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**BM78 Evaluation Board (EVB)  
User's Guide**

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## Preface

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### 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](http://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 will be useful to know before using the BM78 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 BM78 EVB (also referred to as “Evaluation kit”) 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 and features of the BM78 EVB.
- **Chapter 2. “Hardware”** provides hardware details of the BM78 EVB.
- **Chapter 3. “Getting Started With BM78 EVB”** describes how to establish Bluetooth serial data connection using the BM78 EVB.
- **Appendix A. “Reference Schematics”** provides the BM78 EVB reference schematics.

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

### DOCUMENTATION CONVENTIONS

| Description                                      | Represents   | Examples  |
|--|--|---|
| Italic characters                                | Referenced books   | <i>MPLAB IDE User's Guide</i>   |
|  | Emphasized text  | ...is the <i>only</i> 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  | <u><i>File &gt; Save</i></u>  |
| Bold characters                                  | A dialog button  | Click <b>OK</b>   |
|  | A tab  | Click the <b>Power</b> 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'   |
| <i>Italic Courier New</i>                        | A variable argument  | <i>file.o</i> , where <i>file</i> can be any valid filename   |
| Square brackets [ ]                              | Optional arguments   | mcc18 [options] <i>file</i> [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)<br>{ ...<br>}  |
| 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. | <b>Note:</b> This is a standard note box.   |
|  |  | <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p><b>CAUTION</b></p> <p><b>This is a caution note.</b></p> </div> <p><b>Note 1:</b> This is a note used in a table.</p> |

## RECOMMENDED READING

This user's guide describes how to use the Evaluation kit. The following Microchip documents are available and recommended as supplemental reference resources.

### **BM78 Data Sheet (DS60001380)**

Refer to this document for detailed information on the BM78 module. Reference information found in this data sheet includes:

- BM78 Module features and pin configurations
- Electrical Specifications
- Reference Circuits

### **IS1678 Data Sheet (DS60001386)**

Refer to this document for detailed information on the IS1678 SoC. Reference information found in this data sheet includes:

- IS1678 SoC features and pin configuration
- Electrical characteristics
- Reference Circuits

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listings
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- **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
- **Programmiers** – The latest information on Microchip programmers including the PICkit™ 3 development programmer

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

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



## DOCUMENT REVISION HISTORY

### Revision A (January 2016)

This is the initial released version of this document.

NOTES:

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## Chapter 1. Introduction

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Thank you for purchasing a BM78 Evaluation Kit. This document describes a detailed information about the Microchip Technology BM78 Evaluation Board (EVB).

The BM78 EVB enables the user to evaluate and demonstrate the functionalities of the Microchip BM78 dual-mode Bluetooth® module. The BM78 EVB includes an integrated configuration and programming interface for plug-and-play capability. It also includes on board connection and data status LEDs which enable rapid prototyping and quicker time to market.

Along with the BM78 EVB, software applications are provided to demonstrate the Bluetooth data connections to the on board BM78 module and optionally configuring it.

The demonstration softwares are as follows:

- Android™ Bluetooth Chat (BtChat) Application, Serial Port Profile (SPP)
- iOS Bluetooth Terminal (BLETR)
- Bluetooth Chat Tool

The configuration softwares are as follows:

- BM78 Configuration Library
- BM78 Configuration User Interface (UI) Tool
- BM78 EEPROM Table Utility

The BM78 EVB can be powered using USB host or through the Microchip PICtail™ Plus interface. The BM78 EVB uses a fully certified Bluetooth 4.2 dual-mode wireless BM78 module that supports Bluetooth classic SPP and BLE by providing Bluetooth serial data connections. The BM78 EVB provides a USB-Universal Asynchronous Receiver/Transmitter (UART) converter allowing flexible interface to host PC, a PC terminal utility, and smart phone Applications to drive both classic SPP and BLE data connections.

Additionally, the BM78 EVB also provides the PICtail and PICtail Plus interfaces to be able to interface with the Microchip PIC MCUs using standard Microchip development tools.

This chapter includes the following topics:

### **1.1 “Kit Contents”**

### **1.2 “BM78 EVB Functionality”**

### **1.3 “BM78 EVB Features”**

### **1.4 “PICtail Plus Interface”**

## 1.1 KIT CONTENTS

The BM78 EVB Evaluation kit contains the following items:

- EVB PCB
- BM78 Module (BM78SPPS5MC2/NC2)

**Note:** If you are missing any part of the Evaluation 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 BM78 EVB FUNCTIONALITY

The following are key features of the BM78 EVB.

- Transparent serial data connection over Bluetooth classic SPP and BLE transparent serial data service
- Automatic configuration mode for quick setup (default)
- Manual configuration mode where the MCU can access configuration settings
- Configuration settings stored in the internal EEPROM of the BM78 module
- On board dip switch block to set operating modes
- PICtail and PICtail Plus interfaces to fully access the BM78 module using an external PIC MCU
- Embedded USB-to-UART converter to enable application mode and programming interface to update firmware and configuration settings

## 1.3 BM78 EVB FEATURES

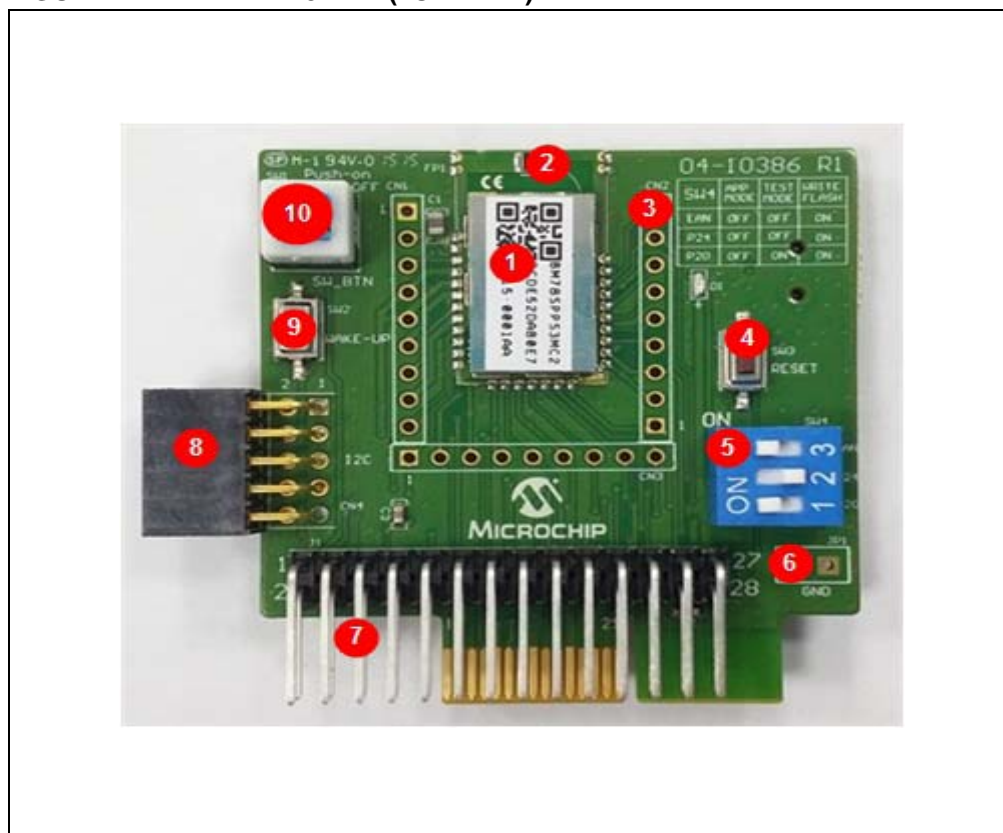
Representations of the layout of the BM78 EVB are shown in [Figure 1-1](#) and [Figure 1-2](#).

The top assembly of the BM78 EVB includes these key features, as indicated in [Figure 1-1](#):

1. FP1 – BM78 module (BM78SPPS5MC2/NC2).
2. On board antenna – Mounted on the BM78 module.
3. CN2 – Header that brings out the BM78 module pins.
4. SW3 – Reset button.
5. SW4 – Mode Switch.
6. JP1 – Ground (GND) test points.
7. J1 – PICtail interface.
8. CN4 – I<sup>2</sup>C expansion port.
9. SW2 – Wake-up button.
10. SW1 – Button to SW\_BTN pin.

For detailed information on these features, refer to **Chapter 2. “Hardware”**.

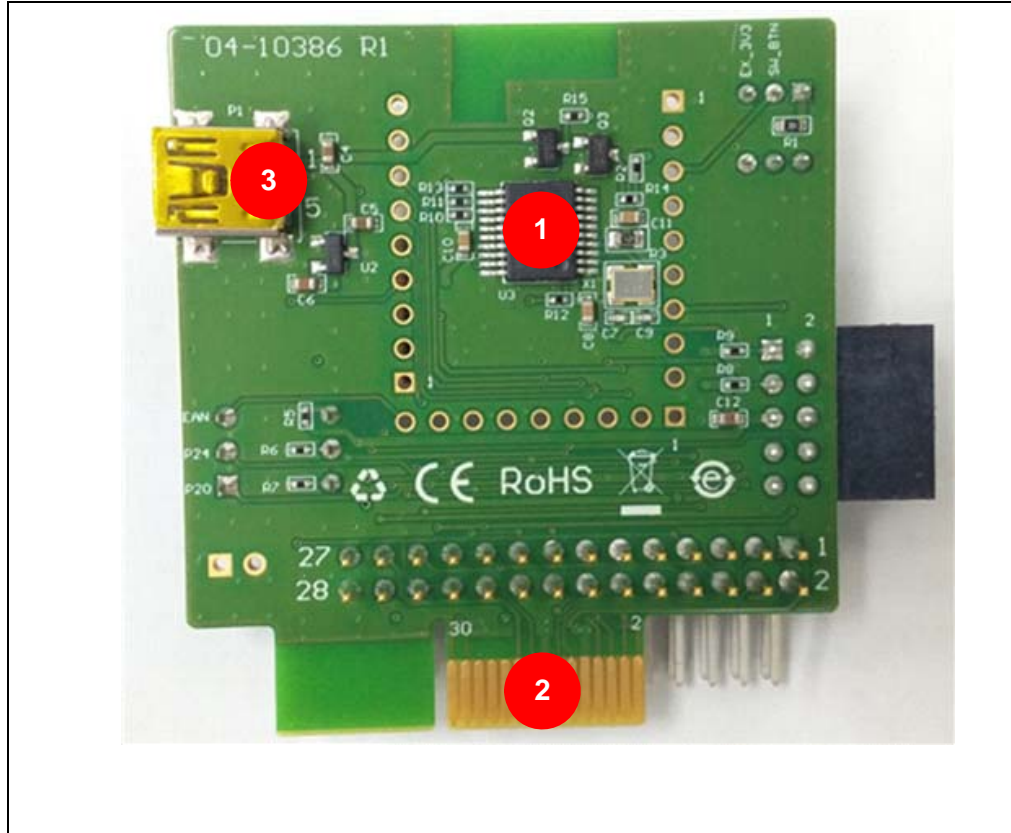
**FIGURE 1-1: BM78 EVB (TOP VIEW)**



The bottom assembly of the BM78 EVB includes these key features, as indicated in Figure 1-2:

1. U3 – Microchip MCP2200 chip, USB-to-UART serial converter.
2. J2 – PICTail Plus interface.
3. P1 – Mini-B USB connector.

**FIGURE 1-2: BM78 EVB (BOTTOM VIEW)**



### 1.3.1 USB-to-UART Serial Converter

The BM78 EVB consists of a USB-to-UART converter that enables flexible interface to a host computer, a computer terminal utility, and smart phone applications to drive both classic SPP and BLE data connections. The UART port on the BM78 is exposed through a MCP2200 USB-to-UART converter for easy interfacing with a host computer.

On the BM78 EVB, connecting the mini-B USB receptacle (P1) to the USB port of a computer enumerates the BM78 module as a Composite Device Class (CDC) USB device for serial communication. After the MCP2200 enumerates, a dedicated COM port is assigned to the host computer for serial communication with the BM78 module on the BM78 EVB. A computer terminal utility or application can open the assigned COM port and connect to the UART port for serial data transfer or to configure and control the BM78 module. If the MCP2200 does not enumerate, the user must download the MCP2200 drivers and install it from the following location: [www.microchip.com/MCP2200](http://www.microchip.com/MCP2200).

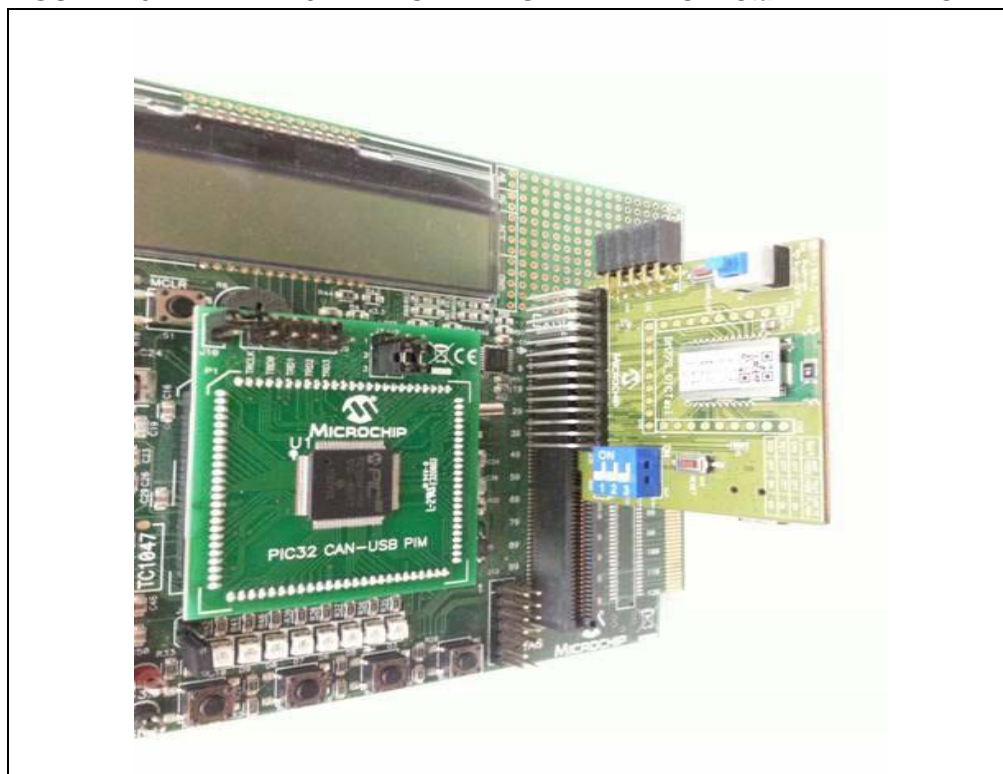
## 1.4 PICtail PLUS INTERFACE

Using the PICtail Plus (J2) or PICtail (J1) interface, the BM78 EVB can be plugged into any standard Microchip development board, for example, Explorer 16 Development Board (DM240001) or the PIC18 Explorer Board (DM183032) which supports the PICtail Plus or PICtail interface. This interface provides access to the UART port and control and General Purpose Input/Output (GPIO) pins on the BM78 module.

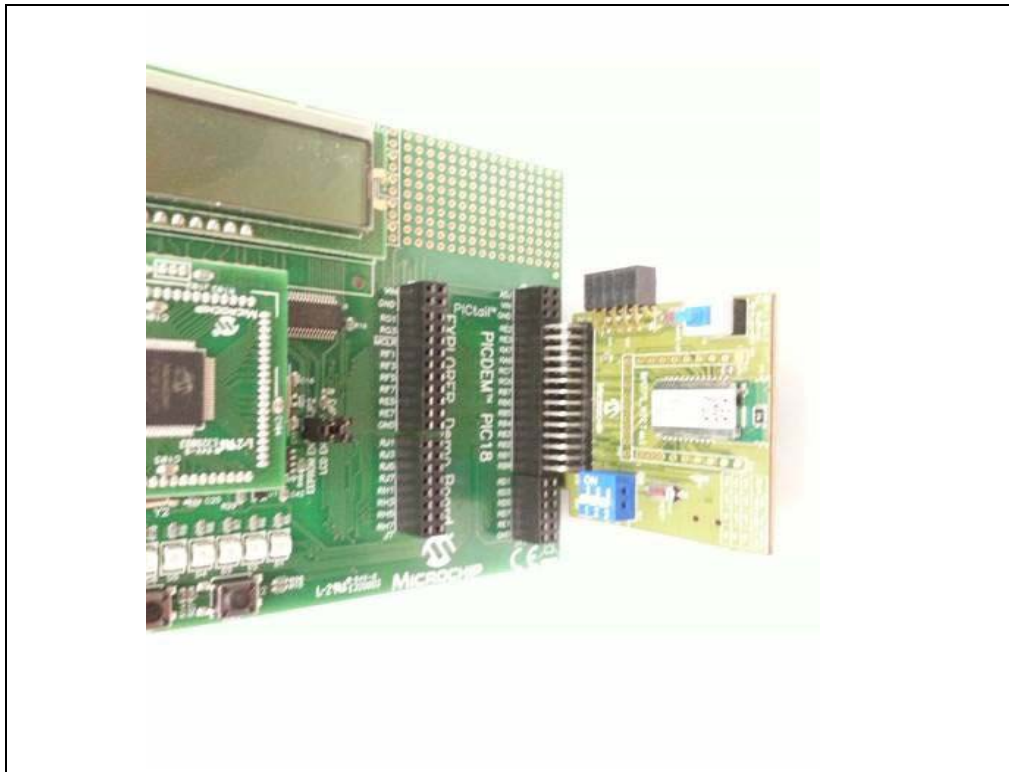
The PICtail Plus or PICtail interface can be used to configure the BM78 module by updating the Bluetooth parameters residing on the internal EEPROM and the BM78 module firmware on the internal Flash, and put the BM78 module into Application mode. In Application mode, pairing procedure can be performed on the BM78 EVB followed by establishing a Bluetooth connection for SPP or BLE data transfer.

Figure 1-3 and Figure 1-4 show the BM78 EVB is inserted into PICtail and PICtail Plus interfaces.

**FIGURE 1-3: BM78 EVB BOARD INSERTED INTO PICtail™ INTERFACE**



**FIGURE 1-4: BM78 EVB BOARD INSERTED INTO PICtail™ Plus INTERFACE**



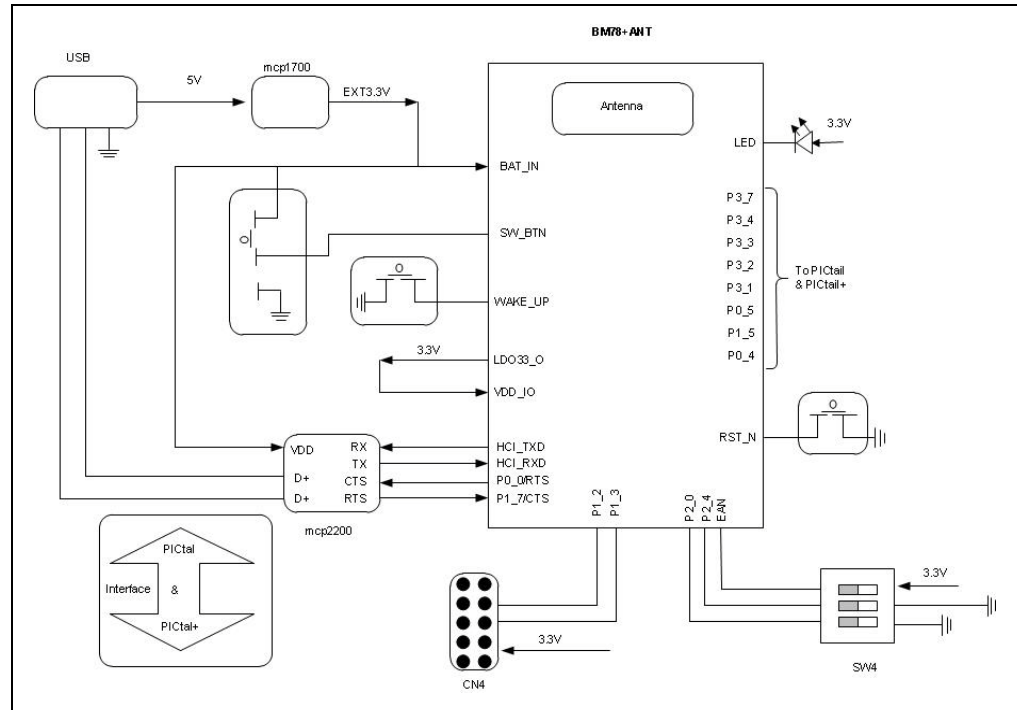
**Note:** Ensure that the BM78 module on the BM78 EVB is facing the PIC Plug-In Module (PIM) while inserting the BM78 EVB board into either of the EVB headers.



## Chapter 2. Hardware

This chapter describes the hardware features of the BM78 EVB. The BM78 EVB includes a range of peripheral features as shown in [Figure 2-1](#).

**FIGURE 2-1: BM78 EVB BLOCK DIAGRAM**



### 2.1 HARDWARE FEATURES

The following key features of the BM78 EVB are provided in the order given in the [Figure 1-1](#).

#### 2.1.1 Power Supply

Users can supply power to the BM78 EVB using any one of the following options:

- USB\_5V which can be converted to 3V3 by MCP1700
- PICtail 3V3

#### 2.1.2 USB connectivity

The BM78 EVB provides mini-USB cable connectivity.

## 2.1.3 Switches

Push-button switches provide the following functionalities:

- SW1 – Push on/off switch button
- SW2 – Wake-up switch to wake up the module from deep-sleep state
- SW3 – Reset button for the BM78 module
- SW4 – Mode switch

[Table 2-1](#) and [Table 2-2](#) provide the details of the SW1 and SW4 switches.

**Note:** The SW\_BTN/SW1 button must be pressed to wake-up the BM78 module.

**TABLE 2-1: SWITCH SW1 DETAILS**

| Part Number | Pin | Signal  | Pin Description                             |
|-------------|-----|---------|---|
| SW1         | 1   | GND     | Connects 20 Kohm pull-down resistance       |
|             | 2   | SW_BTN  | BM78 SW_BTN pin                             |
|             | 3   | EXT_3V3 | Power source from USB 5V to 3.3V LDO output |
|             | 4   | NC      | NC  |
|             | 5   | NC      | NC  |
|             | 6   | NC      | NC  |

**TABLE 2-2: SWITCH SW4 DETAILS**

| Part Number | Pin | Signal | Pin Description  |
|-------------|-----|--------|--|
| SW4         | 1   | P2_0   | P2_0 (pin 18), in the ON state, is connected with 4.7 kohm to GND. |
|             | 2   | P2_4   | P2_4 (pin 19), in the ON state, is connected with 4.7 kohm to GND. |
|             | 3   | EAN    | EAN (pin 20), in the ON state, is connected with 10 ohm to VDD_IO. |

Table 2-3 provides the switch positions of the BM78 EVB.

**TABLE 2-3: BM78 EVB SWITCH POSITIONS**



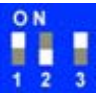


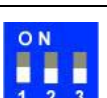
| Switch Position   | Switch Number | 1   | 2   | 3   |
|---|---------------|---|---|---|
|  | Pin Names     | P2_0  | P2_4  | EAN   |
|   | ON State      | Low   | Low   | High  |
|   | Pin Functions | Test Mode<br>High = Application Mode<br>Low = Test Mode | Flash Write<br>High = Flash Write Enable<br>Low = Flash Write Disable | Boot by Flash or ROM<br>High = Boot from ROM<br>Low = Boot from Flash |

Table 2-4 provides the mode and switch positions for the BM78 EVB.

**TABLE 2-4: BM78 EVB MODE SWITCH POSITIONS**

| Mode  |                       | Switch Positions  | PIN Definition |        |       |
|-------|-----------------------|---|----------------|--------|-------|
|       |                       |   | 1/P2_0         | 2/P2_4 | 3/EAN |
| Flash | Write Flash           |    | ON             | ON     | ON    |
| ROM   | Test (Write EEPROM)   |   | ON             | OFF    | ON    |
|       | Application (default) |  | OFF            | OFF    | ON    |
| Flash | Test (Write EEPROM)   |  | ON             | OFF    | OFF   |
|       | Application (default) |  | OFF            | OFF    | OFF   |

## 2.1.4 LED

The BM78 EVB contains one LED (D1) which displays the connection status.

## 2.1.5 Jumpers

Table 2-5 describes the pin, signal, and pin description of the Jumper J1.

**TABLE 2-5: GROUND TEST CONNECTOR**

| Part Number | Pin | Signal | Pin Description |
|-------------|-----|--------|-----------------|
| J1          | 1   | GND    | Ground Test Pin |
|             | 2   | GND    | Ground Test Pin |

## 2.1.6 Ports

The [Table 2-6](#) provides the CN4-I<sup>2</sup>C expansion port details.

**TABLE 2-6: CN4-I<sup>2</sup>C EXPANSION PORT DETAILS**

| Part Number | Pin | Signal   | Pin Description                           |
|-------------|-----|----------|---|
| CN4         | 1   | P1_2/SCL | BM78 P1_2 (pin 13) and its SCL function   |
|             | 2   | GND      | Ground Pin                                |
|             | 3   | P1_3/SDA | BM78 P1_3 (pin 14) and its SCL function   |
|             | 4   | NC       | NC  |
|             | 5   | INT_3V3  | Connect BM78 VDD_I/O                      |
|             | 6   | NC       | NC  |
|             | 7   | NC       | NC  |
|             | 8   | P3_6     | BM78 P3_6 (pin 28) and its Reset function |
|             | 9   | NC       | NC  |
|             | 10  | NC       | NC  |

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## Chapter 3. Getting Started

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This chapter describes how to establish Bluetooth serial data connection using the BM78 EVB over USB-to-UART MCP2200 interface. It also demonstrates the basic data capabilities and interoperability of the BM78 EVB with other Bluetooth devices.

**Note:** In this demonstrations, the BM78 EVB is a Bluetooth slave waiting for a connection to be initiated by the Bluetooth master device.

This chapter covers the following topics:

**Section 3.1 “Prerequisites”**

**Section 3.2 “Using BM78 EVB in usb-to-Uart Serial Interface Mode”**

**Section 3.3 “Using BM78 EVB in PICtail Interface Mode”**

### 3.1 PREREQUISITES

The following hardware and software are required for getting started with the BM78 EVB.

#### 3.1.1 Hardware Requirement

- BM78 EVB
  - Users can procure the BM78 EVB from the Microchip web site: [www.microchipdirect.com](http://www.microchipdirect.com)
- Bluetooth-enabled smart phone or tablet:
  - Android™ device running Android 4.3 or later version
  - iOS: iPhone® 4S or later version, iPad® 3 or later version (it must support BLE)
- Windows® host PC with USB port
- USB-mini cable

#### 3.1.2 Software Requirement

The following applications are available for download from the Microchip web site: [www.microchip.com/BM78](http://www.microchip.com/BM78).

- Bluetooth chat application, `BT Chat.exe`
- Android chat application, `BTChat.apk`
- iOS Terminal `BLETR`, available at Apple Store®
- Bluetooth SPP Pro Application
- MCP2200 driver for windows, available for download at [www.microchip.com/MCP2200](http://www.microchip.com/MCP2200)

## 3.2 USING BM78 EVB IN USB-TO-UART SERIAL INTERFACE MODE

Establishing the connection between Bluetooth classic and BLE data, and transferring data on the BM78 module through the USB-UART serial interface can be performed using a computer terminal utility and a smart phone application.

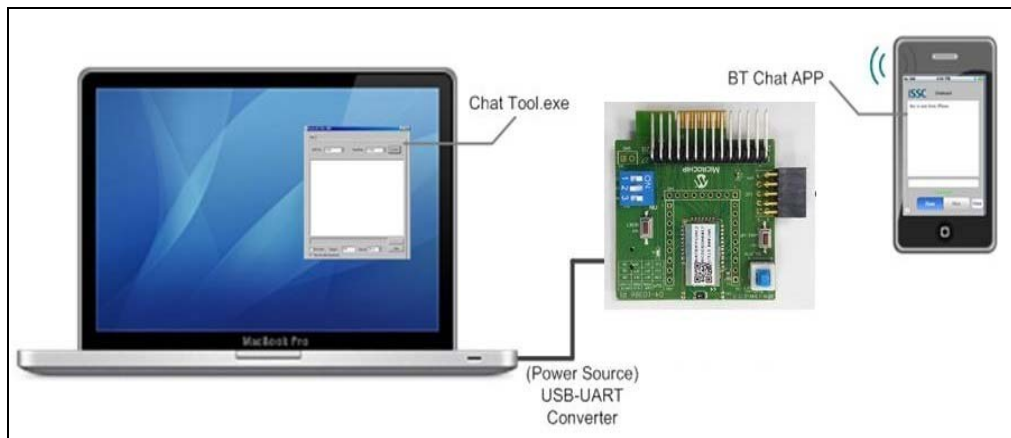
### 3.2.1 Bluetooth SPP demonstration using Android Devices

The host computer runs the Bluetooth chat application and transfers serial data over a COM-port (USB virtual COM-port) to the BM78 EVB which is then transmitted over a Bluetooth connection to the remote Bluetooth host. Please note, a smart phone application is used as a Bluetooth host for the SPP demonstration, see [Figure 3-1](#).

**Note:** For the SPP demonstration, a smart phone or tablet running Android v4.3 or later is required.

A virtual COM port is required when the BM78 EVB is connected to a host computer. If virtual COM port is not available in the Device Manager port list, install the Microchip MCP2200 driver which is available for download from the Microchip web site using the keyword "Microchip MCP2200 Driver".

**FIGURE 3-1: BLUETOOTH SPP CONNECTION TO ANDROID SMART PHONE/TABLET**



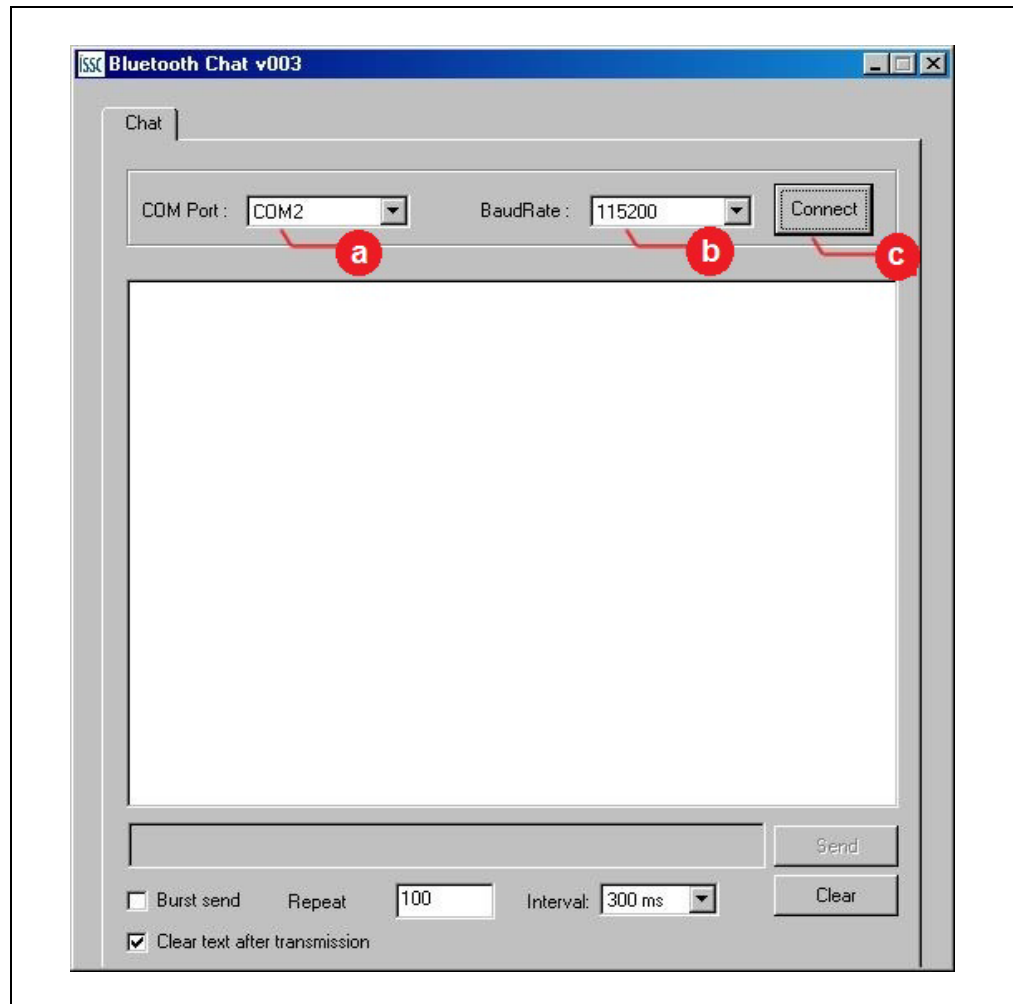
To set up the Bluetooth (SPP) data connection between the Bluetooth Chat application and smart phone application using the BM78 EVB, perform the following actions:

1. Ensure that the BM78 EVB is plugged into the EVB interface of a Microchip development board.
2. Verify the SW4 switch is set to the Application mode (ROM):
  - 1/P2\_0: OFF
  - 2/P2\_4: OFF
  - 3/EAN: ON
3. Verify that the SW1 button is ON (i.e. pushed down).
4. Using the mini-B USB cable, connect the BM78 EVB mini-B USB receptacle (P1) to the host computer USB port to power-up the EVB.
5. The LED1 (D1) display (blue) indicates the connection states as follows:
  - Stand-by state: the LED1 of the EVB will blink once
  - Pairing, connected state: the LED1 will blink twice

**Note:** The LED status can be configured by the UI settings.

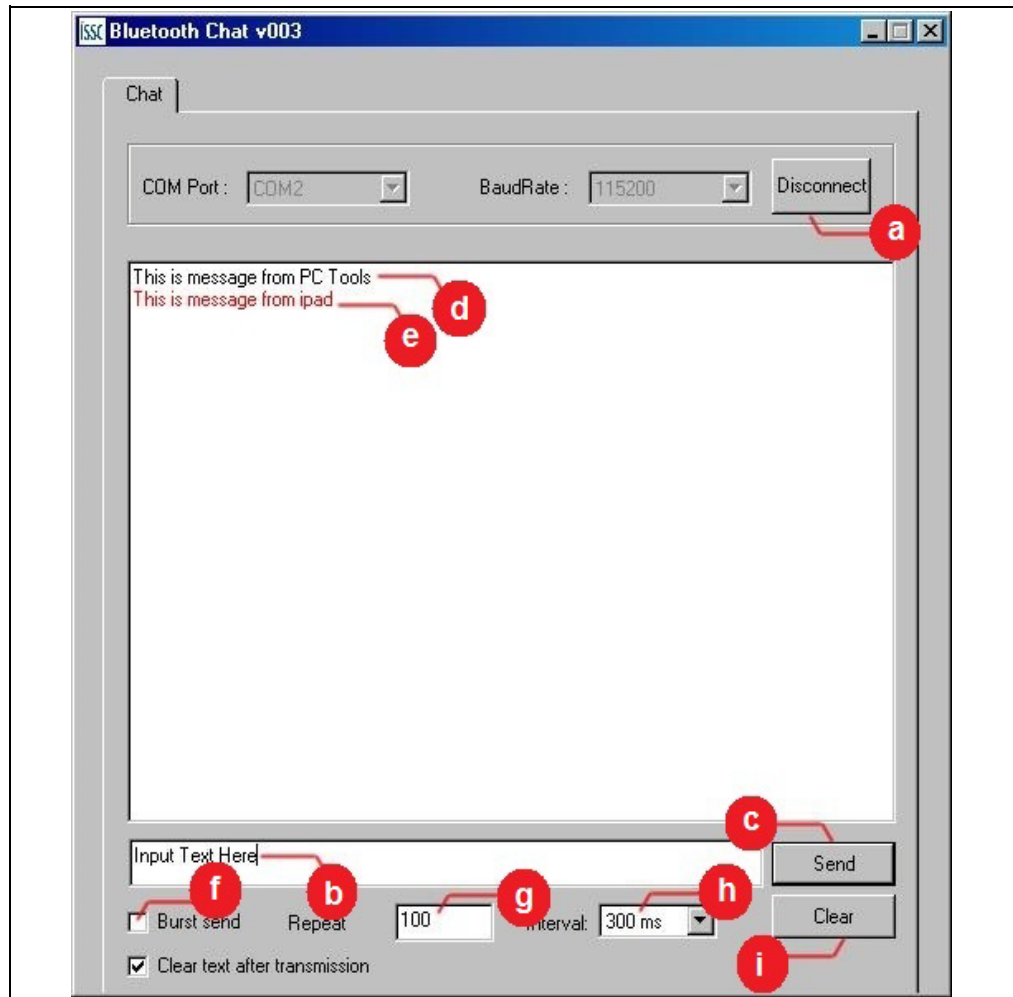
6. Verify whether the virtual COM port is created.
7. Ensure that the COM port is connected and run `BT Chat Tool.exe` on your computer. The Bluetooth Chat Application window is displayed, see [Figure 3-2](#).

**FIGURE 3-2: BLUETOOTH CHAT APPLICATION WINDOW**



8. To transmit and receive a text:
  - Select COM Port which is assigned to the BM78 EVB
  - Select BaudRate (the default value is 115200)
9. Click **Connect**.
10. The Bluetooth Chat window will display the transmitted and received text along with the following options, see [Figure 3-3](#).

**FIGURE 3-3: BLUETOOTH CHAT SHOWING TRANSMITTED AND RECEIVED TEXT**

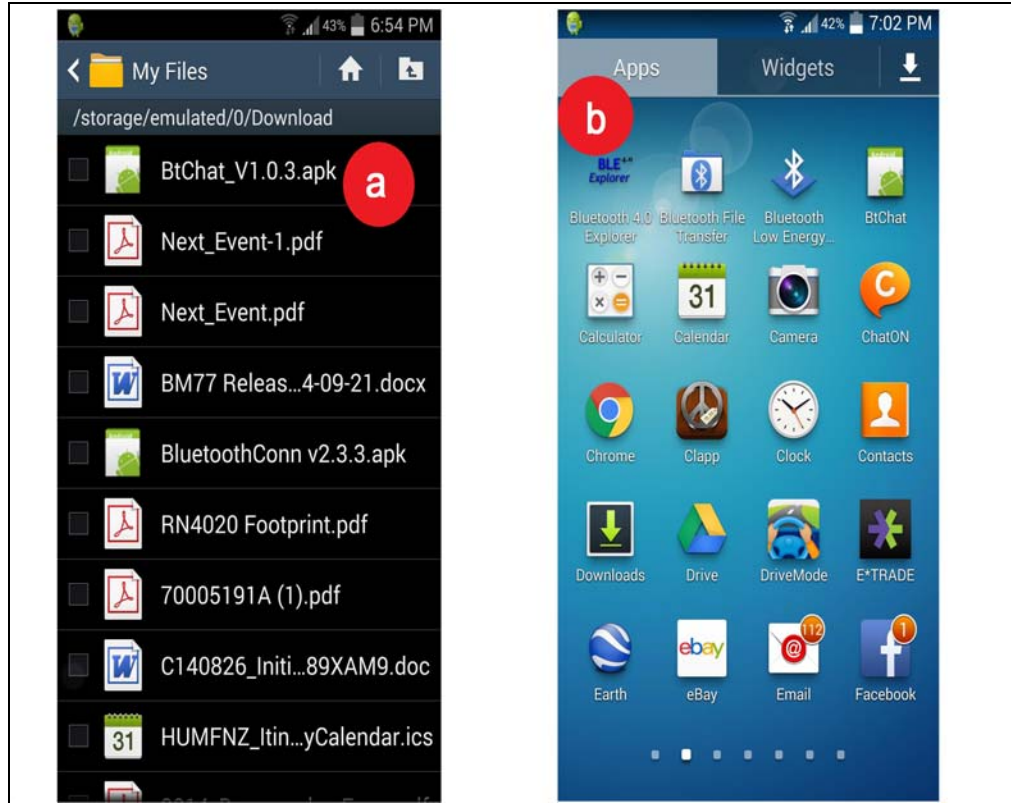


- a) Disconnect button: The button status is changed from the 'Connect' to the 'Disconnected'.
  - b) Text field: To enter the text to transmit.
  - c) Send button: To transmit the text to the smart phone over the BM78 EVB Bluetooth connection.
  - d) Message sent from the computer application (Bluetooth EVB) to the smart phone.
  - e) Message sent from the smart phone to the computer tool (BM78 EVB).
  - f) Burst send: Select this check box to send a text repeatedly from this application.
  - g) Repeat: Specify the number of times the text needs to be resent.
  - h) Interval: Choose the interval between two resends.
  - i) Clear: Press this button to clears the text from the text box.
11. Install the Bluetooth Chat application on the Android device by copying or downloading the `BtChat.apk` file. The `BtChat.apk` file can be copied to the Android device by using an SD card to transfer the files or by connecting the Android device to the host computer, wherein the Android device mounts as an external USB drive. Please note, Android MTP is required on the host computer.
12. After the `BtChat.apk` file is copied onto the Android device, perform the following actions:



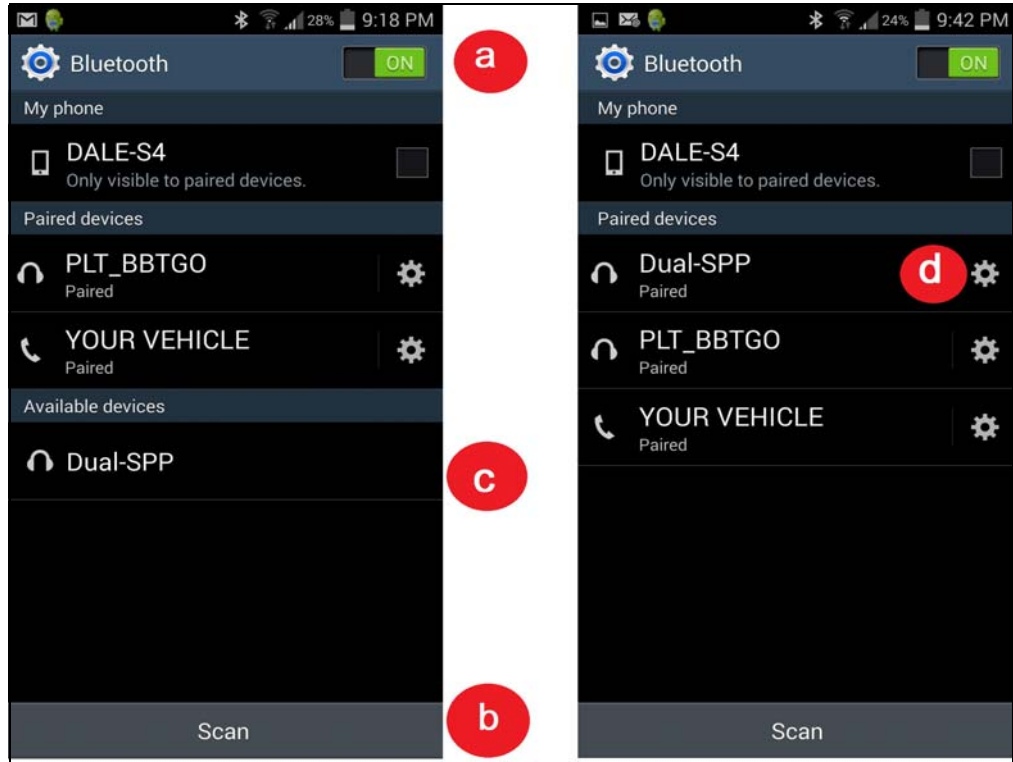
- a) Tap 'Open File' to install "My Files" application from the File Manager. During installation, ensure that the "Unknown Sources" is enabled in the Device Security settings, see [Figure 3-4](#).
- b) After the installation, the BtChat application icon is displayed in the application view.

**FIGURE 3-4: FILE MANAGER VIEW AND BtChat APPLICATION ICON**



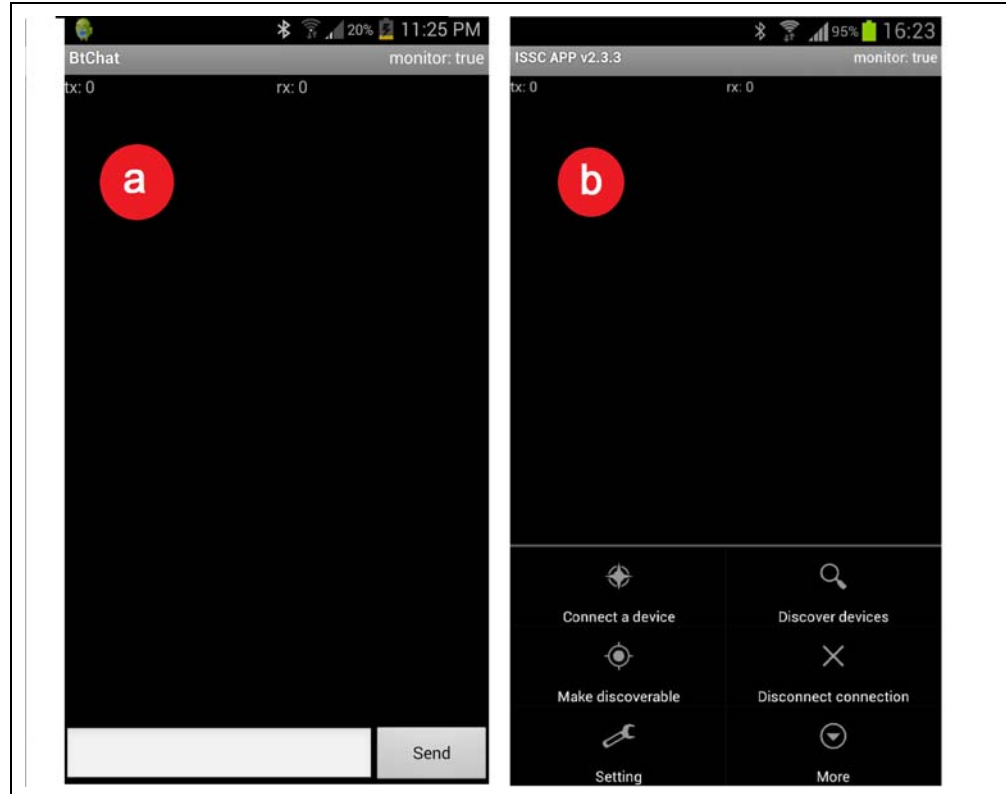
13. To pair the BM78 EVB with the Android device, perform the following actions, see [Figure 3-5](#).
- a) On the Android device, go to *Settings > Bluetooth* and then turn on the Bluetooth by dragging **ON**.
  - b) Tap **Scan** to initiate the Bluetooth device scan.
  - c) Locate the Dual -SPP device (BM78 EVB) and then tap **Start** to start the pairing.
  - d) Once paired, the Dual-SPP device is listed in the paired devices list.

**FIGURE 3-5: BtChat SHOWING PAIRED DEVICE LIST**



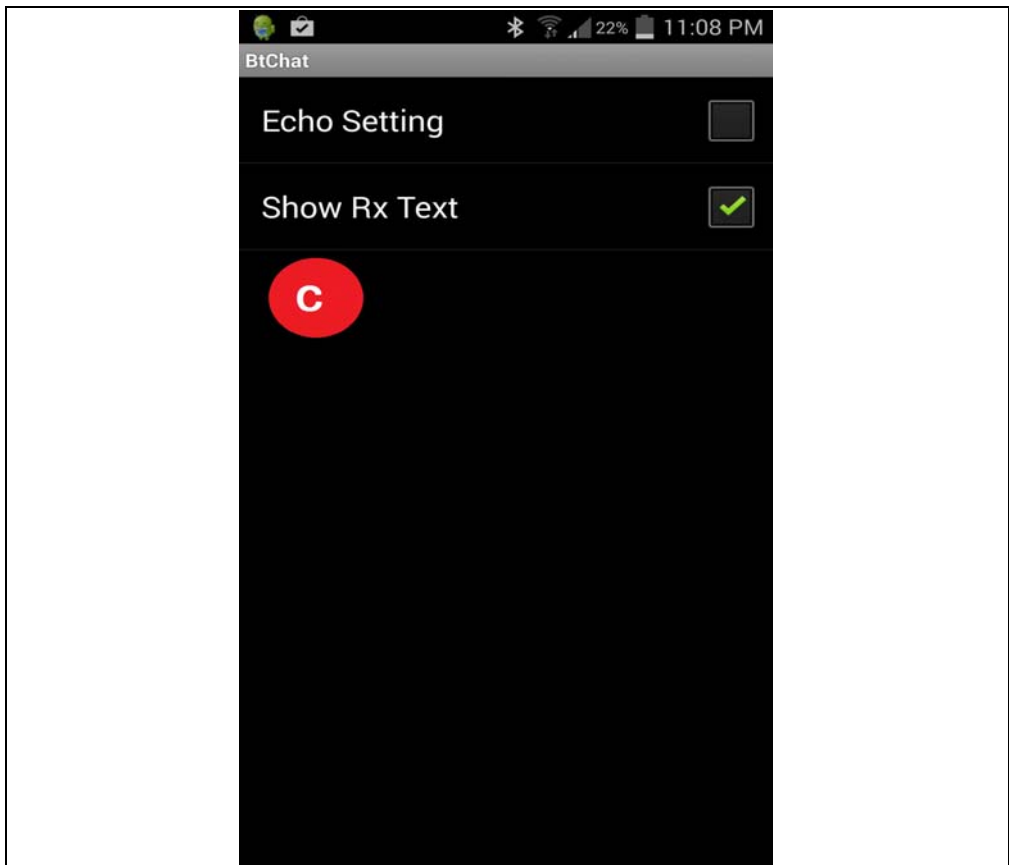
14. To launch the BtChat application on the Android device, follow these steps:
  - a) From the BtChat main window, use the Android menu to open the BtChat menu, [Figure 3-6](#).
  - b) Tap **Setting** to open the Application Settings.

**FIGURE 3-6: BtChat MENU**



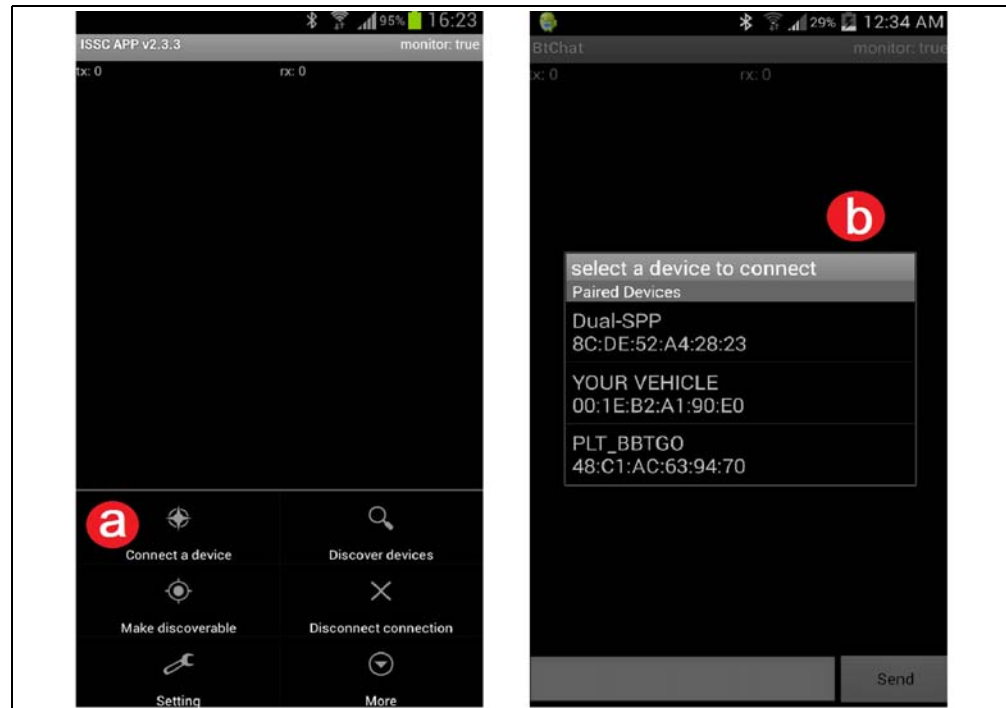
- c) Enable **Show Rx Text** option to display the received text in the application, see [Figure 3-7](#).
- d) Tap **Back** to return to the main window.

**FIGURE 3-7: BtChat APPLICATION SETTINGS**



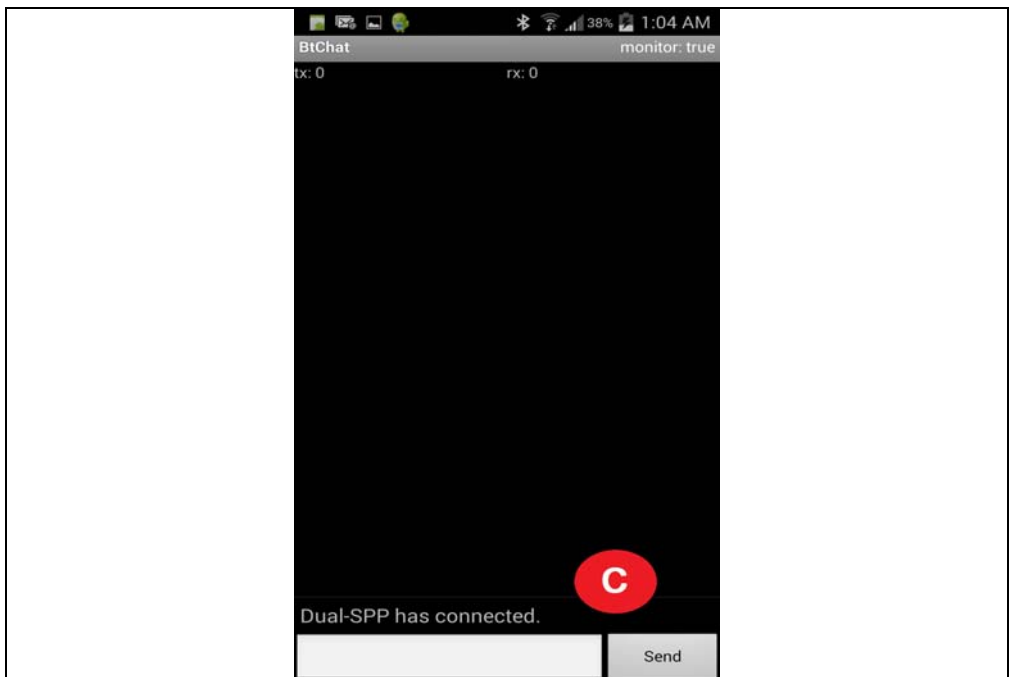
15. To set up the Bluetooth SPP connection to the BM78 EVB, follow these steps, see [Figure 3-9](#).
  - a) From the Bluetooth Chat Application main screen, tap the Android menu to open the Bluetooth Chat menu options and Tap **Connect a device** to open the Paired Devices list.
  - b) Tap **Dual-SPP** to open an SPP connection to the BM78 EVB.

**FIGURE 3-8: BtChat SHOWING DUAL SPP**



- c) After the connection is established, the status message "Dual SPP has connected" will be displayed on the main window, see [Figure 3-9](#).

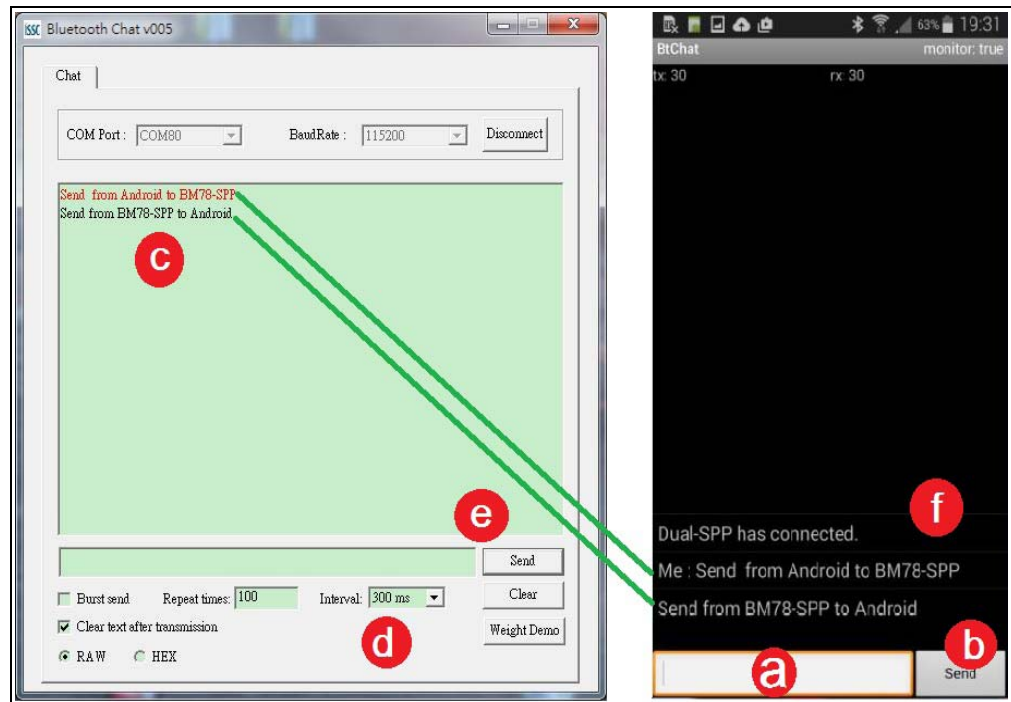
**FIGURE 3-9: BtChat SHOWING DUAL SPP CONNECTION MESSAGE**



16. [Figure 3-10](#) shows the data transfer from the BM78 EVB to the Android device through the Bluetooth SPP connection. To launch the Bluetooth chat application on the host computer and set the correct COM port that corresponds to the BM78 EVB, follow these steps:
  - a) On the BtChat application, enter the text to be sent to the Bluetooth Chat application on the host computer.
  - b) Click **Send** to transmit the text to the BM78 EVB which is connected to the Bluetooth Chat application.
  - c) The received text is displayed on the Bluetooth Chat window.
  - d) In the Bluetooth Chat window, enter the text to be sent to the BM78 EVB.
  - e) Click **Send** to transmit the text.
  - f) The Bluetooth Android application window will display the transmitted messages.

**Note:** The SPP demo can be performed using the Bluetooth SPP Pro Application on the Android devices. It can also work with iOS devices, but it needs Apple® authentication hardware, which connects the I<sup>2</sup>C expansion port and iOS application.

**FIGURE 3-10: BLUETOOTH CHAT WINDOW**



## 3.2.2 Connecting Bluetooth Low Energy (BLE) Data to iOS Device

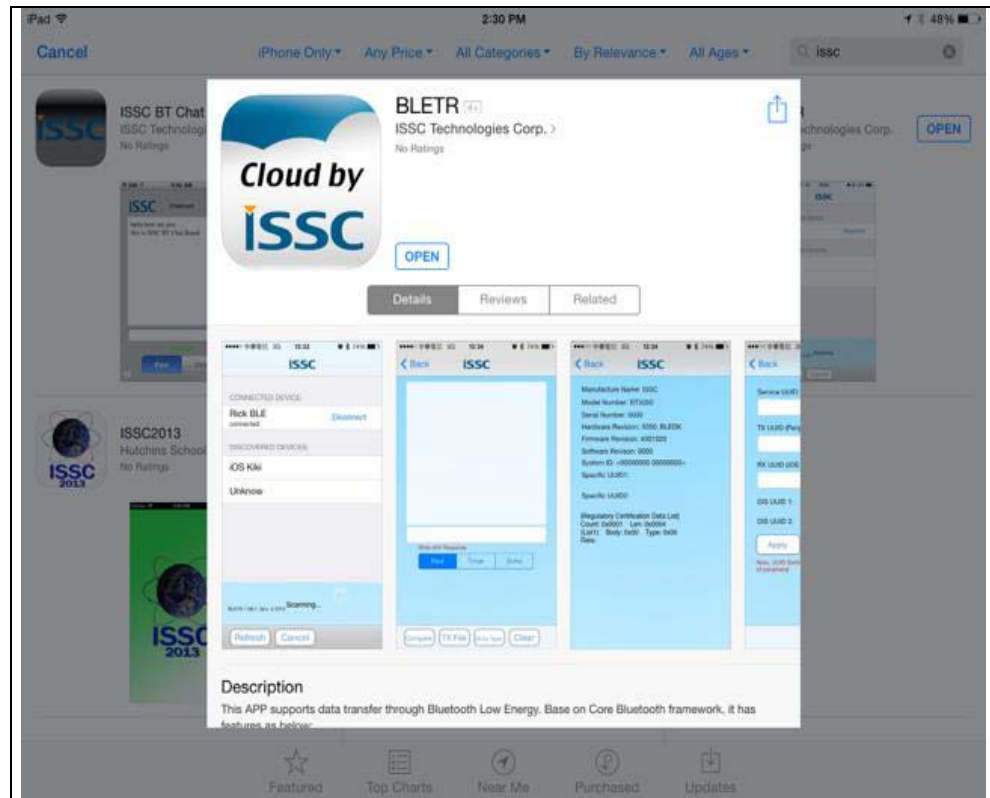
This demonstration describes how serial data is transmitted from the BM78 EVB (through PC chat utility) to an iOS device using the BLE connection. This demonstration uses the BLETR application to establish the connection to the BM78 EVB. Please note, BLE do not need authentication hardware to work with iOS devices. The key feature of the BM78 EVB is a transparent serial data connection from the BM78 module's UART to an iOS device over BLE connection.

To connect BLE data to an iOS device, perform the following actions:

1. Using a device running iPhone 4S or later version or a device running iPad3 or later version, download and install the BLETR application, seen [Figure 3-11](#).

**Note:** Users can purchase the BLETR application from the Apple Store.

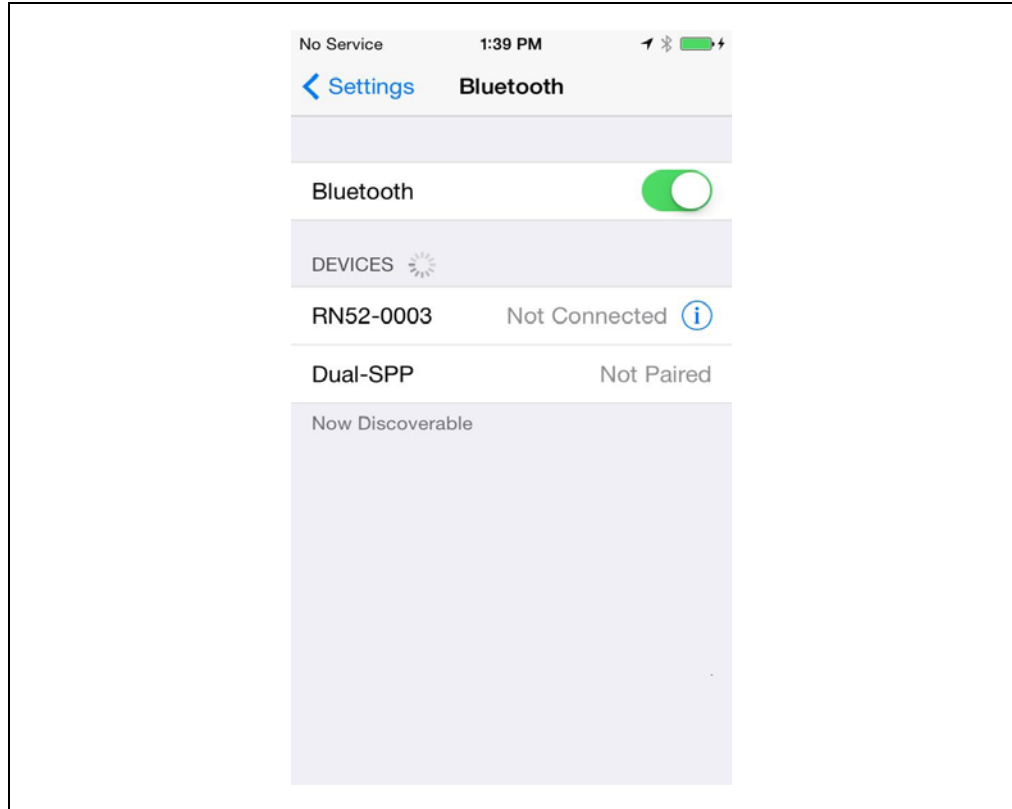
**FIGURE 3-11: BLETR APPLICATION PAGE**





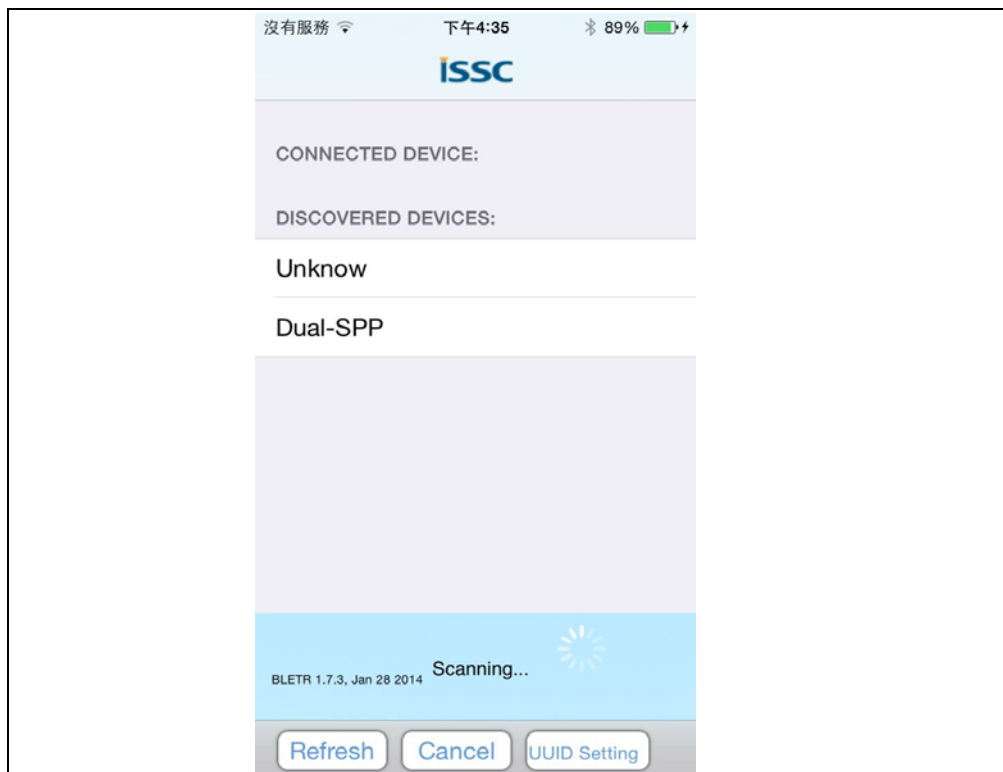
2. [Figure 3-12](#) shows the Bluetooth radio on the iPhone, iPod, or iPad application Settings.
3. Tap *Settings > Bluetooth*.
4. To turn on Bluetooth, drag the slider.

**FIGURE 3-12: ENABLING BLUETOOTH FUNCTIONALITY**



5. BLETR scans the BLE peripheral devices and lists them, and if the devices are not displayed, tap **Refresh** to restart the BLE peripheral scan, see [Figure 3-13](#).

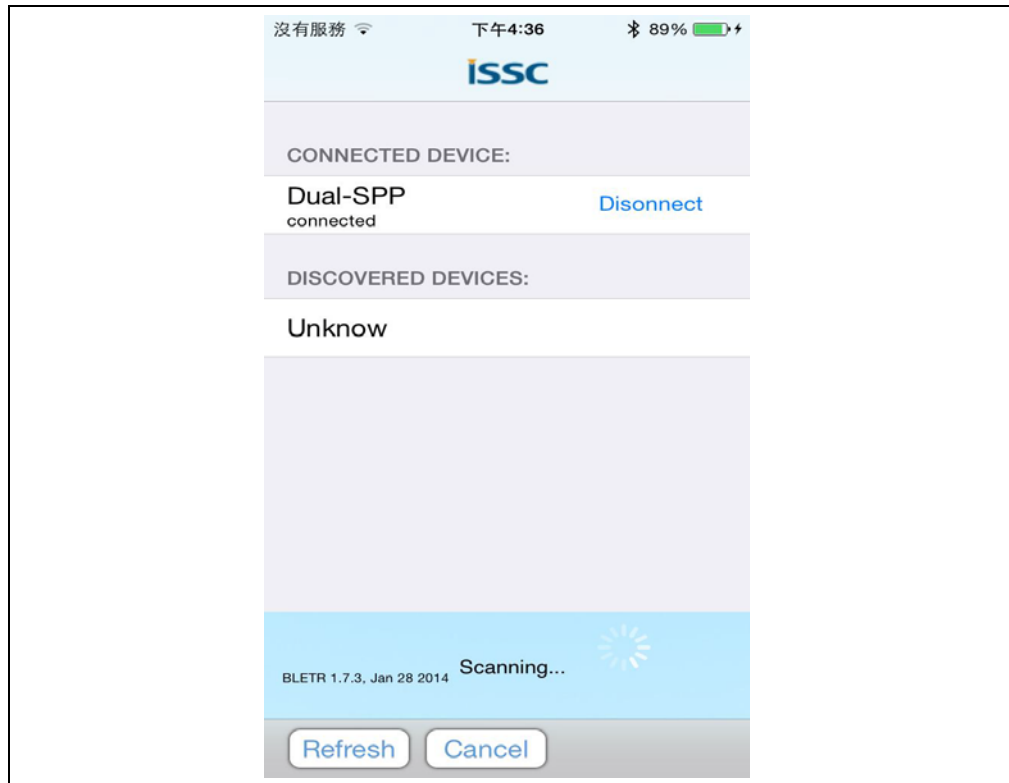
**FIGURE 3-13: SCANNING BLE DEVICES**



6. Search for the Dual-SPP BLE peripheral device and tap to establish the connection to the BM78 EVB.

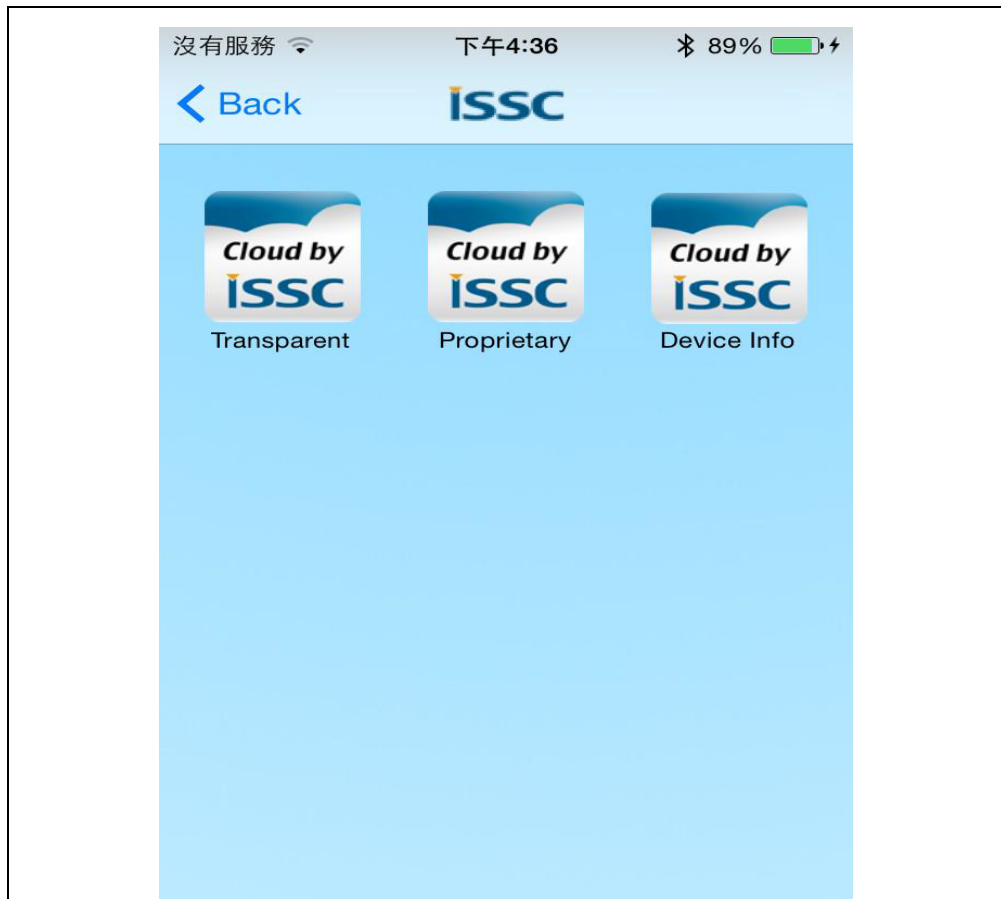
7. On successful connection to the BM78 EVB, BLETR displays “Dual-SPP connected” message, see [Figure 3-14](#).

**FIGURE 3-14: BLETR APPLICATION**

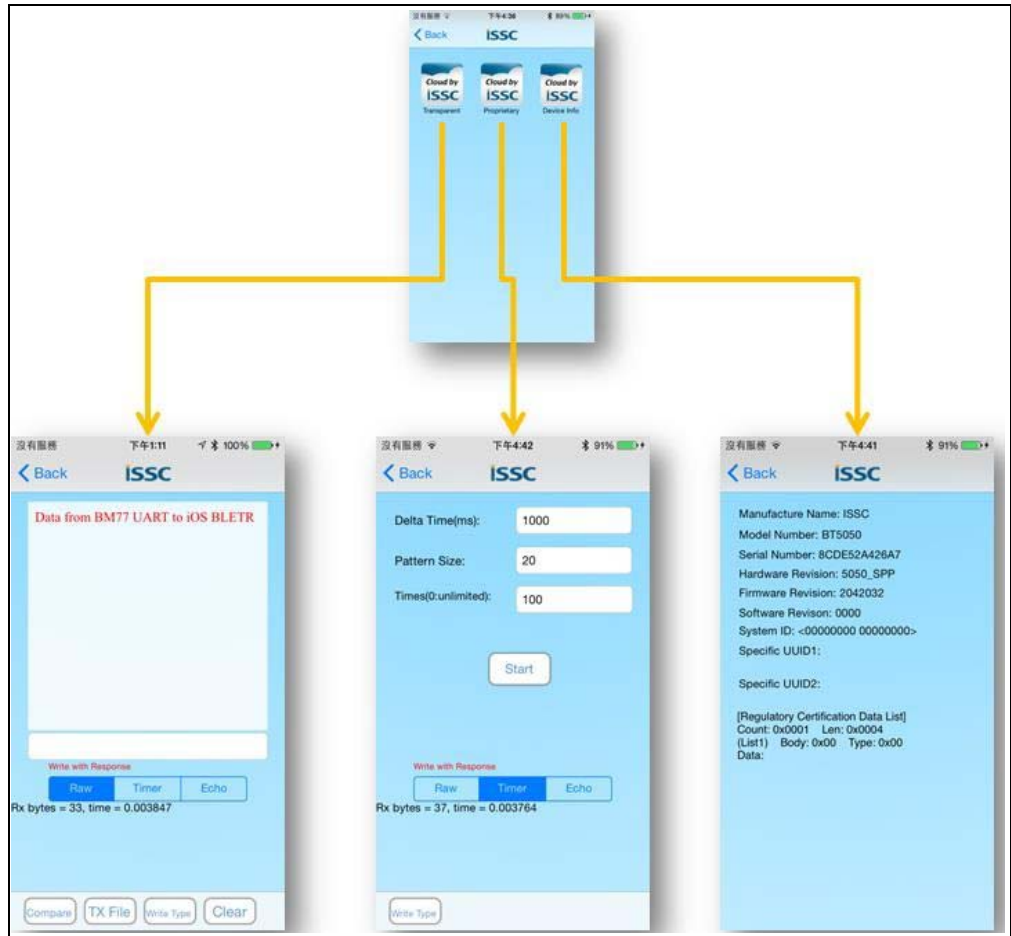


8. Tap the connected Dual-SPP device to display the top-level view. The window displays the following three views when the Dual-SPP is connected to the BM78 EVB, see [Figure 3-15](#) and [Figure 3-16](#).
  - Transparent – Displays the received data, sent data, and options to enable the features.
  - Proprietary – Displays the BLE connection parameters.
  - Device Info – Displays the BLE device information service settings.

**FIGURE 3-15: CONNECTED DUAL-SPP DEVICE SHOWING THREE VIEWS**

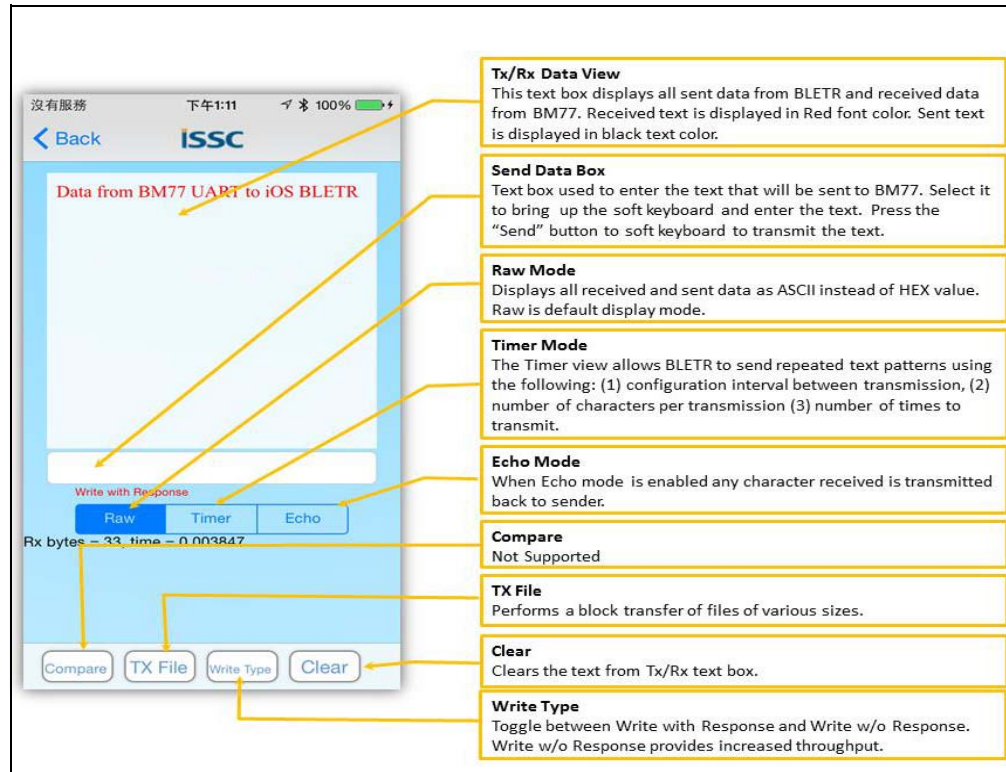


**FIGURE 3-16: TRANSPARENT, PROPRIETARY, AND DEVICE INFO VIEW DETAILS**



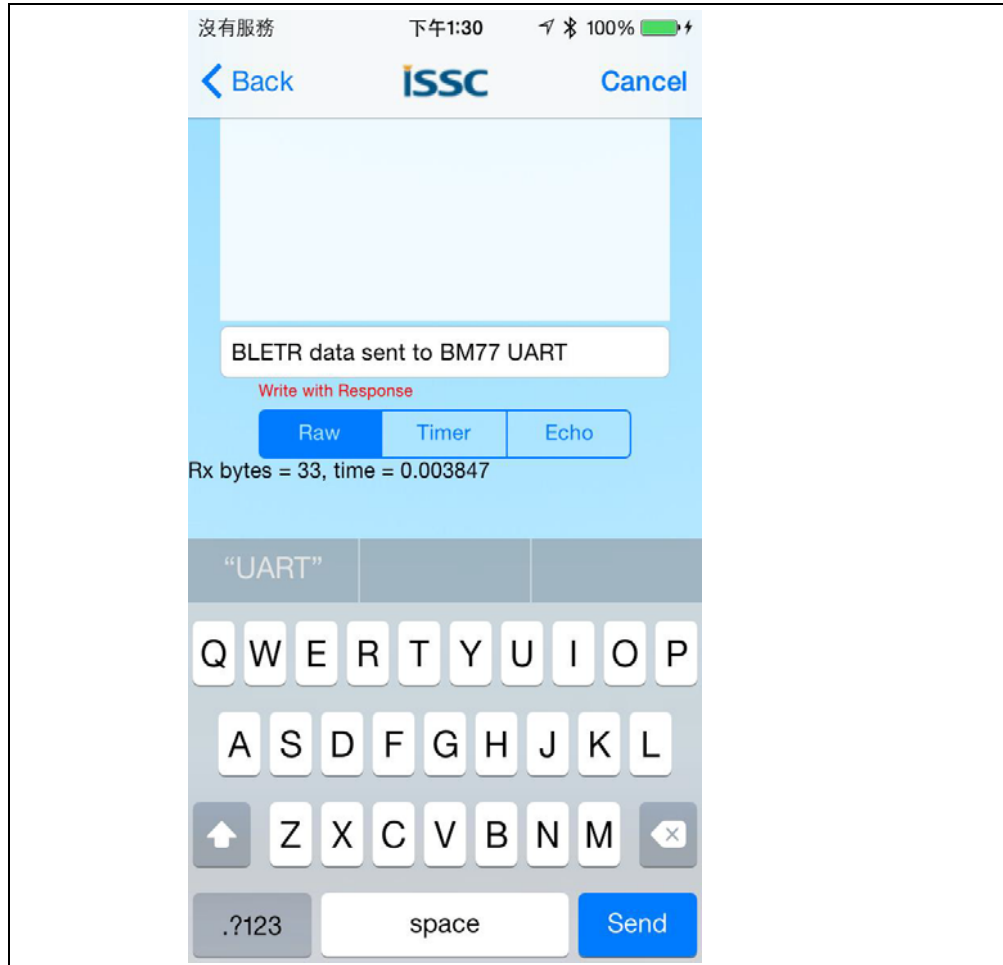
- Tap **Transparent** to open the Transparent Serial Data view, which displays three modes: Raw, Timer, and Eco. See [Figure 3-17](#). For additional information on these three modes, refer to [Section 3.2.3 “Data Modes”](#).

**FIGURE 3-17: DATA MODE**



- To send data from the BLETR iOS device to the BM78 EVB, enter data in the text box using the soft keypad, see [Figure 3-18](#).

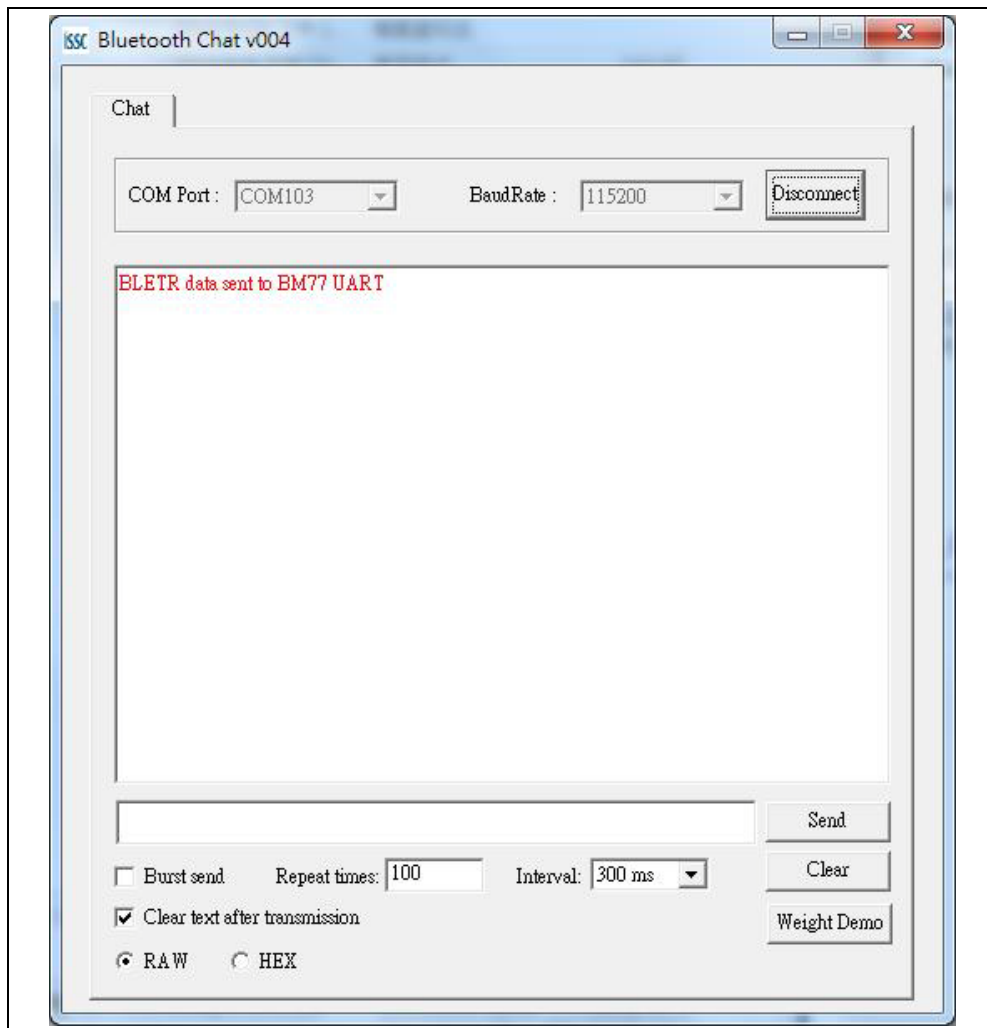
**FIGURE 3-18: BLETR APPLICATION: SOFT KEYBOARD**



11. Tap keypad to enter the text and then tap **Send** to transmit the text to the BM78 EVB over BLE connection.

12. The text is received through the BM78 UART and is displayed in the Bluetooth Chat text window, see [Figure 3-19](#).

**FIGURE 3-19: BLUETOOTH CHAT WINDOW SHOWING RECEIVED TEXT**





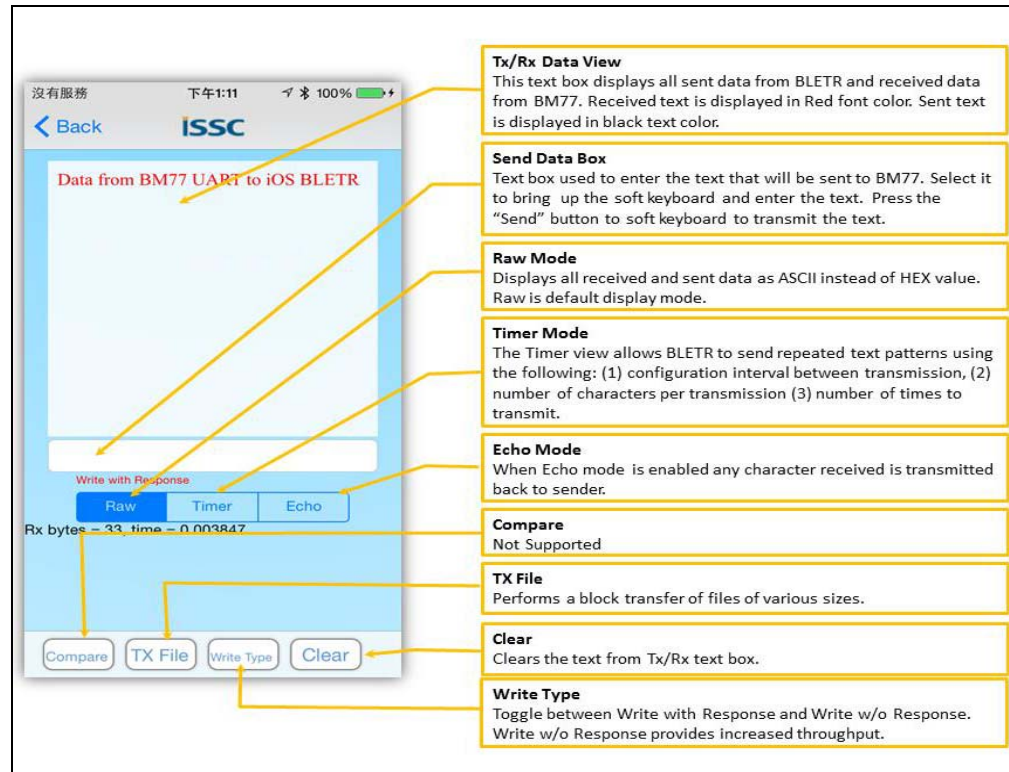
## 3.2.3 Data Modes

Figure 3-20 provides detailed description of three modes: Raw, Timer, and Echo.

### 3.2.3.1 RAW

The Raw mode is the default mode which displays all received and sent data as ASCII value instead of hex value. In the text box, all received data will be displayed in red text.

**FIGURE 3-20: RAW MODE**

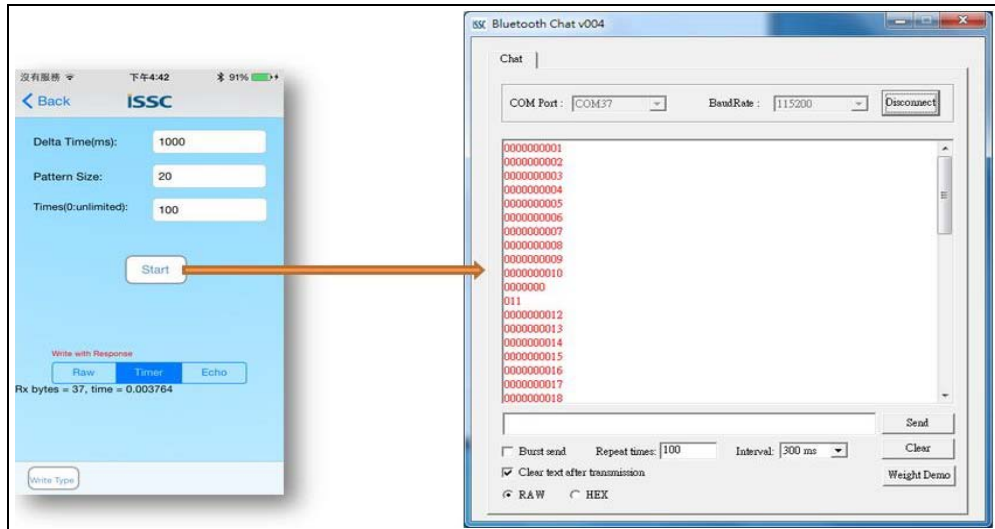


### 3.2.3.2 TIMER

The Timer mode enables the BLETR to send repeated text patterns to the Bluetooth chat application for throughput and data transfer test. For example, BLETR is configured to transmit 100 text blocks of 20 characters in every 1000 ms. The Bluetooth Chat application receives the text pattern data and displays it in red. The line break indicates the BLE packet break, that is, the transmitted text block is fragmented into multiple BLE packets. Figure 3-21 shows the BLETR window with values.

Users must tap Start button in the BLETR window to initiate the data transfer and the Bluetooth Chat application window will display the received data.

**FIGURE 3-21: BLETR APPLICATION WINDOW AND BLUETOOTH CHAT WINDOW WITH RECEIVED DATA**



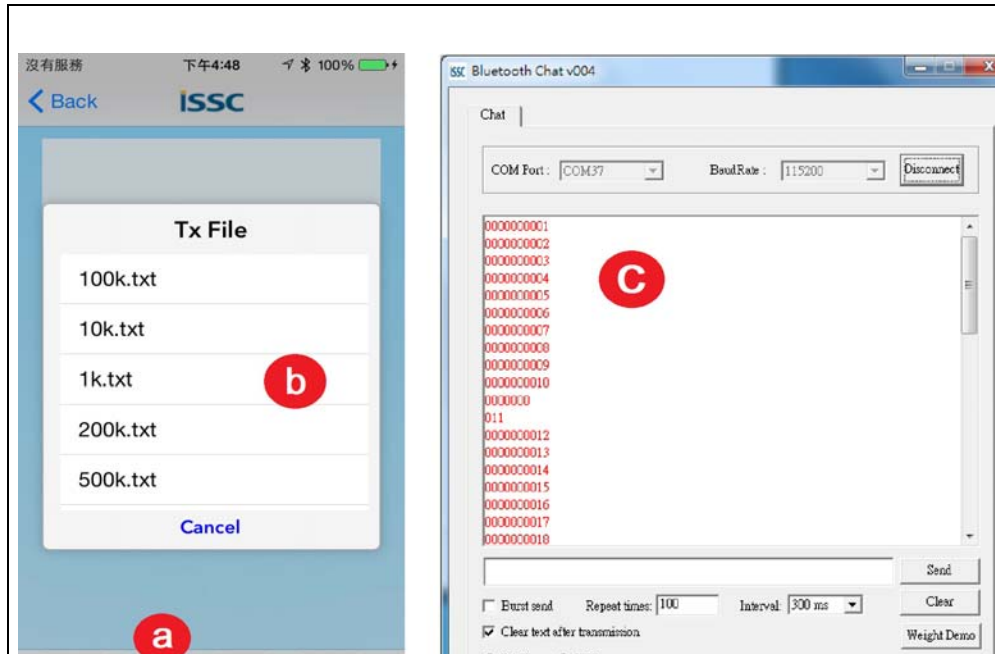
### 3.2.3.3 TX FILE

The Tx File transfer feature is similar to the Timer feature. [Figure 3-22](#) shows the Tx File functions and the transferred files (which are embedded in the BLETR) to the BM78 EVB.

To transmit a file, perform these actions:

- Tap **Tx File**. The Tx File dialog is displayed.
- The Tx File window displays .txt file sizes to be transmitted. Tap the file size to be transmitted.
- The Bluetooth chat application will display the received files.

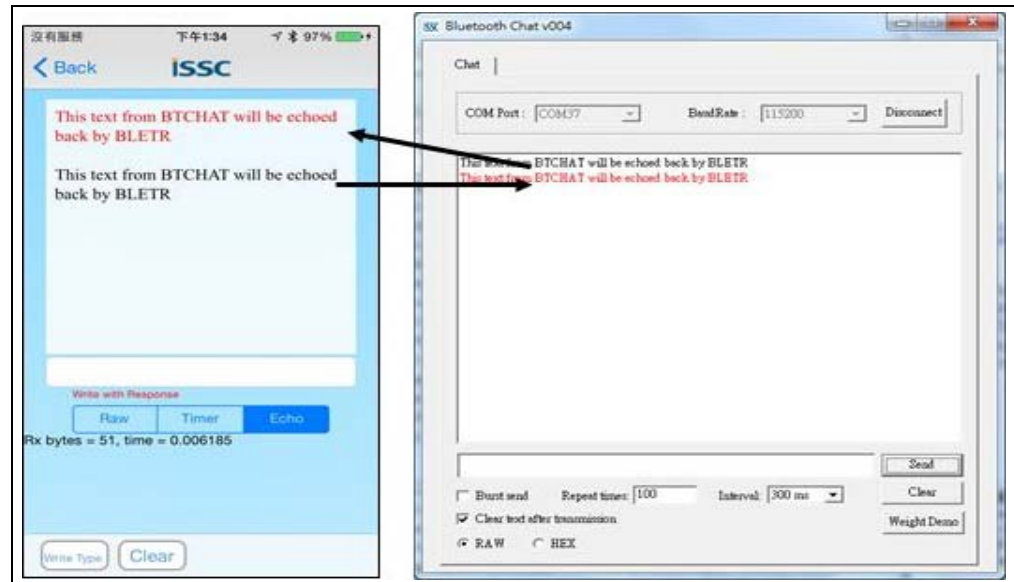
**FIGURE 3-22: BLETR APPLICATION: TX FILE DIALOG BOX**



## 3.2.3.4 ECHO

The Echo mode is an optional function in the Transparent mode data view. When the Echo feature is enabled, any data received by the BLETR is echoed back to the sender. [Figure 3-23](#) shows texts sent from the Bluetooth Chat tool being echoed to the BLETR when the Echo mode is enabled.

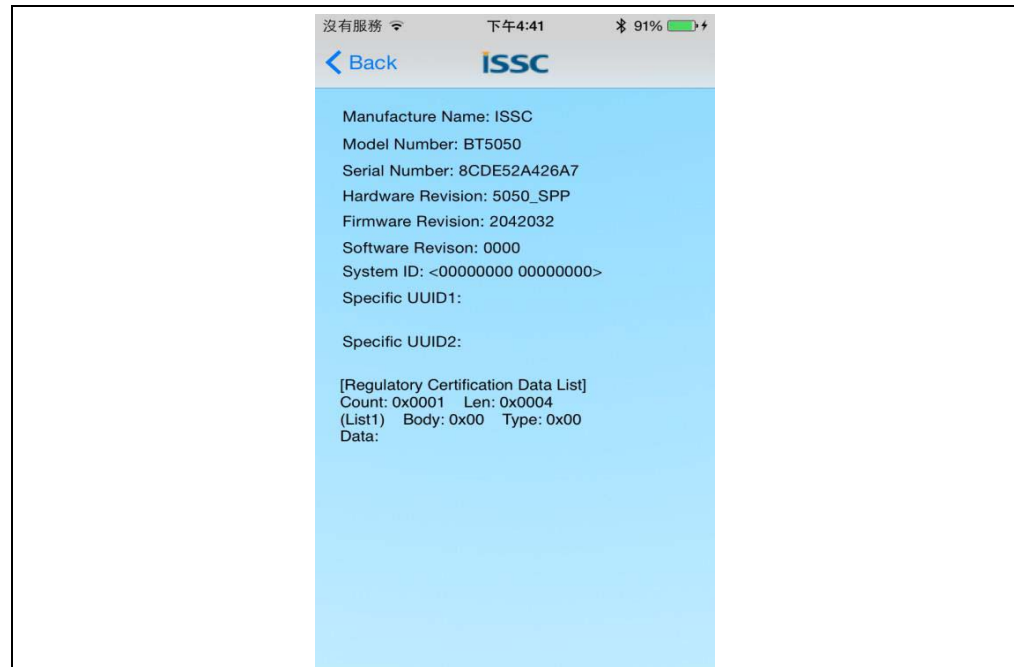
**FIGURE 3-23: BLUETOOTH CHAT WINDOW**



## 3.2.4 BLETR Application Device Information

[Figure 3-24](#) shows the device information view that displays the characteristics associated with the device information service. The device information service is available to all Bluetooth Low Energy 4.2 hosts that access the BM78 EVB and it provides the identification information of the BM78 BLE peripheral device.

**FIGURE 3-24: BLETR APPLICATION: DEVICE INFORMATION VIEW**



## 3.2.5 Proprietary (Configuration) Feature

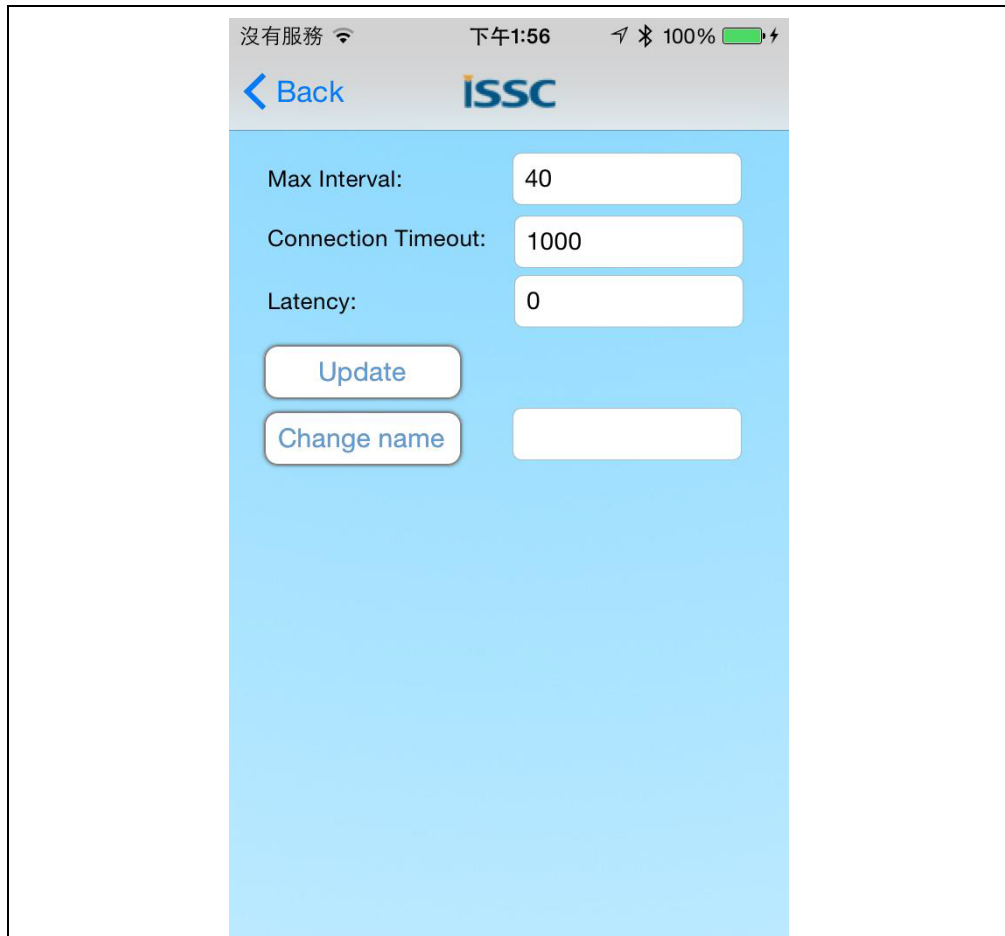
In the Proprietary view users can remotely modify the following BLE connection parameters through BLETR. Please note the BLE connection parameters only affect the BLE connections.

- Max Interval – communication time (ms) interval between the BM78 module and BLE central device.
- Connection Timeout – time (ms) between communication events before a connection is considered lost.
- Latency – number of connection events the peripheral device (BM78 module) is allowed to skip.

To modify the BLE connection parameters, perform these actions:

1. Enter values for Max Interval, Connection Timeout, and Latency.
2. Tap **Update**.
3. Enter a new name in the text field and then tap **Change name** to invoke the modifications, see [Figure 3-25](#). This name is used to advertise the peripheral name for scanning central devices.

**FIGURE 3-25: BLETR APPLICATION: PROPRIETARY VIEW**



## 3.3 USING BM78 EVB IN PICTAIL INTERFACE MODE

This section provides an overview of tools that can be used to configure the BM78 EVB using a PIC MCU through the PICTail interface. The BM78 Configuration UI Tool is used to change the Bluetooth parameters and generate a EEPROM configuration dump file. The BM78 EEPROM table utility can be used to convert the EEPROM configuration dump file generated by the BM78 UI tool into an EEPROM structure file, for additional information refer to “*EEPROM\_Tool User Manual*” available for download from the Microchip web site. The EEPROM structure file can be imported by the BM78 configuration library demo workspace to program the Bluetooth parameters to the BM78 module through the PICTail interface over UART.

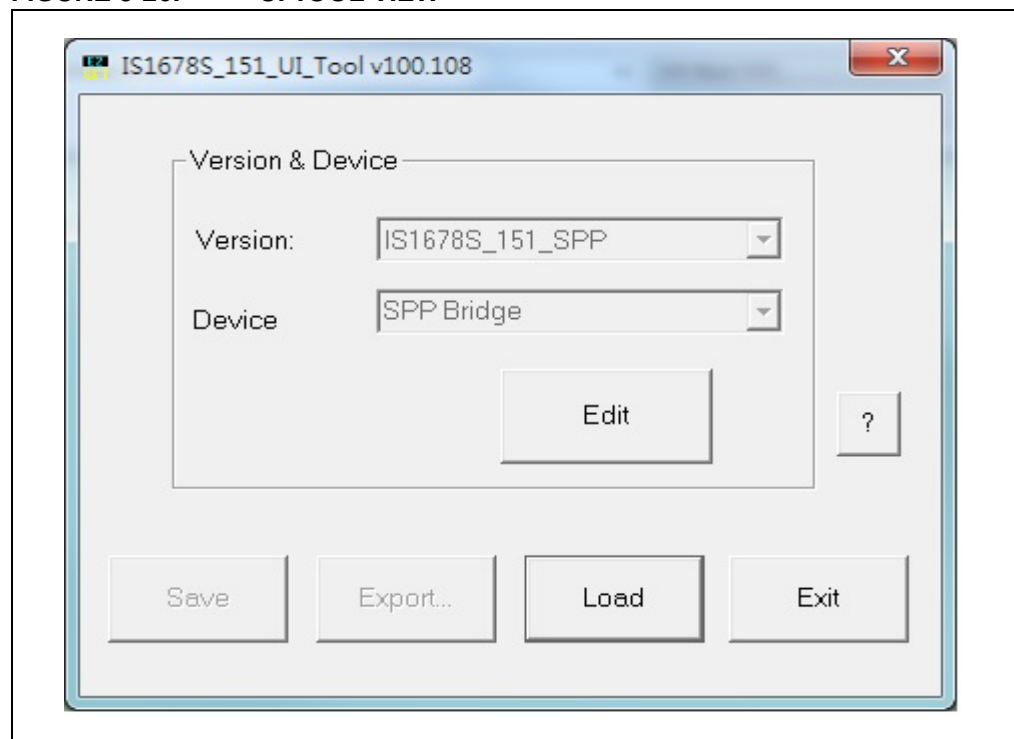
### 3.3.1 Configuring BM78 Module Using User Interface (UI) Tool

Using the BM78 module, users can update and configure various Bluetooth configuration parameters. The BM78 Configuration UI Tool or BM78 UI Tool is a user friendly computer application that enables the user to update various Bluetooth parameters and save in the EEPROM configuration dump file. The Bluetooth parameters, saved in the EEPROM configuration dump file, can be downloaded to the BM78 module using the BM78 Configuration Library.

The BM78 UI tool is available for download from the [www.microchip.com/BM78](http://www.microchip.com/BM78).

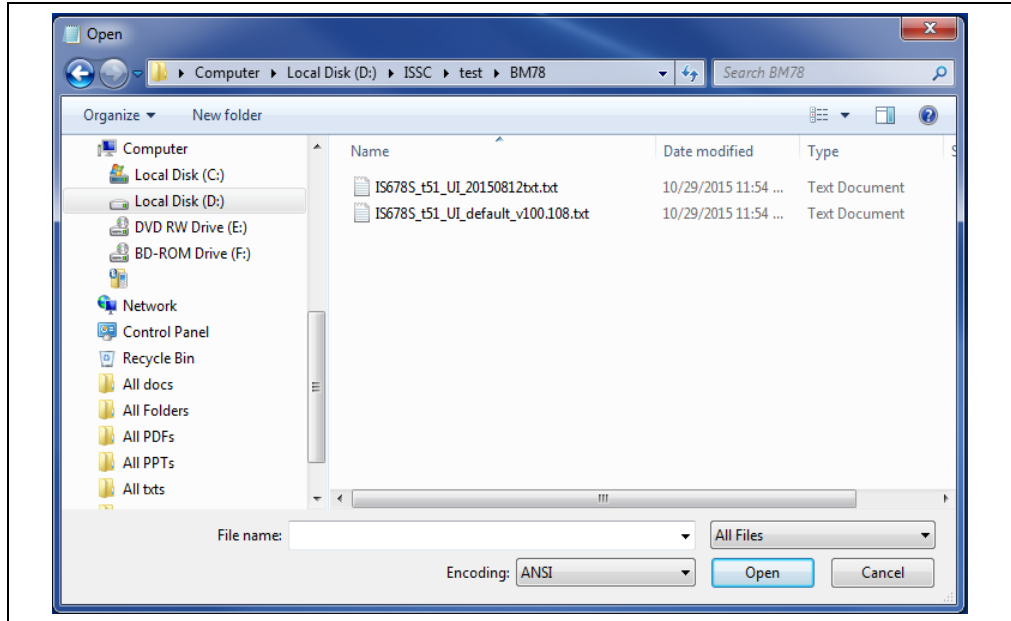
1. Download the BM78 Configuration UI tool to a computer (Windows OS) and run the application.
2. From the BM78 UI tool dialog, click **Load** to import the default EEPROM configuration dump file (BM78\_eeeprom\_configuration\_dump\_default.txt), provided with the application, see [Figure 3-26](#).

**FIGURE 3-26: UI TOOL VIEW**



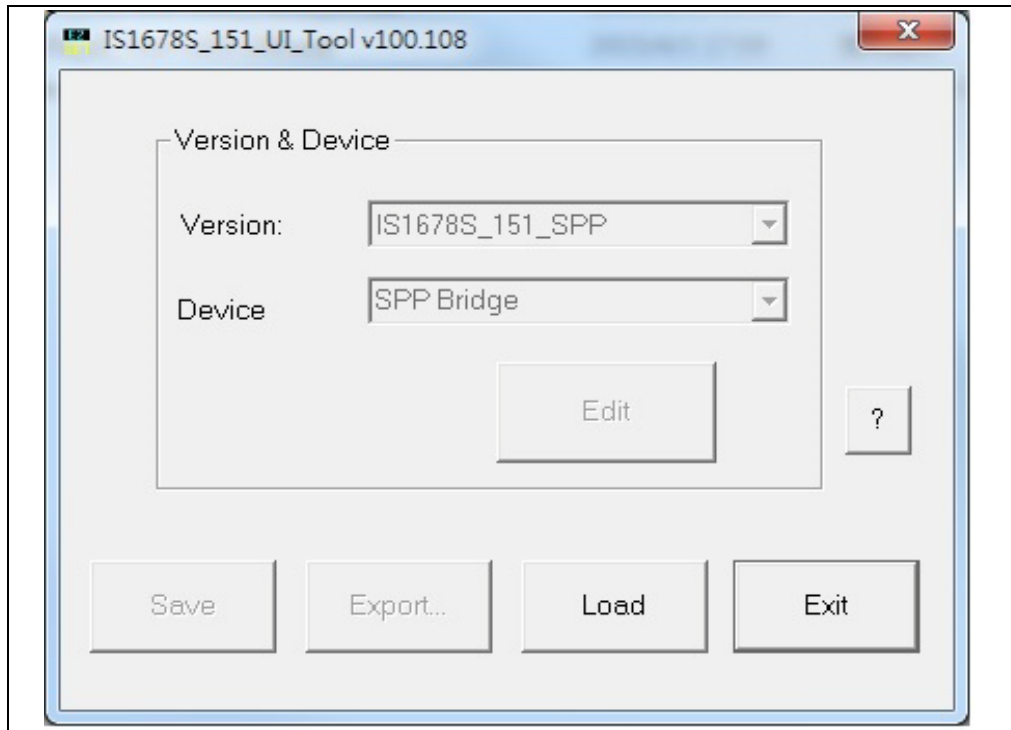
3. Browse to import the dump file, and then click **Open**, see [Figure 3-27](#).

**FIGURE 3-27: LOAD UI PARAMETER**



4. In the UI Tool dialog, under Version & Device section, Click **Edit**, see [Figure 3-28](#).

**FIGURE 3-28: UI TOOL VIEW**



5. The BM78 UI tool will display the Bluetooth configuration window with various options (tabs) to configure Bluetooth parameters, see [Figure 3-29](#). Click **Help** to configure each parameters required for the specific application.
6. After updating the Bluetooth parameters, click **Finish**. The Start Menu window is displayed.

**FIGURE 3-29: UI PARAMETER SETTING PAGE**

The screenshot shows the 'Beacon Setting' window with the following configuration details:

| Section            | Parameter              | Value          | Unit/Constraint | Help |
|--------------------|------------------------|----------------|-----------------|------|
| Device Information | BT Address             | 0x [ ]         | [6 Bytes]       | Help |
|                    | Class of Device        | 0x 040424      | [3 Bytes]       |      |
|                    | Device Name            | Dual-SPP       | [16 characters] |      |
|                    | PIN Code               | 0000           | [4 ~ 16 Number] |      |
|                    | BT3.0 UUID             | 0x 0000        | [2 Bytes]       |      |
| SPP Server Setting | RFCOMM Server Channel  | 0x00 : default |                 | Help |
| Uart Setting       | HCI Baud Rate Index    | 0x03 : 115200  |                 | Help |
|                    | Parity Check           | Disable        |                 |      |
|                    | Stop Bits              | 1 bit          |                 |      |
|                    | Parity Mode            | ODD            |                 |      |
|                    | H/W Flow Control (CTS) | Disable        |                 |      |

Navigation buttons at the bottom: Previous, Next, Finish.

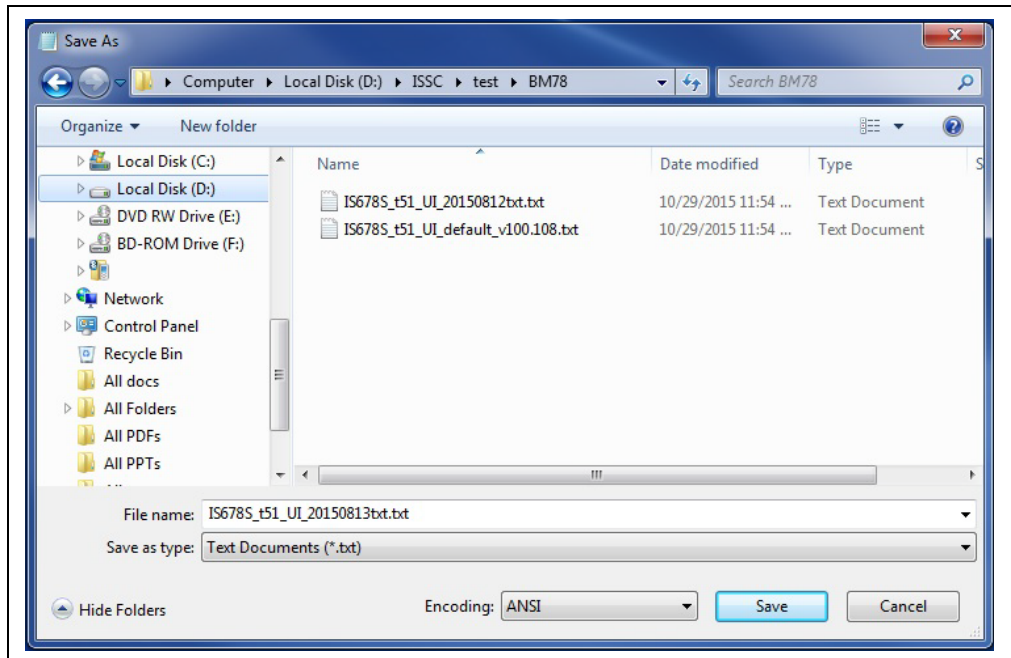
7. In the Start Menu, click **Save** to save the updated EEPROM configuration dump file. The new EEPROM configuration dump file will be different from the default EEPROM configuration dump file due to the updates made to the Bluetooth parameters using the BM78 UI tool.

**FIGURE 3-30: START MENU VIEW**



8. In the Save As window, select the file location, and then click **Save**.

**FIGURE 3-31: SAVE AS WINDOW**

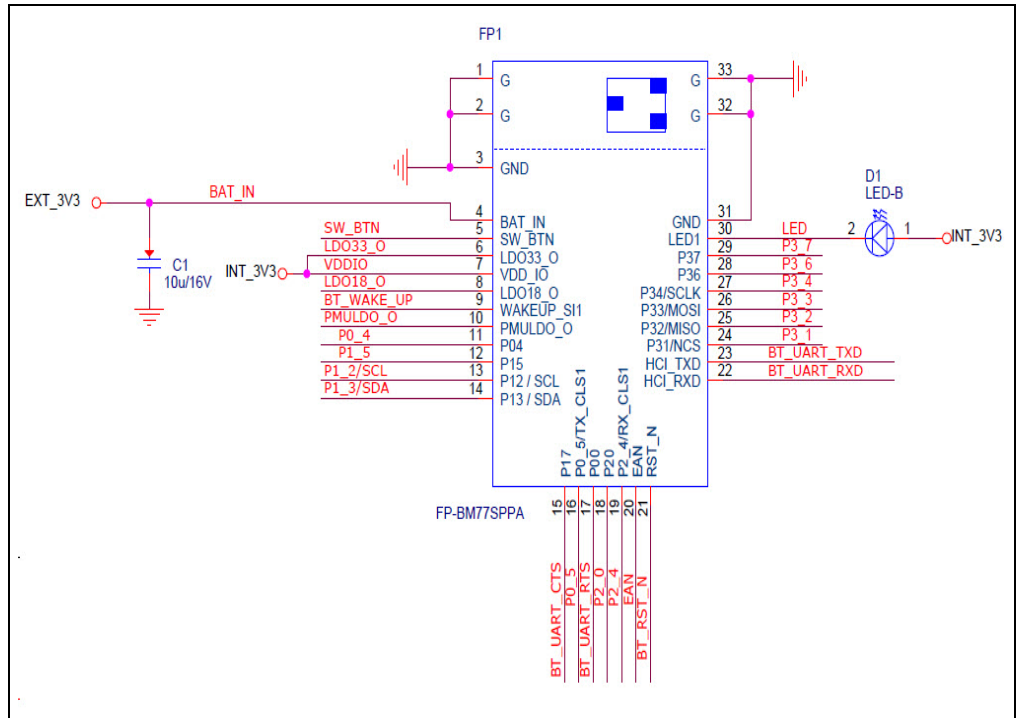




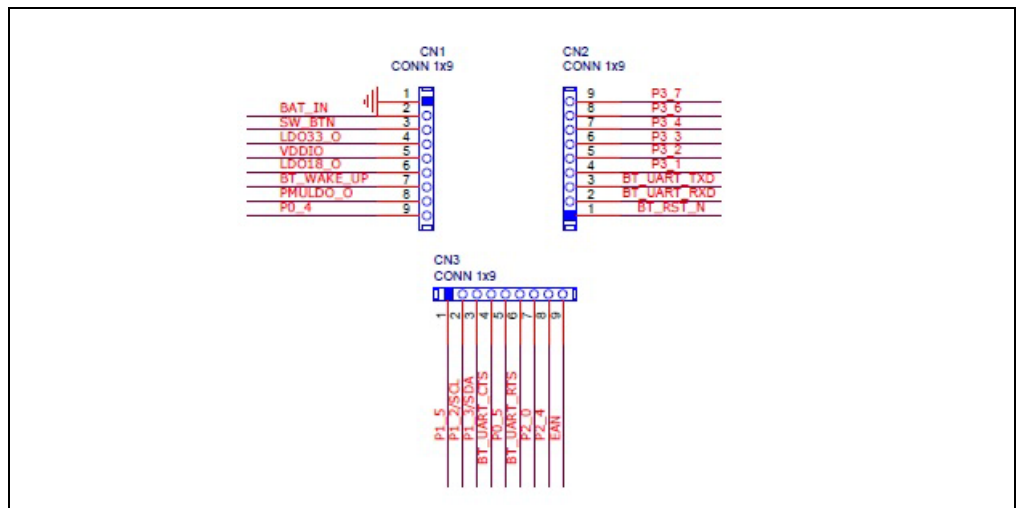
**Appendix A. Schematics**

**A.1 BM78 EVB SCHEMATICS**

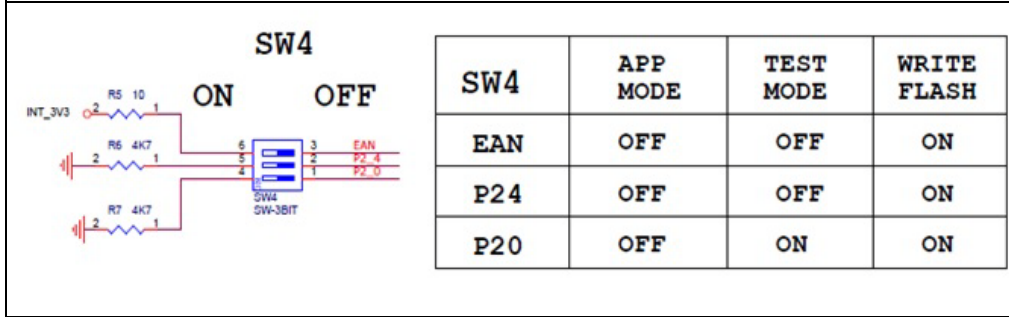
**FIGURE A-1: BM78 EVB SCHEMATICS**



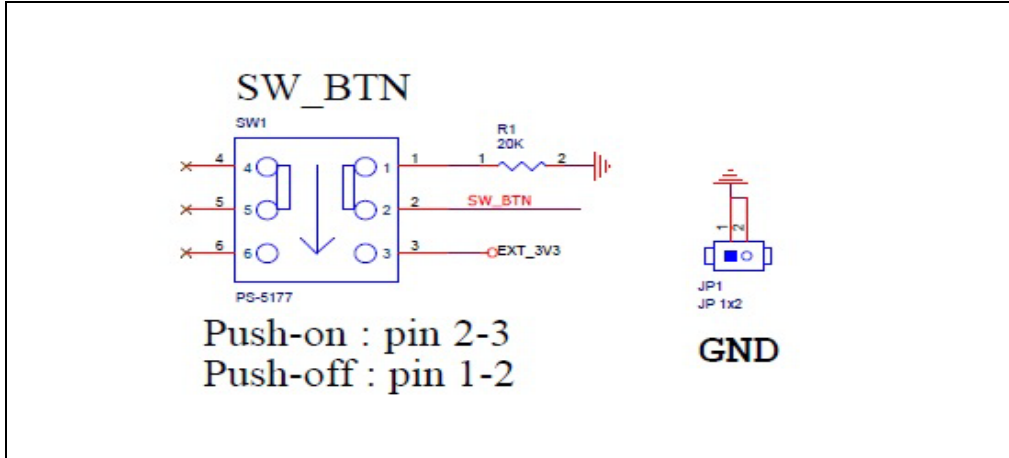
**FIGURE A-2: BM78 MODULE TEST INTERFACE**



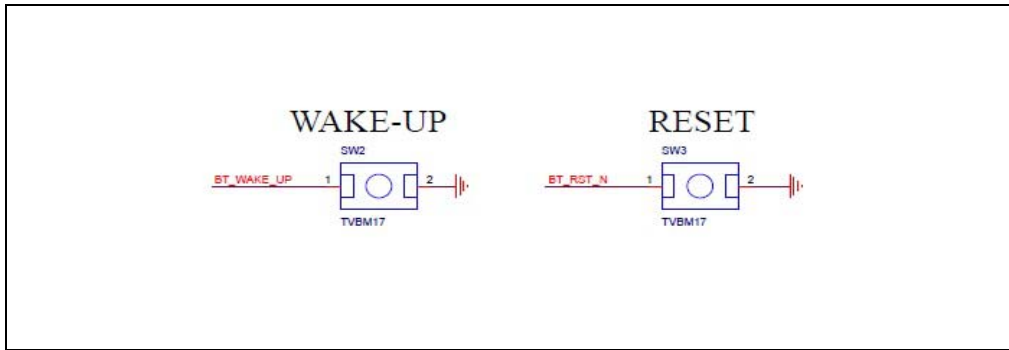
**FIGURE A-3: BM78 EVB CONFIGURATION**



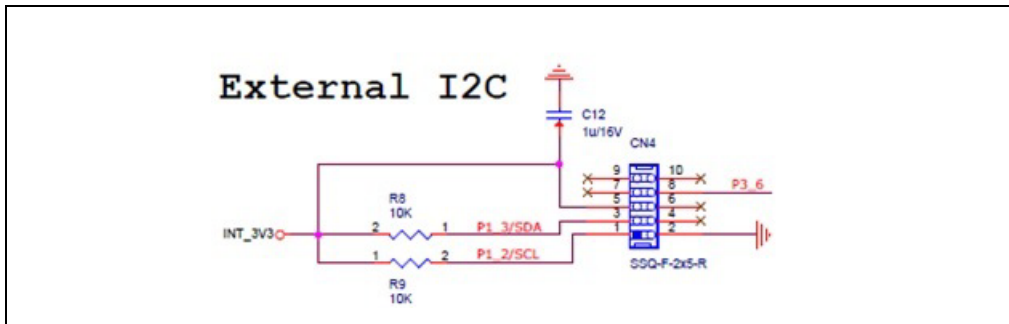
**FIGURE A-4: BM78 EVB POWER SWITCH TEST BUTTON**



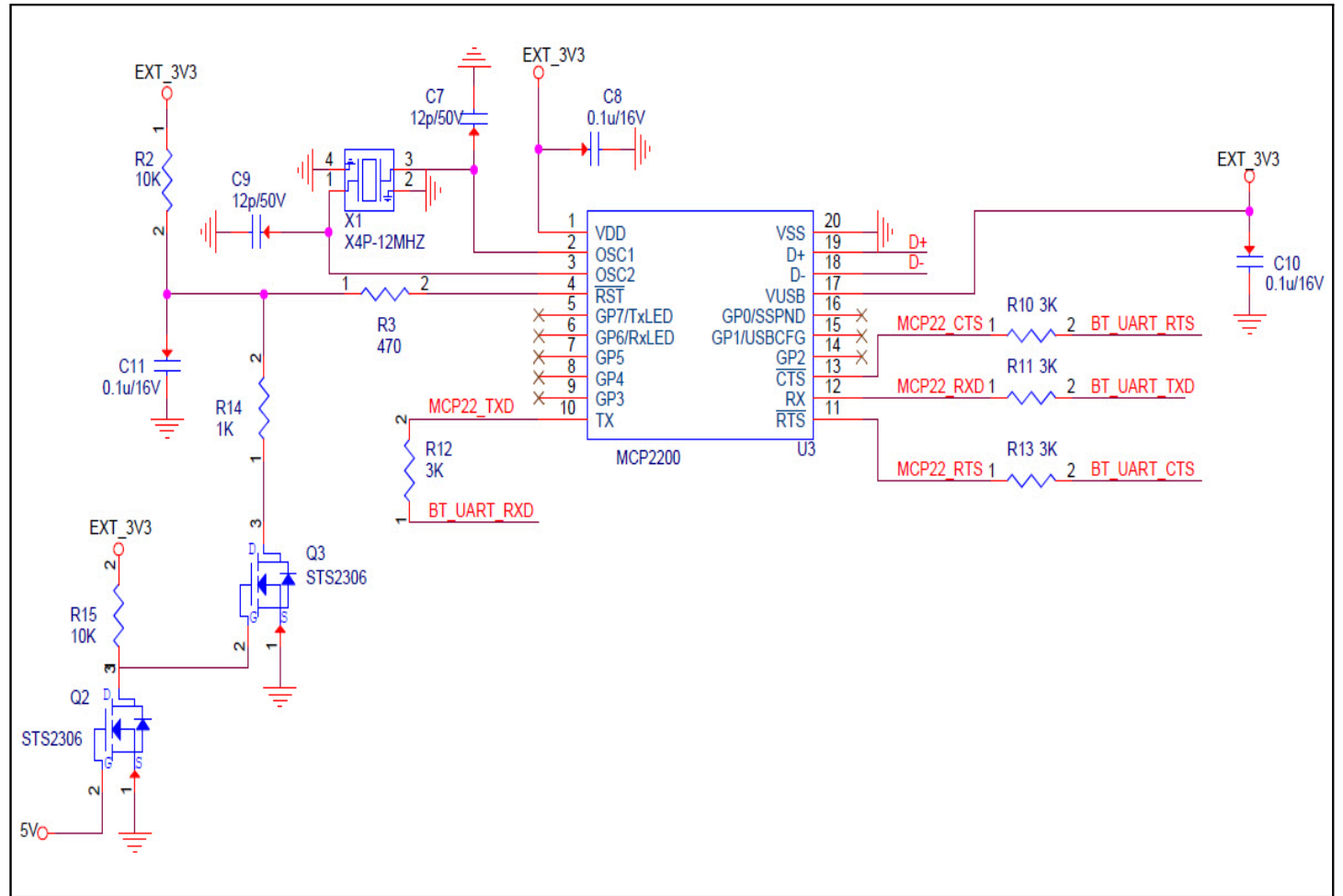
**FIGURE A-5: VBAT GROUND TEST CONNECTOR**



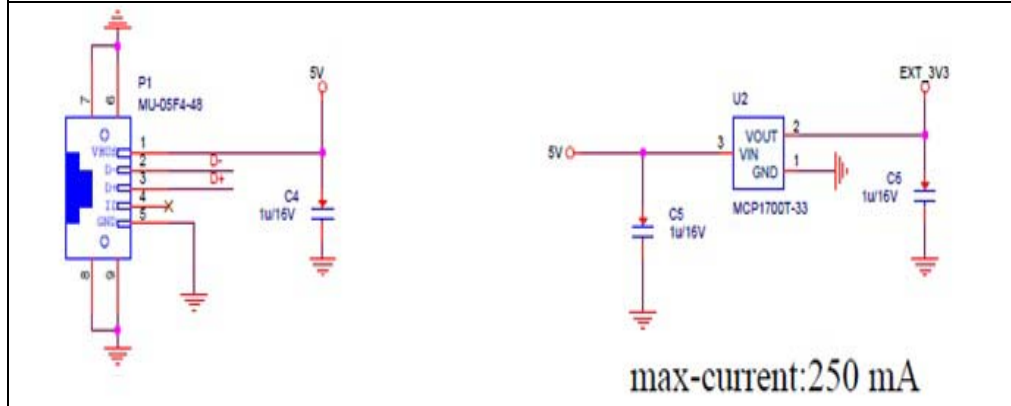
**FIGURE A-6: EXTERNAL I<sup>2</sup>C INTERFACE**



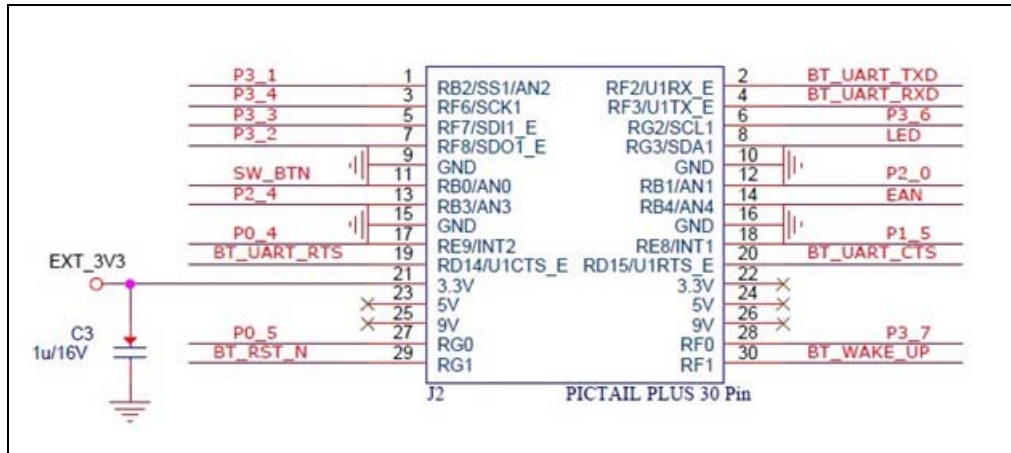
**FIGURE A-7: BM78 EVB SCHEMATIC**



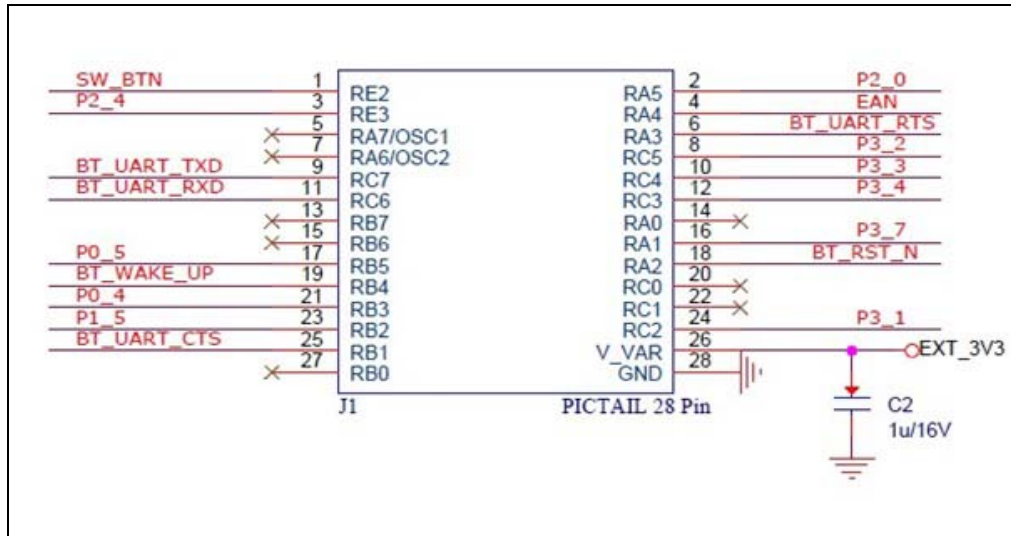
**FIGURE A-8: USB TO UART CONVERTER**



**FIGURE A-9: PICTAIL PLUS 30-PIN INTERFACE ON BM78 EVB BOARD**



**FIGURE A-10: PICTAIL 28-PIN INTERFACE ON BM78 EVB BOARD**



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**NOTES:**



## Worldwide Sales and Service

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