PIC18F23K20/24K20/25K20/26K20
43K20/44K20/45K20/46K20

Data Sheet

Flash Microcontrollers
with 10-Bit A/D and nanoWatt Technology

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CERTIFIED BY DNV
ISO/TS 16949:2002

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PIC18F2XK20/4XK20

28/40/44-Pin Flash Microcontrollers with 10-Bit A/D and nanoWatt Technology

Power-Managed Modes:

- Run: CPU on, Peripherals on
- Idle: CPU off, Peripherals on
- Sleep: CPU off, Peripherals off
- Idle Mode Currents Down to 1.0 μA, typical
- Sleep Mode Current Down to 0.1 μA, typical
- Timer1 Oscillator: 1.0 μA, 32 kHz, 1.8V, typical
- Watchdog Timer: 2.0 μA, 1.8V, typical
- Two-Speed Oscillator Start-up

Peripheral Highlights:

- High-Current Sink/Source 25 mA/25 mA
- Three Programmable External Interrupts
- Four Independent Input-Change Interrupts
- 8 Independent Weak Pull-ups
- Programmable Slew Rate
- Capture/Compare/PWM (CCP) module
- Enhanced Capture/Compare/PWM (ECCP) module:
  - 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 I^2C™ Master and Slave modes with address mask
- 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 Break
  - Auto-Baud Detect
- 10-bit, up to 14-Channel Analog-to-Digital Converter module (ADC):
  - Auto-acquisition capability
  - Conversion available during Sleep
  - Internal 1.2V Fixed Voltage Reference (FVR) channel
  - Independent input multiplexing
- Dual Analog Comparators:
  - Rail-to-rail operation
  - Independent input multiplexing
- Programmable On-Chip Voltage Reference (CV_{REF}) module (% of V_{DD})

Flexible Oscillator Structure:

- Four Crystal modes, up to 64 MHz
- 4X Phase Lock Loop (available for crystal and internal oscillators)
- Two External RC modes, up to 4 MHz
- Two External Clock modes, up to 64 MHz
- Internal Oscillator Block:
  - 8 user selectable frequencies, from 31 kHz to 16 MHz
  - Provides a complete range of clock speeds from 31 kHz to 64 MHz when used with PLL
  - User tunable to compensate for frequency drift
- Secondary Oscillator using Timer1 @ 32 kHz
- Fail-Safe Clock Monitor:
  - Allows for safe shutdown if primary or secondary oscillator stops

Special Microcontroller Features:

- C Compiler Optimized Architecture:
  - Optional extended instruction set designed to optimize re-entrant code
- Self-Programmable under Software Control
- Priority Levels for Interrupts
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
  - Programmable period from 4 ms to 131s
- Single-Supply 3V In-Circuit Serial Programming™ (ICSP™) via two pins
- In-Circuit Debug (ICD) via Two Pins
- Operating Voltage Range: 1.8V to 3.6V
- Programmable 16-Level High/Low-Voltage Detection (HLVD) module:
  - Supports interrupt on High/Low-Voltage Detection
- Programmable Brown-out Reset (BOR):
  - With software enable option

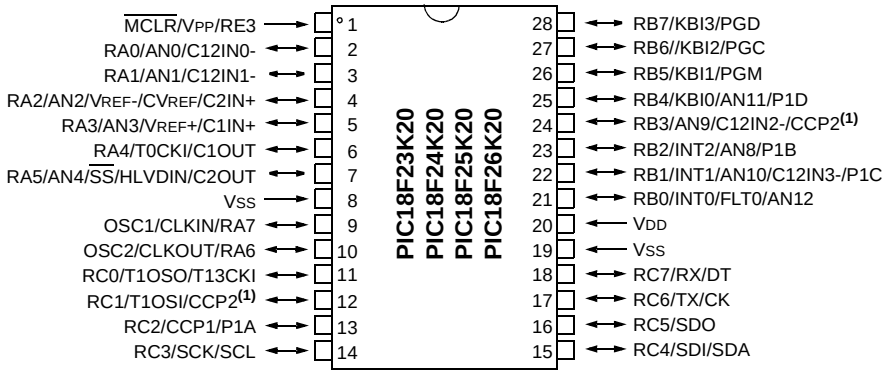
Device	Program Memory		Data Memory		I/O[1]	10-bit A/D (ch)[2]	CCP/ ECCP (PWM)	MSSP		EUSART	Comp.	Timers 8/16-bit
	Flash (bytes)	# Single-Word Instructions	SRAM (bytes)	EEPROM (bytes)				SPI	Master I^2C™			
PIC18F23K20	8K	4096	512	256	25	11	1/1	Y	Y	1	2	1/3
PIC18F24K20	16K	8192	768	256	25	11	1/1	Y	Y	1	2	1/3
PIC18F25K20	32K	16384	1536	256	25	11	1/1	Y	Y	1	2	1/3
PIC18F26K20	64k	32768	3936	1024	25	11	1/1	Y	Y	1	2	1/3
PIC18F43K20	8K	4096	512	256	36	14	1/1	Y	Y	1	2	1/3
PIC18F44K20	16K	8192	768	256	36	14	1/1	Y	Y	1	2	1/3
PIC18F45K20	32K	16384	1536	256	36	14	1/1	Y	Y	1	2	1/3
PIC18F46K20	64k	32768	3936	1024	36	14	1/1	Y	Y	1	2	1/3

Note 1: One pin is input only.

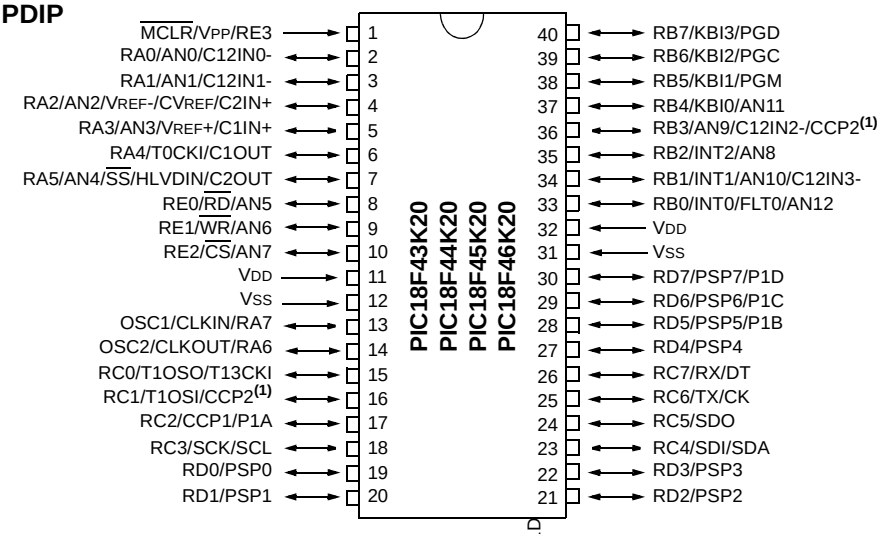
2: Channel count includes internal fixed voltage reference channel.

Pin Diagrams

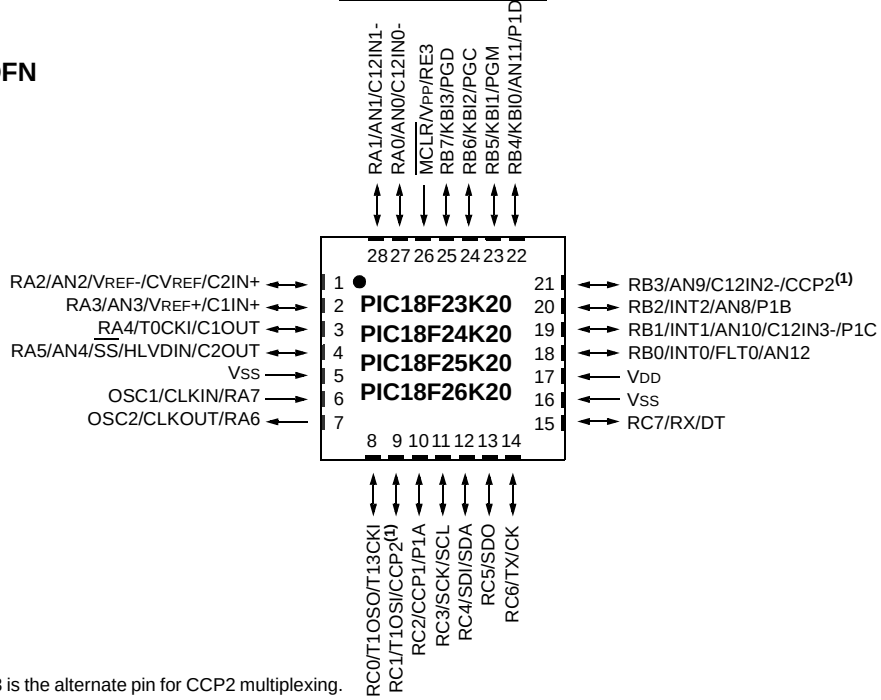
28-pin PDIP, SOIC, SSOP



40-pin PDIP



28-pin QFN



Note 1: RB3 is the alternate pin for CCP2 multiplexing.

Pin Diagrams (Cont.'d)

44-pin TQFP

44-pin QFN

Note 1: RB3 is the alternate pin for CCP2 multiplexing.

TABLE 1: PIC18F4XK20 PIN SUMMARY

DIL Pin	TQFP Pin	QFN Pin	I/O	Analog	Comparator	Reference	ECCP	EUSART	MSSP	Timers	Slave	Interrupts	Pull-up	Basic
2	19	19	RA0	AN0	C12IN0-	—	—	—	—	—	—	—	—	—
3	20	20	RA1	AN1	C12IN1-	—	—	—	—	—	—	—	—	—
4	21	21	RA2	AN2	C2IN+	VREF-/ CVREF	—	—	—	—	—	—	—	—
5	22	22	RA3	AN3	C1IN+	VREF+	—	—	—	—	—	—	—	—
6	23	23	RA4		C1OUT	—	—	—	—	T0CKI	—	—	—	—
7	24	24	RA5	AN4	C2OUT	HLVDIN	—	—	$\overline{SS}$	—	—	—	—	—
14	31	33	RA6	—	—	—	—	—	—	—	—	—	—	OSC2/ CLKOUT
13	30	32	RA7	—	—	—	—	—	—	—	—	—	—	OSC1/CLKIN
33	8	9	RB0	AN12	—	—	FLT0	—	—	—	—	INT0	Yes	—
34	9	10	RB1	AN10	C12IN3-	—	—	—	—	—	—	INT1	Yes	—
35	10	11	RB2	AN8	—	—	—	—	—	—	—	INT2	Yes	—
36	11	12	RB3	AN9	C12IN2-	—	CCP2(1)	—	—	—	—	—	Yes	—
37	14	14	RB4	AN11	—	—	—	—	—	—	—	KBI0	Yes	—
38	15	15	RB5	—	—	—	—	—	—	—	—	KBI1	Yes	PGM
39	16	16	RB6	—	—	—	—	—	—	—	—	KBI2	Yes	PGC
40	17	17	RB7	—	—	—	—	—	—	—	—	KBI3	Yes	PGD
15	32	34	RC0	—	—	—	—	—	—	T1OSO/ T13CKI	—	—	—	—
16	35	35	RC1	—	—	—	CCP2(2)	—	—	T1OSI	—	—	—	—
17	36	36	RC2	—	—	—	CCP1/ P1A	—	—	—	—	—	—	—
18	37	37	RC3	—	—	—	—	—	SCK/ SCL	—	—	—	—	—
23	42	42	RC4	—	—	—	—	—	SDI/ SDA	—	—	—	—	—
24	43	43	RC5	—	—	—	—	—	SDO	—	—	—	—	—
25	44	44	RC6	—	—	—	—	TX/CK	—	—	—	—	—	—
26	1	1	RC7	—	—	—	—	RX/DT	—	—	—	—	—	—
19	38	38	RD0	—	—	—	—	—	—	—	PSP0	—	—	—
20	39	39	RD1	—	—	—	—	—	—	—	PSP1	—	—	—
21	40	40	RD2	—	—	—	—	—	—	—	PSP2	—	—	—
22	41	41	RD3	—	—	—	—	—	—	—	PSP3	—	—	—
27	2	2	RD4	—	—	—	—	—	—	—	PSP4	—	—	—
28	3	3	RD5	—	—	—	P1B	—	—	—	PSP5	—	—	—
29	4	4	RD6	—	—	—	P1C	—	—	—	PSP6	—	—	—
30	5	5	RD7	—	—	—	P1D	—	—	—	PSP7	—	—	—
8	25	25	RE0	AN5	—	—	—	—	—	—	$\overline{RD}$	—	—	—
9	26	26	RE1	AN6	—	—	—	—	—	—	$\overline{WR}$	—	—	—
10	27	27	RE2	AN7	—	—	—	—	—	—	$\overline{CS}$	—	—	—
1	18	18	RE3(3)	—	—	—	—	—	—	—	—	—	—	$\overline{MCLR}$/VPP
11	7	7	—	—	—	—	—	—	—	—	—	—	—	VDD
32	28	28	—	—	—	—	—	—	—	—	—	—	—	VDD
12	6	6	—	—	—	—	—	—	—	—	—	—	—	VSS
31	29	30	—	—	—	—	—	—	—	—	—	—	—	VSS
–	NC	8	—	—	—	—	—	—	—	—	—	—	—	VDD
–	NC	29	—	—	—	—	—	—	—	—	—	—	—	VDD
–	NC	31	—	—	—	—	—	—	—	—	—	—	—	VSS

Note 1: CCP2 multiplexed with RB3 when CONFIG3H<0> = 0
2: CCP2 multiplexed with RC1 when CONFIG3H<0> = 1
3: Input only.

TABLE 2: PIC18F2XK20 PIN SUMMARY

Pin DIL	Pin QUAD	I/O	Analog	Comparator	Reference	ECCP	EUSART	MSSP	Timers	Slave	Interrupts	Pull-up	Basic
2	27	RA0	AN0	C12IN0-									
3	28	RA1	AN1	C12IN1-									
4	1	RA2	AN2	C2IN+	VREF-/ CVREF								
5	2	RA3	AN3	C1IN+	VREF+								
6	3	RA4		C1OUT					T0CKI				
7	4	RA5	AN4	C2OUT	HLVDIN			$\overline{SS}$					
10	7	RA6											OSC2/ CLKOUT
9	6	RA7											OSC1/ CLKIN
21	18	RB0	AN12			FLT0					INT0	Yes	
22	19	RB1	AN10	C12IN3-		P1C					INT1	Yes	
23	20	RB2	AN8			P1B					INT2	Yes	
24	21	RB3	AN9	C12IN2-		CCP2(1)						Yes	
25	22	RB4	AN11			P1D					KBI0	Yes	
26	23	RB5									KBI1	Yes	PGM
27	24	RB6									KBI2	Yes	PGC
28	25	RB7									KBI3	Yes	PGD
11	8	RC0							T1OSO/ T13CKI				
12	9	RC1				CCP2(2)			T1OSI				
13	10	RC2				CCP1/ P1A							
14	11	RC3						SCK/ SCL					
15	12	RC4						SDI/ SDA					
16	13	RC5						SDO					
17	14	RC6					TX/CK						
18	15	RC7					RX/DT						
1	26	RE3(3)											$\overline{MCLR}$/ VPP
8	5												VSS
19	16												VSS
20	17												VDD

Note 1: CCP2 multiplexed with RB3 when CONFIG3H<0> = 0
2: CCP2 multiplexed with RC1 when CONFIG3H<0> = 1
3: Input only

