PSoC® Creator™
Project Datasheet for CARD

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Table of Contents

1 Overview

The Cypress PSoC 4 is a family of 32-bit devices with the following characteristics:

- Digital system that includes configurable Universal Digital Blocks (UDBs) and specific function peripherals such as PWM, UART, SPI and I2C
- Analog subsystem that includes 12-bit SAR ADC, comparators, op amps, CapSense, LCD drive and more
- Several types of memory elements, including SRAM and flash
- Programming and debug system through Serial Wire Debug (SWD)
- High-performance 32-bit ARM Cortex-M0 core with a nested vectored interrupt controller (NVIC)
- Flexible routing to all pins

Figure 1 shows the major components of a typical PSoC 4200 series member PSoC 4 device. For details on all the systems listed above, please refer to the PSoC 4 Technical Reference Manual .

Figure 1. PSoC 4200 Device Series Block Diagram

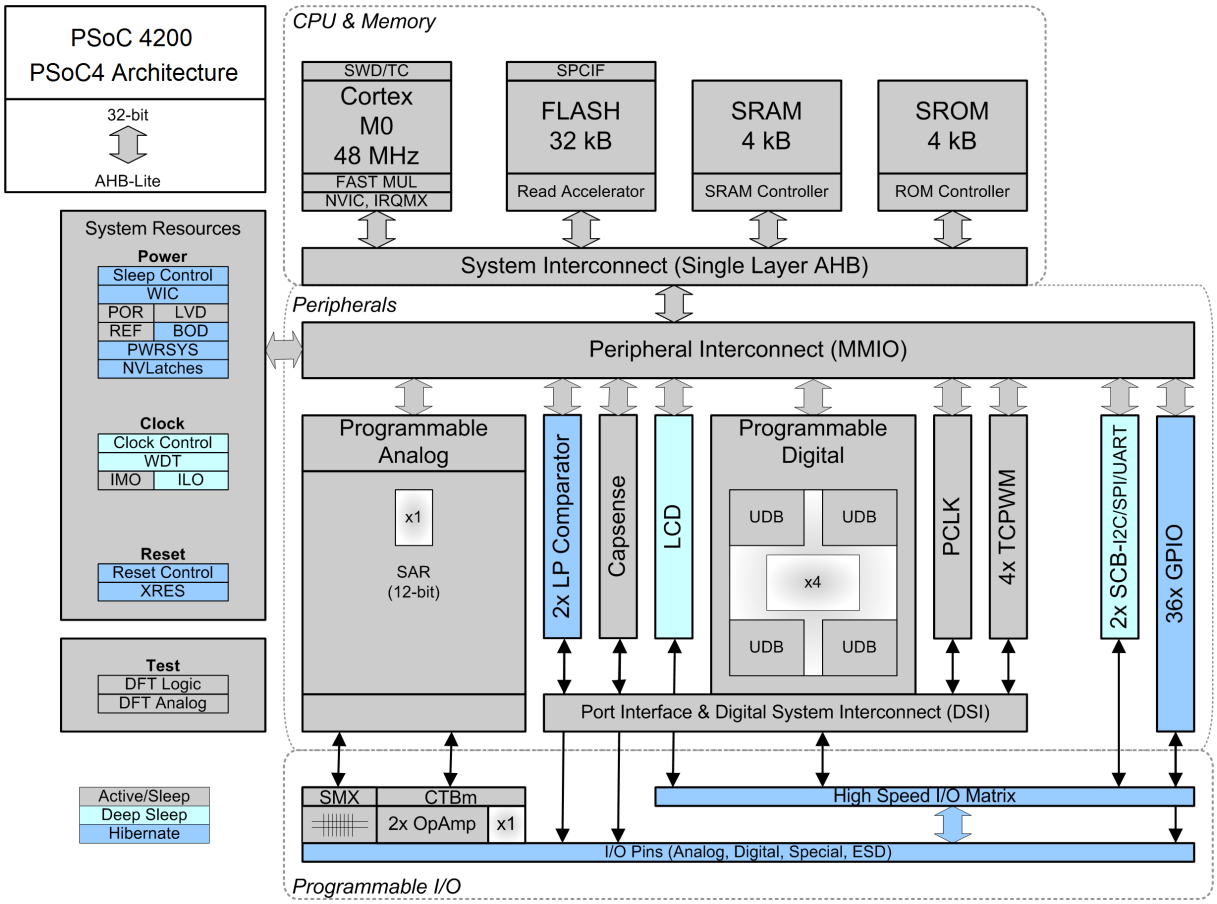


Table 1 lists the key characteristics of this device.

Table 1. Device Characteristics

Name	Value
Part Number	CY8C4245AXI-483
Package Name	44-TQFP
Family	PSoC 4
Series	PSoC 4200
Max CPU speed (MHz)	48
Flash size (kB)	32
SRAM size (kB)	4
Vdd range (V)	1.71 to 5.5
Automotive qualified	No (Industrial Grade Only)
Temp range (Celsius)	-40 to 85

NOTE: The CPU speed noted above is the maximum available speed. The CPU is clocked by HFCLK, listed in the System Clocks section below.

Table 2 lists the device resources that this design uses:

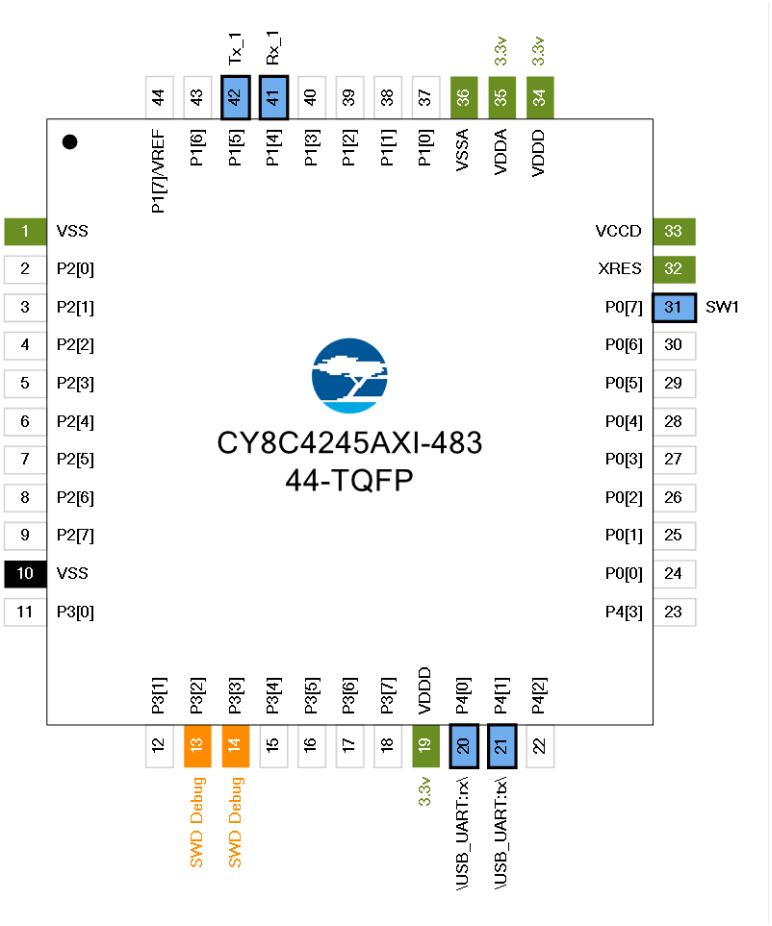
Table 2. Device Resources

Resource Type	Used	Free	Max	% Used
Digital Clocks	1	3	4	25.00 %
Interrupts	4	28	32	12.50 %
IO	7	29	36	19.44 %
Segment LCD	0	1	1	0.00 %
CapSense	0	1	1	0.00 %
Die Temp	0	1	1	0.00 %
Serial Communication (SCB)	1	1	2	50.00 %
Timer/Counter/PWM	0	4	4	0.00 %
UDB				
Macrocells	24	8	32	75.00 %
Unique P-terms	44	20	64	68.75 %
Total P-terms	53			
Datapath Cells	3	1	4	75.00 %
Status Cells	3	1	4	75.00 %
StatusI Registers	2			
Routed Count7 Load/Enable	1			
Control Cells	1	3	4	25.00 %
Count7 Cells	1			
Comparator/Opamp	0	2	2	0.00 %
LP Comparator	0	2	2	0.00 %
SAR ADC	0	1	1	0.00 %
DAC				
7-bit IDAC	0	1	1	0.00 %
8-bit IDAC	0	1	1	0.00 %

2 Pins

Figure 2 shows the pin layout of this device.

Figure 2. Device Pin Layout



2.1 Hardware Pins

Table 3 contains information about the pins on this device in device pin order. (No connection ["n/c"] pins have been omitted.)

Table 3. Device Pins

Pin	Port	Name	Type	Drive Mode
1	VSS	VSS	Power	
2	P2[0]	GPIO [unused]		
3	P2[1]	GPIO [unused]		
4	P2[2]	GPIO [unused]		
5	P2[3]	GPIO [unused]		
6	P2[4]	GPIO [unused]		
7	P2[5]	GPIO [unused]		
8	P2[6]	GPIO [unused]		
9	P2[7]	GPIO [unused]		
11	P3[0]	GPIO [unused]		
12	P3[1]	GPIO [unused]		
13	P3[2]	Debug:SWD_IO	Reserved	
14	P3[3]	Debug:SWD_CK	Reserved	
15	P3[4]	GPIO [unused]		
16	P3[5]	GPIO [unused]		
17	P3[6]	GPIO [unused]		
18	P3[7]	GPIO [unused]		
19	VDDD	VDDD	Power	
20	P4[0]	\USB_UART:rx\	Dgtl In	HiZ digital
21	P4[1]	\USB_UART:tx\	Dgtl Out	Strong drive
22	P4[2]	GPIO [unused]		
23	P4[3]	GPIO [unused]		
24	P0[0]	GPIO [unused]		
25	P0[1]	GPIO [unused]		
26	P0[2]	GPIO [unused]		
27	P0[3]	GPIO [unused]		
28	P0[4]	GPIO [unused]		
29	P0[5]	GPIO [unused]		
30	P0[6]	GPIO [unused]		
31	P0[7]	SW1	Dgtl In	Res pull up
32	XRES	XRES	Dedicated	
33	VCCD	VCCD	Power	
34	VDDD	VDDD	Power	
35	VDDA	VDDA	Power	
36	VSSA	VSSA	Power	
37	P1[0]	GPIO [unused]		
38	P1[1]	GPIO [unused]		
39	P1[2]	GPIO [unused]		
40	P1[3]	GPIO [unused]		
41	P1[4]	Rx_1	Dgtl In	HiZ digital
42	P1[5]	Tx_1	Dgtl Out	Strong drive
43	P1[6]	GPIO [unused]		
44	P1[7]/VREF	GPIO [unused]		

Abbreviations used in Table 3 have the following meanings:

- Dgtl In = Digital Input

- HiZ digital = High impedance digital
- Dgtl Out = Digital Output
- Res pull up = Resistive pull up

2.2 Hardware Ports

Table 4 contains information about the pins on this device in device port order. (No connection ["n/c"], power and dedicated pins have been omitted.)

Table 4. Device Ports

Port	Pin	Name	Type	Drive Mode
P0[0]	24	GPIO [unused]		
P0[1]	25	GPIO [unused]		
P0[2]	26	GPIO [unused]		
P0[3]	27	GPIO [unused]		
P0[4]	28	GPIO [unused]		
P0[5]	29	GPIO [unused]		
P0[6]	30	GPIO [unused]		
P0[7]	31	SW1	Dgtl In	Res pull up
P1[0]	37	GPIO [unused]		
P1[1]	38	GPIO [unused]		
P1[2]	39	GPIO [unused]		
P1[3]	40	GPIO [unused]		
P1[4]	41	Rx_1	Dgtl In	HiZ digital
P1[5]	42	Tx_1	Dgtl Out	Strong drive
P1[6]	43	GPIO [unused]		
P1[7]/VREF	44	GPIO [unused]		
P2[0]	2	GPIO [unused]		
P2[1]	3	GPIO [unused]		
P2[2]	4	GPIO [unused]		
P2[3]	5	GPIO [unused]		
P2[4]	6	GPIO [unused]		
P2[5]	7	GPIO [unused]		
P2[6]	8	GPIO [unused]		
P2[7]	9	GPIO [unused]		
P3[0]	11	GPIO [unused]		
P3[1]	12	GPIO [unused]		
P3[2]	13	Debug:SWD_IO	Reserved	
P3[3]	14	Debug:SWD_CK	Reserved	
P3[4]	15	GPIO [unused]		
P3[5]	16	GPIO [unused]		
P3[6]	17	GPIO [unused]		
P3[7]	18	GPIO [unused]		
P4[0]	20	\USB_UART:rx\	Dgtl In	HiZ digital
P4[1]	21	\USB_UART:tx\	Dgtl Out	Strong drive
P4[2]	22	GPIO [unused]		
P4[3]	23	GPIO [unused]		

Abbreviations used in Table 4 have the following meanings:

- Dgtl In = Digital Input
- Res pull up = Resistive pull up
- HiZ digital = High impedance digital
- Dgtl Out = Digital Output

2.3 Software Pins

Table 5 contains information about the software pins on this device in alphabetical order. (Only software-accessible pins are shown.)

Table 5. Software Pins

Name	Port	Type
\USB_UART:rx\	P4[0]	Dgtl In
\USB_UART:tx\	P4[1]	Dgtl Out
Debug:SWD_CK	P3[3]	Reserved
Debug:SWD_IO	P3[2]	Reserved
GPIO [unused]	P0[1]	
GPIO [unused]	P1[6]	
GPIO [unused]	P1[7]/VREF	
GPIO [unused]	P4[3]	
GPIO [unused]	P0[0]	
GPIO [unused]	P0[2]	
GPIO [unused]	P1[0]	
GPIO [unused]	P0[6]	
GPIO [unused]	P1[2]	
GPIO [unused]	P1[1]	
GPIO [unused]	P1[3]	
GPIO [unused]	P0[3]	
GPIO [unused]	P0[5]	
GPIO [unused]	P0[4]	
GPIO [unused]	P4[2]	
GPIO [unused]	P2[5]	
GPIO [unused]	P2[6]	
GPIO [unused]	P2[0]	
GPIO [unused]	P2[3]	
GPIO [unused]	P2[2]	
GPIO [unused]	P2[1]	
GPIO [unused]	P2[7]	
GPIO [unused]	P3[6]	
GPIO [unused]	P3[5]	
GPIO [unused]	P2[4]	
GPIO [unused]	P3[7]	
GPIO [unused]	P3[1]	
GPIO [unused]	P3[0]	
GPIO [unused]	P3[4]	
Rx_1	P1[4]	Dgtl In
SW1	P0[7]	Dgtl In
Tx_1	P1[5]	Dgtl Out

Abbreviations used in Table 5 have the following meanings:

- Dgtl In = Digital Input
- Dgtl Out = Digital Output

For more information on reading, writing and configuring pins, please refer to:

- Pins chapter in the System Reference Guide
  - CyPins API routines
- Programming Application Interface section in the cy_pins component datasheet

3 System Settings

3.1 System Configuration

Table 6. System Configuration Settings

Name	Value
Device Configuration Mode	Compressed
Unused Bonded IO	Disallowed
Heap Size (bytes)	0x1f0
Stack Size (bytes)	0x0400
Include CMSIS Core Peripheral Library Files	True

3.2 System Debug Settings

Table 7. System Debug Settings

Name	Value
Debug Select	SWD (serial wire debug)
Chip Protection	Open

3.3 System Operating Conditions

Table 8. System Operating Conditions

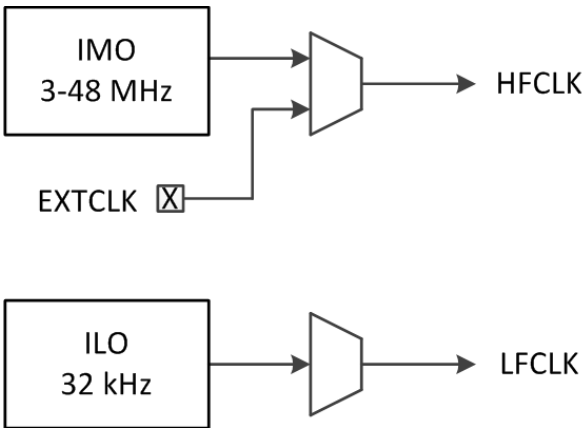
Name	Value
VDDA (V)	3.3
VDDD (V)	3.3
Variable VDDA	True

4 Clocks

The clock system includes these clock resources:

- Two internal clock sources:
  - 3 to 48 MHz Internal Main Oscillator (IMO) ±2% at 3 MHz
  - 32 kHz Internal Low Speed Oscillator (ILO) output
- HFCLK can be generated using an external signal from EXTCLK pin
- Twelve clock dividers, each with 16-bit divide capability:
  - Eight can be used for fixed-function blocks
  - Four can be used for the UDBs

Figure 3. System Clock Configuration



4.1 System Clocks

Table 9 lists the system clocks used in this design.

Table 9. System Clocks

Name	Domain	Source	Desired Freq	Nominal Freq	Accuracy (%)	Start at Reset	Enabled
DPLL_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
SYSCLK	NONE	HFCLK	? MHz	24 MHz	±2	True	True
Direct_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
PLL1_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
PLL0_Sel	NONE	IMO	24 MHz	24 MHz	±2	True	True
HFCLK	NONE	Direct_Sel	24 MHz	24 MHz	±2	True	True
IMO	NONE		24 MHz	24 MHz	±2	True	True
LFCLK	NONE	ILO	? MHz	32 kHz	±60	True	True
ILO	NONE		32 kHz	32 kHz	±60	True	True
Timer2 (WDT2)	NONE	LFClk	? MHz	? MHz	±0	False	False
EXTCLK	NONE		24 MHz	? MHz	±0	False	False
DigSig3	NONE		? MHz	? MHz	±0	False	False
DigSig2	NONE		? MHz	? MHz	±0	False	False
DigSig4	NONE		? MHz	? MHz	±0	False	False
DigSig1	NONE		? MHz	? MHz	±0	False	False
Timer1 (WDT1)	NONE	LFClk	? MHz	? MHz	±0	False	False
Timer0 (WDT0)	NONE	LFClk	? MHz	? MHz	±0	False	False

4.2 Local and Design Wide Clocks

Local clocks drive individual analog and digital blocks. Design wide clocks are a user-defined optimization, where two or more analog or digital blocks that share a common clock profile (frequency, etc) can be driven from the same clock divider output source.

Figure 4. Local and Design Wide Clock Configuration

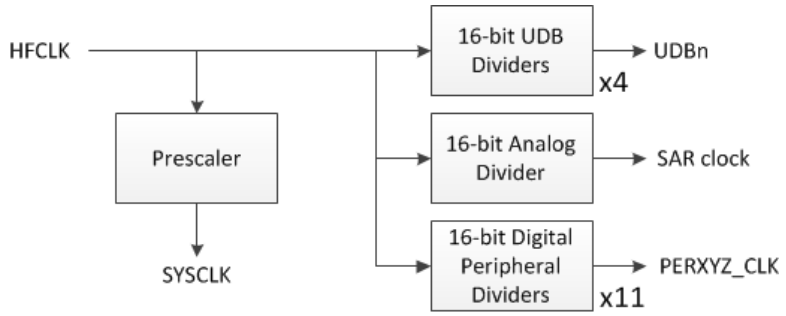


Table 10 lists the local clocks used in this design.

Table 10. Local Clocks

Name	Domain	Source	Desired Freq	Nominal Freq	Accuracy (%)	Start at Reset	Enabled
USB_UART_-SCBCLK	FIXED_-FUNCT-ION	HFCLK	1.382 MHz	1.412 MHz	±2	True	True

Name	Domain	Source	Desired Freq	Nominal Freq	Accuracy (%)	Start at Reset	Enabled
ATM_UART_-IntClock	DIGITAL	HFCLK	921.6 kHz	923.077 kHz	±2	True	True

For more information on clocking resources, please refer to:

- Clocking System chapter in the PSoC 4 Technical Reference Manual
- Clocking chapter in the System Reference Guide
  - CySysClkImo API routines
  - CySysClkIlo API routines
  - CySysClkWrite API routines

5 Interrupts

5.1 Interrupts

This design contains the following interrupt components: (0 is the highest priority)

Table 11. Interrupts

Name	Intr Num	Vector	Priority
Reset_isr	0	0	3
ATM_UART_-RXInternalInterrupt	2	2	3
ATM_UART_-TXInternalInterrupt	3	3	3
USB_UART_SCB_IRQ	10	10	3

For more information on interrupts, please refer to:

- Interrupt Controller chapter in the PSoC 4 Technical Reference Manual
- Interrupts chapter in the System Reference Guide
  - CyInt API routines and related registers
- Datasheet for cy_isr component

6 Flash Memory

PSoC 4 devices offer a host of Flash protection options and device security features that you can leverage to meet the security and protection requirements of an application. These requirements range from protecting configuration settings or Flash data to locking the entire device from external access.

Table 12 lists the Flash protection settings for your design.

Table 12. Flash Protection Settings

Start Address	End Address	Protection Level
0x0	0x7FFF	U - Unprotected

Flash memory is organized as rows with each row of flash having 128 bytes. Each flash row can be assigned one of four protection levels:

- U - Unprotected
- W - Full Protection

For more information on Flash memory and protection, please refer to:

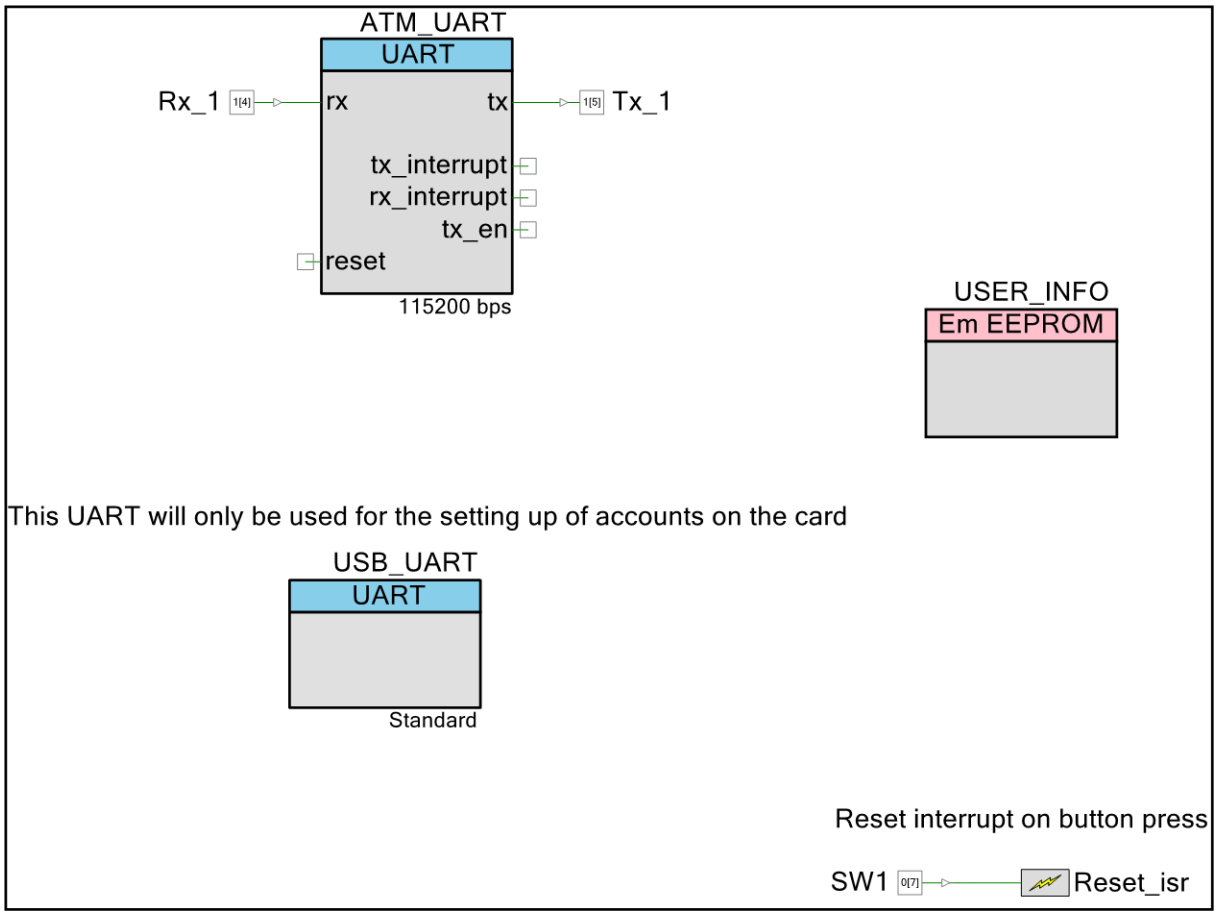
- Flash Protection chapter in the PSoC 4 Technical Reference Manual
- Flash and EEPROM chapter in the System Reference Guide
  - CySysFlash API routines

7 Design Contents

This design's schematic content consists of the following schematic sheet:

7.1 Schematic Sheet: Page 1

Figure 5. Schematic Sheet: Page 1



This schematic sheet contains the following component instances:

- Instance ATM_UART (type: UART_v2_50)
- Instance USB_UART (type: SCB_P4_v3_20)
- Instance USER_INFO (type: Em_EEPROM_v1_20)

8 Components

8.1 Component type: Em_EEPROM [v1.20]

8.1.1 Instance USER_INFO

Description: Emulates an EEPROM device in flash memory.
Instance type: Em_EEPROM [v1.20]
Datasheet: online component datasheet for Em_EEPROM

Table 13. Component Parameters for USER_INFO

Parameter Name	Value	Description
User Comments		Instance-specific comments.

8.2 Component type: SCB_P4 [v3.20]

8.2.1 Instance USB_UART

Description: Serial Communication Block (SCB)
Instance type: SCB_P4 [v3.20]
Datasheet: online component datasheet for SCB_P4

Table 14. Component Parameters for USB_UART

Parameter Name	Value	Description
EzI2cBusVoltage	3.3	When the SCB mode is EZI2C, this parameter specifies the voltage applied to the pull-up resistors on the I2C bus. Only applicable for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
EzI2cByteModeEnable	false	When the SCB mode is EZI2C, this parameter specifies the number of bits per FIFO data element. The byte mode – false: a 16-bit FIFO data element. The FIFO depth is 8 entries. The byte mode – true: an 8-bit FIFO data element. The FIFO depth is 16 entries. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
EzI2cClockFromTerm	false	When the SCB mode is EZI2C, this parameter provides a clock terminal to connect a clock outside the component.
EzI2cClockStretching	true	When the SCB mode is EZI2C, this parameter specifies whether the SCL is stretched while in EZI2C operation.

Parameter Name	Value	Description
EzI2cDataRate	100	When the SCB mode is EZI2C, this parameter defines EZI2C Data rate in kbps. The standard data rates are: 100, 400 and 1000 kbps.
EzI2cNumberOfAddresses	1	When the SCB mode is EZI2C, this parameter defines the number of I2C slave addresses that device respond to.
EzI2cPrimarySlaveAddress	8	When the SCB mode is EZI2C, this parameter specifies EZI2C primary 7-bits slave address (MSB ignored).
EzI2cSecondarySlaveAddress	9	When the SCB mode is EZI2C, this parameter specifies EZI2C secondary 7-bits slave address (MSB ignored). Only applicable when EZI2C clock stretching option is set.
EzI2cSlewRate	Fast	When the SCB mode is EZI2C, this parameter specifies the slew rate settings of the I2C pins. For devices supporting GPIO Over-Voltage Tolerance (GPIO_OVT) pins, I2C FM+ options should be used when I2C data rate is greater than 400 kbps. This option also requires the I2C bus voltage to be defined.Refer to the Device Datasheet to determine which pins are GPIO_OVT capable.
EzI2cSubAddressSize	8	When the SCB mode is EZI2C, this parameter specifies the maximum size of the slave buffer that is exposed to the master: 8bits – maximum buffer size is 256 bytes, 16 bits – maximum buffer size is 65535 bytes.
EzI2cWakeEnable	false	When the SCB mode is EZI2C, this parameter enables wakeup from Deep Sleep on I2C address match event.
I2cAcceptAddress	false	When the SCB mode is I2C, this parameter specifies whether to accept the match slave address in RX FIFO or not. All slave matched addresses are ACKed. The user has to register the callback function to handle accepted addresses. This feature has to be used when more than one address support is required.

Parameter Name	Value	Description
I2cAcceptGeneralCall	false	When the SCB mode is I2C, this parameter specifies whether to accept the general call address. The general call address is ACKed when accepted and NAKed otherwise. The user has to register the callback function to handle the general call address.
I2cBusVoltage	3.3	When the SCB mode is I2C, this parameter specifies the voltage applied to the pull-up resistors on the I2C bus. Only applicable for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
I2cByteModeEnable	false	When the SCB mode is I2C, this parameter specifies the number of bits per FIFO data element. The byte mode – false: a 16-bit FIFO data element. The FIFO depth is 8 entries. The byte mode – true: an 8-bit FIFO data element. The FIFO depth is 16 entries. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
I2cClockFromTerm	false	When the SCB mode is I2C, this parameter provides a clock terminal to connect a clock outside the component.
I2cDataRate	100	When the SCB mode is I2C, this parameter specifies the data rate in kbps. The standard data rates are: 100, 400 and 1000 kbps.
I2cExternIntrHandler	false	When the SCB mode is I2C, this parameter specifies whether the I2C interrupt handler is configured in SCB_I2CInit(). This parameter is intended to be used by the PM/SM bus component. The modification parameter default value causes I2C mode failures.
I2cManualOversampleControl	true	When the SCB mode is I2C, this parameter specifies the method of calculating the oversampling as manual or automatic.
I2cMode	Slave	When the SCB mode is I2C, this parameter defines the I2C operation mode as: Slave, Master, Multi-Master or Multi-Master-Slave.

Parameter Name	Value	Description
I2cOvsFactor	16	When the SCB mode is I2C, this parameter defines the oversampling factor of SCBCLK.
I2cOvsFactorHigh	8	When the SCB mode is I2C, this parameter defines the high oversampling factor of SCBCLK. Only applicable for I2C Master modes.
I2cOvsFactorLow	8	When the SCB mode is I2C, this parameter defines the low oversampling factor of SCBCLK. Only applicable for I2C Master modes.
I2cSlaveAddress	8	When the SCB mode is I2C, this parameter specifies the I2C 7-bits slave address (MSB ignored).
I2cSlaveAddressMask	254	When the SCB mode is I2C, this parameter specifies the I2C Slave address mask. Bit value 0 – excludes bit from address comparison. Bit value 1 – the bit needs to match with the corresponding bit of the I2C slave address.
I2cSlewRate	Fast	When the SCB mode is I2C, this parameter specifies the slew rate settings of the I2C pins. For devices supporting GPIO Over-Voltage Tolerance (GPIO_OVT) pins, I2C FM+ options should be used when I2C data rate is greater than 400 kbps. This option also requires the I2C bus voltage to be defined. Refer to the Device Datasheet to determine which pins are GPIO_OVT capable.
I2cWakeEnable	false	When the SCB mode is I2C, this parameter enables wakeup from Deep Sleep on an I2C address match event.
ScbMisoSdaTxEnable	true	This parameter defines the availability of the spi_miso_i2c_-sda_uart_tx pin.
ScbMode	UART	This parameter defines the mode of operation for the SCB component.
ScbMosiSclRxEnable	true	This parameter defines the availability of the spi_mosi_i2c_-scl_uart_rx pin.
ScbRxWakeIrqEnable	false	This parameter defines the availability of the spi_mosi_i2c_-scl_uart_rx_wake pin.
ScbSclkEnable	false	This parameter defines the availability of the sclk pin.

Parameter Name	Value	Description
ScbSs0Enable	false	This parameter defines the availability of the ss0 pin.
ScbSs1Enable	false	This parameter defines the availability of the ss1 pin.
ScbSs2Enable	false	This parameter defines the availability of the ss2 pin.
ScbSs3Enable	false	This parameter defines the availability of the ss3 pin.
SpiBitRate	1000	When the SCB mode is SPI, this parameter specifies the Bit rate in kbps (up to 8000 kbps); the actual rate may differ based on available clock frequency and component settings. This parameter has no effect if the Clock from terminal parameter is enabled.
SpiBitsOrder	MSB First	When the SCB mode is SPI, this parameter defines the bit order as: MSB first or LSB first.
SpiByteModeEnable	false	When the SCB mode is SPI, this parameter specifies the number of bits per FIFO data element. The byte mode – false: a 16-bit FIFO data element. The FIFO depth is 8 entries. The byte mode – true: an 8-bit FIFO data element. The FIFO depth is 16 entries. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
SpiClockFromTerm	false	When the SCB mode is SPI, this parameter provides a clock terminal to connect a clock outside the component.
SpiFreeRunningSclk	false	When the SCB mode is SPI, this parameter specifies the SCLK generation by the master as: gated or free running (continuous). Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
SpiInterruptMode	None	When the SCB mode is SPI, this parameter specifies the interrupt mode. None: Removes all interrupt support. Internal: Leaves the interrupt SCBIRQ inside the component - the interrupt terminal becomes invisible. External: Provides an interrupt terminal to connect an interrupt outside the component.

Parameter Name	Value	Description
SpiIntrMasterSpiDone	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_M. SPI_DONE interrupt source. SCB.INTR_M. SPI_DONE: all data are sent into TX FIFO and the TX FIFO and the shifter register are emptied. Only applicable for SPI Master mode.
SpiIntrRxFull	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_RX.FULL interrupt source. SCB.INTR_RX.FULL trigger condition: RX FIFO is full.
SpiIntrRxNotEmpty	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_RX.NOT_EMPTY interrupt source. SCB.INTR_RX.NOT_EMPTY trigger condition: RX FIFO is not empty. There is at least one entry to get data from.
SpiIntrRxOverflow	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_RX.OVERFLOW interrupt source. SCB.INTR_RX.OVERFLOW trigger condition: attempt to write to a full RX FIFO.
SpiIntrRxTrigger	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_RX.TRIGGER interrupt source. SCB.INTR_RX.TRIGGER trigger condition: remains active until RX FIFO has more entries than the value specified by SpiRxTriggerLevel.
SpiIntrRxUnderflow	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_RX.UNDERFLOW interrupt source. SCB.INTR_RX.UNDERFLOW trigger condition: attempt to read from an empty RX FIFO.
SpiIntrSlaveBusError	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_SLAVE.BUS_-ERROR interrupt source. SCB.INTR_SLAVE.BUS_-ERROR trigger condition: slave select line is deselected at an unexpected time in the SPI transfer. Only applicable for SPI Slave mode.

Parameter Name	Value	Description
SpiIntrTxEmpty	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_TX.EMPTY interrupt source. SCB.INTR_TX.EMPTY trigger condition: TX FIFO is empty.
SpiIntrTxNotFull	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_TX.NOT_FULL interrupt source. SCB.INTR_TX.NOT_FULL trigger condition: TX FIFO is not full. There is at least one entry to put data.
SpiIntrTxOverflow	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_TX.OVERFLOW interrupt source. SCB.INTR_TX.OVERFLOW trigger condition: attempt to write to a full TX FIFO.
SpiIntrTxTrigger	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_TX.TRIGGER interrupt source. SCB.INTR_TX.TRIGGER trigger condition: remains active until TX FIFO has fewer entries than the value specified by SpiTxTriggerLevel.
SpiIntrTxUnderflow	false	When the SCB mode is SPI, this parameter enables the SCB.INTR_TX.UNDERFLOW interrupt source. SCB.INTR_TX.UNDERFLOW trigger condition: attempt to read from an empty TX FIFO.
SpiLateMisoSampleEnable	false	When the SCB mode is SPI, this parameter enables late sampling of the MISO line by the master.
SpiMedianFilterEnable	false	When the SCB mode is SPI, this parameter applies a digital 3 tap median filter to the SPI input line.
SpiMode	Slave	When the SCB mode is SPI, this parameter selects SPI mode of operation as: Slave or Master.
SpiNumberOfRxDataBits	8	When the SCB mode is SPI, this parameter specifies the number of data bits inside the SPI byte/word for RX direction.
SpiNumberOfSelectLines	1	When the SCB mode is SPI, this parameter defines the number of slave select lines. The SPI Slave has only one slave select line. The SPI Master has up to 4 lines.

Parameter Name	Value	Description
SpiNumberOfTxDataBits	8	When the SCB mode is SPI, this parameter define the number of data bits inside the SPI byte/word for TX direction.
SpiOvsFactor	16	When the SCB mode is SPI, this parameter defines the oversampling factor of SCBCLK.
SpiRemoveMiso	false	When the SCB mode is SPI, this parameter removes the MISO pin.
SpiRemoveMosi	false	When the SCB mode is SPI, this parameter removes the MOSI pin.
SpiRemoveSclk	false	When the SCB mode is SPI, this parameter removes the SCLK pin.
SpiRxBufferSize	8	When the SCB mode is SPI, this parameter defines the size of the RX buffer.
SpiRxOutputEnable	false	When the SCB mode is SPI, this parameter enables the RX trigger output terminal of the component. This terminal must be connected to the DMA input trigger or left unconnected. Only applicable for devices which have a DMA controller.
SpiRxTriggerLevel	7	When the SCB mode is SPI, this parameter defines the number of entries in the RX FIFO to control the SCB.INTR_-RX.TRIGGER interrupt event or RX DMA trigger output.
SpiSclkMode	CPHA = 0, CPOL = 0	When the SCB mode is SPI, this parameter defines the serial clock phase (CPHA) and polarity (CPOL).
SpiSmartioEnable	false	When the SCB mode is SPI, this parameter enables the SmartIO support.
SpiSs0Polarity	Active Low	When the SCB mode is SPI, this parameter specifies active polarity of slave select 0. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
SpiSs1Polarity	Active Low	When the SCB mode is SPI, this parameter specifies active polarity of slave select 1. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.

Parameter Name	Value	Description
SpiSs2Polarity	Active Low	When the SCB mode is SPI, this parameter specifies active polarity of slave select 2. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
SpiSs3Polarity	Active Low	When the SCB mode is SPI, this parameter specifies active polarity of slave select 3. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
SpiSubMode	Motorola	When the SCB mode is SPI, this parameter defines the sub mode of the SPI as: Motorola, TI(Start Coincides), TI(Start Precedes), or National Semiconductor.
SpiTransferSeparation	Continuous	When the SCB mode is SPI, this parameter defines the type of SPI transfers separation as: continuous or separated.
SpiTxBufferSize	8	When the SCB mode is SPI, this parameter defines the size of the TX buffer.
SpiTxOutputEnable	false	When the SCB mode is SPI, this parameter enables the TX trigger output terminal of the component. This terminal must be connected to the DMA input trigger or left unconnected. Only applicable for devices which have a DMA controller.
SpiTxTriggerLevel	0	When the SCB mode is SPI, this parameter defines the number of entries in the TX FIFO to control the SCB.INTR_-TX.TRIGGER interrupt event or TX DMA trigger output.
SpiWakeEnable	false	When the SCB mode is SPI, this parameter enables wakeup from Deep Sleep on slave select event.
UartByteModeEnable	false	When the SCB mode is UART, this parameter specifies the number of bits per FIFO data element. The byte mode – false: a 16-bit FIFO data element. The FIFO depth is 8 entries. The byte mode – true: an 8-bit FIFO data element. The FIFO depth is 16 entries. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.

Parameter Name	Value	Description
UartClockFromTerm	false	When the SCB mode is UART, this parameter provides a clock terminal to connect a clock outside the component.
UartCtsEnable	false	When the SCB mode is UART, this parameter enables the cts input. Only applicable for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
UartCtsPolarity	Active Low	When the SCB mode is UART, this parameter specifies active polarity of an input cts signal. Only applicable for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
UartDataRate	115200	When the SCB mode is UART, this parameter specifies the Baud rate in bps (up to 1000 kbps); the actual rate may differ based on available clock frequency and component settings. This parameter has no effect if the Clock from terminal parameter is enabled.
UartDirection	TX + RX	When the SCB mode is UART, this parameter enables RX or TX direction or both simultaneously.
UartDropOnFrameErr	false	When the SCB mode is UART, this parameter defines whether the data is dropped from RX FIFO on a frame error event.
UartDropOnParityErr	false	When the SCB mode is UART, this parameter determines whether the data is dropped from RX FIFO on a parity error event.
UartInterruptMode	Internal	When the SCB mode is UART, this parameter specifies the interrupt mode. None: Removes all interrupt support. Internal: Leaves the interrupt SCBIRQ inside the component - the interrupt terminal becomes invisible. External: Provides an interrupt terminal to connect an interrupt outside component.
UartIntrRxFrameErr	false	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.FRAME_-ERROR interrupt source. SCB.INTR_RX.FRAME_-ERROR trigger condition: frame error in received data frame.

Parameter Name	Value	Description
UartIntrRxFull	false	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.FULL interrupt source. SCB.INTR_RX.FULL trigger condition: RX FIFO is full.
UartIntrRxNotEmpty	true	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.NOT_EMPTY interrupt source. SCB.INTR_RX.NOT_EMPTY trigger condition: RX FIFO is not empty. There is at least one entry to get data from.
UartIntrRxOverflow	false	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.OVERFLOW interrupt source. SCB.INTR_RX.OVERFLOW trigger condition: attempt to write to a full RX FIFO.
UartIntrRxParityErr	false	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.PARITY_-ERROR interrupt source. SCB.INTR_RX.PARITY_-ERROR trigger condition: parity error in received data frame.
UartIntrRxTrigger	false	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.TRIGGER interrupt source. SCB.INTR_RX.TRIGGER trigger condition: remains active until RX FIFO has more entries than the value specified by UartRxTriggerLevel.
UartIntrRxUnderflow	false	When the SCB mode is UART, this parameter enables the SCB.INTR_RX.UNDERFLOW interrupt source. SCB.INTR_RX.UNDERFLOW trigger condition: attempt to read from an empty RX FIFO.
UartIntrTxEmpty	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.EMPTY interrupt source. SCB.INTR_TX.EMPTY trigger condition: TX FIFO is empty.
UartIntrTxNotFull	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.NOT_FULL interrupt source. SCB.INTR_TX.NOT_FULL trigger condition: TX FIFO is not full. There is at least one entry to put data.

Parameter Name	Value	Description
UartIntrTxOverflow	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.OVERFLOW interrupt source. SCB.INTR_TX.OVERFLOW trigger condition: attempt to write to a full TX FIFO.
UartIntrTxTrigger	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.TRIGGER interrupt source. SCB.INTR_TX.TRIGGER trigger condition: remains active until TX FIFO has fewer entries than the value specified by UartTxTriggerLevel.
UartIntrTxUartDone	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.UART_DONE interrupt source. SCB.INTR_TX.UART_DONE trigger condition: all data are sent in to TX FIFO and the transmit FIFO and the shifter register are emptied.
UartIntrTxUartLostArb	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.UART_ARB_-LOST interrupt source. SCB.INTR_TX.UART_ARB_-LOST trigger condition: UART lost arbitration, the value driven on the TX line is not the same as the value observed on the RX line. This event is useful when the transmitter and the receiver share a TX/RX line. Only applicable for UART SmartCard mode.
UartIntrTxUartNack	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.UART_NACK interrupt source. SCB.INTR_TX.UART_NACK trigger condition: UART transmitter received a negative acknowledgement. Only applicable for UART SmartCard mode.
UartIntrTxUnderflow	false	When the SCB mode is UART, this parameter enables the SCB.INTR_TX.UNDERFLOW interrupt source. SCB.INTR_TX.UNDERFLOW trigger condition: attempt to read from an empty TX FIFO.

Parameter Name	Value	Description
UartIrdaLowPower	false	When the SCB mode is UART, this parameter enables the low power receiver option. Only applicable for UART IrDA mode.
UartIrdaPolarity	Non-Inverting	When the SCB mode is UART, this parameter inverts the incoming RX line signal. Only applicable for UART IrDA mode.
UartMedianFilterEnable	false	When the SCB mode is UART, this parameter applies a digital 3 tap median filter to the UART input line.
UartMpEnable	false	When the SCB mode is UART, this parameter enables the UART multi-processor mode. Only applicable for UART Standard mode.
UartMpRxAcceptAddress	false	When the SCB mode is UART, this parameter define whether to put the matched UART address into RX FIFO. Only applicable for UART multi-processor mode.
UartMpRxAddress	2	When the SCB mode is UART, this parameter defines the UART address. Only applicable for UART multi-processor mode.
UartMpRxAddressMask	255	When the SCB mode is UART, this parameter defines the address mask in multi-processor operation mode. Bit value 0 – excludes bit from address comparison. Bit value 1 – the bit needs to match with the corresponding bit of the UART address. Only applicable for UART multi-processor mode.
UartNumberOfDataBits	8 bits	When the SCB mode is UART, this parameter defines the number of data bits inside the UART byte/word.
UartNumberOfStopBits	1 bit	When the SCB mode is UART, this parameter defines the number of Stop bits.
UartOvsFactor	12	When the SCB mode is UART, this parameter defines the oversampling factor of SCBCLK.
UartParityType	None	When the SCB mode is UART, this parameter applies UART parity check as Odd or Even or discards the parity entirely.

Parameter Name	Value	Description
UartRtsEnable	false	When the SCB mode is UART, this parameter enables the rts output. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
UartRtsPolarity	Active Low	When the SCB mode is UART, this parameter specifies active polarity of the output rts signal. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
UartRtsTriggerLevel	4	When the SCB mode is UART, this parameter specifies the number of entries in the RX FIFO to activate the rts output signal. When the receiver FIFO has fewer entries than the UartRtsTriggerLevel, an rts output signal is activated. Applicable only for devices other than PSoC 4000/PSoC 4100/PSoC 4200.
UartRxBufferSize	128	When the SCB mode is UART, this parameter defines the size of the RX buffer.
UartRxOutputEnable	false	When the SCB mode is UART, this parameter enables the RX trigger output terminal of the component. This terminal must be connected to the DMA input trigger or left unconnected. Only applicable for devices which have a DMA controller.
UartRxTriggerLevel	7	When the SCB mode is UART, this parameter defines the number of entries in the RX FIFO to trigger control the SCB.INTR_RX.TRIGGER interrupt event or RX DMA trigger output.
UartSmartioEnable	false	When the SCB mode is UART, this parameter enables the SmartIO support.
UartSmCardRetryOnNack	false	When the SCB mode is UART, this parameter defines whether to send a message again when a NACK response is received. Only applicable for UART SmartCard mode.
UartSubMode	Standard	When the SCB mode is UART, this parameter defines the sub mode of UART as: Standard, SmartCard or IrDA.

Parameter Name	Value	Description
UartTxBufferSize	128	When the SCB mode is UART, this parameter defines the size of the TX buffer.
UartTxOutputEnable	false	When the SCB mode is UART, this parameter enables the TX trigger output terminal of the component. This terminal must be connected to the DMA input trigger or left unconnected. Only applicable for devices which have a DMA controller.
UartTxTriggerLevel	0	When the SCB mode is UART, this parameter defines the number of entries in the TX FIFO to control the SCB.INTR_-TX.TRIGGER interrupt event or TX DMA trigger output.
UartWakeEnable	false	When the SCB mode is UART, this parameter enables the wakeup from Deep Sleep on start bit event. The actual wakeup source is RX GPIO. The skip start UART feature allows it to continue receiving bytes.
User Comments		Instance-specific comments.

8.3 Component type: UART [v2.50]

8.3.1 Instance ATM_UART

Description: Universal Asynchronous Receiver Transmitter
Instance type: UART [v2.50]
Datasheet: online component datasheet for UART

Table 15. Component Parameters for ATM_UART

Parameter Name	Value	Description
Address1	0	This parameter specifies the RX Hardware Address #1.
Address2	0	This parameter specifies the RX Hardware Address #2.
BaudRate	115200	Sets the target baud rate.
BreakBitsRX	13	Specifies the break signal length for the RX (detection) channel.
BreakBitsTX	13	Specifies the break signal length for the TX channel.
BreakDetect	false	Enables the break detect hardware.
CRCoutputsEn	false	Enables the CRC outputs.
EnIntRXInterrupt	true	Enables the internal RX interrupt configuration and the ISR.
EnIntTXInterrupt	true	Enables the internal TX interrupt configuration and the ISR.
FlowControl	None	Enable the flow control signals.

Parameter Name	Value	Description
HalfDuplexEn	false	Enables half duplex mode on the RX Half of the UART module.
HwTXEnSignal	true	Enables the external TX enable signal output.
InternalClock	true	Enables the internal clock. This parameter removes the clock input pin.
InterruptOnTXComplete	false	This is an Interrupt mask used to enable/disable the interrupt on 'TX complete' event.
InterruptOnTXFifoEmpty	true	This is an Interrupt mask used to enable/disable the interrupt on 'TX FIFO empty' event.
InterruptOnTXFifoFull	false	This is an Interrupt mask used to enable/disable the interrupt on 'TX FIFO full' event.
InterruptOnTXFifoNotFull	false	This is an Interrupt mask used to enable/disable the interrupt on 'TX FIFO not full' event.
IntOnAddressDetect	false	Enables the interrupt on hardware address detected event by default
IntOnAddressMatch	false	Enables the interrupt on hardware address match detected event by default
IntOnBreak	false	Enables the interrupt on break signal detected event by default
IntOnByteRcvd	true	Enables the interrupt on RX byte received event by default
IntOnOverrunError	false	Enables the interrupt on overrun error event by default
IntOnParityError	false	Enables the interrupt on parity error event by default
IntOnStopError	false	Enables the interrupt on stop error event by default
NumDataBits	8	Defines the number of data bits. Values can be 5, 6, 7 or 8 bits.
NumStopBits	1	Defines the number of stop bits. Values can be 1 or 2 bits.
OverSamplingRate	8	This parameter defines the over sampling rate.
ParityType	None	Sets the parity type as Odd, Even or Mark/Space
ParityTypeSw	false	This parameter allows the parity type to be changed through software by using the WriteControlRegister API
RXAddressMode	None	Configures the RX hardware address detection mode
RXBufferSize	16	The size of the RAM space allocated for the RX input buffer.
RXEnable	true	Enables the RX in the UART
TXBitClkGenDP	true	When enabled, this parameter enables the TX clock generation on DataPath resource. When disabled, TX clock is generated from Clock7.

Parameter Name	Value	Description
TXBufferSize	16	The size of the RAM space allocated for the TX output buffer.
TXEnable	true	Enables the TX in the UART
Use23Polling	true	Allows the use of 2 out of 3 polling resources on the RX UART sampler.
User Comments		Instance-specific comments.

9 Other Resources

The following documents contain important information on Cypress software APIs that might be relevant to this design:

- Standard Types and Defines chapter in the System Reference Guide
  - Software base types
  - Hardware register types
  - Compiler defines
  - Cypress API return codes
  - Interrupt types and macros
- Registers
  - The full PSoC 4 register map is covered in the PSoC 4 Registers Technical Reference Manual
  - Register Access chapter in the System Reference Guide
    - CY_GET API routines
    - CY_SET API routines
- System Functions chapter in the System Reference Guide
  - General API routines
  - CyDelay API routines
  - CyVd Voltage Detect API routines
- Power Management
  - Power Supply and Monitoring chapter in the PSoC 4 Technical Reference Manual
  - Low Power Modes chapter in the PSoC 4 Technical Reference Manual
  - Power Management chapter in the System Reference Guide
    - CyPm API routines
- Watchdog Timer chapter in the System Reference Guide
  - CyWdt API routines