# PIC16F87/88

## 18/20/28-Pin Enhanced Flash MCUs with nanoWatt Technology

#### Low-Power Features:

· Power-Managed modes:

- Primary Run: RC oscillator, 76 μA, 1 MHz, 2V

RC\_RUN: 7 μA, 31.25 kHz, 2V
 SEC\_RUN: 9 μA, 32 kHz, 2V

- Sleep: 0.1 μA, 2V

Timer1 Oscillator: 1.8 μA, 32 kHz, 2V

Watchdog Timer: 2.2 μA, 2V
Two-Speed Oscillator Start-up

#### Oscillators:

· Three Crystal modes:

- LP, XT, HS: up to 20 MHz

· Two External RC modes

· One External Clock mode:

- ECIO: up to 20 MHz

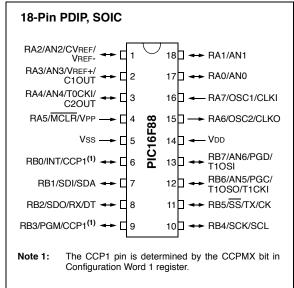
· Internal oscillator block:

 8 user selectable frequencies: 31 kHz, 125 kHz, 250 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, 8 MHz

#### **Peripheral Features:**

- · Capture, Compare, PWM (CCP) module:
  - Capture is 16-bit, max. resolution is 12.5 ns
  - Compare is 16-bit, max. resolution is 200 ns
  - PWM max. resolution is 10-bit
- 10-bit, 7-channel Analog-to-Digital Converter
- Synchronous Serial Port (SSP) with SPI™ (Master/Slave) and I<sup>2</sup>C™ (Slave)
- Addressable Universal Synchronous Asynchronous Receiver Transmitter (AUSART/SCI) with 9-bit address detection:
  - RS-232 operation using internal oscillator (no external crystal required)
- · Dual Analog Comparator module:
  - Programmable on-chip voltage reference
  - Programmable input multiplexing from device inputs and internal voltage reference
  - Comparator outputs are externally accessible

#### Pin Diagram



### **Special Microcontroller Features:**

- 100,000 erase/write cycles Enhanced Flash program memory typical
- 1,000,000 typical erase/write cycles EEPROM data memory typical
- · EEPROM Data Retention: > 40 years
- In-Circuit Serial Programming<sup>™</sup> (ICSP<sup>™</sup>)
  via two pins
- Processor read/write access to program memory
- Low-Voltage Programming
- · In-Circuit Debugging via two pins
- · Extended Watchdog Timer (WDT):
  - Programmable period from 1 ms to 268s
- · Wide operating voltage range: 2.0V to 5.5V

	Program Memory		Data Memory		1/0	10-bit	ССР				Timers
Device	Flash (bytes)	# Single-Word Instructions	SRAM (bytes)	EEPROM (bytes)		A/D (ch)		AUSART	Comparators	SSP	8/16-bit
PIC16F87	7168	4096	368	256	16	N/A	1	Υ	2	Υ	2/1
PIC16F88	7168	4096	368	256	16	1	1	Υ	2	Υ	2/1

FIGURE 2-3:	PIC16F88 REG	SISTER FILE MAP

	File ddress		ddress	/th		Address	
Indirect addr. (*)	00h	Indirect addr. (*)	80h	Indirect addr.(*)	100h	Indirect addr. (*)	180h
TMR0	01h	OPTION_REG	81h	TMR0	101h	OPTION_REG	181h
PCL	02h	PCL	82h	PCL	102h	PCL	182h
STATUS	03h	STATUS	83h	STATUS	103h	STATUS	183h
FSR	04h	FSR	84h	FSR	104h	FSR	184h
PORTA	05h	TRISA	85h	WDTCON	105h		185h
PORTB	06h	TRISB	86h	PORTB	106h	TRISB	186h
	07h		87h		107h		187h
	08h		88h		108h		188h
	09h		89h		109h		189h
PCLATH	0Ah	PCLATH	8Ah	PCLATH	10Ah	PCLATH	18Ah
INTCON	0Bh	INTCON	8Bh	INTCON	10Bh	INTCON	18Bh
PIR1	0Ch	PIE1	8Ch	EEDATA	10Ch	EECON1	18Ch
PIR2	0Dh	PIE2	8Dh	EEADR	10Dh	EECON2	18Dh
TMR1L	0Eh	PCON	8Eh	EEDATH	10Eh	Reserved <sup>(1)</sup>	18Eh
TMR1H	0Fh	OSCCON	8Fh	EEADRH	10Fh	Reserved <sup>(1)</sup>	18Fh
T1CON	10h	OSCTUNE	90h		110h		190h
TMR2	11h		91h				
T2CON	12h	PR2	92h				
SSPBUF	13h	SSPADD	93h				
SSPCON	14h	SSPSTAT	94h				
CCPR1L	15h		95h				
CCPR1H	16h		96h	0		Company	
CCP1CON	17h		97h	General Purpose		General Purpose	
RCSTA	18h	TXSTA	98h	Register		Register	
TXREG	19h	SPBRG	99h	16 Bytes		16 Bytes	
RCREG	1Ah		9Ah				
	1Bh	ANSEL	9Bh				
	1Ch	CMCON	9Ch				
	1Dh	CVRCON	9Dh				
ADRESH	1Eh	ADRESL	9Eh				
ADCON0	1Fh	ADCON1	9Fh		11Fh		19Fh
General Purpose Register	20h	General Purpose Register 80 Bytes	A0h EFh	General Purpose Register 80 Bytes	120h	General Purpose Register 80 Bytes	1A0h
96 Bytes		accesses 70h-7Fh	F0h	accesses 70h-7Fh	170h	accesses 70h-7Fh	1F0h
Bank 0	7Fh	Bank 1	FFh	Bank 2	17Fh	Bank 3	1FFr