



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



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 I²C™ 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

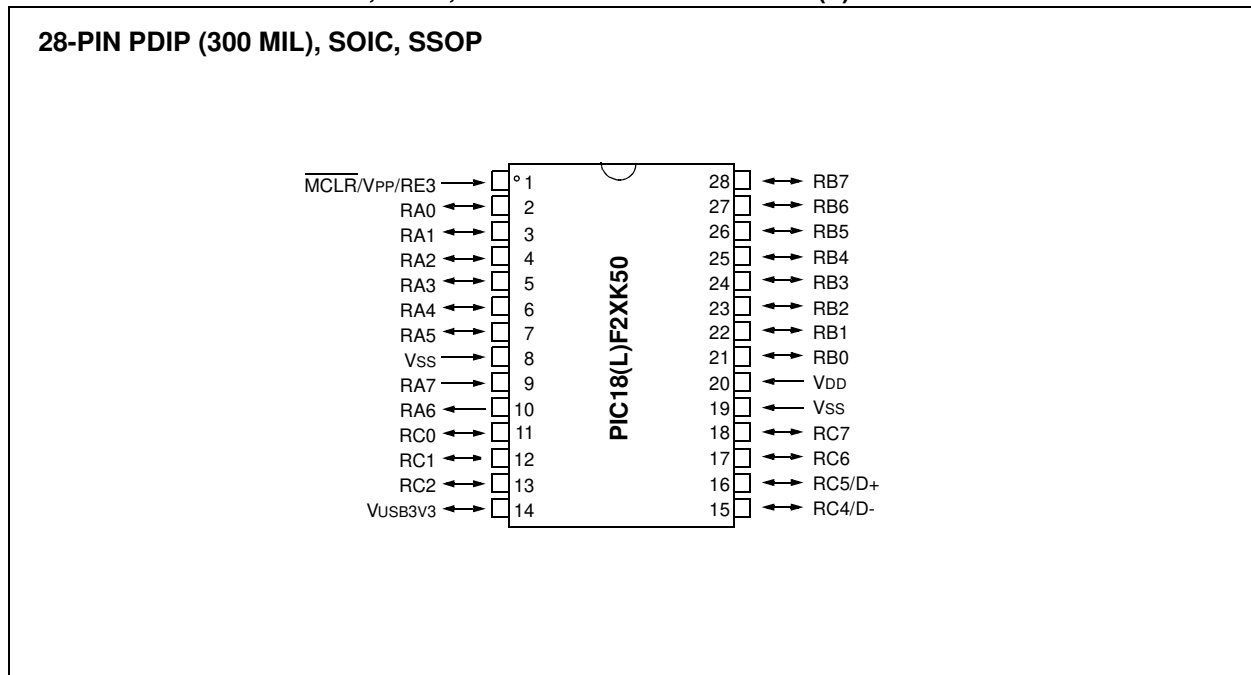
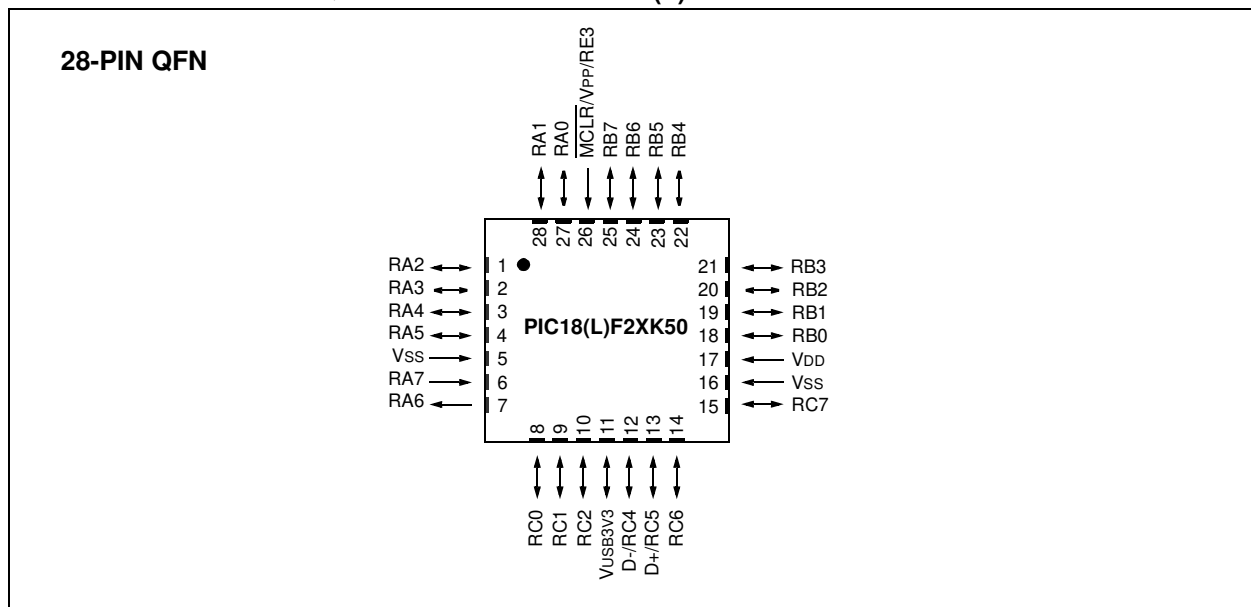


FIGURE 2: 28-PIN QFN DIAGRAM FOR PIC18(L)F2XK50



PIC18(L)F2X/45K50

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

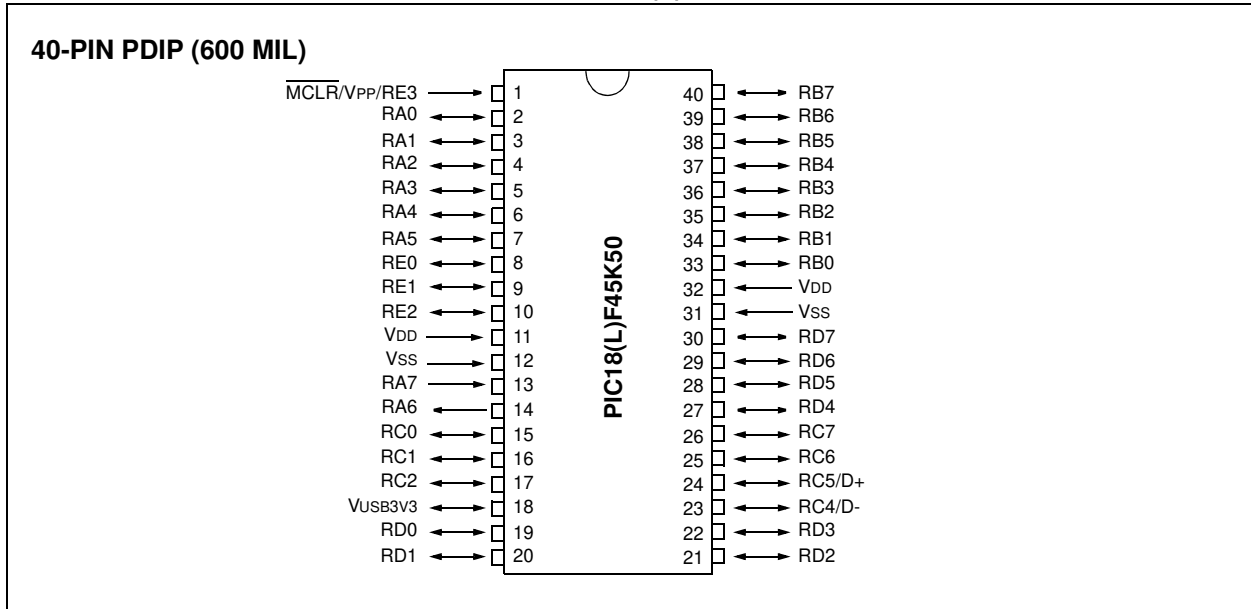
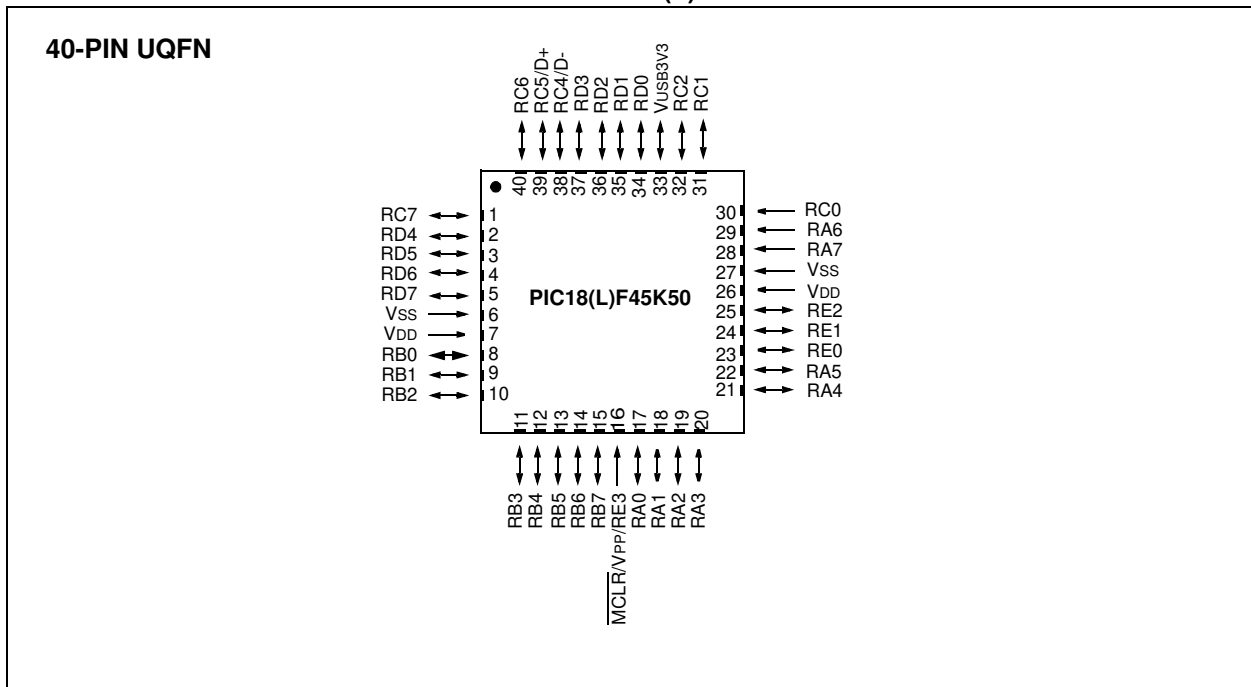


FIGURE 4: 40-PIN UQFN DIAGRAM FOR PIC18(L)F45K50



PIC18(L)F2X/45K50

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

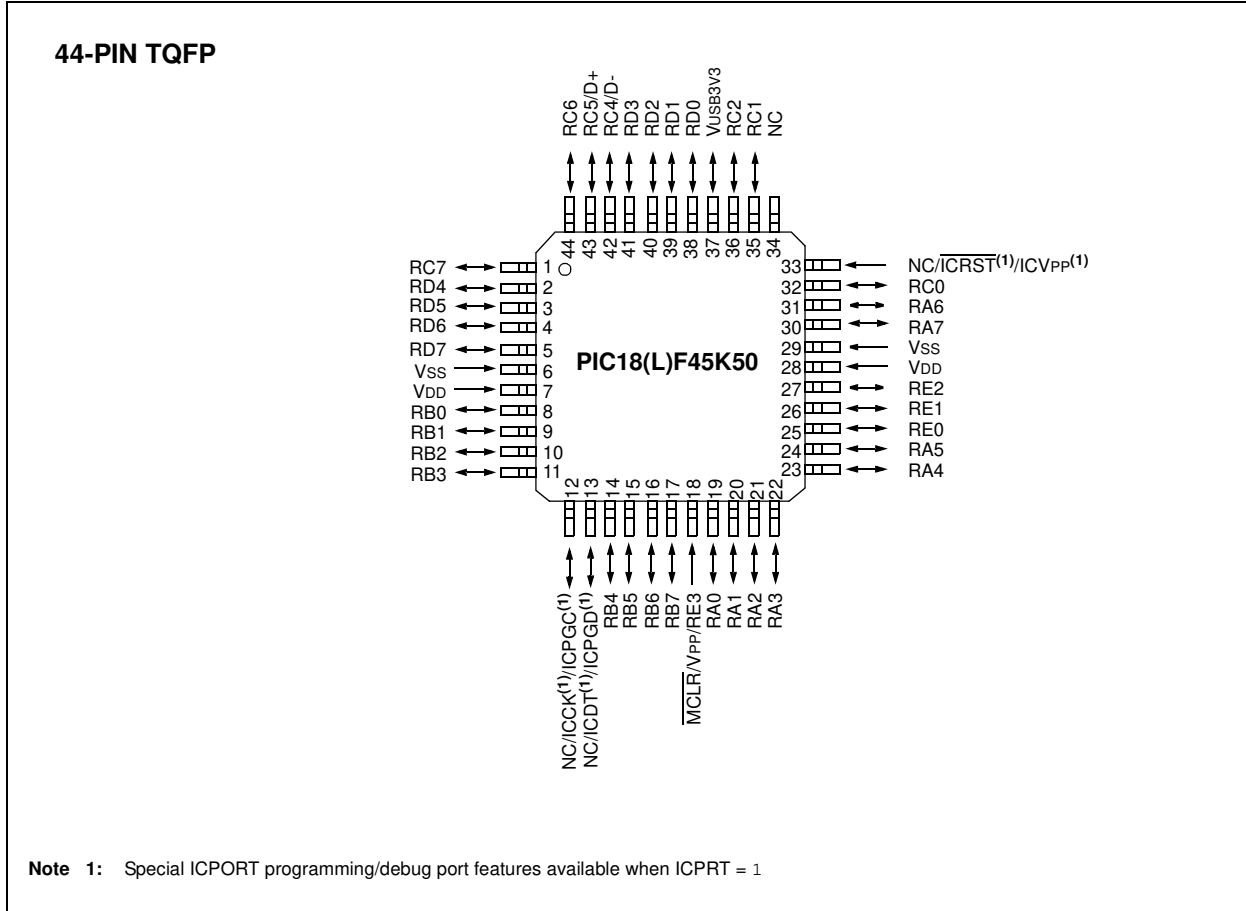


TABLE 1: PIC18(L)F2X/45K50 PIN SUMMARY

| 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 | | | \overline{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 | | | $\overline{FLT0}$ | SDI SDA | | INT0 | Y | | | |
| RB1 | 22 | 19 | 34 | 9 | 9 | AN10 | C12IN3- | | | | | P1C ⁽⁵⁾ | SCK SCL | | INT1 | Y | | | |
| RB2 | 23 | 20 | 35 | 10 | 10 | AN8 | | CTED1 | | | | P1B ⁽⁵⁾ | | | INT2 | Y | | | |
| RB3 | 24 | 21 | 36 | 11 | 11 | AN9 | C12IN2- | CTED2 | | | | CCP2 ⁽¹⁾ | SDO | | | | Y | | |
| RB4 | 25 | 22 | 37 | 12 | 14 | AN11 | | | | | | P1D ⁽⁵⁾ | | | | IOCB4 | Y | | |
| RB5 | 26 | 23 | 38 | 13 | 15 | AN13 | | | | | | | | T1G T3CKI ⁽²⁾ | | 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 ⁽⁷⁾ | 15 | 12 | 23 | 38 | 42 | — | | | | | D- | | | | | IOCC4 | | | |
| RC5 ⁽⁷⁾ | 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).

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

| O/I | 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 ⁽⁷⁾ | 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 ⁽³⁾ | | | | | | | | | | | | | | ICPGC ⁽³⁾ | ICCK ⁽³⁾ |
| | | | — | — | 13 ⁽³⁾ | | | | | | | | | | | | | | ICPGD ⁽³⁾ | ICDT ⁽³⁾ |
| | | | — | — | 33 ⁽³⁾ | | | | | | | | | | | | | | ICVPP ⁽³⁾ | $\overline{\text{ICRST}}$ ⁽³⁾ |

- 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

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable.”

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rfPIC and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.


FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICKit, PICtail, REAL ICE, rfLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2012, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 9781620762592

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

**QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
= ISO/TS 16949 =**



MICROCHIP

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Osaka
Tel: 81-66-152-7160
Fax: 81-66-152-9310

Japan - Yokohama
Tel: 81-45-471-6166
Fax: 81-45-471-6122

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-536-4818
Fax: 886-7-330-9305

Taiwan - Taipei
Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820

11/29/11