ENABLE *DPSLP_ULPWU_DISABLE</p> <p>RTCC wake up source enable/disable *DPSLP_RTCC_WAKEUP_ENABLE *DPSLP_RTCC_WAKEUP_DISABLE</p>

Returns

None

Remarks

Affects Ultra Low Power wake up module configuration.

8.4.1.2 DeepSleep_WakeUpSource

```
void DeepSleepWakeUpSource( SRC* ptr)
```

This function updates source of wake up of device from deep sleep.

Input Parameters

Input Parameters	Description
SRC	Pointer to union that reflects the status of deep sleep wake up source

Returns

Updates the SRC union with the source of wake up from deep sleep

Remarks

This function updates union SRC reflects the wake up source of deep sleep.

8.4.1.3 IsResetFrom_DeepSleep

unsigned char IsResetFromDeepSleep(void)
--

This function returns the source of reset.

Returns

Reset source

* -1 : Reset source is Deep Sleep Wake up

* 0 : Reset source is pure Power on Reset/BOR during sleep/some other source

Remarks

Clears DS bit in WDTCON.

8.4.1.4 Read_DSGPR

void ReadDSGPR(CONTEXT* ptr)

This function reads context saved in DSGPRx registers and updates in CONTEXT structure.

Input Parameters

Input Parameters	Description
CONTEXT	Pointer to union to which the state of device stored before going to Deep Sleep is read back

Returns

Updates the CONTEXT union with the state of device stored before entering to Deep Sleep

8.4.1.5 ULPWakeUp_Enable

void ULPWakeUpEnable(void)

This function enables the Ultra Low power wake up module.

Remarks

User must have charged the capacitor prior to enabling the deep sleep wake up from ultra low power wake up and must have called "EnableIntULPWU" function.

8.4.2 DeepSleep Structs,Records,Enums

8.4.2.1 _BOOL

Boolean value with Logic 1 and Logic 0 values defined

8.4.3 Deep Sleep Macros

8.4.4 Deep Sleep Examples

8.4.4.1 Deep Sleep Example1

Example Source Code demonstrating peripheral library usage

```
*****  
* NOTES:  
* Code uses the Peripheral library support available with MCC18 Compiler  
* Code Tested on:  
* PIC18F46J50 controller  
*****  
  
#define USE_OR_MASKS  
#include <p18cxx.h>  
#include "dpslp.h"  
#include "portb.h"  
#include "rtcc.h"  
#define TRUE 1  
  
//Function Prototypes  
void user_main(void);  
void USER_Function(void);  
void RTCC_configure(void);  
void Check_INT_SRV_Routine(void);  
  
//Global structures used in deep sleep library  
SRC ptr;  
CONTEXT read_state;  
rtccTimeDate RtccTimeDate ,RtccAlrmTimeDate, Rtcc_read_TimeDate ;  
  
//main function  
int main(void)  
{  
    if(IsResetFromDeepSleep() == 0xFF) //if this is the reset after the  
                                         //deep_sleep wakeup...then do this  
    {  
        ReadDSGPR(&read_state); //Read the deep sleep GPR  
        DeepSleepWakeUpSource(&ptr); //Check the deep sleep wakeup source (if required)  
        ReleaseDeepSleep(); //Release the Deep sleep (IO configuration)  
        if((ptr.WK_SRC.DS_POR) == TRUE)  
        {  
    }  
}
```

```

//deep sleep wakeup source is DSPOR
USER_Function();
}
if(ptr.WK_SRC.DS_MCLR==TRUE)
{
//deep sleep wakeup source is MCLR
USER_Function();
}
if(ptr.WK_SRC.DS_RTC==TRUE)
{
//deep sleep wakeup source is RTCC
USER_Function();
}
if(ptr.WK_SRC.DS_WDT==TRUE)
{
//deep sleep wakeup source is DSWDT
USER_Function();
}
if(ptr.WK_SRC.DS_FLT==TRUE)
{
//deep sleep wakeup source is Falut in deep sleep configuration
USER_Function();
}
if(ptr.WK_SRC.DS_INT0==TRUE)
{
//deep sleep wakeup source is INT0
USER_Function();
}
if(ptr.WK_SRC.DS_BOR==TRUE)
{
//deep sleep wakeup source is DSBOR
USER_Function();
}
if(ptr.WK_SRC.DS_ULP==TRUE)
{
//deep sleep wakeup source is DSULP
USER_Function();
}
user_main(); //call the "user_main" -- The User application program
}
else //else... this is the Normal (pure) Power_on Reset...do the normal init
{
//Normal POR init program here
user_main(); //call the "user_main" -- The User application program
}
while(1);
}

void user_main(void)
{
while(1)
{
{
    Write_DSGPR(0x67,0x7A); //Save state of system prior to deep sleep
    RTCC_configure(); //Configure RTCC as one of sources of wake up
// **** Charge the capacitor on RA0 for ultra low power
//      wake up as source of wake up from deep sleep*****
    TRISAbits.TRISA0 = 0;
    PORTAbits.RA0 = 1;
    for(i = 0; i < 10000; i++) Nop();
// *** configure INT0 with pullups enabled, falling edge ***
    config = PORTB_CHANGE_INT_ON | FALLING_EDGE_INT | PORTB_PULLUPS_ON;
    OpenRB0INT(config); //configures INT0 & enables it
// ***** configure deep sleep wake up sources
***** config = ( DPSLP_ULPWU_ENABLE | DPSLP_RTCC_WAKEUP_DISABLE);
GotoDeepSleep(config); //This function puts the device into deep sleep

Check_INT_SRV_Routine(); //Interrupt occured simultaneously while going to deep
}
}

```

```

sleep.Hence service it.
    }
}
}

void USER_Function(void);
{
    Nop();
    //USER written application to process the source of wake up from deep sleep
}

void RTCC_configure(void)
{
unsigned int i=0,j=0;

    RtccInitClock(); //turn on clock source
    for(i=0;i<4;i++) //Delay for Secondary oscillator to stabilize
    for(j=0;j<60000;j++);

    RtccWrOn(); //write enable the rtcc registers
    RtccTimeDate.f.hour = 9; //Set Date and time
    RtccTimeDate.f.min = 10;
    RtccTimeDate.f.sec = 9;
    RtccTimeDate.f.mday = 18;
    RtccTimeDate.f.mon = 1;
    RtccTimeDate.f.year = 8;
    RtccAlrmTimeDate.f.hour = RtccTimeDate.f.hour;
    RtccAlrmTimeDate.f.min = RtccTimeDate.f.min ;
    RtccAlrmTimeDate.f.sec = RtccTimeDate.f.sec + 9;
    RtccAlrmTimeDate.f.mday = RtccTimeDate.f.mday;
    RtccAlrmTimeDate.f.mon = RtccTimeDate.f.mon;
    RtccAlrmTimeDate.f.year = RtccTimeDate.f.year;

    RtccWriteTimeDate(&RtccTimeDate,1); //write into registers
    RtccSetAlarmRpt(RTCC_RPT_TEN_SEC,1); //Set the alarm repeat to every 10 seconds
    RtccSetAlarmRptCount(5,1);
    RtccWriteAlrmTimeDate(&RtccAlrmTimeDate);

    mRtccOn(); //enable the rtcc
    mRtccAlrmEnable(); //enable the rtcc alarm to wake the device up from deep sleep
}

void Check_INT_SRV_Routine(void)
{
    while(1); //User written INT service routine to handle interrupt
}

```

8.5 Peripheral Pin Select (PPS)

The peripheral pin select feature provides an enabling the user's peripheral set selection and their placement on a wide range of I/O pins. By increasing the pinout options available on a particular device, users can better tailor the microcontroller to their entire application, rather than trimming the application to fit the device.

The peripheral pin select feature operates over a fixed subset of digital I/O pins. Users may independently map the input and/or output of any one of many digital peripherals to any one of these I/O pins. Peripheral pin select is performed in software and generally does not require the device to be reprogrammed. Hardware safeguards are included that prevent accidental or spurious changes to the peripheral mapping once it has been established.

8.5.1 PPS Macros

8.5.1.1 PPS_Input_Page1/2

```
#define PPSInput(fn,pin) iPPSInput(IN_FN_##fn,IN_PIN_##pin)
```

The macro assigns given pin as input pin by configuring register RPINRx

Input Parameters

Input Parameters	Description
fn	function to be assigned for particular pin: * PPS_INT1 * PPS_INT2 * PPS_INT3 * PPS_T0CK * PPS_T3CK * PPS_IC1 * PPS_IC2 * PPS_T1G * PPS_T3G * PPS_RX2DT2 * PPS_CK2 * PPS_SDI2 * PPS_SCK2IN * PPS_SS2IN * PPS_FLT0

pin	pin number(x) for which functionality has to be assigned: * PPS_RP0 * PPS_RP1 * PPS_RP2 * PPS_RP3 * PPS_RP4 * PPS_RP5 * PPS_RP6 * PPS_RP7 * PPS_RP8 * PPS_RP9 * PPS_RP10 * PPS_RP11 * PPS_RP12 * PPS_RP13 * PPS_RP17 * PPS_RP18 * PPS_RP19 * PPS_RP20 * PPS_RP21 * PPS_RP22 * PPS_RP23 * PPS_RP24 * PPS_VSS
-----	--

Remarks

Equivalent to iPPSInput (see page 936) Macro

8.5.1.2 iPPS_Input_Page1/2

#define iPPSInput(fn,pin) fn=pin

The macro assigns given pin as input pin by configuring register RPINRx

Input Parameters

Input Parameters	Description
fn	<p>function to be assigned for particular pin:</p> <ul style="list-style-type: none"> * IN_FN_PPS_INT1 * IN_FN_PPS_INT2 * IN_FN_PPS_INT3 * IN_FN_PPS_T0CK * IN_FN_PPS_T3CK * IN_FN_PPS_IC1 * IN_FN_PPS_IC2 * IN_FN_PPS_T1G * IN_FN_PPS_T3G * IN_FN_PPS_RX2DT2 * IN_FN_PPS_CK2 * IN_FN_PPS_SDI2 * IN_FN_PPS_SCK2IN * IN_FN_PPS_SS2IN * IN_FN_PPS_FLT0
pin	<p>pin number(x) for which functionality has to be assigned:</p> <ul style="list-style-type: none"> * IN_PIN_PPS_RP0 * IN_PIN_PPS_RP1 * IN_PIN_PPS_RP2 * IN_PIN_PPS_RP3 * IN_PIN_PPS_RP4 * IN_PIN_PPS_RP5 * IN_PIN_PPS_RP6 * IN_PIN_PPS_RP7 * IN_PIN_PPS_RP8 * IN_PIN_PPS_RP9 * IN_PIN_PPS_RP10 * IN_PIN_PPS_RP11 * IN_PIN_PPS_RP12 * IN_PIN_PPS_RP13 * IN_PIN_PPS_RP17 * IN_PIN_PPS_RP18 * IN_PIN_PPS_RP19 * IN_PIN_PPS_RP20 * IN_PIN_PPS_RP21 * IN_PIN_PPS_RP22 * IN_PIN_PPS_RP23 * IN_PIN_PPS_RP24 * IN_PIN_PPS_VSS

Remarks

Equivalent to PPSInput (see page 935) Macro

8.5.1.3 iPPS_Input_Page1/2_1

```
#define iPPSInput(fn,pin) fn=pin
```

The macro assigns given pin as input pin by configuring register RPINRx

Input Parameters

Input Parameters	Description
fn	function to be assigned for particular pin: * IN_FN_PPS_INT1 * IN_FN_PPS_INT2 * IN_FN_PPS_INT3 * IN_FN_PPS_T0CK * IN_FN_PPS_T3CK * IN_FN_PPS_IC1 * IN_FN_PPS_IC2 * IN_FN_PPS_T1G * IN_FN_PPS_T3G * IN_FN_PPS_RX2DT2 * IN_FN_PPS_CK2 * IN_FN_PPS_SDI2 * IN_FN_PPS_SCK2IN * IN_FN_PPS_SS2IN * IN_FN_PPS_FLT0

pin	pin number(x) for which functionality has to be assigned: * IN_PIN_PPS_RP0 * IN_PIN_PPS_RP1 * IN_PIN_PPS_RP2 * IN_PIN_PPS_RP3 * IN_PIN_PPS_RP4 * IN_PIN_PPS_RP5 * IN_PIN_PPS_RP6 * IN_PIN_PPS_RP7 * IN_PIN_PPS_RP8 * IN_PIN_PPS_RP9 * IN_PIN_PPS_RP10 * IN_PIN_PPS_RP11 * IN_PIN_PPS_RP12 * IN_PIN_PPS_RP13 * IN_PIN_PPS_RP14 * IN_PIN_PPS_RP15 * IN_PIN_PPS_RP16 * IN_PIN_PPS_RP17 * IN_PIN_PPS_RP18 * IN_PIN_PPS_RP19 * IN_PIN_PPS_RP20 * IN_PIN_PPS_RP21 * IN_PIN_PPS_RP22 * IN_PIN_PPS_RP23 * IN_PIN_PPS_RP24 * IN_PIN_PPS_VSS
-----	--

Remarks

Equivalent to PPSInput (see page 939) Macro

8.5.1.4 PPS_Input_Page1/2_1

```
#define PPSInput(fn,pin) iPPSInput(IN_FN_##fn,IN_PIN_##pin)
```

The macro assigns given pin as input pin by configuring register RPINRx

Input Parameters

Input Parameters	Description
fn	<p>function to be assigned for particular pin:</p> <ul style="list-style-type: none"> * IN_FN_PPS_INT1 * IN_FN_PPS_INT2 * IN_FN_PPS_INT3 * IN_FN_PPS_T0CK * IN_FN_PPS_T3CK * IN_FN_PPS_IC1 * IN_FN_PPS_IC2 * IN_FN_PPS_T1G * IN_FN_PPS_T3G * IN_FN_PPS_RX2DT2 * IN_FN_PPS_CK2 * IN_FN_PPS_SDI2 * IN_FN_PPS_SCK2IN * IN_FN_PPS_SS2IN * IN_FN_PPS_FLT0
pin	<p>pin number(x) for which functionality has to be assigned:</p> <ul style="list-style-type: none"> * IN_PIN_PPS_RP0 * IN_PIN_PPS_RP1 * IN_PIN_PPS_RP2 * IN_PIN_PPS_RP3 * IN_PIN_PPS_RP4 * IN_PIN_PPS_RP5 * IN_PIN_PPS_RP6 * IN_PIN_PPS_RP7 * IN_PIN_PPS_RP8 * IN_PIN_PPS_RP9 * IN_PIN_PPS_RP10 * IN_PIN_PPS_RP11 * IN_PIN_PPS_RP12 * IN_PIN_PPS_RP13 * IN_PIN_PPS_RP14 * IN_PIN_PPS_RP15 * IN_PIN_PPS_RP16 * IN_PIN_PPS_RP17 * IN_PIN_PPS_RP18 * IN_PIN_PPS_RP19 * IN_PIN_PPS_RP20 * IN_PIN_PPS_RP21 * IN_PIN_PPS_RP22 * IN_PIN_PPS_RP23 * IN_PIN_PPS_RP24 * IN_PIN_PPS_VSS

Remarks

Made with *Doc-O-Matic*.

Equivalent to iPPSInput (see page 938) Macro

8.5.1.5 PPS_Output_Page1

```
#define PPSOutput(pin,fn) iPPSOutput(OUT_PIN_##pin,OUT_FN##fn)
```

The macro assigns given pin as output pin by configuring register RPORx.

Input Parameters

Input Parameters	Description
pin	pin number(x) for which functionality has to be assigned: * PPS_RP0 * PPS_RP1 * PPS_RP2 * PPS_RP3 * PPS_RP4 * PPS_RP5 * PPS_RP6 * PPS_RP7 * PPS_RP8 * PPS_RP9 * PPS_RP10 * PPS_RP11 * PPS_RP12 * PPS_RP13 * PPS_RP14 * PPS_RP15 * PPS_RP16 * PPS_RP17 * PPS_RP18

fn

function to be assigned for particular pin:
* PPS_NULL
* PPS_C1OUT
* PPS_C2OUT
* PPS_TX2CK2
* PPS_DT2
* PPS_SDO2
* PPS_SCK2
* PPS_SSDMA
* PPS_ULPWU
* PPS_CCP1P1A
* PPS_P1B
* PPS_P1C
* PPS_P1D
* PPS_CCP2P2A
* PPS_P2B
* PPS_P2C
* PPS_P2D

Remarks

Equivalent to iPPSOutput Macro

8.5.1.6 PPS_Output_Page2

```
#define PPSOutput(pin,fn) iPPSOutput(OUT_PIN_##pin,OUT_FN_##fn)
```

The macro assigns given pin as output pin by configuring register RPORx.

Input Parameters

Input Parameters	Description
pin	pin number(x) for which functionality has to be assigned: * PPS_RP0 * PPS_RP1 * PPS_RP2 * PPS_RP3 * PPS_RP4 * PPS_RP5 * PPS_RP6 * PPS_RP7 * PPS_RP8 * PPS_RP9 * PPS_RP10 * PPS_RP11 * PPS_RP12 * PPS_RP13 * PPS_RP14 * PPS_RP15 * PPS_RP16 * PPS_RP17 * PPS_RP18 * PPS_RP19 * PPS_RP20 * PPS_RP21 * PPS_RP22 * PPS_RP23 * PPS_RP24
fn	function to be assigned for particular pin: * PPS_NULL * PPS_C1OUT * PPS_C2OUT * PPS_TX2CK2 * PPS_DT2 * PPS_SDO2 * PPS_SCK2 * PPS_SSDMA * PPS_ULPWU * PPS_CCP1P1A * PPS_P1B * PPS_P1C * PPS_P1D * PPS_CCP2P2A * PPS_P2B * PPS_P2C * PPS_P2D

Remarks

Equivalent to iPPSOutput Macro

8.5.1.7 iPPS_Output_Page1

```
#define iPPSOutput(pin,fn) pin=fn
```

The macro assigns given pin as output pin by configuring register RPORx.

Input Parameters

Input Parameters	Description
pin	pin number(x) for which functionality has to be assigned: * OUT_PIN_PPS_RP0 * OUT_PIN_PPS_RP1 * OUT_PIN_PPS_RP2 * OUT_PIN_PPS_RP3 * OUT_PIN_PPS_RP4 * OUT_PIN_PPS_RP5 * OUT_PIN_PPS_RP6 * OUT_PIN_PPS_RP7 * OUT_PIN_PPS_RP8 * OUT_PIN_PPS_RP9 * OUT_PIN_PPS_RP10 * OUT_PIN_PPS_RP11 * OUT_PIN_PPS_RP12 * OUT_PIN_PPS_RP13 * OUT_PIN_PPS_RP14 * OUT_PIN_PPS_RP15 * OUT_PIN_PPS_RP16 * OUT_PIN_PPS_RP17 * OUT_PIN_PPS_RP18

fn	function to be assigned for particular pin: * OUT_FN_PPS_NULL * OUT_FN_PPS_C1OUT * OUT_FN_PPS_C2OUT * OUT_FN_PPS_TX2CK2 * OUT_FN_PPS_DT2 * OUT_FN_PPS_SDO2 * OUT_FN_PPS_SCK2 * OUT_FN_PPS_SSDMA * OUT_FN_PPS_ULPWU * OUT_FN_PPS_CCP1P1A * OUT_FN_PPS_P1B * OUT_FN_PPS_P1C * OUT_FN_PPS_P1D * OUT_FN_PPS_CCP2P2A * OUT_FN_PPS_P2B * OUT_FN_PPS_P2C * OUT_FN_PPS_P2D
----	---

Remarks

Equivalent to iPPSOutput Macro

8.5.1.8 iPPS_Output_Page2

#define iPPSOutput(pin,fn) pin=fn

The macro assigns given pin as output pin by configuring register RPORx.

Input Parameters

Input Parameters	Description
pin	pin number(x) for which functionality has to be assigned: * OUT_PIN_PPS_RP0 * OUT_PIN_PPS_RP1 * OUT_PIN_PPS_RP2 * OUT_PIN_PPS_RP3 * OUT_PIN_PPS_RP4 * OUT_PIN_PPS_RP5 * OUT_PIN_PPS_RP6 * OUT_PIN_PPS_RP7 * OUT_PIN_PPS_RP8 * OUT_PIN_PPS_RP9 * OUT_PIN_PPS_RP10 * OUT_PIN_PPS_RP11 * OUT_PIN_PPS_RP12 * OUT_PIN_PPS_RP13 * OUT_PIN_PPS_RP14 * OUT_PIN_PPS_RP15 * OUT_PIN_PPS_RP16 * OUT_PIN_PPS_RP17 * OUT_PIN_PPS_RP18 * OUT_PIN_PPS_RP19 * OUT_PIN_PPS_RP20 * OUT_PIN_PPS_RP21 * OUT_PIN_PPS_RP22 * OUT_PIN_PPS_RP23 * OUT_PIN_PPS_RP24
fn	function to be assigned for particular pin: * OUT_FN_PPS_NULL * OUT_FN_PPS_C1OUT * OUT_FN_PPS_C2OUT * OUT_FN_PPS_TX2CK2 * OUT_FN_PPS_DT2 * OUT_FN_PPS_SDO2 * OUT_FN_PPS_SCK2 * OUT_FN_PPS_SSDMA * OUT_FN_PPS_ULPWU * OUT_FN_PPS_CCP1P1A * OUT_FN_PPS_P1B * OUT_FN_PPS_P1C * OUT_FN_PPS_P1D * OUT_FN_PPS_CCP2P2A * OUT_FN_PPS_P2B * OUT_FN_PPS_P2C * OUT_FN_PPS_P2D

Remarks

Equivalent to iPPSSOutput Macro

8.5.1.9 iPPS_Input_Page3

```
#define iPPSInput(fn,pin) fn=pin
```

The macro assigns given pin as input pin by configuring register RPINRx

Input Parameters

Input Parameters	Description
fn	function to be assigned for particular pin: * IN_FN_PPS_INT1 * IN_FN_PPS_INT2 * IN_FN_PPS_INT3 * IN_FN_PPS_TOCK * IN_FN_PPS_T3CK * IN_FN_PPS_T5CK * IN_FN_PPS_IC1 * IN_FN_PPS_IC2 * IN_FN_PPS_IC3 * IN_FN_PPS_T1G * IN_FN_PPS_T3G * IN_FN_PPS_T5G * IN_FN_PPS_RX2DT2 * IN_FN_PPS_CK2 * IN_FN_PPS_SDI2 * IN_FN_PPS_SCK2IN * IN_FN_PPS_SS2IN * IN_FN_PPS_FLT0

pin

pin number(x) for which functionality has to be assigned:
* IN_PIN_PPS_RP0
* IN_PIN_PPS_RP1
* IN_PIN_PPS_RP2
* IN_PIN_PPS_RP3
* IN_PIN_PPS_RP4
* IN_PIN_PPS_RP5
* IN_PIN_PPS_RP6
* IN_PIN_PPS_RP7
* IN_PIN_PPS_RP8
* IN_PIN_PPS_RP9
* IN_PIN_PPS_RP10
* IN_PIN_PPS_RP11
* IN_PIN_PPS_RP12
* IN_PIN_PPS_RP13
* IN_PIN_PPS_RP17
* IN_PIN_PPS_RP18
* IN_PIN_PPS_RP19
* IN_PIN_PPS_RP20
* IN_PIN_PPS_RP21
* IN_PIN_PPS_RP22
* IN_PIN_PPS_RP23
* IN_PIN_PPS_RP24
* IN_PIN_PPS_VSS

Remarks

Equivalent to PPSInput (see page 935) Macro

8.5.1.10 PPS_Input_Page3

```
#define PPSInput(fn,pin) iPPSInput(IN_FN_##fn,IN_PIN_##pin)
```

The macro assigns given pin as input pin by configuring register RPINRx

Input Parameters

Input Parameters	Description
fn	<p>function to be assigned for particular pin:</p> <ul style="list-style-type: none"> * PPS_INT1 * PPS_INT2 * PPS_INT3 * PPS_T0CK * PPS_T3CK * PPS_T5CK * PPS_IC1 * PPS_IC2 * PPS_IC3 * PPS_T1G * PPS_T3G * PPS_T5G * PPS_RX2DT2 * PPS_CK2 * PPS_SDI2 * PPS_SCK2IN * PPS_SS2IN * PPS_FLT0
pin	<p>pin number(x) for which functionality has to be assigned:</p> <ul style="list-style-type: none"> * PPS_RP0 * PPS_RP1 * PPS_RP2 * PPS_RP3 * PPS_RP4 * PPS_RP5 * PPS_RP6 * PPS_RP7 * PPS_RP8 * PPS_RP9 * PPS_RP10 * PPS_RP11 * PPS_RP12 * PPS_RP13 * PPS_RP17 * PPS_RP18 * PPS_RP19 * PPS_RP20 * PPS_RP21 * PPS_RP22 * PPS_RP23 * PPS_RP24 * PPS_VSS

Remarks

Equivalent to iPPSInput (see page 936) Macro

8.5.1.11 iPPS_Output_Page3

```
#define iPPSOutput(pin,fn) pin=fn
```

The macro assigns given pin as output pin by configuring register RPORx.

Input Parameters

Input Parameters	Description
pin	pin number(x) for which functionality has to be assigned: * OUT_PIN_PPS_RP0 * OUT_PIN_PPS_RP1 * OUT_PIN_PPS_RP2 * OUT_PIN_PPS_RP3 * OUT_PIN_PPS_RP4 * OUT_PIN_PPS_RP5 * OUT_PIN_PPS_RP6 * OUT_PIN_PPS_RP7 * OUT_PIN_PPS_RP8 * OUT_PIN_PPS_RP9 * OUT_PIN_PPS_RP10 * OUT_PIN_PPS_RP11 * OUT_PIN_PPS_RP12 * OUT_PIN_PPS_RP13 * OUT_PIN_PPS_RP17 * OUT_PIN_PPS_RP18 * OUT_PIN_PPS_RP19 * OUT_PIN_PPS_RP20 * OUT_PIN_PPS_RP21 * OUT_PIN_PPS_RP22 * OUT_PIN_PPS_RP23 * OUT_PIN_PPS_RP24

fn

function to be assigned for particular pin:
* OUT_FN_PPS_NULL
* OUT_FN_PPS_C1OUT
* OUT_FN_PPS_C2OUT
* OUT_FN_PPS_TX2CK2
* OUT_FN_PPS_DT2
* OUT_FN_PPS_SDO2
* OUT_FN_PPS_SCK2
* OUT_FN_PPS_SSDMA
* OUT_FN_PPS_ULPWU
* OUT_FN_PPS_CCP1P1A
* OUT_FN_PPS_P1B
* OUT_FN_PPS_P1C
* OUT_FN_PPS_P1D
* OUT_FN_PPS_CCP2P2A
* OUT_FN_PPS_P2B
* OUT_FN_PPS_P2C
* OUT_FN_PPS_P2D
* OUT_FN_PPS_CCP3P3A
* OUT_FN_PPS_P3B
* OUT_FN_PPS_P3C
* OUT_FN_PPS_P3D

Remarks

Equivalent to iPPSOutput Macro

8.5.1.12 PPS_Output_Page3

```
#define PPSOutput(pin,fn) iPPSOutput(OUT_PIN_##pin,OUT_FN_##fn)
```

The macro assigns given pin as output pin by configuring register RPORx.

Input Parameters

Input Parameters	Description
pin	pin number(x) for which functionality has to be assigned: * PPS_RP0 * PPS_RP1 * PPS_RP2 * PPS_RP3 * PPS_RP4 * PPS_RP5 * PPS_RP6 * PPS_RP7 * PPS_RP8 * PPS_RP9 * PPS_RP10 * PPS_RP11 * PPS_RP12 * PPS_RP13 * PPS_RP17 * PPS_RP18 * PPS_RP19 * PPS_RP20 * PPS_RP21 * PPS_RP22 * PPS_RP23 * PPS_RP24
fn	function to be assigned for particular pin: * PPS_NULL * PPS_C1OUT * PPS_C2OUT * PPS_TX2CK2 * PPS_DT2 * PPS_SDO2 * PPS_SCK2 * PPS_SSDMA * PPS_ULPWU * PPS_CCP1P1A * PPS_P1B * PPS_P1C * PPS_P1D * PPS_CCP2P2A * PPS_P2B * PPS_P2C * PPS_P2D * PPS_CCP3P3A * PPS_P3B * PPS_P3C * PPS_P3D

RemarksMade with *Doc-O-Matic*.

Equivalent to iPPSOutput Macro

8.5.2 PPS Examples

8.5.2.1 PPS Example1

Example Source Code demonstrating peripheral library usage

```
/*
 * NOTES:
 * Code uses the Peripheral library support available with MCC18 Compiler
 * Code Tested on:
 * PIC18F46J50 controller
 *
 * signal to be compared are applied to C1INA & C1INB and output is tapped at C1OUT mapped
 * to pin RP24 using PPS
 */
#define USE_OR_MASKS
#include <p18f46j50.h>
#include "ancomp.h"
#include "pps.h"

unsigned char CMPResult;

void main(void)
{
    unsigned char config=0x00,h=0;
    TRISD=0x00;

    //---PPS Configuration---
    PPSUnLock();
    iPPSOutput(OUT_PIN_PPS_RP24,OUT_FN_PPS_C1OUT);           //Configre RP24 as C1OUT
pin
    PPSLock();

    //*****Configure Analog Comparator *****
    /** Analog comparator is configured for:
     * Output is non-inverted
     * comparator 1 configured with C1INA as positive input terminal and C1INB as negetive
     input terminal
     * comparator output is enabled onto pin C1OUT mapped to RP24 using PPS
     * comparator interrupt in enabled
     * interrupt on both the edges
    */
    config = COMP_OP_NINV | COMP_REF_CINA | COMP_VINM_CINB | COMP_OP_EN ;
    Open_ancomp1(config);

    while(1)
    {
        if( CMSTAT&0x01 )      //check for the comparator output status or comparartor
interrupt flag status
            CMPResult=1;          //flag the logic 1 status of comparartor output
        else
            CMPResult=0;          // flag the logic 0 status ofcomparator output
    }
    //--- Turn off comparator ---
    Close_ancomp1();
}
```

}

8.6 Input Capture (INCAP)

Input Capture modules offers a wide range of configuration and operating options for capturing external pulse events and generating interrupts. Key features of the input capture module include:

- Hardware-configurable for 16-bit operation in all modes by cascading two adjacent modules
 - Synchronous and Trigger modes of output compare operation, with many user-selectable trigger/sync sources available
 - A buffer for capturing and holding timer values for several events
 - Configurable interrupt generation
 - Up to 6 clock sources available for each module, driving a separate internal 16-bit counter
-

8.6.1 Input Capture Function

8.6.1.1 Open_Capture

8.6.1.1.1 Open_Capture1

```
void OpenCapture1(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.2 Open_Capture2

void OpenCapture2(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.3 Open_Capture2_Page2

```
void OpenCapture2(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer source selection * CCP_2_SEL_TMR12 * CCP_2_SEL_TMR34 * CCP_2_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.4 Open_Capture3

```
void OpenCapture3(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.5 Open_Capture3_Page2

void OpenCapture3(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer source selection * CCP_3_SEL_TMR12 * CCP_3_SEL_TMR34 * CCP_3_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.6 Open_Capture4

```
void OpenCapture4(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.7 Open_Capture4_Page2

void OpenCapture4(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR36 * CCP_4_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.7.1 Open_Capture4_Page4

void OpenCapture4(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR56 * CCP_4_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.8 Open_Capture4_Page3

void OpenCapture4(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer source selection * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.9 Open_Capture5

```
void OpenCapture5(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.10 Open_Capture5_Page2

void OpenCapture5(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR54 * CCP_5_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.11 Open_Capture5_Page3

```
void OpenCapture5(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer source selection * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR34 * CCP_5_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.12 Open_ECapture1

```
void OpenECapture1(unsigned char config)
```

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

NOTE: In addition to opening the capture, the appropriate timer module must be enabled before any of the captures will operate. See the data sheet for CCP and timer interconnect configurations and Timer Functions for the arguments used with CCP in OpenTimer3.

8.6.1.1.13 Open_ECapture1_Page2

void OpenECapture1(unsigned char config)

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR36 * ECCP_1_SEL_TMR38 * ECCP_1_SEL_TMR310 * ECCP_1_SEL_TMR312 * ECCP_1_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.14 Open_ECapture1_Page3

void OpenECapture1(unsigned char config)

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR36 * ECCP_1_SEL_TMR38 * ECCP_1_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.15 Open_ECapture1_Page4

```
void OpenECapture1(unsigned char config)
```

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.16 Open_ECapture2_Page1

```
void OpenECapture2(unsigned char config)
```

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR36 * ECCP_2_SEL_TMR38 * ECCP_2_SEL_TMR310 * ECCP_2_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.17 Open_ECapture2_Page2

```
void OpenECapture2(unsigned char config)
```

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR36 * ECCP_2_SEL_TMR38 * ECCP_2_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.18 Open_ECapture3_Page1

void OpenECapture2(unsigned char config)

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the ECCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_3_SEL_TMR12 * ECCP_3_SEL_TMR34 * ECCP_3_SEL_TMR36 * ECCP_3_SEL_TMR38 * ECCP_3_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.19 Open_Capture6_Page1

void OpenCapture6(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_6_SEL_TMR12 * CCP_6_SEL_TMR52 * CCP_6_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.20 Open_Capture7_Page1

void OpenCapture7(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_7_SEL_TMR12 * CCP_7_SEL_TMR54 * CCP_7_SEL_TMR56 * CCP_7_SEL_TMR58 * CCP_7_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.21 Open_Capture8_Page1

void OpenCapture8(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_8_SEL_TMR12 * CCP_8_SEL_TMR74 * CCP_8_SEL_TMR76 * CCP_8_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.22 Open_Capture8_Page2

void OpenCapture8(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_8_SEL_TMR12 * CCP_8_SEL_TMR14 * CCP_8_SEL_TMR16 * CCP_8_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.23 Open_Capture9_Page1

void OpenCapture9(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_9_SEL_TMR12 * CCP_9_SEL_TMR74 * CCP_9_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.24 Open_Capture10_Page1

```
void OpenCapture10(unsigned char config)
```

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_10_SEL_TMR12 * CCP_10_SEL_TMR72 * CCP_10_SEL_TMR_MASK</p>

Returns

None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.25 Open_ECapture1_Page5

```
void OpenECapture1(unsigned char config)
```

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR56 * ECCP_1_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.26 Open_ECapture2_Page4

void OpenECapture2(unsigned char config)

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR56 * ECCP_2_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.27 Open_ECapture3_Page4

void OpenECapture3(unsigned char config)

This function configures the Extended Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * ECAP_EVERY_FALL_EDGE * ECAP_EVERY_RISE_EDGE * ECAP_EVERY_4_RISE_EDGE * ECAP_EVERY_16_RISE_EDGE * ECAP_MODE_MASK</p> <p>Timer Source Selection * ECCP_3_SEL_TMR12 * ECCP_3_SEL_TMR34 * ECCP_3_SEL_TMR56 * ECCP_3_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.1.28 Open_Capture5_Page4

void OpenCapture5(unsigned char config)
--

This function configures the Input Capture module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>This contains the parameters to be configured in the CCPxCON register as defined below</p> <p>Enable CCP Interrupts: * CAPTURE_INT_ON * CAPTURE_INT_OFF * CAPTURE_INT_MASK</p> <p>Capture configuration * CAP_EVERY_FALL_EDGE * CAP_EVERY_RISE_EDGE * CAP_EVERY_4_RISE_EDGE * CAP_EVERY_16_RISE_EDGE * CAP_MODE_MASK</p> <p>Timer Selection * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR34 * CCP_5_SEL_TMR56 * CCP_5_SEL_TMR_MASK</p>

Returns
None

Remarks

This function configures the input capture for idle mode, clock select, capture per interrupt and mode select

8.6.1.2 Read_Capture

8.6.1.2.1 Read_Capture1

unsigned int ReadCapture1(void)
--

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR1L andCCPR1H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.2 Read_Capture2

```
unsigned int ReadCapture1(void)
```

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR1L and CCPR1H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.3 Read_Capture3

```
unsigned int ReadCapture3(void)
```

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR3L and CCPR3H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.4 Read_Capture4

```
unsigned int ReadCapture4(void)
```

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR4L and CCPR4H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.5 Read_Capture5

```
unsigned int ReadCapture5(void)
```

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR5L and CCPR5H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.6 Read_Capture6

unsigned int ReadCapture6(void)

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR6L and CCPR6H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.7 Read_Capture7

unsigned int ReadCapture7(void)

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR7L and CCPR7H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.8 Read_Capture8

unsigned int ReadCapture8(void)

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR8L and CCPR8H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.9 Read_Capture9

unsigned int ReadCapture9(void)

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR9L and CCPR9H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.10 Read_Capture10

unsigned int ReadCapture10(void)

This function reads the pending Input Capture buffer.

Returns

This routine reads the CCPR10L and CCPR10H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.11 Read_ECapture1

unsigned int ReadECapture1(void)

This function reads the pending Extended Input Capture buffer.

Returns

This routine reads the ECCPR1L and ECCPR1H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.12 Read_ECapture2

unsigned int ReadECapture2(void)

This function reads the pending Extended Input Capture buffer.

Returns

This routine reads the ECCPR2L and ECCPR2H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.2.13 Read_ECapture3

unsigned int ReadECapture3(void)

This function reads the pending Extended Input Capture buffer.

Returns

This routine reads the ECCPR3L and ECCPR3H into the union Cap of type CapResult that is defined in global data space. The int result is then returned.

Remarks

This function reads the pending Input Capture buffer

8.6.1.3 Close_Capture

8.6.1.3.1 Close_Capture1

void CloseCapture1(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.2 Close_Capture2

void CloseCapture2(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.3 Close_Capture3

void CloseCapture3(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.4 Close_Capture4

void CloseCapture4(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.5 Close_Capture5

void CloseCapture5(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.6 Close_Capture6

```
void CloseCapture6(void)
```

This function turns off the Input Capture module

Returns
None

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.7 Close_Capture7

```
void CloseCapture7(void)
```

This function turns off the Input Capture module

Returns
None

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.8 Close_Capture8

```
void CloseCapture8(void)
```

This function turns off the Input Capture module

Returns
None

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.9 Close_Capture9

```
void CloseCapture9(void)
```

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.10 Close_Capture10

void CloseCapture10(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.11 Close_ECapture1

void CloseECapture1(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.12 Close_ECapture2

void CloseECapture2(void)

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.1.3.13 Close_ECapture3

```
void CloseECapture3(void)
```

This function turns off the Input Capture module

Returns

None

Remarks

This function disables the Input Capture interrupt and then turns off the module.

8.6.2 Input Capture Structs, Records, Enums

8.6.3 Input Capture Macros

8.6.4 Input Capture Examples

8.6.4.1 Input Capture Example1

Example Source Code demonstrating peripheral library usage

```
*****  
* NOTES:  
* Code uses the Peripheral library support available with MCC18 Compiler  
* Code Tested on:  
* PicDem2+ demo board with PIC18F4685 controller  
*  
* signal to be captured is fed to CCP1 pin.  
*****  
  
#define USE_OR_MASKS  
#include <p18cxx.h>  
#include "capture.h" //header file for using library API for input capture  
#include "timers.h" //header file for using the library APIs for timers  
that act as source for input capture  
  
unsigned int INCAPResult;  
  
void main(void)  
{  
unsigned char config1=0x00,timer_value = 0x00;  
  
----Configure timer for corresponding timer module selection for capture module----  
SetTmrCCPSrc(T1_SOURCE_CCP); //Set Timer 1 as source for  
input capture module
```

```

//---Configure input capture ---
config1 = CAP_EVERY_RISE_EDGE | CAPTURE_INT_OFF ;           //configure input capture
for capture on every rising edge and its interrupt off
    OpenCapture1(config1);
    OpenTimer1(0);                                         //start the timer

//---wait till input is captured---
while(!PIR1bits.CCP1IF);                                     // Wait for event

//--- read result---
INCAPResult = ReadCapture1();                                // read result

//---close capture module---
CloseCapture1();

while(1);                                                 //End of program
}

```

8.7 Output Compare (OCMP)

Output Compare module offers a wide range of configuration and operating options for generating pulse trains on internal device events, and can produce pulse-width modulated waveforms for driving power applications. Key features of the output compare module include:

- Hardware-configurable for 16-bit operation in all modes.
- Synchronous and Trigger modes of output compare operation, with user-selectable trigger/sync sources available
- Configurable for single-pulse or continuous pulse generation on an output event, or continuous PWM waveform generation

8.7.1 Output Compare Functions

8.7.1.1 Open_Compare

8.7.1.1.1 Open_Compare1

```
void OpenCompare1(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.2 Open_Compare2

```
void OpenCompare2(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.3 Open_Compare2_Page2

```
void OpenCompare2(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_2_SEL_TMR12 * CCP_2_SEL_TMR34 * CCP_2_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.4 Open_Compare3

```
void OpenCompare3(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.5 Open_Compare3_Page2

```
void OpenCompare3(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_3_SEL_TMR12 * CCP_3_SEL_TMR34 * CCP_3_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.6 Open_Compare4

```
void OpenCompare4(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.7 Open_Compare4_Page2

```
void OpenCompare4(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR36 * CCP_4_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.8 Open_Compare4_Page3

```
void OpenCompare4(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.9 Open_Compare5

```
void OpenCompare5(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.10 Open_Compare5_Page2

```
void OpenCompare5(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR54 * CCP_5_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.11 Open_Compare5_Page3

```
void OpenCompare5(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR34 * CCP_5_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.12 Open_ECompare1

void OpenECompare1(unsigned char config,unsigned int period)

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.13 Open_ECompare1_Page2

```
void OpenECompare1(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR36 * ECCP_1_SEL_TMR38 * ECCP_1_SEL_TMR310 * ECCP_1_SEL_TMR312 * ECCP_1_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.14 Open_ECompare1_Page3

void OpenECompare1(unsigned char config,unsigned int period)

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR36 * ECCP_1_SEL_TMR38 * ECCP_1_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.15 Open_ECompare1_Page4

```
void OpenECompare1(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.16 Open_ECompare2_Page1

void OpenECompare2(unsigned char config,unsigned int period)

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR36 * ECCP_2_SEL_TMR38 * ECCP_2_SEL_TMR310 * ECCP_2_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.17 Open_ECompare2_Page2

```
void OpenECompare2(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR36 * ECCP_2_SEL_TMR38 * ECCP_2_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.18 Open_ECompare3_Page1

```
void OpenECompare2(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_3_SEL_TMR12 * ECCP_3_SEL_TMR34 * ECCP_3_SEL_TMR36 * ECCP_3_SEL_TMR38 * ECCP_3_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.19 Open_Compare6_Page1

```
void OpenCompare6(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_6_SEL_TMR12 * CCP_6_SEL_TMR52 * CCP_6_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.20 Open_Compare7_Page1

```
void OpenCompare7(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_7_SEL_TMR12 * CCP_7_SEL_TMR54 * CCP_7_SEL_TMR56 * CCP_7_SEL_TMR58 * CCP_7_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.21 Open_Compare8_Page1

```
void OpenCompare8(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_8_SEL_TMR12 * CCP_8_SEL_TMR74 * CCP_8_SEL_TMR76 * CCP_8_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.22 Open_Compare8_Page2

```
void OpenCompare8(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_8_SEL_TMR12 * CCP_8_SEL_TMR14 * CCP_8_SEL_TMR16 * CCP_8_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.23 Open_Compare9_Page1

```
void OpenCompare9(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_9_SEL_TMR12 * CCP_9_SEL_TMR74 * CCP_9_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.24 Open_Compare10_Page1

```
void OpenCompare10(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_10_SEL_TMR12 * CCP_10_SEL_TMR72 * CCP_10_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

8.7.1.1.25 Open_ECompare1_Page5

```
void OpenECompare1(unsigned char config,unsigned int period)
```

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable ECCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR56 * ECCP_1_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.26 Open_ECompare2_Page4

void OpenECompare2(unsigned char config,unsigned int period)

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR56 * ECCP_2_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.27 Open_ECompare3_Page4

void OpenECompare3(unsigned char config,unsigned int period)

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * ECOM_TOGG_MATCH * ECOM_LO_MATCH * ECOM_UNCHG_MATCH * ECOM_TRIG_SEVNT * ECOM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * ECCP_3_SEL_TMR12 * ECCP_3_SEL_TMR34 * ECCP_3_SEL_TMR56 * ECCP_3_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.28 Open_Compare4_Page4

void OpenCompare4(unsigned char config,unsigned int period)
--

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR56 * CCP_4_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.1.29 Open_Compare5_Page4

void OpenCompare5(unsigned char config,unsigned int period)
--

This routine configures the compare for interrupt, output signal and compare period.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Bit definitions to configure compare unit</p> <p>Enable CCP Interrupts:</p> <ul style="list-style-type: none"> * COM_INT_ON * COM_INT_OFF * COM_INT_MASK <p>Compare configuration</p> <ul style="list-style-type: none"> * COM_TOGG_MATCH * COM_LO_MATCH * COM_UNCHG_MATCH * COM_TRIG_SEVNT * COM_MODE_MASK <p>Timer Selection</p> <ul style="list-style-type: none"> * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR34 * CCP_5_SEL_TMR56 * CCP_5_SEL_TMR_MASK
period	This is the 16bit integer data, to be compared with TMRx values, it can have any value from 1 to 65535.

Returns
None

Remarks

This function first resets the compare module to the POR state and then configures the output compare for the specified event, also the 16bit period data is assigned to the CCPRx registers.

NOTE: In addition to opening the compare, the appropriate timer module must be enabled before any of the compares will operate. See the data sheet for CCP and timer interconnect configurations.

8.7.1.2 Close_Compare

8.7.1.2.1 Close_Compare1

```
void CloseCompare1(void)
```

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.2 Close_Compare2

void CloseCompare2(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.3 Close_Compare3

void CloseCompare3(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.4 Close_Compare4

void CloseCompare4(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.5 Close_Compare5

void CloseCompare5(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.6 Close_Compare6

void CloseCompare6(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.7 Close_Compare7

void CloseCompare7(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.8 Close_Compare8

void CloseCompare8(void)

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.9 Close_Compare9

```
void CloseCompare9(void)
```

This function turns off the Output Compare module.

Returns
None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.10 Close_Compare10

```
void CloseCompare10(void)
```

This function turns off the Output Compare module.

Returns
None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.11 Close_ECompare1

```
void CloseECompare1(void)
```

This function turns off the Output Compare module.

Returns
None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.12 Close_ECompare2

```
void CloseECompare2(void)
```

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.1.2.13 Close_ECompare3**void CloseECompare3(void)**

This function turns off the Output Compare module.

Returns

None

Remarks

This function disables the Output Compare interrupt and then turns off the module.

8.7.2 Output Compare Macros**8.7.3 Output Compare Examples****8.7.3.1 Output Compare Example1****Example Source Code demonstrating peripheral library usage**

```
*****
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
* output compare module output is observed at CCP1 pin
*****
```

```
#define USE_OR_MASKS
#include <p18cxx.h>
#include "compare.h"           //header file for using library API for output compare
#include "timers.h"            //header file for using the library APIs for timers
that act as source for output compare

void main(void)
{
    unsigned int period=0x00;
    unsigned char config=0x00,config1=0x00;
```

```

//---Configure timer for corresponding timer module selection for capture module---
SetTmrCCPSrc(T1_SOURCE_CCP);
OpenTimer1(config1);

//---Configure output compare ---
config = COM_TOGG_MATCH | COM_INT_OFF ;
period = 0x0101;
OpenCompare1( config, period);

//*** On match of period the CCP1 pin toggles ***
while(1);                                //End of program
}

```

8.8 Pulse Width Modulation (PWM)

Pulse-Width Modulation (PWM) mode, the CCP1 pin produces up to a 10-bit resolution PWM output. PWM has a time base (period) register and associated Timer2 against which the value in time period register is constantly compared and upon match, the event can be triggered which is user selectable.

8.8.1 PWM Functions

8.8.1.1 Open_PWM

8.8.1.1.1 Open_PWM1

void OpenPWM1(char period)

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMR2 prescaler

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timer2.

NOTE : In addition to configuring the PWM, Timer2 must also be configured with an OpenTimer2 (see page 1123)

function before the PWM configuration

8.8.1.1.2 Open_PWM2

void OpenPWM2(char period)

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMR2 prescaler

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timer2.

NOTE : In addition to configuring the PWM, Timer2 must also be configured with an OpenTimer2 (see page 1123) function before the PWM configuration

8.8.1.1.3 Open_PWM3

void OpenPWM3(char period)

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMR2 prescaler

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timer2.

NOTE : In addition to configuring the PWM, Timer2 must also be configured with an OpenTimer2 (see page 1123)

function before the PWM configuration

8.8.1.1.4 Open_PWM3_Page2

```
void OpenPWM3 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRS register to select the source of timers for CCP module * CCP_3_SEL_TMR12 * CCP_3_SEL_TMR34 * CCP_3_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.5 Open_PWM4

```
void OpenPWM4( char period )
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMR2 prescaler

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timer2.

NOTE : In addition to configuring the PWM, Timer2 must also be configured with an OpenTimer2 (see page 1123) function before the PWM configuration

8.8.1.1.6 Open_PWM4_Page2

```
void OpenPWM4 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR36 * CCP_4_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.7 Open_PWM4_Page3

```
void OpenPWM3 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler

timer_source	These parameters configures CCPTMRS register to select the source of timers for CCP module * CCP_3_SEL_TMR12 * CCP_3_SEL_TMR34 * CCP_3_SEL_TMR_MASK
--------------	--

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.8 Open_PWM2_Page2

```
void OpenPWM2 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRS register to select the source of timers for CCP module * CCP_2_SEL_TMR12 * CCP_2_SEL_TMR34 * CCP_2_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.9 Open_PWM5

```
void OpenPWM5( char period )
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMR2 prescaler

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timer2.

NOTE : In addition to configuring the PWM, Timer2 must also be configured with an OpenTimer2 (see page 1123) function before the PWM configuration

8.8.1.1.10 Open_PWM5_Page2

```
void OpenPWM5 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR54 * CCP_5_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.11 Open_PWM5_Page3

```
void OpenPWM5 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(period) + 1] \times 4 \times Tosc \times \text{TMRx prescaler}$
timer_source	<p>These parameters configures CCPTMRS register to select the source of timers for CCP module</p> <ul style="list-style-type: none"> * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR34 * CCP_5_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.12 Open_PWM6_Page1

```
void OpenPWM6 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(period) + 1] \times 4 \times Tosc \times \text{TMRx prescaler}$
timer_source	<p>These parameters configures CCPTMRSx register to select the source of timers for CCP module</p> <ul style="list-style-type: none"> * CCP_6_SEL_TMR12 * CCP_6_SEL_TMR52 * CCP_6_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.13 Open_PWM7_Page1

```
void OpenPWM7 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * CCP_7_SEL_TMR12 * CCP_7_SEL_TMR54 * CCP_7_SEL_TMR56 * CCP_7_SEL_TMR58 * CCP_7_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.14 Open_PWM8_Page1

```
void OpenPWM8 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to selct the source of timers for CCP moudle * CCP_8_SEL_TMR12 * CCP_8_SEL_TMR74 * CCP_8_SEL_TMR76 * CCP_8_SEL_TMR_MASK

Returns
None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.15 Open_PWM8_Page2

```
void OpenPWM8 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to selct the source of timers for CCP moudle * CCP_8_SEL_TMR12 * CCP_8_SEL_TMR14 * CCP_8_SEL_TMR16 * CCP_8_SEL_TMR_MASK

Returns
None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.16 Open_PWM9_Page1

```
void OpenPWM9 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(period) + 1] \times 4 \times Tosc \times \text{TMRx prescaler}$
timer_source	<p>These parameters configures CCPTMRSx register to select the source of timers for CCP module</p> <ul style="list-style-type: none"> * CCP_9_SEL_TMR12 * CCP_9_SEL_TMR74 * CCP_9_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.17 Open_PWM10_Page1

```
void OpenPWM10 ( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(period) + 1] \times 4 \times Tosc \times \text{TMRx prescaler}$
timer_source	<p>These parameters configures CCPTMRSx register to select the source of timers for CCP module</p> <ul style="list-style-type: none"> * CCP_10_SEL_TMR12 * CCP_10_SEL_TMR72 * CCP_10_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timerx.

8.8.1.1.18 Open_EPWM1

```
void OpenEPWM1( char period )
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMR2 prescaler

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base. PWM uses only Timer2.

NOTE : In addition to configuring the PWM, Timer2 must also be configured with an OpenTimer2 (see page 1123) function before the PWM configuration

8.8.1.1.19 Open_EPWM1_Page2

```
void OpenEPWM1( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler

timer_source	These parameters configures CCPTMRSx register to selct the source of timers for CCP moudle * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR36 * ECCP_1_SEL_TMR38 * ECCP_1_SEL_TMR310 * ECCP_1_SEL_TMR312 * ECCP_1_SEL_TMR_MASK
--------------	---

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.20 Open_EPWM1_Page3

```
void OpenEPWM1( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: $\text{PWM period} = [(period) + 1] \times 4 \times Tosc \times TMRx \text{ prescaler}$
timer_source	These parameters configures CCPTMRSx register to selct the source of timers for CCP moudle * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR36 * ECCP_1_SEL_TMR38 * ECCP_1_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.21 Open_EPWM2_Page1

```
void OpenEPWM2( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(\text{period}) + 1] \times 4 \times \text{Tosc} \times \text{TMRx prescaler}$
timer_source	<p>These parameters configures CCPTMRSx register to select the source of timers for CCP module</p> <ul style="list-style-type: none"> * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR36 * ECCP_2_SEL_TMR38 * ECCP_2_SEL_TMR310 * ECCP_2_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.22 Open_EPWM2_Page2

```
void OpenEPWM2( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(\text{period}) + 1] \times 4 \times \text{Tosc} \times \text{TMRx prescaler}$

timer_source	<p>These parameters configures CCPTMRSx register to selct the source of timers for CCP moudle</p> <ul style="list-style-type: none"> * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR36 * ECCP_2_SEL_TMR38 * ECCP_2_SEL_TMR_MASK
--------------	---

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.23 Open_EPWM3_Page1

```
void OpenEPWM3( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(period) + 1] \times 4 \times Tosc \times TMRx \text{ prescaler}$
timer_source	<p>These parameters configures CCPTMRSx register to selct the source of timers for CCP moudle</p> <ul style="list-style-type: none"> * ECCP_3_SEL_TMR12 * ECCP_3_SEL_TMR34 * ECCP_3_SEL_TMR36 * ECCP_3_SEL_TMR38 * ECCP_3_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.24 Open_EPWM1_Page4

```
void OpenEPWM1( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(\text{period}) + 1] \times 4 \times \text{Tosc} \times \text{TMRx prescaler}$
timer_source	<p>These parameters configures CCPTMRSx register to select the source of timers for CCP module</p> <ul style="list-style-type: none"> * ECCP_1_SEL_TMR12 * ECCP_1_SEL_TMR34 * ECCP_1_SEL_TMR56 * ECCP_1_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.25 Open_EPWM2_Page3

```
void OpenEPWM2( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	<p>Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula:</p> $\text{PWM period} = [(\text{period}) + 1] \times 4 \times \text{Tosc} \times \text{TMRx prescaler}$

timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * ECCP_2_SEL_TMR12 * ECCP_2_SEL_TMR34 * ECCP_2_SEL_TMR56 * ECCP_2_SEL_TMR_MASK
--------------	--

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.26 Open_EPWM3_Page3

```
void OpenEPWM3( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * ECCP_3_SEL_TMR12 * ECCP_3_SEL_TMR34 * ECCP_3_SEL_TMR56 * ECCP_3_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.27 Open_PWM4_Page4

```
void OpenPWM4( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * CCP_4_SEL_TMR12 * CCP_4_SEL_TMR34 * CCP_4_SEL_TMR56 * CCP_4_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.1.28 Open_PWM5_Page4

```
void OpenPWM5( unsigned char period, unsigned char timer_source );
```

Configure PWM channel

Input Parameters

Input Parameters	Description
period	Can be any value from 0x00 to 0xff. This value determines the PWM frequency by using the following formula: PWM period = [(period) + 1] x 4 x Tosc x TMRx prescaler
timer_source	These parameters configures CCPTMRSx register to select the source of timers for CCP module * CCP_5_SEL_TMR12 * CCP_5_SEL_TMR34 * CCP_5_SEL_TMR56 * CCP_5_SEL_TMR_MASK

Returns

None

Remarks

This function configures the specified PWM channel for period and for time base.

8.8.1.2 SetOutput_PWM

8.8.1.2.1 SetOutput_PWM1

```
void SetOutputPWM1(unsigned char outputconfig, unsigned char outputmode)
```

Sets the PWM output configuration bits for ECCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
outputconfig	PWM Output configuration Selection: * SINGLE_OUT * FULL_OUT_FWD * HALF_OUT * FULL_OUT_REV * PWM_OP_MODE_MASK
outputmode	PWM Output mode selection: * PWM_MODE_1 * PWM_MODE_2 * PWM_MODE_3 * PWM_MODE_4 * PWM_MODE_MASK

Returns

None

Remarks

This function is only applicable to those devices with Extended or Enhanced CCP (ECCP)

8.8.1.2.2 SetOutput_PWM2

```
void SetOutputPWM2(unsigned char outputconfig, unsigned char outputmode)
```

Sets the PWM output configuration bits for ECCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
outputconfig	PWM Output configuration Selection: * SINGLE_OUT * FULL_OUT_FWD * HALF_OUT * FULL_OUT_REV * PWM_OP_MODE_MASK
outputmode	PWM Output mode selection: * PWM_MODE_1 * PWM_MODE_2 * PWM_MODE_3 * PWM_MODE_4 * PWM_MODE_MASK

Returns

None

Remarks

This function is only applicable to those devices with Extended or Enhanced CCP (ECCP)

8.8.1.2.3 SetOutput_PWM3

```
void SetOutputPWM3(unsigned char outputconfig, unsigned char outputmode)
```

Sets the PWM output configuration bits for ECCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
outputconfig	PWM Output configuration Selection: * SINGLE_OUT * FULL_OUT_FWD * HALF_OUT * FULL_OUT_REV * PWM_OP_MODE_MASK

outputmode	PWM Output mode selection: * PWM_MODE_1 * PWM_MODE_2 * PWM_MODE_3 * PWM_MODE_4 * PWM_MODE_MASK
------------	---

Returns
None

Remarks

This function is only applicable to those devices with Extended or Enhanced CCP (ECCP)

8.8.1.2.4 SetOutput_EPWM1

```
void SetOutputEPWM1(unsigned char outputconfig, unsigned char outputmode)
```

Sets the PWM output configuration bits for ECCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
outputconfig	PWM Output configuration Selection: * SINGLE_OUT * FULL_OUT_FWD * HALF_OUT * FULL_OUT_REV * PWM_OP_MODE_MASK
outputmode	PWM Output mode selection: * PWM_MODE_1 * PWM_MODE_2 * PWM_MODE_3 * PWM_MODE_4 * PWM_MODE_MASK

Returns
None

Remarks

This function is only applicable to those devices with Extended or Enhanced CCP (ECCP)

8.8.1.2.5 SetOutput_EPWM2_Page1

```
void SetOutputEPWM2(unsigned char outputconfig, unsigned char outputmode)
```

Sets the PWM output configuration bits for ECCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
outputconfig	PWM Output configuration Selection: * SINGLE_OUT * FULL_OUT_FWD * HALF_OUT * FULL_OUT_REV * PWM_OP_MODE_MASK
outputmode	PWM Output mode selection: * PWM_MODE_1 * PWM_MODE_2 * PWM_MODE_3 * PWM_MODE_4 * PWM_MODE_MASK

Returns

None

Remarks

This function is only applicable to those devices with Extended or Enhanced CCP (ECCP)

8.8.1.2.6 SetOutput_EPWM3_Page1

```
void SetOutputEPWM3(unsigned char outputconfig, unsigned char outputmode)
```

Sets the PWM output configuration bits for ECCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
outputconfig	PWM Output configuration Selection: * SINGLE_OUT * FULL_OUT_FWD * HALF_OUT * FULL_OUT_REV * PWM_OP_MODE_MASK
outputmode	PWM Output mode selection: * PWM_MODE_1 * PWM_MODE_2 * PWM_MODE_3 * PWM_MODE_4 * PWM_MODE_MASK

Returns
None

Remarks

This function is only applicable to those devices with Extended or Enhanced CCP (ECCP)

8.8.1.3 SetDC_PWM

8.8.1.3.1 SetDC_PWM1

void SetDCPWM1(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula: $\text{PWM} \times \text{Duty cycle} = (\text{DCx}<9:0>) \times \text{Tosc}$ where DCx<9:0> is the 10-bit value specified in the call to this function

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.2 SetDC_PWM2

void SetDCPWM2(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}<9:0>) \times \text{Tosc}$ <p>where DCx<9:0> is the 10-bit value specified in the call to this function</p>

Returns

None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.3 SetDC_PWM3

void SetDCPWM3(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.4 SetDC_PWM4

void SetDCPWM4(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.5 SetDC_PWM5

void SetDCPWM5(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}<9:0>) \times \text{Tosc}$ <p>where DCx<9:0> is the 10-bit value specified in the call to this function</p>

Returns

None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.6 SetDC_PWM6_Page1

void SetDCPWM6(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.7 SetDC_PWM7_Page1

void SetDCPWM7(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.8 SetDC_PWM8_Page1

void SetDCPWM8(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}<9:0>) \times \text{Tosc}$ <p>where DCx<9:0> is the 10-bit value specified in the call to this function</p>

Returns

None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.9 SetDC_PWM9_Page1

void SetDCPWM9(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{F pwm}) / \log(2)$$

8.8.1.3.10 SetDC_PWM10_Page1

void SetDCPWM10(unsigned int dutycycle)
--

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.11 SetDC_EPWM1

void SetDCEPWM1(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}<9:0>) \times \text{Tosc}$ <p>where DCx<9:0> is the 10-bit value specified in the call to this function</p>

Returns

None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.3.12 SetDC_EPWM2_Page1

void SetDCEPWM2(unsigned int dutycycle)

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{F pwm}) / \log(2)$$

8.8.1.3.13 SetDC_EPWM3_Page1

void SetDCEPWM3(unsigned int dutycycle)
--

Write a new duty cycle value to the specified PWM channel duty cycle registers

Input Parameters

Input Parameters	Description
dutycycle	<p>The value of dutycycle can be any 10-bit number. Only the lower 10-bits of dutycycle are written into the duty cycle registers. The duty cycle, or more specifically the high time of the PWM waveform, can be calculated from the following formula:</p> $\text{PWM} \times \text{Duty cycle} = (\text{DCx}_{9:0}) \times \text{Tosc}$ <p>where DCx_{9:0} is the 10-bit value specified in the call to this function</p>

Returns
None

Remarks

This function writes the new value for dutycycle to the specified PWM channel duty cycle registers.

The maximum resolution of the PWM waveform can be calculated from the period using the following formula:

$$\text{Resolution (bits)} = \log(\text{Fosc}/\text{Fpwm}) / \log(2)$$

8.8.1.4 Close_PWM

8.8.1.4.1 Close_PWM1

void ClosePWM1(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.2 Close_PWM2

void ClosePWM2(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.3 Close_PWM3

void ClosePWM3(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.4 Close_PWM4

void ClosePWM4(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.5 Close_PWM5

void ClosePWM5(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.6 Close_PWM6_Page1

void ClosePWM6(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.7 Close_PWM7_Page1

void ClosePWM7(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.8 Close_PWM8_Page1

void ClosePWM8(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.9 Close_PWM9_Page1

void ClosePWM9(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.10 Close_PWM10_Page1

void ClosePWM10(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.11 Close_EPWM1

void CloseEPWM1(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.12 Close_EPWM3_Page1

void CloseEPWM3(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.1.4.13 Close_EPWM2_Page1

void CloseEPWM2(void)

Disable PWM channel

Returns

None

Remarks

This function disables the specified PWM channel

8.8.2 PWM Structs,Records,Enums

8.8.3 PWM Macros

8.8.4 PWM Examples

8.8.4.1 PWM Example1

Example Source Code demonstrating peripheral library usage

```
/*
 * NOTES:
 * Code uses the Peripheral library support available with MCC18 Compiler
 * Code Tested on:
 * PicDem2+ demo board with PIC18F4685 controller
 * PWM output is obtained on CCP1 pin. duty cycle is given by
 *
 * Formula for Period and Duty cycle calculation
 *
 * PWM period = [(period ) + 1] x 4 x Tosc x TMR2 prescaler
 *
 * PWM x Duty cycle = (DCx<9:0>) x Tosc
 *
 * Resolution (bits) = log(Fosc/F pwm) / log(2)
 */

#define USE_OR_MASKS
#include <p18cxx.h>
#include "pwm.h"

void main(void)
{
    char period=0x00;
    unsigned char outputconfig=0, outputmode=0, config=0;
    unsigned int duty_cycle=0;

    //----Configure pwm ----
    period = 0xFF;
    OpenPWM1( period);           //Configure PWM module and initialize PWM period

    //----set duty cycle----
    duty_cycle = 0x0F00;
    SetDCPWM1(duty_cycle);      //set the duty cycle

    //----set pwm output----
    outputconfig = FULL_OUT_FWD ;
    outputmode = PWM_MODE_1;
    SetOutputPWM1( outputconfig, outputmode); //output PWM in respective modes

    while(1);                  //observe output on CCP1 pin

    //----close pwm----
    ClosePWM1();
}
```

8.9 EEPROM (EEP)

The data EEPROM is a nonvolatile memory array, separate from the data RAM and program memory, that is used for long-term storage of program data. Peripheral library supports the EEPROM operations that includes:

- Byte Read from the specified location in EEPROM

- Byte Write to specified location in EEPROM
- Function to check the status of the EEPROM

8.9.1 EEP Functions

8.9.1.1 Write_Byte_EEP

```
void Write_b_eep( unsigned int baddr,unsigned char bdata )
```

This function Writes a single byte of data to Internal EEP at the user specified location

Input Parameters

Input Parameters	Description
baddr	Address of EEPROM location at which the byte of data has to be stored
bdata	byte of data to be stored in EEPROM

Returns

None

Remarks

User has to refer data sheet to get the address range and availability of internal EEPROM on specific device.

8.9.1.2 Read_Byte_EEP

```
unsigned char Read_b_eep( unsigned int baddr )
```

Reads a single byte from Internal EEPROM from the user specified location

Input Parameters

Input Parameters	Description
baddr	Address of EEPROM location at which the byte of data has to be stored

Returns

Returns byte of data stored stored at the specified address

Remarks

None

8.9.1.3 Busy_EEP

```
void Busy_eep ( void )
```

Checks & waits the status of ER bit in EECON1 register

Returns
None

Remarks

If the EEPROM is busy, then the function will be in continuous loop till the EEPROM is free.

8.9.2 EEP Examples

8.9.2.1 EEP Example1

Example Source Code demonstrating peripheral library usage

```
*****  
* NOTES:  
* Code uses the Peripheral library support available with MCC18 Compiler  
* Code Tested on:  
* PicDem2+ demo board with PIC18F4685 controller  
*****  
  
#define USE_OR_MASKS  
#include <p18cxx.h>  
#include "EEP.h"  
  
unsigned char EEPWrite[15] = "MICROCHIP_TECH", EEPRead[15], Error=0 ;  
  
void main(void)  
{  
    unsigned char q=0;  
    unsigned int address;  
  
    address = 0x0200;  
  
    /* Write single byte to Internal EEPROM*/  
    for(q=0;q<16;q++)  
    {  
        Write_b_eep (address, EEPWrite[q]);      // write into to EEPROM  
        address++;                                //increment the address of EEPROM to next  
        location  
        /* Checks & waits the status of ER bit in EECON1 register */  
        Busy_eep ();  
    }  
  
    address = 0x0200;          // initialize the starting address  
    Error = 0;                //clear the error flag  
    /* Read single byte from Internal EEPROM*/  
    for(q=0;q<16;q++)  
    {  
        EEPRead[q] = Read_b_eep (address++);      //read the EEPROM data written previously
```

```

from corresponding address
    if (EEPRead[q] != EEPROMWrite[q] )
        //check if the data read abck is same as
        //that was written
    {
        Error=1;
        //if the data read/ write match does not
        //occur, then flag the error status
        while(1);
        //error occurred
    }
}

while(1);                                //End of program
}

```

8.10 Inter Integrated Circuit Communication (I2C)

The Inter-Integrated Circuit (I2C) module is a serial interface useful for communicating with other peripheral or microcontroller devices. These peripheral devices may be serial EEPROMs, display drivers, A/D Converters, etc. The I2C module supports these features:

- 7-bit and 10-bit device addresses
- General call address, as defined in the I2C protocol
- Clock stretching to provide delays for the processor to respond to a slave data request
- Both 100 kHz and 400 kHz bus specifications.
- Configurable address masking
- Multi-Master modes to prevent loss of messages in arbitration
- Bus Repeater mode, allowing the acceptance of all messages as a slave regardless of the address
- Automatic SCL

8.10.1 I2C Functions

8.10.1.1 I2C_Open

8.10.1.1.1 Open_I2C

```
void OpenI2C( unsigned char sync_mode, unsigned char slew )
```

Configures the I2C in SSP module.

8

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	This contains the parameter to configure the SSPCONx register: Mode Select * SLAVE_7 * SLAVE_10 * MASTER
slew	This contains the parameter to configure the SSPCONx register: Slew Rate Control * SLEW_OFF * SLEW_ON

Returns
None

Remarks

OpenI2C resets the SSP module to the POR state and then configures the module for Master/Slave mode and the selected slew rate.

8.10.1.1.2 Open_I2C1

void OpenI2C1(unsigned char sync_mode, unsigned char slew)

Configures the I2C in SSP1 module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	This contains the parameter to configure the SSPCONx register: Mode Select * SLAVE_7 * SLAVE_10 * MASTER
slew	This contains the parameter to configure the SSPCONx register: Slew Rate Control * SLEW_OFF * SLEW_ON

Returns

None

Remarks

OpenI2C1 resets the SSP1 module to the POR state and then configures the module for Master/Slave mode and the selected slew rate.

8.10.1.1.3 Open_I2C2

```
void OpenI2C2( unsigned char sync_mode, unsigned char slew )
```

Configures the I2C in SSP2 module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	<p>This contains the parameter to configure the SSPCONx register:</p> <p>Mode Select * SLAVE_7 * SLAVE_10 * MASTER</p>
slew	<p>This contains the parameter to configure the SSPCONx register:</p> <p>Slew Rate Control * SLEW_OFF * SLEW_ON</p>

Returns

None

Remarks

OpenI2C2 resets the SSP2 module to the POR state and then configures the module for Master/Slave mode and the selected slew rate.

8.10.1.2 I2C_Write

8.10.1.2.1 Write_I2C

```
unsigned char Writel2C( unsigned char data_out )
```

This function is used to write out a single data byte to the I2C device.

Input Parameters

Input Parameters	Description
data_out	A single data byte to be written to the I2C bus device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)
- * -2 -- if negative acknowledgement received from other I2C device

Remarks

This function writes a single byte to the I2C bus.

This function performs the same function as putl2Cx.

8.10.1.2.2 Write_I2C1

```
unsigned char Writel2C1( unsigned char data_out )
```

This function is used to write out a single data byte to the I2C device.

Input Parameters

Input Parameters	Description
data_out	A single data byte to be written to the I2C bus device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)
- * -2 -- if negative acknowledgement received from other I2C device

Remarks

This function writes a single byte to the I2C bus.

This function performs the same function as putl2Cx.

8.10.1.2.3 Write_I2C2

```
unsigned char Writel2C2( unsigned char data_out )
```

This function is used to write out a single data byte to the I2C device.

Input Parameters

Input Parameters	Description
data_out	A single data byte to be written to the I2C bus device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)
- * -2 -- if negative acknowledgement received from other I2C device

Remarks

This function writes a single byte to the I2C bus.

This function performs the same function as putl2Cx.

8.10.1.3 I2C_Read

8.10.1.3.1 Read_I2C

```
unsigned char Readl2C( void )
```

This function is used to read a single byte from I2C bus

Returns

The return value is the data byte read from the I2C bus.

Remarks

This function reads in a single byte from the I2C bus.

This function performs the same function as getl2Cx.

8.10.1.3.2 Read_I2C1

```
unsigned char Readl2C1( void )
```

This function is used to read a single byte from I2C bus

Returns

The return value is the data byte read from the I2C bus.

Remarks

This function reads in a single byte from the I2C bus.

This function performs the same function as getI2Cx.

8.10.1.3.3 Read_I2C2

unsigned char ReadI2C2(void)

This function is used to read a single byte from I2C bus

Returns

The return value is the data byte read from the I2C bus.

Remarks

This function reads in a single byte from the I2C bus.

This function performs the same function as getI2Cx.

8.10.1.4 I2C_puts

8.10.1.4.1 puts_I2C

unsigned char putsI2C(unsigned char *wrptr)

This function is used to write out a data string to the I2C bus.

Input Parameters

Input Parameters	Description
wrptr	Character type pointer to data objects in RAM. The data objects are written to the I2C device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)
- * -2 -- if negative acknowledgement received from other I2C device

Remarks

This routine writes a data string to the I2C bus until a null character is reached. The null character itself is not transmitted.

This routine can operate in both Master or Slave mode.

8.10.1.4.2 puts_I2C1

unsigned char putsI2C1(unsigned char *wrptr)

This function is used to write out a data string to the I2C bus.

Input Parameters

Input Parameters	Description
wrptr	Character type pointer to data objects in RAM. The data objects are written to the I2C device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)
- * -2 -- if negative acknowledgement received from other I2C device

Remarks

This routine writes a data string to the I2C bus until a null character is reached. The null character itself is not transmitted.
This routine can operate in both Master or Slave mode.

8.10.1.4.3 puts_I2C2

unsigned char putsI2C2(unsigned char *wrptr)

This function is used to write out a data string to the I2C bus.

Input Parameters

Input Parameters	Description
wrptr	Character type pointer to data objects in RAM. The data objects are written to the I2C device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)
- * -2 -- if negative acknowledgement received from other I2C device

Remarks

This routine writes a data string to the I2C bus until a null character is reached. The null character itself is not transmitted.
This routine can operate in both Master or Slave mode.

8.10.1.5 I2C_gets

8.10.1.5.1 gets_I2C

```
unsigned char getsI2C( unsigned char *rdptr, unsigned char length )
```

This function reads predetermined data string length from the I2C bus.

Input Parameters

Input Parameters	Description
rdptr	Character type pointer to RAM for storage of data read from I2C device
length	Number of bytes to read from I2C device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)

Remarks

This routine reads a predefined data string from the I2C bus.

NOTE:

User has to send a ACK or NACK signal after this function in application to complete the acknowledgement sequence for the last byte of data received.

8.10.1.5.2 gets_I2C1

```
unsigned char getsI2C1( unsigned char *rdptr, unsigned char length )
```

This function reads predetermined data string length from the I2C bus.

Input Parameters

Input Parameters	Description
rdptr	Character type pointer to RAM for storage of data read from I2C device
length	Number of bytes to read from I2C device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)

Remarks

This routine reads a predefined data string from the I2C bus.

NOTE:

User has to send a ACK or NACK signal after this function in application to complete the acknowledgement sequence for the last byte of data received.

8.10.1.5.3 gets_I2C2

```
unsigned char getsI2C2( unsigned char *rdptr, unsigned char length )
```

This function reads predetermined data string length from the I2C bus.

Input Parameters

Input Parameters	Description
rdptr	Character type pointer to RAM for storage of data read from I2C device
length	Number of bytes to read from I2C device.

Returns

Returns error condition status:

- * 0 -- if the write was successful
- * -1 -- if there was a write collision (for Master Mode only)

Remarks

This routine reads a predefined data string from the I2C bus.

NOTE:

User has to send a ACK or NACK signal after this function in application to complete the acknowledgement sequence for the last byte of data received.

8.10.1.6 Close_I2C

```
void CloseI2C( void )
```

This function turns off the I2C module

Returns

None

Remarks

None

8.10.1.7 Idle_I2C

void IdleI2C(void)

This function generates Wait condition until I2C bus is Idle

Returns

None

Remarks

This function will be in a wait state until Start Condition Enable bit, Stop Condition Enable bit, Receive Enable bit, Acknowledge Sequence Enable bit of I2C Control register and Transmit Status bit I2C Status register are clear. The IdleI2C function is required since the hardware I2C peripheral does not allow for spooling of bus sequence. The I2C peripheral must be in Idle state before an I2C operation can be initiated or write collision will be generated

8.10.2 I2C Macros

8.10.3 I2C Examples

8.10.3.1 I2C Example1_Master

Example Source Code demonstrating peripheral library usage

```
*****
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
* SCA & SCL must be connected to the corresponding in slave
* Note: If not using PicDem2+ demo board, then SCA & SCL lines have to be pulled up by
connecting 4.7KOhms resister to Vdd.
*****
```

```
#define USE_OR_MASKS
#include <p18cxx.h>
#include "i2c.h"

unsigned char I2C_Send[21] = "MICROCHIP:I2C_MASTER" ;
```

```

unsigned char I2C_Recv[21];

//***** I2C MASTER *****
void main(void)
{
    unsigned char sync_mode=0, slew=0, add1,w,data,status,length;

    for(w=0;w<20;w++)
        I2C_Recv[w]=0;

    add1=0xA2;           //address of the device (slave) under communication

    CloseI2C();          //close i2c if was operating earlier

//---INITIALISE THE I2C MODULE FOR MASTER MODE WITH 100KHz ---
    sync_mode = MASTER;
    slew = SLEW_OFF;

    OpenI2C(sync_mode,slew);

    SSPADD=0x0A;          //400kHz Baud clock(9) @8MHz

//check for bus idle condition in multi master communication
    IdleI2C();

//---START I2C---
    StartI2C();

//****write the address of the device for communication***
    data = SSPBUF;          //read any previous stored content in buffer to clear buffer full
    status
    do
    {
        status = WriteI2C( add1 | 0x00 );      //write the address of slave
        if(status == -1)           //check if bus collision happened
        {
            data = SSPBUF;          //upon bus collision detection clear the buffer,
            SSPCON1bits.WCOL=0;     // clear the bus collision status bit
        }
    }
    while(status!=0);          //write untill successful communication
//R/W BIT IS '0' FOR FURTHER WRITE TO SLAVE

//****WRITE THE THE DATA TO BE SENT FOR SLAVE***
    while(putsI2C(I2C_Send)!=0);      //write string of data to be transmitted to slave

//---TERMINATE COMMUNICATION FROM MASTER SIDE---
    IdleI2C();

//---RESTART I2C COMMUNICATION---
    RestartI2C();
    IdleI2C();

//****write the address of the device for communication***
    data = SSPBUF;          //read any previous stored content in buffer to clear buffer full
    status

//R/W BIT IS '1' FOR READ FROM SLAVE
    add1 = 0xA2;
    do
    {
        status = WriteI2C( add1 | 0x01 );      //write the address of slave
        if(status == -1)           //check if bus collision happened
        {
            data = SSPBUF;          //upon bus collision detection clear the buffer,
            SSPCON1bits.WCOL=0;     // clear the bus collision status bit
        }
    }
    while(status!=0);          //write untill successful communication

```

```

//**** Recieve data from slave ***
while( getsI2C(I2C_Recv,20) );           //recieve data string of lenght 20 from slave
I2C_Recv[20] = '\0' ;

NotAckI2C();                           //send the end of transmission signal through nack
while( SSPCON2bits.ACKEN!=0);          //wait till ack sequence is complete

//*** close I2C ***
CloseI2C();                            //close I2C module

while(1);                                //End of program
}

```

8.10.3.2 I2C Example1_Slave

Example Source Code demonstrating peripheral library usage

```

***** NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
* signal to be compared are applied to CxIN+ & CxIN- and output is tapped at CxOUT
***** */

#define USE_OR_MASKS
#include <p18cxx.h>
#include "i2c.h"

unsigned char I2C_Send[21] = "MICROCHIP:I2C_SLAVE" ;
unsigned char I2C_Recv[21];

//***** I2C SLAVE *****
void main(void)
{
    unsigned char sync_mode=0, slew=0, add1,status,temp,w,length=0;

    for(w=0;w<20;w++)
        I2C_Recv[w]=0;

    CloseI2C();                                //close i2c if was operating earlier

    //---INITIALISE THE I2C MODULE FOR MASTER MODE WITH 100KHz ---
    sync_mode = SLAVE_7;
    slew = SLEW_OFF;
    OpenI2C(sync_mode,slew);

    SSPADD = 0xA2;                             //initialze slave address
    //**** Read the address sent by master from buffer ***
    while(DataRdyI2C()==0);                  //WAIT UNTILL THE DATA IS TRANSMITTED FROM master
    temp = ReadI2C();

    //**** Data reception from master by slave ***
    do
    {
        while(DataRdyI2C()==0);              //WAIT UNTILL THE DATA IS TRANSMITTED FROM master
        I2C_Recv[length++]=getcI2C();        // save byte received
    }
    while(length!=20);

    //*** write sequence from slave ***
    while(SSPSTATbits.S!=1);                //wait until STOP CONDITION

```

```

//*** Read the address sent by master from buffer ***
    while(DataRdyI2C()==0);           //WAIT UNTILL THE DATA IS TRANSMITTED FROM master
    temp = ReadI2C();

//*** Slave transmission ***
    if(SSPSTAT & 0x04)                //check if master is ready for reception
        while(puttsI2C(I2C_Send));      // send the data to master

//---TERMINATE COMMUNICATION FROM MASTER SIDE---
    CloseI2C();                      //close I2C module

    while(1);                         //End of program
}

```

8.11 I2C EEPROM (I2C_EEP)

The Inter-Integrated Circuit (I2C) module is a serial interface useful for communicating with other peripheral or microcontroller devices. This section provides peripheral library support to serial I2C compatible EEPROMs

8.11.1 I2C_EEP Functions

8.11.1.1 EEAckPolling_I2C

8.11.1.1.1 I2C_EEAckPolling

unsigned char EEAckPolling(unsigned char control)
--

Acknowledge polling of I2C EE memory device.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -3 -- if there was a bus collision

Remarks

This function is used to generate the Acknowledge polling sequence for EE I2C memory devices that utilize Acknowledge polling.

NOTE:

- I2C module on device must be configured using the OpenI2C (see page 1063) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.1.2 I2C_EEAckPolling1

unsigned char EEAckPolling1(unsigned char control)

Acknowledge polling of I2C EE memory device.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -3 -- if there was a bus collision

Remarks

This function is used to generate the Acknowledge polling sequence for EE I2C memory devices that utilize Acknowledge polling.

NOTE:

- I2C module on device must be configured using the OpenI2C1 (see page 1064) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.1.3 I2C_EEAckPolling2

unsigned char EEAckPolling2(unsigned char control)

Acknowledge polling of I2C EE memory device.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -3 -- if there was a bus collision

Remarks

This function is used to generate the Acknowledge polling sequence for EE I2C memory devices that utilize Acknowledge polling.

NOTE:

- I2C module on device must be configured using the OpenI2C2 (see page 1065) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.2 EECurrentAddRead_I2C

8.11.1.2.1 I2C_EECurrentAddRead

```
unsigned int EECurrentAddRead( unsigned char control )
```

This function Reads data at current address of EE memory.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision
- The read byte of **data** is returned as an unsigned 16-bit quantity. Since the buffer itself is only 8-bits wide, this means that the Most Significant Byte will be zero and the Least Significant Byte will contain the read buffer contents.

Remarks

This function reads a byte of data from the current address loaded previously to the I2C EE memory device. The address location of the data to read is that of the current pointer within the I2C EE device. The memory device contains an address counter that maintains the address of the last word accessed, incremented by one.

NOTE:

- I2C module on device must be configured using the OpenI2C (see page 1063) function available in I2C section of

- document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
 - Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.2.2 I2C_EECurrentAddRead1

```
unsigned int EECurrentAddRead1( unsigned char control )
```

This function Reads data at current address of EE memory.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision
- The read byte of **data** is returned as an unsigned 16-bit quantity. Since the buffer itself is only 8-bits wide, this means that the Most Significant Byte will be zero and the Least Significant Byte will contain the read buffer contents.

Remarks

This function reads a byte of data from the current address loaded previously to the I2C EE memory device. The address location of the data to read is that of the current pointer within the I2C EE device. The memory device contains an address counter that maintains the address of the last word accessed, incremented by one.

NOTE:

- I2C module on device must be configured using the OpenI2C1 (see page 1064) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.2.3 I2C_EECurrentAddRead2

```
unsigned int EECurrentAddRead2( unsigned char control )
```

This function Reads data at current address of EE memory.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision
- The read byte of **data** is returned as an unsigned 16-bit quantity. Since the buffer itself is only 8-bits wide, this means that the Most Significant Byte will be zero and the Least Significant Byte will contain the read buffer contents.

Remarks

This function reads a byte of data from the current address loaded previously to the I2C EE memory device. The address location of the data to read is that of the current pointer within the I2C EE device. The memory device contains an address counter that maintains the address of the last word accessed, incremented by one.

NOTE:

- I2C module on device must be configured using the OpenI2C2 (see page 1065) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.3 EEByteWrite_I2C

8.11.1.3.1 I2C_EEByteWrite

```
unsigned char EEByteWrite( unsigned char control, unsigned char address, unsigned char data )
```

This function Write a byte of data to the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
data	Data to write to EEPROM address specified in function parameter address.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function writes a byte of data to the I2C EE memory device. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C (see page 1063) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.3.2 I2C_EEByteWrite1

unsigned char EEByteWrite1(unsigned char control, unsigned char address, unsigned char data)

This function Write a byte of data to the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
data	Data to write to EEPROM address specified in function parameter address.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function writes a byte of data to the I2C EE memory device. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C1 (see page 1064) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.3.3 I2C_EEByteWrite2

unsigned char EEByteWrite2(unsigned char control, unsigned char address, unsigned char data)

This function Write a byte of data to the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
data	Data to write to EEPROM address specified in function parameter address.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function writes a byte of data to the I2C EE memory device. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C2 (see page 1065) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.4 EEPAGEWRITE_I2C

8.11.1.4.1 I2C_EEPAGEWRITE

```
unsigned char EEPAGEWRITE( unsigned char control, unsigned char address, unsigned char *wrptr )
```

This function Write a string of data to the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
wrptr	Character type pointer to PICmicro MCU RAM area from where the data to be written to EEPROM device.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision
- * -4 -- if there was a bus device responded possible error

Remarks

This function writes a null terminated string of data to the I2C EE memory device. The null character itself is not transmitted. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C (see page 1063) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.4.2 I2C_EEPageWrite1

```
unsigned char EEPageWrite1( unsigned char control, unsigned char address, unsigned char *wrptr )
```

This function Write a string of data to the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
wrptr	Character type pointer to PICmicro MCU RAM area from where the data to be written to EEPROM device.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision
- * -4 -- if there was a bus device responded possible error

Remarks

This function writes a null terminated string of data to the I2C EE memory device. The null character itself is not transmitted. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C1 (see page 1064) function available in I2C section of

- document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
 - Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.4.3 I2C_EEPageWrite2

```
unsigned char EEPageWrite2( unsigned char control, unsigned char address, unsigned char *wrptr )
```

This function Write a string of data to the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
wrptr	Character type pointer to PICmicro MCU RAM area from where the data to be written to EEPROM device.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision
- * -4 -- if there was a bus device responded possible error

Remarks

This function writes a null terminated string of data to the I2C EE memory device. The null character itself is not transmitted. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C2 (see page 1065) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.5 EESequenctialRead_I2C

8.11.1.5.1 I2C_EESequentialRead

```
unsigned char EESequenctialRead( unsigned char control, unsigned char address, unsigned char *rdptr, unsigned char length )
```

This function reads a string of data from the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
rdptr	Character type pointer to PICmicro MCU RAM area for placement of data read from EEPROM device.
length	Number of bytes to read from EEPROM device.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function reads in a predefined string length of data from the I2C bus. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C (see page 1063) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.5.2 I2C_EESequentialRead1

```
unsigned char EEESequentialRead1( unsigned char control, unsigned char address, unsigned char *rdptr, unsigned char length )
```

This function reads a string of data from the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
rdptr	Character type pointer to PICmicro MCU RAM area for placement of data read from EEPROM device.
length	Number of bytes to read from EEPROM device.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function reads in a predefined string length of data from the I2C bus. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C1 (see page 1064) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.5.3 I2C_EESequentialRead2

```
unsigned char EEESequentialRead2( unsigned char control, unsigned char address, unsigned char *rdptr, unsigned char length )
```

This function reads a string of data from the I2C EEPROM from the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location
rdptr	Character type pointer to PICmicro MCU RAM area for placement of data read from EEPROM device.
length	Number of bytes to read from EEPROM device.

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function reads in a predefined string length of data from the I2C bus. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C2 (see page 1065) function available in I2C section of

- document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
 - Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.6 EERandomRead_I2C

8.11.1.6.1 I2C_EERandomRead

```
unsigned int EERandomRead( unsigned char control, unsigned char address )
```

This function reads a single byte of data from the I2C EEPROM at the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function reads in a single byte from the I2C EEPROM. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C (see page 1063) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.6.2 I2C_EERandomRead1

```
unsigned int EERandomRead1( unsigned char control, unsigned char address )
```

This function reads a single byte of data from the I2C EEPROM at the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function reads in a single byte from the I2C EEPROM. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C1 (see page 1064) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.1.6.3 I2C_EERandomRead2

```
unsigned int EERandomRead2( unsigned char control, unsigned char address )
```

This function reads a single byte of data from the I2C EEPROM at the specified address.

Input Parameters

Input Parameters	Description
control	EEPROM control / bus device select address byte
address	EEPROM internal address location

Returns

Returns error condition status:

- * 0 -- if the control/address write was successful
- * -1 -- if there was a bus collision
- * -2 -- if negative acknowledgement received from other I2C device
- * -3 -- if there was a bus collision

Remarks

This function reads in a single byte from the I2C EEPROM. The routine can be used for Microchip I2C EE memory devices which only require 1 byte of address information.

NOTE:

- I2C module on device must be configured using the OpenI2C2 (see page 1065) function available in I2C section of document prior to using the I2C EEPROM functions
- I2C on device must be configured in MASTER mode only
- Refer I2C compatible EEPROM data sheet for "control" parameter details and "address" range.

8.11.2 I2C_EEP Examples

8.11.2.1 I2C_EEP Example1

Example Source Code demonstrating peripheral library usage

//The following is a simple code example illustrating the SSP module configured for I2C master communication. The routine illustrates I2C communications with a Microchip 24LC01B I2C EE memory device.

```
#include "p18cxx.h"
#include "i2c.h"

unsigned char arraywr[] = {1,2,3,4,5,6,7,8,0};
unsigned char arrayrd[20];

//*****
void main(void)
{
    OpenI2C(MASTER, SLEW_ON); // Initialize I2C module
    SSPADD = 9;               //400kHz Baud clock(9) @16MHz
                               //100kHz Baud clock(39) @16MHz

    while(1)
    {
        EEByteWrite(0xA0, 0x30, 0xA5);

        EEAckPolling(0xA0);

        EECurrentAddRead(0xA0);

        EEPageWrite(0xA0, 0x70, arraywr);

        EEAckPolling(0xA0);

        EESequentialRead(0xA0, 0x70, arrayrd, 20);

        EERandomRead(0xA0, 0x30);
    }
}
```

8.12 IO Ports

All of the device pins (except VDD, VSS, MCLR and OSC1/CLK1) are shared between the peripherals and the parallel I/O ports. All I/O input ports feature Schmitt Trigger inputs for improved noise immunity.

8.12.1 Ports Functions

8.12.1.1 Open_PORTB

```
void OpenPORTB(unsigned char config)
```

Configure the interrupts and internal pull-up resistors on PORTB.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Parameters to configure Interrupt on change and Pull Ups</p> <p>Interrupt-on-change: * PORTB_CHANGE_INT_ON * PORTB_CHANGE_INT_OFF * PORTB_CHANGE_INT_MASK</p> <p>Enable/Disable Pullups: * PORTB_PULLUPS_ON * PORTB_PULLUPS_OFF * PORTB_PULLUPS_MASK</p>

Returns

None

Remarks

This function configures the interrupts and internal pull-up resistors on PORTB.

8.12.1.2 Open_RB0INT

```
void OpenRB0INT(unsigned char config)
```

Enable interrupts for the INT0 pin.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Parameters to configure Interrupt on change and Pull Ups</p> <p>Interrupt-on-change: * PORTB_CHANGE_INT_ON * PORTB_CHANGE_INT_OFF * PORTB_CHANGE_INT_MASK</p> <p>Interrupt-on-edge: * RISING_EDGE_INT * FALLING_EDGE_INT * EDGE_INT_MASK</p> <p>Interrupt Priority Select: * PORTB_INT_PRIO_HIGH * PORTB_INT_PRIO_LOW * PORTB_INT_PRIO_MASK</p> <p>Enable/Disable Pullups: * PORTB_PULLUPS_ON * PORTB_PULLUPS_OFF * PORTB_PULLUPS_MASK</p>

Returns
None

Remarks

This function configures the interrupts and internal pull-up resistors on INT0.

8.12.1.3 Open_RB1INT

```
void OpenRB1INT(unsigned char config)
```

Enable interrupts for the INT1 pin.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Parameters to configure Interrupt on change and Pull Ups</p> <p>Interrupt-on-change: * PORTB_CHANGE_INT_ON * PORTB_CHANGE_INT_OFF * PORTB_CHANGE_INT_MASK</p> <p>Interrupt-on-edge: * RISING_EDGE_INT * FALLING_EDGE_INT * EDGE_INT_MASK</p> <p>Interrupt Priority Select: * PORTB_INT_PRIO_HIGH * PORTB_INT_PRIO_LOW * PORTB_INT_PRIO_MASK</p> <p>Enable/Disable Pullups: * PORTB_PULLUPS_ON * PORTB_PULLUPS_OFF * PORTB_PULLUPS_MASK</p>

Returns
None

Remarks

This function configures the interrupts and internal pull-up resistors on INT1.

8.12.1.4 Open_RB2INT

```
void OpenRB2INT(unsigned char config)
```

Enable interrupts for the INT2 pin.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Parameters to configure Interrupt on change and Pull Ups</p> <p>Interrupt-on-change: * PORTB_CHANGE_INT_ON * PORTB_CHANGE_INT_OFF * PORTB_CHANGE_INT_MASK</p> <p>Interrupt-on-edge: * RISING_EDGE_INT * FALLING_EDGE_INT * EDGE_INT_MASK</p> <p>Interrupt Priority Select: * PORTB_INT_PRIO_HIGH * PORTB_INT_PRIO_LOW * PORTB_INT_PRIO_MASK</p> <p>Enable/Disable Pullups: * PORTB_PULLUPS_ON * PORTB_PULLUPS_OFF * PORTB_PULLUPS_MASK</p>

Returns
None

Remarks

This function configures the interrupts and internal pull-up resistors on INT2.

8.12.1.5 Open_RB3INT

```
void OpenRB3INT(unsigned char config)
```

Enable interrupts for the INT3 pin.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Parameters to configure Interrupt on change and Pull Ups</p> <p>Interrupt-on-change: * PORTB_CHANGE_INT_ON * PORTB_CHANGE_INT_OFF * PORTB_CHANGE_INT_MASK</p> <p>Interrupt-on-edge: * RISING_EDGE_INT * FALLING_EDGE_INT * EDGE_INT_MASK</p> <p>Interrupt Priority Select: * PORTB_INT_PRIO_HIGH * PORTB_INT_PRIO_LOW * PORTB_INT_PRIO_MASK</p> <p>Enable/Disable Pullups: * PORTB_PULLUPS_ON * PORTB_PULLUPS_OFF * PORTB_PULLUPS_MASK</p>

Returns
None

Remarks

This function configures the interrupts and internal pull-up resistors on INT3.

8.12.2 Ports Macros

8.12.3 Ports Examples

8.12.3.1 Ports Example1

Example Source Code demonstrating peripheral library usage

```
*****
* ADDITIONAL NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
```

```

* Uses INT0/INT1/INT2/RBx pins to cause interrupts
***** */

#define USE_OR_MASKS
#include <p18cxx.h>
#include "portb.h"

unsigned char PORTResult[5]={0,0,0,0,0};

void main(void)
{
    unsigned char config=0;
    ADCON1 = 0xFF;

    //*** configure INT0 with pullups enabled, falling edge ***
    config = PORTB_CHANGE_INT_ON | FALLING_EDGE_INT | PORTB_PULLUPS_ON;
    OpenRB0INT(config); //configures INT0 & enables it

    //*** configure INT1 with pullups enabled, falling edge ***
    config=0;
    config = PORTB_CHANGE_INT_ON | FALLING_EDGE_INT | PORTB_PULLUPS_ON;
    OpenRB1INT(config); //configures and enables INT1

    //*** configure INT2 with pullups enabled, falling edge ***
    config=0;
    config = PORTB_CHANGE_INT_ON | FALLING_EDGE_INT | PORTB_PULLUPS_ON;
    OpenRB2INT(config); //configures and enables INT2

    //*** configure Change Notification in PORTB with pullups enabled, falling edge ***
    config=0;
    config = PORTB_CHANGE_INT_ON | PORTB_PULLUPS_ON;
    OpenPORTB(config); //configures and enables change notification
    in PORTB

    //*** Check for interrupts ***
    while(1)
    {
        if( INTCONbits.INT0IF == 1) //Check for INT0
        {
            PORTResult[0]=1; //Set flag to indicate occurrence of INT0
            INTCONbits.INT0IF = 0; //Clear INT0
        }

        if(INTCON3bits.INT1IF == 1) //Check for INT1
        {
            PORTResult[1]=1; //Set flag to indicate occurrence of INT1
            INTCON3bits.INT1IF = 0; //Clear INT1
        }

        if(INTCON3bits.INT2IF == 1) //Check for INT2
        {
            PORTResult[2]=1; //Set flag to indicate occurrence of INT2
            INTCON3bits.INT2IF = 0; //Clear INT2
        }

        if(INTCONbits.RBIF == 1) //Check for Change Notification interrupt
        {
            PORTResult[4]=1; //Set flag to indicate occurrence of Change
            INTCONbits.RBIF = 0; //Clear Change Notification interrupt
        }
    }

    CloseRB0INT(); //disable INT0
    CloseRB1INT(); //disable INT1
    CloseRB2INT(); //disable INT2
    ClosePORTB(); //disable Change notification
}

```

{}

8.13 Real Time Clock & Calender (RTCC)

This module implements a full-featured clock and calendar with alarm functions in hardware, freeing up timer resources and program memory space for use of the core application.

8.13.1 RTCC Functions

8.13.1.1 RTCC_InitClock

void RtccInitClock(void)

The function initializes the RTCC device. It starts the RTCC clock, sets the RTCC Off and disables RTCC write. Disables the OE.

Returns

None

Remarks

Enables the secondary oscillator from Timer1

8.13.1.2 RTCC_ReadAlrmDate

void RtccReadAlrmDate(rtccDate* pDt)

The function updates the user supplied union/structure with the current alarm Date of the RTCC device.

Input Parameters

Input Parameters	Description
rtccDate *pDt	pointer to a rtccDate union to store the alarm Date

Returns

Updates the rtccDate structure

Remarks

pDt a valid pointer

8.13.1.3 RTCC_ReadAlrmTime

```
void RtccReadAlrmTime(rtccTime* pTm)
```

The function updates the user supplied union/structure with the current alarm time of the RTCC device.

Input Parameters

Input Parameters	Description
rtccTime* pTm	pointer to a rtccTime union to store the alarm time

Returns

Updates the rtccTime structure

Remarks

pTm a valid pointer

8.13.1.4 RTCC_ReadAlrmTimeDate

```
void RtccReadAlrmTimeDate(rtccTimeDate* pTD)
```

The function updates the user supplied union/structure with the current alarm time and date of the RTCC device.

Input Parameters

Input Parameters	Description
rtccTimeDate* pTD	pointer to a rtccTimeDate union to store the alarm time and date

Returns

Updates the rtccTimeDate structure

Remarks

pTD a valid pointer

8.13.1.5 RTCC_ReadDate

```
void RtccReadDate(rtccDate* pDt)
```

The function updates the user supplied union/structure with the current time of the RTCC device.

Input Parameters

Input Parameters	Description
rtccDate* pDt	pointer to a rtccTime union to store the current time

Returns

Updates the rtccDate structure

Remarks

The function makes sure that the read value is valid. It avoids waiting for the RTCSYNC to be clear by performing successive reads.

8.13.1.6 RTCC_ReadTime

void RtccReadTime(rtccTime* pTm)

The function updates the user supplied union/structure with the current time of the RTCC device.

Input Parameters

Input Parameters	Description
rtccTime* pTm	pointer to a rtccTime union to store the current time

Returns

Updates the rtccTime structure

Remarks

The function makes sure that the read value is valid. It avoids waiting for the RTCSYNC to be clear by performing successive reads.

8.13.1.7 RTCC_ReadTimeDate

void RtccReadTimeDate(rtccTimeDate* pTD)

The function updates the user supplied union/structure with the current time and date of the RTCC device.

Input Parameters

Input Parameters	Description
rtccTimeDate* pTD	pointer to a rtccTimeDate union to store the current time and date

Returns

Updates the pTD structure

Remarks

This firmware solution would consist of reading each register twice and then comparing the two values. If the two values match, then a rollover did not occur.

8.13.1.8 RTCC_SetAlarmRpt

void RtccSetAlarmRpt(rtccRepeat rpt, BOOL dsblAlrm)

The function sets the RTCC alarm repeat count.

Input Parameters

Input Parameters	Description
rpt	value of the desired alarm repeat rate
dsblAlrm	if TRUE, the API can temporarily disable the alarm when changing the RPT value

Returns

None

Remarks

If alarm is enabled, changing the repeat count can be safely made only when the sync pulse is unasserted. To avoid waiting for the sync pulse, the user can choose to temporarily disable the alarm and then re-enable it. This means that the user has the knowledge that an alarm

event is not imminent.

8.13.1.9 RTCC_WrOn

void RtccWrOn(void)

Function to set the RTCCFG.RTCWREN

Returns

None

Remarks

The interrupts are disabled in order to have a proper device initialization

8.13.1.10 RTCC_WriteTimeDate

BOOL RtccWriteTimeDate(const rtccTimeDate* pTD , BOOL di)

The function updates the user supplied union/structure with the current time and date of the RTCC device.

Input Parameters

Input Parameters	Description
rtccTimeDate* pTD	pointer to a rtccTimeDate union to store the current time and date
di	if interrupts need to be disabled

Returns

TRUE '1' : If all the values are within range

FALSE '0' : If any value is out of above mentioned range.

Remarks

The write is successful only if Wr Enable is set. The function will enable the write itself, if needed.

Also, the Alarm will be temporarily disabled and the device will be stopped (On set to 0) in order to safely perform the update of the RTC time register. However, the device status will be restored.

Usually the disabling of the interrupts is desired, if the user has to have more precise control over the actual moment of the time setting.

PreCondition: rtccTimeDate structure fields have to have proper values:

*sec: BCD codification, 00-59

*min: BCD codification, 00-59

*hour: BCD codification, 00-24

*wday: BCD codification, 00-06

*mday: BCD codification, 01-31

*mon: BCD codification, 01-12

*year: BCD codification, 00-99

8.13.1.11 RTCC_WriteTime

BOOL RtccWriteTime(const rtccTime* pTm , BOOL di)

The function updates the user supplied union/structure with the current time and date of the RTCC device.

Input Parameters

Input Parameters	Description
rtccTime* pTm	pointer to a rtccTime union to store the current time and date
di	if interrupts need to be disabled

Returns

TRUE '1' : If all the values are within range
 FALSE '0' : If any value is out of above mentioned range.

Remarks

The write is successful only if Wr Enable is set. The function will enable the write itself, if needed.

Also, the Alarm will be temporarily disabled and the device will be stopped (On set to 0) in order to safely perform the update of the RTC time register. However, the device status will be restored.

Usually the disabling of the interrupts is desired, if the user has to have more precise control over the actual moment of the time setting.

PreCondition: pTm pointing to a valid rtccTime structure having proper values:

sec: BCD codification, 00-59

min: BCD codification, 00-59

hour: BCD codification, 00-24

8.13.1.12 RTCC_WriteDate

BOOL RtccWriteDate(const rtccDate* pDt , BOOL di)

The function updates the user supplied union/structure with the current time and date of the RTCC device.

Input Parameters

Input Parameters	Description
rtccDate* pDt	pointer to a rtccDate union to store the current time and date
di	if interrupts need to be disabled

Returns

TRUE '1' : If all the values are within range
 FALSE '0' : If any value is out of above mentioned range.

Remarks

The write is successful only if Wr Enable is set. The function will enable the write itself, if needed.

Also, the Alarm will be temporarily disabled and the device will be stopped (On set to 0) in order

to safely perform the update of the RTC time register. However, the device status will be restored.

Usually the disabling of the interrupts is desired, if the user has to have more precise control over the actual moment of the time setting.

PreCondition: pDt is a valid rtccDate pointer having proper values:

wday: BCD codification, 00-06

mday: BCD codification, 01-31

mon: BCD codification, 01-12

year: BCD codification, 00-99

8.13.1.13 RTCC_WriteAlrmTimeDate

BOOL RtccWriteAlrmTimeDate(const rtccTimeDate* pTD)

The function sets the current alarm time and date in the RTCC device.

Input Parameters

Input Parameters	Description
rtccTimeDate* pTD	pointer to a rtccTimeDate union to store the current time and date

Returns

TRUE '1' : If all the values are within range

FALSE '0' : If any value is out of above mentioned range.

Remarks

Note that the alarm time does not contain a year field.

PreCondition: rtccTimeDate structure fields have to have proper values:

sec: BCD codification, 00-59

min: BCD codification, 00-59

hour: BCD codification, 00-24

wday: BCD codification, 00-06

mday: BCD codification, 01-31

mon: BCD codification, 01-12

8.13.1.14 RTCC_WriteAlrmTime

BOOL RtccWriteAlrmTime(const rtccTime* pTm)

The function sets the current time in the RTCC device.

Input Parameters

Input Parameters	Description
rtccTime* pTm	pointer to a rtccTime union to store the current time and date

Returns

TRUE '1' : If all the values are within range
 FALSE '0' : If any value is out of above mentioned range.

Remarks

The write is successful only if Wr Enable is set. The function will enable the write itself, if needed.

Also, the Alarm will be temporarily disabled in order to safely perform the update of the ALRMTIME register. However, the device status will be restored.

PreCondition: pTm a valid rtccTime pointer having proper values:

sec: BCD codification, 00-59

min: BCD codification, 00-59

hour: BCD codification, 00-24

8.13.1.15 RTCC_WriteAlrmDate

BOOL RtccWriteAlrmDate(const rtccDate* pDt)

The function sets the alarm date in the RTCC device.

Input Parameters

Input Parameters	Description
rtccDate* pDt	pointer to a rtccDate union to store the current time and date

Returns

TRUE '1' : If all the values are within range
 FALSE '0' : If any value is out of above mentioned range.

Remarks

The write is successful only if Wr Enable is set. The function will enable the write itself, if needed.

Also, the Alarm will be temporarily disabled in order to safely perform the update of the ALRMTIME register. However, the device status will be restored.

PreCondition: pDt a valid rtccDate pointer having proper values:

wday: BCD codification, 00-06

mday: BCD codification, 01-31

mon: BCD codification, 01-12

8.13.1.16 RTCC_SetChimeEnable

```
void RtccSetChimeEnable(BOOL enable, BOOL dsblAlrm)
```

The function enables/disables the chime alarm of the RTCC device.

Input Parameters

Input Parameters	Description
enable	boolean to enable/disable the RTCC chime
dsblAlrm	if TRUE, the API can temporarily disable the alarm when changing the Chime status

Returns

None

Remarks

If alarm is enabled, changing the chime status can be safely made when the sync pulse is unasserted. To avoid waiting for the sync pulse, the user can choose to temporarily disable the alarm and then

re-enable it. This means that the user has knowledge that an alarm event is not imminent.

8.13.1.17 RTCC_SetCalibration

```
void RtccSetCalibration(int drift)
```

The function updates the value that the RTCC uses in the auto-adjust feature, once every minute.

The drift value acts as a signed value, [-128*4, +127*4], 0 not having any effect.

Input Parameters

Input Parameters	Description
drift	value to be added/subtracted to perform calibration

Returns

None

Remarks

Writes to the RTCCAL[7:0] register should only occur when the timer is turned off or immediately or after the edge of the seconds pulse (except when SECONDS=00 - due to the possibility of the auto-adjust event). In order to speed-up the process, the API function performs the reading of the HALFSEC field. The function may block for half a second, worst case, when called at the start of the minute. Interrupts can not be disabled for such a long period. However, long interrupt routines can interfere with the proper functioning of the device. Care must be taken.

8.13.1.18 RTCC_SetAlarmRptCount

```
void RtccSetAlarmRptCount(unsigned char rptCnt, BOOL dsblAirm)
```

The function sets the RTCC alarm repeat rate.

Input Parameters

Input Parameters	Description
rptCnt	value of the desired alarm repeat rate
dsblAirm	if TRUE, the API can temporarily disable the alarm when changing the RPT value

Returns

None

Remarks

rptCnt will be truncated to fit into 8 bit representation. If alarm is enabled, changing the repeat count can be safely made only when the sync pulse is unasserted. To avoid waiting for the sync pulse, the user can choose to temporarily disable the alarm and then re-enable it. This means that the user has the knowledge that an alarm event is not imminent.

8.13.2 RTCC Structs,Records,Enums

8.13.3 RTCC Macros

8.13.4 RTCC Examples

8.13.4.1 RTCC Example1

Example Source Code demonstrating peripheral library usage

```
*****
```

Made with [Doc-O-Matic](#).

```

* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PIC18F46J50 controller
* NOTE: Device Operates with 3.3V supply
***** */

#include <p18cxx.h>
#include "rtcc.h"

//---Function Prototypes---
void RTCC_configure(void);

//---Global structures used in deep sleep library---
rtccTimeDate RtccTimeDate ,RtccAlrmTimeDate, Rtcc_read_TimeDate ;

//*****main function*****
void main(void)
{
    mRtcc_Clear_Intr_Status_Bit;
    RTCC_configure();                                //clears the RTCC interrupt status bit
                                                    //Configure RTCC using library APIs

    while(PIR3bits.RTCCIF==0)                       //wait untill alarm is set
        RtccReadTimeDate(&Rtcc_read_TimeDate);      //Rtcc_read_TimeDate will have latest time

    while(1);                                         //End of program
}

void RTCC_configure(void)
{
unsigned int i=0,j=0;

    RtccInitClock();                                //turn on clock source
    RtccWrOn();                                     //write enable the rtcc registers
    mRtccSetClockOe(1);                            //enable RTCC output on RTCC
output pin
    PIE3bits.RTCCIE=1;                             //Set Date and time using global structures defined in libraries
    RtccTimeDate.f.hour = 1;                         //Set Hour
    RtccTimeDate.f.min = 0;                          //Set minute
    RtccTimeDate.f.sec = 0;                          //Set second
    RtccTimeDate.f.mday = 04;                        //Set day
    RtccTimeDate.f.mon = 04;                         //Se month
    RtccTimeDate.f.year = 09;                        //set year
    RtccTimeDate.f.wday = 6;                         //Set which day of the week for
the corrspoding date

    //Set the alarm time and date using gloabl structures defined in libraries
    RtccAlrmTimeDate.f.hour = RtccTimeDate.f.hour;   //Set Hour
    RtccAlrmTimeDate.f.min = RtccTimeDate.f.min ;    //Set minute
    RtccAlrmTimeDate.f.sec = RtccTimeDate.f.sec + 4; //alarm after ten seconds
    RtccAlrmTimeDate.f.mday = RtccTimeDate.f.mday;   //Set day
    RtccAlrmTimeDate.f.wday = RtccTimeDate.f.wday;   //Set which day of the week for
the corrspoding date
    RtccAlrmTimeDate.f.mon = RtccTimeDate.f.mon;     //Se month
    RtccAlrmTimeDate.f.year = RtccTimeDate.f.year;   //set year

    RtccWriteTimeDate(&RtccTimeDate,1);           //write into registers
    RtccSetAlarmRpt(RTCC_RPT_TEN_SEC,1);           //Set the alarm repeat to
every minute
    RtccSetAlarmRptCount(5,1);                     //set alarm repeat count
    RtccWriteAlrmTimeDate(&RtccAlrmTimeDate);      //write the time for alarm into
alarm registers
    mRtccOn();                                     //enable the rtcc
    mRtccAlrmEnable();                            //enable the rtcc alarm to wake
the device up from deep sleep

```

{}

8.14 Software RTCC (SW_RTCC)

This peripheral library support provides simulated RTCC support using the normal timer modules available on the device. This module can be made use for those devices on which the RTCC module in hardware is not available.

8.14.1 SW_RTCC Functions

8.14.1.1 Open_SW_RTCC

void Open_RTCC(void)

Configure and enable Timer1 which is used in the RTCC simulation

Returns
None

Remarks

Configures Timer1 to work as clock source for RTCC, enables Timer1 interrupts, and writes a value into TMR1H & TMR1L registers to get 1second interrupt

8.14.1.2 update_SW_RTCC

unsigned char update_RTCC(void)
--

Checks for the Timer1 interrupt flag and refreshes TMR1H register in case of interrupt

Returns

Returns the state of the TMR1IF to check if the 1 second interval is completed or not

Remarks

checks for the TMR1 interrupt flag, refreshes TMR1H if interrupt has occurred and returns the state of TMR1IF

8.14.1.3 Close_SW_RTCC

void Close_RTCC(void)

Disable Timer1 and ends the RTCC in software

Returns

None

Remarks

Disable Timer1, clear TMR1 interrupt flag, disable TMR1 interrupt

8.14.2 SW_RTCC Examples

8.14.2.1 SW_RTCC Example1

Example Source Code demonstrating peripheral library usage

```
*****
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*****
```

```
#define USE_OR_MASKS
#include <pl8cxx.h>
#include "rtcc.h"
#include "LCD.h"

//***** Prototypes *****
void User_Timer(void);

//***** Global variables *****
unsigned int msec, sec, min, hr,MSD, MdD, LSD;
char day=04,month=04,year=09;

//***** Main function *****
void main(void)
{
    unsigned char config1=0x00;
    unsigned char config2=0x00;
    unsigned int timer_value=0x00;

    //**** Initialization of Time 00:00:00 and Date 04/04/09 ***
    hr=0;
    min=0;
    sec=0;
    msec=0;
    day = 4;
    month = 4;
    year = 9 ;

    //****Configure SW_RTCC****
    Open_RTCC();           //Configures RTCC using timer in controller

    while(1)
    {
        DisplayTime(hr,min,sec,msec);      //Display the Time on LCD
        DisplayDate(day,month,year);        //Display Date on LCD
        while(update_RTCC());             //wait for timer interruption after one milli
```

```

second completion
    User_Timer();
} //Update Timer count

/** Close SW_RTCC**/
Close_RTCC();
}

void User_Timer(void)
{
    msec++;
    if(msec>=100)
    {
        sec++;
        msec=0;
        if(sec>=60)
        {
            min++;
            sec=0;
            if(min>=60)
            {
                hr++;
                min=0;
                if(hr>=24)
                {
                    hr=0;
                }
            }
        }
    }
}

```

8.15 Serial Peripheral Interface (SPI)

The Serial Peripheral Interface (SPI) module is a synchronous serial interface useful for communicating with other peripheral or microcontroller devices. These peripheral devices may be serial EEPROMs, shiftregisters, display drivers, A/D Converters, etc. The SPI module is compatible with Motorola's SPI and SIOP interfaces. The module supports operation in two buffer modes. In Standard mode, data is shifted through a single serial buffer.

8.15.1 SPI Functions

8.15.1.1 SPI_Open

8.15.1.1.1 Open_SPI

```
void OpenSPI( unsigned char sync_mode, unsigned char bus_mode, unsigned char smp_phase)
```

Initialize the SSPx module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	This contains the parameters to be configured in the SSPxCON1 register * SPI_FOSC_4 * SPI_FOSC_16 * SPI_FOSC_64 * SPI_FOSC_TMR2 * SLV_SSON * SLV_SSOFF
bus_mode	SPI bus mode * MODE_00 * MODE_01 * MODE_10 * MODE_11
smp_phase	Data sampling selection * SMPEND * SMPMID

Returns

None

Remarks

This function sets up the SSPx module for use with a SPIx bus device.

8.15.1.1.2 Open_SPI1

void OpenSPI1(unsigned char sync_mode, unsigned char bus_mode, unsigned char smp_phase)

Initialize the SSPx module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	This contains the parameters to be configured in the SSPxCON1 register * SPI_FOSC_4 * SPI_FOSC_16 * SPI_FOSC_64 * SPI_FOSC_TMR2 * SLV_SSON * SLV_SSOFF
bus_mode	SPI bus mode * MODE_00 * MODE_01 * MODE_10 * MODE_11
smp_phase	Data sampling selection * SMPEND * SMPMID

Returns
None

Remarks

This function sets up the SSPx module for use with a SPIx bus device.

8.15.1.1.3 Open_SPI2

```
void OpenSPI2( unsigned char sync_mode, unsigned char bus_mode, unsigned char smp_phase)
```

Initialize the SSPx module.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	This contains the parameters to be configured in the SSPxCON1 register * SPI_FOSC_4 * SPI_FOSC_16 * SPI_FOSC_64 * SPI_FOSC_TMR2 * SLV_SSON * SLV_SSOFF
bus_mode	SPI bus mode * MODE_00 * MODE_01 * MODE_10 * MODE_11
smp_phase	Data sampling selection * SMPEND * SMPMID

Returns
None

Remarks

This function sets up the SSPx module for use with a SPIx bus device.

8.15.1.2 SPI_Write

8.15.1.2.1 Write_SPI

unsigned char WriteSPI(unsigned char data_out)

This routine writes a single byte to the SPIx bus

Input Parameters

Input Parameters	Description
data_out	Value to be written to the SPIx bus

Returns

Returns fault value:

- * 0 : if no write collision occurred
- * -1 : if a write collision occurred

Remarks

This function writes a single data byte out and then checks for a write collision. putcSPI is alternative name to WriteSPI.

8.15.1.2.2 Write_SPI1

unsigned char WriteSPI1(unsigned char data_out)
--

This routine writes a single byte to the SPIx bus

Input Parameters

Input Parameters	Description
data_out	Value to be written to the SPIx bus

Returns

Returns fault value:

- * 0 : if no write collision occurred
- * -1 : if a write collision occurred

Remarks

This function writes a single data byte out and then checks for a write collision. putcSPI1 is alternative name to WriteSPI1

8.15.1.2.3 Write_SPI2

unsigned char WriteSPI2(unsigned char data_out)
--

This routine writes a single byte to the SPIx bus

Input Parameters

Input Parameters	Description
data_out	Value to be written to the SPIx bus

Returns

Returns fault value:

- * 0 : if no write collision occurred
- * -1 : if a write collision occurred

Remarks

This function writes a single data byte out and then checks for a write collision. putcSPI2 is alternative name to WriteSPI2

8.15.1.3 SPI_Read

8.15.1.3.1 Read_SPI

```
unsigned char ReadSPI( void )
```

Read single byte from SPI bus

Returns

This function returns a byte of data read during a SPIx read cycle.

Remarks

This function initiates a SPIx bus cycle for the acquisition of a byte of data. getcSPI is alternative name to ReadSPI

8.15.1.3.2 Read_SPI1

```
unsigned char ReadSPI1( void )
```

Read single byte from SPI1 bus

Returns

This function returns a byte of data read during a SPIx read cycle.

Remarks

This function initiates a SPIx bus cycle for the acquisition of a byte of data. getcSPI1 is alternative name to ReadSPI1

8.15.1.3.3 Read_SPI2

```
unsigned char ReadSPI2( void )
```

Read single byte from SPI2 bus

Returns

This function returns a byte of data read during a SPIx read cycle.

Remarks

This function initiates a SPIx bus cycle for the acquisition of a byte of data. getcSPI2 is alternative name to ReadSPI2

8.15.1.4 SPI_puts

8.15.1.4.1 puts_SPI

```
void putsSPI( unsigned char *wrptr )
```

Write a string to the SPIx bus

Input Parameters

Input Parameters	Description
wrptr	Pointer to the array of data in RAM that will be written to the SPIx bus

Returns

None

Remarks

This function writes out a data string to the SPIx bus device. The routine is terminated by reading a null character in the data string (the null character is not written to the bus).

8.15.1.4.2 puts_SPI1

```
void putsSPI1( unsigned char *wrptr )
```

Write a string to the SPIx bus

Input Parameters

Input Parameters	Description
wrptr	Pointer to the array of data in RAM that will be written to the SPIx bus

Returns

None

Remarks

This function writes out a data string to the SPIx bus device. The routine is terminated by reading a null character in the data string (the null character is not written to the bus).

8.15.1.4.3 puts_SPI2

```
void putsSPI2( unsigned char *wrptr )
```

Write a string to the SPIx bus

Input Parameters

Input Parameters	Description
wrptr	Pointer to the array of data in RAM that will be written to the SPIx bus

Returns

None

Remarks

This function writes out a data string to the SPIx bus device. The routine is terminated by reading a null character in the data string (the null character is not written to the bus).

8.15.1.5 SPI_gets

8.15.1.5.1 gets_SPI

```
void getsSPI( unsigned char *rdptr, unsigned char length )
```

Read a string from the SPIx bus

Input Parameters

Input Parameters	Description
rdptr	Pointer to location in RAM of device to store data read from SPIx device
length	Number of bytes to read from SPIx device

Returns

None

Remarks

This function reads in a predetermined data string length from the SPIx bus

8.15.1.5.2 gets_SPI1

```
void getsSPI1( unsigned char *rdptr, unsigned char length )
```

Read a string from the SPIx bus

Input Parameters

Input Parameters	Description
rdptr	Pointer to location in RAM of device to store data read from SPIx device
length	Number of bytes to read from SPIx device

Returns
None

Remarks

This function reads in a predetermined data string length from the SPIx bus

8.15.1.5.3 gets_SPI2

```
void getsSPI2( unsigned char *rdptr, unsigned char length )
```

Read a string from the SPIx bus

Input Parameters

Input Parameters	Description
rdptr	Pointer to location in RAM of device to store data read from SPIx device
length	Number of bytes to read from SPIx device

Returns
None

Remarks

This function reads in a predetermined data string length from the SPIx bus

8.15.2 SPI Macros**8.15.3 SPI Examples****8.15.3.1 SPI Example1_Master****Example Source Code demonstrating peripheral library usage**

```
*****
```

```

* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
* SDO,SDI & SCK must be connected to the corresponding in slave
*      MASTER           SLAVE
*
*      SDO      <----->      SDI
*      SDI      <----->      SDO
*      SCK      <----->      SCK
* NOTE: Refer Slave source code also
***** */

#define USE_OR_MASKS
#include <p18cxx.h>
#include "spi.h"

unsigned char SPI_Send[21] = "MICROCHIP_SPI_MASTER";
unsigned char SPI_Recv[21];

//***** SPI MASTER *****

void main(void)
{
    unsigned char sync_mode=0;
    unsigned char bus_mode=0;
    unsigned char smp_phase=0;
    unsigned char w=0;

    CloseSPI();                                // Turn off SPI modules if was previosly on

    //***Configure SPI MASTER module to transmit in master mode ***
    sync_mode = SPI_FOSC_64 ;
    bus_mode = MODE_01;
    smp_phase = SMPMID;
    OpenSPI(sync_mode,bus_mode,smp_phase );

    //*** WRITE INITIAL CHARECTER ***
    while(WriteSPI(0xF5));                    //send initial charecter to use the same as flag
    at slave side and send it till successful transmision

    //*** WRITE THE STRING TO SPI ****
    putsSPI(SPI_Send);                        //send the string of data to be sent to slave

    //*** Read the initial flag id ***
    if( 0xF5 == ReadSPI() )
    {
        getsSPI(SPI_Recv,20);                // read the string sent from slave
        SPI_Recv[20] = '\0';                  //terminate the string with a null charecter
    }

    /* Turn off SPI module and clear IF bit */
    CloseSPI();

    while(1);                                //End of program
}

```

8.15.3.2 SPI Example1_Slave

Example Source Code demonstrating peripheral library usage

```

***** */
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*

```

```

* SDO,SDI & SCK must be connected to the corresponding in slave
*      MASTER           SLAVE
*
*      SDO      <----->    SDI
*      SDI      <----->    SDO
*      SCK      <----->    SCK
* NOTE: Refer Master source code also
***** */

#define USE_OR_MASKS
#include <p18cxx.h>
#include "spi.h"

unsigned char SPI_Send[25] = "MICROCHIP_SPI_SLAVE";
unsigned char SPI_Recv[25];

//***** SPI SLAVE *****

void main(void)
{
    unsigned char sync_mode=0;
    unsigned char bus_mode=0;
    unsigned char smp_phase=0;
    unsigned char w=0,temp;

    for(w=0;w<25;w++)
        SPI_Recv[w]=0;

    CloseSPI();                                // Turn off SPI modules if was previosly on

    //****Configure SPI SLAVE module *****
    sync_mode = SLV_SSOFF;
    bus_mode = MODE_01;
    smp_phase = SMPMID;
    OpenSPI(sync_mode,bus_mode,smp_phase);

    //****Read the initial flag byte sent by master ***
    temp = ReadSPI();                         //This is for address implementation in software

    if(temp == 0xF5)
    {
        getsSPI(SPI_Recv,21);                //recieve the string of data from master
        SPI_Recv[21] = '\0';                  //put null character at the end of string received
        while( PIR1bits.SSP1IF!=1 );          //wait till completion of transmission

        WriteSPI(0xF5);                     //send the software flag bit to master
        while( PIR1bits.SSP1IF!=1 );          //wait till completion of transmission

        //**** WRITE THE STRING TO SPI ****
        putsSPI(SPI_Send);
    }

    /* Turn off SPI module and clear IF bit */
    CloseSPI();

    while(1);                                //End of program
}

```

8.16 TIMERS

The Timers module is a 8/16-bit timer which can serve as the time counter for the Real-Time Clock (RTC), or operate as a free-running, interval timer/counter. The Timer2/3 and Timer4/5 modules are 8/16-bit timers, which can also be configured as four independent 8-bit timers with selectable operating modes. Timer 1 operates in CPU Idle modes and Sleep modes.

Individually, timers can function as synchronous timers or counters.

8.16.1 TIMERS Functions

8.16.1.1 Open_Timer

8.16.1.1.1 Open_Timer0

```
void OpenTimer0(unsigned char config)
```

Configure and enable Timer0

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer0 Interrupt: * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK</p> <p>Timer Width: * T0_8BIT * T0_16BIT * T0_BIT_MASK</p> <p>Clock Source: * T0_SOURCE_EXT * T0_SOURCE_INT * T0_SOURCE_MASK</p> <p>External Clock Trigger (for T0_SOURCE_EXT): * T0_EDGE_FALL * T0_EDGE_RISE * T0_EDGE_MASK</p> <p>Prescale Value: * T0_PS_1_1 * NO_T0_PS_MASK</p> <p>* T0_PS_1_2 * T0_PS_1_4 * T0_PS_1_8 * T0_PS_1_16 * T0_PS_1_32 * T0_PS_1_64 * T0_PS_1_128 * T0_PS_1_256 * T0_PS_MASK</p>

Returns
None

Remarks

This function configures Timer0 according to the options specified and then enables it

8.16.1.1.2 Open_Timer1_Page1

```
void OpenTimer1(unsigned char config)
```

Configure and enable Timer1

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer1 Interrupt: * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK</p> <p>Timer Width: * T1_8BIT_RW * T1_16BIT_RW * T1_BIT_RW_MASK</p> <p>Clock Source: * T1_SOURCE_EXT * T1_SOURCE_INT * T1_SOURCE_MASK</p> <p>Prescaler: * T1_PS_1_1 * T1_PS_1_2 * T1_PS_1_4 * T1_PS_1_8 * T1_PS_MASK</p> <p>Oscillator Use: * T1_OSC1EN_ON * T1_OSC1EN_OFF * T1_OSC_MASK</p> <p>Synchronize Clock Input: * T1_SYNC_EXT_ON * T1_SYNC_EXT_OFF * T1_SYNC_MASK</p>

Returns

None

Remarks

This function configures Timer1 according to the options specified and then enables it

8.16.1.1.3 Open_Timer1_Page2

```
void OpenTimer1(unsigned char config, unsigned char config1)
```

Configure and enable Timer1

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer1 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Timer Width:</p> <ul style="list-style-type: none"> * T1_8BIT_RW * T1_16BIT_RW * T1_BIT_RW_MASK <p>Clock Source:</p> <ul style="list-style-type: none"> * T1_SOURCE_PINOSC * T1_SOURCE_CAPOSC * T1_SOURCE_FOSC_4 * T1_SOURCE_FOSC * T1_SOURCE_MASK <p>Prescaler:</p> <ul style="list-style-type: none"> * T1_PS_1_1 * T1_PS_1_2 * T1_PS_1_4 * T1_PS_1_8 * T1_PS_MASK <p>Oscillator Use:</p> <ul style="list-style-type: none"> * T1_OSC1EN_ON * T1_OSC1EN_OFF * T1_OSC_MASK <p>Synchronize Clock Input:</p> <ul style="list-style-type: none"> * T1_SYNC_EXT_ON * T1_SYNC_EXT_OFF * T1_SYNC_MASK

config1	Timer1 Gate Enable * TIMER_GATE_ON * TIMER_GATE_OFF * TIMER_GATE_MASK
	Timer1 Gate Polarity * TIMER_GATE_POL_HI * TIMER_GATE_POL_LO * TIMER_GATE_POL_MASK
	Timer1 Gate Toggle Mode * TIMER_GATE_TOGGLE_ON * TIMER_GATE_TOGGLE_OFF * TIMER_GATE_TOGGLE_MASK
	Timer1 Gate One Shot Enable * TIMER_GATE_1SHOT_ON * TIMER_GATE_1SHOT_OFF * TIMER_GATE_1SHOT_MASK
	Timer1 Gate Source Select * TIMER_GATE_SRC_T1GPIN * TIMER_GATE_SRC_T0 * TIMER_GATE_SRC_T2 * TIMER_GATE_SRC_MASK
	Enable Timer1 Gate Interrupt: * TIMER_GATE_INT_OFF * TIMER_GATE_INT_ON * TIMER_GATE_INT_MASK

Returns

None

Remarks

This function configures Timer1 according to the options specified and then enables it

8.16.1.1.4 Open_Timer2**void OpenTimer2(unsigned char config)**

Configure and enable Timer2

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer2 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T2_PS_1_1 * T2_PS_1_4 * T2_PS_1_16 <p>Postscale Value:</p> <ul style="list-style-type: none"> * T2_POST_1_1 * T2_POST_1_2 * T2_POST_1_3 * T2_POST_1_4 * T2_POST_1_5 * T2_POST_1_6 * T2_POST_1_7 * T2_POST_1_8 * T2_POST_1_9 * T2_POST_1_10 * T2_POST_1_11 * T2_POST_1_12 * T2_POST_1_13 * T2_POST_1_14 * T2_POST_1_15 * T2_POST_1_16 * T2_POST_MASK

Returns

None

Remarks

This function configures Timer2 according to the options specified and then enables it

8.16.1.1.5 Open_Timer3_Page1**void OpenTimer3(unsigned char config)**

Configure and enable Timer3

8

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer3 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Timer Width:</p> <ul style="list-style-type: none"> * T3_8BIT_RW * T3_16BIT_RW * T3_BIT_MASK <p>Clock Source:</p> <ul style="list-style-type: none"> * T3_SOURCE_EXT * T3_SOURCE_INT * T3_SOURCE_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T3_PS_1_1 * T3_PS_1_2 * T3_PS_1_4 * T3_PS_1_8 * T3_PS_MASK <p>Synchronize Clock Input:</p> <ul style="list-style-type: none"> * T3_SYNC_EXT_ON * T3_SYNC_EXT_OFF * T3_SYNC_MASK

Returns
None

Remarks

This function configures Timer2 according to the options specified and then enables it

8.16.1.1.6 Open_Timer3_Page2

```
void OpenTimer3(unsigned char config, unsigned char config1)
```

Configure and enable Timer3

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer3 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Timer Width:</p> <ul style="list-style-type: none"> * T3_8BIT_RW * T3_16BIT_RW * T3_BIT_MASK <p>Clock Source:</p> <ul style="list-style-type: none"> * T3_SOURCE_PINOSC * T3_SOURCE_CAOOSC * T3_SOURCE_FOSC_4 * T3_SOURCE_FOSC * T3_SOURCE_MASK <p>Oscillator Use:</p> <ul style="list-style-type: none"> * T3_OSC1EN_ON * T3_OSC1EN_OFF * T3_OSC_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T3_PS_1_1 * T3_PS_1_2 * T3_PS_1_4 * T3_PS_1_8 * T3_PS_MASK <p>Synchronize Clock Input:</p> <ul style="list-style-type: none"> * T3_SYNC_EXT_ON * T3_SYNC_EXT_OFF * T3_SYNC_MASK

config1	Timer3 Gate Enable * TIMER_GATE_ON * TIMER_GATE_OFF * TIMER_GATE_MASK Timer3 Gate Polarity * TIMER_GATE_POL_HI * TIMER_GATE_POL_LO * TIMER_GATE_POL_MASK Timer3 Gate Toggle Mode * TIMER_GATE_TOGGLE_ON * TIMER_GATE_TOGGLE_OFF * TIMER_GATE_TOGGLE_MASK Timer3 Gate One Shot Enable * TIMER_GATE_1SHOT_ON * TIMER_GATE_1SHOT_OFF * TIMER_GATE_1SHOT_MASK Timer3 Gate Source Select * TIMER_GATE_SRC_T1GPIN * TIMER_GATE_SRC_T0 * TIMER_GATE_SRC_T2 * TIMER_GATE_SRC_MASK Enable Timer3 Gate Interrupt: * TIMER_GATE_INT_OFF * TIMER_GATE_INT_ON * TIMER_GATE_INT_MASK
---------	--

Returns

None

Remarks

This function configures Timer3 according to the options specified and then enables it

8.16.1.1.7 Open_Timer5

```
void OpenTimer5(unsigned char config,unsigned int t5pr)
```

Configure and enable Timer5

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer5 Interrupt: * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK</p> <p>Timer5 Sleep Enable: * T5_SLP_EN * T5_SLP_DIS * T5_SLP_MASK</p> <p>Special Event Reset: * T5_SP_EVNT_REN * T5_SP_EVNT_RDIS * T5_SP_ENNT_MASK</p> <p>Timer5 Mode: * T5_MD_SNGL_SHOT * T5_MD_CONT_COUNT * T5_MD_MASK</p> <p>Prescale Value: * T5_PS_1_1 * T5_PS_1_2 * T5_PS_1_4 * T5_PS_1_8 * T5_PS_MASK</p> <p>Synchronize Clock Input: * T5_EX_CLK_SYNC * T5_EX_CLK_NOSYNC * T5_EX_CLK_SYNC_MASK</p> <p>Clock Source: * T5_CLK_EXTRN * T5_CLK_INT * T5_CLK_SOURCE_MASK</p>
t5pr	t5pr value will be loaded in to low and high byte of the Timer5 Period Register (i.e. PR5L = t5pr, PR5H = (t5pr>>8))

Returns
None

Remarks

This function configures Timer5 according to the options specified and then enables it

8.16.1.1.8 Open_Timer5_Page2

```
void OpenTimer5(unsigned char config, unsigned char config1)
```

Configure and enable Timer5

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer5 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Timer Width:</p> <ul style="list-style-type: none"> * T5_8BIT_RW * T5_16BIT_RW * T5_BIT_MASK <p>Clock Source:</p> <ul style="list-style-type: none"> * T5_SOURCE_PINOSC * T5_SOURCE_CAPOSC * T5_SOURCE_FOSC_4 * T5_SOURCE_FOSC * T5_SOURCE_MASK <p>Oscillator Use:</p> <ul style="list-style-type: none"> * T5_OSC1EN_ON * T5_OSC1EN_OFF * T5_OSC_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T5_PS_1_1 * T5_PS_1_2 * T5_PS_1_4 * T5_PS_1_8 * T5_PS_MASK <p>Synchronize Clock Input:</p> <ul style="list-style-type: none"> * T5_SYNC_EXT_ON * T5_SYNC_EXT_OFF * T5_SYNC_MASK

config1	Timer5 Gate Enable * TIMER_GATE_ON * TIMER_GATE_OFF * TIMER_GATE_MASK
	Timer5 Gate Polarity * TIMER_GATE_POL_HI * TIMER_GATE_POL_LO * TIMER_GATE_POL_MASK
	Timer5 Gate Toggle Mode * TIMER_GATE_TOGGLE_ON * TIMER_GATE_TOGGLE_OFF * TIMER_GATE_TOGGLE_MASK
	Timer5 Gate One Shot Enable * TIMER_GATE_1SHOT_ON * TIMER_GATE_1SHOT_OFF * TIMER_GATE_1SHOT_MASK
	Timer5 Gate Source Select * TIMER_GATE_SRC_T1GPIN * TIMER_GATE_SRC_T0 * TIMER_GATE_SRC_T2 * TIMER_GATE_SRC_MASK
	Enable Timer5 Gate Interrupt: * TIMER_GATE_INT_OFF * TIMER_GATE_INT_ON * TIMER_GATE_INT_MASK

Returns

None

Remarks

This function configures Timer5 according to the options specified and then enables it

8.16.1.1.9 Open_Timer4**void OpenTimer4(unsigned char config)**

Configure and enable Timer4

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer4 Interrupt: * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK</p> <p>Prescale Value: * T4_PS_1_1 * T4_PS_1_4 * T4_PS_1_16</p> <p>Postscale Value: * T4_POST_1_1 * T4_POST_1_2 * T4_POST_1_3 * T4_POST_1_4 * T4_POST_1_5 * T4_POST_1_6 * T4_POST_1_7 * T4_POST_1_8 * T4_POST_1_9 * T4_POST_1_10 * T4_POST_1_11 * T4_POST_1_12 * T4_POST_1_13 * T4_POST_1_14 * T4_POST_1_15 * T4_POST_1_16 * T4_POST_MASK</p>

Returns
None

Remarks

This function configures Timer4 according to the options specified and then enables it

8.16.1.1.10 Open_Timer6_Page1

```
void OpenTimer6(unsigned char config)
```

Configure and enable Timer6

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer6 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T6_PS_1_1 * T6_PS_1_4 * T6_PS_1_16 <p>Postscale Value:</p> <ul style="list-style-type: none"> * T6_POST_1_1 * T6_POST_1_2 * T6_POST_1_3 * T6_POST_1_4 * T6_POST_1_5 * T6_POST_1_6 * T6_POST_1_7 * T6_POST_1_8 * T6_POST_1_9 * T6_POST_1_10 * T6_POST_1_11 * T6_POST_1_12 * T6_POST_1_13 * T6_POST_1_14 * T6_POST_1_15 * T6_POST_1_16 * T6_POST_MASK

Returns
None

Remarks

This function configures Timer6 according to the options specified and then enables it

8.16.1.1.11 Open_Timer7_Page1

```
void OpenTimer7(unsigned char config, unsigned char config1)
```

Configure and enable Timer7

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer7 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Timer Width:</p> <ul style="list-style-type: none"> * T7_8BIT_RW * T7_16BIT_RW * T7_BIT_MASK <p>Clock Source:</p> <ul style="list-style-type: none"> * T7_SOURCE_PINOSC * T7_SOURCE_CAOOSC * T7_SOURCE_FOSC_4 * T7_SOURCE_FOSC * T7_SOURCE_MASK <p>Oscillator Use:</p> <ul style="list-style-type: none"> * T7_OSC1EN_ON * T7_OSC1EN_OFF * T7_OSC_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T7_PS_1_1 * T7_PS_1_2 * T7_PS_1_4 * T7_PS_1_8 * T7_PS_MASK <p>Synchronize Clock Input:</p> <ul style="list-style-type: none"> * T7_SYNC_EXT_ON * T7_SYNC_EXT_OFF * T7_SYNC_MASK

config1	Timer7 Gate Enable * TIMER_GATE_ON * TIMER_GATE_OFF * TIMER_GATE_MASK
	Timer7 Gate Polarity * TIMER_GATE_POL_HI * TIMER_GATE_POL_LO * TIMER_GATE_POL_MASK
	Timer7 Gate Toggle Mode * TIMER_GATE_TOGGLE_ON * TIMER_GATE_TOGGLE_OFF * TIMER_GATE_TOGGLE_MASK
	Timer7 Gate One Shot Enable * TIMER_GATE_1SHOT_ON * TIMER_GATE_1SHOT_OFF * TIMER_GATE_1SHOT_MASK
	Timer7 Gate Source Select * TIMER_GATE_SRC_T1GPIN * TIMER_GATE_SRC_T0 * TIMER_GATE_SRC_T2 * TIMER_GATE_SRC_MASK
	Enable Timer7 Gate Interrupt: * TIMER_GATE_INT_OFF * TIMER_GATE_INT_ON * TIMER_GATE_INT_MASK

Returns

None

Remarks

This function configures Timer7 according to the options specified and then enables it

8.16.1.1.12 Open_Timer8_Page1**void OpenTimer8(unsigned char config)**

Configure and enable Timer8

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Timer8 Interrupt:</p> <ul style="list-style-type: none"> * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK <p>Prescale Value:</p> <ul style="list-style-type: none"> * T8_PS_1_1 * T8_PS_1_4 * T8_PS_1_16 <p>Postscale Value:</p> <ul style="list-style-type: none"> * T8_POST_1_1 * T8_POST_1_2 * T8_POST_1_3 * T8_POST_1_4 * T8_POST_1_5 * T8_POST_1_6 * T8_POST_1_7 * T8_POST_1_8 * T8_POST_1_9 * T8_POST_1_10 * T8_POST_1_11 * T8_POST_1_12 * T8_POST_1_13 * T8_POST_1_14 * T8_POST_1_15 * T8_POST_1_16 * T8_POST_MASK

Returns
None

Remarks

This function configures Timer8 according to the options specified and then enables it

8.16.1.1.13 Open_Timer10_Page1

```
void OpenTimer10(unsigned char config)
```

Configure and enable Timer10

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Time10 Interrupt: * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK</p> <p>Prescale Value: * T10_PS_1_1 * T10_PS_1_4 * T10_PS_1_16</p> <p>Postscale Value: * T10_POST_1_1 * T10_POST_1_2 * T10_POST_1_3 * T10_POST_1_4 * T10_POST_1_5 * T10_POST_1_6 * T10_POST_1_7 * T10_POST_1_8 * T10_POST_1_9 * T10_POST_1_10 * T10_POST_1_11 * T10_POST_1_12 * T10_POST_1_13 * T10_POST_1_14 * T10_POST_1_15 * T10_POST_1_16 * T10_POST_MASK</p>

Returns
None

Remarks

This function configures Timer10 according to the options specified and then enables it

8.16.1.1.14 Open_Timer12_Page1

```
void OpenTimer12(unsigned char config)
```

Configure and enable Timer12

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Enable Time12 Interrupt: * TIMER_INT_ON * TIMER_INT_OFF * TIMER_INT_MASK</p> <p>Prescale Value: * T12_PS_1_1 * T12_PS_1_4 * T12_PS_1_16</p> <p>Postscale Value: * T12_POST_1_1 * T12_POST_1_2 * T12_POST_1_3 * T12_POST_1_4 * T12_POST_1_5 * T12_POST_1_6 * T12_POST_1_7 * T12_POST_1_8 * T12_POST_1_9 * T12_POST_1_10 * T12_POST_1_11 * T12_POST_1_12 * T12_POST_1_13 * T12_POST_1_14 * T12_POST_1_15 * T12_POST_1_16 * T12_POST_MASK</p>

Returns

None

Remarks

This function configures Timer12 according to the options specified and then enables it

8.16.1.2 Read_Timer

8.16.1.2.1 Read_Timer0

<code>unsigned int ReadTimer0(void)</code>
--

Reads the value of the Timer0 registers TMR0L,TMR0H

Returns

The current value of the Timer0

Remarks

When using a timer in 8-bit mode that may be configured in 16-bit mode (e.g., timer0), the upper byte is not ensured to be zero. The user may wish to cast the result to a char for correct results. For example:

```
// Example of reading a 16-bit result
```

```
// from a 16-bit timer operating in
```

```
// 8-bit mode:
```

```
unsigned int result;
```

```
result = (unsigned char) ReadTimer0();
```

8.16.1.2.2 Read_Timer1

unsigned int ReadTimer1(void)

Reads the value of the Timer1 registers TMR1L,TMR1H

Returns

The current value of the Timer1

Remarks

None

8.16.1.2.3 Read_Timer3

unsigned int ReadTimer3(void)

Reads the value of the Timer3 registers TMR3L,TMR3H

Returns

The current value of the Timer3

Remarks

None

8.16.1.2.4 Read_Timer5

unsigned int ReadTimer5(void)

Reads the value of the Timer5 registers TMR5L,TMR5H

Returns

The current value of the Timer5

[Remarks](#)

None

8.16.1.2.5 Read_Timer7_Page1

unsigned int ReadTimer7(void)

Reads the value of the Timer7 registers TMR7L,TMR7H

Returns

The current value of the Timer7

[Remarks](#)

None

8.16.1.3 Write_Timer

8.16.1.3.1 Write_Timer0

void WriteTimer0(unsigned int timer0)

Write a value into the Timer0 registers TMR0L & TMR0H

[Input Parameters](#)

Input Parameters	Description
timer0	The value that will be loaded into the specified timer registers (TMR0H = unsigned char(timer0>>8) & TMR0L = unsigned char timer0)

Returns

None

8.16.1.3.2 Write_Timer1

```
void WriteTimer1(unsigned int timer1)
```

Write a value into the Timer1 registers TMR1L & TMR1H

Input Parameters

Input Parameters	Description
timer1	The value that will be loaded into the specified timer registers (TMR1H = unsigned char(timer1>>8) & TMR1L = unsigned char timer1)

Returns

None

8.16.1.3.3 Write_Timer3

```
void WriteTimer3(unsigned int timer3)
```

Write a value into the Timer3 registers TMR3L & TMR3H

Input Parameters

Input Parameters	Description
timer3	The value that will be loaded into the specified timer registers (TMR3H = unsigned char(timer3>>8) & TMR3L = unsigned char timer3)

Returns

None

8.16.1.3.4 Write_Timer5

```
void WriteTimer5(unsigned int timer5)
```

Write a value into the Timer5 registers TMR5L & TMR5H

Input Parameters

Input Parameters	Description
timer5	The value that will be loaded into the specified timer registers (TMR5H = unsigned char(timer5>>8) & TMR5L = unsigned char timer5)

Returns
None

8.16.1.3.5 Write_Timer7_Page1

```
void WriteTimer7(unsigned int timer7)
```

Write a value into the Timer7 registers TMR7L & TMR7H

Input Parameters

Input Parameters	Description
timer7	The value that will be loaded into the specified timer registers (TMR7H = unsigned char(timer7>>8) & TMR7L = unsigned char timer7)

Returns
None

8.16.1.4 Set_TmrCCPSrc

8.16.1.4.1 Set_TmrCCPSrc_Page1

```
void SetTmrCCPSrc(unsigned char config)
```

Enable timer source to CCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	Timers as source of CCP * T3_SOURCE_CCP * T1_CCP1_T3_CCP2 * T1_SOURCE_CCP * TMR_SOURCE_CCP_MASK

Returns
None

Remarks

This function configures timer as a clock sources for the CCP module

8.16.1.4.2 Set_TmrCCPSrc_Page2

void SetTmrCCPSrc(unsigned char config)
--

Enable timer source to CCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	Timers as source of CCP * T34_SOURCE_CCP * T12_CCP12_T34_CCP345 * T12_CCP1_T34_CCP2345 * T12_SOURCE_CCP * TMR_SOURCE_CCP_MASK

Returns
None

Remarks

This function configures timer as a clock sources for the CCP module

8.16.1.4.3 Set_TmrCCPSrc_Page3

void SetTmrCCPSrc(unsigned char config)
--

Enable timer source to CCP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	Timers as source of CCP * T34_SOURCE_CCP12 * T12_CCP1_T34_CCP2 * T12_SOURCE_CCP * TMR_SOURCE_CCP_MASK

Returns
None

Remarks

This function configures timer as a clock sources for the CCP module

8.16.1.5 Close_Timer

8.16.1.5.1 Close_Timer0

void CloseTimer0(void)

Disable the Timer0.

Returns
None

Remarks

This function disables the interrupt and the Timer0

8.16.1.5.2 Close_Timer1

void CloseTimer1(void)

Disable the Timer1.

Returns
None

Remarks

This function disables the interrupt and the Timer1

8.16.1.5.3 Close_Timer2

void CloseTimer2(void)

Disable the Timer2.

Returns

None

Remarks

This function disables the interrupt and the Timer2

8.16.1.5.4 Close_Timer3

void CloseTimer3(void)

Disable the Timer3.

Returns

None

Remarks

This function disables the interrupt and the Timer3

8.16.1.5.5 Close_Timer4

void CloseTimer4(void)

Disable the Timer4.

Returns

None

Remarks

This function disables the interrupt and the Timer4

8.16.1.5.6 Close_Timer5

void CloseTimer5(void)

Disable the Timer5.

Returns

None

Remarks

This function disables the interrupt and the Timer5

8.16.1.5.7 Close_Timer6_Page1

void CloseTimer6(void)

Disable the Timer6.

Returns

None

Remarks

This function disables the interrupt and the Timer6

8.16.1.5.8 Close_Timer7_Page1

void CloseTimer7(void)

Disable the Timer7.

Returns

None

Remarks

This function disables the interrupt and the Timer7

8.16.1.5.9 Close_Timer8_Page1

void CloseTimer8(void)

Disable the Timer8.

Returns

None

Remarks

This function disables the interrupt and the Timer8

8.16.1.5.10 Close_Timer10_Page1

```
void CloseTimer10(void)
```

Disable the Timer10.

Returns
None

This function disables the interrupt and the Timer10

8.16.1.5.11 Close_Timer12_Page1

```
void CloseTimer12(void)
```

Disable the Timer12.

Returns
None

This function disables the interrupt and the Timer12

8.16.2 TIMERS Structs,Records,Enums

8.16.3 TIMERS Macros

8.16.4 TIMERS Examples

8.16.4.1 TIMERS Example1

Example Source Code demonstrating peripheral library usage

```
*****
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
```

```
*****
#define USE_OR_MASKS
#include <p18cxx.h>
#include "timers.h"
#include "LCD.h"

//**** Prototypes ****
void User_Timer(void);

//*** Global variables ***
unsigned int msec, sec, min, hr, MSD, MdD, LSD;
char day=04,month=04,year=09;

void main(void)
{
    unsigned char config1=0x00;
    unsigned char config2=0x00;
    unsigned int timer_value=0x00;

    //----Configure Timers----
    timer_value = 0x00;
    WriteTimer1(timer_value);           //clear timer if previously contains any value

    config1 = T1_8BIT_RW | T1_SOURCE_EXT | T1_PS_1_8
              | T1_OSC1EN_ON | T1_SYNC_EXT_ON | TIMER_INT_ON;
    OpenTimer1(config1);             //API configures the tmer1 as per user defined
parameters

    while(1)
    {
        DisplayTime(hr,min,sec,msec);   //Display the Time on LCD
        DisplayDate(day,month,year);     //Displays the Data on LCD
        while(!PIR1bits.TMR1IF);        //wait for timer interruption after one milli
second completion
        User_Timer();                  //Update Timer count
    }

    //*** Close Timer ***
    CloseTimer1();
}

void User_Timer(void)
{
    msec++;
    if(msec>=100)
    {
        sec++;
        msec=0;
        if(sec>=60)
        {
            min++;
            sec=0;
            if(min>=60)
            {
                hr++;
                min=0;
                if(hr>=24)
                {
                    hr=0;
                }
            }
        }
    }
}
```

8.17 Universal Asynchronous/Synchronous Reciever Transmitter (USART)

The Universal Asynchronous/Synchronous Receiver Transmitter (uart) module is one of the serial I/O modules available in the PIC18F device family. The usart is a full-duplex system that can communicate with peripheral devices, such as personal computers, LIN,RS-232 and RS-485 interfaces. The module also supports a hardware flow control option and also includes an IrDA® encoder and decoder. The primary features of the usart module are:

- Asynchronous (full duplex) with:
 - Auto-Wake-up on Character Reception
 - Auto-Baud Calibration
 - 12-Bit Break Character Transmission
- Synchronous – Master (half duplex) with selectable Clock Polarity
- Synchronous – Slave (half duplex) with selectable Clock Polarity

8.17.1 USART Functions

8.17.1.1 USART_Open

8.17.1.1.1 Open_1USART

```
void Open1USART( unsigned char config, unsigned int spbrg)
```

Configure the specified usart module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Interrupt on Transmission:</p> <ul style="list-style-type: none"> * USART_TX_INT_ON * USART_TX_INT_OFF * USART_TX_INT_MASK <p>Interrupt on Receipt:</p> <ul style="list-style-type: none"> * USART_RX_INT_ON * USART_RX_INT_OFF * USART_RX_INT_MASK <p>uart Mode:</p> <ul style="list-style-type: none"> * USART_ASYNC_MODE * USART_SYNCH_MODE * USART_MODE_MASK <p>Transmission Width:</p> <ul style="list-style-type: none"> * USART_EIGHT_BIT * USART_NINE_BIT * USART_BIT_MASK <p>Slave/Master Select (Applicable to Synchronous mode only):</p> <ul style="list-style-type: none"> * USART_SYNC_SLAVE * USART_SYNC_MASTER * USART_SYNC_MASK <p>Reception mode:</p> <ul style="list-style-type: none"> * USART_SINGLE_RX * USART_CONT_RX * USART_CONT_RX_MASK <p>Baud rate:</p> <ul style="list-style-type: none"> * USART_BRGH_HIGH * USART_BRGH_LOW * USART_BRGH_MASK <p>Address Detect Enable:</p> <ul style="list-style-type: none"> * USART_ADDEN_ON * USART_ADDEN_OFF * USART_ADDEN_MASK

spbreg	This is the value that is written to the baud rate generator register which determines the baud rate at which the usart operates. The formulas for baud rate are: Asynchronous mode, high speed: $Fosc / (16 * (spbreg + 1))$ Asynchronous mode, low speed: $Fosc / (64 * (spbreg + 1))$ Synchronous mode: $Fosc / (4 * (spbreg + 1))$ Where Fosc is the oscillator frequency
--------	--

Returns

None

Remarks

This function configures the usart module according to the specified configuration options

8.17.1.1.2 Open_2USART

void Open2USART(unsigned char config, unsigned int spbreg)

Configure the specified usart module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Interrupt on Transmission:</p> <ul style="list-style-type: none"> * USART_TX_INT_ON * USART_TX_INT_OFF * USART_TX_INT_MASK <p>Interrupt on Receipt:</p> <ul style="list-style-type: none"> * USART_RX_INT_ON * USART_RX_INT_OFF * USART_RX_INT_MASK <p>uart Mode:</p> <ul style="list-style-type: none"> * USART_ASYNC_MODE * USART_SYNCH_MODE * USART_MODE_MASK <p>Transmission Width:</p> <ul style="list-style-type: none"> * USART_EIGHT_BIT * USART_NINE_BIT * USART_BIT_MASK <p>Slave/Master Select (Applicable to Synchronous mode only):</p> <ul style="list-style-type: none"> * USART_SYNC_SLAVE * USART_SYNC_MASTER * USART_SYNC_MASK <p>Reception mode:</p> <ul style="list-style-type: none"> * USART_SINGLE_RX * USART_CONT_RX * USART_CONT_RX_MASK <p>Baud rate:</p> <ul style="list-style-type: none"> * USART_BRGH_HIGH * USART_BRGH_LOW * USART_BRGH_MASK <p>Address Detect Enable:</p> <ul style="list-style-type: none"> * USART_ADDEN_ON * USART_ADDEN_OFF * USART_ADDEN_MASK

spbreg	This is the value that is written to the baud rate generator register which determines the baud rate at which the usart operates. The formulas for baud rate are: Asynchronous mode, high speed: $Fosc / (16 * (spbreg + 1))$ Asynchronous mode, low speed: $Fosc / (64 * (spbreg + 1))$ Synchronous mode: $Fosc / (4 * (spbreg + 1))$ Where Fosc is the oscillator frequency
--------	--

Returns

None

Remarks

This function configures the usart module according to the specified configuration options

8.17.1.1.3 Open_USART

void OpenUSART(unsigned char config, unsigned int spbreg)

Configure the specified usart module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	<p>Interrupt on Transmission:</p> <ul style="list-style-type: none"> * USART_TX_INT_ON * USART_TX_INT_OFF * USART_TX_INT_MASK <p>Interrupt on Receipt:</p> <ul style="list-style-type: none"> * USART_RX_INT_ON * USART_RX_INT_OFF * USART_RX_INT_MASK <p>uart Mode:</p> <ul style="list-style-type: none"> * USART_ASYNC_MODE * USART_SYNCH_MODE * USART_MODE_MASK <p>Transmission Width:</p> <ul style="list-style-type: none"> * USART_EIGHT_BIT * USART_NINE_BIT * USART_BIT_MASK <p>Slave/Master Select (Applicable to Synchronous mode only):</p> <ul style="list-style-type: none"> * USART_SYNC_SLAVE * USART_SYNC_MASTER * USART_SYNC_MASK <p>Reception mode:</p> <ul style="list-style-type: none"> * USART_SINGLE_RX * USART_CONT_RX * USART_CONT_RX_MASK <p>Baud rate:</p> <ul style="list-style-type: none"> * USART_BRGH_HIGH * USART_BRGH_LOW * USART_BRGH_MASK <p>Address Detect Enable:</p> <ul style="list-style-type: none"> * USART_ADDEN_ON * USART_ADDEN_OFF * USART_ADDEN_MASK

spbrg	<p>This is the value that is written to the baud rate generator register which determines the baud rate at which the usart operates. The formulas for baud rate are:</p> <p>Asynchronous mode, high speed: $Fosc / (16 * (spbrg + 1))$</p> <p>Asynchronous mode, low speed: $Fosc / (64 * (spbrg + 1))$</p> <p>Synchronous mode: $Fosc / (4 * (spbrg + 1))$</p> <p>Where Fosc is the oscillator frequency</p>
-------	---

Returns

None

Remarks

This function configures the usart module according to the specified configuration options

8.17.1.2 USART_Write

8.17.1.2.1 Write_1USART

void Write1USART(char data)

Write a byte (one character) to the usart transmit buffer, including the 9th bit if enabled

Input Parameters

Input Parameters	Description
data	The value to be written to the usart

Returns

None

Remarks

This function writes a byte to the usart transmit buffer. If 9-bit mode is enabled, the 9th bit is written from the field TX_NINE, found in a union of type USART1:

8.17.1.2.2 Write_2USART

```
void Write2USART(char data)
```

Write a byte (one character) to the usart transmit buffer, including the 9th bit if enabled

Input Parameters

Input Parameters	Description
data	The value to be written to the usart

Returns

None

Remarks

This function writes a byte to the usart transmit buffer. If 9-bit mode is enabled, the 9th bit is written from the field TX_NINE, found in a union of type USART2:

8.17.1.2.3 Write_USART

```
void WriteUSART(char data)
```

Write a byte (one character) to the usart transmit buffer, including the 9th bit if enabled

Input Parameters

Input Parameters	Description
data	The value to be written to the usart

Returns

None

Remarks

This function writes a byte to the usart transmit buffer. If 9-bit mode is enabled, the 9th bit is written from the field TX_NINE, found in a union of type USART:

8.17.1.3 USART_baud

8.17.1.3.1 baud_1USART

```
void baud1USART (unsigned char baudconfig)
```

Set the baud rate configuration bits for enhanced usart operation

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
baudconfig	<p>RX Idle State:</p> <p>In Asynchronous mode:</p> <ul style="list-style-type: none"> * BAUD_IDLE_RX_PIN_STATE_HIGH * BAUD_IDLE_RX_PIN_STATE_LOW * BAUD_IDLE_TX_RX_PIN_STATE_MASK <p>In Synchronous mode:</p> <ul style="list-style-type: none"> * BAUD_IDLE_RX_PIN_STATE_HIGH * BAUD_IDLE_RX_PIN_STATE_LOW * BAUD_IDLE_TX_PIN_STATE_HIGH * BAUD_IDLE_TX_PIN_STATE_LOW * BAUD_IDLE_TX_RX_PIN_STATE_MASK <p>Clock Idle State: (In Synchronous mode)</p> <ul style="list-style-type: none"> * BAUD_IDLE_CLK_HIGH * BAUD_IDLE_CLK_LOW * BAUD_IDLE_CLK_MASK <p>Baud Rate Generation:</p> <ul style="list-style-type: none"> * BAUD_16_BIT_RATE * BAUD_8_BIT_RATE * BAUD_BIT_RATE <p>RX Pin Monitoring:</p> <ul style="list-style-type: none"> * BAUD_WAKEUP_ON * BAUD_WAKEUP_OFF * BAUD_WAKEUP_MASK <p>Baud Rate Measurement:</p> <ul style="list-style-type: none"> * BAUD_AUTO_ON * BAUD_AUTO_OFF * BAUD_AUTO_MASK

Returns

None

Remarks

These functions are only available for processors with enhanced usart capability

8.17.1.3.2 baud_2USART

void baud2USART (unsigned char baudconfig)

Set the baud rate configuration bits for enhanced usart operation

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
baudconfig	<p>RX Idle State:</p> <p>In Asynchronous mode:</p> <ul style="list-style-type: none"> * BAUD_IDLE_RX_PIN_STATE_HIGH * BAUD_IDLE_RX_PIN_STATE_LOW * BAUD_IDLE_TX_RX_PIN_STATE_MASK <p>In Synchronous mode:</p> <ul style="list-style-type: none"> * BAUD_IDLE_RX_PIN_STATE_HIGH * BAUD_IDLE_RX_PIN_STATE_LOW * BAUD_IDLE_TX_PIN_STATE_HIGH * BAUD_IDLE_TX_PIN_STATE_LOW * BAUD_IDLE_TX_RX_PIN_STATE_MASK <p>Clock Idle State: (In Synchronous mode)</p> <ul style="list-style-type: none"> * BAUD_IDLE_CLK_HIGH * BAUD_IDLE_CLK_LOW * BAUD_IDLE_CLK_MASK <p>Baud Rate Generation:</p> <ul style="list-style-type: none"> * BAUD_16_BIT_RATE * BAUD_8_BIT_RATE * BAUD_BIT_RATE <p>RX Pin Monitoring:</p> <ul style="list-style-type: none"> * BAUD_WAKEUP_ON * BAUD_WAKEUP_OFF * BAUD_WAKEUP_MASK <p>Baud Rate Measurement:</p> <ul style="list-style-type: none"> * BAUD_AUTO_ON * BAUD_AUTO_OFF * BAUD_AUTO_MASK

Returns

None

Remarks

These functions are only available for processors with enhanced usart capability

8.17.1.3.3 baud_USART

void baudUSART (unsigned char baudconfig)

Set the baud rate configuration bits for enhanced usart operation

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
baudconfig	<p>RX Idle State:</p> <p>In Asynchronous mode:</p> <ul style="list-style-type: none"> * BAUD_IDLE_RX_PIN_STATE_HIGH * BAUD_IDLE_RX_PIN_STATE_LOW * BAUD_IDLE_TX_RX_PIN_STATE_MASK <p>In Synchronous mode:</p> <ul style="list-style-type: none"> * BAUD_IDLE_RX_PIN_STATE_HIGH * BAUD_IDLE_RX_PIN_STATE_LOW * BAUD_IDLE_TX_PIN_STATE_HIGH * BAUD_IDLE_TX_PIN_STATE_LOW * BAUD_IDLE_TX_RX_PIN_STATE_MASK <p>Clock Idle State: (In Synchronous mode)</p> <ul style="list-style-type: none"> * BAUD_IDLE_CLK_HIGH * BAUD_IDLE_CLK_LOW * BAUD_IDLE_CLK_MASK <p>Baud Rate Generation:</p> <ul style="list-style-type: none"> * BAUD_16_BIT_RATE * BAUD_8_BIT_RATE * BAUD_BIT_RATE <p>RX Pin Monitoring:</p> <ul style="list-style-type: none"> * BAUD_WAKEUP_ON * BAUD_WAKEUP_OFF * BAUD_WAKEUP_MASK <p>Baud Rate Measurement:</p> <ul style="list-style-type: none"> * BAUD_AUTO_ON * BAUD_AUTO_OFF * BAUD_AUTO_MASK

Returns

None

Remarks

These functions are only available for processors with enhanced usart capability

8.17.1.4 USART_gets

8.17.1.4.1 gets_1USART

```
void gets1USART(char *buffer, unsigned char len)
```

Read a fixed-length string of characters from the specified usart

Input Parameters

Input Parameters	Description
buffer	A pointer to the location in RAM where incoming characters are to be stored
len	The number of characters to read from the usart

Returns

Read location in RAM will be updated with the data received

Remarks

This function only works in 8-bit transmit/receive mode. This function waits for and reads len number of characters out of the specified usart. There is no time out when waiting for characters to arrive

8.17.1.4.2 gets_2USART

```
void gets2USART(char *buffer, unsigned char len)
```

Read a fixed-length string of characters from the specified usart

Input Parameters

Input Parameters	Description
buffer	A pointer to the location in RAM where incoming characters are to be stored
len	The number of characters to read from the usart

Returns

Read location in RAM will be updated with the data received

Remarks

This function only works in 8-bit transmit/receive mode. This function waits for and reads len number of characters out of the specified usart. There is no time out when waiting for characters to arrive

8.17.1.4.3 gets_USART

void getsUSART(char *buffer, unsigned char len)

Read a fixed-length string of characters from the specified usart

Input Parameters

Input Parameters	Description
buffer	A pointer to the location in RAM where incoming characters are to be stored
len	The number of characters to read from the usart

Returns

Read location in RAM will be updated with the data received

Remarks

This function only works in 8-bit transmit/receive mode. This function waits for and reads len number of characters out of the specified usart. There is no time out when waiting for characters to arrive

8.17.1.5 USART_puts

8.17.1.5.1 putsr_1USART

void putsr1USART(const rom char *data)

Writes a string of characters to the usart including the null character from a location in Program Memory

Input Parameters

Input Parameters	Description
data	Pointer to a null-terminated string of data in Program Memory

Returns

None

Remarks

This function only works in 8-bit transmit/receive mode. This function writes a string of data to the usart including the null character.

Note : Strings located in data memory should be used with the “puts” versions of these functions.

8.17.1.5.2 putsr_2USART

void putsr2USART(const rom char *data)

Writes a string of characters to the usart including the null character from a location in Program Memory

Input Parameters

Input Parameters	Description
data	Pointer to a null-terminated string of data in Program Memory

Returns

None

Remarks

This function only works in 8-bit transmit/receive mode. This function writes a string of data to the usart including the null character.

Note : Strings located in data memory should be used with the “puts” versions of these functions.

8.17.1.5.3 putsr_USART

void putsrUSART(const rom char *data)
--

Writes a string of characters to the usart including the null character from a location in Program Memory

Input Parameters

Input Parameters	Description
data	Pointer to a null-terminated string of data in Program Memory

Returns

None

Remarks

This function only works in 8-bit transmit/receive mode. This function writes a string of data to the usart including the null character.

Note : Strings located in data memory should be used with the “puts” versions of these functions.

8.17.1.6 USART_puts

8.17.1.6.1 puts_1USART

void puts1USART(char *data)

Writes a string of characters to the usart including the null character from a location in Program Memory

Input Parameters

Input Parameters	Description
data	Pointer to a null-terminated string of data in Program Memory

Returns

None

Remarks

This function only works in 8-bit transmit/receive mode. This function writes a string of data to the usart including the null character.

Note : Strings located in program memory, including string literals, should be used with the “putrs” versions of these functions

8.17.1.6.2 puts_2USART

void puts2USART(char *data)

Writes a string of characters to the usart including the null character from a location in Program Memory

Input Parameters

Input Parameters	Description
data	Pointer to a null-terminated string of data in Program Memory

Returns

None

Remarks

This function only works in 8-bit transmit/receive mode. This function writes a string of data to the usart including the null character.

Note : Strings located in program memory, including string literals, should be used with the “putrs” versions of these functions

8.17.1.6.3 puts_USART

void putsUSART(char *data)

Writes a string of characters to the usart including the null character from a location in Program Memory

Input Parameters

Input Parameters	Description
data	Pointer to a null-terminated string of data in Program Memory

Returns

None

Remarks

This function only works in 8-bit transmit/receive mode. This function writes a string of data to the usart including the null character.

Note : Strings located in program memory, including string literals, should be used with the “putrs” versions of these functions

8.17.1.7 USART_Read

8.17.1.7.1 Read_1USART

char Read1USART(void)

Read a byte (one character) out of the usart receive buffer, including the 9th bit if enabled

Returns

Returns a byte of data read from usart buffer. The 9 th bit are saved in a union USART1
--

Remarks

This function reads a byte out of the usart receive buffer. The Status bits and the 9th data bits are saved in a union USART1. The 9th bit is read-only if 9-bit mode is enabled. The Status bits are however read always.

8.17.1.7.2 Read_2USART

char Read2USART(void)

Read a byte (one character) out of the usart receive buffer, including the 9th bit if enabled

Returns

Returns a byte of data read from usart buffer. The 9th bit are saved in a union USART2

Remarks

This function reads a byte out of the usart receive buffer. The Status bits and the 9th data bits are saved in a union USART2
The 9th bit is read-only if 9-bit mode is enabled. The Status bits are however read always.

8.17.1.7.3 Read_USART

```
char ReadUSART(void)
```

Read a byte (one character) out of the usart receive buffer, including the 9th bit if enabled

Returns

Returns a byte of data read from usart buffer. The 9th bit are saved in a union USART

Remarks

This function reads a byte out of the usart receive buffer. The Status bits and the 9th data bits are saved in a union USART
The 9th bit is read-only if 9-bit mode is enabled. The Status bits are however read always.

8.17.2 USART Structs,Records,Enums

8.17.3 USART Macros

8.17.4 USART Examples

8.17.4.1 USART Example1

Example Source Code demonstrating peripheral library usage

```
*****
* NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
*
* Uses Tx pin for transmission and Rx pin for reception.
* Baud rate of 2400 is configred at 8MHz oscillator frequency
```

```
*****
#define USE_OR_MASKS
#include <p18cxx.h>
#include "uart.h"

unsigned char Rxdata[25];
unsigned char Txdata[] = "MICROCHIP_USART";

void main(void)
{
    unsigned char config=0,spbrg=0,baudconfig=0,i=0;

    CloseUSART(); //turn off usart if was previously on

    //----configure USART ----
    config = USART_TX_INT_OFF | USART_RX_INT_OFF | USART_ASYNCH_MODE | USART_EIGHT_BIT |
    USART_CONT_RX | USART_BRGH_LOW;
    //----SPBRG needs to be changed depending upon oscillator frequency-----
    spbrg = 51; //At 8Mhz of oscillator frequency & baud rate of 2400.

    OpenUSART(config, spbrg); //API configures USART for desired parameters

    baudconfig = BAUD_8_BIT_RATE | BAUD_AUTO_OFF;
    baudUSART (baudconfig);

    //----USART Transmission ----
    while(BusyUSART()); //Check if Usart is busy or not
    putsUSART((char *)Txdata); //transmit the string

    //---USART Reception ---
    getsUSART((char *)Rxdata,24); //Recieve data upto 24 bytes

    while(BusyUSART()); //Check if Usart is busy or not
    putsUSART((char *)Rxdata); //echo back the data received back to host

    CloseUSART();
    while(1); //end of program
}

}
```

8.18 MicroWire (MWIRE)

Microwire, is a restricted subset of SPI. MWIRE module is a synchronous serial interface useful for communicating with other peripheral or microcontroller devices. These peripheral devices may be serial EEPROMs, shiftregisters, display drivers, A/D Converters, etc. The MWIRE module is compatible with Motorola's SPI and SIOP interfaces. The module supports operation in two buffer modes. In Standard mode, data is shifted through a single serial buffer.

8.18.1 MWIRE Functions

8.18.1.1 Mwire_Open

8.18.1.1.1 Open_Mwire1

```
void OpenMwire1( unsigned char sync_mode )
```

Configure the SSP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	MWIRE Mode Selection: * MWIRE_FOSC_4 * MWIRE_FOSC_16 * MWIRE_FOSC_64 * MWIRE_FOSC_TMR2

Returns
None

Remarks

Function resets the SSP module to the POR state and then configures the module for Microwire communications

8.18.1.1.2 Open_Mwire2

```
void OpenMwire2( unsigned char sync_mode )
```

Configure the SSP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	MWIRE Mode Selection: * MWIRE_FOSC_4 * MWIRE_FOSC_16 * MWIRE_FOSC_64 * MWIRE_FOSC_TMR2

Returns
None

Remarks

Function resets the SSP module to the POR state and then configures the module for Microwire communications

8.18.1.1.3 Open_Mwire

void OpenMwire(unsigned char sync_mode)
--

Configure the SSP module

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
sync_mode	MWIRE Mode Selection: * MWIRE_FOSC_4 * MWIRE_FOSC_16 * MWIRE_FOSC_64 * MWIRE_FOSC_TMR2

Returns

None

Remarks

Function resets the SSP module to the POR state and then configures the module for Microwire communications

8.18.1.2 Mwire_gets**8.18.1.2.1 gets_Mwire1**

void getsMwire1(unsigned char *rdptr, unsigned char length)
--

Read a string from the Microwire device

Input Parameters

Input Parameters	Description
rdptr	Pointer to PICmicro MCU RAM for placement of data read from Microwire device
length	Number of bytes to read from Microwire device

Returns

Updates the location in RAM with the data read from MicroWire Device

Remarks

This function is used to read a predetermined length of data from a Microwire device. Before using this function, a Read command with the appropriate address must be issued

8.18.1.2.2 gets_Mwire2

void getsMwire2(unsigned char *rdptr, unsigned char length)

Read a string from the Microwire device

Input Parameters

Input Parameters	Description
rdptr	Pointer to PICmicro MCU RAM for placement of data read from Microwire device
length	Number of bytes to read from Microwire device

Returns

Updates the location in RAM with the data read from MicroWire Device

Remarks

This function is used to read a predetermined length of data from a Microwire device. Before using this function, a Read command with the appropriate address must be issued

8.18.1.2.3 gets_Mwire

void getsMwire(unsigned char *rdptr, unsigned char length)

Read a string from the Microwire device

Input Parameters

Input Parameters	Description
rdptr	Pointer to PICmicro MCU RAM for placement of data read from Microwire device
length	Number of bytes to read from Microwire device

Returns

Updates the location in RAM with the data read from MicroWire Device

Remarks

This function is used to read a predetermined length of data from a Microwire device. Before using this function, a Read command with the appropriate address must be issued

8.18.1.3 Mwire_Write

8.18.1.3.1 Write_Mwire1

```
unsigned char WriteMwire1( unsigned char data_out )
```

This function is used to write out a single data byte (one character)

Input Parameters

Input Parameters	Description
data_out	Single byte of data to write to Microwire device

Returns

None

Remarks

This function writes out single data byte to a Microwire device utilizing the SSP module

putcMwire1 is an alternative name for WriteMwire1

8.18.1.3.2 Write_Mwire2

```
unsigned char WriteMwire2( unsigned char data_out )
```

This function is used to write out a single data byte (one character)

Input Parameters

Input Parameters	Description
data_out	Single byte of data to write to Microwire device

Returns

None

Remarks

This function writes out single data byte to a Microwire device utilizing the SSP module

putcMwire2 is an alternative name for WriteMwire2

8.18.1.3.3 Write_Mwire

```
unsigned char WriteMwire( unsigned char data_out )
```

This function is used to write out a single data byte (one character)

Input Parameters

Input Parameters	Description
data_out	Single byte of data to write to Microwire device

Returns

None

Remarks

This function writes out single data byte to a Microwire device utilizing the SSP module

putcMwire is an alternative name for WriteMwire

8.18.1.4 Mwire_Read

8.18.1.4.1 Read_Mwire1

```
unsigned char ReadMwire1( unsigned char high_byte, unsigned char low_byte )
```

Read a byte from a Microwire device

Input Parameters

Input Parameters	Description
high_byte	First byte of 16-bit instruction word
low_byte	Second byte of 16-bit instruction word

Returns

Returns a byte of data read from MicroWire device

Remarks

This function reads in a single byte from a Microwirex device. The Start bit, opcode and address compose the high and low bytes passed into this function

getcMwire1 is an alternative name for ReadMwire1

8.18.1.4.2 Read_Mwire2

```
unsigned char ReadMwire2( unsigned char high_byte, unsigned char low_byte )
```

Read a byte from a Microwire device

Input Parameters

Input Parameters	Description
high_byte	First byte of 16-bit instruction word
low_byte	Second byte of 16-bit instruction word

Returns

Returns a byte of data read from MicroWire device

Remarks

This function reads in a single byte from a Microwirex device. The Start bit, opcode and address compose the high and low bytes passed into this function

getcMwire2 is an alternative name for ReadMwire2

8.18.1.4.3 Read_Mwire

```
unsigned char ReadMwire( unsigned char high_byte, unsigned char low_byte )
```

Read a byte from a Microwire device

Input Parameters

Input Parameters	Description
high_byte	First byte of 16-bit instruction word
low_byte	Second byte of 16-bit instruction word

Returns

Returns a byte of data read from MicroWire device

Remarks

This function reads in a single byte from a Microwirex device. The Start bit, opcode and address compose the high and low bytes passed into this function

getcMwire is an alternative name for ReadMwire

8.18.2 MWIRE Macros

8.18.3 MWIRE Examples

8.18.3.1 MWIRE Example1

Example Source Code demonstrating peripheral library usage

```
//The following is a simple code example illustrating the SSP module communicating with a
Microchip 93LC66 Microwire EE memory device.

#include "p18cxx.h"
#include "mwire.h"

// 93LC66 x 8
// FUNCTION Prototypes

void main(void);
void ew_enable(void);
void erase_all(void);
void busy_poll(void);
void write_all(unsigned char data);
void byte_read(unsigned char address);
void read_mult(unsigned char address,
               unsigned char *rdptr,
               unsigned char length);
void write_byte(unsigned char address,
                unsigned char data);

// VARIABLE Definitions
unsigned char arrayrd[20];
unsigned char var;

// DEFINE 93LC66 MACROS -- see datasheet for details
#define READ 0x0C
#define WRITE 0x0A
#define ERASE 0x0E
#define EWEN1 0x09
#define EWEN2 0x80
#define ERAL1 0x09
#define ERAL2 0x00
#define WRAL1 0x08
#define WRAL2 0x80
#define EWDS1 0x08
#define EWDS2 0x00
#define W_CS LATCbits.LATC2

void main(void)
{
    TRISCbits.TRISC2 = 0;
    W_CS = 0;           //ensure CS is negated
    OpenMwire(MWIRE_FOSC_16); //enable SSP peripheral
    ew_enable(); //send erase/write enable
    write_byte(0x13, 0x34); //write byte (address, data)
    busy_poll();
    Nop();
    byte_read(0x13); //read single byte (address)
    read_mult(0x10, arrayrd, 10); //read multiple bytes
    erase_all(); //erase entire array
```

```

    CloseMwire();                                //disable SSP peripheral
}

void ew_enable(void)
{
    W_CS = 1;          //assert chip select
    putcMwire(EWEN1); //enable write command byte 1
    putcMwire(EWEN2); //enable write command byte 2
    W_CS = 0;          //negate chip select
}

void busy_poll(void)
{
    W_CS = 1;
    while(! DataRdyMwire() );
    W_CS = 0;
}

void write_byte(unsigned char address,
                unsigned char data)
{
    W_CS = 1;
    putcMwire(WRITE);   //write command
    putcMwire(address); //address
    putcMwire(data);    //write single byte
    W_CS = 0;
}

void byte_read(unsigned char address)
{
    W_CS = 1;
    getcMwire(READ,address); //read one byte
    W_CS = 0;
}

void read_mult(unsigned char address,
                 unsigned char *rdptr,
                 unsigned char length)
{
    W_CS = 1;
    putcMwire(READ);        //read command
    putcMwire(address);     //address (A7 - A0)
    getsMwire(rdptr, length); //read multiple bytes
    W_CS = 0;
}

void erase_all(void)
{
    W_CS = 1;
    putcMwire(ERAL1); //erase all command byte 1
    putcMwire(ERAL2); //erase all command byte 2
    W_CS = 0;
}

```

8.19 Power Control PWM (PCPWM)

The Power Control PWM module simplifies the task of generating multiple, synchronized Pulse-Width Modulated (PWM) outputs for use in the control of motor controllers and power conversion applications.

The PWM module has the following features:

- Up to eight PWM I/O pins with four duty cycle generators. Pins can be paired to get a complete half-bridge control.
- Up to 14-bit resolution, depending upon the PWM period.

- On-the-fly PWM frequency changes.
 - Edge and Center-Aligned Output modes.
 - Single-Pulse Generation mode.
 - Programmable dead-time control between paired PWMs.
 - Interrupt support for asymmetrical updates in Center-Aligned mode.
 - Output override for Electrically Commutated Motor (ECM) operation; for example, BLDC.
 - Special Event Trigger comparator for scheduling other peripheral events.
 - PWM outputs disable feature sets PWM outputs to their inactive state when in Debug mode
-

8.19.1 PCPWM Functions

8.19.1.1 Open_pcpwm_Page1

```
void Openpcpwm(unsigned char config0,unsigned char config1,unsigned char config2,unsigned char config3,unsigned int period,unsigned int sptime)
```

Configure the PCPWM module for period, special event time, pwm mode

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config0	<p>configures PWMCON0:</p> <p>PWM Module Enable:</p> <ul style="list-style-type: none">* PWM_IO_ALL_ODD* PWM_IO_1AND3* PWM_IO_ALL* PWM_IO_0TO5* PWM_IO_0TO3* PWM_IO_0AND1* PWM_IO_1* PWM_DISABLE* PWM_IO_MASK <p>PWM Output Pair Mode:</p> <p>PMOD0:</p> <ul style="list-style-type: none">* PWM_0AND1_IND PEN* PWM_0AND1_COMPLI* PWM_0AND1_MASK <p>PMOD1:</p> <ul style="list-style-type: none">* PWM_2AND3_IND PEN* PWM_2AND3_COMPLI* PWM_2AND3_MASK <p>PMOD2:</p> <ul style="list-style-type: none">* PWM_4AND5_IND PEN* PWM_4AND5_COMPLI* PWM_4AND5_MASK

config1	configures PWMCON1: PWM Special Event Trigger : * PW_SEVT_POS_1_1 * PW_SEVT_POS_1_2 * PW_SEVT_POS_1_3 * PW_SEVT_POS_1_4 * PW_SEVT_POS_1_5 * PW_SEVT_POS_1_6 * PW_SEVT_POS_1_7 * PW_SEVT_POS_1_8 * PW_SEVT_POS_1_9 * PW_SEVT_POS_1_10 * PW_SEVT_POS_1_11 * PW_SEVT_POS_1_12 * PW_SEVT_POS_1_13 * PW_SEVT_POS_1_14 * PW_SEVT_POS_1_15 * PW_SEVT_POS_1_16 * PW_SEVT_POS_MASK PWM Special Event Count Direction: * PW_SEVT_DIR_UP * PW_SEVT_DIR_DWN * PW_SEVT_DIR_MASK PWM Output Override Synchronization: * PW_OP_SYNC * PW_OP_ASYNC * PW_OP_SYNC_MASK
---------	--

config2	<p>configures PTCON0:</p> <p>PWM Time Base Output Postscale Select:</p> <ul style="list-style-type: none"> * PT_POS_1_1 * PT_POS_1_2 * PT_POS_1_3 * PT_POS_1_4 * PT_POS_1_5 * PT_POS_1_6 * PT_POS_1_7 * PT_POS_1_8 * PT_POS_1_9 * PT_POS_1_10 * PT_POS_1_11 * PT_POS_1_12 * PT_POS_1_13 * PT_POS_1_14 * PT_POS_1_15 * PT_POS_1_16 * PT_POS_MASK <p>PWM Time Base Input Clock Prescale Select:</p> <ul style="list-style-type: none"> * PT_PRS_1_1 * PT_PRS_1_4 * PT_PRS_1_16 * PT_PRS_1_64 * PT_PRS_MASK <p>PWM Time Base Mode Select:</p> <ul style="list-style-type: none"> * PT_MOD_CNT_UPDN_INT * PT_MOD_CNT_UPDN * PT_MOD_SNGL_SHOT * PT_MOD_FREE_RUN * PT_MOD_MASK
config3	<p>configures PTCON1:</p> <p>PWM Time Base Timer Enable/Disable :</p> <ul style="list-style-type: none"> * PT_ENABLE * PT_DISABLE * PT_MASK <p>PWM Time Base Count Direction Status :</p> <ul style="list-style-type: none"> * PT_CNT_UP * PT_CNT_DWN * PT_CNT_MASK
period	<p>configures PTPERL & PTPERH:</p> <p>16 Bit value loaded to PWM Time Base Period register</p>

sptime	configures SEVTCMPL & SEVTCMPH: 16 bit value loaded to PWM Special Event Trigger Compare Registers
--------	---

Returns

None

Remarks

None

8.19.1.2 Open_pcpwm_Page2

```
void Openpcpwm(unsigned char config0,unsigned char config1,unsigned char config2,unsigned char config3,unsigned int period,unsigned int sptime)
```

Configure the PCPWM module for period, special event time, pwm mode

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config0	<p>configures PWMCON0:</p> <p>PWM Module Enable:</p> <ul style="list-style-type: none"> * PWM_IO_ALL_ODD * PWM_IO_1AND3 * PWM_IO_ALL * PWM_IO_0TO5 * PWM_IO_0TO3 * PWM_IO_0AND1 * PWM_IO_1 * PWM_DISABLE * PWM_IO_MASK <p>PWM Output Pair Mode:</p> <p>PMOD0:</p> <ul style="list-style-type: none"> * PWM_0AND1_IND PEN * PWM_0AND1_COMPLI * PWM_0AND1_MASK <p>PMOD1:</p> <ul style="list-style-type: none"> * PWM_2AND3_IND PEN * PWM_2AND3_COMPLI * PWM_2AND3_MASK <p>PMOD2:</p> <ul style="list-style-type: none"> * PWM_4AND5_IND PEN * PWM_4AND5_COMPLI * PWM_4AND5_MASK <p>PMOD3:</p> <ul style="list-style-type: none"> * PWM_6AND7_IND PEN * PWM_6AND7_COMPLI * PWM_6AND7_MASK

config1	configures PWMCON1: PWM Special Event Trigger : * PW_SEVT_POS_1_1 * PW_SEVT_POS_1_2 * PW_SEVT_POS_1_3 * PW_SEVT_POS_1_4 * PW_SEVT_POS_1_5 * PW_SEVT_POS_1_6 * PW_SEVT_POS_1_7 * PW_SEVT_POS_1_8 * PW_SEVT_POS_1_9 * PW_SEVT_POS_1_10 * PW_SEVT_POS_1_11 * PW_SEVT_POS_1_12 * PW_SEVT_POS_1_13 * PW_SEVT_POS_1_14 * PW_SEVT_POS_1_15 * PW_SEVT_POS_1_16 * PW_SEVT_POS_MASK PWM Special Event Count Direction: * PW_SEVT_DIR_UP * PW_SEVT_DIR_DWN * PW_SEVT_DIR_MASK PWM Output Override Synchronization: * PW_OP_SYNC * PW_OP_ASYNC * PW_OP_SYNC_MASK
---------	--

config2	<p>configures PTCON0:</p> <p>PWM Time Base Output Postscale Select:</p> <ul style="list-style-type: none"> * PT_POS_1_1 * PT_POS_1_2 * PT_POS_1_3 * PT_POS_1_4 * PT_POS_1_5 * PT_POS_1_6 * PT_POS_1_7 * PT_POS_1_8 * PT_POS_1_9 * PT_POS_1_10 * PT_POS_1_11 * PT_POS_1_12 * PT_POS_1_13 * PT_POS_1_14 * PT_POS_1_15 * PT_POS_1_16 * PT_POS_MASK <p>PWM Time Base Input Clock Prescale Select:</p> <ul style="list-style-type: none"> * PT_PRS_1_1 * PT_PRS_1_4 * PT_PRS_1_16 * PT_PRS_1_64 * PT_PRS_MASK <p>PWM Time Base Mode Select:</p> <ul style="list-style-type: none"> * PT_MOD_CNT_UPDN_INT * PT_MOD_CNT_UPDN * PT_MOD_SNGL_SHOT * PT_MOD_FREE_RUN * PT_MOD_MASK
config3	<p>configures PTCON1:</p> <p>PWM Time Base Timer Enable/Disable :</p> <ul style="list-style-type: none"> * PT_ENABLE * PT_DISABLE * PT_MASK <p>PWM Time Base Count Direction Status :</p> <ul style="list-style-type: none"> * PT_CNT_UP * PT_CNT_DWN * PT_CNT_MASK
period	<p>configures PTPERL & PTPERH:</p> <p>16 Bit value loaded to PWM Time Base Period register</p>

sptime	configures SEVTCMPL & SEVTCMPH: 16 bit value loaded to PWM Special Event Trigger Compare Registers
--------	---

Returns

None

Remarks

None

8.19.1.3 Setdc0_pcpwm

void Setdc0pcpwm(unsigned int dutycycle)

This function configures the duty cycle

Input Parameters

Input Parameters	Description
dutycycle	Integer value that will be loaded into Duty cycle register

Returns

None

Remarks

This function configures the duty cycle by loading the argument into the PWM DUTY CYCLE REGISTERS (PDC0L and PDC0H). The value in these registers amounts for the time during which the PWM remains high

8.19.1.4 Setdc1_pcpwm

void Setdc1pcpwm(unsigned int dutycycle)

This function configures the duty cycle

Input Parameters

Input Parameters	Description
dutycycle	Integer value that will be loaded into Duty cycle register

Returns

None

Remarks

This function configures the duty cycle by loading the argument into the PWM DUTY CYCLE REGISTERS (PDC1L and PDC1H). The value in these registers amounts for the time during which the PWM remains high

8.19.1.5 Setdc2_pcpwm

```
void Setdc2pcpwm(unsigned int dutycycle)
```

This function configures the duty cycle

Input Parameters

Input Parameters	Description
dutycycle	Integer value that will be loaded into Duty cycle register

Returns

None

Remarks

This function configures the duty cycle by loading the argument into the PWM DUTY CYCLE REGISTERS (PDC2L and PDC2H). The value in these registers amounts for the time during which the PWM remains high

8.19.1.6 Setdc3_pcpwm

```
void Setdc3pcpwm(unsigned int dutycycle)
```

This function configures the duty cycle

Input Parameters

Input Parameters	Description
dutycycle	Integer value that will be loaded into Duty cycle register

Returns

None

Remarks

This function configures the duty cycle by loading the argument into the PWM DUTY CYCLE REGISTERS (PDC3L and PDC3H). The value in these registers amounts for the time during which the PWM remains high

8.19.1.7 OVD_CTRL_pcpwm

```
void pcpwm_OVD_CTRL(unsigned char config)
```

This function configures for channel Override

Input Parameters

Input Parameters	Description
config	(configures OVDCOND) Values of OVDCON Bit<0-7>: 1 :- PWM Output on PCPWM pin is controlled by Value in Duty cycle register. 0 :- PWM output on pin is controlled by POUT value in OVDCONS register

Returns

None

Remarks

Configures OVDCOND register to override PWM output on pin

8.19.1.8 OVD_IO_STA_pcpwm

```
void pcpwm_OVD_IO_STA(unsigned char config)
```

This function configures for channel Override

Input Parameters

Input Parameters	Description
config	(configures OVDCONS) Values of OVDCONS Bit<0-7>: 1 :- PWM Output on PCPWM pin is active when the corresponding PWM output override bit is cleared. 0 :- PWM Output on PCPWM pin is inactive when the corresponding PWM output override bit is cleared

Returns

None

Remarks

Configures OVDCONS register to override PWM output on pin

8.19.1.9 dt_clk_source_pcpwm

void pcpwm_dt_clk_source(unsigned char config)

This function selects the clock source (prescaler) for Dead time

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description
config	(configures DTCON) Dead-Time Unit A Prescale Select : * DT_CLK_SRC_FOSC_16 * DT_CLK_SRC_FOSC_8 * DT_CLK_SRC_FOSC_4 * DT_CLK_SRC_FOSC_2 * DT_CLK_SRC_MASK

Returns

None

Remarks

Function configures the clock prescaler for Dead time unit

8.19.1.10 dt_assignment_pcpwm

void pcpwm_dt_assignment(unsigned char config)

This function updates the dead time

Input Parameters

Input Parameters	Description
config	(configures DTCON) Unsigned 6-Bit value (Dead-Time Value) for Dead-Time Unit bits

Returns

None

Remarks

Function configures the Dead time by loading the unsigned 6 bit value into DTCON register

8.19.1.11 Close_pcpwm

void Closepcpwm(void)

This function turns off the PCPWM module and sets the ports as input ports

Returns

None

Remarks

Function disables the interrupts and clears the interrupt flags.

8.19.2 PCPWM Macros

8.20 Parallel Master Port (PMP)

The Parallel Master Port (PMP) module is a parallel 8-bit I/O module, specifically designed to communicate with a wide variety of parallel devices, such as communication peripherals, LCDs, external memory devices and microcontrollers. Because the interface to parallel peripherals varies significantly, the PMP is highly configurable. Key features of the PMP module include:

- Up to 16 Programmable Address Lines
- Up to 2 Chip Select Lines
- Programmable Strobe Options:
 - Individual Read and Write Strobes or;
 - Read/Write Strobe with Enable Strobe
 - Address Auto-Increment/Auto-Decrement
 - Programmable Address/Data Multiplexing
 - Programmable Polarity on Control Signals
 - Legacy Parallel Slave Port Support
 - Enhanced Parallel Slave Support:

- Address Support
- 4-Byte Deep Auto-Incrementing Buffer
- Programmable Wait States
- Selectable Input Voltage Levels

8.20.1 PMP Functions

8.20.1.1 Open_PMP

```
void PMPOpen(UINT control, UINT mode, UINT port, UINT addrs, BYTE interrupt)
```

Provides method for setting PMP registers using bit masks provided in this header file.

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing bitwise OR operation ('|'), configurable as shown in the examples

Input Parameters	Description
------------------	-------------

8.20.1.2 SetAddress_PMP

```
void PMPSetAddress(WORD address)
```

This function sets the PMP port address

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing bitwise OR operation ('|'), configurable as shown in the examples

Input Parameters	Description
address	<p>This contains the parameters to be configured in the PMADDR register as defined below</p> <p>Chip Select</p> <ul style="list-style-type: none"> • BIT_CS2_ON • BIT_CS2_OFF • BIT_CS1_ON • BIT_CS1_OFF <p>Destination Address</p> <ul style="list-style-type: none"> • BIT_A13 • BIT_A12 • BIT_A11 • BIT_A10 • BIT_A9 • BIT_A8 • BIT_A7 • BIT_A6 • BIT_A5 • BIT_A4 • BIT_A3 • BIT_A2 • BIT_A1 • BIT_A0

Returns
None

Remarks

Use in Master mode 1 or 2, MODE[1:0] = 10, 11

8.20.1.3 MasterRead_PMP

WORD PMPMasterRead(void)

This function reads the data from PMP data lines latched onto buffer

8

Returns
8-bit value read from external device

Remarks

Use in Master mode 1 or 2, MODE[1:0] = 10, 11

8.20.1.4 MasterWrite_PMP

void PMPMasterWrite(WORD value)

If 8-bit data mode is selected, the data appears on 8 data lines. If 16-bit data mode, the lower 8 bits of data are written first, followed by the upper 8 bits of data.

Input Parameters

Input Parameters	Description
value	to write to external device

Returns

None

Remarks

Use in Master mode 1 or 2, MODE[1:0] = 10, 11

8.20.1.5 IsBufferNEmpty_PMP

BOOL PMPIsBufferNEmpty(BUFFER buf)

Returns state of PMSTAT.OBnE (output buffer(s) empty bit)

Input Parameters

Input Parameters	Description
buf	buffer(0..3)

Returns

TRUE/FALSE

Remarks

Use in SLAVE BUFFERED mode, MODE[1:0] = 00 or SLAVE ENHANCED mode, MODE[1:0] = 00 and INCM[1:0]=11

8.20.1.6 IsBufferNFull_PMP

BOOL PMPIsBufferNFull(BUFFER buf)

Returns state of PMSTAT.IBxF (input buffer(s) full bit)

Input Parameters

Input Parameters	Description
buf	buffer(0..3)

Returns

TRUE/FALSE

Remarks

Use in SLAVE BUFFERED mode, MODE[1:0] = 00 or SLAVE ENHANCED mode, MODE[1:0] = 00 and INCM[1:0]=11

8.20.1.7 SlaveReadBufferN_PMP

unsigned char PMPSlaveReadBufferN(BUFFER buf)

Reads the value in PMDATA register written by a master device.

Input Parameters

Input Parameters	Description
buf	buffer(0..3)

Returns

The value in selected buffer.

Remarks

Use in SLAVE BUFFERED mode, MODE[1:0] = 00 and INCM[1:0]=11 or SLAVE ENHANCED mode, MODE[1:0] = 01

8.20.1.8 SlaveReadBuffers_PMP

void PMPSlaveReadBuffers(BYTE* ref)

Copies 4 bytes from DATAIN buffers to a starting location pointed to by input parameter.

Input Parameters

Input Parameters	Description
ref	BYTE pointer

Returns

The contents of the 4 8-bit slave buffer registers.

Remarks

Use in SLAVE BUFFERED mode, MODE[1:0] = 00 and INCM[1:0]=11 or SLAVE ENHANCED mode, MODE[1:0] = 01

8.20.1.9 SlaveWriteBufferN_PMP

BOOL PMPSlaveWriteBufferN(BUFFER buf, BYTE value)

writes the desired value into the selected output buffer

Input Parameters

Input Parameters	Description
buf	buffer(0..3)
value	value to be written

Returns

Returns the state of PMSTAT.OBE prior to the write operation.

Remarks

Use in SLAVE BUFFERED mode, MODE[1:0] = 00 or SLAVE ENHANCED mode, MODE[1:0] = 00 and INCM[1:0]=11

8.20.1.10 SlaveWriteBuffers_PMP

BOOL PMPSlaveWriteBuffers(BYTE* ref)

Copies 4 bytes, addressed by the pointer/ref argument, into the corresponding output registers. Byte[0] -> OUT1[7:0], byte[1] -> OUT1[15:8], ... etc. If entire buffer is empty, (IBF = 0) function returns TRUE, else the bytes are not copied and returns FALSE.

Input Parameters

Input Parameters	Description
ref	BYTE pointer

8

Returns

Returns the state of PMSTAT.OBE prior to the write operation.

Remarks

Use in SLAVE BUFFERED mode, MODE[1:0] = 00 or SLAVE ENHANCED mode, MODE[1:0] = 00 and INCM[1:0]=11

8.20.1.11 Close_PMP

void PMPClose(void)

disables PMP module, disables interrupt

Returns

None

Remarks

PMCONH.PMPEN, PIE1.PMPIE, PIR1.PMPIF are cleared.

8.20.2 PMP Structs,Records,Enums

8.20.3 PMP Macros

8.20.4 PMP Examples

8.20.4.1 PMP Example1

Example Source Code demonstrating peripheral library usage

```
*****
*
* NOTES:
* Code uses the PERIPHERAL LIBRARY support available with MCC18 Compiler
* Code Tested on:
* PIC18F46J50 controller
* The Processor starts with the External Crystal (8 Mhz).
*
* PMP module used in LCD driver.
* Tianma TM162JCAWG1 LCD used to display message
* Refer Tianma TM162JCAWG1 LCD for timing diagrams, control instructions and time delay
information
*****
#define USE_OR_MASKS
#include "p18cxx.h"
#include "pmp.h"

#if defined(__18F46J50)
***** CONFIGURATION *****
* Oscillator is configured as HS
* Fail safe monitor is enabled
* watch dog timer is disabled
```

```

* Extended instruction mode is disabled
* oscillator switch over is enabled
* CPU clock is not devided
*****
#pragma config OSC=HS, FCMEN=ON, WDTEN=OFF, IESO=ON, XINST=OFF, CPUDIV=OSC1
#endif

***** Macros for LCD delays *****
// Define a fast instruction execution time in terms of loop time
// typically > 43us
#define LCD_F_INSTR 100

// Define a slow instruction execution time in terms of loop time
// typically > 1.35ms
#define LCD_S_INSTR 1500 //150

// Define the startup time for the LCD in terms of loop time
// typically > 30ms
#define LCD_STARTUP 14000 //2000

unsigned int _uLCDloops;
unsigned char LCD_DATA1[] = "MICROCHIP's PIC";

***** Prototype declarations *****
void pmp_Init(void);
void LCDInit(void);
void LCDHome(void);
void LCD1Home(void);
void LCD2Home(void);
void LCDClear(void);
void LCDPut(char A);
void DisplayMSG(unsigned char *array);
void Wait(unsigned int B);

void main(void)
{
    LCDInit();                                //Initialize LCD module
    DisplayMSG(LCD_DATA1);                   //Display message in LCD_DATA1 string on
    first row of LCD
    while(1);                                //end of program
}

*****
*Function : pmp_Init
*Function initializes PMP module for data transfer to LCD module
* Parameter passed: None
* Return value: None
* Affects registers and port pins associated with PMP module
*****
void pmp_Init(void)
{
    unsigned int mode,control,port,addrs,interrupt;

    PMPClose();                                //dsiable PMP if enabled
    previously

***** PMP configuration *****
***** configuration settings *****
*****
```

```

/*
*      PMP module enabled
*      Configure RD, RD/WR strobe = ON; WR, WR/ENB strobe = ON
*      Configure Write/ENB and Read/RW polarity = active high
*      Configure MASTER mode 1
*      Configure 4 Tcy WAIT for Data Setup to Read/Write Wait State
*      Configure 15 Tcy WAIT for Read to Byte Enable Strobe Wait State
*      Configure 4 Tcy WAIT for Data Hold After Strobe Wait State
*****
control = BIT_PMP_ON | BIT_RD_WR_ON | BIT_RD_WR_HI ;
mode = BIT_MODE_MASTER_1 | BIT_WAITB_4_TCY | BIT_WAITM_15_TCY | BIT_WAITE_4_TCY ;
port = BIT_P0;
addrs = 0x0000;
interrupt = 0x0000;
PMPOpen(control,mode,port,addrs,interrupt);           //Configure PMP and enable it
}

//***** LCD initialization *****
void LCDInit(void)
{
    pmp_Init();                                         //Initialize PMP

    //wait for typically > 30us
    _uLCDloops = LCD_STARTUP;
    Wait(_uLCDloops);

    //wait for typically > 1.35us
    _uLCDloops = LCD_F_INSTR;
    PMPMasterWrite(0x0038);                           // Set the default function
    Wait(_uLCDloops);

    //wait for typically > 30us
    _uLCDloops = LCD_STARTUP;
    Wait(_uLCDloops);
    //wait for typically > 1.35us
    _uLCDloops = LCD_F_INSTR;
    PMPMasterWrite(0x000C);
    Wait(_uLCDloops);
    //wait for typically > 30us
    _uLCDloops = LCD_STARTUP;
    Wait(_uLCDloops);
    //wait for typically > 43us
    _uLCDloops = LCD_S_INSTR;
    PMPMasterWrite(0x0001);                           // Clear the display
    Wait(_uLCDloops);

    //wait for typically > 30us
    _uLCDloops = LCD_STARTUP;
    Wait(_uLCDloops);
    //wait for typically > 43us
    _uLCDloops = LCD_S_INSTR;
    PMPMasterWrite(0x0006);                           // Set the entry mode
    Wait(_uLCDloops);

    LCDClear();
    LCDHome();
}

void LCDHome(void)
{
    _uLCDloops = LCD_S_INSTR;
    PMPSetAddress(0x0000);
    PMPMasterWrite(0x0002);
}

```

```

while(_uLCDloops)
    _uLCDloops--;
}

void LCDL1Home(void)
{
    _uLCDloops = LCD_S_INSTR;
    PMPSetAddress(0x0000);
    PMPMasterWrite(0x0080);
    while(_uLCDloops)
        _uLCDloops--;
}

void LCDL2Home(void)
{
    _uLCDloops = LCD_S_INSTR;
    PMPSetAddress(0x0000);
    PMPMasterWrite(0x00C0);
    while(_uLCDloops)
        _uLCDloops--;
}

void LCDClear(void)
{
    _uLCDloops = LCD_S_INSTR;
    PMPSetAddress(0x0000);
    PMPMasterWrite(0x0001);
    while(_uLCDloops)
        _uLCDloops--;
}

void LCDPut(char A)
{
    _uLCDloops = LCD_F_INSTR;
    PMPSetAddress(0x0001);
    PMPMasterWrite( (WORD) A);
    while(_uLCDloops)
        _uLCDloops--;
    Nop();
    Nop();
    Nop();
    Nop();
}

void Wait(unsigned int B)
{
    while(B)
        B--;
}

void DisplayMSG(unsigned char *array)
{
    unsigned char i=0,line=1;
    LCDL1Home();
    while (*array)                                // Continue display characters from STRING
until NULL character appears.
    {
        LCDPut(*array++);
        if (i>19 && line==1)
        {
            LCDL2Home();
            line++;
        }
        i++;
    }
}

```

```
    }
```

8.21 Flash

8.21.1 Flash Functions

8.21.1.1 Erase_Flash_Page1

```
void EraseFlash(unsigned long startaddr, unsigned long endaddr)
```

The function erases flash from starting address in terms of 64 byte till end address or nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be erased
endaddr	End address till which flash has to be erased

Returns

None

Remarks

Note: 1. If number of bytes between strating and end address in not in multiples of number of bytes of flash specified in data sheet, then excessive memory is erased upto nearest next multiple of number of bytes of flash specified in data sheet.
2. The starting and end address has to be in blocks of number of bytes of flash specified in data sheet else function will align the address to nearest previous and next aligned address respectively

8.21.1.2 Erase_Flash_Page2

```
void EraseFlash(unsigned long startaddr, unsigned long endaddr)
```

The function erases flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be erased
endaddr	End address till which flash has to be erased

Returns
None

Remarks

Note: 1. If number of bytes between strating and end address in not in multiples of number of bytes of flash specified in data sheet, then excessive memory is erased upto nearest next multiple of number of bytes of flash specified in data sheet.

2. The starting and end address has to be in blocks of number of bytes of flash specified in data sheet else function will align the address to nearest previous and next aligned address respectively

8.21.1.3 Erase_Flash_Page3

```
void EraseFlash(unsigned long startaddr, unsigned long endaddr)
```

The function erases flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be erased
endaddr	End address till which flash has to be erased

Returns
None

Remarks

Note: 1. If number of bytes between strating and end address in not in multiples of number of bytes of flash specified in data sheet, then excessive memory is erased upto nearest next multiple.

2. The starting and end address has to be in blocks of number of bytes of flash specified in data sheet else function will align the address to nearest previous and next aligned address respectively

8.21.1.4 Read_Flash_Page1

```
void ReadFlash(unsigned long startaddr, unsigned int num_bytes, unsigned char *flash_array)
```

The function reads flash for number of bytes passed as parameter from starting address

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be read
num_bytes	Number of bytes of flash to be read
flash_array	Pointer to array to which the flash has be read

Returns

None

Remarks

1. Non zero number of bytes has to be passed as parameter for num_bytes
2. Maximum number of bytes that can be read in one call is 64K bytes

8.21.1.5 WriteBlock_Flash_Page1

```
void WriteBlockFlash(unsigned long startaddr, unsigned char num_blocks, unsigned char *flash_array)
```

The function writes flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple. If number of bytes between starting and end address in not in multiples of number of bytes of flash specified in data sheet, write begins from address that is previous nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_blocks	Number of blocks of flash to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

Note: 1. Necessary to erase flash block exclusively in application before writing
if application had written data into to this block of flash(after erasing followed by

programming).

2. Necessary to write interms of block of number of bytes of flash specified in data sheet

8.21.1.6 WriteBlock_Flash_Page2

void WriteBlockFlash(unsigned long startaddr, unsigned char num_blocks, unsigned char *flash_array)

The function writes flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple. If number of bytes between starting and end address in not in multiples of number of bytes of flash specified in data sheet, write begins from address that is previous nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_blocks	Number of blocks of flash to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

Note: 1. Necessary to erase flash block exclusively in application before writing

if application had written data into to this block of flash(after erasing followed by programming).

2. Necessary to write interms of block of number of bytes of flash specified in data sheet

8.21.1.7 WriteBlock_Flash_Page3

void WriteBlockFlash(unsigned long startaddr, unsigned char num_blocks, unsigned char *flash_array)

The function writes flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple. If number of bytes between starting and end address in not in multiples of number of bytes of flash specified in data sheet, write begins from address that is previous nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_blocks	Number of blocks of flash to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

- Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).
2. Necessary to write interms of block of number of bytes of flash specified in data sheet

8.21.1.8 WriteBlock_Flash_Page4

```
void WriteBlockFlash(unsigned long startaddr, unsigned char num_blocks, unsigned char *flash_array)
```

The function writes flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple. If number of bytes between starting and end address in not in multiples of number of bytes of flash specified in data sheet, write begins from address that is previous nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_blocks	Number of blocks of flash to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

- Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).
2. Necessary to write interms of block of number of bytes of flash specified in data sheet

8.21.1.9 WriteBlock_Flash_Page5

```
void WriteBlockFlash(unsigned long startaddr, unsigned char num_blocks, unsigned char *flash_array)
```

The function writes flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple. If number of bytes between starting and end address in not in multiples of number of bytes of flash specified in data sheet, write begins from address that is previous nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_blocks	Number of blocks of flash to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

- Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).
 2. Necessary to write interms of block of number of bytes of flash specified in data sheet

8.21.1.10 WriteBlock_Flash_Page6

void WriteBlockFlash(unsigned long startaddr, unsigned char num_blocks, unsigned char *flash_array)
--

The function writes flash from starting address in terms of number of bytes of flash specified in data sheet till end address or nearest multiple. If number of bytes between starting and end address is not in multiples of number of bytes of flash specified in data sheet, write begins from address that is previous nearest multiple

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_blocks	Number of blocks of flash to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

- Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).
 2. Necessary to write interms of block of number of bytes of flash specified in data sheet

8.21.1.11 WriteWord_Flash_Page1

```
void WriteWordFlash(unsigned long startaddr, unsigned int data)
```

The function writes word to flash

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
data	Data to be written into flash

Returns

None

Remarks

Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).
 2. Starting address has to be an even address else boundary mismatch will occur

8.21.1.12 WriteBytes_Flash_Page1

```
void WriteBytesFlash(unsigned long startaddr, unsigned int num_bytes, unsigned char *flash_array)
```

The function writes flash from starting address till end address.

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_bytes	Number of bytes to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by

programming).

2. Maximum number of bytes that can be written in one call is 64K bytes

8.21.1.13 WriteBytes_Flash_Page2

```
void WriteBytesFlash(unsigned long startaddr, unsigned int num_bytes, unsigned char *flash_array)
```

The function writes flash from starting address till end address.

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_bytes	Number of bytes to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).

2. Maximum number of bytes that can be written in one call is 64K bytes

8.21.1.14 WriteBytes_Flash_Page3

```
void WriteBytesFlash(unsigned long startaddr, unsigned int num_bytes, unsigned char *flash_array)
```

The function writes flash from starting address till end address.

Input Parameters

Input Parameters	Description
startaddr	Strating address from which flash has to be written
num_bytes	Number of bytes to be written
flash_array	Pointer to array contents of which has to be written to flash

Returns

None

Remarks

- Note: 1. Necessary to erase flash block exclusively in application before writing if application had written data into to this block of flash(after erasing followed by programming).
2. Maximum number of bytes that can be written in one call is 64K bytes
-

8.21.2 Flash Macros

8.21.3 Flash Examples

8.21.3.1 Flash Example1

```
*****
* 2009 Microchip Technology Inc.
*
* FileName:          Flash.c
* Dependencies:     Header (.h) files if applicable, see below
* Processor:        PIC18F
* Compiler:         MCC18 v3.30 or higher
*
* SOFTWARE LICENSE AGREEMENT:
* Microchip Technology Incorporated ("Microchip") retains all
* ownership and intellectual property rights in the code accompanying
* this message and in all derivatives hereto. You may use this code,
* and any derivatives created by any person or entity by or on your
* behalf, exclusively with Microchip's proprietary products. Your
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*
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* MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE APPLY TO THIS
* CODE, ITS INTERACTION WITH MICROCHIP'S PRODUCTS, COMBINATION WITH
* ANY OTHER PRODUCTS, OR USE IN ANY APPLICATION.
*
* YOU ACKNOWLEDGE AND AGREE THAT, IN NO EVENT, SHALL MICROCHIP BE
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* BREACH OF STATUTORY DUTY), STRICT LIABILITY, INDEMNITY,
* CONTRIBUTION, OR OTHERWISE, FOR ANY INDIRECT, SPECIAL, PUNITIVE,
* EXEMPLARY, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, FOR COST OR
* EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE CODE, HOWSOEVER
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*
* REVISION HISTORY:
* ~~~~~~
```

```

* Author          Date      Comments on this revision
*-----*
* Harsha.J.M    04/05/10   First release of source file
*-----*
*
* ADDITIONAL NOTES:
* Code uses the Peripheral library support available with MCC18 Compiler
* Code Tested on:
* PicDem2+ demo board with PIC18F4685 controller
* The Processor starts with the External Crystal (8 Mhz).
* Program depicts the usage of Flash Write/Read/Erase APIs
***** */

#define USE_OR_MASKS
#include <p18cxx.h>
#include "flash.h"

//-----Configuration setting
-----
/***
 * Oscillator is configured as HS
 * Fail safe monitor is enabled
 * watch dog timer is disabled
 * Extended instruction mode is disabled
 * oscillator switch over is enabled
*/
#if defined(__18F4685)           //If the selected device is PIC18F4685, then apply
below settings else user will have to set
#pragma config OSC=HS, FCMEN=ON, WDT=OFF, IESO=ON, XINST=OFF, LVP=OFF
#endif

#pragma udata    WRITE_BANK=0x200
unsigned char Write_Data[250];
#pragma udata    READ_BANK=0x300
unsigned char Read_Data[250];

void main(void)
{
unsigned char i;

//Initialize Data to be written to flash
for(i=0;i<250;i++)
{
    Write_Data[i]=i+1;
    Read_Data[i]=0;
}

//Write data into flash from the specified location
WriteBytesFlash((UINT32)0x6000,(UINT16)250,Write_Data);

//Read the data to verify the writted data
ReadFlash((UINT32)0x6000,(UINT16)250,Read_Data);

//Erase Flash
EraseFlash((UINT32)0x6000,(UINT32)0x7000);

//Read the data to verify the erased data
ReadFlash((UINT32)0x6000,(UINT16)128,Read_Data);

//Write data into flash from the specified location
WriteBlockFlash((UINT32)0x6000,4,Write_Data);

//Read the data to verify the writted data
ReadFlash((UINT32)0x6000,(UINT16)128,Read_Data);

while(1);           //End of Program
}

```

8.22 Prototype_Page

--

Input Parameters

Parameters are passed to arguments of functions as a bitmask, created by performing either bitwise AND operation ('&') or bitwise OR operation ('|'), configurable either way as shown in the examples

Input Parameters	Description

Returns

Remarks

9 Symbol Reference

9.1 Files

The following table lists files in this documentation.

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Name	Description
adc.h (see page 1207)	
ancomp.h (see page 1207)	
capture.h (see page 1207)	
compare.h (see page 1208)	
ctmu.h (see page 1208)	
dpslp.h (see page 1208)	
EEP.h (see page 1208)	
flash.h (see page 1208)	
i2c.h (see page 1208)	
mwire.h (see page 1208)	
pc pwm.h (see page 1208)	
pmp.h (see page 1208)	
portb.h (see page 1208)	
pps.h (see page 1208)	
ProMPT.h (see page 1209)	
pwm.h (see page 1209)	
reset.h (see page 1209)	
rtcc.h (see page 1209)	
spi.h (see page 1209)	
timers.h (see page 1209)	
uart.h (see page 1209)	

9.1.1 adc.h

9.1.2 ancomp.h

9.1.3 capture.h

9.1.4 compare.h

9.1.5 ctmu.h

9.1.6 dpslp.h

9.1.7 EEP.h

9.1.8 flash.h

9.1.9 i2c.h

9.1.10 mwire.h

9.1.11 pcpwm.h

9.1.12 pmp.h

9.1.13 portb.h

9.1.14 pps.h

9.1.15 ProMPT.h

9.1.16 pwm.h

9.1.17 reset.h

9.1.18 rtcc.h

9.1.19 spi.h

9.1.20 timers.h

9.1.21 usart.h

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