PIC16F15213/14/23/24/43/44

PIC16F15213/14/23/24/43/44 Low Pin Count Microcontrollers

Introduction

The PIC16F152 microcontroller family has a suite of digital and analog peripherals that enable cost-sensitive sensor and real-time control applications. This product family is available from 8 to 44-pin packages in a memory range of 3.5 KB to 28 KB, with speeds up to 32 MHz. The family includes a 10-bit Analog-to-Digital Converter (ADC), Peripheral Pin Select (PPS), Memory Access Partition (MAP) to support users in data protection and bootloader applications, Device Information Area (DIA) that stores Fixed Voltage Reference (FVR) offset values to help improve ADC accuracy, digital communication peripherals, timers and waveform generators. This small form factor device is well suited for low-cost sensor and control applications.

PIC16F152 Family Types

Table 1. Devices Included in This Data Sheet

Device	Program Flash Memory (bytes)	Data SRAM (bytes)	Memory Access Partition/ Device Information Area	I/O Pins(1)/ Peripheral Pin Select	8-Bit Timers with HLT/ 16-Bit Timers(2)	10-Bit PWM/ CCP	10-Bit ADC Channels (External/Internal)	MSSP	EUSART	SMBus Compatible I/O Pads	External Interrupt Pins	Interrupt-on-Change Pins	Watchdog Timer
PIC16F15213	3.5K	256	Y/Y	6/Y	1/2	2/2	5/2	1	1	N	1	6	Y
PIC16F15214	7K	512	Y/Y	6/Y	1/2	2/2	5/2	1	1	N	1	6	Y
PIC16F15223	3.5K	256	Y/Y	12/Y	1/2	2/2	9/2	1	1	Y	1	12	Y
PIC16F15224	7K	512	Y/Y	12/Y	1/2	2/2	9/2	1	1	Y	1	12	Y
PIC16F15243	3.5K	256	Y/Y	18/Y	1/2	2/2	12/2	1	1	Y	1	18	Y
PIC16F15244	7K	512	Y/Y	18/Y	1/2	2/2	12/2	1	1	Y	1	18	Y

Table 2. Devices Not Included in This Data Sheet

Device	Program Flash Memory (bytes)	Data SRAM (bytes)	Memory Access Partition/ Device Information Area	I/O Pins(1)/ Peripheral Pin Select	8-Bit Timers with HLT/ 16-Bit Timers(2)	10-Bit PWM/ CCP	10-Bit ADC Channels (External/Internal)	MSSP	EUSART	SMBus Compatible I/O Pads	External Interrupt Pins	Interrupt-on-Change Pins	Watchdog Timer
PIC16F15225	14K	1024	Y/Y	12/Y	1/2	2/2	9/2	1	1	Y	1	12	Y
PIC16F15245	14K	1024	Y/Y	18/Y	1/2	2/2	12/2	1	1	Y	1	18	Y
PIC16F15254	7K	512	Y/Y	26/Y	1/2	2/2	17/2	1	1	Y	1	25	Y
PIC16F15255	14K	1024	Y/Y	26/Y	1/2	2/2	17/2	1	1	Y	1	25	Y
PIC16F15256	28K	2048	Y/Y	26/Y	1/2	2/2	17/2	1	1	Y	1	25	Y
PIC16F15274	7K	512	Y/Y	36/Y	1/2	2/2	28/2	1	1	Y	1	25	Y
PIC16F15275	14K	1024	Y/Y	36/Y	1/2	2/2	28/2	1	1	Y	1	25	Y
PIC16F15276	28K	2048	Y/Y	36/Y	1/2	2/2	28/2	1	1	Y	1	25	Y

Notes:

1. Total I/O count includes one pin ($\overline{MCLR}$) that is input-only.
2. Timer0 can be configured as either an 8 or 16-bit timer.

Core Features

- C Compiler Optimized RISC Architecture
- Operating Speed:
  - DC – 32 MHz clock input
  - 125 ns minimum instruction time
- 16-Level Deep Hardware Stack
- Low-Current Power-on Reset (POR)
- Configurable Power-up Timer (PWRT)
- Brown-out Reset (BOR)
- Watchdog Timer (WDT)

Memory

- Up to 28 KB of Program Flash Memory
- Up to 2 KB of Data SRAM Memory
- Memory Access Partition (MAP): The Program Flash Memory Can Be Partitioned into:
  - Application Block
  - Boot Block
  - Storage Area Flash (SAF) Block
- Programmable Code Protection and Write Protection
- Device Information Area (DIA) Stores:
  - Fixed Voltage Reference (FVR) measurement data
  - Microchip Unique Identifier
- Device Characteristics Area (DCI) Stores:

  - Program/erase row sizes
  - Pin count details
- Direct, Indirect and Relative Addressing Modes

Operating Characteristics

- Operating Voltage Range:
  - 1.8V to 5.5V
- Temperature Range:
  - Industrial: -40°C to 85°C
  - Extended: -40°C to 125°C

Power-Saving Functionality

- Sleep:
  - Reduce device power consumption
  - Reduce system electrical noise while performing ADC conversions
- Low Power Mode Features:
  - Sleep:
    - < 900 nA typical @ 3V/25°C (WDT enabled)
    - < 600 nA typical @ 3V/25°C (WDT disabled)
  - Operating Current:
    - 48 µA typical @ 32 kHz, 3V/25°C
    - < 1 mA typical @ 4 MHz, 5V/25°C

Digital Peripherals

- Two Capture/Compare/PWM (CCP) Modules:
  - 16-bit resolution for Capture/Compare modes
  - 10-bit resolution for PWM mode
- Two Pulse-Width Modulators (PWM):
  - 10-bit resolution
  - Independent pulse outputs
- One Configurable 8/16-Bit Timer (TMR0)
- One 16-Bit Timer (TMR1) with Gate Control
- One 8-Bit Timer (TMR2) with Hardware Limit Timer (HLT)
- One Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART):
  - RS-232, RS-485, LIN compatible
  - Auto-wake-up on Start
- One Host Synchronous Serial Port (MSSP):
  - Serial Peripheral Interface (SPI) mode
    - Client Select Synchronization
  - Inter-Integrated Circuit (I^2C) mode
    - 7/10-bit Addressing modes
- Peripheral Pin Select (PPS):
  - Enables pin mapping of digital I/O
- Device I/O Port Features:
  - Up to 35 I/O pins
  - 1 input-only pin

  - Individual I/O direction, open-drain, input threshold, slew rate and weak pull-up control
  - Interrupt-on-change (IOC) on up to 25 pins
  - One external interrupt pin

Analog Peripherals

- Analog-to-Digital Converter (ADC):
  - 10-bit resolution
  - Up to 28 external input channels
  - Two internal input channels
  - Internal ADC oscillator (ADCRC)
  - Operates in Sleep
  - Selectable auto-conversion trigger sources
- Fixed Voltage Reference (FVR):
  - Selectable 1.024V, 2.048V and 4.096V output levels
  - Internally connected to ADC

Clocking Structure

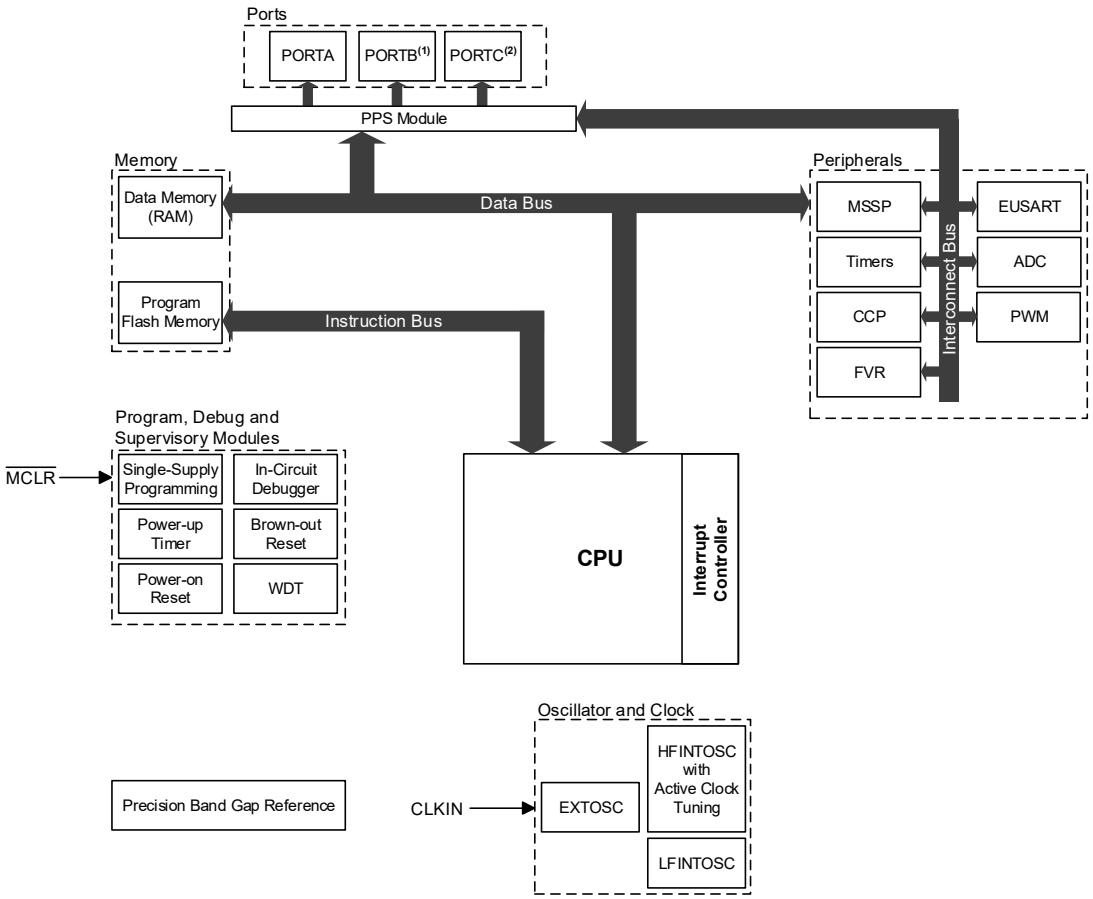
- High-Precision Internal Oscillator Block (HFINTOSC):
  - Selectable frequencies up to 32 MHz
  - ±2% at calibration
- Internal 31 kHz Oscillator (LFINTOSC)
- External High-Frequency Clock Input:
  - Two External Clock (EC) Power modes

Programming/Debug Features

- In-Circuit Serial Programming™ (ICSP™) via Two Pins
- In-Circuit Debug (ICD) with One Breakpoint via Two Pins
- Debug Integrated On-Chip

Block Diagram

Figure 1. PIC16F15213/14/23/24/43/44 Block Diagram



Notes:

1. Available on 20-pin devices only.
2. Available on 14/20-pin devices only.