

## PIC18(L)F2X/45K50 USB Flash MCU Product Brief

### Universal Serial Bus Features:

- USB V2.0 Compliant
- Crystal-less Full Speed (12 Mb/s) and Low-Speed Operation (1.5 Mb/s)
- Supports Control, Interrupt, Isochronous and Bulk Transfers
- Supports up to 32 Endpoints (16 Bidirectional)
- 1 Kbyte Dual Access RAM for USB
- On-Chip USB Transceiver

### Flexible Oscillator Structure:

- 3x and 4x PLL Clock Multipliers
- Two External Clock modes, Up to 48 MHz (12 MIPS)
- Internal 31 kHz Oscillator
- Internal Oscillator, 31 kHz to 16 MHz
  - Factory calibrated to  $\pm 1\%$
  - Self-tune to  $\pm 0.20\%$  max. from USB or secondary oscillator
- Secondary Oscillator using Timer1 @ 32 kHz
- Fail-Safe Clock Monitor:
  - Allows for safe shutdown if any clock stops

### Peripheral Highlights:

- Up to 33 I/O Pins plus 3 Input-Only Pins:
  - High-current Sink/Source 25 mA/25 mA
  - Three programmable external interrupts
  - 11 programmable Interrupt-on-Change
  - 9 programmable weak pull-ups
  - Programmable slew rate
- SR Latch
- Enhanced Capture/Compare/PWM (ECCP) module:
  - One, two or four PWM outputs
  - Selectable polarity
  - Programmable dead time
  - Auto-shutdown and auto-restart
  - Pulse steering control
- Capture/Compare/PWM (CCP) module
- Master Synchronous Serial Port (MSSP) module Supporting 3-Wire SPI (all 4 modes) and I<sup>2</sup>C™ Master and Slave modes
- Two Analog Comparators with Input Multiplexing
- 10-Bit Analog-to-Digital (A/D) Converter module:
  - Up to 25 input channels
  - Auto-acquisition capability
  - Conversion available during Sleep
- Digital-to-Analog Converter (DAC) module:
  - Fixed Voltage Reference (FVR) with 1.024V, 2.048V and 4.096V output levels
  - 5-bit rail-to-rail resistive DAC with positive and negative reference selection

- High/Low-Voltage Detect module
- Charge Time Measurement Unit (CTMU):
  - Supports capacitive touch sensing for touch screens and capacitive switches
- Enhanced USART module:
  - Supports RS-485, RS-232 and LIN/J2602
  - Auto-wake-up on Start bit
  - Auto-Baud Detect

### Extreme Low-Power Management with XLP:

- Sleep mode: 20 nA, typical
- Watchdog Timer: 300 nA, typical
- Timer1 Oscillator: 800 nA @ 32 kHz
- Peripheral Module Disable

### Special Microcontroller Features:

- Low-Power, High-Speed CMOS Flash Technology
- C Compiler Optimized Architecture for Re-Entrant Code
- Power Management Features:
  - Run: CPU on, peripherals on, SRAM on
  - Idle: CPU off, peripherals on, SRAM on
  - Sleep: CPU off, peripherals off, SRAM on
- Priority Levels for Interrupts
- Self-Programmable under Software Control
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
  - Programmable period from 4 ms to 131s
- Single-Supply In-Circuit Serial Programming™ (ICSP™) via Two Pins
- In-Circuit Debug (ICD) with Three Breakpoints via Two Pins
- Optional dedicated ICD/ICSP Port (44-Pin TQFP Package Only)
- Wide Operating Voltage Range:
  - F devices: 2.3V to 5.5V
  - LF devices: 1.8V to 3.6V
- Flash Program Memory of 10,000 Erase/Write Cycles Minimum and 20-year Data Retention

# PIC18(L)F2X/45K50

## PIC18(L)F2X/45K50 Family Types

Device	Program Memory		Data Memory		Pins	I/O	10-bit A/D channels	Comparators	CCP/ ECCP	BOR/LVD	CTMU	MSSP	EUSART	Timers 8-bit/16-bit	USB 2.0
	Flash (bytes)	Single Word Instructions	SRAM (bytes)	Data EEPROM (bytes)											
PIC18(L)F45K50	32K	16384	2048	256	40/44	36	25-ch	2	1/1	Yes	Yes	1	1	2/2	Yes
PIC18(L)F25K50	32K	16384	2048	256	28	25	14-ch	2	1/1	Yes	Yes	1	1	2/2	Yes
PIC18(L)F24K50	16K	8192	2048	256	28	25	14-ch	2	1/1	Yes	Yes	1	1	2/2	Yes

FIGURE 1: 28-PIN PDIP, SOIC, SSOP DIAGRAM FOR PIC18(L)F2XK50

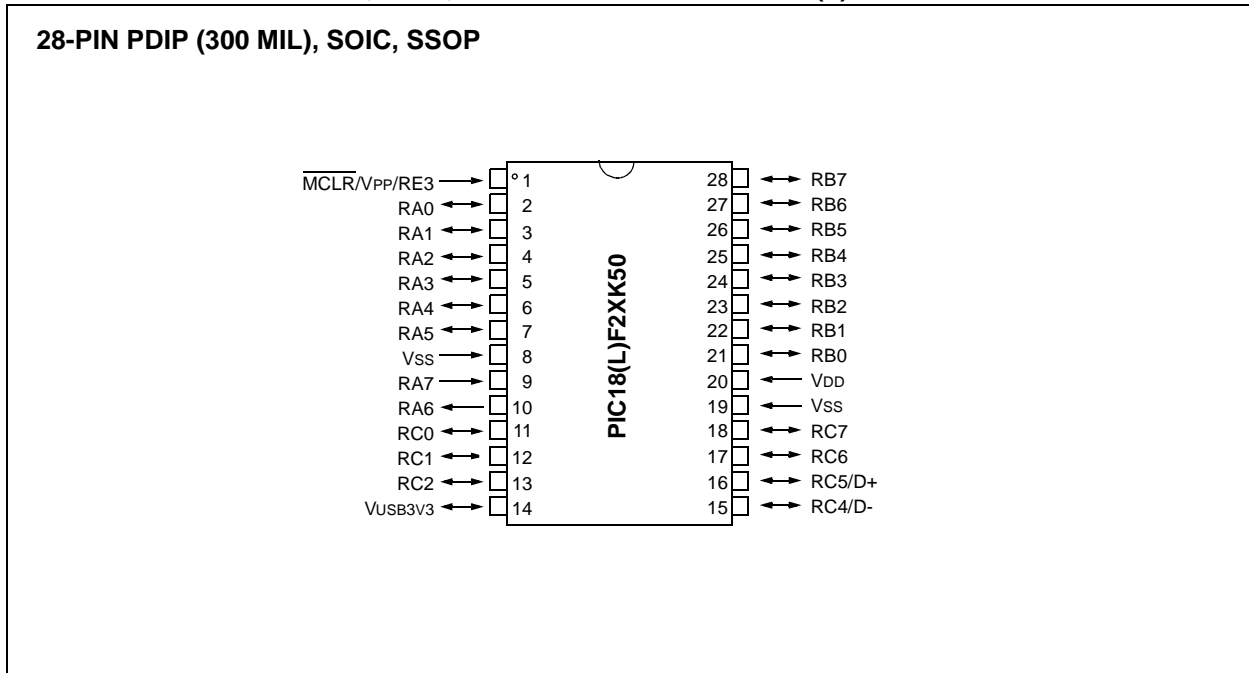
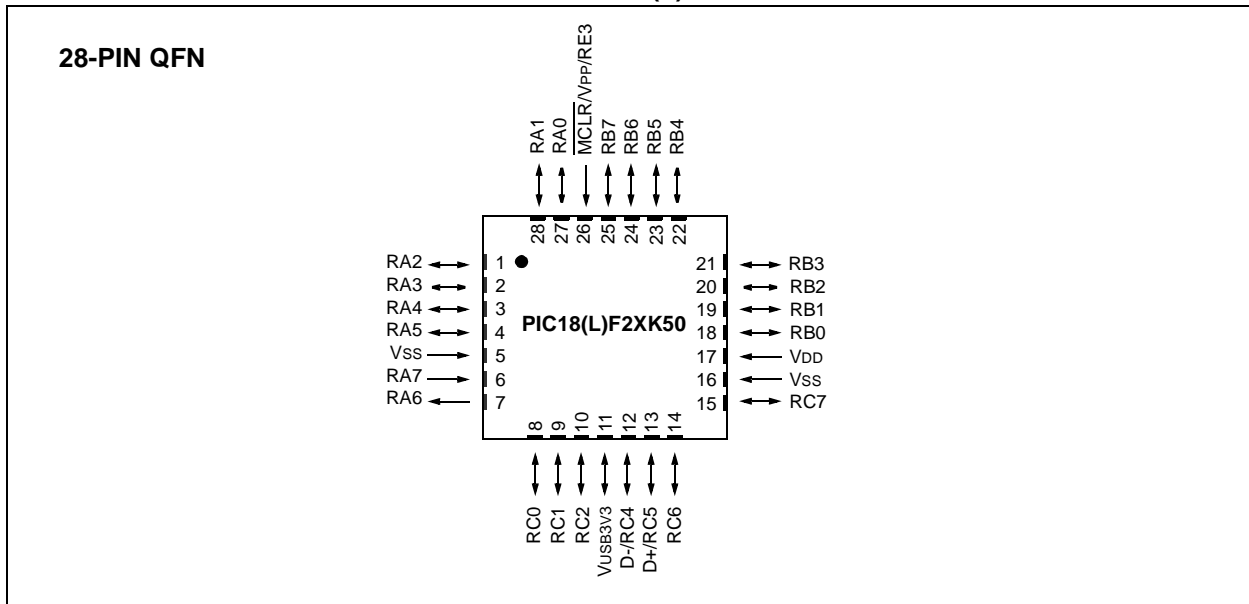
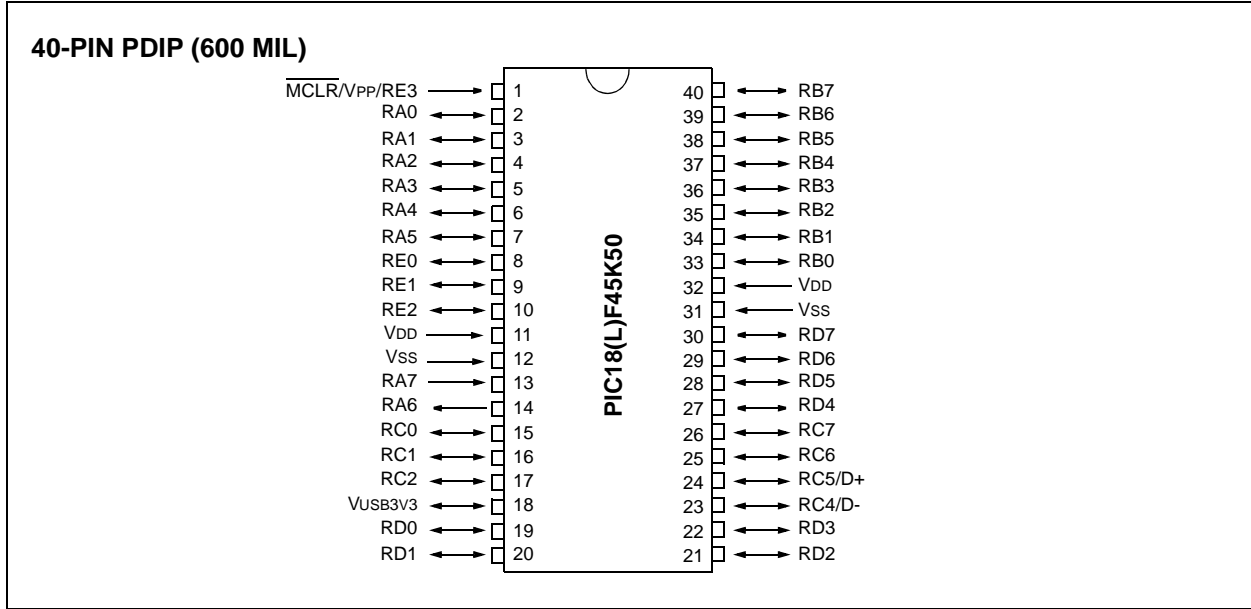


FIGURE 2: 28-PIN QFN DIAGRAM FOR PIC18(L)F2XK50

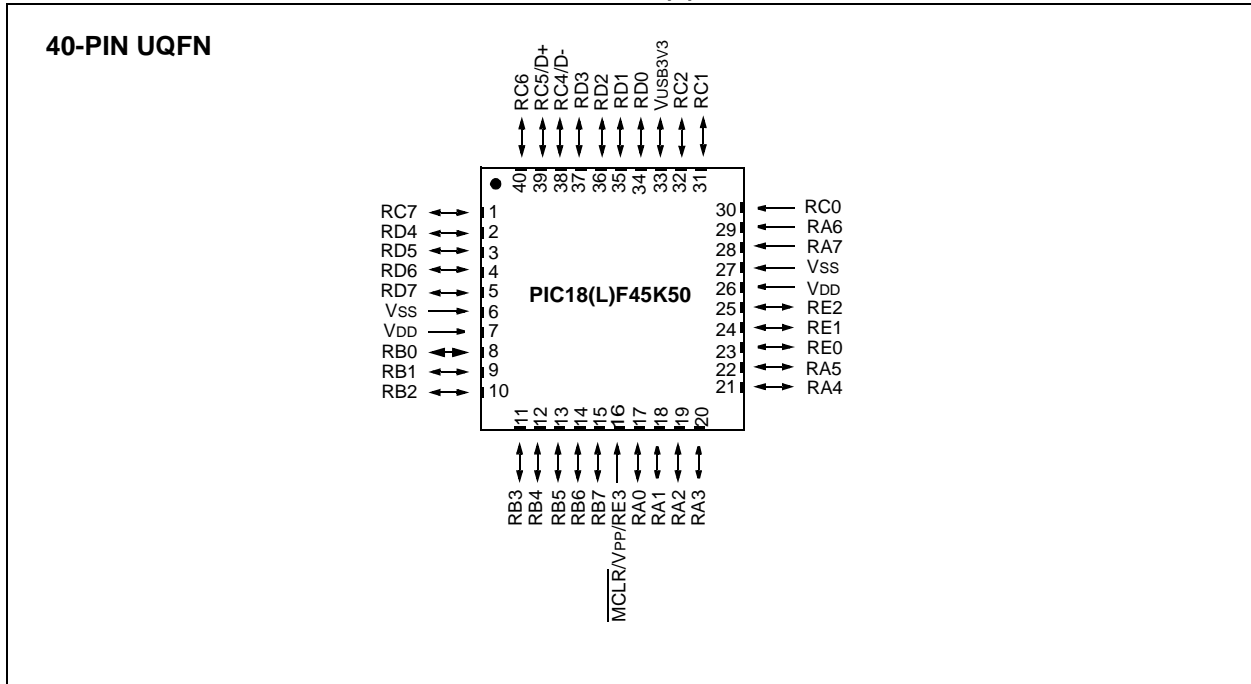


# PIC18(L)F2X/45K50

**FIGURE 3: 40-PIN PDIP DIAGRAM FOR PIC18(L)F45K50**



**FIGURE 4: 40-PIN UQFN DIAGRAM FOR PIC18(L)F45K50**



# PIC18(L)F2X/45K50

FIGURE 5: 44-PIN TQFP DIAGRAM FOR PIC18(L)F45K50

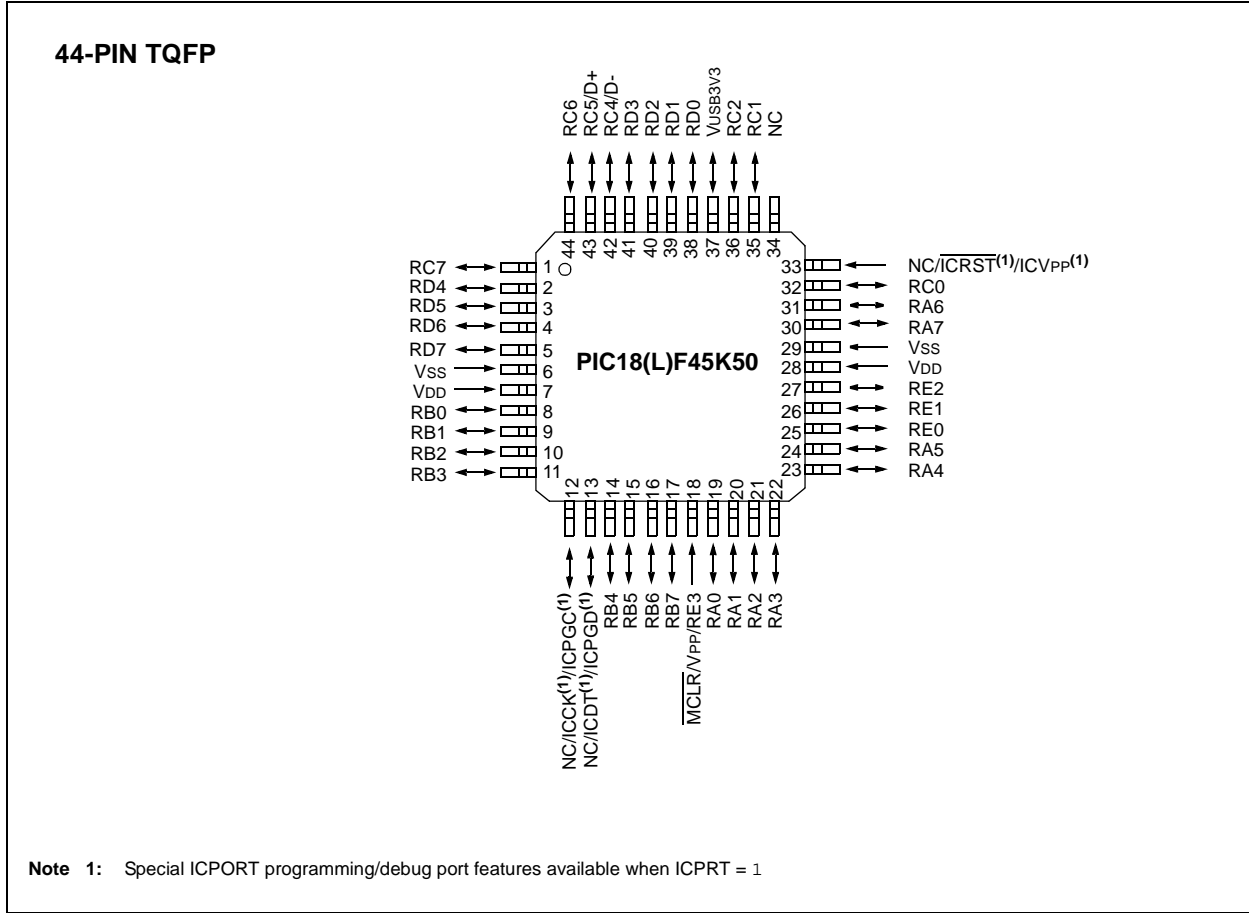


TABLE 1: PIC18(L)F2X/45K50 PIN SUMMARY

I/O	28-Pin PDIP/SSOP	28-Pin QFN	40-Pin PDIP	40-Pin UQFN	44-Pin TQFP	Analog	Comparator	CTMU	SR Latch	Reference	USB	(E)CCP	EUSART	MSSP	Timers	Interrupts	Pull-up	Basic	ICD
RA0	2	27	2	17	19	AN0	C12IN0-												
RA1	3	28	3	18	20	AN1	C12IN1-	CTCMP											
RA2	4	1	4	19	21	AN2	C2IN+			VREF- DACOUT									
RA3	5	2	5	20	22	AN3	C1IN+			VREF+									
RA4	6	3	6	21	23		C1OUT		SRQ						T0CKI				
RA5	7	4	7	22	24	AN4	C2OUT		SRNQ	LVDIN			SS						
RA6	10	7	14	29	31													OSC2 CLKO	
RA7	9	6	13	28	30													OSC1 CLKI	
RB0	21	18	33	8	8	AN12			SRI			FLT0	SDI SDA		INT0	Y			
RB1	22	19	34	9	9	AN10	C12IN3-					P1C <sup>(5)</sup>	SCK SCL		INT1	Y			
RB2	23	20	35	10	10	AN8		CTED1				P1B <sup>(5)</sup>			INT2	Y			
RB3	24	21	36	11	11	AN9	C12IN2-	CTED2				CCP2 <sup>(1)</sup>	SDO				Y		
RB4	25	22	37	12	14	AN11						P1D <sup>(5)</sup>				IOCB4	Y		
RB5	26	23	38	13	15	AN13								T1G T3CKI <sup>(2)</sup>	IOCB5	Y			
RB6	27	24	39	14	16										IOCB6	Y	PGC		
RB7	28	25	40	15	17										IOCB7	Y	PGD		

**Note 1:** Alternate CCP2 pin location based on Configuration bit.

**2:** Alternate T3CKI pin location based on Configuration bits.

**3:** Pins are enabled when ICPRT = 1, otherwise, they are disabled.

**4:** Location on 40/44-Pin parts (PIC18(L)F45K50). Function not on this pin on 28-Pin parts (PIC18(L)F2XK50).

**5:** Location on 28-Pin parts (PIC18(L)F2XK50). Function not on this pin on 40/44-Pin parts (PIC18(L)F45K50).

**6:** Alternate SDO pin location based on Configuration bits.

**7:** RE3, RC4 and RC5 can be used for digital input only (no output functionality).

TABLE 1: PIC18(L)F2X/45K50 PIN SUMMARY

I/O	28-Pin PDIP/SOIC/SSOP	28-Pin QFN	40-Pin PDIP	40-Pin UQFN	44-Pin TQFP	Analog	Comparator	CTMU	SR Latch	Reference	USB	(E)CCP	EUSART	MSSP	Timers	Interrupts	Pull-up	Basic	ICD
RC0	11	8	15	30	32										SOSCO T1CKI T3CKI T3G	IOCC0			
RC1	12	9	16	31	35							CCP2			SOSCI	IOCC1			
RC2	13	10	17	32	36	AN14		CTPLS				CCP1 P1A				IOCC2			
—	14	11	18	33	37	—					VUSB3V3							VDDCORE	
RC4 <sup>(7)</sup>	15	12	23	38	42	—					D-					IOCC4			
RC5 <sup>(7)</sup>	16	13	24	39	43	—					D+					IOCC5			
RC6	17	14	25	40	44	AN18										IOCC6			
RC7	18	15	26	1	1	AN19										IOCC7			
RD0	—	—	19	34	38	AN20													
RD1	—	—	20	35	39	AN21													
RD2	—	—	21	36	40	AN22													
RD3	—	—	22	37	41	AN23													
RD4	—	—	27	2	2	AN24													
RD5	—	—	28	3	3	AN25													
RD6	—	—	29	4	4	AN26													
RD7	—	—	30	5	5	AN27													
RE0	—	—	8	23	25	AN5													

- Note 1:** Alternate CCP2 pin location based on Configuration bit.  
**2:** Alternate T3CKI pin location based on Configuration bits.  
**3:** Pins are enabled when ICPRT = 1, otherwise, they are disabled.  
**4:** Location on 40/44-Pin parts (PIC18(L)F45K50). Function not on this pin on 28-Pin parts (PIC18(L)F2XK50).  
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TABLE 1: PIC18(L)F2X/45K50 PIN SUMMARY

I/O	28-Pin PDIP/SOIC/SSOP	28-Pin QFN	40-Pin PDIP	40-Pin UQFN	44-Pin TQFP	Analog	Comparator	CTMU	SR Latch	Reference	USB	(E)CCP	EUSART	MSSP	Timers	Interrupts	Pull-up	Basic	ICD
RE1	—	—	9	24	26	AN6													
RE2	—	—	10	25	27	AN7													
RE3 <sup>(7)</sup>	1	26	1	16	18	—											Y	$\overline{\text{MCLR}}$ VPP	
	20	17	11, 32	7, 26	7, 28													VDD	
	8, 19	5, 16	12, 31	6, 27	6, 29													VSS	
			—	—	12 <sup>(3)</sup>													ICPGC <sup>(3)</sup>	ICCK <sup>(3)</sup>
			—	—	13 <sup>(3)</sup>													ICPGD <sup>(3)</sup>	ICDT <sup>(3)</sup>
			—	—	33 <sup>(3)</sup>													ICVPP <sup>(3)</sup>	$\overline{\text{ICRST}}$ <sup>(3)</sup>

- Note 1:** Alternate CCP2 pin location based on Configuration bit.  
**Note 2:** Alternate T3CKI pin location based on Configuration bits.  
**Note 3:** Pins are enabled when ICPR1 = 1, otherwise, they are disabled.  
**Note 4:** Location on 40/44-Pin parts (PIC18(L)F45K50). Function not on this pin on 28-Pin parts (PIC18(L)F2XK50).  
**Note 5:** Location on 28-Pin parts (PIC18(L)F2XK50). Function not on this pin on 40/44-Pin parts (PIC18(L)F45K50).  
**Note 6:** Alternate SDO pin location based on Configuration bits.  
**Note 7:** RE3, RC4 and RC5 can be used for digital input only (no output functionality).

# PIC18(L)F2X/45K50

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NOTES:



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