XBee interface with PIC18F4550

Overview of Xbee

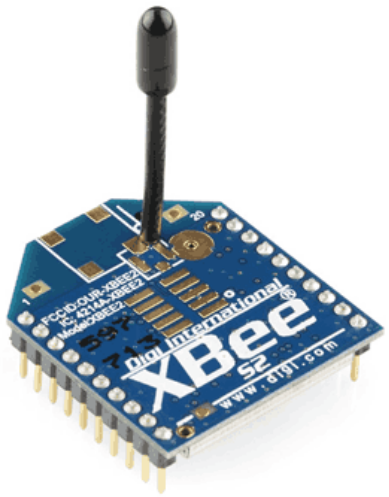
XBee radios are based on IEEE 802.15.4 (https://en.wikipedia.org/wiki/IEEE_802.15.4) (technical standard which defines the operation of low-rate wireless personal area networks (LR-WPANs)) standard and it is designed for point to point, star, etc. communication over the air.

Following are the major features of XBee radio devices,

- They work on 2.5GHz (Unlicensed Radio Band) radiofrequency.
- Low data rate (≈250Kbps).
- Low power consumption (1mW, 6mW, 250mW etc.).
- Over short distance (90m, 750m, 1mile, etc.) wireless communication applications

Hence they are used in Home Automation, Wireless sensor n/w, Industrial control, Medical data collection, Building automation, etc.

To know more about how the Xbee module works, refer to XBee Module (https://www.electronicwings.com/sensors-modules/xbee-module).



XBee Module

Interfacing of XBee device with PIC18F4550

Here, we have connected the following to the XBee End Device

- An LM35 Temperature sensor as an analog sample
- Switch as a digital sample

Now we request those analog and digital samples from XBee End Device using XBee Coordinator.

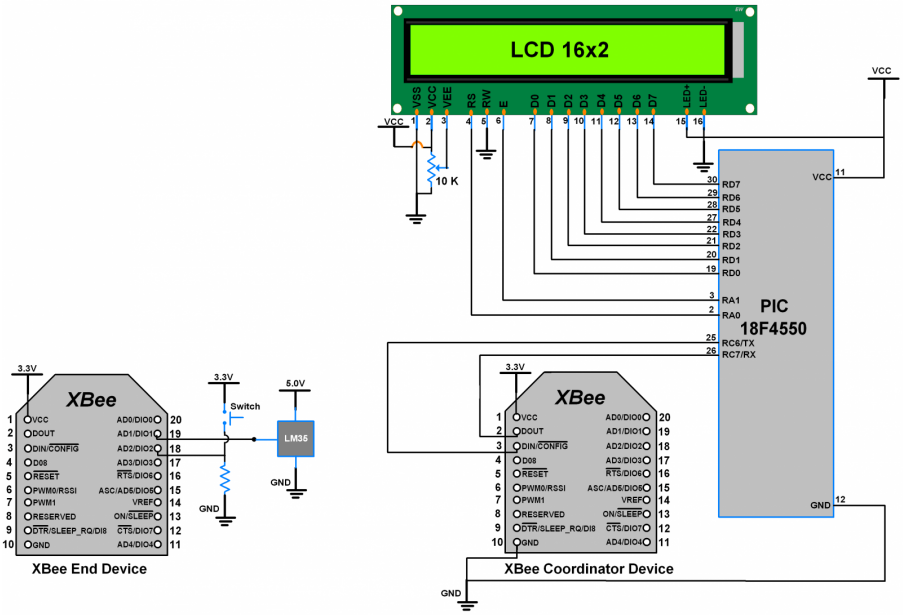
Now let's program PIC18F4550 to request Analog and Digital samples from the XBee end device through the XBee coordinator. Both XBee is used API operating mode.

We are displaying the status of the switch in digital form (0 for OFF and 1 for ON), and the LM35 temperature received by the XBee Coordinator Device on the 16x2 LCD connected to PIC18F4550.

Select that ADC Vref is according to XBee Model. Refer ADC Voltages (http://knowledge.digi.com/articles/Knowledge_Base_Article/Digital-and-analog-sampling-using-XBee-radios) to find Vref of your model.

The XBee model we are using is based on the ZigBee protocol and it has a fixed Vref of 1.2V.

Connection Diagram of Xbee to PIC18F4550



XBee Interfacing with PIC18F4550

Note: In the above example, we need to configure XBee End Device pins (AD1/DIO1 & AD2/DIO2) as Analog and Digital input. Refer to configuring the XBee pins section in XBee Module (https://www.electronicwings.com/sensors-modules/xbee-module).

Need to know

Here we are using XBee in API mode so for basic communication purpose we are building some basic frames like

- AT COMMAND FRAME: -
  - Using this frame, we can send AT command to the XBee device.
- REMOTE AT COMMAND FRAME: -
  - Using this frame, we can send AT command to the XBee device located at a remote location with their address specified in the frame.
- TRANSMIT REQUEST FRAME: -
  - Using this frame, we can transmit data string to the XBee device with their address specified in the frame.
- IO DATA SAMPLE FRAME: -
  - Using this frame, we receive analog/digital data transmitted by the XBee device located at a remote location with their address specified in the

frame.

In the below program, we are using functions that build the above-mentioned frames structure. API frame structure functions are lengthy, but easy to understand once we know each API Frame structure.

To be familiar with API frames and their structure refer to **API Frame Generator in the X-CTU** section in XBee Module (https://www.electronicwings.com/sensors-modules/xbee-module).

Xbee Code for PIC18F4550

```
/*
 * PIC18F4550 interface with X-Bee
 * http://www.electronicwings.com
 */


#include <pic18f4550.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <stdint.h>
#include <stdbool.h>
#include "Configuration_header_file.h"
#include "LCD_16x2_Header_File.h"   /* Include LCD header file */
#include "USART_Header_File.h"      /* Include USART header file */

/* Define Required XBee Frame Type and Responses */
#define START_DELIMITER                 0x7E
#define AT_COMMAND_FRAME                0x08
#define TRANSMIT_REQUEST_FRAME          0x10
#define REMOTE_AT_COMMAND_FRAME         0x17
```

Video of Xbee Communication using PIC18F4550

Components Used

XBee S2 Module XBee is a radio module developed by Digi Intern...	X 1	(https://www.mouser.in/ProductDetail/DIGI/XB3-24Z8PT-J?qs=%2Fha2pyFaduhSsfO4rIoaMEwI6Xrnnc75IwhRCq3AEFAcGF%252B%2FI4124w%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/xbee-s2-module/1/datasheet)
PIC18f4550 PIC18f4550	X 1	(https://www.mouser.in/ProductDetail/Microchip-Technology/PIC18F4550-I-P?qs=oKK8NaWdAJs8nLDXBGwMXw%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/pic18f4550/1/datasheet)

Components Used

Powered By

PICKit 4 MPLAB PICKit 4 MPLAB	X 1	(https://www.mouser.in/ProductDetail/Microchip-Technology/PG164140?qs=r5DSvlrkXmLKDuYNJlmLWw%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/pickit-4-mplab/1/datasheet)
LCD16x2 Display LCD16x2 Display	X 1	(https://www.mouser.com/ProductDetail/Adafruit/1447?qs=XAKIUOoRPe6AClmsjw7y7g%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Components Used

LM35 Temperature Sensor LM35 is a sensor which is used to measure tempe...	X 1	(https://www.mouser.com/ProductDetail/Texas-Instruments/LM35DZ-NOPB?qs=QbsRYf82W3F5RpWTxhXHxA%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/lm35-temperature-sensor/1/datasheet)
Breadboard Breadboard	X 1	(https://www.mouser.com/ProductDetail/Bus-Board-Prototype-Systems/BB830?qs=VEfmQw3KOauhPeTwYxNCaA%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0) Datasheet (/components/breadboard/1/datasheet)

Downloads

XBee Datasheet	Download (/api/download/platform-attachment/218)
PIC18F4550 Interface with XBee Project File	Download (/api/download/platform-attachment/319)

Comments

Comment

ascanipek
(/users/ascanipek/profile)
2018-03-03 00:45:38

Hi,
I want to use this project but could you give me exactly model of XBee modules?

And thanks for great project

Reply Like

lokeshc
(/users/lokeshc/profile)
2018-03-03 11:02:24

Here Xbee S2 module used.

Reply Like 1

ascanipek
(/users/ascanipek/profile)
2018-03-06 00:21:30

Thanks a lot! So is this Xbee S2 module a transceiver ? I guess they're both the same in that project.

Reply Like

lokeshc
(/users/lokeshc/profile)
2018-03-06 00:38:10

Yes, they are both same and transceiver.

Reply Like

anandkrisshnap
(/users/anandkrisshnap/profile)
2019-03-11 13:07:55

can u please send the code written in mikroc pro software..

Reply Like

samadhanshinde020
(/users/samadhanshinde020/profile)
2018-03-24 03:11:06

I connect one zigee model to the laptop for transmission purpose and another one zigbee model is connected to the pic18f4550 to receive character.when i write input on serial window of laptop. Receiver zigbee receive character but this character display on lcd is different means..when i write 1 through serial terminal then 9 is printed on lcd of pic18f4550.....sir please help me.why such problem occurred.and tell possible reason.
Reply Like

lokeshc
(/users/lokeshc/profile)
2018-03-24 04:28:16

the program is for receive IO samples (analog/digital). if you want to receive serial data on your Xbee device connected to PIC18f4550 then you need to use receive packet frame.
Reply Like

samadhanshinde020
(/users/samadhanshinde020/profile)
2018-03-24 06:50:25

can i get one sample code of transmission and reception of zigbee ?
Reply Like

ramu
(/users/ramu/profile)
2018-10-30 06:11:18

I want to communicate between two xbees in api mode with pic16f1834. Please anybody help me in the programming
Reply Like