PIC16F18345 Internet of Things (IoT) Sensor Badge Demonstration

Summary

The number of connected applications is growing rapidly, along with the need to handle multiple functions and reduce power consumption. There are many communication protocols used with different characteristics such as wired, wireless, low energy and long-range connectivity. Connected applications range from reading remote sensors and sending the data to the cloud, to enabling remote bootloader capability for functionality and software updates.

Offering an array of Core Independent Peripherals (CIPs), Microchip's 8-bit PIC® microcontrollers provide the capabilities to handle multiple functions without the core for low power consumption. The integrated analog, digital and communication peripherals perform functions autonomously, with the ability to alter system performance based on feedback or other application needs. The multiple on-board communication peripherals can be used with external modules to enable Ethernet, Wi-Fi®, Bluetooth® and long-range communications such as LoRa®.

The 20-pin PIC16F18345-based IoT Sensor Badge shows this concept by interfacing with multiple sensors, sound buzzer, communication module and RGB LEDs to perform various application functions, including communication with a smartphone application via a Bluetooth LE module.

For more information on the PIC16F18345, visit www.microchip.com/PIC16F18345.

Product Highlights

PIC16F18345

- 17 channel 10-bit Analog-to-Digital Converter (ADC)
- 5-bit Digital-to-Analog Converter (DAC)
- Two comparators and two 10-bit PWMS
- Complementary Waveform Generator (COG)
- Four Capture/Compare PWMs (CCPs)
- Numerically Controlled Oscillator (NCO)
- Data Signal Modulator (DSM)
- Four Configurable Logic Cells (CLCs)
- EUSART
- Two I^{2}C/SPI interfaces
- Peripheral Pin Select (PPS)
- IDLE and DOZE low-power modes
- Peripheral module disable

MCP16252

- Synchronous boost DC/DC regulator for single-cell operation

MCP9701

- Analog temperature sensor

RN4020

- Low-energy Bluetooth module

Demonstration Highlights

The PIC16F18345 manages:

- Badge tilt angle and temperature
- Color mix and pattern for RGB LEDs
- Buzzer drive and tone control
- Bluetooth LE module
- Remote control via smartphone/tablet application

Four Modes of Operation

- *Mode 1:* PIC16F18345 with 3-axis accelerometer and RGB LEDs
  - The RGB LEDs light up based on the accelerometer data. The LEDs on the axis with the most measure force will light up. The center LEDs turns off when the badge is tilted beyond 45 degrees.
- *Mode 2:* PIC16F18345 with RGB LEDs
  - The RGB LEDs will light up based on a predetermined pattern with color dimming
- *Mode 3:* PIC16F18345 with 3-axis accelerometer, RGB LEDs and buzzer
  - The buzzer and LEDs are driven based on the magnitude of the force sensed by the accelerometer. The higher the force, the higher the pitch sound and the brighter the LEDs.
- *Mode 4:* PIC16F18345 with 3-axis accelerometer, RGB LEDs and buzzer
  - Check board status with Android™ app via Bluetooth LE

Smartphone/Tablet Application

- View real-time tilt angle and temperature of the badge
- View real-time status of each RGB LED
- Change operation mode of the badge
- Check battery voltage

![MICROCHIP logo]

Featured Products

Device	Program Flash Memory (KB)	EEPROM (bytes)	Data SRAM (bytes)	I/O Pins	10-bit ADC with Computation*	5-bit DAC	Comparator	8-/16-bit Timer	SMT	Windowed Watchdog Timer	CRC + Memory Scan	CCP/10-bit PWM	Zero-Cross Detect	CWG	NCO	CLC	DSM	EUSART/I²C/SPI	Peripheral Pin Select
PIC16(L)F18313	3.5	256	256	6	9	1	1	2/1	–	–	–	2/2	–	1	1	2	1	1/1	✓
PIC16(L)F18323	3.5	256	256	12	15	1	2	2/1	–	–	–	2/2	–	1	1	2	1	1/1	✓
PIC16(L)F18324	7	256	512	12	15	1	2	4/3	–	–	–	4/2	–	2	1	4	1	1/1	✓
PIC16(L)F18325	14	256	1K	12	15	1	2	4/3	–	–	–	4/2	–	2	1	4	1	1/2	✓
PIC16(L)F18326	28	256	2K	12	15	1	2	4/3	–	–	–	4/2	–	2	1	4	1	1/2	✓
PIC16(L)F18344	7	256	512	18	21	1	2	4/3	–	–	–	4/2	–	2	1	4	1	1/2	✓
PIC16(L)F18345	14	256	1K	18	21	1	2	4/3	–	–	–	4/2	–	2	1	4	1	1/2	✓
PIC16(L)F18346	28	256	2K	18	21	1	2	4/3	–	–	–	4/2	–	2	1	4	1	1/2	✓
PIC16(L)F18854	7	256	512	25	24	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓
PIC16(L)F18855	14	256	1K	25	24	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓
PIC16(L)F18875	14	256	1K	36	35	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓
PIC16(L)F18856	28	256	2K	25	24	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓
PIC16(L)F18876	28	256	2K	36	35	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓
PIC16(L)F18857	56	256	4K	25	24	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓
PIC16(L)F18877	56	256	4K	36	35	1	2	3/4	2	✓	✓	5/2	✓	3	1	4	1	1/2	✓

*10-bit ADC with computation only available of 28- and 40-pin devices

Block Diagram

PIC16F18345 Microcontroller
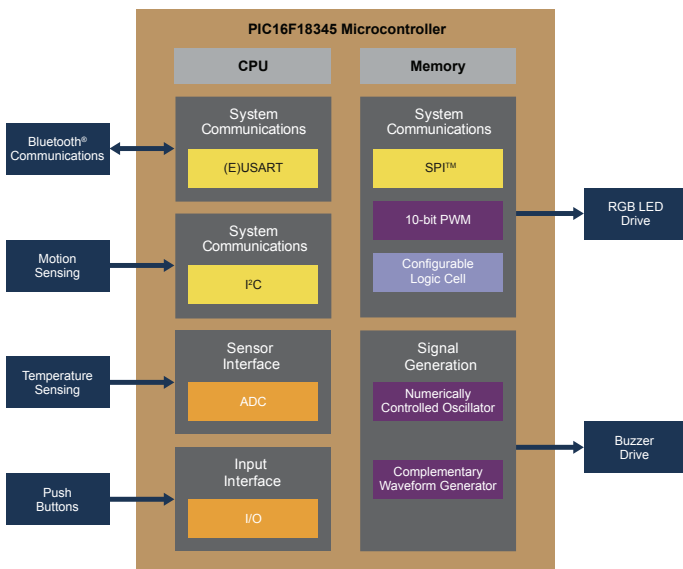
Development Made Easy

Start with the free download of the schematic and 'C' source code that can easily be modified to your specific application needs.

Additional Information

- IoT Sensor Badge Demonstration page: www.microchip.com/IoTSensorBadge
- PIC16F18345 product page: www.microchip.com/PIC16F18345
- PIC16F183XX family page: www.microchip.com/PIC16F183XX
- PIC16F188XX family page: www.microchip.com/PIC16F18877ProductFamily
- MCP16252 product page: www.microchip.com/MCP16252
- MCP9701 product page: www.microchip.com/MCP9701
- RN4020 product page: www.microchip.com/RN4020

www.microchip.com/8bit

Visit our web site for additional product information and to locate your local sales office.

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