BM70 PICtail™/PICtail Plus Evaluation Board (EVB) User's Guide

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® X IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that is useful to know before using the BM70 PICtail™/PICtail Plus Evaluation Board (EVB). Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the BM70 PICtail™/PICtail Plus EVB (also referred as "BM70 EVB"), as a development tool to emulate and debug firmware on a target board. This user's guide is composed of the following chapters:

- **Chapter 1. "Introduction"** provides an overview of the BM70 EVB and its features.
- **Chapter 2. "Hardware"** provides hardware details of the BM70 EVB.
- **Chapter 3. "Getting Started"** provides information about various steps involved to update the User Interface (UI) parameters and to set up a connection between the BM70 EVB and a smartphone using the Bluetooth® Low Energy (BLE) link.
- **Chapter 4. "Flash Programming Procedure"** describes various steps involved in downloading the Flash code on the BM70 EVB.
- **Chapter 5. "USB-to-UART Converter and Host DUT"** describes the use of the USB- to-UART converter circuit, available on the host Device Under Test (DUT).
- **Appendix A. "Schematics"** provides the BM70 EVB reference schematics.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Italic characters	Referenced books	*MPLAB IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File > Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
`Plain Courier New`	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
`Italic Courier New`	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`
Notes	A Note presents information that we want to re-emphasize, either to help you avoid a common pitfall or to make you aware of operating differences between some device family members. A Note can be in a box, or when used in a table or figure, it is located at the bottom of the table or figure.	**Note:** This is a standard note box. **CAUTION** **This is a caution note.** **Note 1:** This is a note used in a table.

RECOMMENDED READING

This user's guide describes how to use the BM70 EVB. The following Microchip document is available and recommended as supplemental reference resources.

BM70/BM71 Data Sheet (DS60001372)

Refer to this document for detailed information on the BM70 module. The reference information found in this data sheet includes:

- Features and pin configurations
- Electrical specifications
- Reference circuits

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at: http://www.microchip.com. This web site makes files and information easily available to customers. Accessible by most Internet browsers, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listings
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listings of seminars and events; and listings of Microchip sales offices, distributors and factory representatives

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- **Compilers** – The latest information on Microchip C compilers and other language tools
- **Emulators** – The latest information on the Microchip in-circuit emulator, MPLAB REAL ICE™
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 3
- **MPLAB X IDE** – The latest information on Microchip MPLAB X IDE, the Windows® Integrated Development Environment for development systems tools
- **Programmers** – The latest information on Microchip programmers including the PICkit™ 3 development programmer

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or Field Application Engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com.

DOCUMENT REVISION HISTORY

Revision A (October 2015)

This is the initial released version of this document.

Revision B (October 2015)

This revision includes the following updates:

- Added Figure 2-1, Table 2-1 through Table 2-10
- Updated Figure A-1

Minor updates to text and formatting were incorporated throughout the document.

Revision C (May 2016)

This revision includes the following updates:

- Updated **Chapter 3. "Getting Started"**
- Updated **Chapter 4. "Flash Programming Procedure"**
- Updated **Chapter 5. "USB-to-UART Converter and Host DUT"**
- Updated **Appendix A. "Schematics"**

Minor updates to text and formatting were incorporated throughout the document.

Revision D (January 2018)

This revision includes the following updates:

- Updated **Appendix A. "Schematics"**

Minor updates to text and formatting were incorporated throughout the document.

NOTES:

Chapter 1. Introduction

Thank you for purchasing a Microchip Technology BM70 PICtail™/PICtail Plus Evaluation Board (EVB). This document provides detailed information about the BM70 EVB.

The BM70 EVB is designed to evaluate and demonstrate the capabilities of the Microchip BM70 BLE module.

This chapter includes the following topics:

1.1 "Kit Contents"

1.2 "BM70 EVB Features"

The BM70 EVB can be evaluated using various tools which are listed on the product page of the Microchip worldwide web site: http:// www.microchip.com/bm-70-pictail.

1.1 KIT CONTENTS

The BM70 EVB kit contains these items:

- One BM70 EVB, which contains the BM70BLES1FC2 module
- One micro-USB cable

> **Note:** If you are missing any part of the kit, contact a Microchip sales office for assistance. A list of Microchip offices for sales and service is provided on the back page of this document.

1.2 BM70 EVB FEATURES

The following are key features of the BM70 EVB:

- Option to switch power source between the Coin Cell battery, USB, and PICtail interface
- The UART interface to connect to an external MCU
- Connection and test interface between the BM70 module and Host Emulator tool on the PC (with UART commands)
- Ability to update the firmware using the micro-USB port
- Switch between Application mode and Test mode
- LED, push button, I^2C and SPI interface

Representation of the layout of the BM70 EVB is illustrated in Figure 1-1 and Figure 1-2. The top view of the board includes the following key features as indicated in Figure 1-1.

1. The BM70BLES1FC2 module
2. Power switch button (SW6)
3. SPI interface (J4)
4. USB GPIO interface (JP10)
5. USB-to-UART interface (J3)
6. LED
7. Power source connector (J1)
8. Reset button (SW5)
9. Test buttons (Push-low)
10. VBAT header pins (J10)
11. Test button header (J7)
12. I^2C interface (JP12, JP13)
13. DIP switch (SW7)
14. LEDs and corresponding header pins (JP5)
15. GND header pins (J2)
16. PICtail interface (J8)

FIGURE 1-1: BM70 EVB (TOP VIEW)

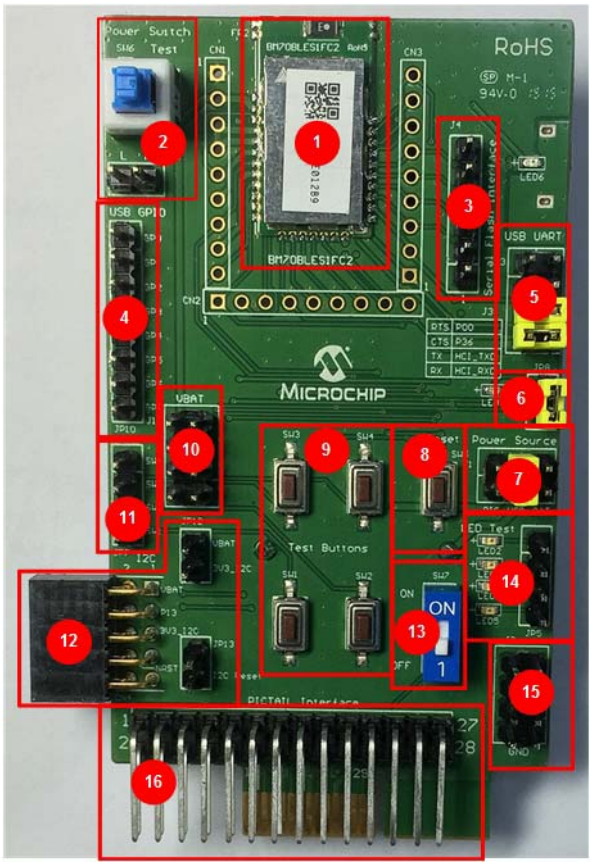
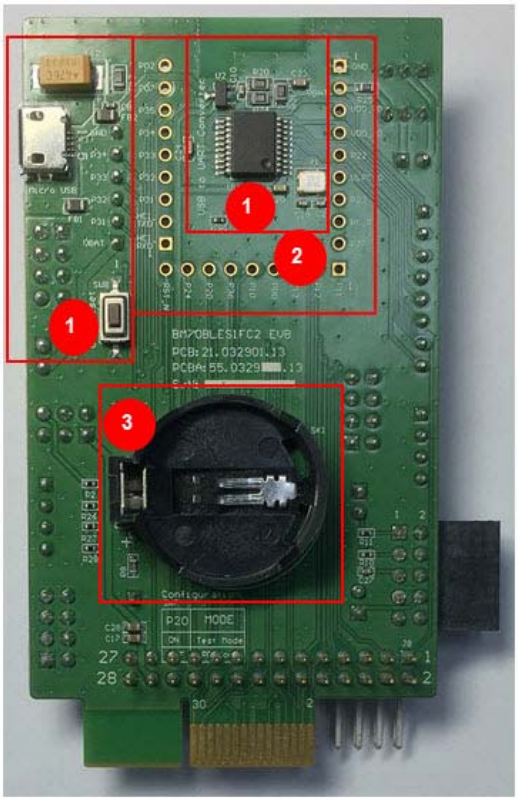


Figure 1-2 illustrates the bottom view of the BM70 EVB with the following key components:

1. USB-to-UART converter. The switch SW8 is the USB Reset button
2. Module pads
3. Coin Cell battery holder

For additional information on these features, refer to **Chapter 2. "Hardware"**.

FIGURE 1-2: BM70 EVB (BOTTOM VIEW)



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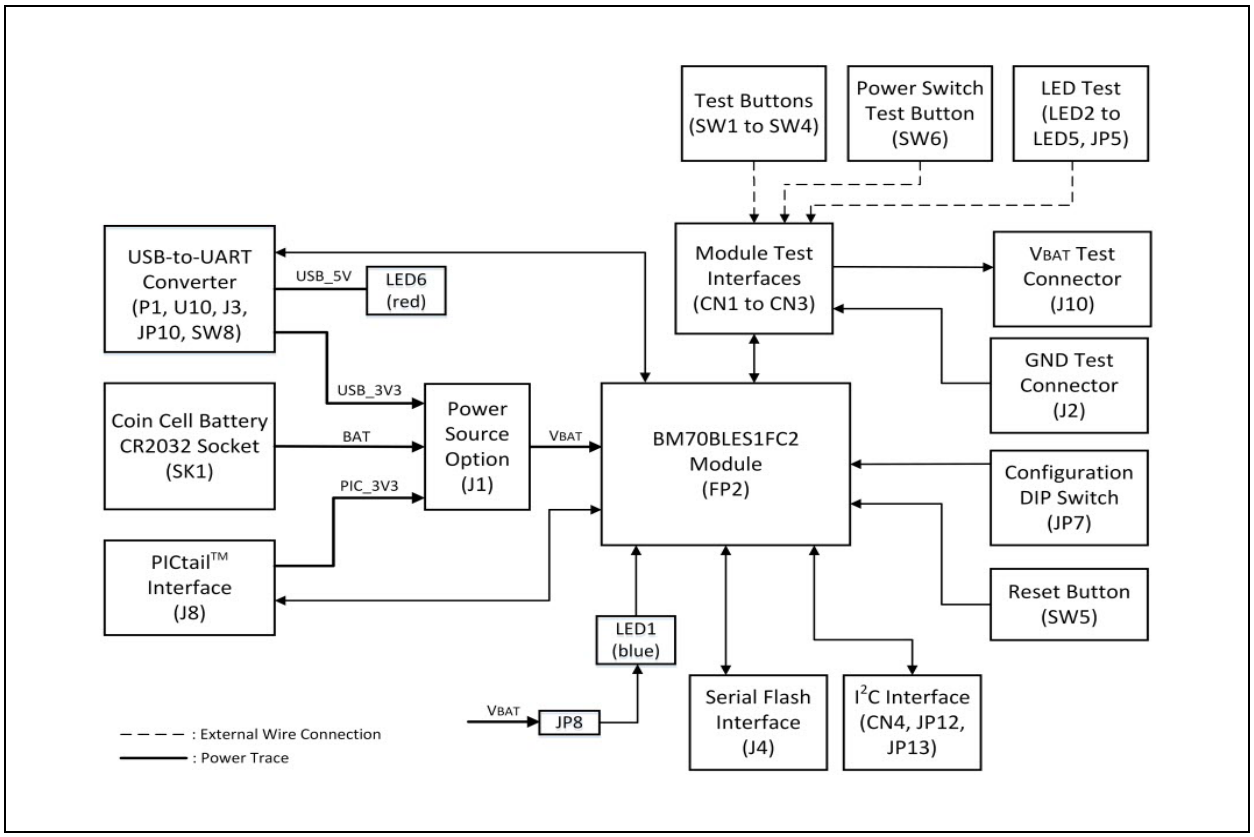
Chapter 2. Hardware

This chapter describes the hardware features of the BM70 EVB. The BM70 EVB provides many options for connecting and communicating with other peripheral devices and power sources as illustrated in Figure 2-1.

FIGURE 2-1: BM70 EVB BLOCK DIAGRAM



2.1 HARDWARE FEATURES

The following sections provide the details of each component in the BM70 EVB. For their locations on the board, refer to Figure 1-1 and Figure 1-2.

2.1.1 Power Supply

There are three ways to supply power to theBM70 EVB:

- Coin Cell battery (socket SK1 for CR2032 battery)
- USB
- PICtail socket connection

2.1.2 USB connectivity

The BM70 EVB provides micro-USB cable connectivity.

2.1.3 Switches

Push button switches provide the following functionality:

- SW1, SW2, SW3 and SW4 – Test buttons, available for evaluation and are connected to the corresponding header pins
- SW5 – Reset button, connects to the Reset pin(pin 21) of the module
- SW6 – Power switch button, includes Push-High and Push-Low header
- SW7 – DIP switch to switch between Application and Test modes
- SW8 – USB Reset button

2.1.4 LEDs

The functionality of the six LEDs are as follows:

- LED1 – Connected to the P0_2 pin(pin 30) of the BM70 module, which provides the module status
- LED2, LED3, LED4 and LED5 – Configurable test LEDs for diagnostics. These LEDs have header connections which can be connected for testing
- LED6 – USB connection indicator. This LED will turn ON when USB 5V input is connected

2.1.5 Jumpers

There are 12 jumpers (J1, J2, J3, J4, J5, J10, JP6, JP7, JP8, JP10, JP12 and JP13) available on the BM70 EVB. Table 2-1 through Table 2-12 provide the details of the pins and signals that are associated with the jumpers.

TABLE 2-1: POWER SOURCE OPTION CONNECTOR

Part Number	Pin	Signal	Description
J1	1	PIC_3V3	Power source from PICtail 3.3V, enabled by pin 2 in the jumper bank J1
	2	VBAT	BM70 power source input
	3	USB_3V3	Power source from USB enabled by pin 4 on the jumper bank J1. The power input is sent to 3.3V LDO to provide the module with a 3.3V input
	4	VBAT	BM70 power source input
	5	BAT	Power source from Coin Cell Battery, enabled by pin 6 on the jumper bank J1
	6	VBAT	BM70 power source input

TABLE 2-2: GROUND TEST CONNECTOR

Part Number	Pin	Signal	Description
J2	1 to 8	GND	Ground test pins

TABLE 2-3: USB TO UART INTERFACE U10

Part Number	Pin	Signal	Description
J3	1	RTS	MCP2200 RTS pin
	2	P0_0	BM70 GPIO P0_0 (Pin 15) Configured as CTS and connected to J3 pin1 by the jumper
	3	CTS	MCP2200 CTS pin
	4	P3_6	BM70 GPIO P3_6 (pin 17) Configured as RTS and connected to J3 pin 3 by the jumper
	5	TX	MCP2200 RX pin
	6	HCI_TXD	BM70 HCI_TXD (pin 23) Connected to J3 pin 5 by the jumper
	7	RX	MCP2200 TX pin
	8	HCI_RXD	BM70 HCI_RXD (pin 22) Connected to J3 pin 7 by the jumper

TABLE 2-4: SERIAL FLASH INTERFACE

Part Number	Pin	Signal	Description
J4	1	V_{BAT}	BM70 power source input
	2	P3_1	Configured as SPI_NCS
	3	P3_2	Configured as SPI_MISO
	4	P3_3	Configured as SPI_MOSI
	5	P3_4	Configured as SPI_SCLK
	6	GND	Ground pin

TABLE 2-5: VBAT TEST CONNECTOR

Part Number	Pin	Signal	Description
J10	1 to 8	V_{BAT}	V_{BAT} test pins

TABLE 2-6: CONNECTOR J10

Part Number	Pin	Signal	Description
JP10	1 to 8	GP0 to GP7	MCP2200 GPIOs

TABLE 2-7: CONNECTOR JP12

Part Number	Pin	Signal	Description
JP12	1	V_{BAT}	V_{BAT} test pin
	2	3V3_I^2C	3V3 voltage of I^2C interface, short to V_{BAT} for voltage supply

Note: The jumper JP12 must be connected as a default jumper.

TABLE 2-8: CONNECTOR JP13

Part Number	Pin	Signal	Description
JP13	1	nRST	I^2C (device) Reset pin, wire connect to the configured GPIO Reset pin
	2	NC	No connect

TABLE 2-9: CONNECTOR J5

Part Number	Pin	Signal	Description
J5	1 to 4	LED2 to LED5	Test LED interface (Pull-Low enable), wire connect to test the GPIO pin

TABLE 2-10: CONNECTOR JP6

Part Number	Pin	Signal	Description
JP6	1	Push-High	Latching switch SW6, Push-High test pin, wire connect to test GPIO
	2	Push-Low	Latching switch SW6, Push-Low test pin, wire connect to test GPIO

TABLE 2-11: CONNECTOR JP7

Part Number	Pin	Signal	Description
JP7	1 to 4	SW1 to SW4	Push-Low test buttons, wire connect to test GPIO

TABLE 2-12: CONNECTOR JP8

Part Number	Pin	Signal	Description
JP8	1	LED	Connected to status LED (LED1)
	2	V_{BAT}	Power source of LED1, short to JP8 pin1 to enable the status LED function

Chapter 3. Getting Started

This chapter describes how to update UI parameters and set up the connection between the BM70 EVB and a smartphone using the BLE link.

This chapter includes the following topics:

3.1 REQUIREMENTS

The following hardware and software are required for getting started with the BM70 EVB.

3.1.1 Hardware Requirements

- One BM70 EVB
- Any one of these Bluetooth-enabled smartphones:
  - iPhone® 4S or later version (it must support BLE)
  - Android™ device running on Android 4.3 or later version
- One Windows® host PC with USB port
- One micro-USB cable

3.1.2 Software Requirements

Users can download the latest firmware and corresponding tools for the following applications, which are available for download from the Microchip web site: www.microchip.com/bm-70-pictail.

- Firmware update tool, `isupdate.v4.0.0.207.rar`
- BLEDK3 Flash code, `BT5505_BLEDK3_v103_c1457.rar`
- BLEDK3 UI tool, `IS187x_102_BLEDK3_UI v100.123.rar`
- `mBIoT Utility app`, available at App Store for iPhone and at Google Play™ store for Android

3.2 CONFIGURING UI PARAMETERS

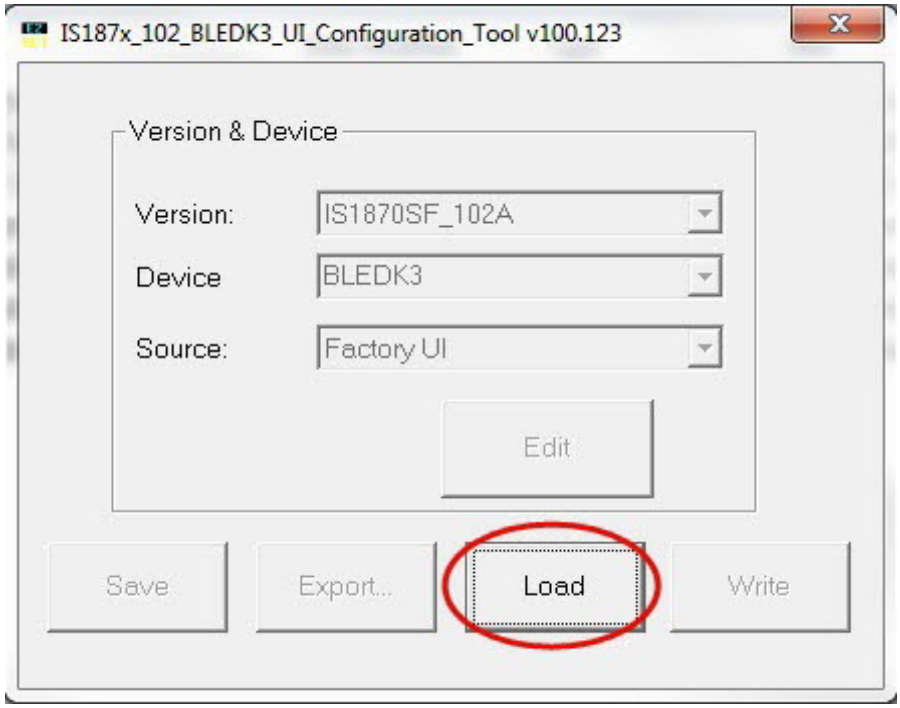
The UI configuration tool enables the user to change the BM70 EVB parameters, such as device name, UART settings, BLE connection settings, and adding or editing the GATT service table.

To update UI parameters, perform these actions:

1. Double-click the `IS187x_102_BLEDK3_UI_Configuration_Tool.exe` to open the BLEDK3 UI configuration tool on the PC. The UI Configuration tool window is displayed.
2. Click **Load**, see Figure 3-1. The Loading Option window is displayed.

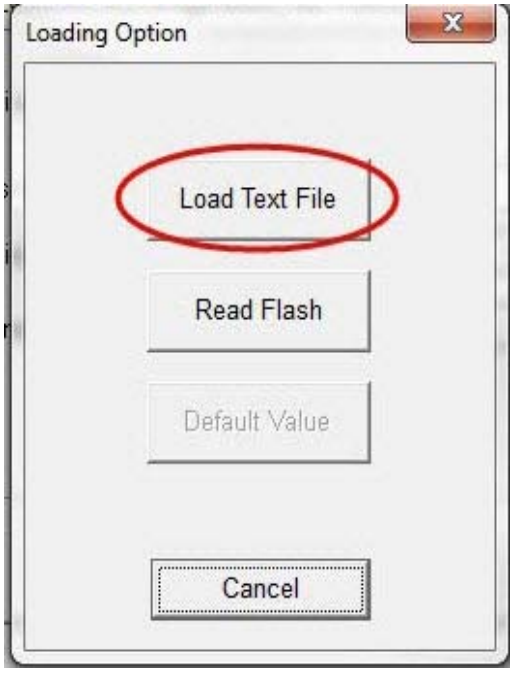
Note: Download and install the UI configuration tool, which is available for download from the Microchip web site: www.microchip.com/bm-70-pictail. In this demonstration, the *IS187x_102_BLEDK3_UI_Configuration_Tool v100.123* tool is used. This UI tool version corresponds to the firmware version of the "BLEDK3 v1.03".

FIGURE 3-1: BLEDK3 UI CONFIGURATION TOOL WINDOW



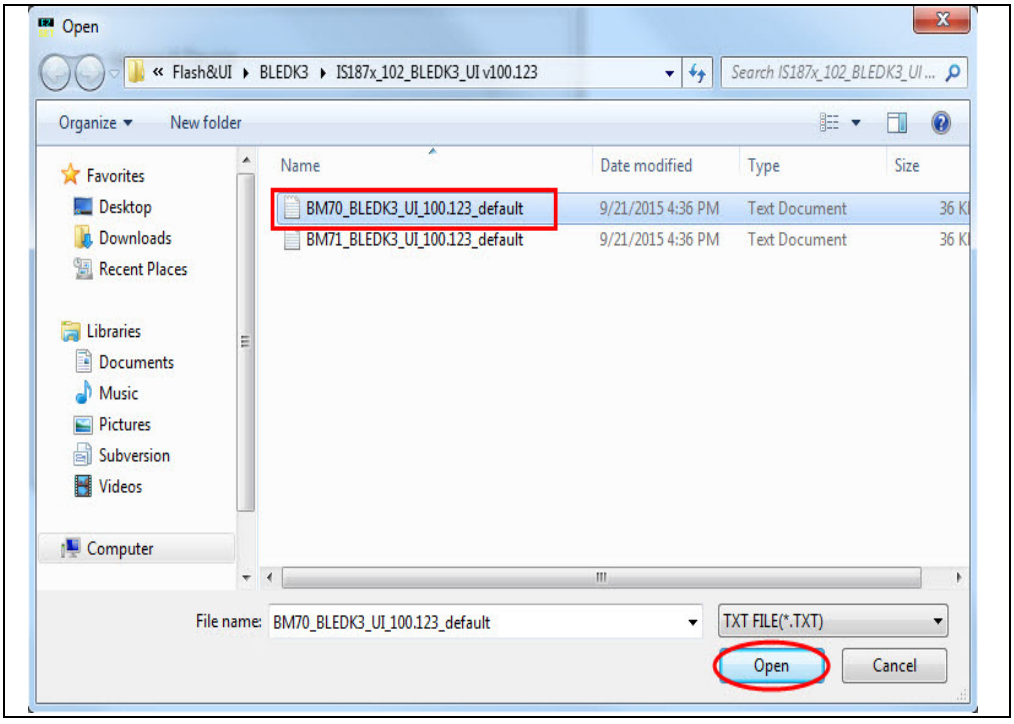
3. In the Loading Option window, click **Load Text File** to load UI parameters, see Figure 3-2.

FIGURE 3-2: LOADING OPTION WINDOW



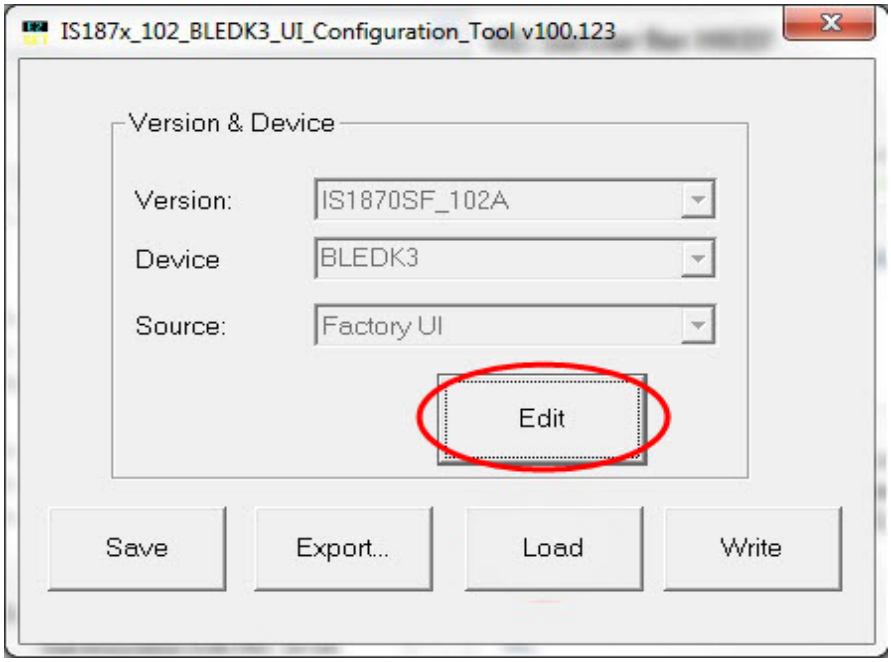
4. From the Open dialog, select the default UI parameter text file (provided with the UI tool) and then click **Open**, see Figure 3-3.

FIGURE 3-3: OPEN DIALOG BOX



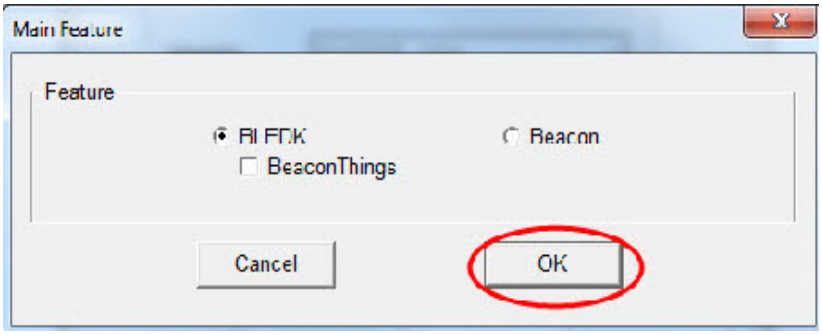
5. From the UI Configuration Tool window, select UI parameters, and then click **Edit**, see Figure 3-4.

FIGURE 3-4: UI CONFIGURATION TOOL WINDOW



6. From the Main Feature window, click **BLEDK** and then click **OK**, see Figure 3-5.

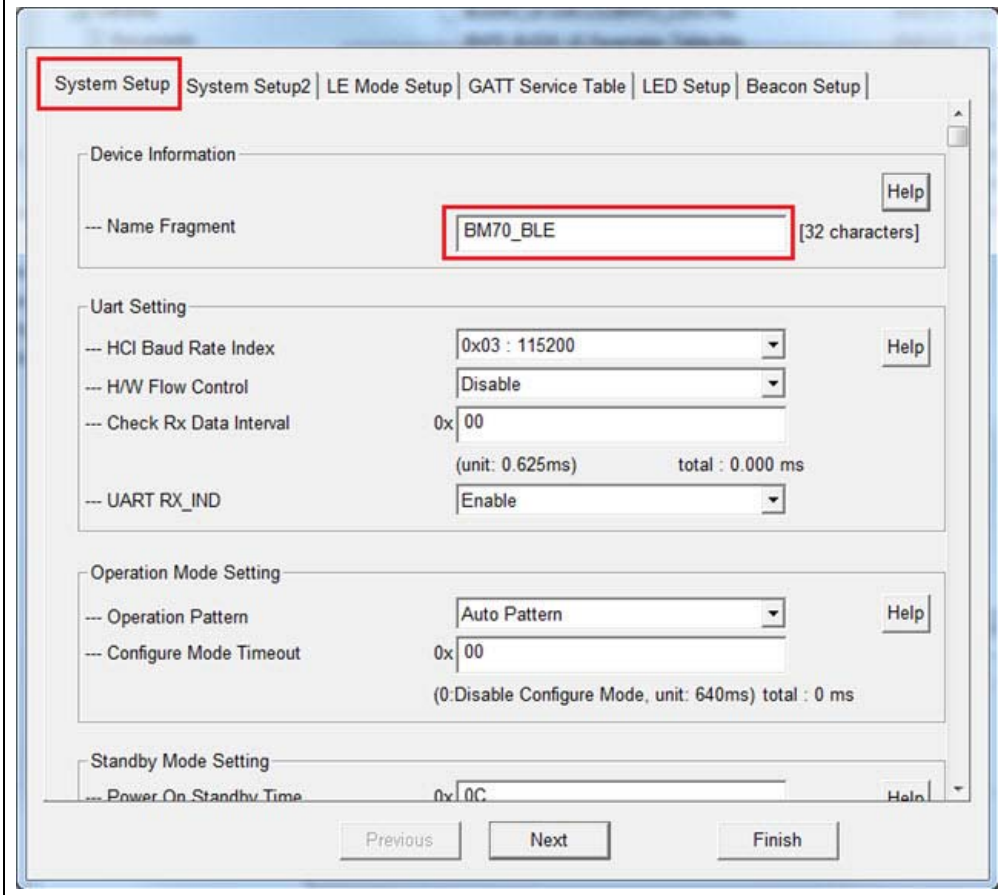
FIGURE 3-5: MAIN FEATURE WINDOW



7. The UI Configuration Tool dialog has various tabs to configure UI parameters. Click the **System Setup** tab, and in the **Name fragment** box, type BM70_BLE (or any user-defined name), see Figure 3-6.

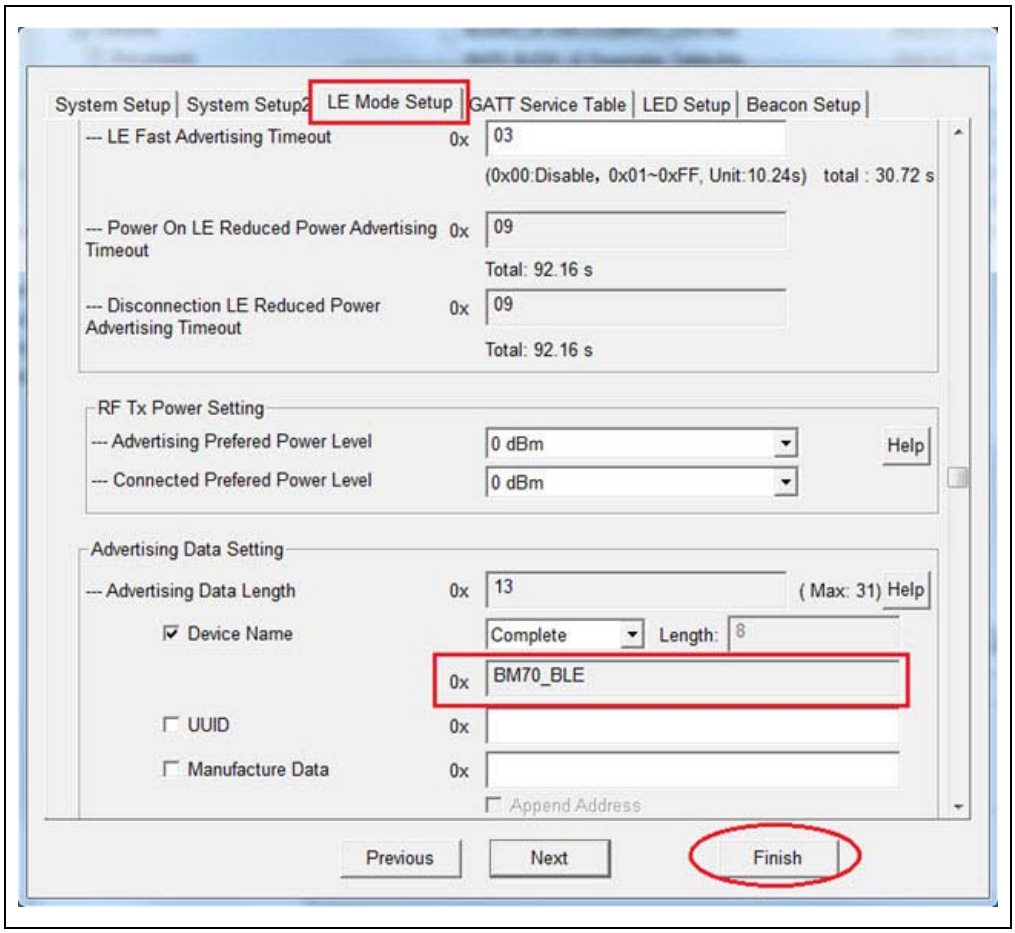
Note: Click Help button to get the information related to UI parameters.

FIGURE 3-6: CONFIGURING UI PARAMETERS - SYSTEM SETUP



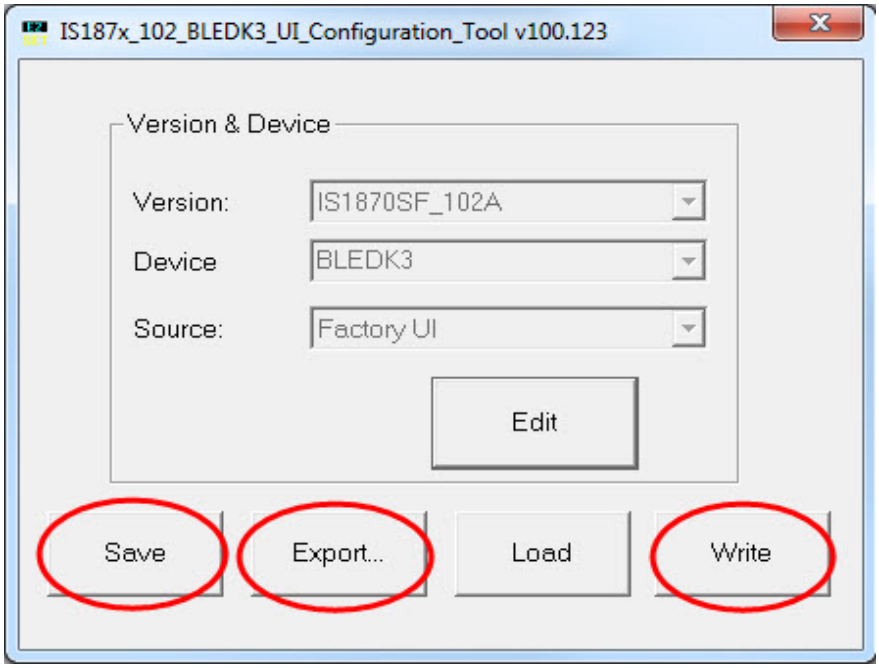
8. Click the **LE Mode Setup** tab, and under the Advertising Data Setting section, select **Device Name** to advertise the device name, see Figure 3-7.

FIGURE 3-7: ADVERTISING DATA SETTING



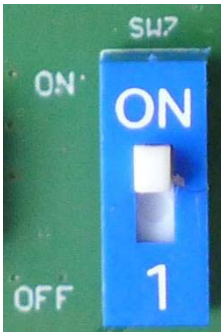
9. Click **Finish**. The UI Configuration Tool window is displayed, see Figure 3-8.

FIGURE 3-8: UI CONFIGURATION TOOL WINDOW



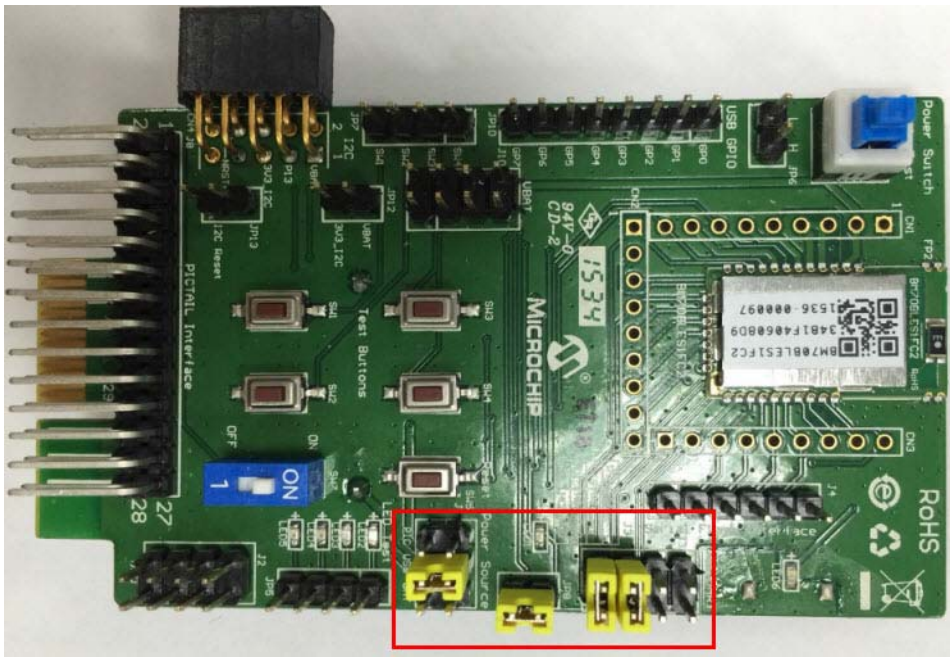
10. From the UI Configuration Tool window, perform any one of these actions:
    - Click **Save** to save the selected UI parameters as `.txt` or `.hex` files (for mass production)
    - Click **Export** to export the UI log `.txt` file. The log file contains the parameters and setup values
    - Click **Write** to download UI parameters to Flash
11. To write UI parameters on the BM70 module, perform these actions:
    a) Set the switch SW7 in the ON position (Test mode), see Figure 3-9.

FIGURE 3-9: SW7 IN TEST MODE



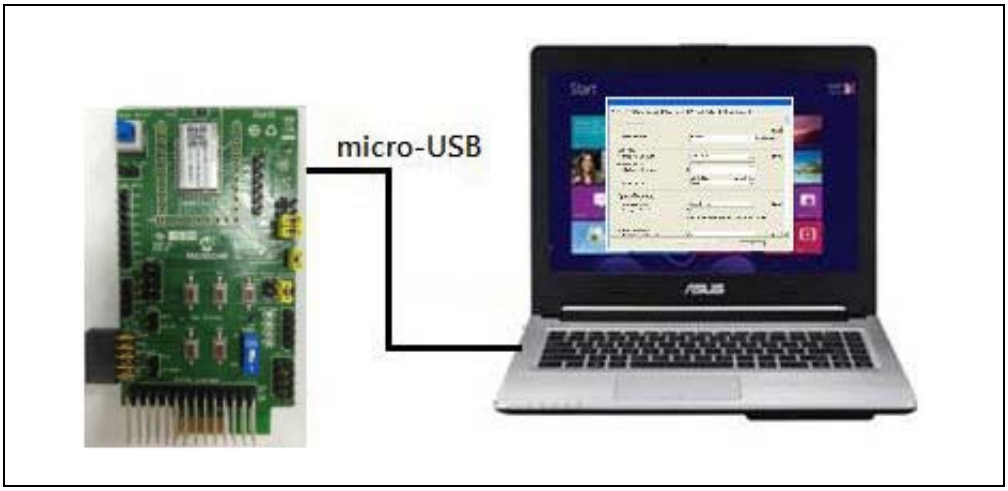
b) Ensure that the jumpers, J1, JP8 and J3, on the BM70 EVB are connected, as shown in Figure 3-10.

FIGURE 3-10: JUMPER AND BM70 EVB CONNECTION DETAILS



c) Connect the USB port (P1) of the BM70 EVB to a PC using the micro-USB cable, see Figure 3-11.

FIGURE 3-11: UI CONFIGURATION SETUP



d) On connection, LED1 (blue) and LED6 (red) on the BM70 EVB will turn ON.

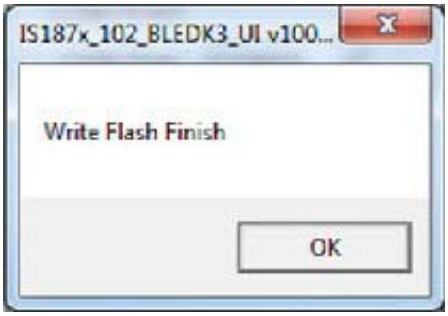
e) Go to the UI Configuration Tool window, and click **Write** to download UI parameters on the BM70 module, see Figure 3-8.

f) The Read/Write Flash window is displayed. Select the values for **COM Port** and **Baudrate**, and then click **Write**, see Figure 3-12.

FIGURE 3-12: READ/WRITE FLASH

g) A message box will appear displaying the message “Write Flash Finish”. Click **OK** to download UI parameters, see Figure 3-13.

FIGURE 3-13: MESSAGE BOX



3.3 BLE CONNECTION TO SMARTPHONE

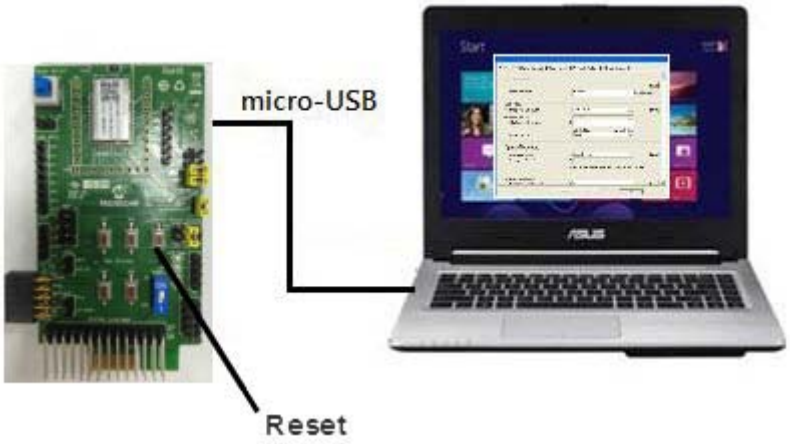
Perform the following actions to establish a BLE connection between the BM70 EVB and a smartphone. An iPhone with iOS9.2.1 is used for this demonstration.

1. Set the switch SW7 to the OFF position (Application mode) on the BM70 EVB, see Figure 3-14.

FIGURE 3-14: SW7 IN APPLICATION MODE

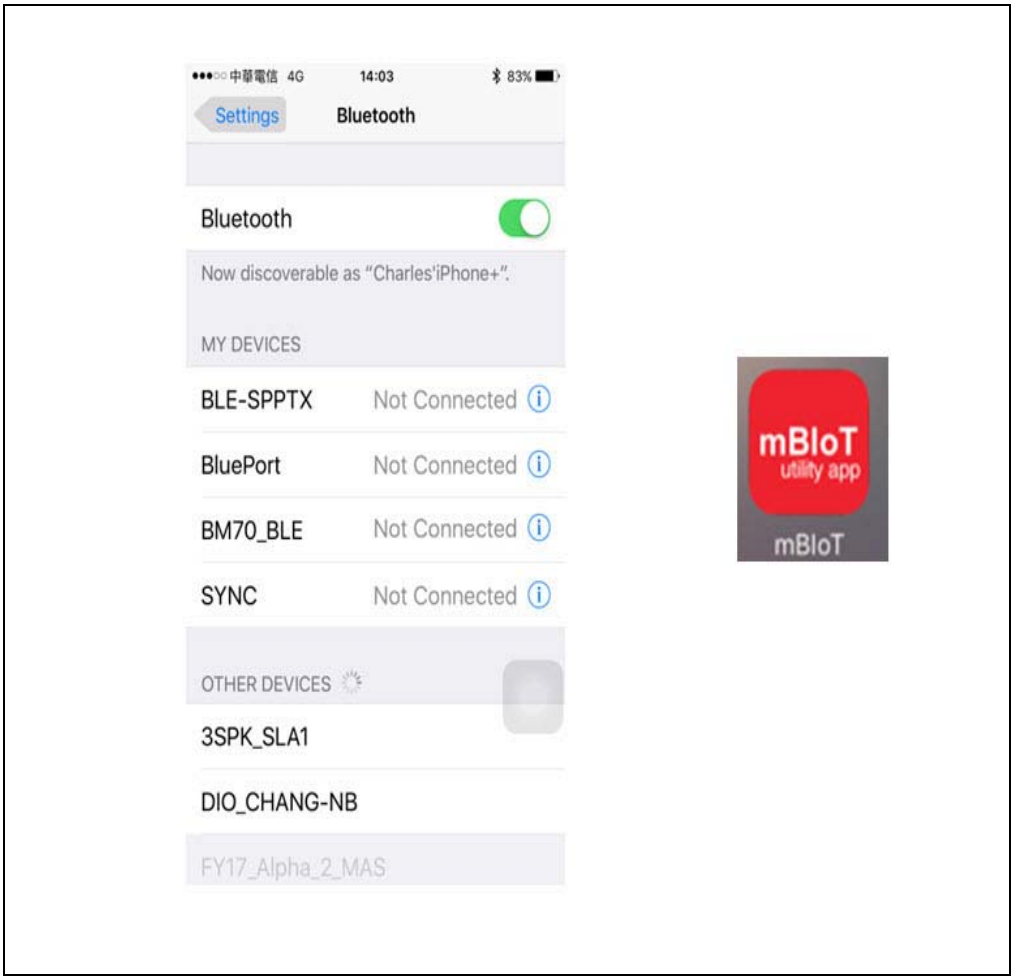
2. Connect the BM70 EVB to a PC using the micro-USB cable, see Figure 3-15. Press the Reset button (SW5) to reset the BM70 EVB. On connection, LED6 (red) will turn ON and LED1 (blue) blinks once at an interval.

FIGURE 3-15: POWER ON BM70 EVB



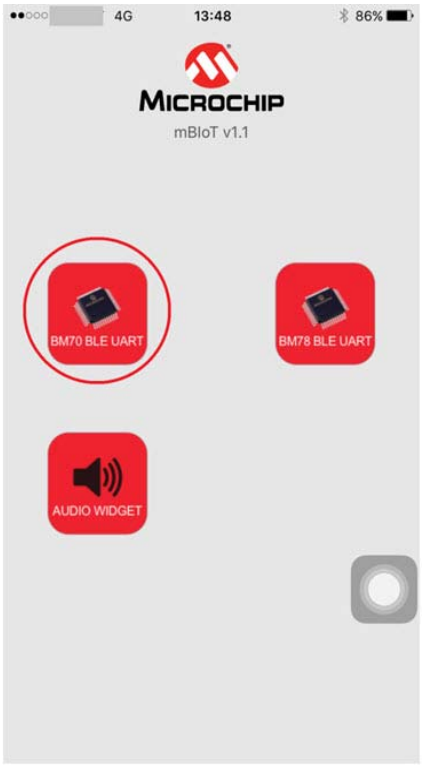
3. Download the `mBIoT app` from the App Store and enable the Bluetooth settings on the iPhone, see Figure 3-16.

FIGURE 3-16: ENABLING BLUETOOTH AND MBIOT APPLICATION



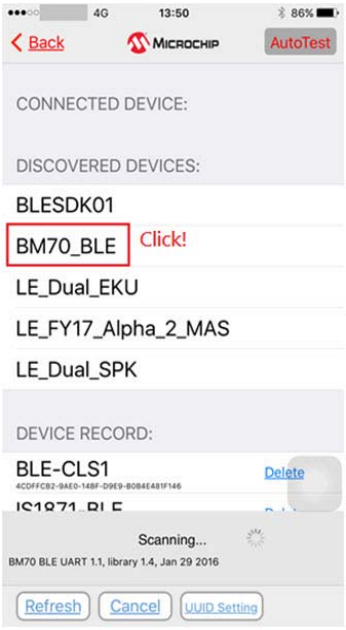
4. Tap `mBIoT` app and then tap to open the **BM70 BLE UART**, see Figure 3-17.

FIGURE 3-17: SELECT BM70 BLE UART



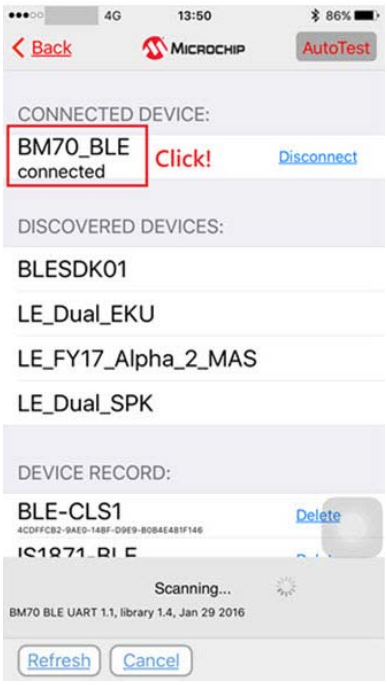
5. A list of discoverable devices will be displayed. Tap on **BM70_BLE** to connect, see Figure 3-18.

FIGURE 3-18: DISCOVERED DEVICES VIEW



6. Under **Connected Device**, tap **BM70_BLE connected** to get the device information, see Figure 3-19

FIGURE 3-19: CONNECTED DEVICE VIEW

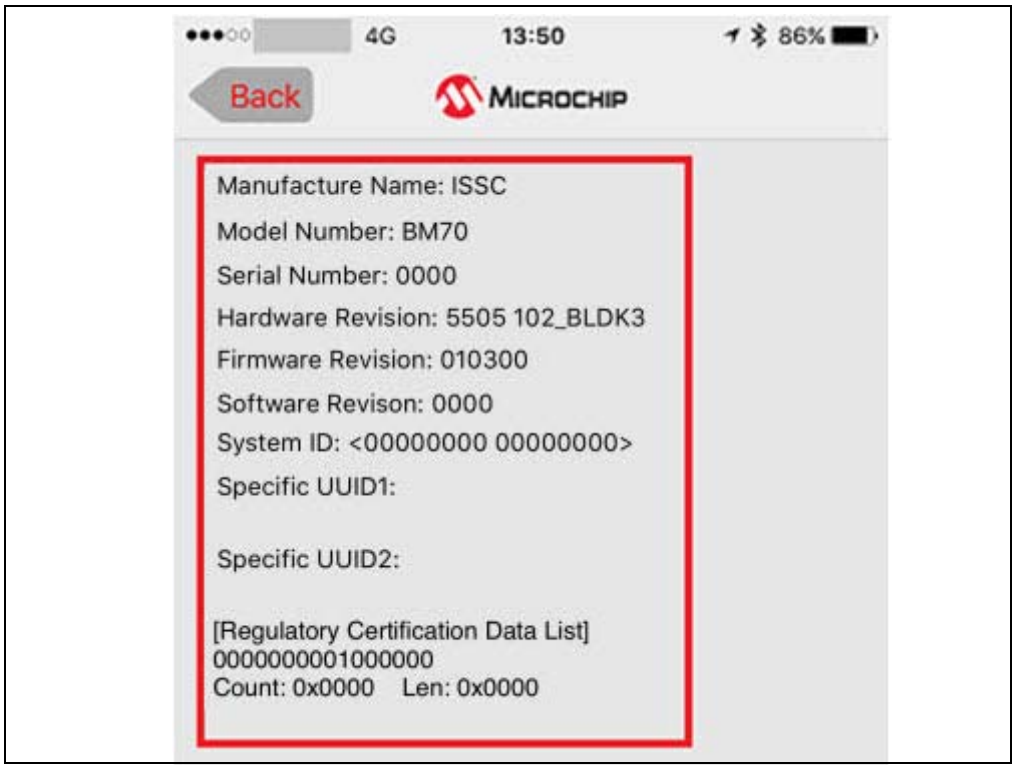


7. Tap **Device Info** to check the device information, see Figure 3-20.

FIGURE 3-20: DEVICE INFORMATION

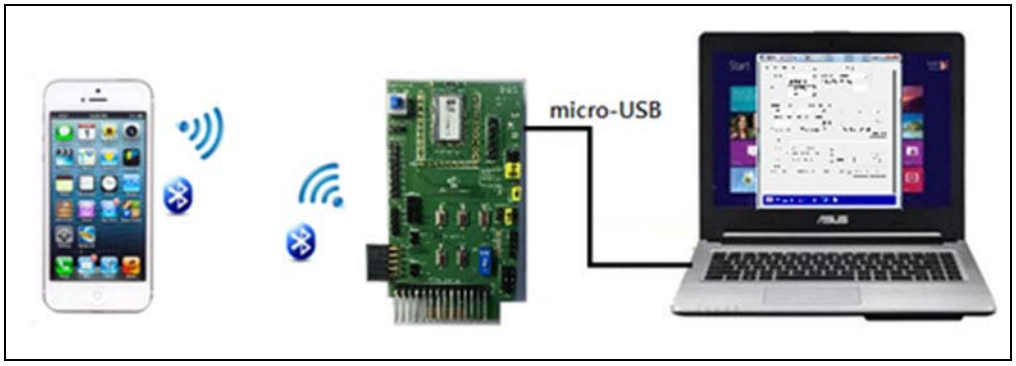
8. The device information will be displayed, see Figure 3-21.

FIGURE 3-21: DEVICE INFORMATION



9. The BLE link is established between the BM70 EVB and an iPhone, see Figure 3-22.

FIGURE 3-22: BLE LINK CONNECTION



3.4 BLEDK3 AUTO PATTERN AND MANUAL PATTERN TOOLS

The BLEDK3 firmware, written on the BM70 module, has two distinct modes, Auto Pattern and Manual Pattern. Both these modes use their own state machines. The BM70 module can be operated in both the modes by setting the value in the EEPROM. By default, the BM70 module is in Auto Pattern mode.

3.4.1 Auto Pattern Mode

In Auto Pattern mode, the state machine automates most of the Bluetooth related operations, such as advertising and Transparent UART service. The Transparent UART service is primarily used to connect the module to a peer device and to create a data pipe with the peer device through the Transparent UART mode with minimal instructions from the host MCU.

To evaluate and test the BM70 module in Auto Pattern mode, download and install the Auto Pattern tool (Windows-based GUI emulation tool), which is available for download on the Microchip web site. This tool implements the communication protocol and provides a fast and easy way to test the functions with the available options in the Auto Pattern mode.

3.4.2 Manual Pattern Mode

The Manual Pattern mode provides a full control of the BM70 module to the user and the module operates only based on the commands from the user or host MCU. The Manual Pattern tool also allows the Transparent UART mode; however, there is a small difference in the protocol used in this mode in comparison to the Auto Pattern mode.

To evaluate and test the BM70 module in Manual Pattern mode, download and install the Manual Pattern tool (Windows-based GUI emulation tool), which is available for download on the Microchip web site. This tool implements the communication protocol and provides a fast and easy way to test the functions with the available options in the Manual Pattern mode.

Note: For more information on Auto Pattern and Manual Pattern tools, refer to the "*IS187x_BM7x BLEDK3 Application Note"*, which is available on the Microchip web site: www.microchip. com/bm-70-pictail.

3.5 APPLICATION FIRMWARE INFORMATION

The BLEDK3 firmware application is the default application on the BM70 EVB. This application provides the BLE UART Transparent, BLE GATT-based transceiver, Beacon and BeaconThings functionality.

For additional information on the BLEDK3 application functionality, refer to the "*IS187x_BM7x BLEDK3 Application Note"*, which is available on the Microchip web site: www.microchip.com/bm-70-pictail.

NOTES:

Chapter 4. Flash Programming Procedure

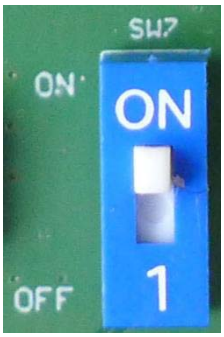
This chapter describes the process of downloading the firmware to the BM70 module.

4.1 FLASH PROGRAMMING PROCEDURE

Flash programming is required to update a newer or specific version of the firmware. Perform the following actions for Flash programming:

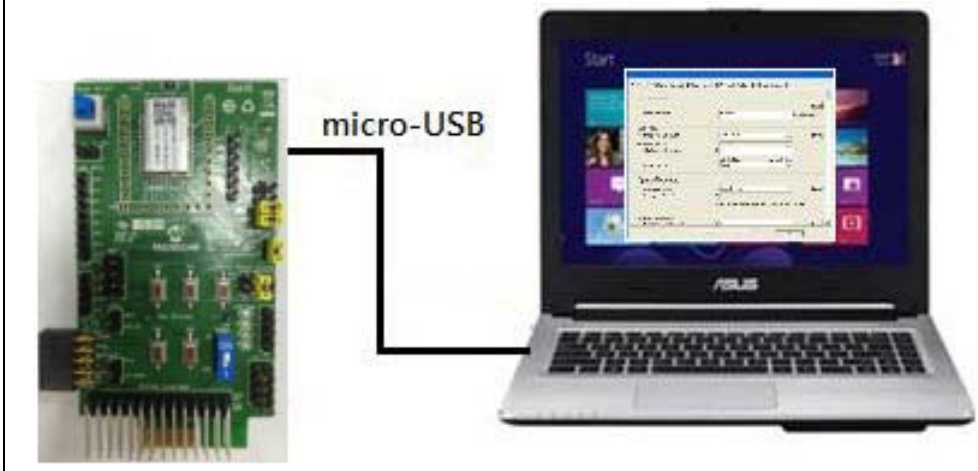
1. Set the switch SW7 in the ON position (Test mode), see Figure 4-1.

FIGURE 4-1: SW7 IN TEST MODE



2. Ensure that the jumpers, J1, JP8 and J3, on the BM70 EVB are connected, as illustrated in Figure 3-10.
3. Connect the BM70 EVB to a PC using the micro-USB cable, see Figure 4-2. On connection, LED6 (red) and LED1 (blue) will turn on. Press the Reset button (SW5) to reset the BM70 module.

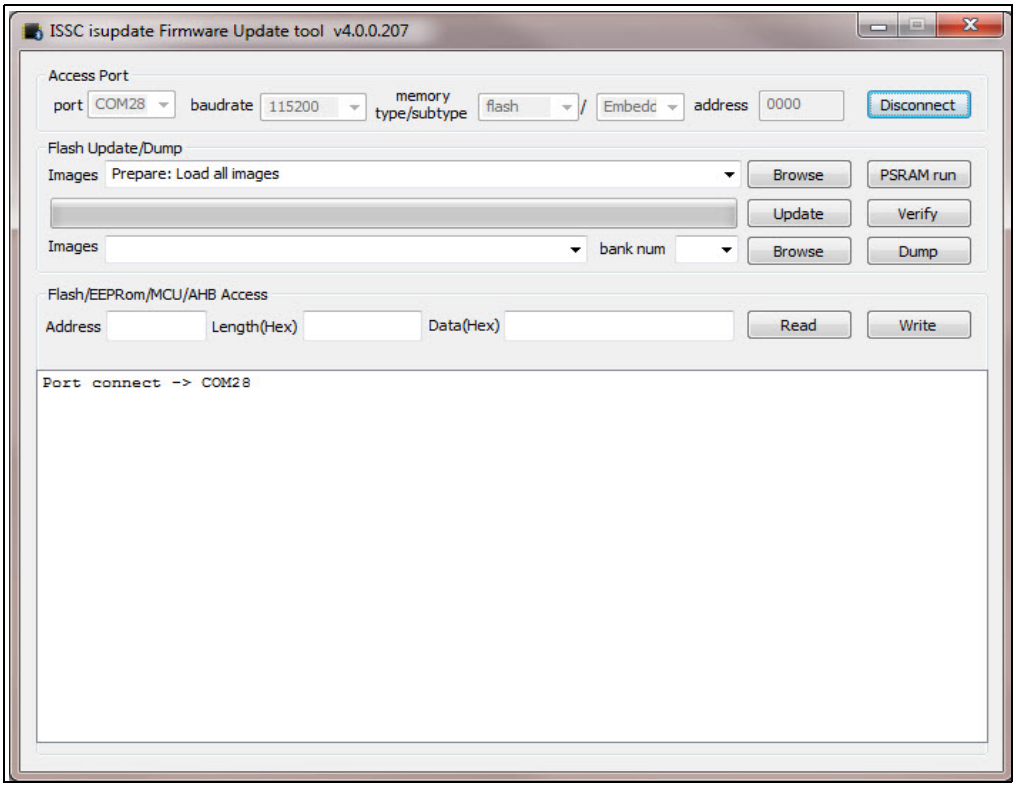
FIGURE 4-2: FLASH PROGRAMMING SETUP



4. Download and install the `isupdate.exe` file, which is available for download from the Microchip web site: www.microchip.com/bm-70-pictail.
5. Double-click the `isupdate.exe` file to open the firmware update tool on the PC.
6. Click **Connect** after setting these parameters.
   - Port
   - Baud Rate: 115200
   - Memory type/subtype: Flash/Embedded Flash
   - Address: 0000

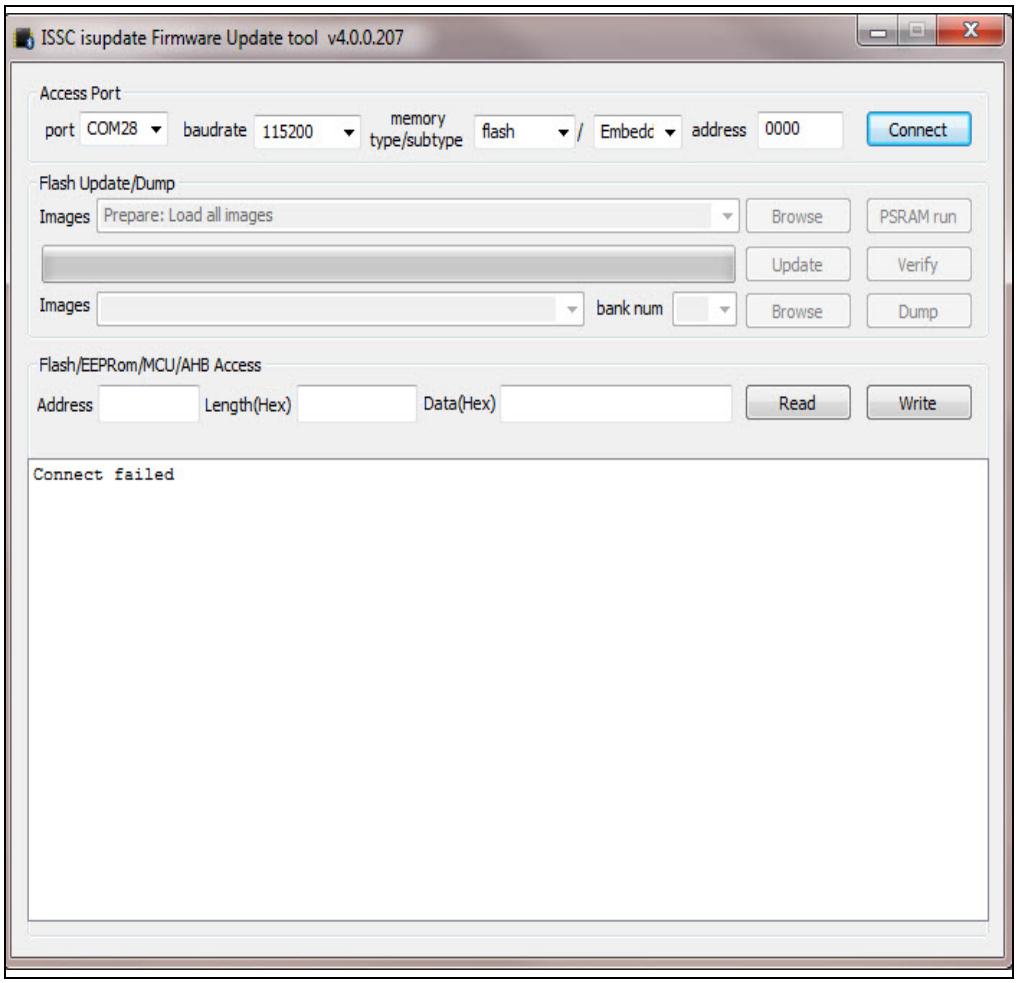
On successful connection, "Port connect -> Port Number" message will be displayed, see Figure 4-3.

FIGURE 4-3: FIRMWARE UPDATE TOOL WINDOW - PORT CONNECT



7. If the connection is failed, “Connect failed” message will be displayed. Verify the parameters and try connecting it again, see Figure 4-4.

FIGURE 4-4: FIRMWARE UPDATE TOOL WINDOW

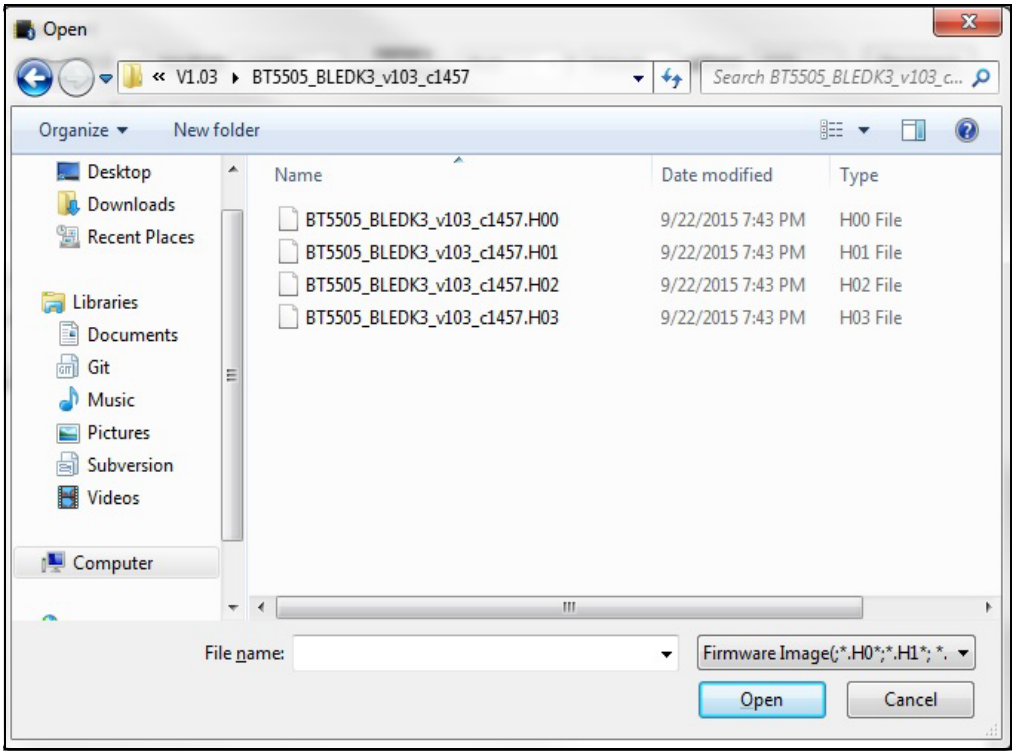


8. Click **Browse** to display four Flash code files (`.hex`) downloaded from the Microchip web site.

9. From the Open dialog, select Flash code files and click **Open,** see Figure 4-5.

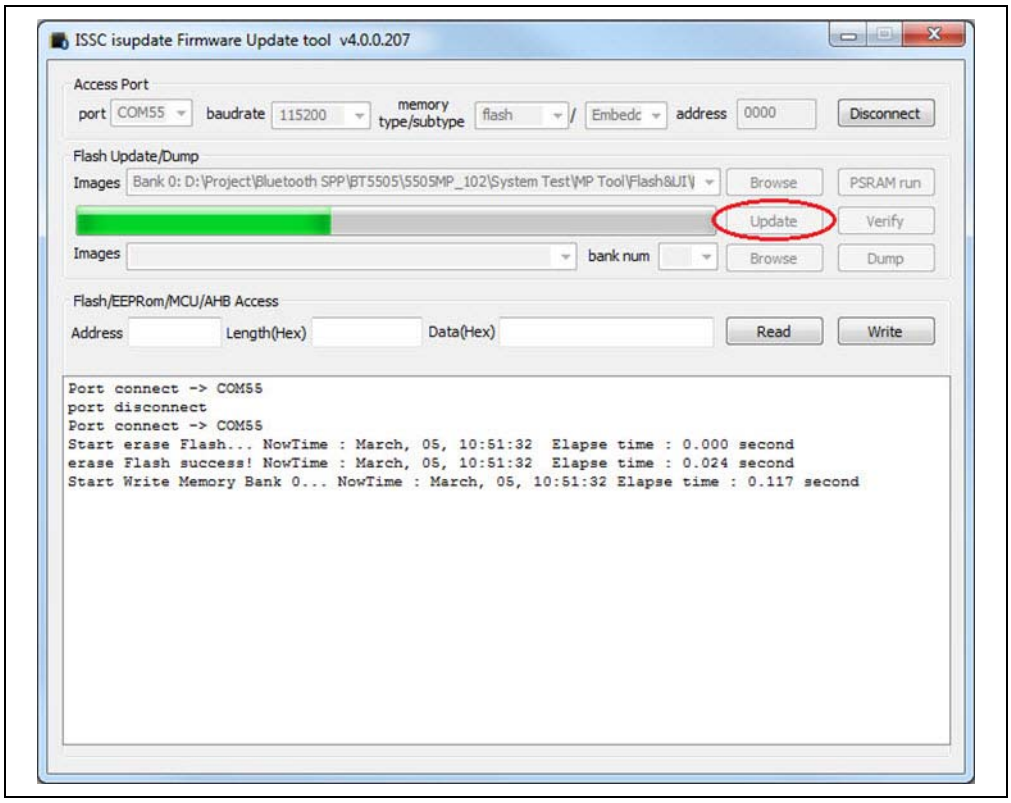
Note: In this demonstration, the BLEDK3 v1.03 is used.

FIGURE 4-5: SELECTING FLASH CODE FILES



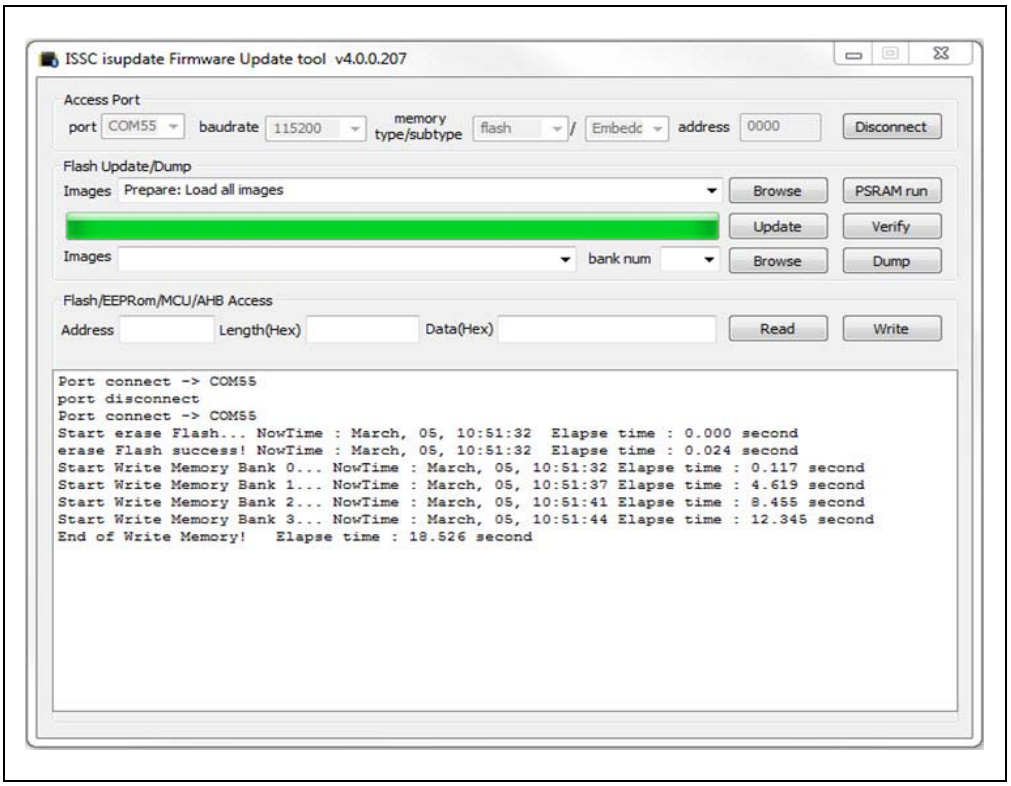
10. In the Firmware Update tool window, click **Update**, see Figure 4-6.

FIGURE 4-6: FIRMWARE UPDATE



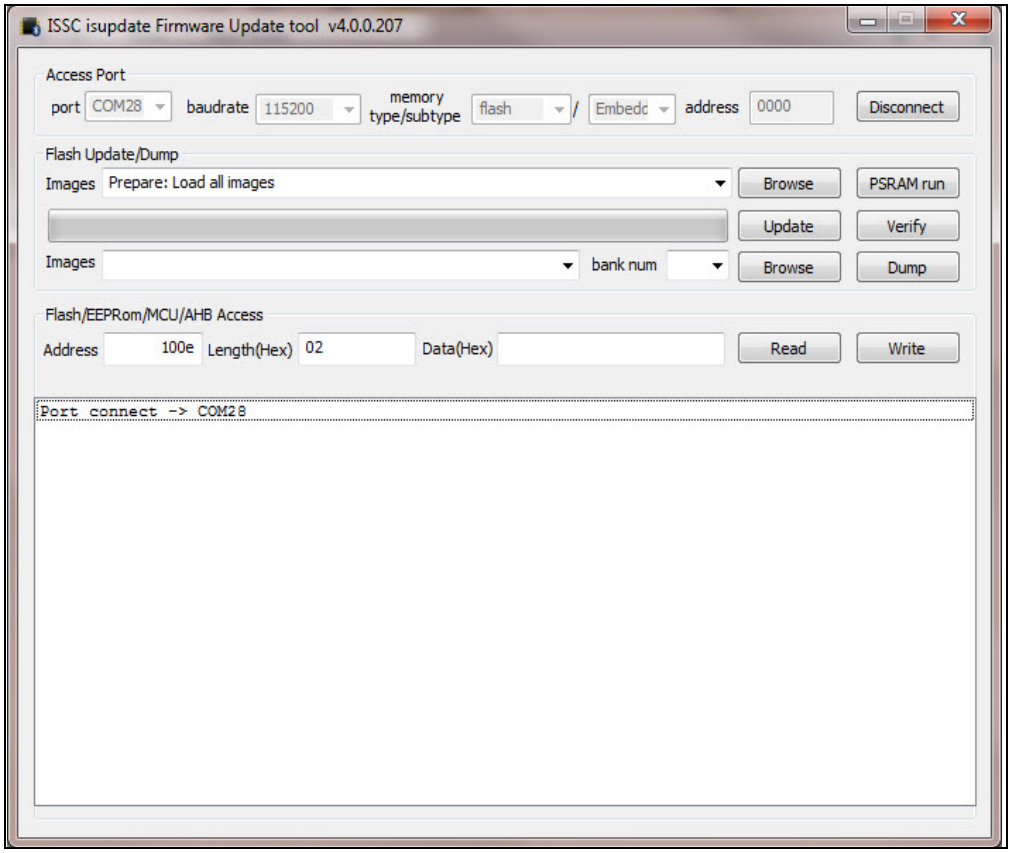
11. The Firmware Update tool will start writing the Flash codes. Wait until the message "End of Write Memory!" with the elapse time is displayed, see Figure 4-7.

FIGURE 4-7: FIRMWARE UPDATE FINISH



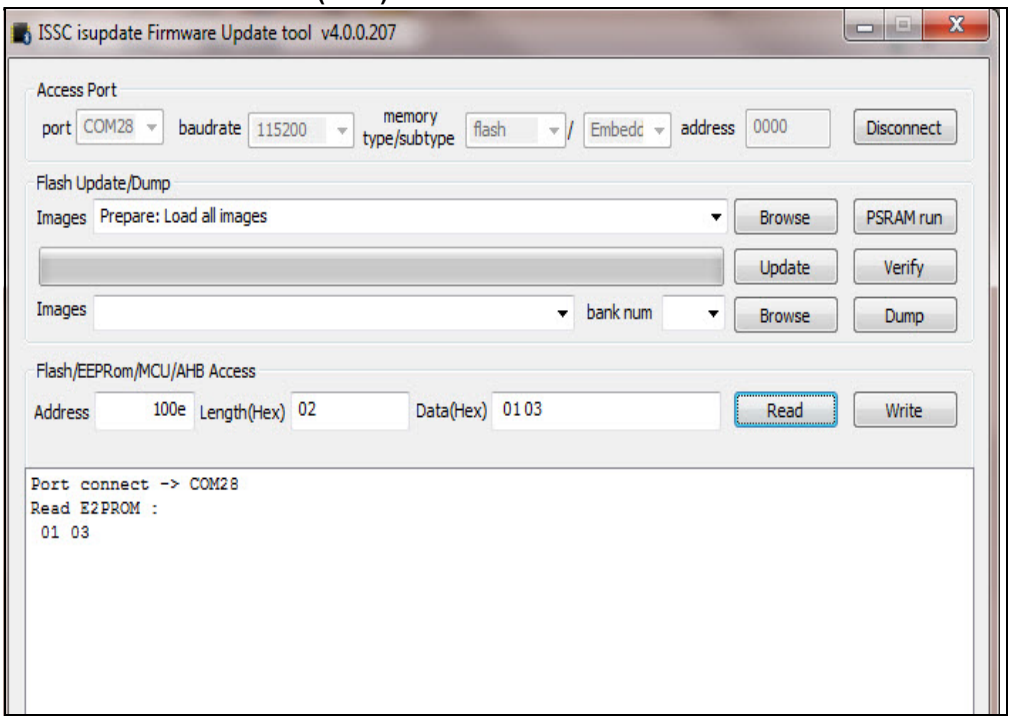
12. To verify the firmware version, enter the following parameters under the Flash/EEPROM/MCU/AHB Access section, and then click **Read**, see Figure 4-8:
    - Address: “100e”
    - Length (Hex): “02”

FIGURE 4-8: ENTERING PARAMETERS



13. The Data (Hex) box will display the value "01 03" along with the related log information, see Figure 4-9.

FIGURE 4-9: DATA (HEX) VALUE



14. After completing the firmware update, reboot the BM70 EVB using the Reset button (SW5).

Chapter 5. USB-to-UART Converter and Host DUT

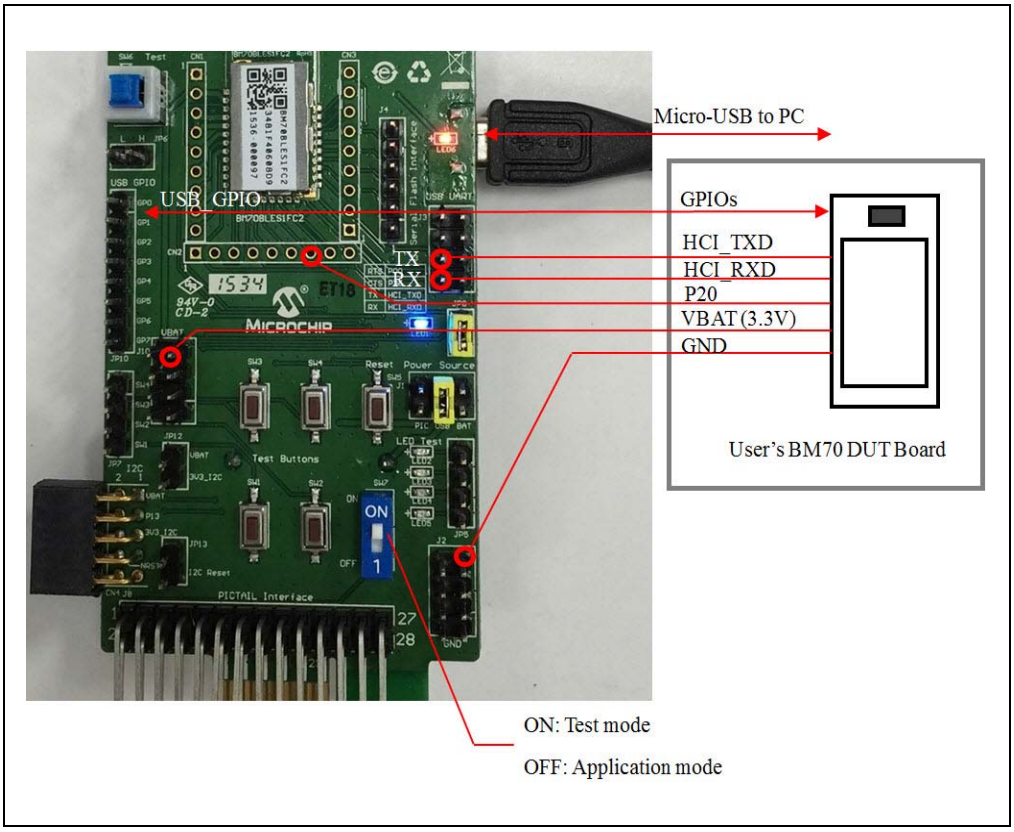
This chapter describes the use of the USB-to-UART converter circuit which is available on the BM70 EVB. The UART interface of the BM70 module on the BM70 EVB can be connected to the user DUT. The DUT can be a customer board with a host microcontroller or another BM70 EVB.

5.1 CONNECTING UART TO BM70 EVB DUT

The BM70 EVB has a MCP2200 IC acting as a USB-to-UART converter that connects the BM70 module to the micro-USB port. The BM70 EVB also has a range of header pins that connect to the UART I/O pins of the BM70 module. This gives the flexibility to connect the USB-to-UART converter on the BM70 EVB to another BM70 DUT, or connect the BM70 EVB test pins directly to another host microcontroller DUT.

Figure 5-1 illustrates how to connect the USB-to-UART converter on the BM70 EVB to the user BM70 DUT. The pins, HCI_TXD, HCI_RXD, P2_0, VBAT, GPIO and GND, are connected to the DUT. The user can connect a micro-USB cable to a PC and perform the emulation tool functions, such as firmware or UI update. The P2_0 pin is connected to the switch SW7 to switch between Application and Test modes.

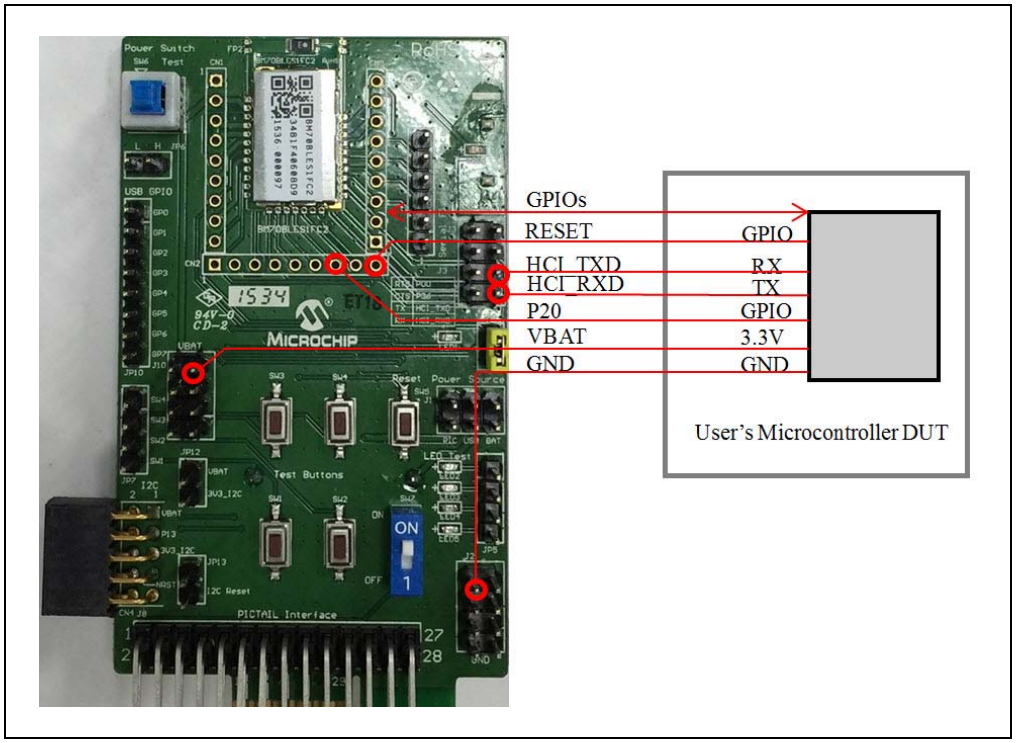
FIGURE 5-1: UART CONNECTION TO BM70 EVB DUT



5.2 CONNECTING UART TO HOST MICROCONTROLLER DUT

Figure 5-2 illustrates how to connect a user microcontroller DUT to a BM70 EVB to perform the emulation tool function. The pins, HCI_TXD, HCI_RXD, P2_0, VBAT, RESET, GPIO, and GND, are connected to the DUT. In this connection, the microcontroller can communicate with the BM70 EVB through the HCI UART interface by a defined command set. The P2_0 pin is controlled by the MCU to switch between Application and Test modes.

FIGURE 5-2: UART CONNECTION TO HOST MICROCONTROLLER DUT



Appendix A. Schematics

A.1 REFERENCE SCHEMATICS

FIGURE A-1: BM70 EVB SCHEMATICS

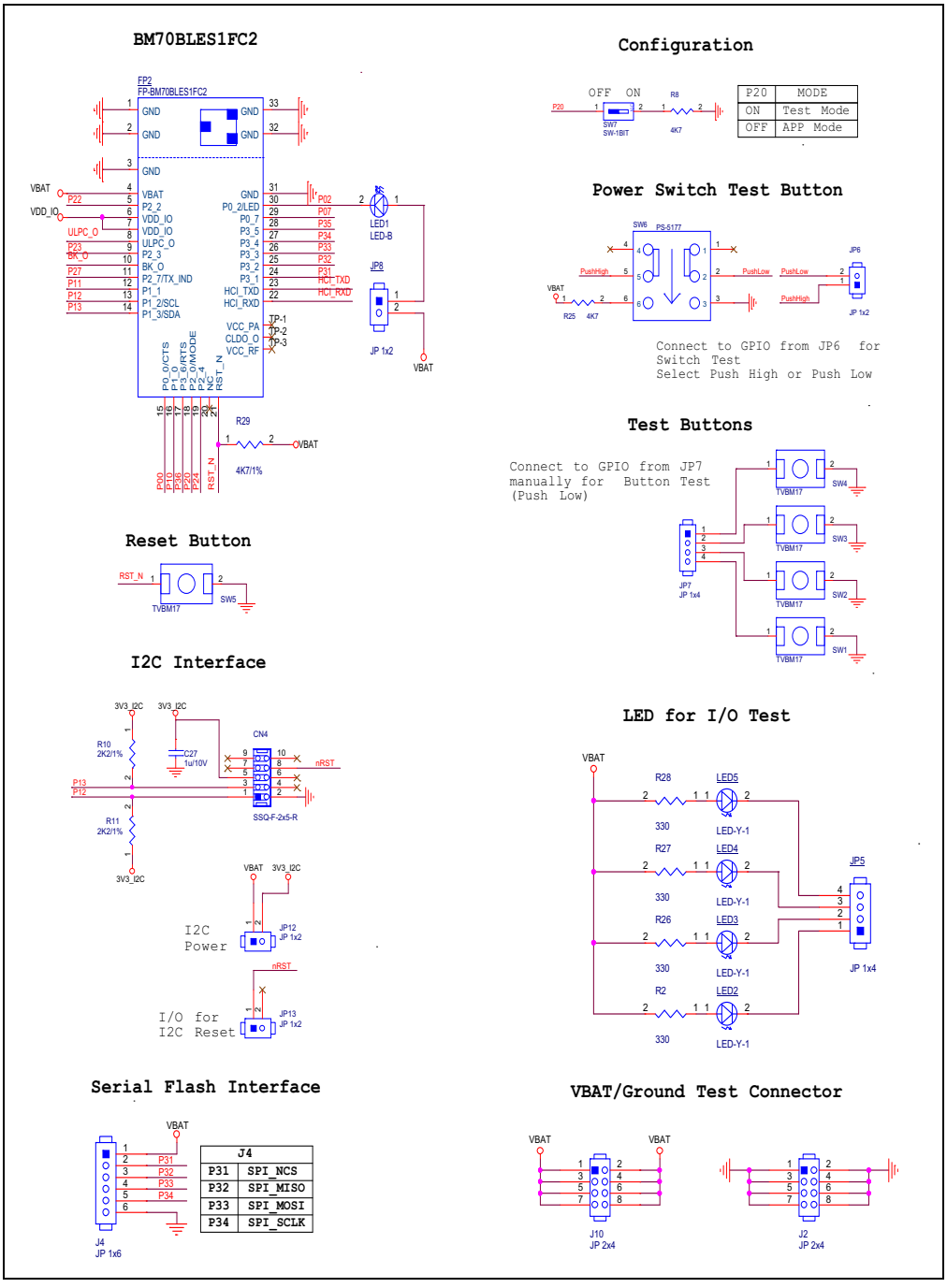
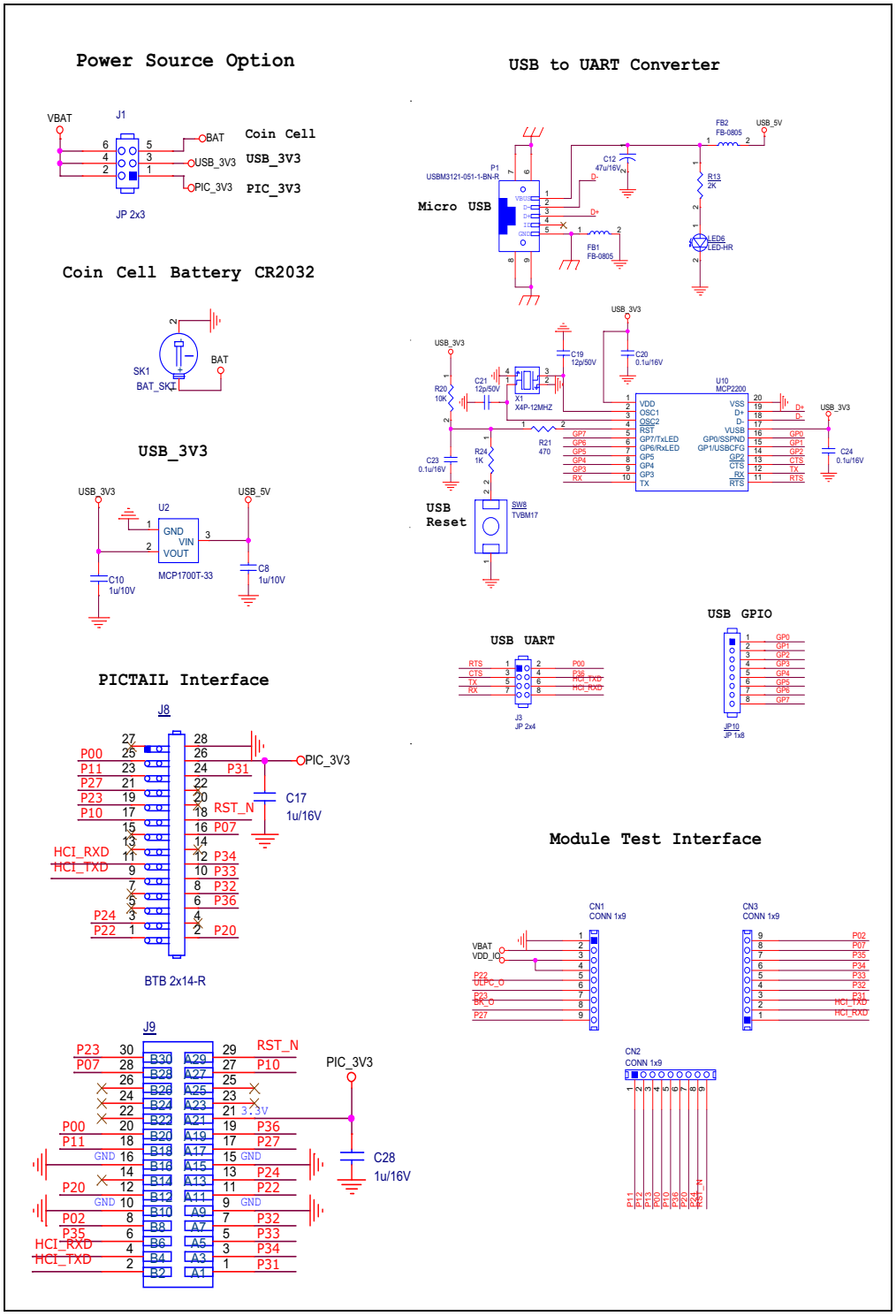


FIGURE A-2: BM70 EVB SCHEMATICS



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