

Welcome to [E-XFL.COM](https://www.e-xfl.com)

What is "[Embedded - Microcontrollers](#)"?

"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Obsolete
Core Processor	PIC
Core Size	8-Bit
Speed	40MHz
Connectivity	I ² C, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, HLVD, POR, PWM, WDT
Number of I/O	25
Program Memory Size	16KB (8K x 16)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	768 x 8
Voltage - Supply (Vcc/Vdd)	2V ~ 5.5V
Data Converters	A/D 10x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	28-SOIC (0.295", 7.50mm Width)
Supplier Device Package	28-SOIC
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/pic18lf2410t-i-so

PIC18F2X1X/4X1X Data Sheet Errata

Clarifications/Corrections to the Data Sheet:

In the Device Data Sheet (DS39636A), the following clarifications and corrections should be noted. Any silicon issues related to the PIC18F2X1X/4X1X devices will be reported in a separate silicon errata. Please check the Microchip web site for any existing issues.

1. Module: I/O Ports

The TRIS setting for the TX pin on PORTC in Table 9-5 of the Device Data Sheet was incorrectly stated as '1'.

The correct TRIS setting for the TX pin on PORTC is '0'.

2. Module: Resets

The PR2 initialization condition shown in Table 4-4 for MCLR Resets, WDT Reset, RESET Instruction, Stack Resets and Wake-up via WDT or Interrupt should read "uuuu uuuu" as shown in the following table (changes are shown in **bold** text):

TABLE 4-4: INITIALIZATION CONDITIONS FOR ALL REGISTERS

Register	Applicable Devices								Power-on Reset, Brown-out Reset	MCLR Resets, WDT Reset, RESET Instruction, Stack Resets	Wake-up via WDT or Interrupt
PR2	2410	2510	2515	2610	4410	4510	4515	4610	1111 1111	uuuu uuuu	uuuu uuuu

Legend: u = unchanged, x = unknown, - = unimplemented bit, read as '0', q = value depends on condition.
Shaded cells indicate conditions do not apply for the designated device.

PIC18F2X1X/4X1X

3. Module: DC Characteristics

In **Section 25.3 “DC Characteristics”** (page 326), the specifications for V_{IL} parameters D033B and D034 have been clarified and now read as follows:

25.3 DC Characteristics: PIC18F2X1X/4X1X (Industrial, Extended) PIC18LF2X1X/4X1X (Industrial)

DC CHARACTERISTICS			Standard Operating Conditions (unless otherwise stated) Operating temperature -40°C ≤ T _A ≤ +85°C for industrial			
Param No.	Symbol	Characteristic	Min	Max	Units	Conditions
D033B D034	V _{IL}	Input Low Voltage				
		OSC1	V _{SS}	0.3	V	XT, LP modes
		T13CKI	V _{SS}	0.3	V	

4. Module: A/D Converter Characteristics

In Table 25-24: A/D Converter Characteristics (page 349), specification A40 has been added:

**TABLE 25-24: A/D CONVERTER CHARACTERISTICS: PIC18F2X1X/4X1X (INDUSTRIAL, EXTENDED)
PIC18LF2X1X/4X1X (INDUSTRIAL)**

Param No.	Symbol	Characteristic		Min	Typ	Max	Units	Conditions
A40	I _{AD}	A/D Current from V _{DD}	PIC18FXXXX	—	180	—	μA	Average current during conversion
			PIC18LFXXXX	—	90	—	μA	

5. Module: Instruction Set

In Table 23-2: PIC18FXXXX Instruction Set (page 261), the BTG instruction has been modified. The changes are shown in **bold** text:

TABLE 23-2: PIC18FXXXX INSTRUCTION SET

Mnemonic, Operands	Description	Cycles	16-Bit Instruction Word		Status Affected	Notes
			MSb	LSb		
BIT-ORIENTED OPERATIONS						
BTG f, b, a	Bit Toggle f	1	0111	bbba ffff ffff	None	1, 2

- Note 1:** When a Port register is modified as a function of itself (e.g., `MOVF PORTB, 1, 0`), the value used will be that value present on the pins themselves. For example, if the data latch is '1' for a pin configured as input and is driven low by an external device, the data will be written back with a '0'.
- 2:** If this instruction is executed on the TMR0 register (and where applicable, 'd' = 1), the prescaler will be cleared if assigned.

6. Module: Timing Diagrams and Specifications

Table 25-6: External Clock Timing Requirements (page 333), has been revised (changes and additions are shown in **bold** text).

TABLE 25-6: EXTERNAL CLOCK TIMING REQUIREMENTS

Param. No.	Symbol	Characteristic	Min	Max	Units	Conditions
1A	FOSC	External CLKI Frequency ⁽¹⁾	DC	1	MHz	XT, RC Oscillator mode
			DC	25	MHz	HS Oscillator mode
			DC	31.25	kHz	LP Oscillator mode
		Oscillator Frequency ⁽¹⁾	DC	40	MHz	EC Oscillator mode
			DC	4	MHz	RC Oscillator mode
			0.1	4	MHz	XT Oscillator mode
			4	25	MHz	HS Oscillator mode
			4	10	MHz	HS + PLL Oscillator mode
			5	200	kHz	LP Oscillator mode
1	TOSC	External CLKI Period ⁽¹⁾	1000	—	ns	XT, RC Oscillator mode
			40	—	ns	HS Oscillator mode
			32	—	μs	LP Oscillator mode
		Oscillator Period ⁽¹⁾	25	—	ns	EC Oscillator mode
			250	—	ns	RC Oscillator mode
			250	1	μs	XT Oscillator mode
			40	250	ns	HS Oscillator mode
			100	250	ns	HS + PLL Oscillator mode
			5	200	μs	LP Oscillator mode

Note 1: Instruction cycle period (Tcy) equals four times the input oscillator time base period for all configurations except PLL. All specified values are based on characterization data for that particular oscillator type under standard operating conditions with the device executing code. Exceeding these specified limits may result in an unstable oscillator operation and/or higher than expected current consumption. All devices are tested to operate at “min.” values with an external clock applied to the OSC1/CLKI pin. When an external clock input is used, the “max.” cycle time limit is “DC” (no clock) for all devices.

7. Module: EUSART

The RX pin sampling information in **Section 17.1.2 “Sampling”** has changed. This section now reads as follows:

17.1.2 SAMPLING

The data on the RX pin is sampled three times by a majority detect circuit to determine if a high or a low level is present at the RX pin when SYNC is clear or when BRG16 and BRGH are both not set.

The data on the RX pin is sampled once when SYNC is set or when BRGH16 and BRGH are both set.

8. Module: MSSP

In **Section 16.3.2 “Operation”**, the following note has been added:

Note: The SSPBUF register cannot be used with read-modify-write instructions, such as BCF, BTFSC, COMF, etc.

9. Module: QFN

In the QFN pin diagrams on pages 3 and 4, and in Table 1-3: PIC18F2410/2510/2515/2610 Pinout I/O Descriptions, the following note has been added:

Note: It is recommended to connect the bottom pad of QFN package parts to Vss.

PIC18F2X1X/4X1X

10. Module: Electrical Characteristics

Parameters D031A and D041A have been added to Section 25-3 “DC Characteristics”, as shown below:

25.3 DC Characteristics: PIC18F2X1X/4X1X (Industrial) PIC18LF2X1X/4X1X (Industrial)

DC CHARACTERISTICS			Standard Operating Conditions (unless otherwise stated) Operating temperature $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for industrial			
Param No.	Symbol	Characteristic	Min	Max	Units	Conditions
D031A	V _{IL}	Input Low Voltage I/O ports: with SMBus buffer	V _{SS}	0.8	V	
D041A	V _{IH}	Input High Voltage I/O ports: with SMBus buffer	2.1	V _{DD}	V	

11. Module: Electrical Characteristics

In Table 25-1: Memory Programming Requirements, parameters D132, D132A, D133 and D133A have been changed. The changes are shown in **bold** in the following table:

TABLE 25-7: MEMORY PROGRAMMING REQUIREMENTS

DC CHARACTERISTICS			Standard Operating Conditions (unless otherwise stated) Operating temperature $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for industrial				
Param No.	Sym	Characteristic	Min	Typ†	Max	Units	Conditions
D132	V _{IE}	Program Flash Memory V _{DD} for Block Erase	3.0	—	5.5	V	Using ICSP™ port, 25°C
D132A	V _{IW}	V _{DD} for Externally Timed Erase or Write	4.5	—	5.5	V	Using ICSP port, 25°C
D133	T _{IE}	ICSP Block Erase Cycle Time	—	4	—	ms	V_{DD} ≥ 4.5V
D133A	T _{IW}	ICSP Erase or Write Cycle Time (externally timed)	1	—	—	ms	V_{DD} ≥ 4.5V, 25°C
D133A	T_{IW}	Self-Timed Write Cycle Time	—	2	—	ms	

REVISION HISTORY

Rev A Document (01/2005)

First revision of this document.

Data Sheet Clarification issues 1 (I/O Ports), 2 (Resets), 3 (DC Characteristics), 4 (A/D Converter Characteristics), 5 (Instruction Set) and 6 (Timing Diagrams and Specifications).

Rev B Document (09/2005)

Added Data Sheet Clarification issues 7 (EUSART), 8 (MSSP), 9 (QFN) and 10-11 (Electrical Characteristics).

PIC18F2X1X/4X1X

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's products as critical components in life support systems is not authorized except with express written approval by Microchip. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, Accuron, dsPIC, KEELoq, microID, MPLAB, PIC, PICmicro, PICSTART, PRO MATE, PowerSmart, rPIC, and SmartShunt are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.


AmpLab, FilterLab, Migratable Memory, MXDEV, MXLAB, PICMASTER, SEEVAL, SmartSensor 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, dsPICDEM, dsPICDEM.net, dsPICworks, ECAN, ECONOMONITOR, FanSense, FlexROM, fuzzyLAB, In-Circuit Serial Programming, ICSP, ICEPIC, Linear Active Thermistor, MPASM, MPLIB, MPLINK, MPSIM, PICkit, PICDEM, PICDEM.net, PICLAB, PICtail, PowerCal, PowerInfo, PowerMate, PowerTool, rLAB, rPICDEM, Select Mode, Smart Serial, SmartTel, Total Endurance and WiperLock 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.

© 2005, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949:2002 ==

Microchip received ISO/TS-16949:2002 quality system certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona and Mountain View, California in October 2003. The Company's quality system processes and procedures are for its PICmicro® 8-bit MCUs, 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.



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://support.microchip.com>
Web Address:
www.microchip.com

Atlanta

Alpharetta, GA
Tel: 770-640-0034
Fax: 770-640-0307

Boston

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

Chicago

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

Dallas

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

Detroit

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

Kokomo

Kokomo, IN
Tel: 765-864-8360
Fax: 765-864-8387

Los Angeles

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

San Jose

Mountain View, CA
Tel: 650-215-1444
Fax: 650-961-0286

Toronto

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

ASIA/PACIFIC

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

China - Beijing
Tel: 86-10-8528-2100
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8676-6200
Fax: 86-28-8676-6599

China - Fuzhou
Tel: 86-591-8750-3506
Fax: 86-591-8750-3521

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

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 - Shunde
Tel: 86-757-2839-5507
Fax: 86-757-2839-5571

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

China - Xian
Tel: 86-29-8833-7250
Fax: 86-29-8833-7256

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-2229-0061
Fax: 91-80-2229-0062

India - New Delhi
Tel: 91-11-5160-8631
Fax: 91-11-5160-8632

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

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

Korea - Gumi
Tel: 82-54-473-4301
Fax: 82-54-473-4302

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

Malaysia - Penang
Tel: 604-646-8870
Fax: 604-646-5086

Philippines - Manila
Tel: 632-634-9065
Fax: 632-634-9069

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

Taiwan - Hsin Chu
Tel: 886-3-572-9526
Fax: 886-3-572-6459

Taiwan - Kaohsiung
Tel: 886-7-536-4818
Fax: 886-7-536-4803

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 - Weis
Tel: 43-7242-2244-399
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: 34-91-352-30-52
Fax: 34-91-352-11-47

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