BM64 Evaluation Board (EVB) User's Guide

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Object of Declaration

BM64 Evaluation Board

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson

12-Sep-14
Date

NOTES:

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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 will be useful to know before using the BM64 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 BM64 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 BM64 EVB and its features.
- **Chapter 2. "Hardware"** provides hardware details of the BM64 EVB.
- **Chapter 3. "Getting Started"** provides information about how to establish the Bluetooth® connection using the BM64 EVB and how to configure the BM64 module using various tools.
- **Appendix A. "Schematics"** provides the BM64 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 BM64 EVB. The following Microchip document is available and recommended as supplemental reference resources.

BM62/64 Data Sheet (DS60001403)

Refer to this document for detailed information on BM64 module. Reference information found in this data sheet includes:

- BM64 module 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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Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

- **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 (June 2016)

This is the initial released version of this document.

Revision B (March 2018)

This revision includes the following updates:

- Updated **3.2 “Getting Started with BM64 EVB”**
- Updated Figure 3-9 and Figure 3-11
- Added Figure 3-12 and Figure 3-13

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

NOTES:

Chapter 1. Introduction

Thank you for purchasing a BM64 Evaluation Board (EVB). This document provides detailed information about the Microchip BM64 EVB.

The BM64 EVB enables the user to evaluate and demonstrate the functionalities of the BM64 module. The BM64 EVB includes status LEDs and an integrated configuration and programming interface for plug-and-play capability, which enables rapid prototyping and faster time to market.

Along with the BM64 EVB, software tools and applications are provided to demonstrate the Bluetooth connections to the on-board BM64 module with options for configuring or programming it.

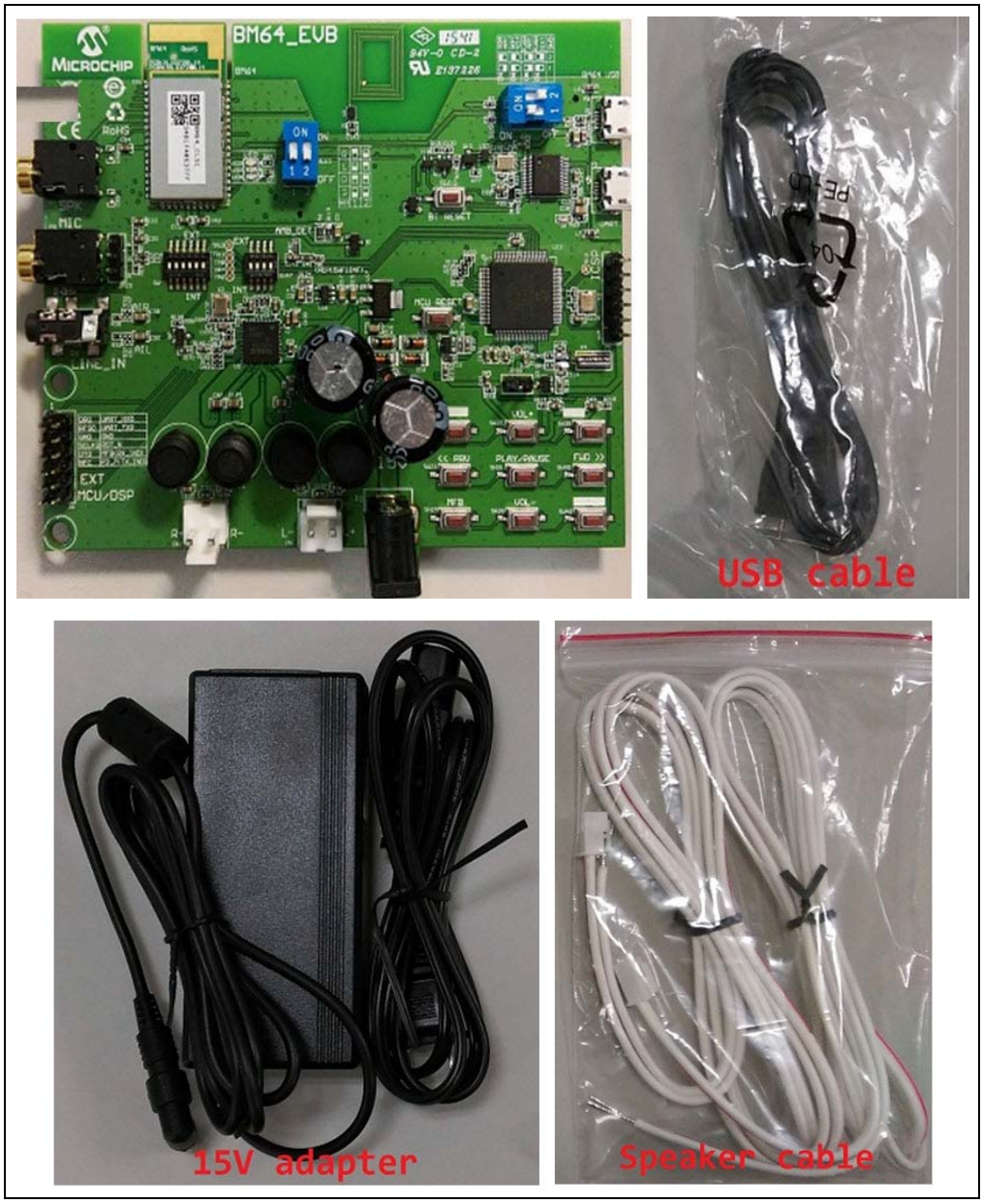
This chapter includes the following topics:

1.1 KIT CONTENTS

The BM64 EVB kit includes the following items, as illustrated in Figure 1-1:

- One BM64 EVB, which contains the BM64SPKS1MC1 module
- One micro-USB cable
- One 15V DC power adapter
- Two speaker cables

FIGURE 1-1: BM64 EVB KIT CONTENTS



Note: If you are missing any part of the BM64 EVB 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 BM64 EVB FEATURES

The following are key features of the BM64 EVB:

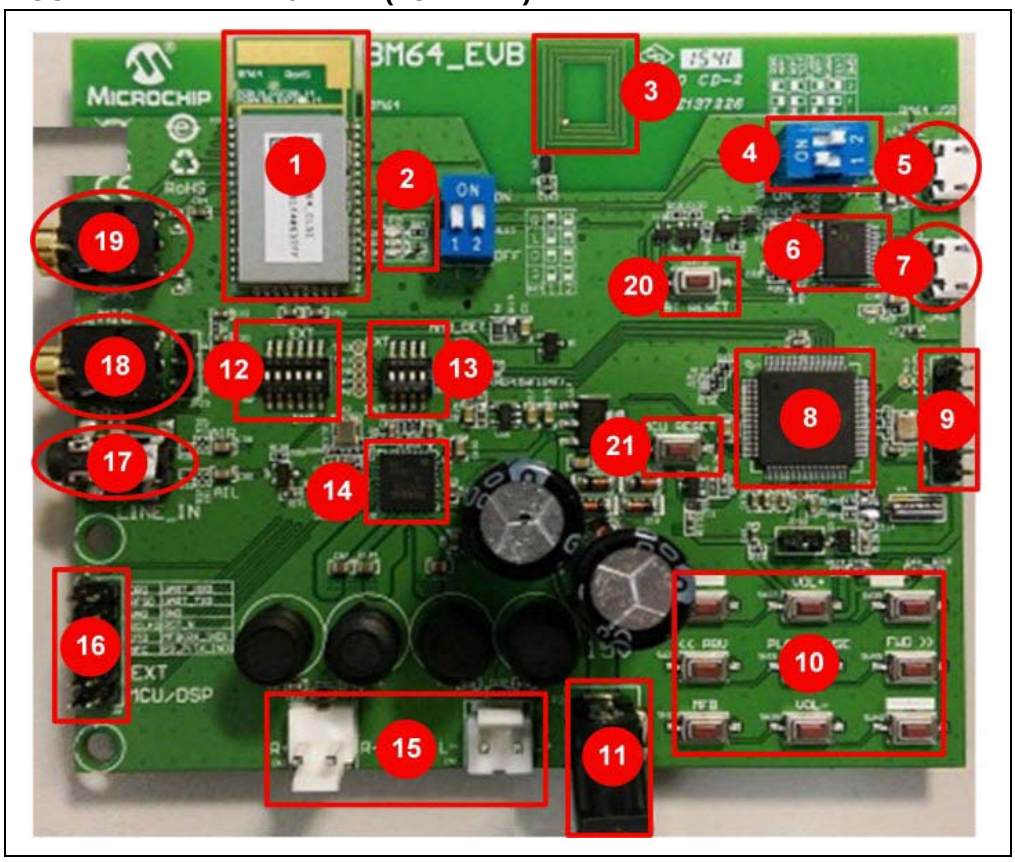
- The BM64 EVB includes a BM64 module, qualified for Bluetooth 4.2 specifications
- On-board MCU (PIC18F85J10) and DSP (YDA174) for easy operation and feature demonstration
- On-board keypad matrix that is controlled by MCU, which makes it easy for playback control
- Built-in Near Field Communication (NFC)
- RoHS compliant

Figure 1-1 illustrates the top view of the BM64 EVB with the following components:

1. BM64SPKS1MC1 module
2. Three status LEDs
3. NFC tag
4. Mode switch (SW9)
5. USB connector (P9)
6. USB to UART converter (MCP2200)
7. UART port over USB connector (P3)
8. MCU (PIC18F85J10)
9. ICSP header (J5)
10. Audio control buttons, Multi-Function Button (MFB) and pairing mode button
11. 15V adapter jack (P2)
12. Internal/External MCU selection switch (SW46)
13. Internal/External DSP selection switch (SW47)
14. On-board DSP (YDA174) with built-in audio amplifier
15. Audio connector (CN1 and CN2)
16. External MCU/DSP header (J6)
17. Auxiliary input 3.5 mm jack (P8)
18. Microphone input 3.5 mm jack (P6)
19. Speaker output 3.5 mm jack (P7)
20. Reset button for BM64 module (SW10)
21. Reset button for MCU (SW1)

For more details on the features, refer to the **Chapter 2. “Hardware”**.

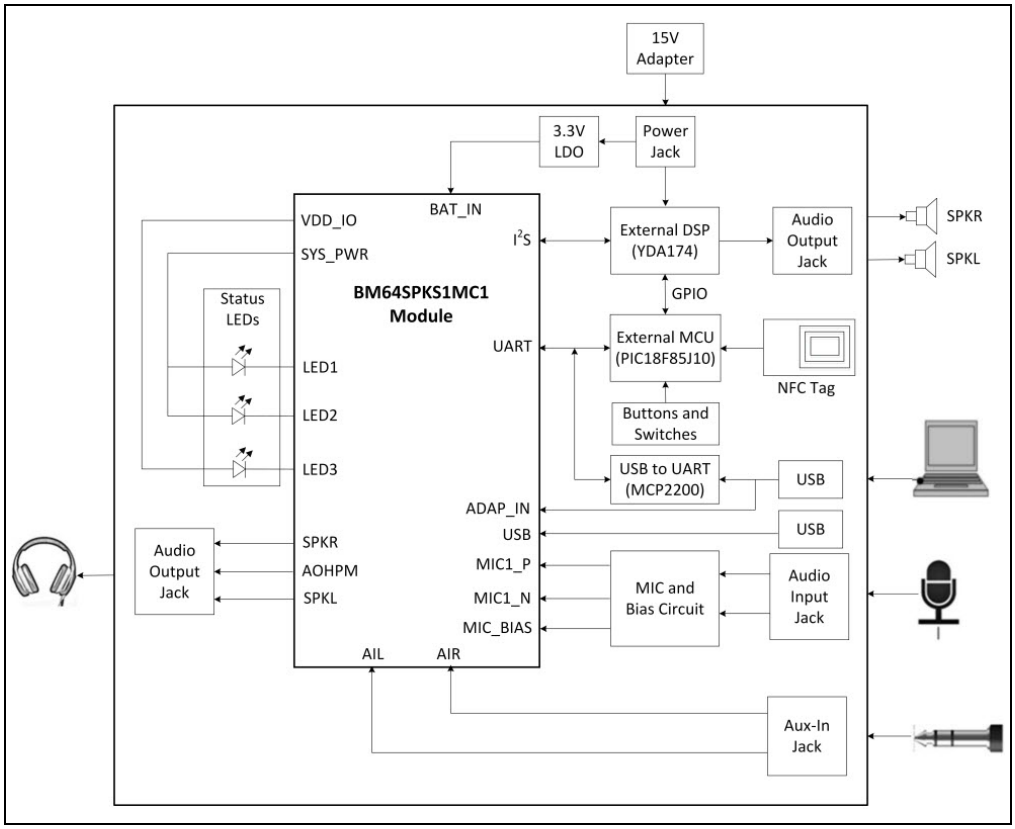
FIGURE 1-1: BM64 EVB (TOP VIEW)



Chapter 2. Hardware

This chapter describes the hardware features of the BM64 EVB. The BM64 EVB includes a range of peripheral components, see Figure 2-1.

FIGURE 2-1: BM64 EVB BLOCK DIAGRAM



2.1 HARDWARE FEATURES

The following list provides the details of each component in the BM64 EVB. For detailed information about the location of these components, refer to Figure 1-1.

2.1.1 Power Supply

The 15V DC power adapter supplies power to the BM64 EVB.

2.1.2 USB connectivity

The BM64 EVB has two USB ports that can be connected to the host PC using a micro-USB cable:

- Debug/program port (P3), where the USB signals are converted to/from the UART by the MCP2200
- USB port (P9), where USB signals are directly connected to BM64 module

2.1.3 Switches and Push Buttons

The functions of the switches and push buttons on the BM64 EVB are:

- SW1 – Reset button for the MCU
- SW9 – Mode switch
- SW10 – Reset button for BM64 module
- SW23 – Skip the audio track backward
- SW24 (MFB) – Push button to turn on/off the BM64 module
- SW27 – Increase volume
- SW28 – Decrease volume
- SW31 – Play or pause the audio playback
- SW40 – Button to enter into pairing mode
- SW45 – Skip the audio track forward

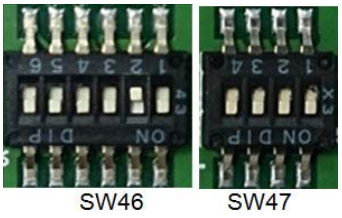
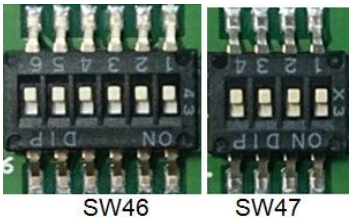
Table 2-1 provides the settings of Mode switch SW9 to configure the BM64 module in various operating modes.

TABLE 2-1: SWITCH SW9 DETAILS

Mode	Switch Positions	Pin Definition
Flash Test Mode		1: ON (P2_0: LOW) 2: OFF (EAN: LOW)
Flash Application Mode		1: OFF (P2_0: HIGH) 2: OFF (EAN: LOW)
ROM Test Mode		1: ON (P2_0: LOW) 2: ON (EAN: HIGH)
ROM Application Mode		1: OFF (P2_0: HIGH) 2: ON (EAN: HIGH)

Table 2-2 details the signals and button connections of the SW46/SW47 switch to the BM64 module and the external MCU/DSP.

TABLE 2-2: SWITCH SW46/SW47 DETAILS

Mode	SW46/SW47 Switch position	Pin Definition
On-board MCU (PIC18F85J10) and DSP audio amplifier (YDA174) signals connection to the BM64 module (default)		SW46 1: ON (NFC trigger to MCU) 2: OFF (TXIND to MCU) 3: ON (RST_N to MCU) 4: ON (HCI_TXD to MCU) 5: ON (HCI_RXD to MCU) 6: ON (MFB controlled by MCU) SW47 1: ON (DT0 to DSP) 2: ON (SCLK0 to DSP) 3: ON (RFS0 to DSP) 4: ON (NC)
External MCU and DSP audio amplifier connection		SW46 1: OFF (NFC trigger) 2: OFF (TXIND) 3: OFF (RST_N) 4: OFF (HCI_TXD) 5: OFF (HCI_RXD) 6: OFF (MFB) SW47 1: OFF (DT0) 2: OFF (SCLK0) 3: OFF (RFS0) 4: OFF (NC)

2.1.4 LEDs

The functions of three LEDs are listed as follows:

- LED1 – Indicates the Bluetooth connection status (UI configuration dependent)
- LED2 – Indicates the Bluetooth connection status (UI configuration dependent)
- LED3 – Charging indication LED (default setting is disabled)

2.1.5 Jumpers and Headers

The following jumpers and headers (J5, J6, JP23) are available on the BM64 EVB.

ICSP header J5 provides the programming/debugging interface for the BM64 EVB. Figure 2-2 illustrates ICSP header J5 and Table 2-3 provides the pin details and description.

FIGURE 2-2: ICSP HEADER J5

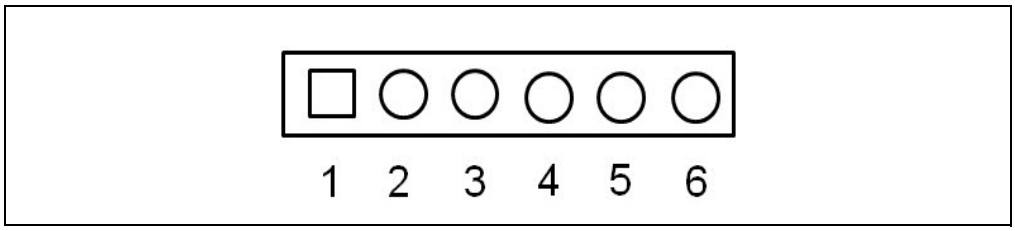


TABLE 2-3: ICSP HEADER J5

Part Number	Pin	Description
J5	1	Reset
	2	MPLAB ICD 3 power
	3	GND
	4	PGD
	5	PGC
	6	NC

The external MCU/DSP header J6 provides the interface to connect an external MCU/DSP to the BM64 EVB. Figure 2-3 illustrates external MCU/DSP header J6 and Table 2-4 provides the pin details and description.

FIGURE 2-3: EXTERNAL MCU/DSP HEADER J6

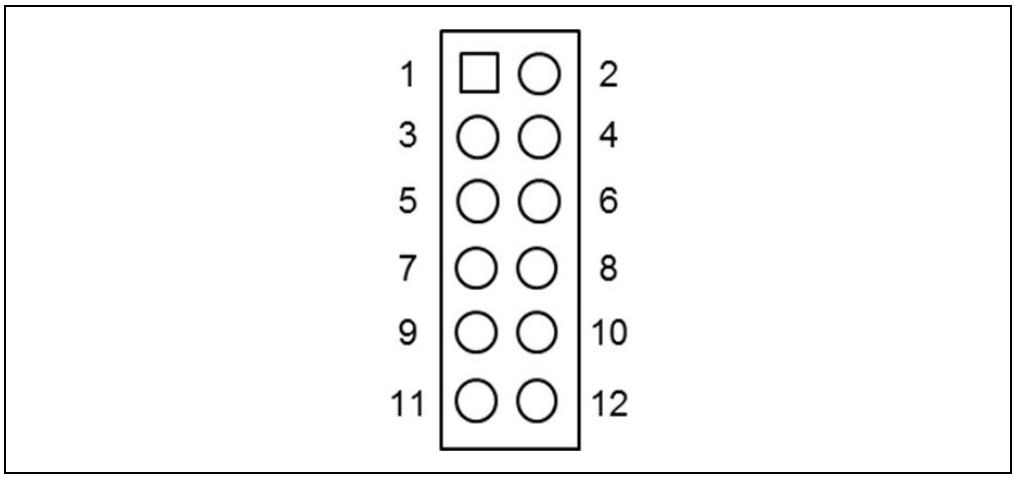


TABLE 2-4: EXTERNAL MCU/DSP HEADER J6

Part Number	Pin	Description
J6	1	I^2S_DR
	2	UART_RXD
	3	I^2S_RFS
	4	UART_TXD
	5	GND
	6	GND
	7	I^2S_SCLK
	8	RST_N
	9	I^2S_DT
	10	RX_IND
	11	NFC
	12	TX_IND

MIC header JP23 is used for connecting a microphone to the BM64 EVB. Figure 2-4 illustrates MIC header JP23 and Table 2-5 provides the pin details and description.

FIGURE 2-4: MIC JP23

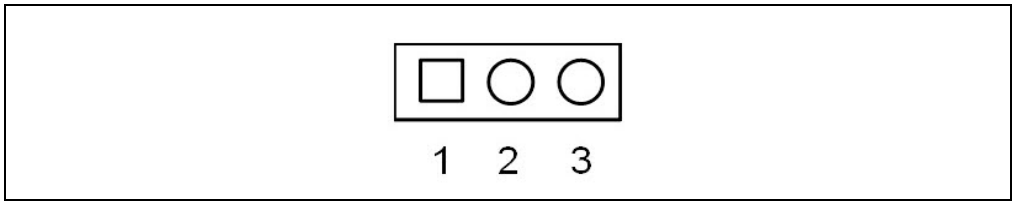


TABLE 2-5: MIC JP23

Part Number	Pin	Description
JP23	1	MIC_P1
	2	AGND
	3	MIC_N1

Chapter 3. Getting Started

This chapter describes how to establish Bluetooth connection between the BM64 EVB and a host device. It also demonstrates the process of updating the parameters using various tools.

This chapter includes the following topics:

3.1 REQUIREMENTS

The following hardware and software components are required for getting started with the BM64 EVB.

3.1.1 Hardware Requirements

- BM64 EVB
- Bluetooth enabled smartphone:
  - Android™ device running Android 4.3 or later version
  - iOS: iPhone® 4S or later version
- Windows® host PC with USB port
- Speaker, microphone or headset
- Micro-USB cable
- MPLAB REAL ICE/MPLAB ICD 3/PICkit™ 3

3.1.2 Software Requirements

Download the latest firmware and corresponding tools from the Microchip web site at: www.microchip.com/BM64.

- User Interface tool
- DSP tool
- Mass Production EEPROM Tool (MPET)
- Firmware update tool
- Flash code
- EEPROM tool
- MPLAB® Integrated Development Environment (MPLAB X IDE) tool

Note: MPLAB X IDE is available for download from the Microchip web site at: www.microchip.com/mplab/mplab-x-ide.

3.2 GETTING STARTED WITH BM64 EVB

The BM64 EVB is preprogrammed with dual-mode software where Advanced Audio Distribution Profile (A2DP) and Bluetooth Low Energy (BLE) can be operated simultaneously. The MCU (PIC18F85J10, U13) on the BM64 EVB is also preprogrammed to work with dual-mode software. To establish the Bluetooth connection between the BM64 EVB and a host device, perform the following actions:

1. Set switch SW9 to Flash Application mode, see Figure 3-1.

FIGURE 3-1: SW9 IN FLASH APPLICATION MODE

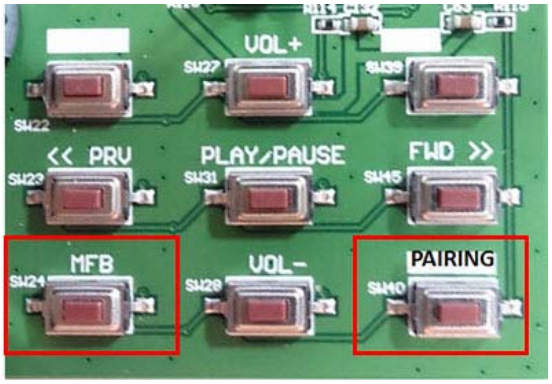
2. Connect the speaker line to the amplifier output connector (CN1 and CN2).
3. Connect the 15V DC power adapter to P2, as illustrated in Figure 3-2.

Note: Do not plug-in the USB cable.

FIGURE 3-2: USING THE EVALUATION BOARD

4. Figure 3-3 illustrates the various push buttons on the BM64 EVB. Long press SW24 (MFB) (approximately 5 seconds) to turn the Bluetooth on. Both LED1 (blue) and LED2 (red) will blink together, and later only LED1 (blue) will blink once at regular intervals.
5. Long press SW40 (pairing key) to enter pairing mode (depending on the UART command settings from the MCU to the Bluetooth module). LED1 (blue) and LED2 (red) will blink alternatively to indicate that the BM64 EVB is in discoverable mode.

FIGURE 3-3: SW24 AND SW40



6. Turn on the Bluetooth on a host device (PC or smartphone) and it will display a list of discoverable Bluetooth devices. The BM64 EVB is displayed as “Dual_SPK” or “LE_Dual_SPK”. Select the device to establish the connection.

Note: The “Dual_SPK” is used for the Bluetooth classic, and the “LE_Dual_SPK” is used for the BLE devices.

7. The LED1 (blue) blinks faster. This indicates the BM64 EVB is paired with the host device.
8. Once the connection is established, LED1 (blue) will blink twice at regular intervals. It will display as “connected” in the Bluetooth settings of the smartphone. With the default settings, the BM64 module enables Advanced Audio Distribution Profile (A2DP) for audio playback and Audio Video Remote Control Profile (AVRCP) for player control.

3.3 APPLICATION DEMONSTRATION

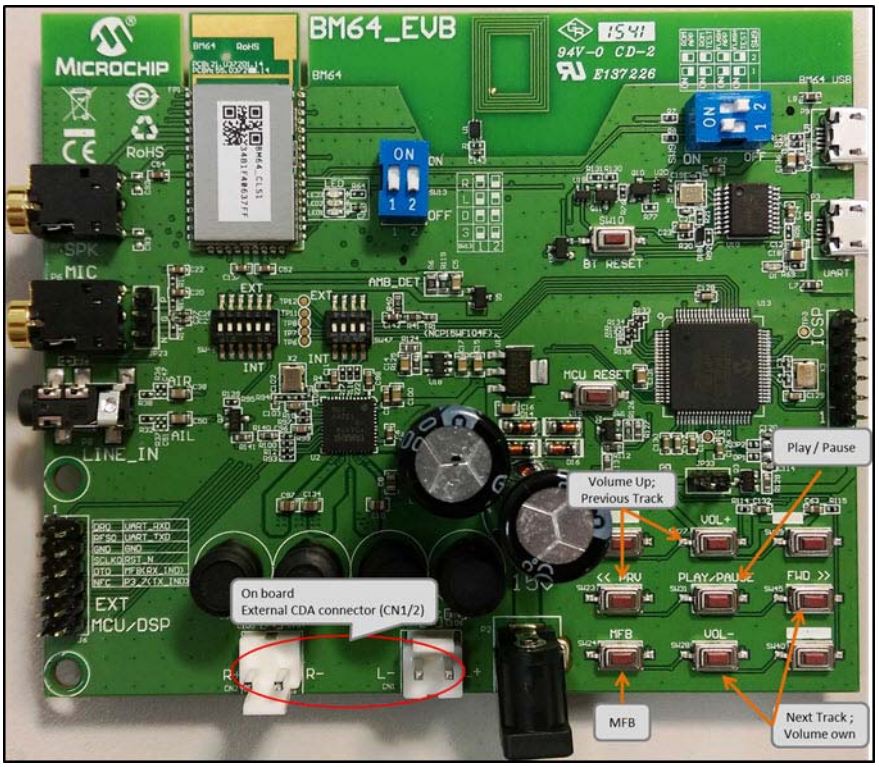
3.3.1 Audio Demonstration

In this demonstration, the user can stream audio on the BM64 EVB using a host device (PC or smartphone). Perform the following actions for the audio demonstration, refer to Figure 3-4.

1. Establish the connection between the BM64 EVB and a host device using the procedure listed in **3.2 “Getting Started with BM64 EVB”**.
2. Once the connection between the BM64 EVB and the host device is established, open the audio source on the host device. Microchip recommends using a media player (for example: Windows® Media Player, iTunes®, and Android™).

3. Start the audio stream on the media player. Both LED1 (blue) and LED2 (red) will blink once at regular intervals during the audio playback.The audio control buttons are used for these functions:
   - To control the audio output volume (long press **VOL+** or **VOL-** button)
   - Go to the previous track (short press **<< PRV** button)
   - Go to the next track (short press **FWD >>** button)
   - Start/stop playing the current track (short press **PLAY/PAUSE** button)

FIGURE 3-4: BM64 EVB AUDIO CONTROL BUTTONS



3.3.2 HSP/HFP Demonstration

In this demonstration, the user can explore the Headset Profile (HSP) or Hands-Free Profile (HFP) setting to receive an incoming voice call from a paired smartphone. Perform the following steps for demonstration, refer to Figure 3-4.

1. Establish the connection between the BM64 EVB and a host device using the procedure listed in **3.2 "Getting Started with BM64 EVB"**.
2. Connect the speaker to the audio out connector (CN1 and CN2) and a microphone to the MIC input (P6), respectively, on the BM64 EVB.
3. Initiate a call from another phone to the smartphone that is paired with the BM64 EVB. The A2DP stream pauses and the ringtone is played on the speaker. LED1 (blue) blinks three times at regular intervals.
4. Press the SW24 (MFB) button on the BM64 EVB to accept the incoming call. LED1 (blue) and LED2 (red) will blink three times at regular intervals.

3.4 CONFIGURING BM64 MODULE

The BM64 EVB can be configured and various parameters can be customized using the UI tool and DSP tool, and then parameters are saved in a file. Using the MPET tool, the saved files are merged into the `*.ipf` file, and then this merged file is programmed into the EEPROM. After EEPROM is programmed, restart the device to see the effect of the customized parameters.

3.4.1 UI Tool Configuration

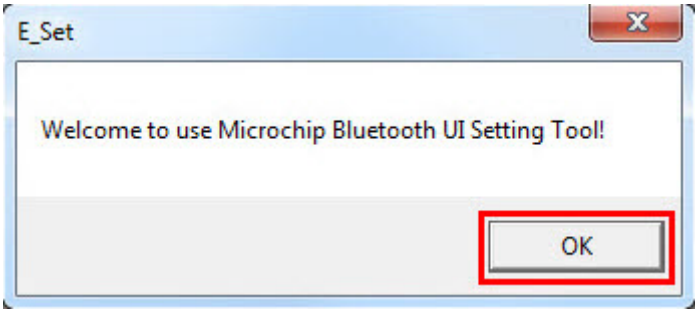
The User Interface (UI) tool is a configuration tool which enables the user to change the BM64 module parameters, such as device name, enable/disable pairing mode, BLE connection settings, configure the LEDs and enable/disable battery functions.

To configure the UI parameters, perform the following actions:

1. Open the UI configuration tool and click **OK** to configure the UI parameters, see Figure 3-5.

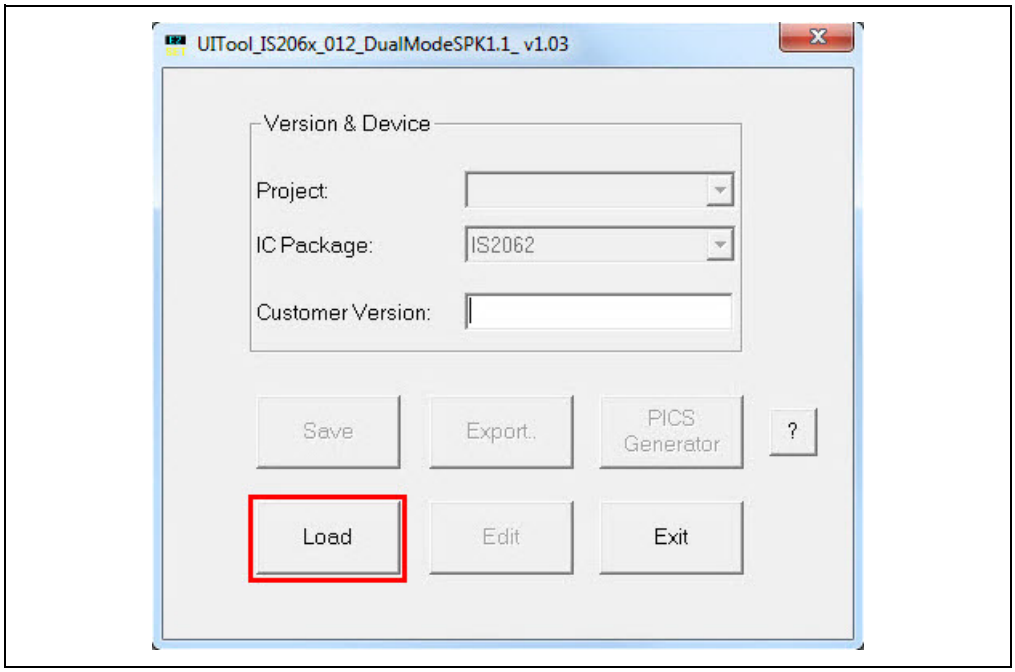
Note: Download and install the UI tool, which is available on the Microchip web site: www.microchip.com/BM64. For this demonstration `UITool_IS206x_012_DualModeSPK1.1_v1.03` is used.

FIGURE 3-5: UI TOOL



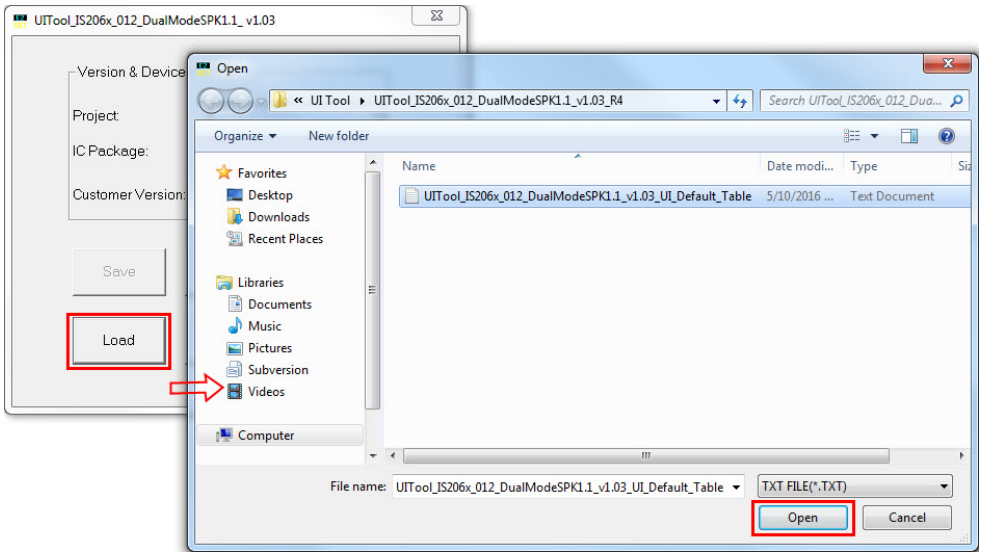
2. In the UI configuration tool, click **Load**, see Figure 3-6.

FIGURE 3-6: UI CONFIGURATION TOOL



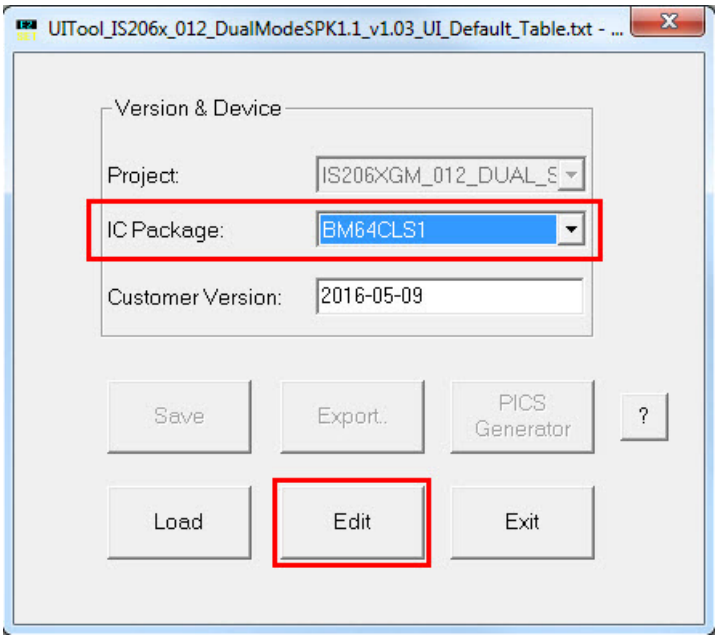
3. From the Open window, select the default UI parameters text file (provided with the UI tool) for the BM64 module, and then click **Open**, see Figure 3-7.

FIGURE 3-7: LOADING DEFAULT UI PARAMETERS



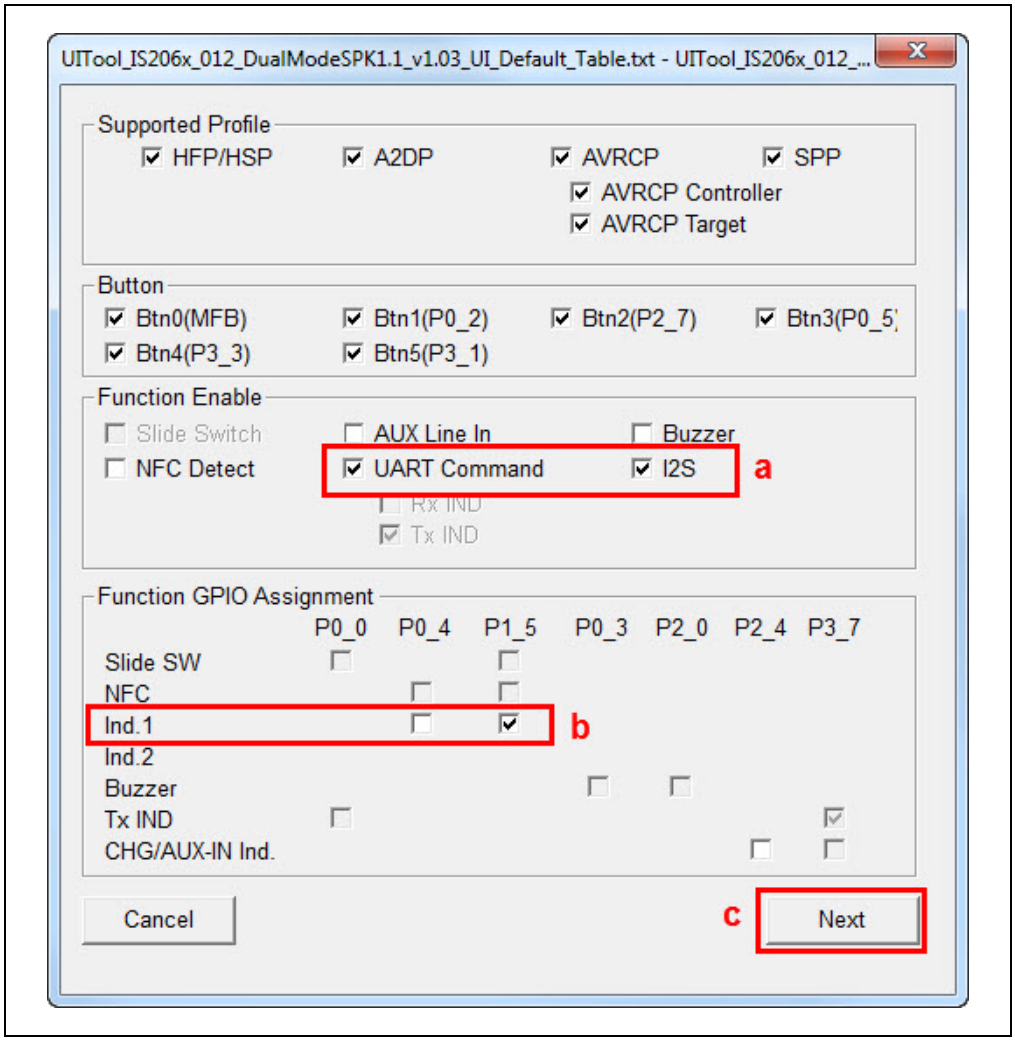
4. After loading the UI parameters, select “BM64CLS1” from the **IC Package** drop-down list and then click **Edit**, see Figure 3-8.

FIGURE 3-8: EDIT UI PARAMETERS



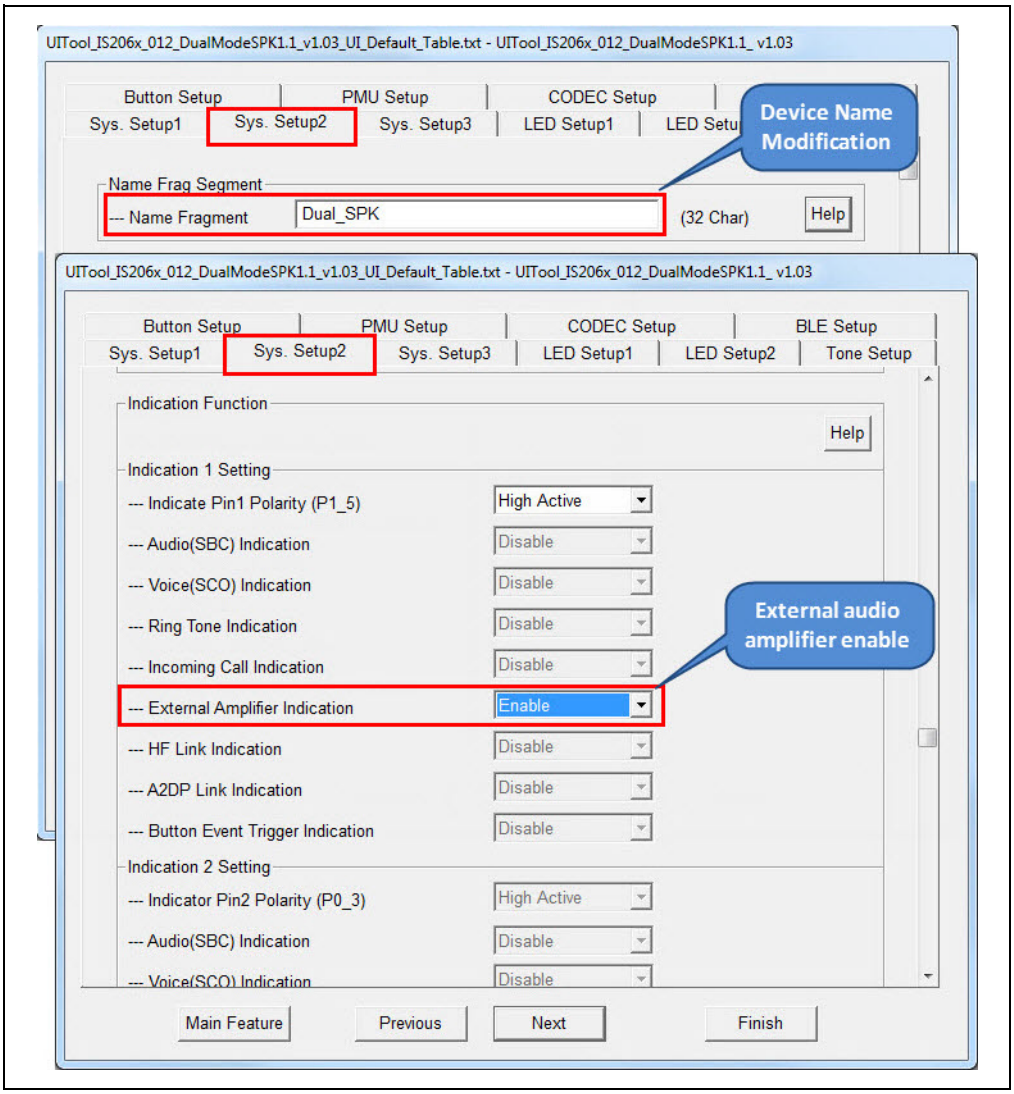
5. In the Main Feature dialog, the user can enable or disable the **Supported Profile** and audio line-in function **Button** and set the following parameters, as illustrated in Figure 3-9.
   a) Select the "UART Command" check box, which allows the module to be controlled by the MCU through the UART interface.
   b) Select "I^2S" check box for the volume key to function.
   c) Select the "Ind.1" check box to enable the external audio amplifier.
   d) Click **Next**.

FIGURE 3-9: MAIN FEATURE SETTINGS



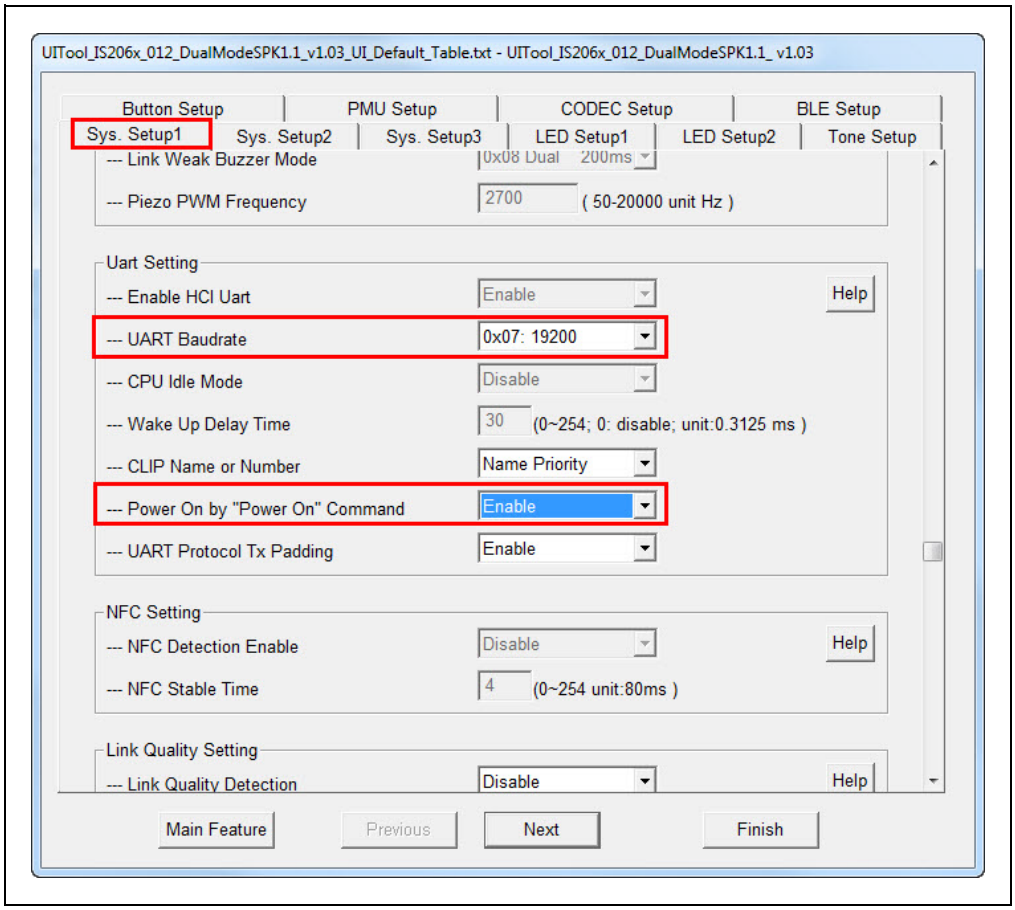
6. The System and Functional Settings dialog with various options (tabs) is displayed to configure the parameters. In the **Sys. Setup2** tab, from the Indication 1 Setting section, enable **External Amplifier Indication**, as illustrated in Figure 3-10. Click **Help** to get more detailed information.

FIGURE 3-10: ENABLE EXTERNAL AMPLIFIER INDICATION



7. In the **Sys. Setup1** tab, from the UART Setting section, set the **UART Baudrate** to "0x07:19200" and then enable **Power On by "Power On" Command**, as illustrated in Figure 3-11. The module will power-on by the UART command and not by the MFB key.

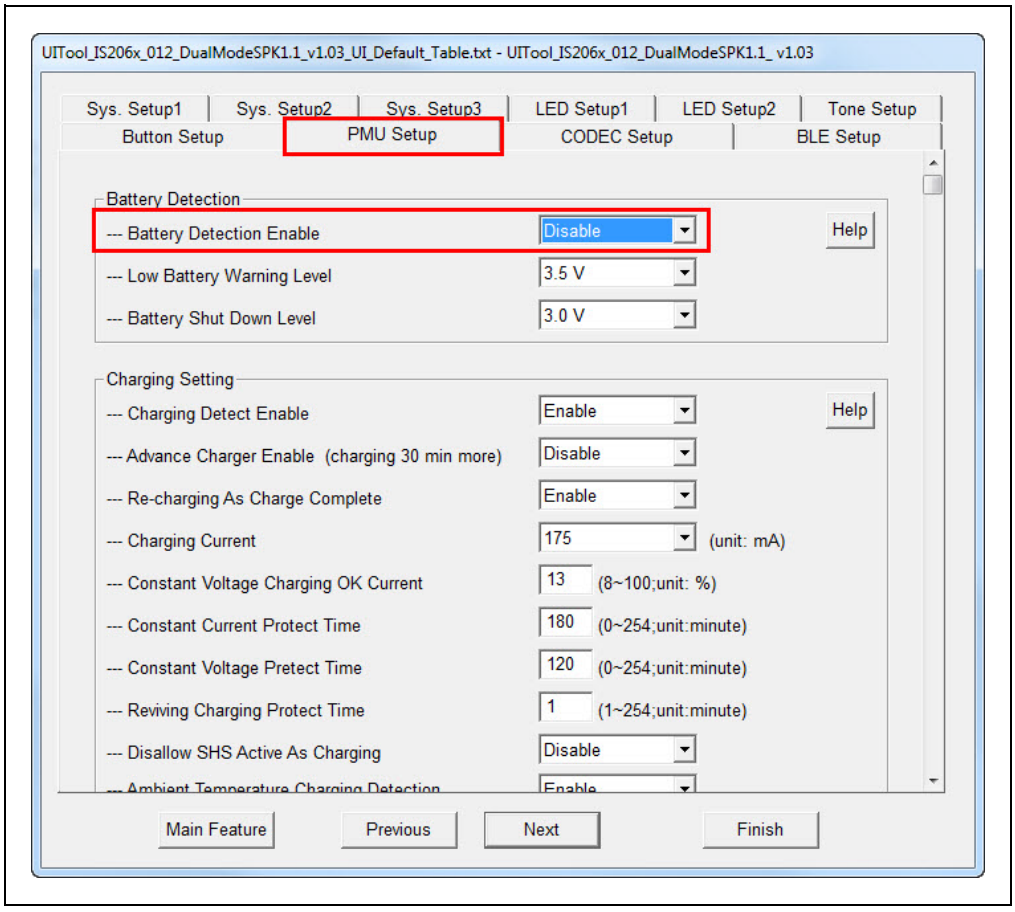
FIGURE 3-11: UART COMMAND SETTING



Note: As the MCU baud rate is set to 19200, the UI baud rate is also set to 19200.

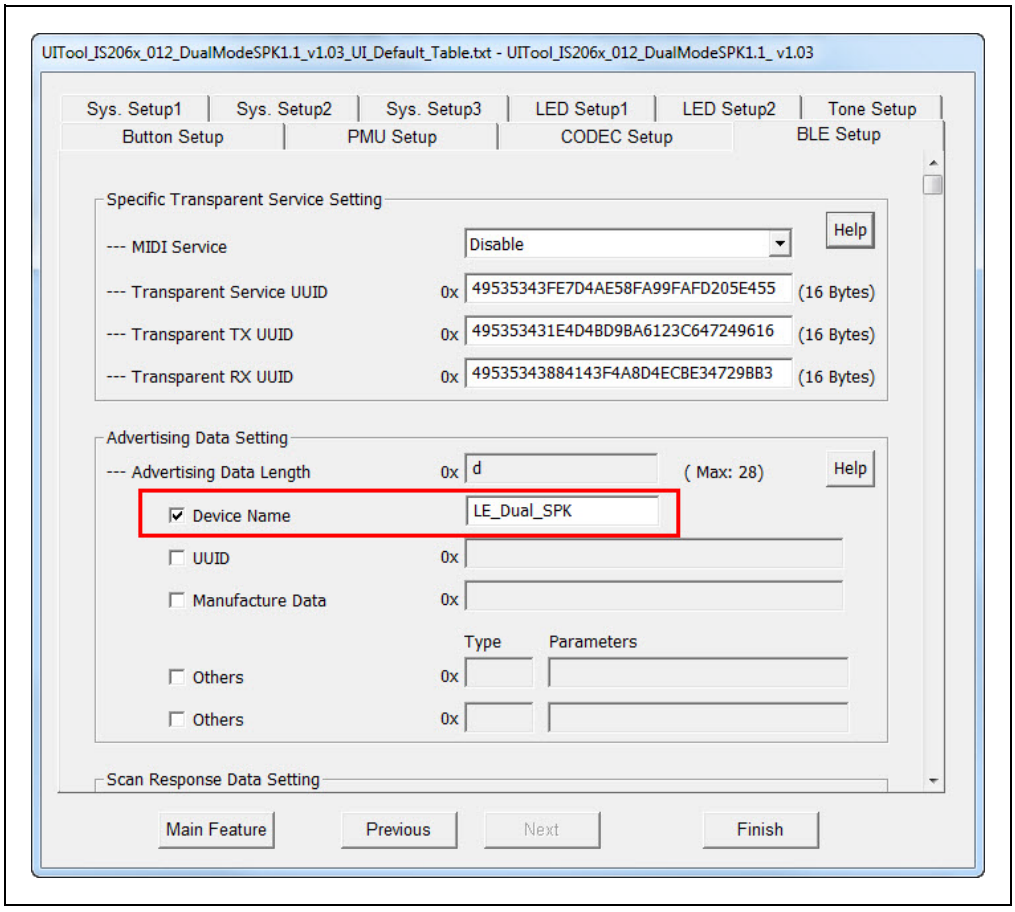
8. In the **PMU Setup** tab, from the Battery Detection section, disable **Battery Detection Enable**, as illustrated in Figure 3-12.

FIGURE 3-12: PMU SETUP



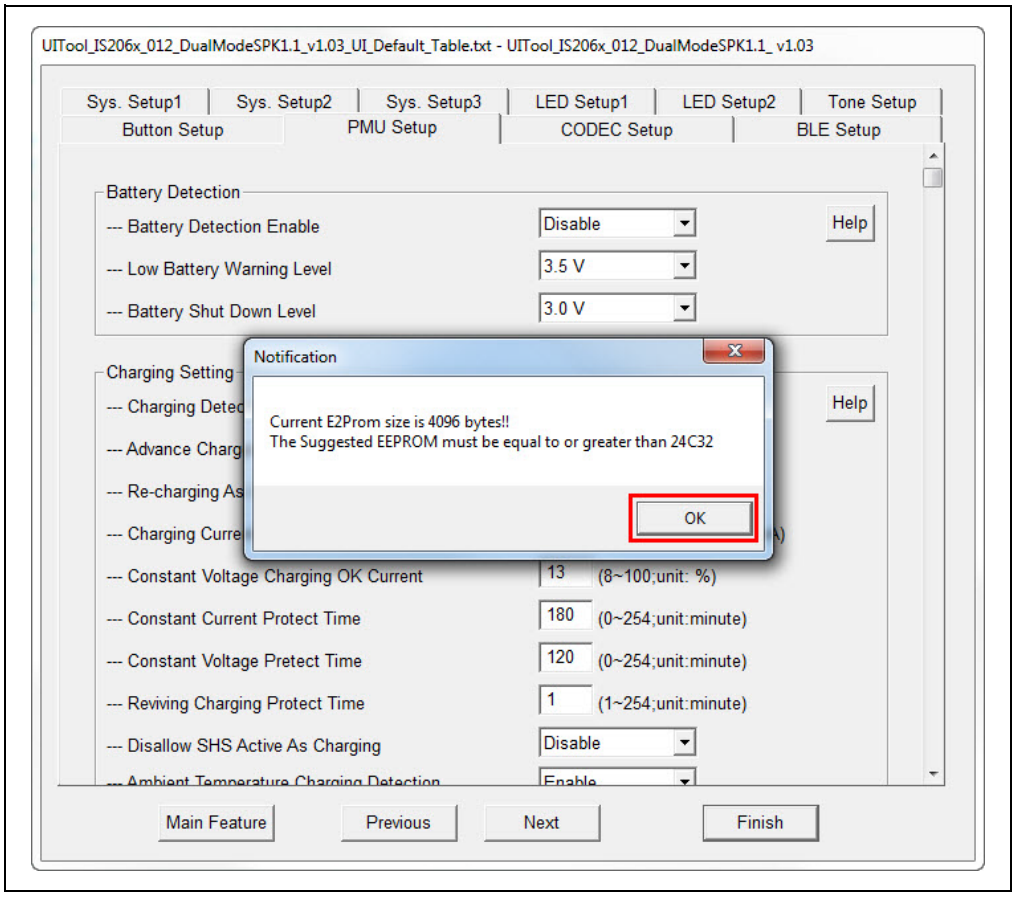
9. In the **BLE Setup** tab, from the Advertising Data Length section, select "Device Name" check box to advertise the device name, as illustrated in Figure 3-13.

FIGURE 3-13: BLE SETUP



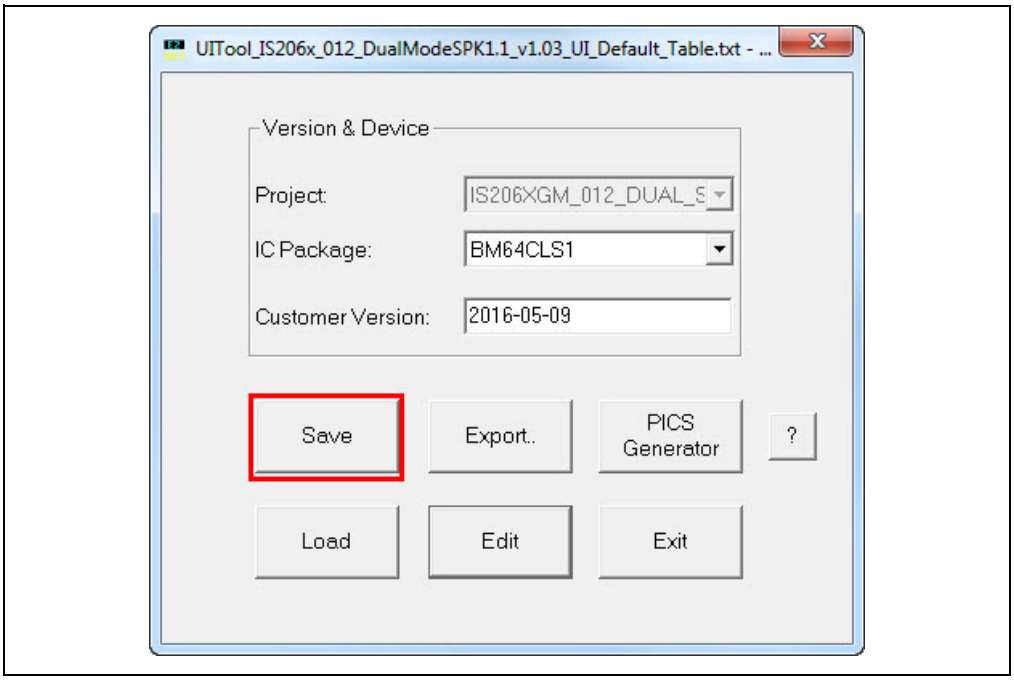
10. After setting up the parameters, click **Finish**. A notification is displayed to check the EEPROM size on the system. Click **OK**, see Figure 3-14.

FIGURE 3-14: EEPROM NOTIFICATION



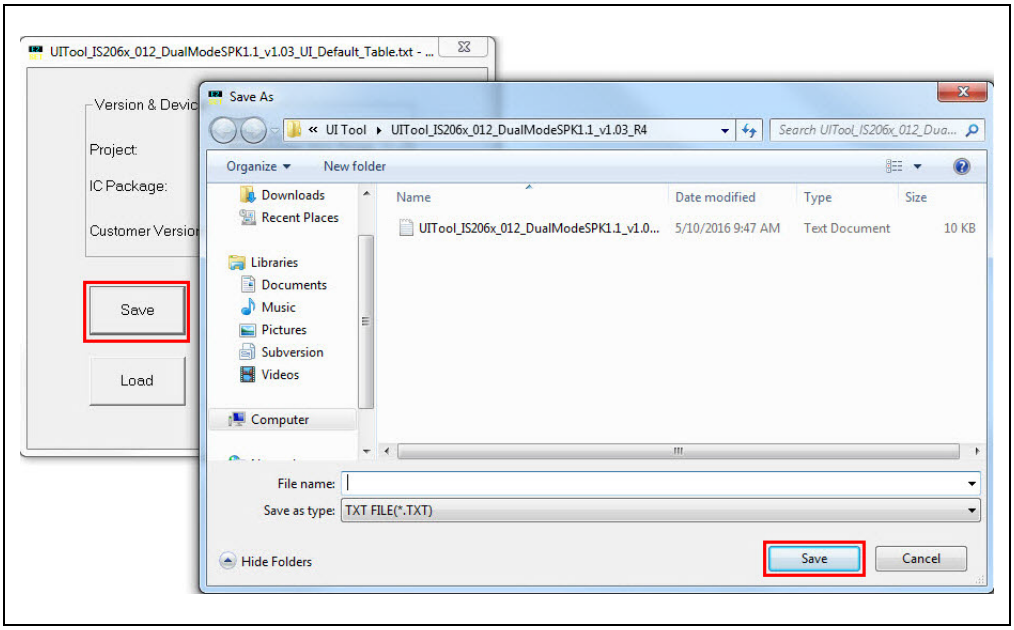
11. Click **Save** to save these UI parameters as a `.txt` file, see Figure 3-15.

FIGURE 3-15: SAVING UI PARAMETERS



12. From the Save As window, select the file location, and then click **Save**, see Figure 3-16.

FIGURE 3-16: SAVE AS WINDOW



13. After saving the UI parameters, click **Exit**.

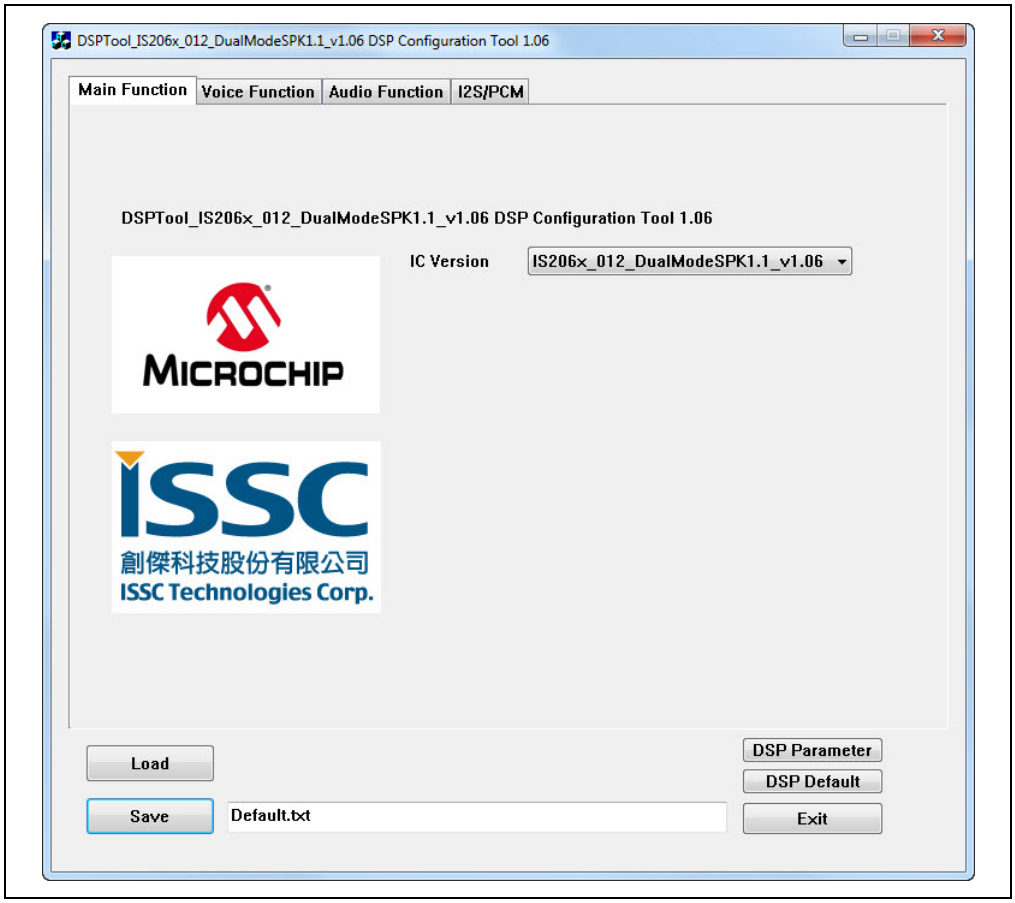
3.4.2 DSP Tool Configuration

The DSP configuration tool provides the visual interface to configure the DSP parameters for the voice and the audio signal processing functions. To configure the DSP parameters, perform the following actions:

1. Open the DSP tool and a dialog displays with various options (tabs) to configure the parameters, as illustrated in Figure 3-17.

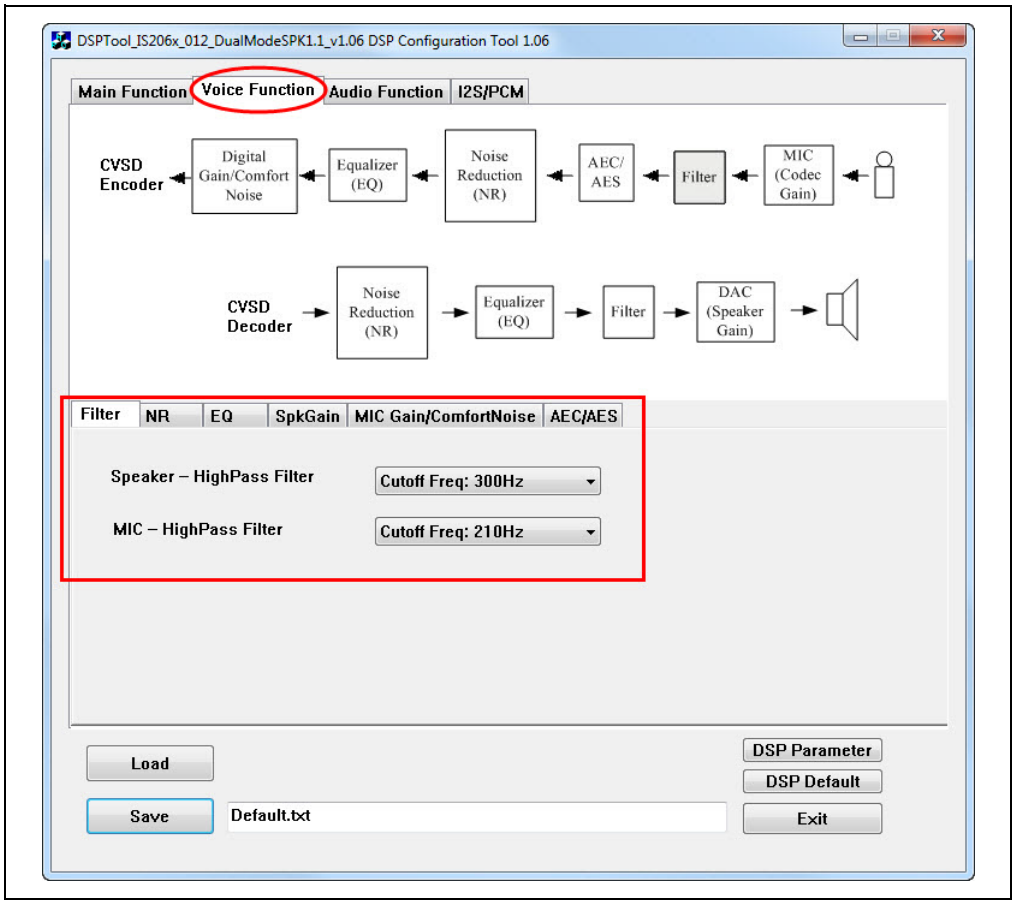
Note: Download and install the DSP tool, which is available on the Microchip web site: www.microchip.com/BM64. For this demonstration `DSPTool_IS206x_012_DualModeSPK1.1_v1.06` is used.

FIGURE 3-17: DSP TOOL SETTINGS



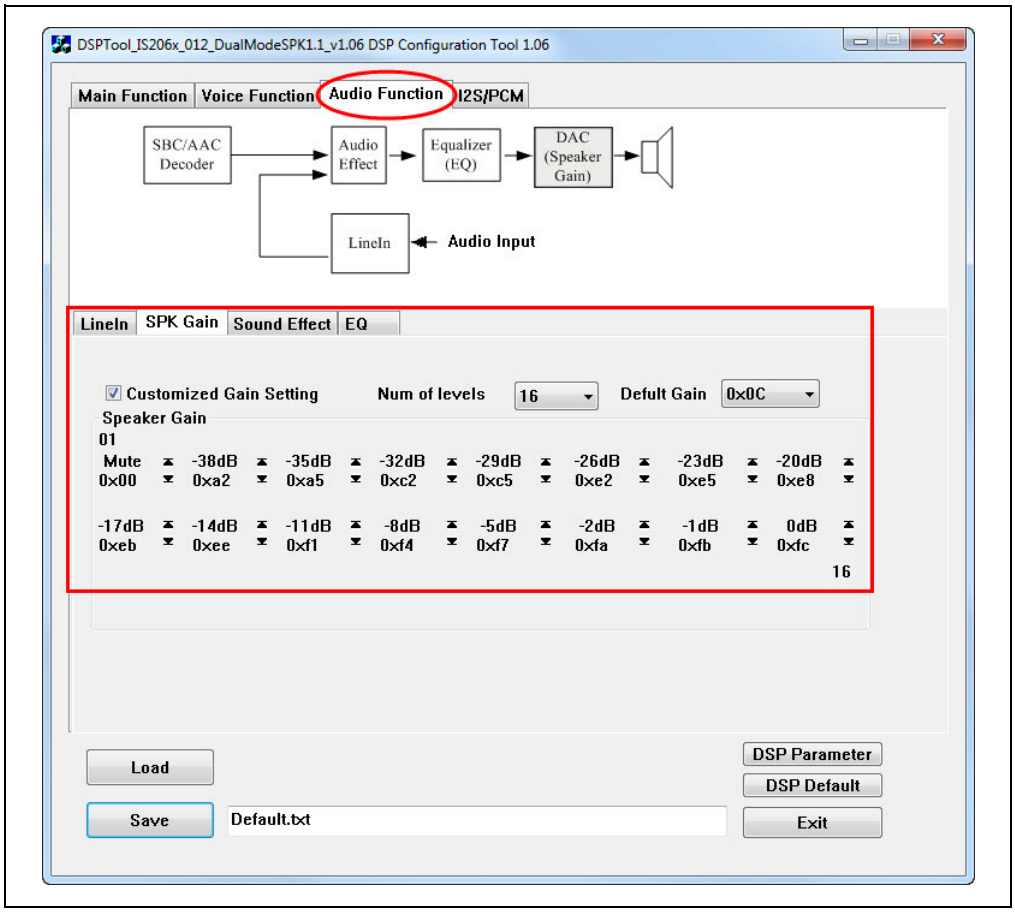
2. In the **Voice Function** tab, set the parameters as illustrated in Figure 3-18.

FIGURE 3-18: DSP VOICE FUNCTION SETTING



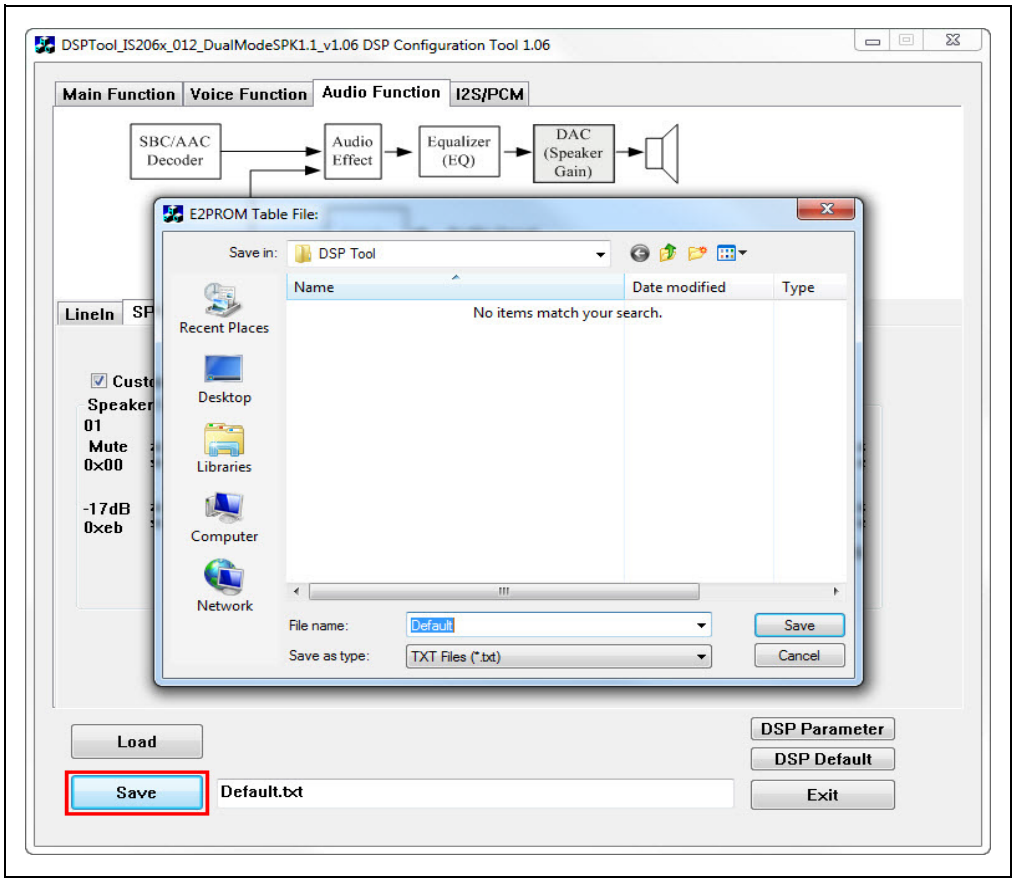
3. In the **Audio Function** tab, set the parameters as illustrated in Figure 3-19.

FIGURE 3-19: DSP AUDIO FUNCTION SETTING



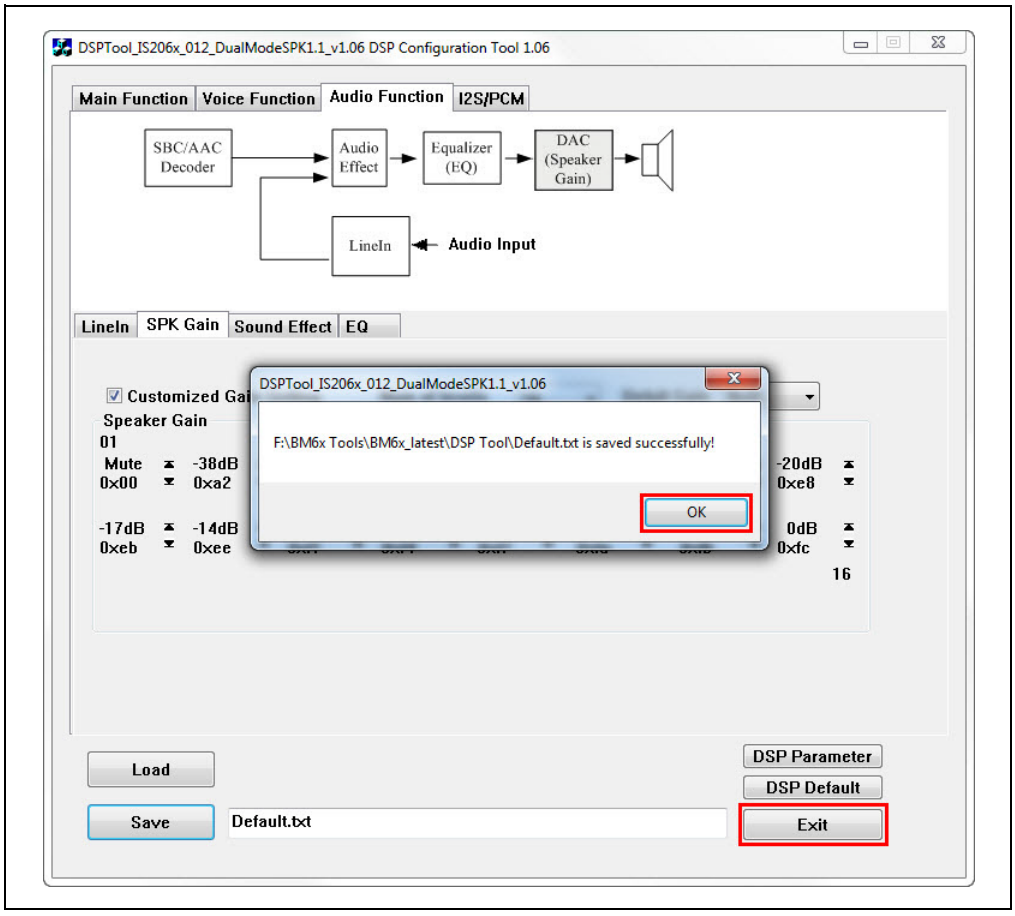
4. Click **Save** to save these DSP parameters as `.txt` file, see Figure 3-20.

FIGURE 3-20: SAVING DSP PARAMETERS



5. After saving the DSP parameters, from the notification pop up, click **OK**, see Figure 3-21. Click **Exit** to exit the DSP tool settings.

FIGURE 3-21: SAVE NOTIFICATION



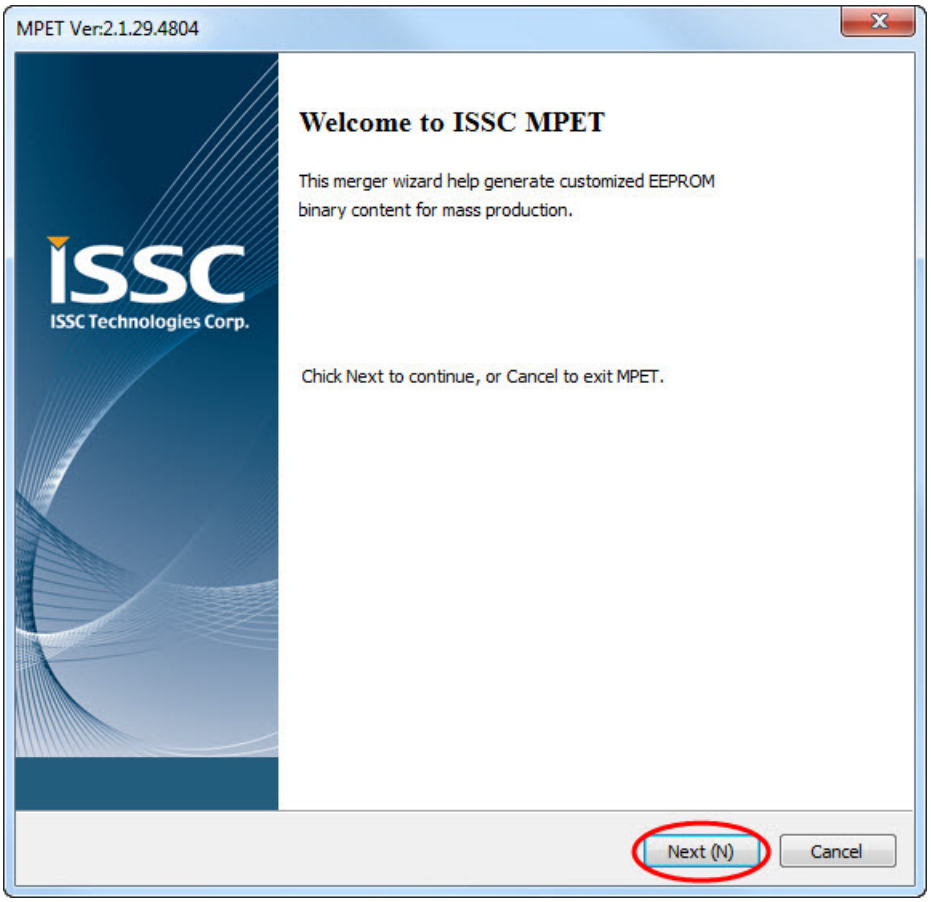
3.4.3 MPET Tool Configuration

The MPET tool is used to merge the UI and the DSP parameters, and generate a patch file (`.ipf`) or binary file (`.bin`). To generate a patch file using the MPET tool, perform the following actions:

1. Open the MPET tool and then click **Next** to continue with the configuration settings, see Figure 3-22.

Note: Download and install the MPET tool, which is available on the Microchip web site: www.microchip.com/BM64. For this demonstration `MPET_V2.1.29.4804` is used.

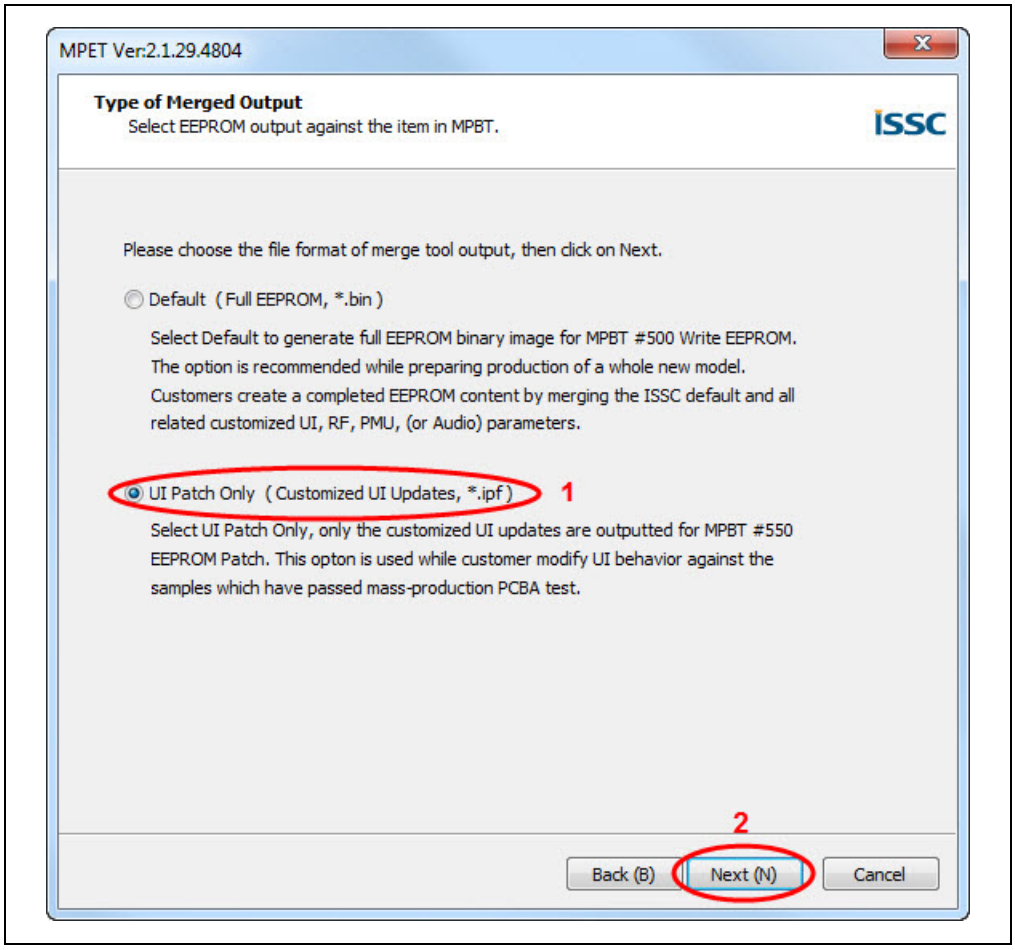
FIGURE 3-22: MPET TOOL SETTING



2. Select **UI Patch Only** to merge the UI and the DSP parameters and then click **Next**, see Figure 3-23.

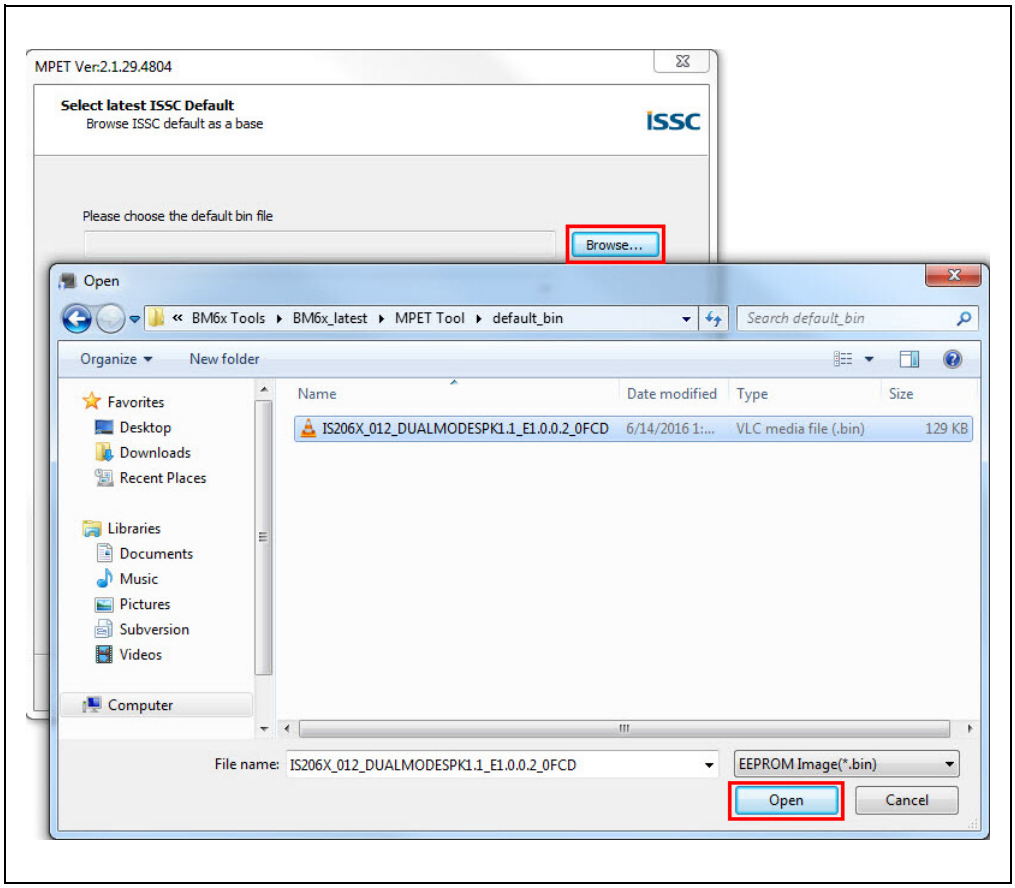
Note: For the UI parameter settings, refer to **3.4.1 "UI Tool Configuration"** and for the DSP parameter settings, refer to **3.4.2 "DSP Tool Configuration"**.

FIGURE 3-23: MERGE UI AND DSP PARAMETERS



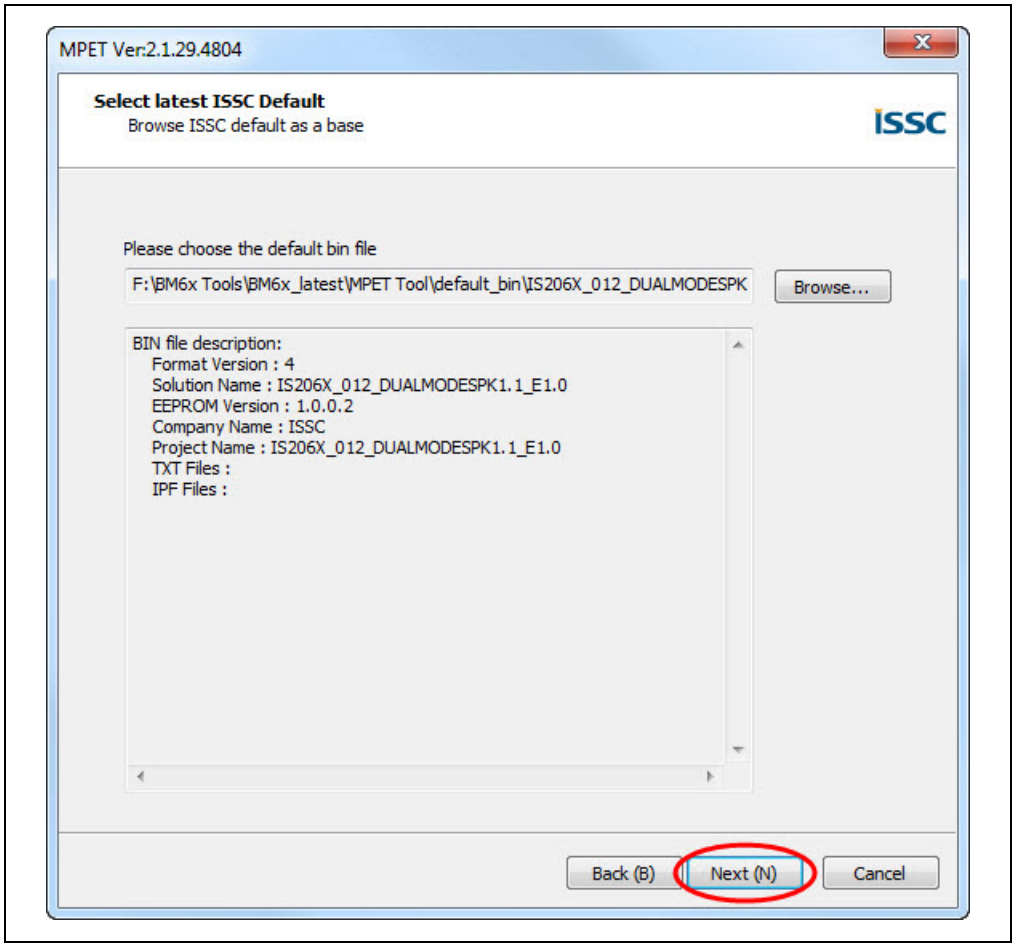
3. Click **Browse** to load the default `.bin` file (provided with the MPET tool). From the Open window, select the default `.bin` file and then click **Open**, see Figure 3-24.

FIGURE 3-24: LOADING DEFAULT BIN FILE



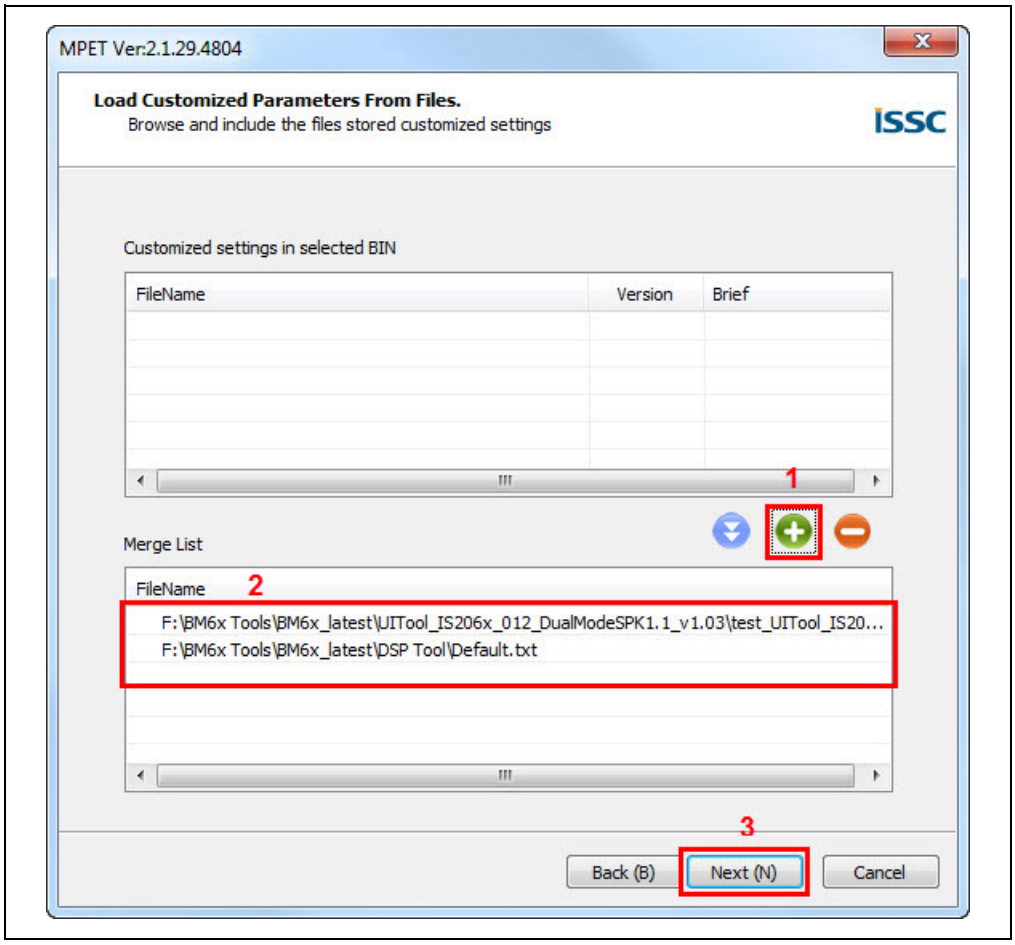
4. The bin file description is displayed. Click **Next**, see Figure 3-25.

FIGURE 3-25: DEFAULT BIN FILE SETTING



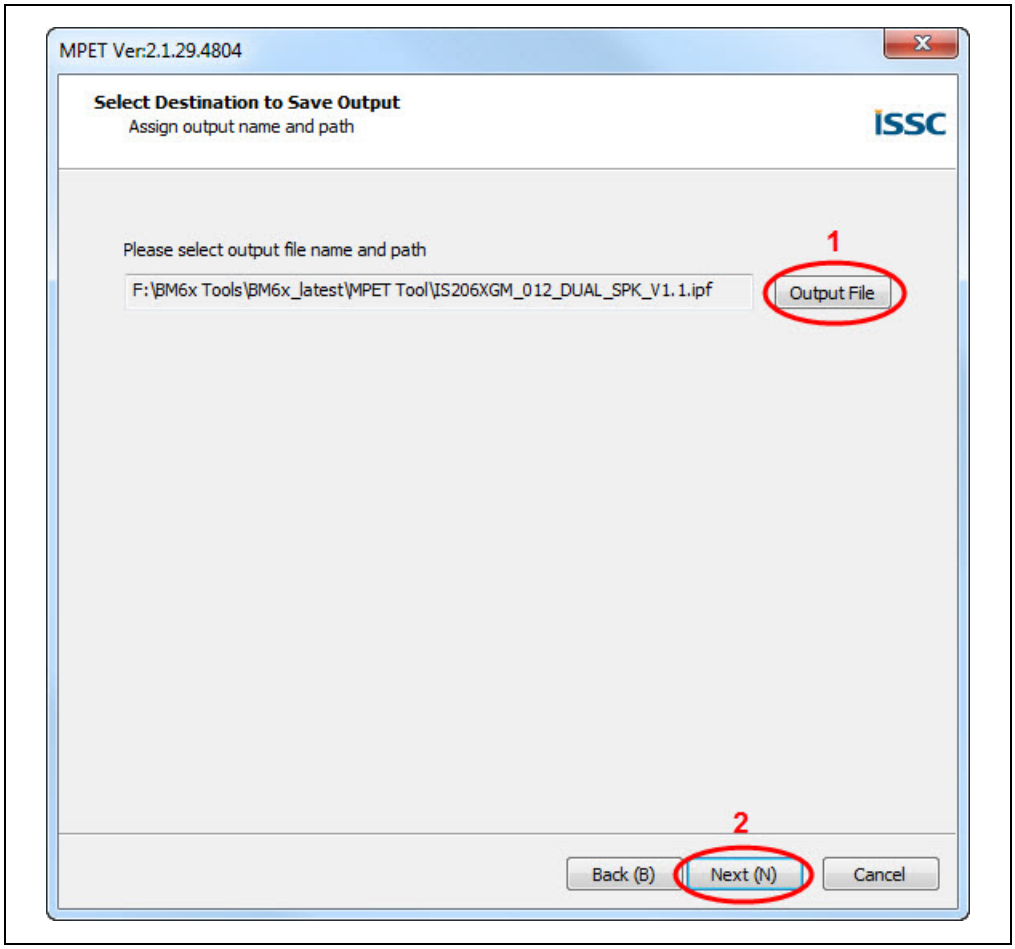
5. Click the "**+**" button to load the UI and DSP parameters (`.txt` file) into the MPET tool to merge with the EEPROM table and then click **Next**, as illustrated in Figure 3-26.

FIGURE 3-26: CUSTOMIZED SETTINGS TO MERGE



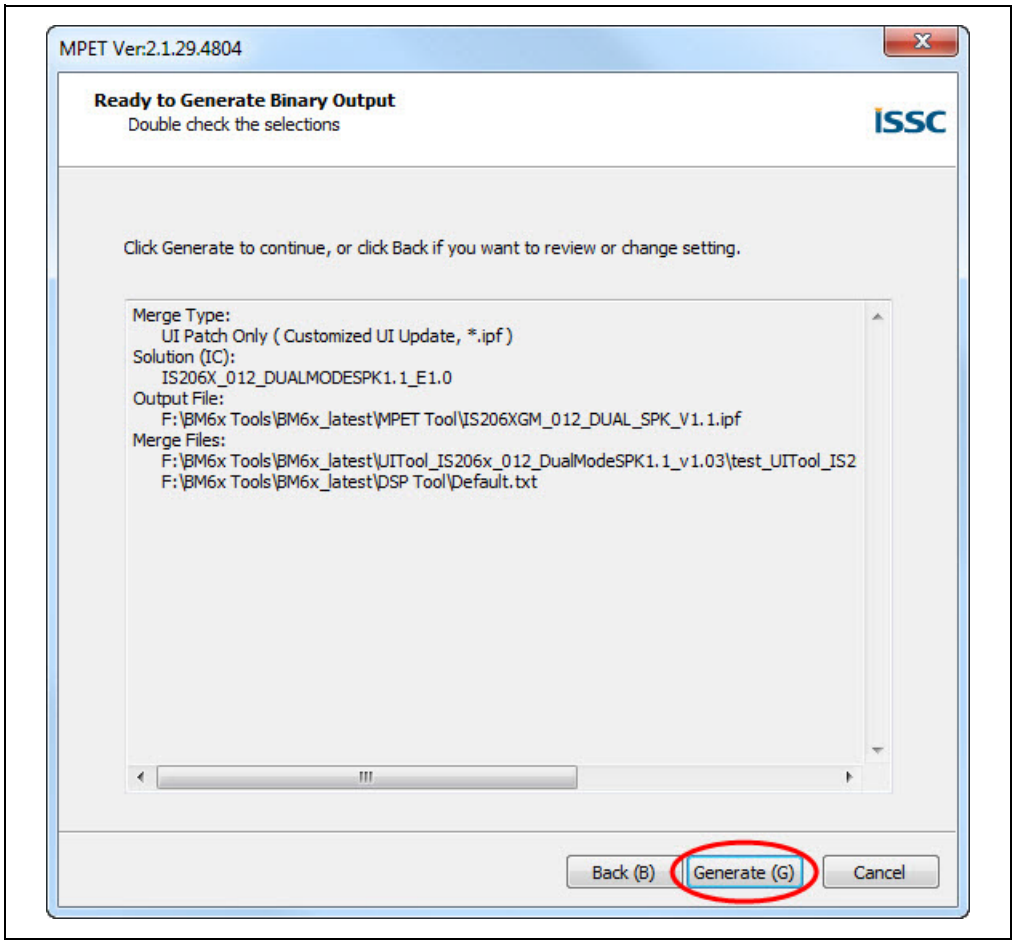
6. Select an Output File path to create the merged EEPROM table (`.ipf` file) and then click **Next**, see Figure 3-27.

FIGURE 3-27: SELECTING OUTPUT FILE NAME AND PATH



7. Click **Generate** to generate the EEPROM table (`.ipf` file), see Figure 3-28.

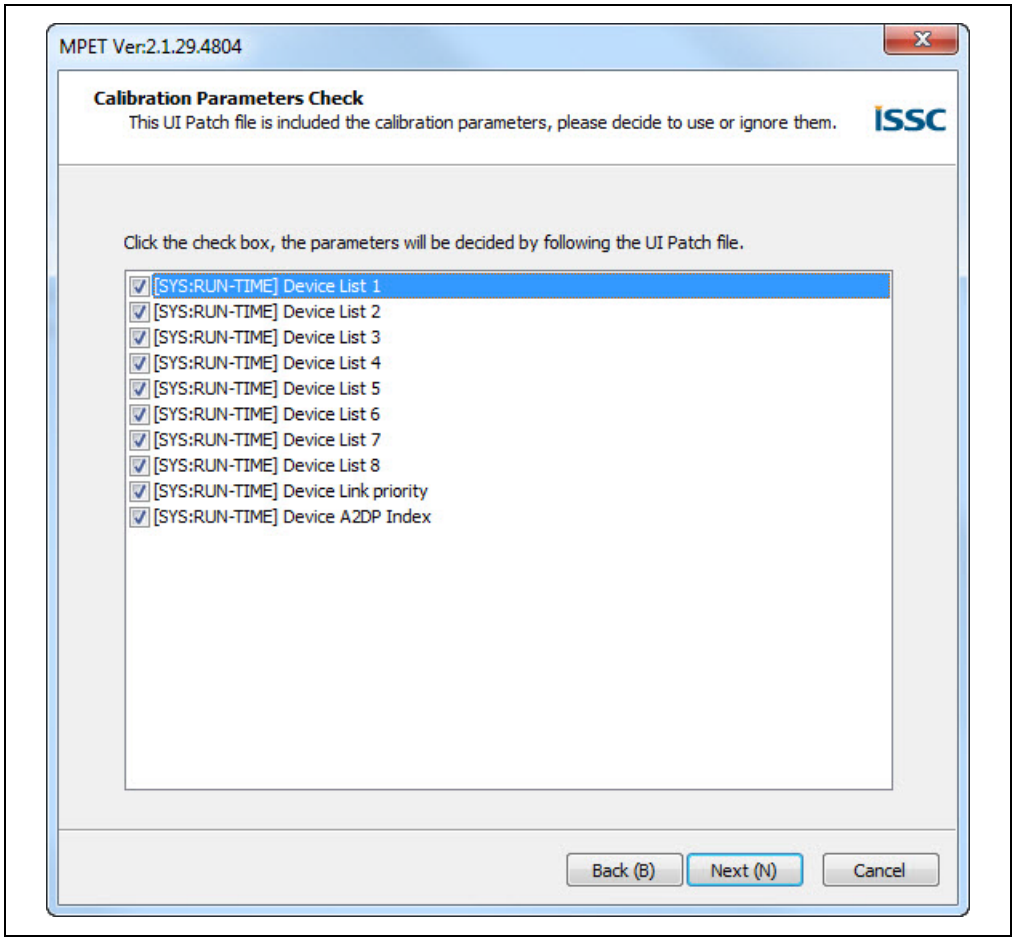
FIGURE 3-28: GENERATE EEPROM TABLE



8. The calibration parameters included in the UI patch file can be selected or ignored. Click **Next**, see Figure 3-29.

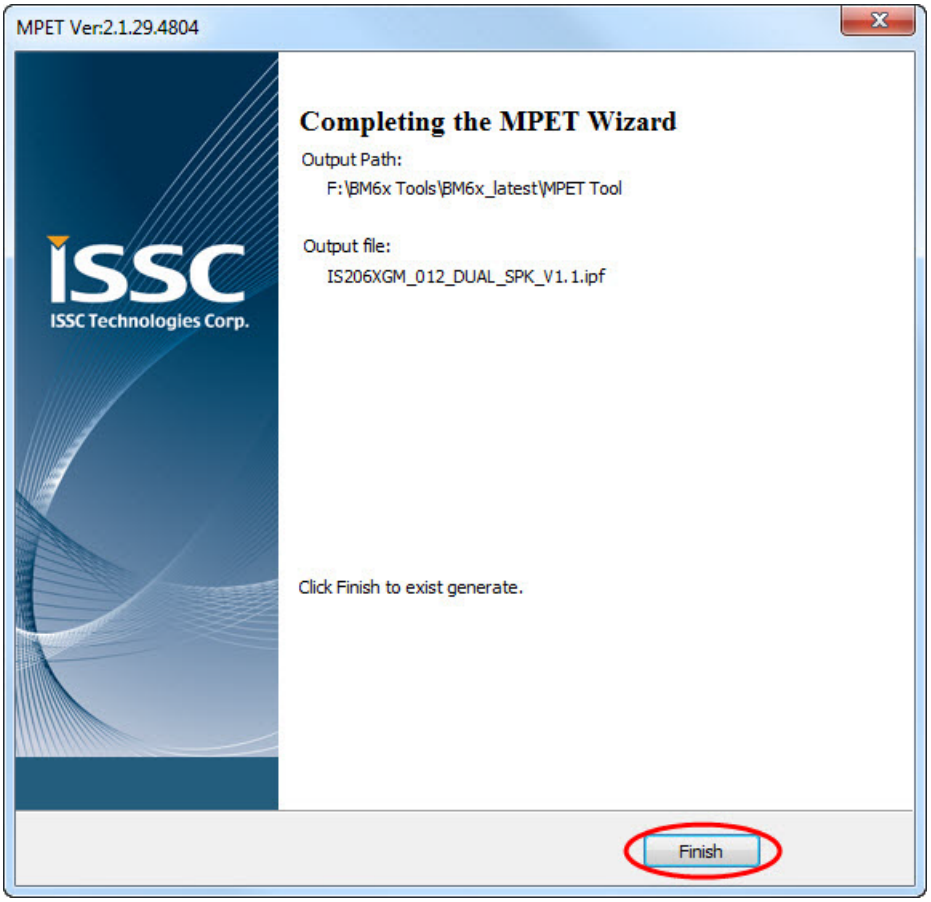
> **Note:** If the items are selected, the calibration parameters of the `.ipf` file will overwrite the parameters in the device.

FIGURE 3-29: CALIBRATION PARAMETERS CHECK



9. After generating the merged EEPROM table (`.ipf` file), click **Finish** to exit the wizard, see Figure 3-30.

FIGURE 3-30: GENERATED OUTPUT FILE



3.5 UPDATING EEPROM PARAMETERS

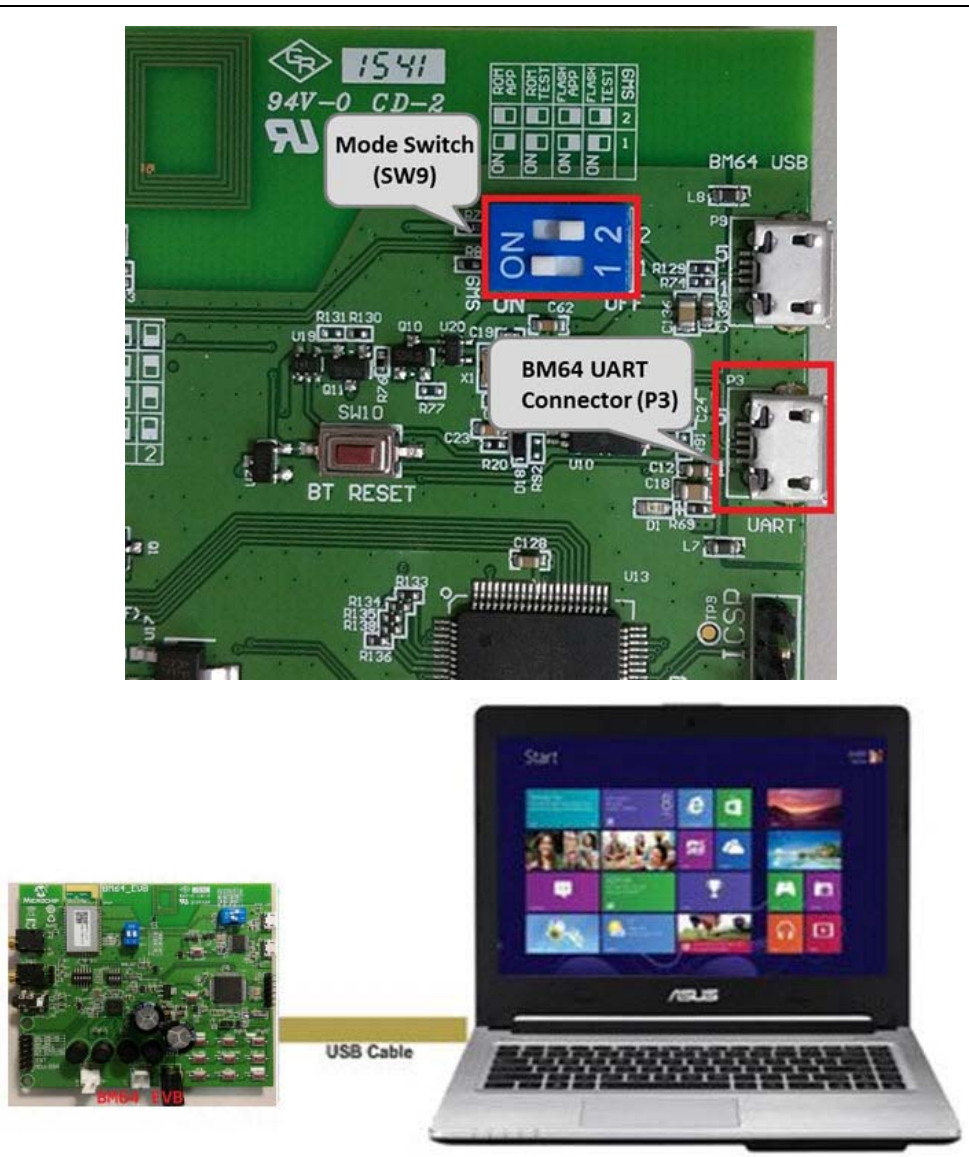
The EEPROM tool is used to write the EEPROM parameters in the BM64 module. Perform the following actions to update the EEPROM parameters:

1. Set switch SW9 to Flash Test mode, see Figure 3-31.

FIGURE 3-31: SWITCH SW9 IN FLASH TEST MODE

2. Connect the BM64 UART Connector (P3) port to a host PC using a micro-USB cable, as illustrated in Figure 3-32. The default LED behavior in Flash Test mode is: LED1 (blue) and LED2 (red) will be ON.

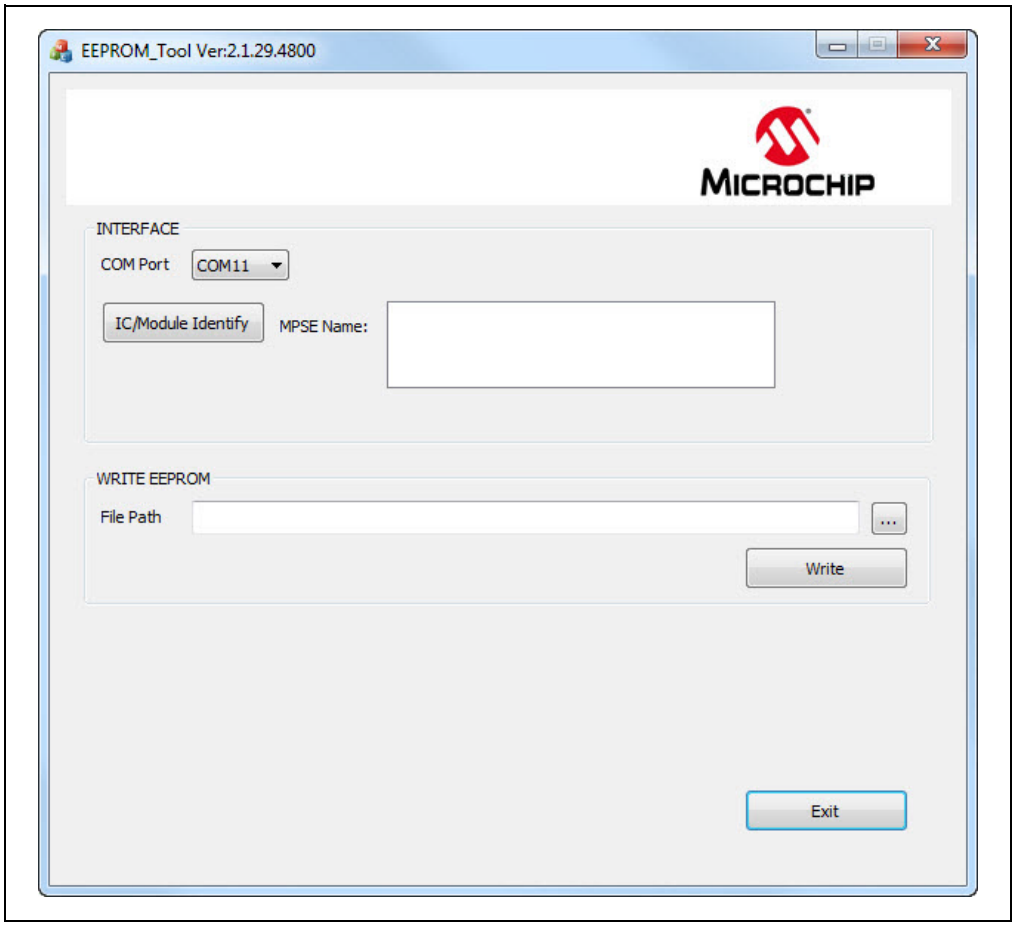
FIGURE 3-32: EEPROM PARAMETERS SETUP



Note: Download and install the EEPROM tool, which is available on the Microchip web site: www.microchip.com/BM64. For this demonstration `EEPROM_Tool_V2.1.29.4800` is used.

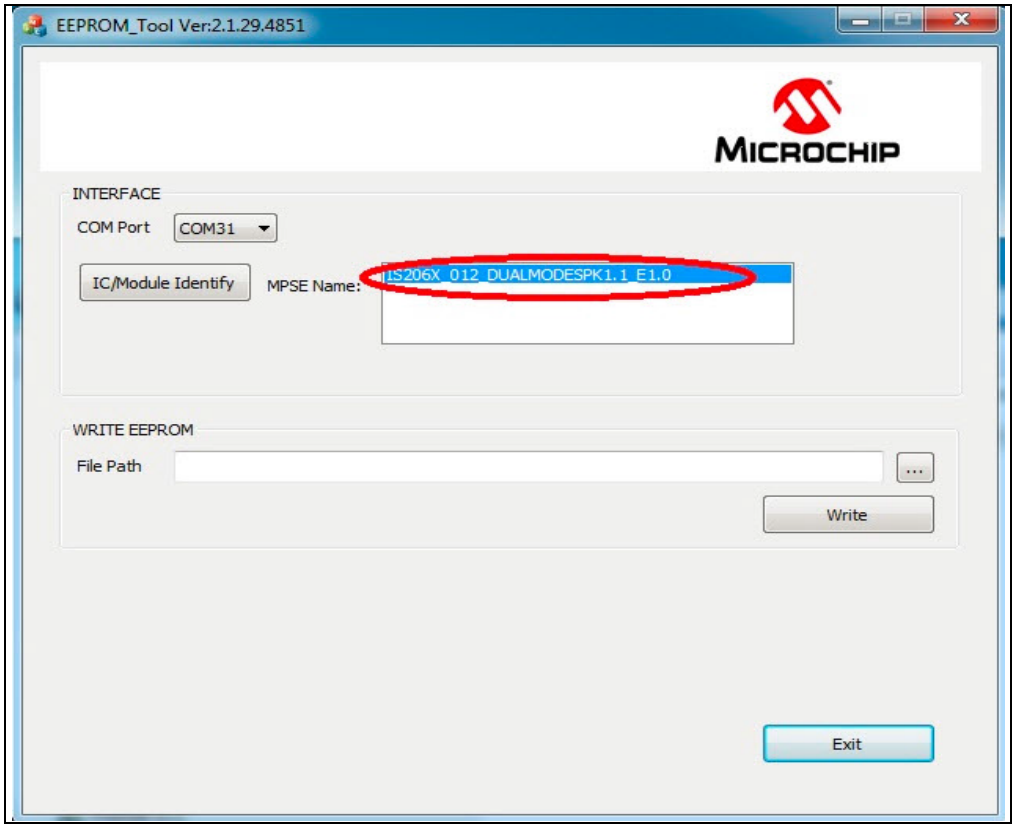
3. Open the EEPROM tool and a window displays, see Figure 3-33.

FIGURE 3-33: EEPROM TOOL



4. Specify the **COM Port** and click **IC/Module** identity, see Figure 3-34.

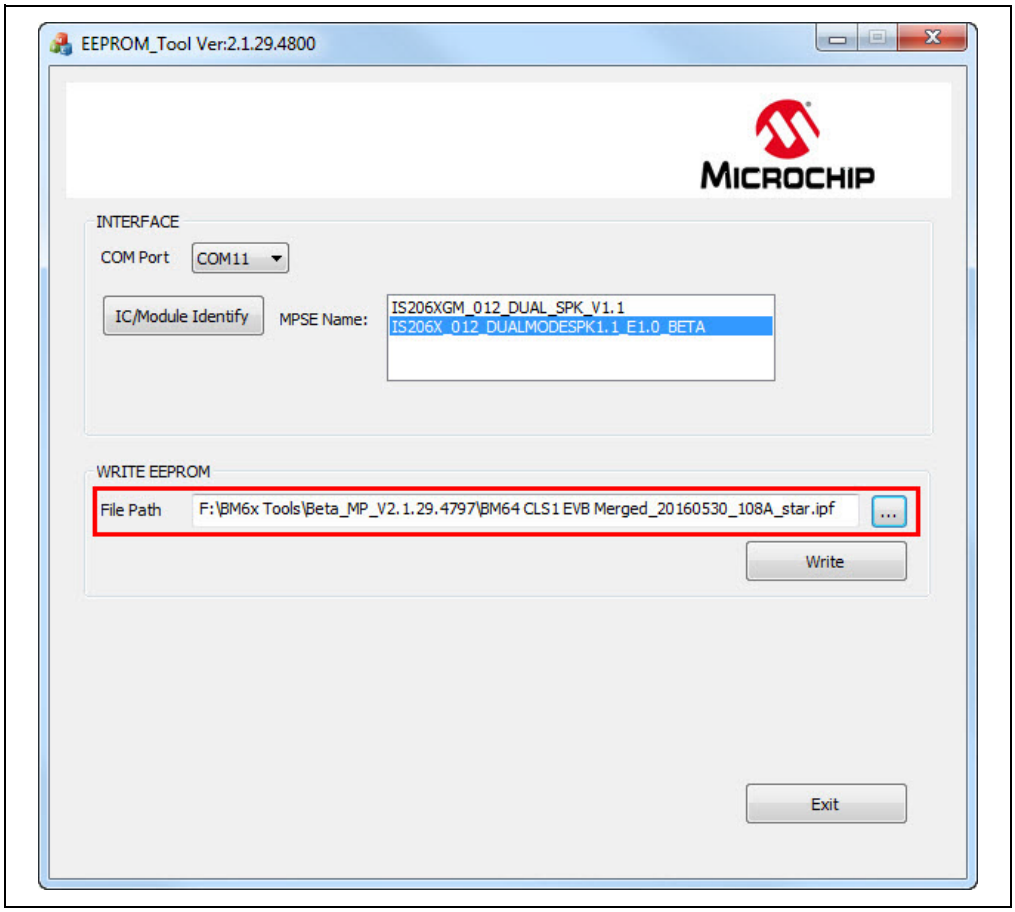
FIGURE 3-34: EEPROM TOOL SETTINGS



5. Click **Browse** and load the generated patch file (`.ipf`) to write to the EEPROM parameters table on the BM64 module, see Figure 3-35.

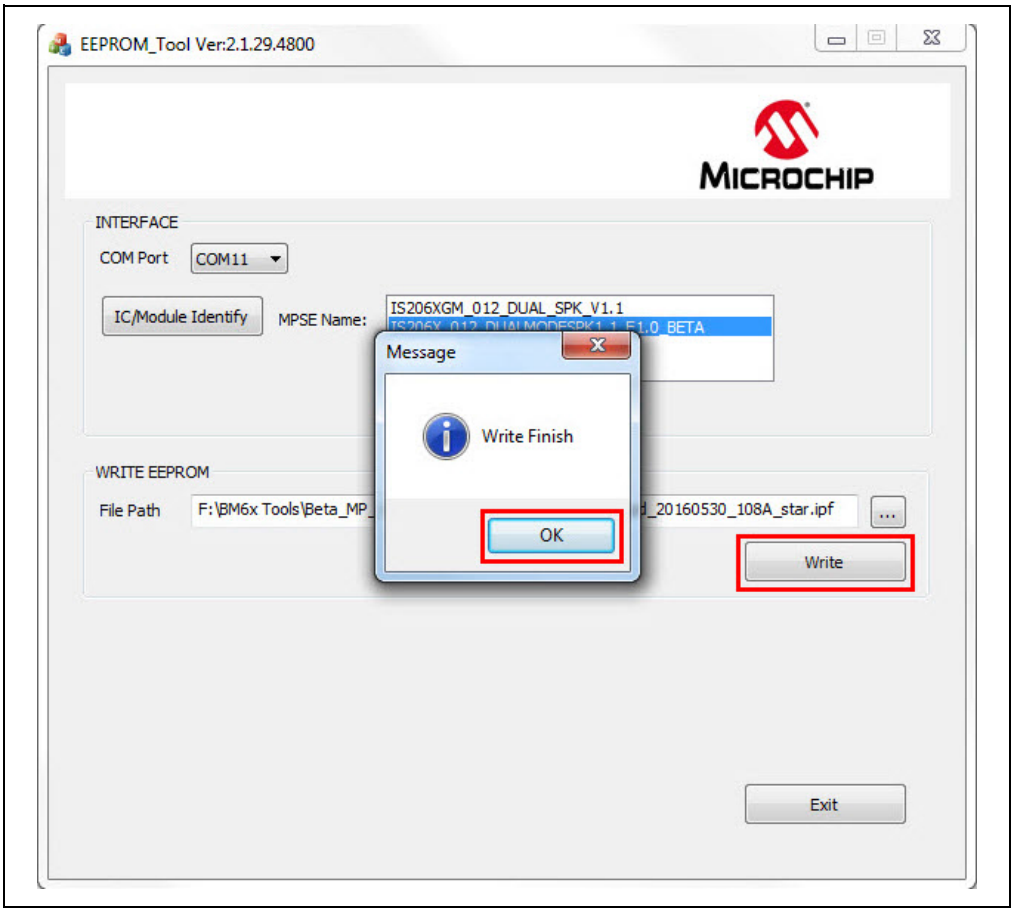
Note: The patch file (`.ipf`) is generated using the MPET tool. For information on generating the patch file, refer to **3.4.3 "MPET Tool Configuration"**.

FIGURE 3-35: LOADING GENERATED PATCH FILE



6. Click **Write** to program the EEPROM parameters on the BM64 module. After programming the EEPROM parameters, a message is displayed. Click **OK** as illustrated in Figure 3-36.

FIGURE 3-36: WRITE EEPROM



7. Click **Exit** and remove the micro-USB cable. Then, set SW9 to Flash Application mode (see Figure 3-37) and reboot.

FIGURE 3-37: SWITCH SW9 IN FLASH APPLICATION MODE

3.6 UPDATING FLASH CODE

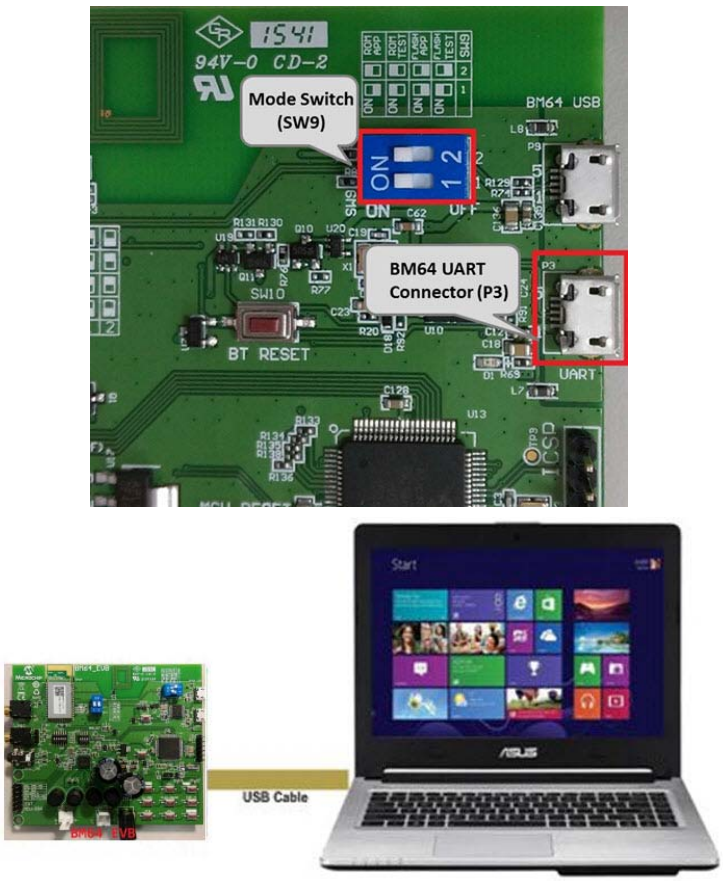
A new or a specific version of the flash code can be programmed using the Flash Programming tool. To program the Flash code, perform these actions:

1. Set switch SW9 to ROM Test mode, see Figure 3-38.

FIGURE 3-38: SWITCH SW9 IN ROM TEST MODE

2. Connect the BM64 UART connector (P3) port to a host PC using a micro-USB cable, as illustrated in Figure 3-39. The default LED behavior in ROM Test mode is: LED1 (blue) and LED2 (red) will be ON.

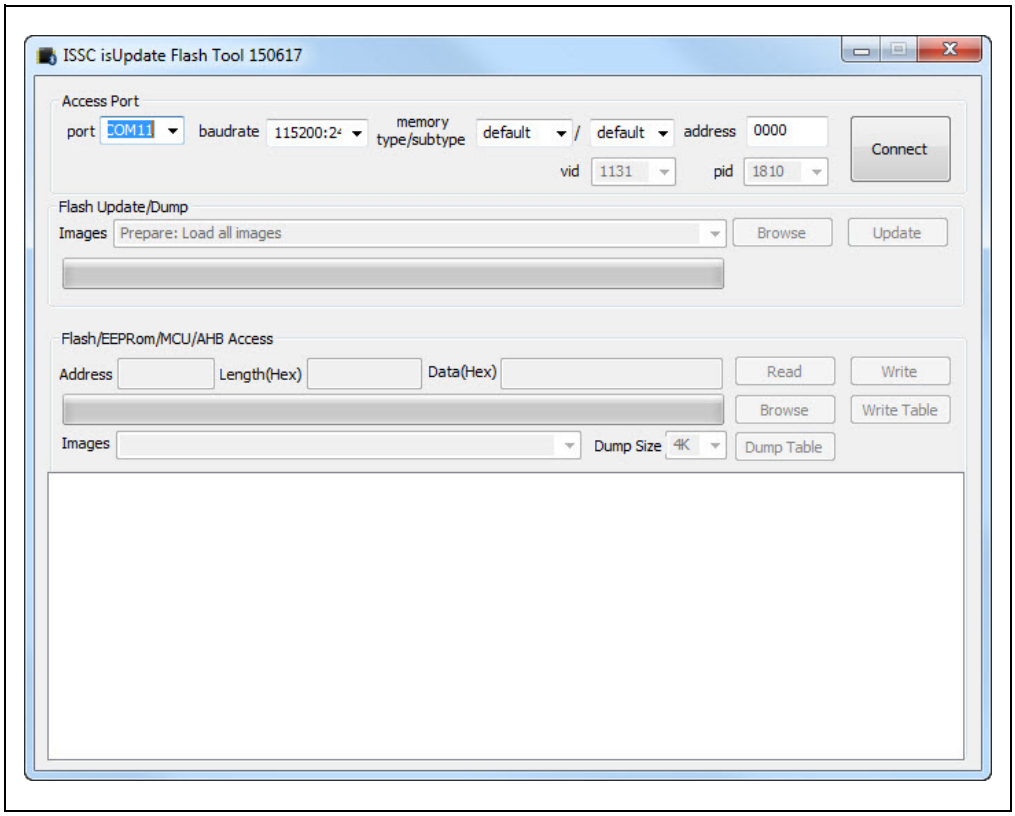
FIGURE 3-39: FLASH CODE SETUP



Note: Download and install the `isupdate.exe` firmware update tool, which is available on the Microchip web site: www.microchip.com/BM64. For this demonstration, flash code `DUAL_SPK_FIRMWARE_V1.1` is used.

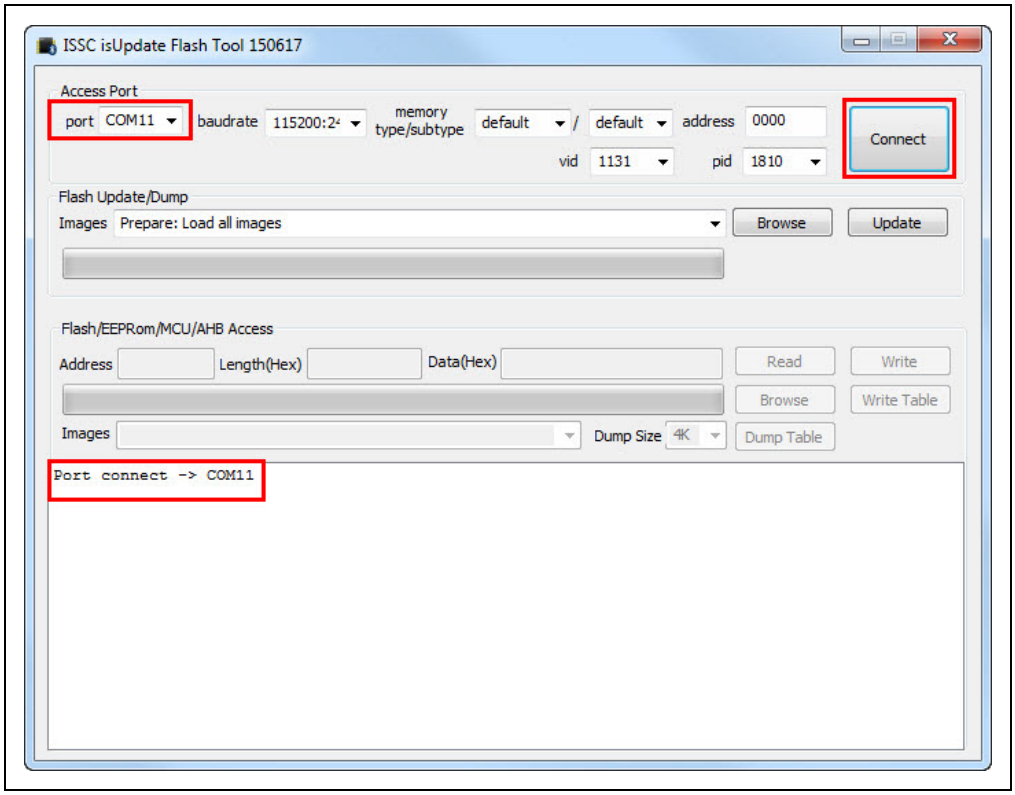
3. Open the `isupdate.exe` firmware update tool on a host PC and a window is displayed, see Figure 3-40.

FIGURE 3-40: FIRMWARE UPDATE TOOL



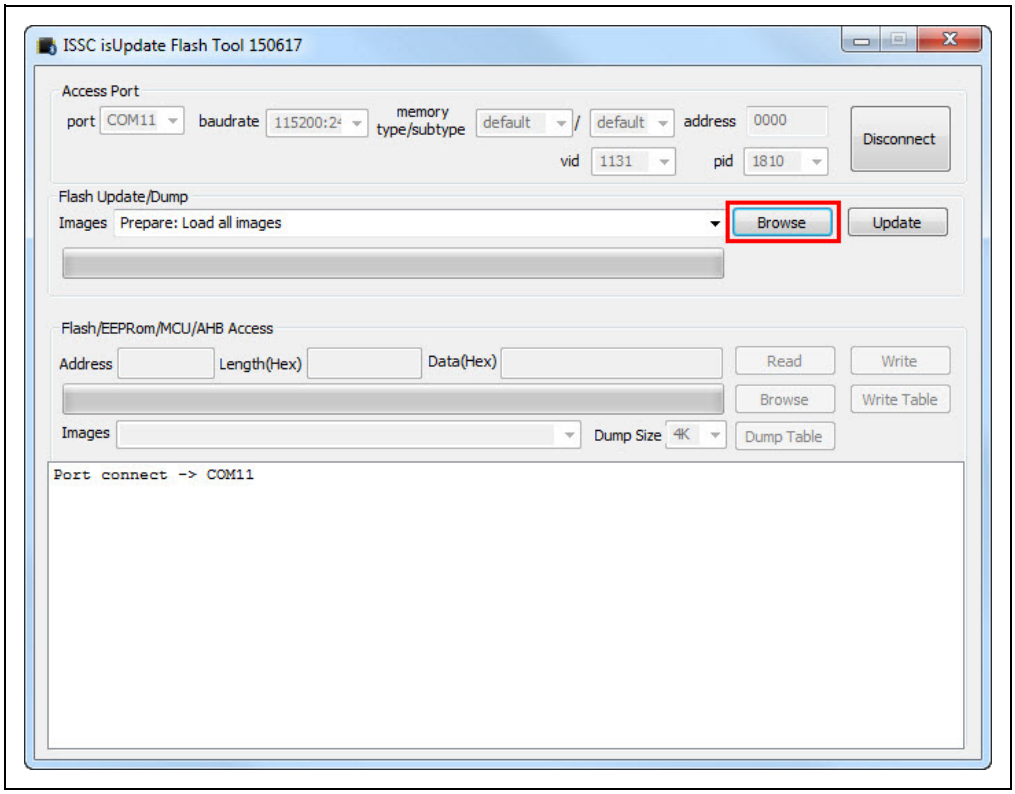
4. Specify the **COM Port** and set the following parameters, as illustrated in Figure 3-41.
   - Baud Rate: 115200
   - Memory type/subtype: default
   - Address: 0000
5. Click **Connect**. On successful connection the "Port connect" message is displayed, see Figure 3-41. In case of a failed connection, verify the parameters entered and try connecting again.

FIGURE 3-41: SETTING THE PARAMETERS



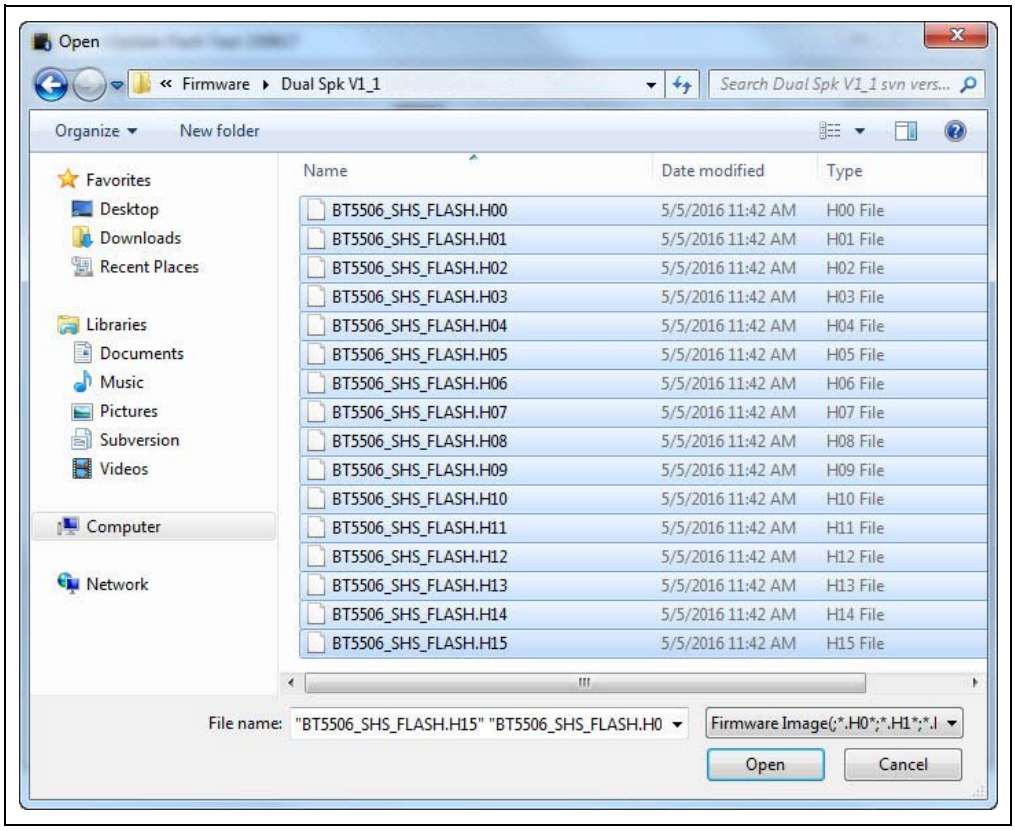
6. Click **Browse** to select the Flash code files (.hex) downloaded from the Microchip web site, see Figure 3-42.

FIGURE 3-42: LOADING FIRMWARE IMAGE



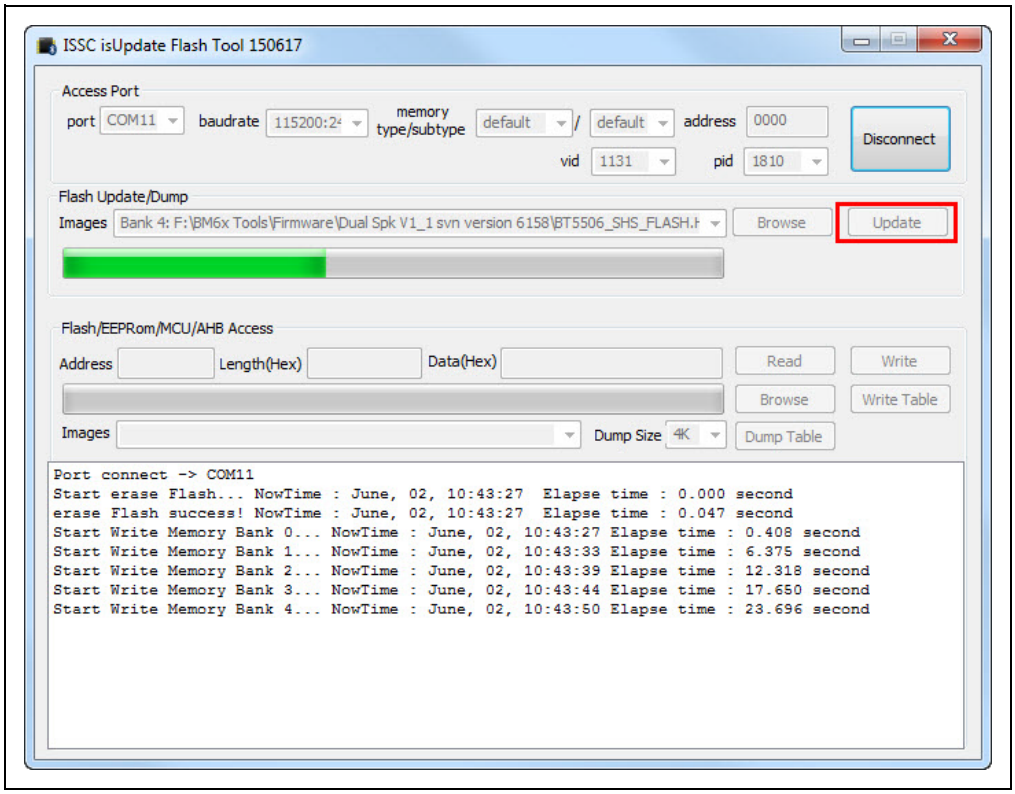
7. From the Open window, select the Flash code files and click **Open**, see Figure 3-43.

FIGURE 3-43: SELECTING FLASH CODE FILES



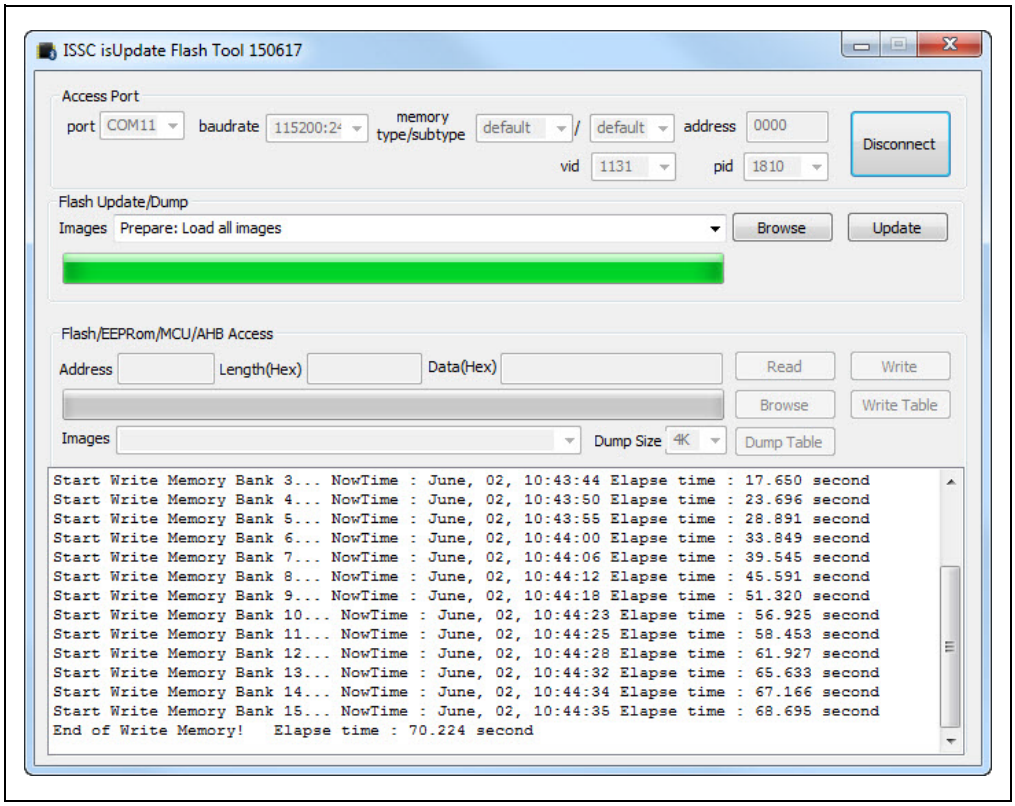
8. Click **Update** to write the Flash code on the BM64 module, see Figure 3-44.

FIGURE 3-44: FIRMWARE UPDATE



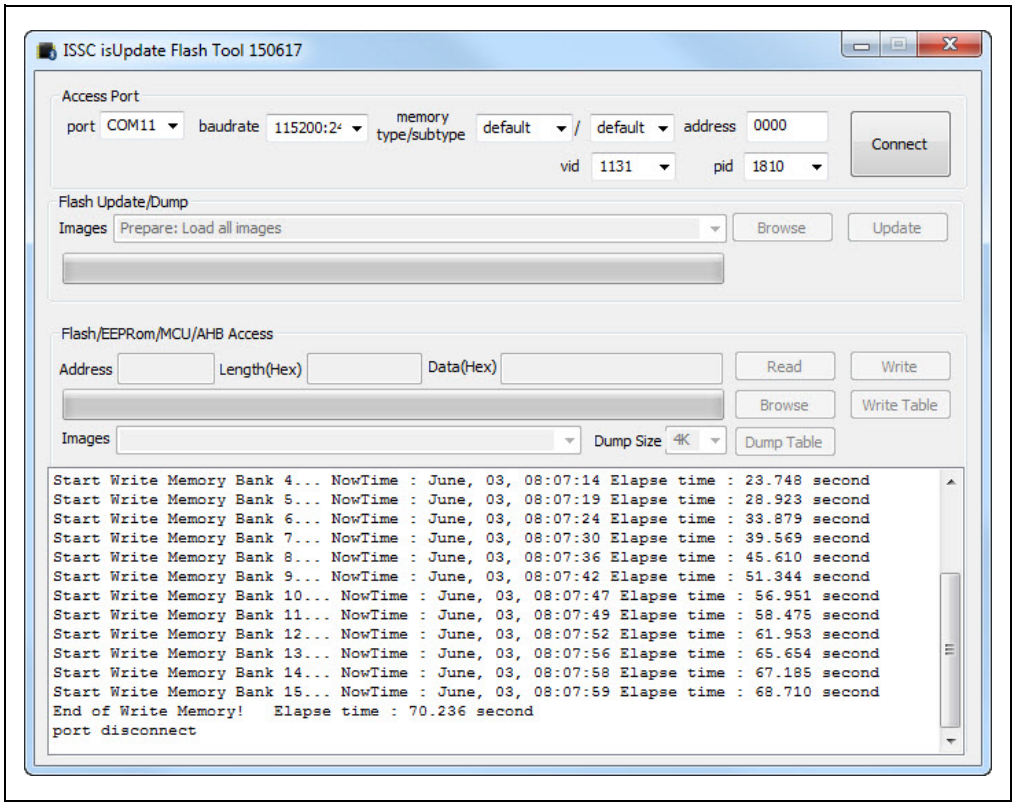
9. The Firmware Update tool will start writing the Flash codes. Wait until the message "End of Write Memory!" with the elapse time is displayed, see Figure 3-45.

FIGURE 3-45: WRITING FLASH CODE



10. After the Flash code update, click **Disconnect**, see Figure 3-45. The “port disconnect” message is displayed, see Figure 3-46. Then remove the USB cable to reboot.

FIGURE 3-46: FIRMWARE UPDATE FINISH



3.7 UPDATING MCU PARAMETERS

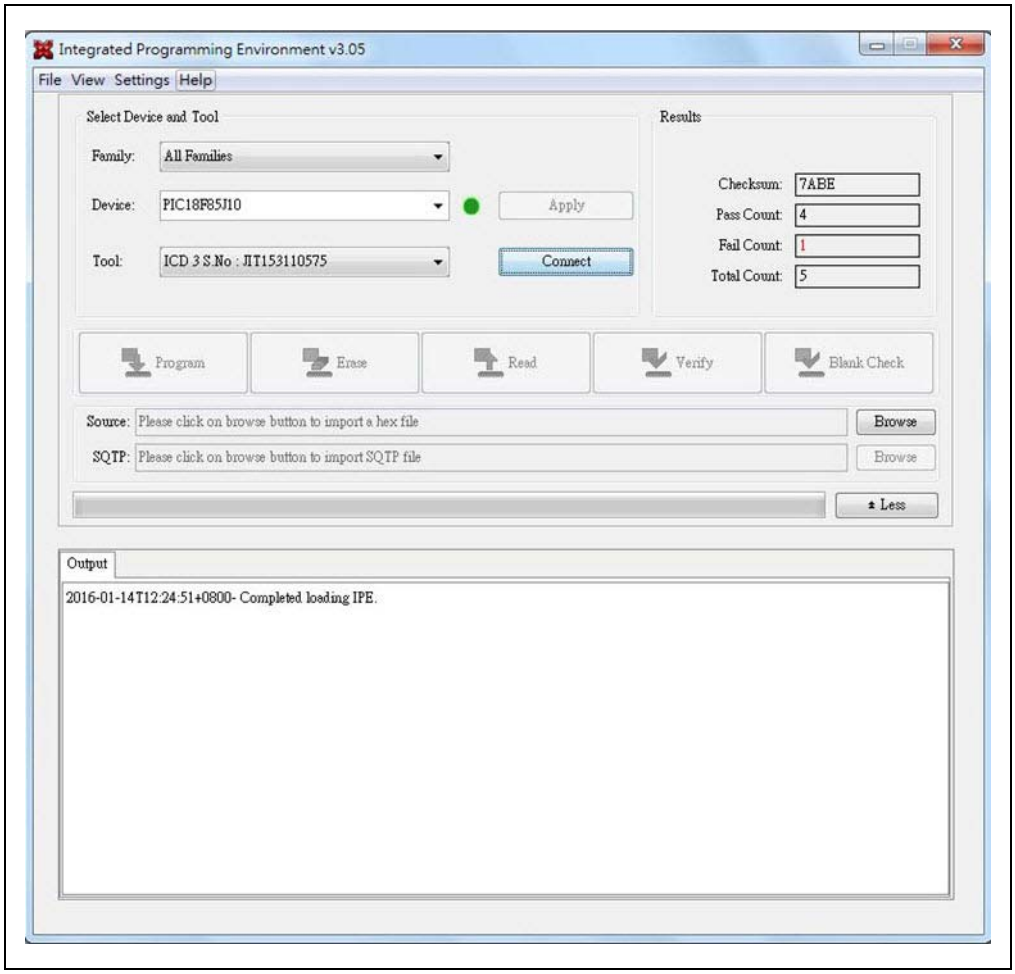
The on-board MCU is preprogrammed for dual-mode, and the MCU code needs to be changed for other applications. To update the MCU parameters, perform the following actions:

1. Plug the 15V DC power adapter into the P2 jack for supplying power to MCU.
2. Connect the MPLAB REAL ICE/MPLAB ICD 3/PICkit™ 3 to ICSP header J5 and then connect MPLAB ICD 3 to a host PC using the USB cable.
3. Ensure that a jumper on JP33 is connected.

> **Note:** Download and install the MPLAB X IDE tool, which is available on the Microchip web site: www.microchip.com/mplab/mplab-x-ide.

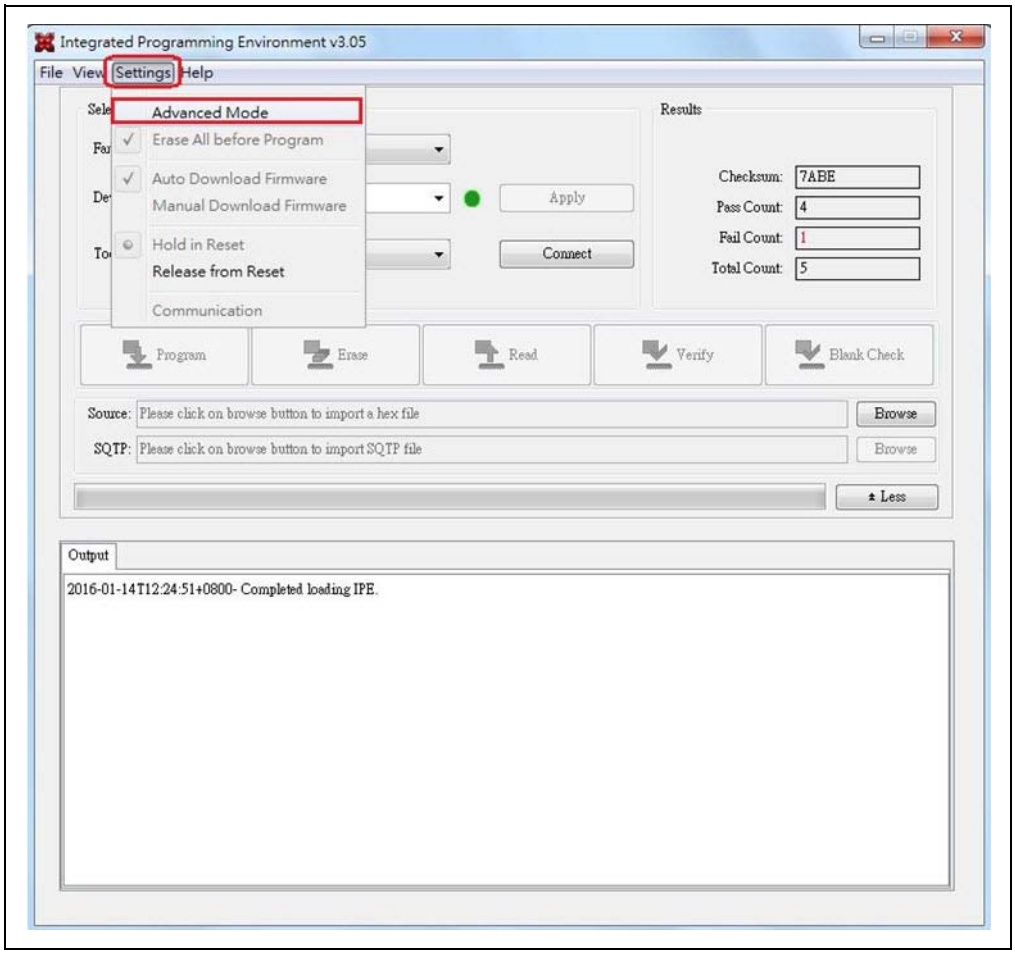
4. Open the MPLAB X IDE tool and a window displays, see Figure 3-47.

FIGURE 3-47: MPLAB® X IDE TOOL



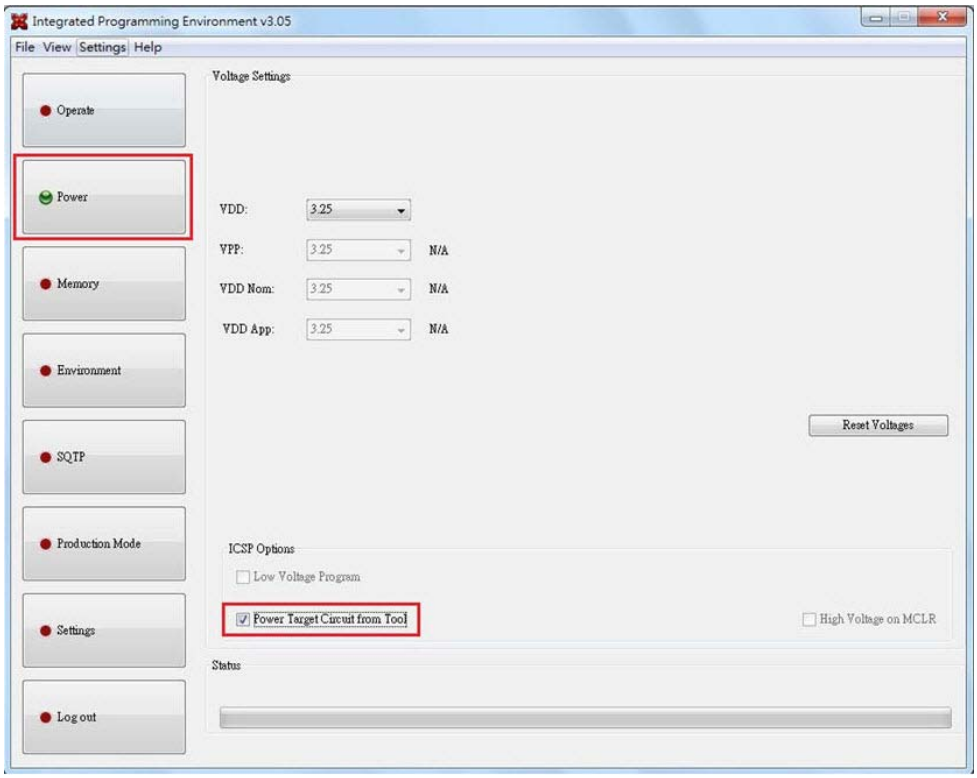
5. From Settings, select “Advanced Mode”, see Figure 3-48.

FIGURE 3-48: ADVANCED MODE SETTINGS



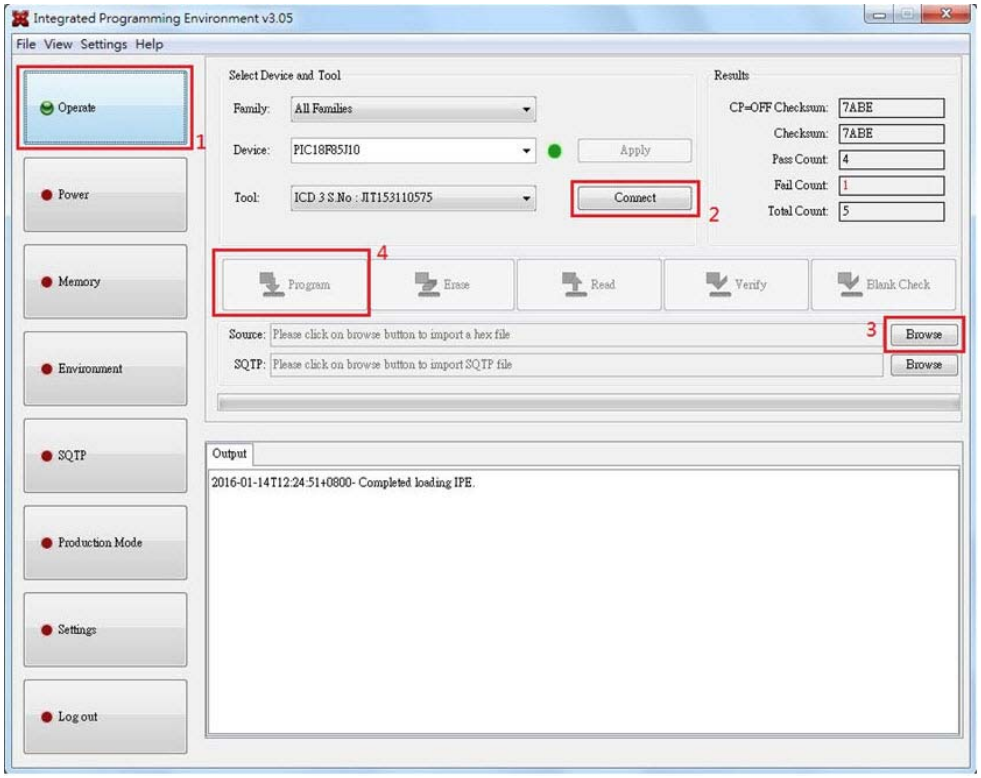
6. The MPLAB X IDE tool will display a window with various options (tabs) to configure the parameters. Click the **Power** tab, and then enable **Power Target Current from Tool**, as illustrated in Figure 3-49.

FIGURE 3-49: POWER TARGET CURRENT FROM TOOL



7. Select the **Operate** tab, click **Connect** to connect with the MPLAB ICD 3, as illustrated in Figure 3-50. Click **Browse** to load the dual-mode PIC18 code, and then click **Program** to program it.

FIGURE 3-50: PROGRAMMING MCU CODE

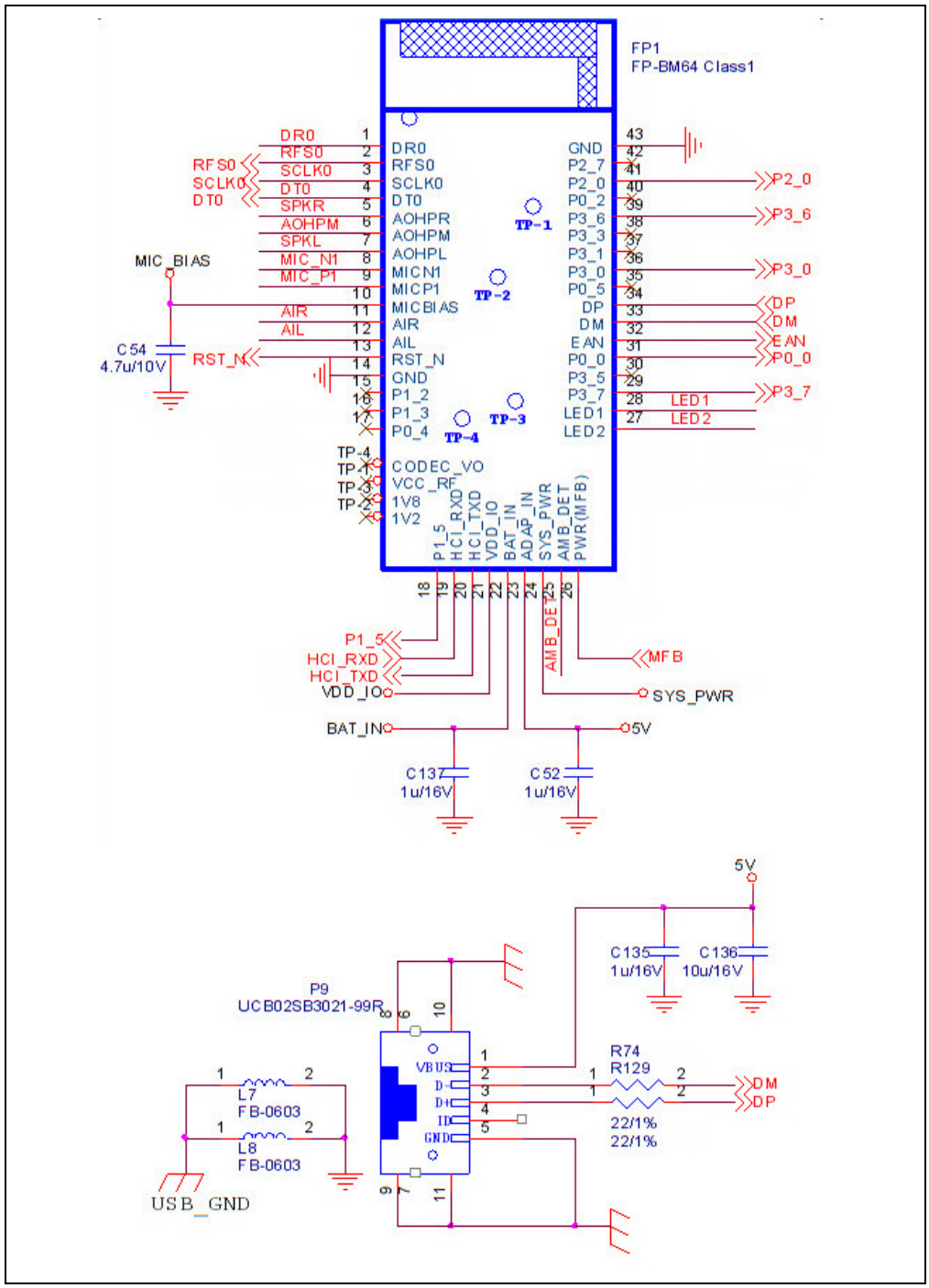


NOTES:

Appendix A. Schematics

A.1 REFERENCE SCHEMATICS

FIGURE A-1: BM64 EVB SCHEMATICS



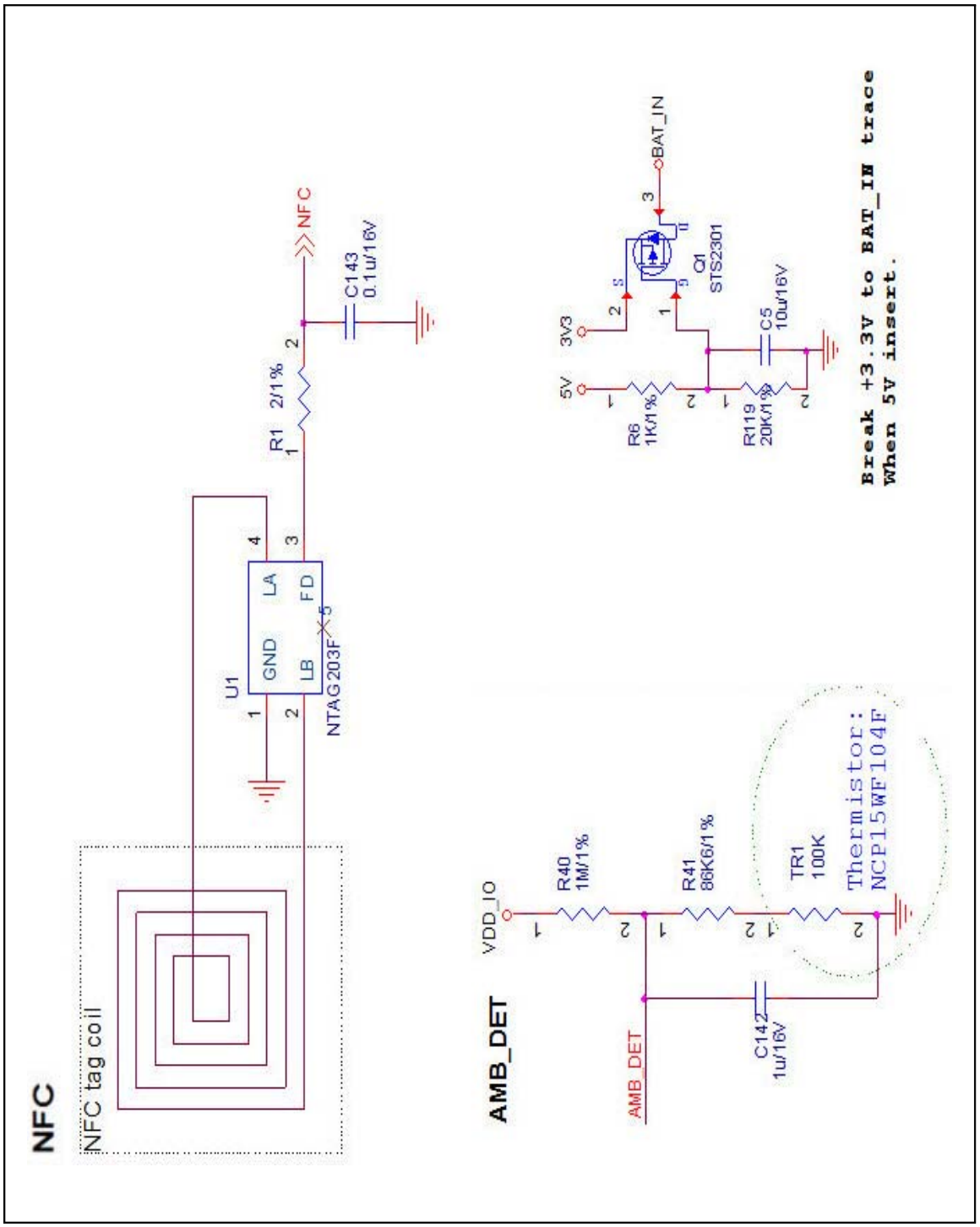


FIGURE A-2: NFC

FIGURE A-3: STATUS LEDS

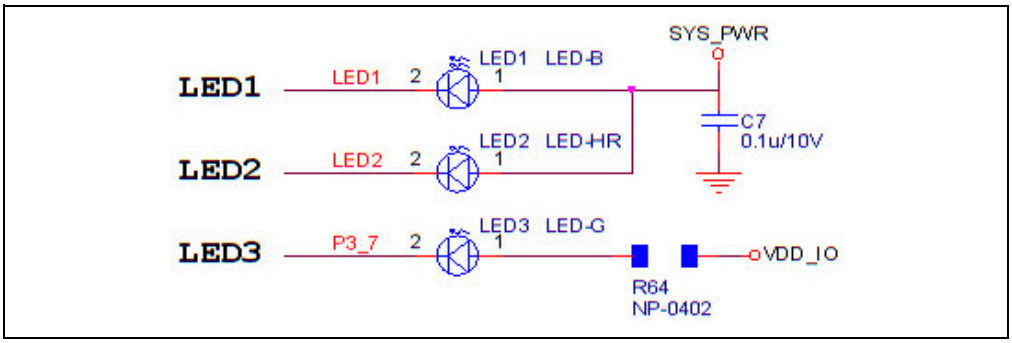


FIGURE A-4: RESET BUTTON

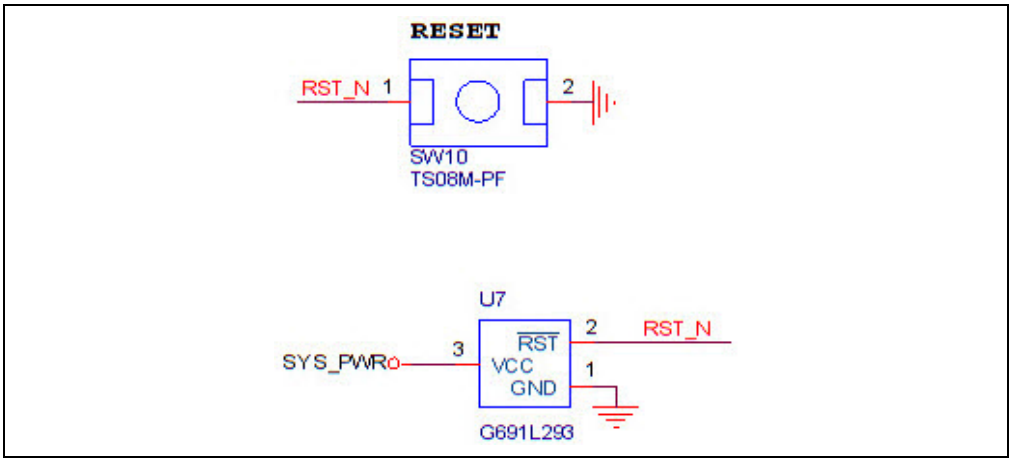


FIGURE A-5: EXTERNAL MCU/DSP HEADER J6

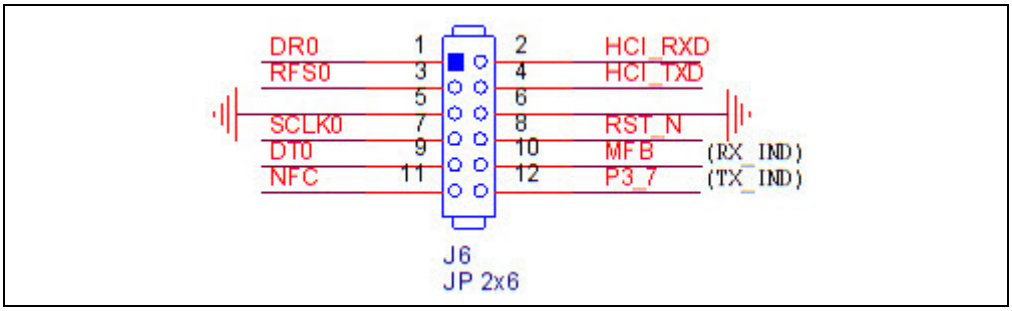


FIGURE A-6: LINE INPUT

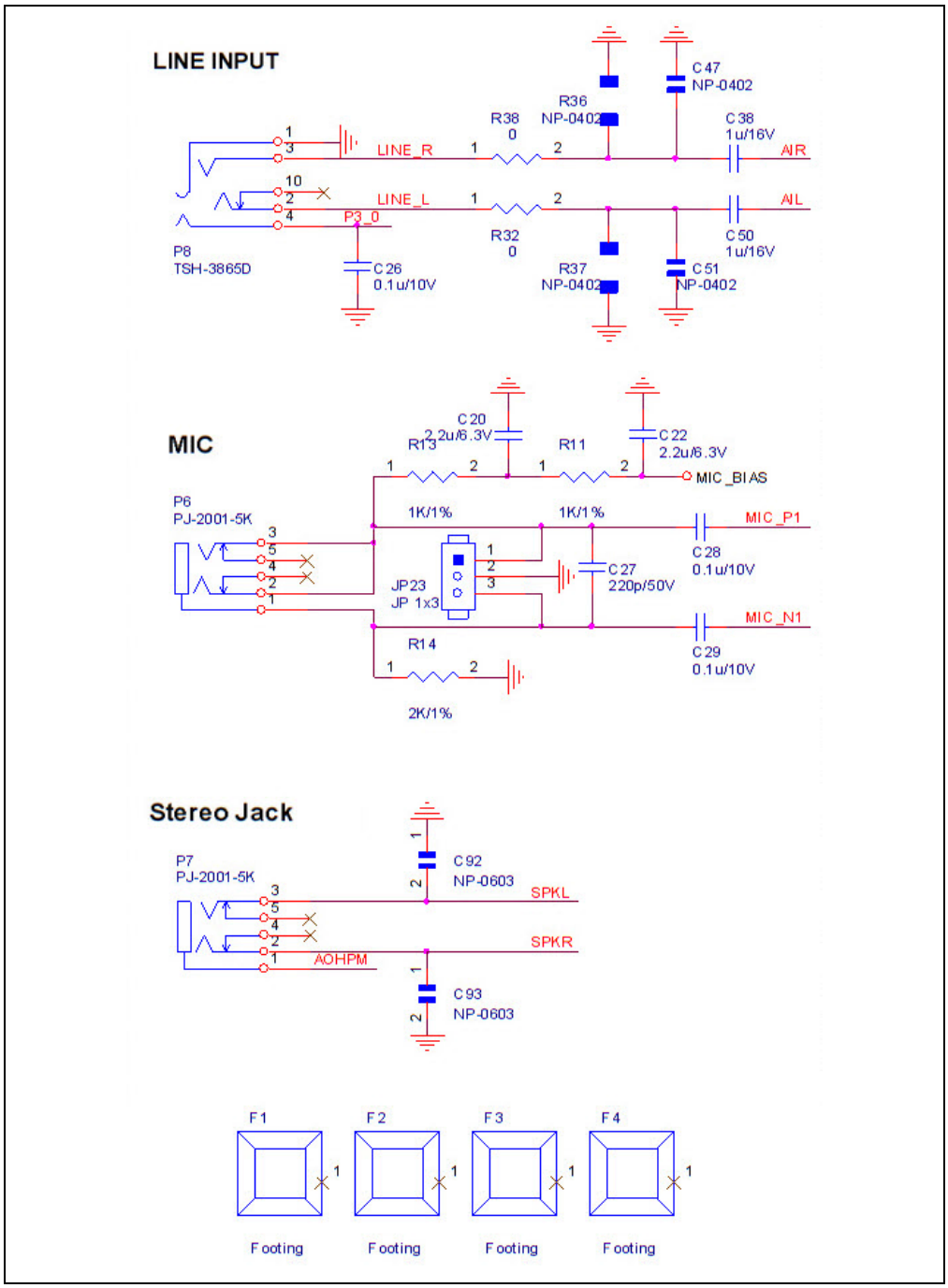


FIGURE A-7: USB TO UART INTERFACE

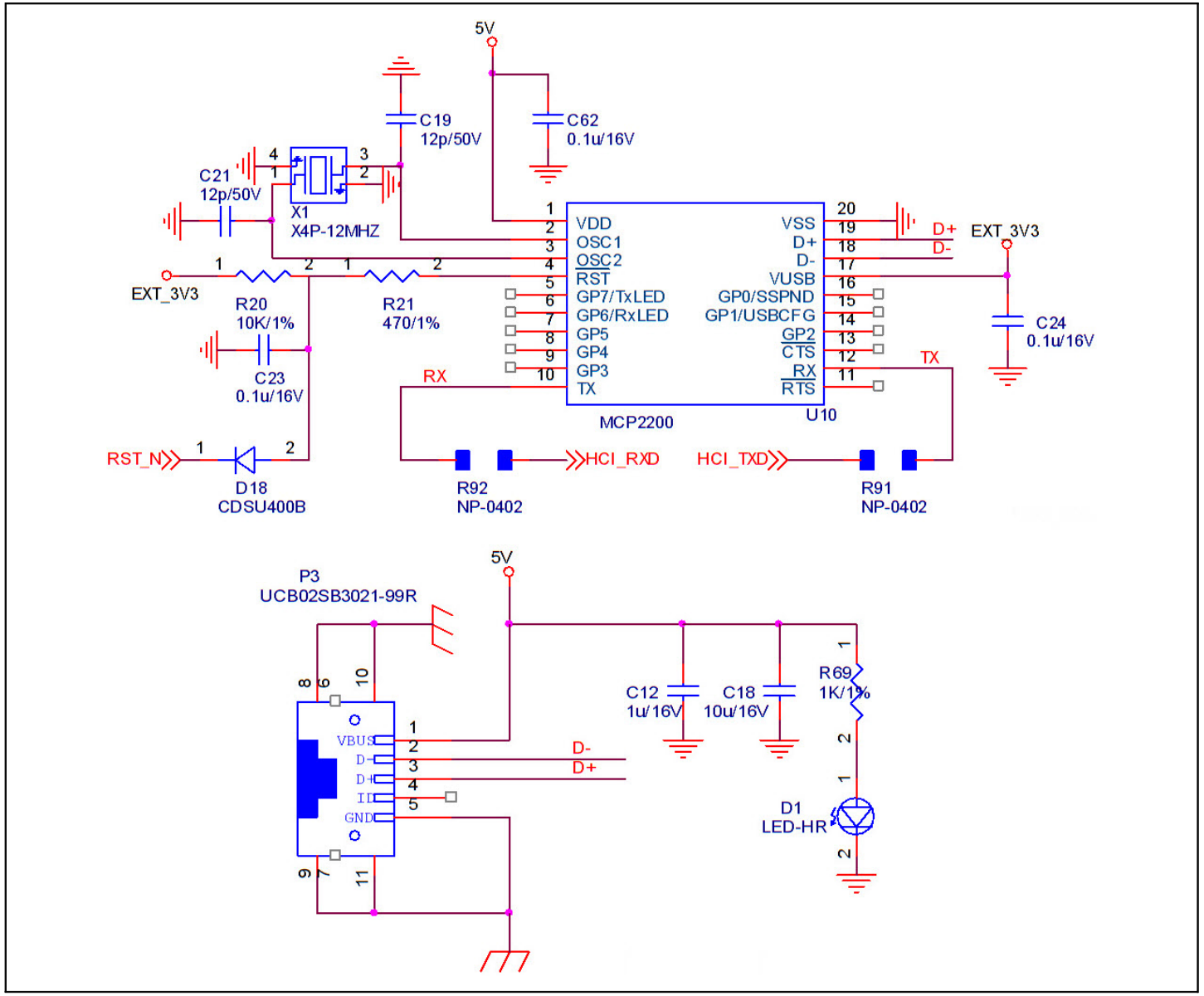


FIGURE A-8: UART INTERFACE

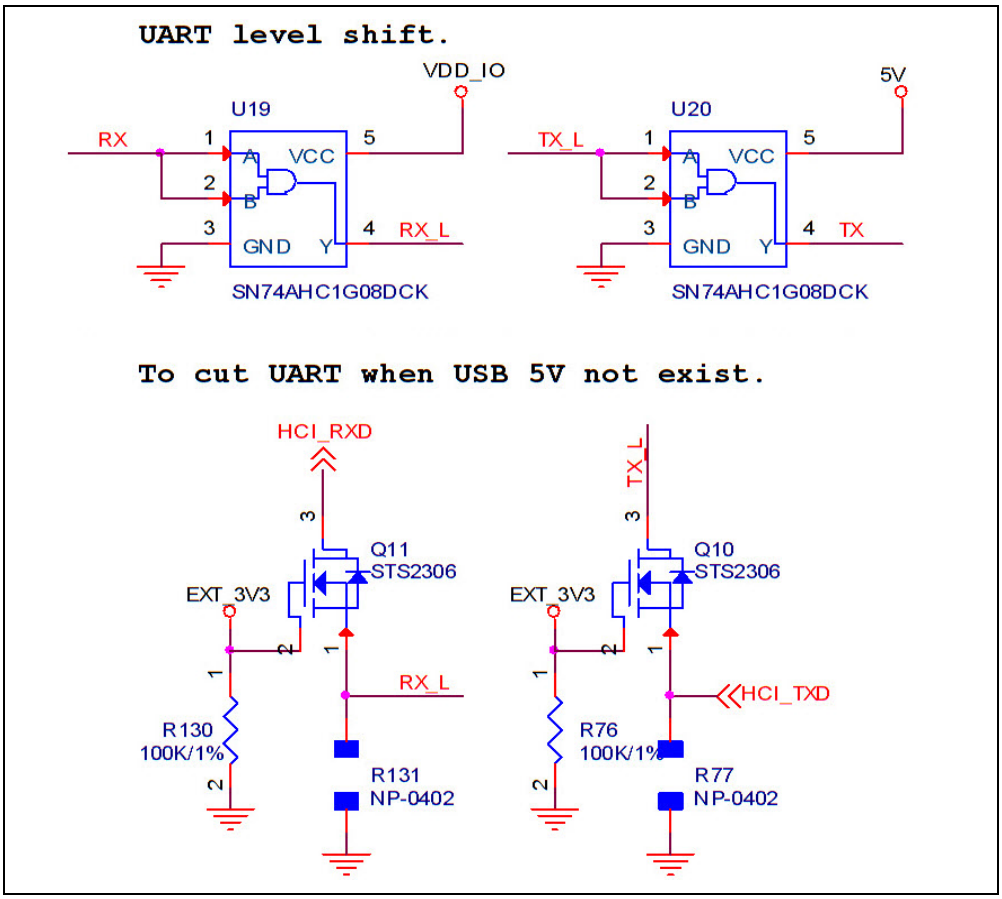
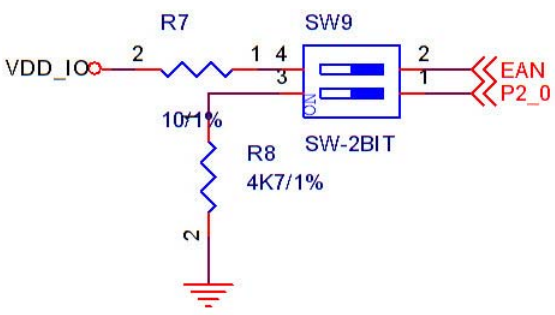
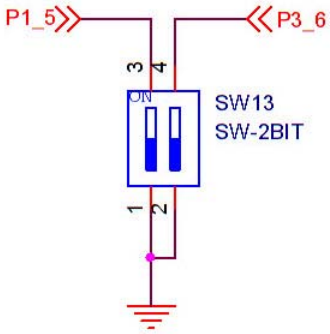


FIGURE A-9: SWITCH CONFIGURATION





	EAN	P2_0
ROM APP	ON	OFF
ROM TEST	ON	ON
Flash APP	OFF	OFF
Flash TEST	OFF	ON

	P1_5	P3_6
Single	OFF	OFF
Double	ON	ON
L	OFF	ON
R	ON	OFF

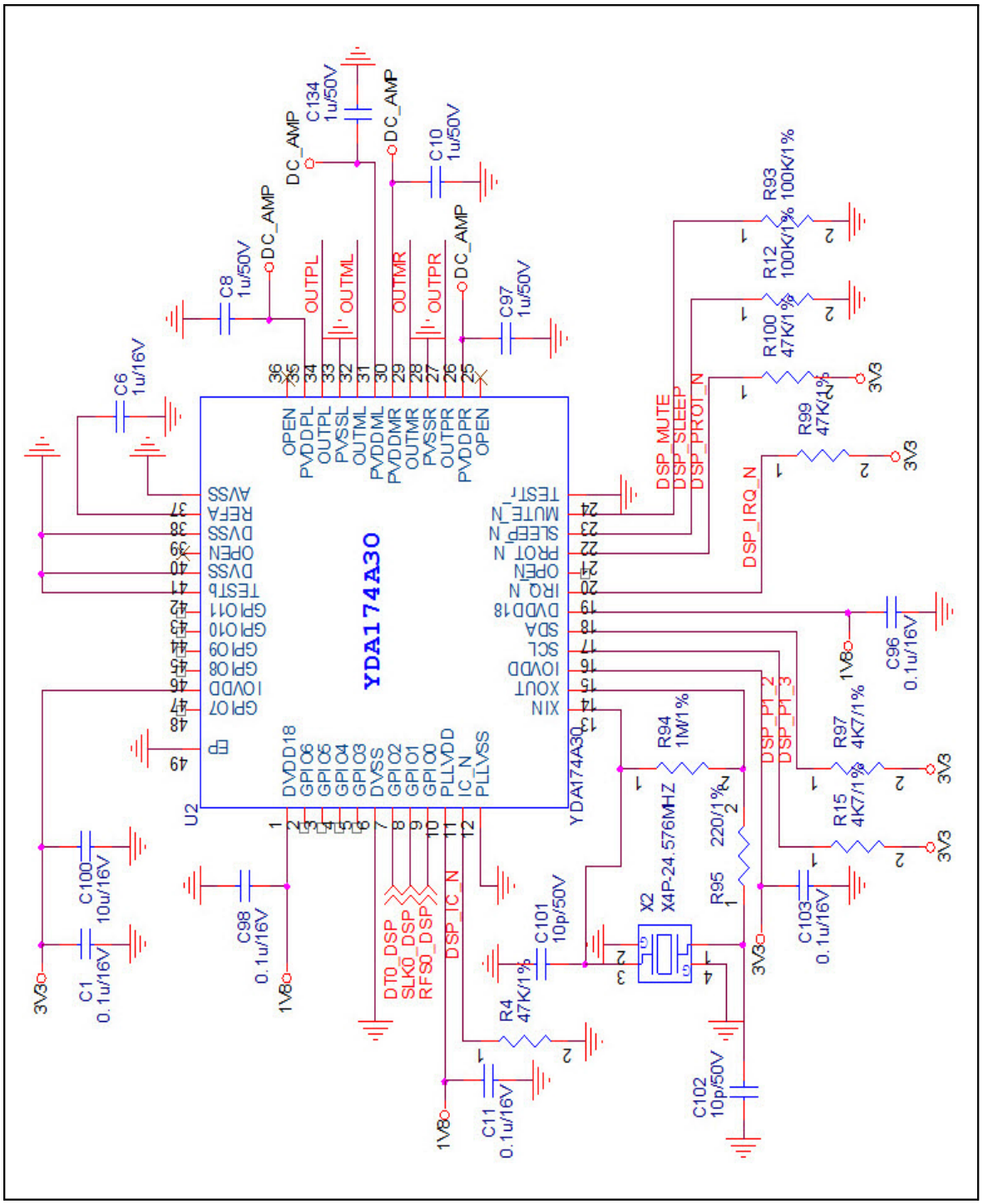


FIGURE A-10: DSP SCHEMATICS

FIGURE A-11: DSP/MCU INTERFACE

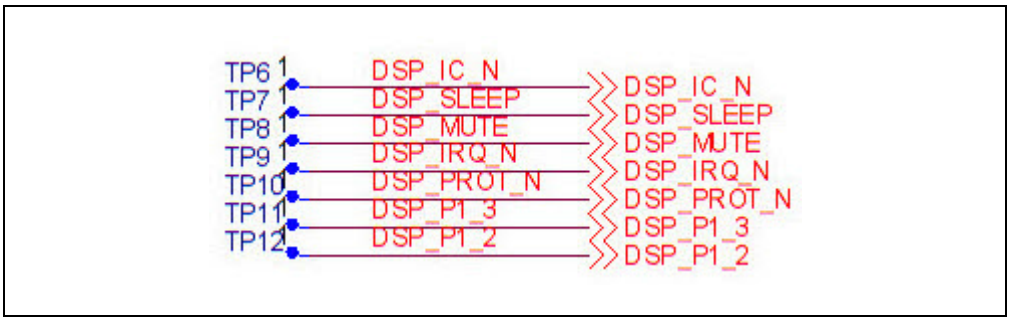


FIGURE A-12: POWER SUPPLY

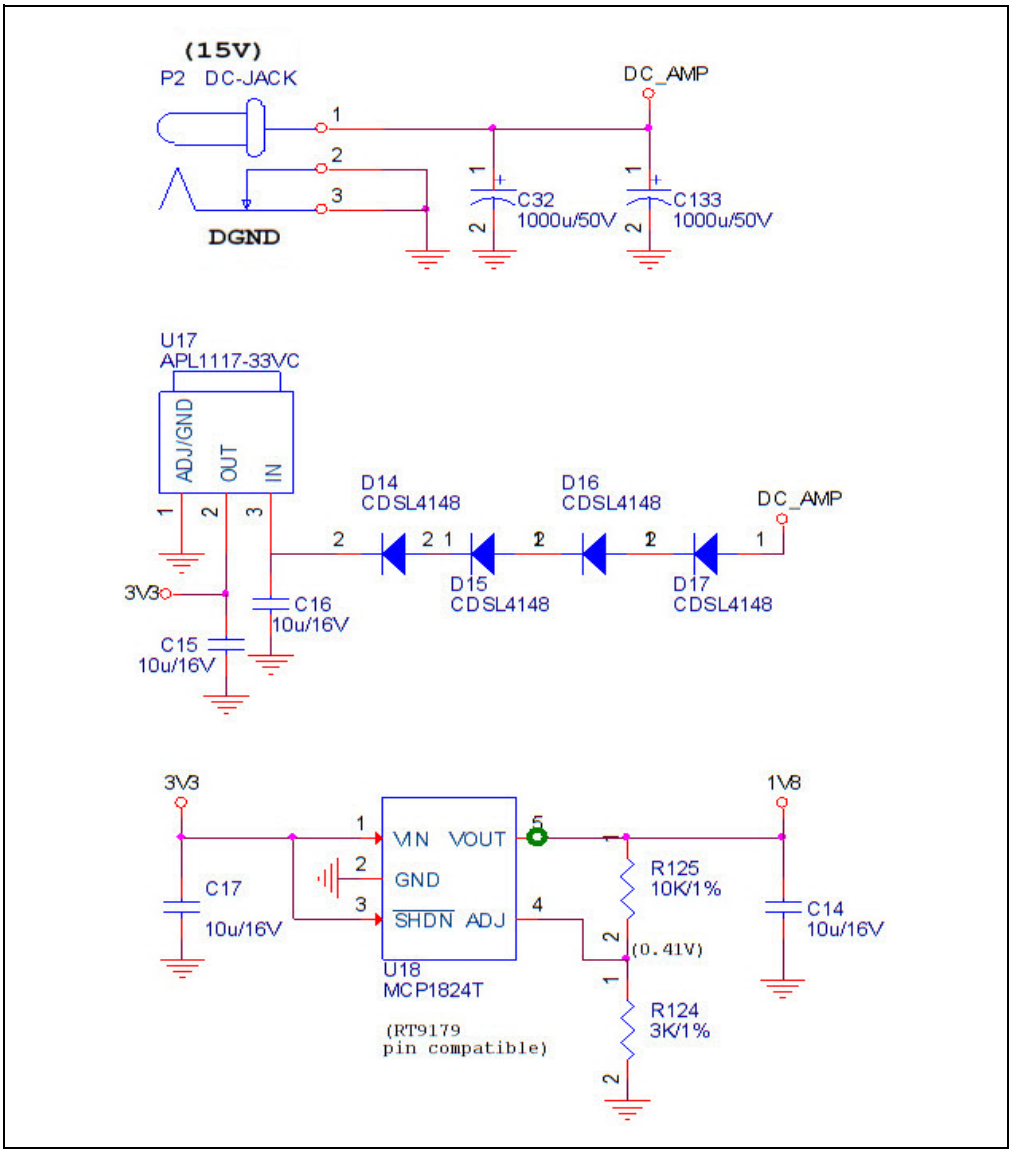


FIGURE A-13: SPEAKER OUTPUT

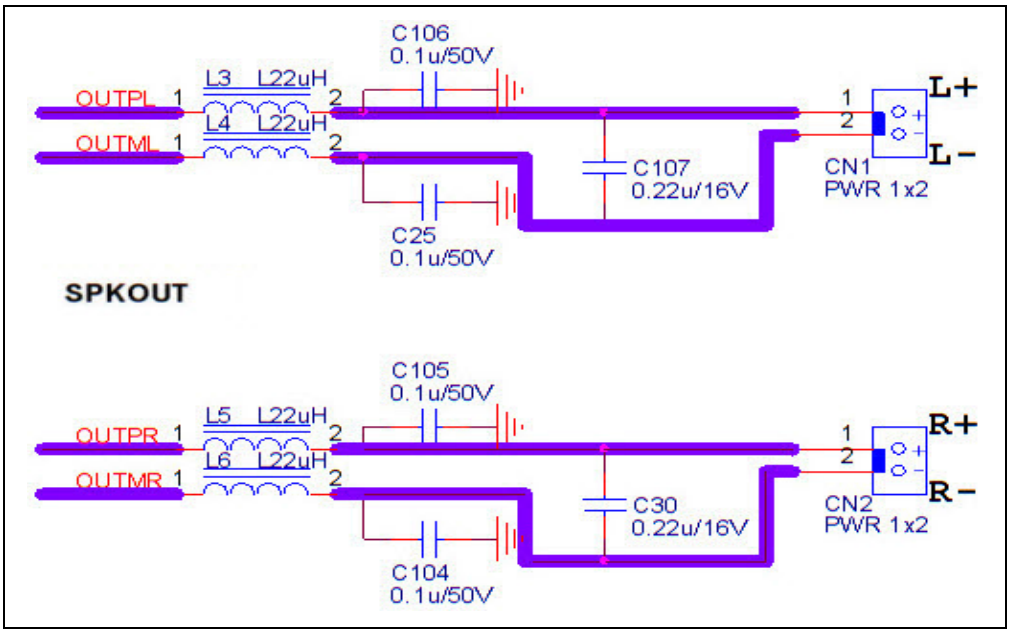


FIGURE A-14: EXTERNAL MCU INTERFACE

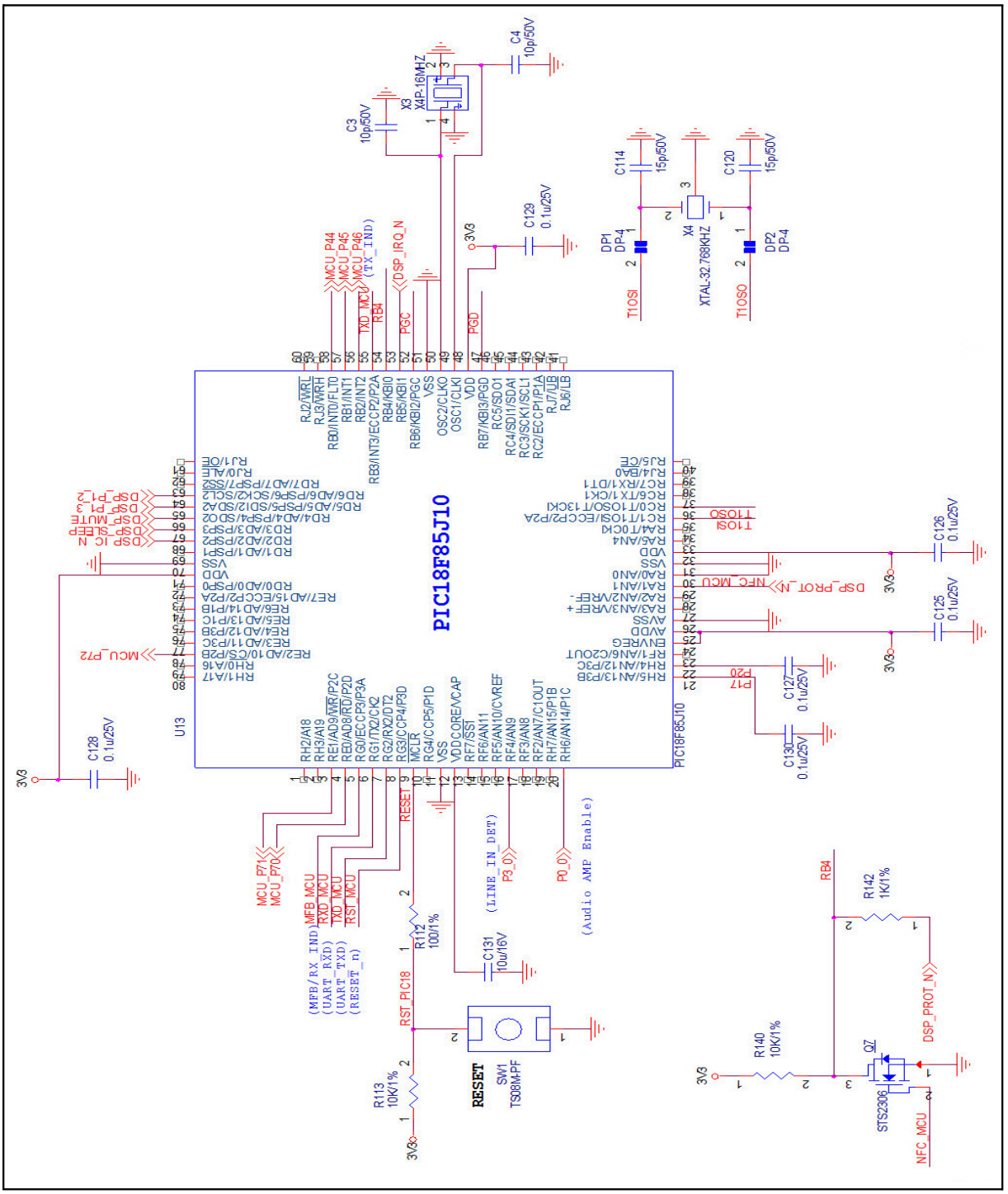


FIGURE A-15: SWITCH SW46/SW47 CONFIGURATION

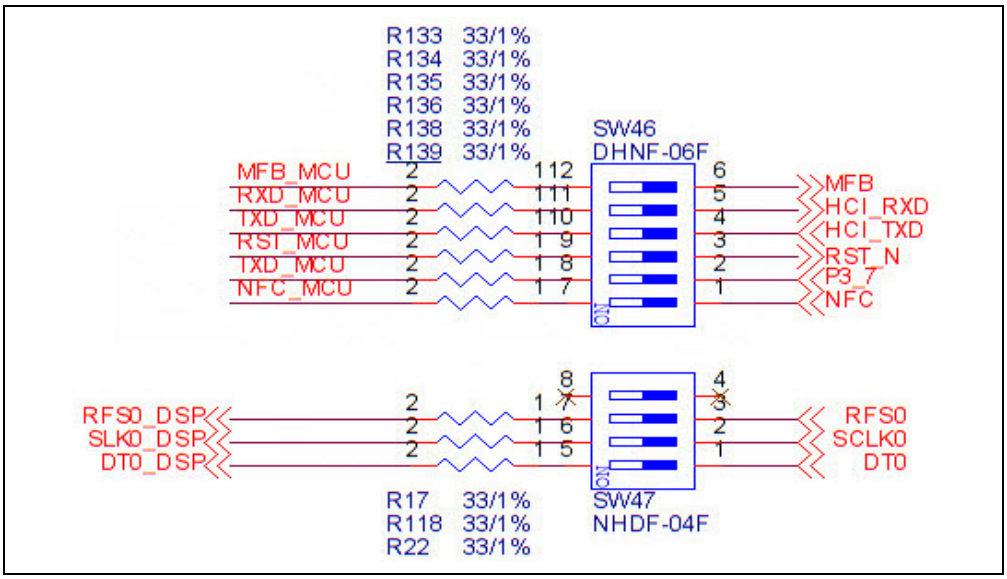


FIGURE A-16: ICSP

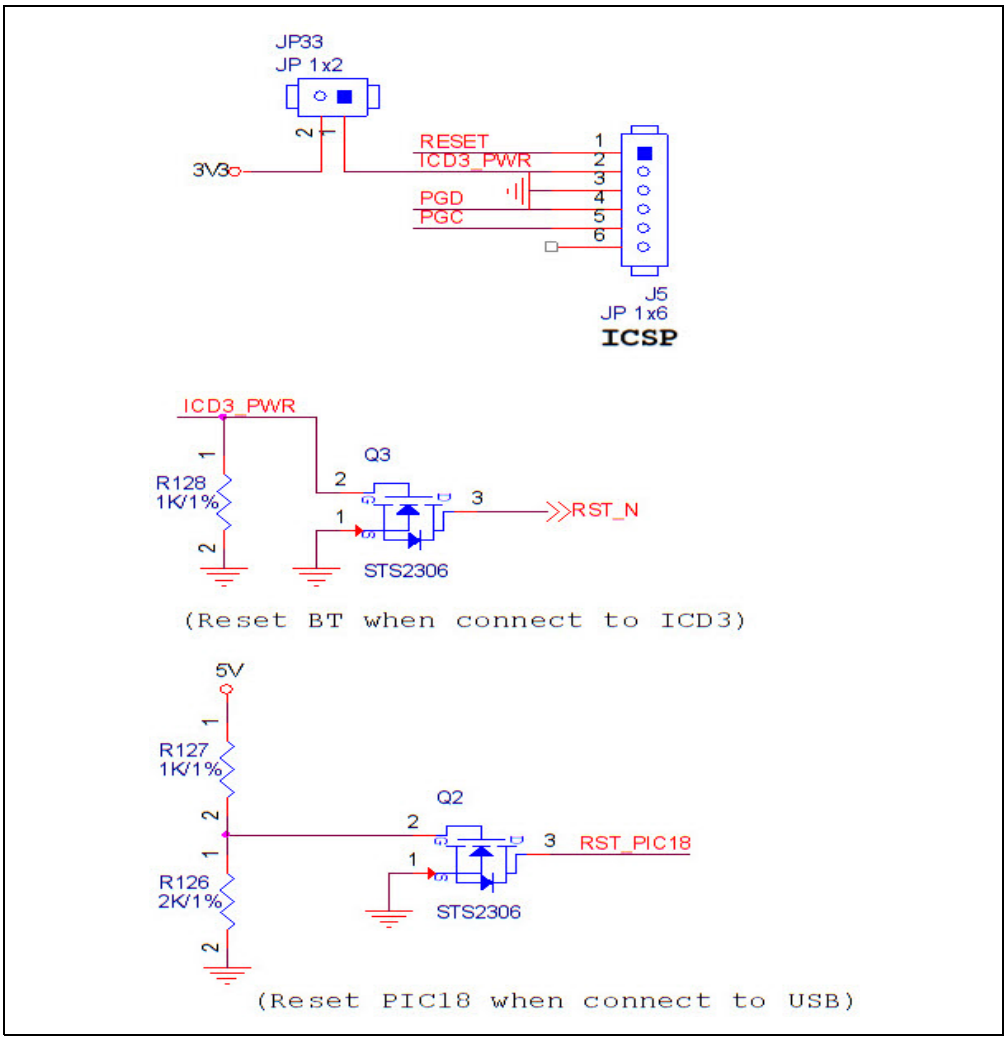
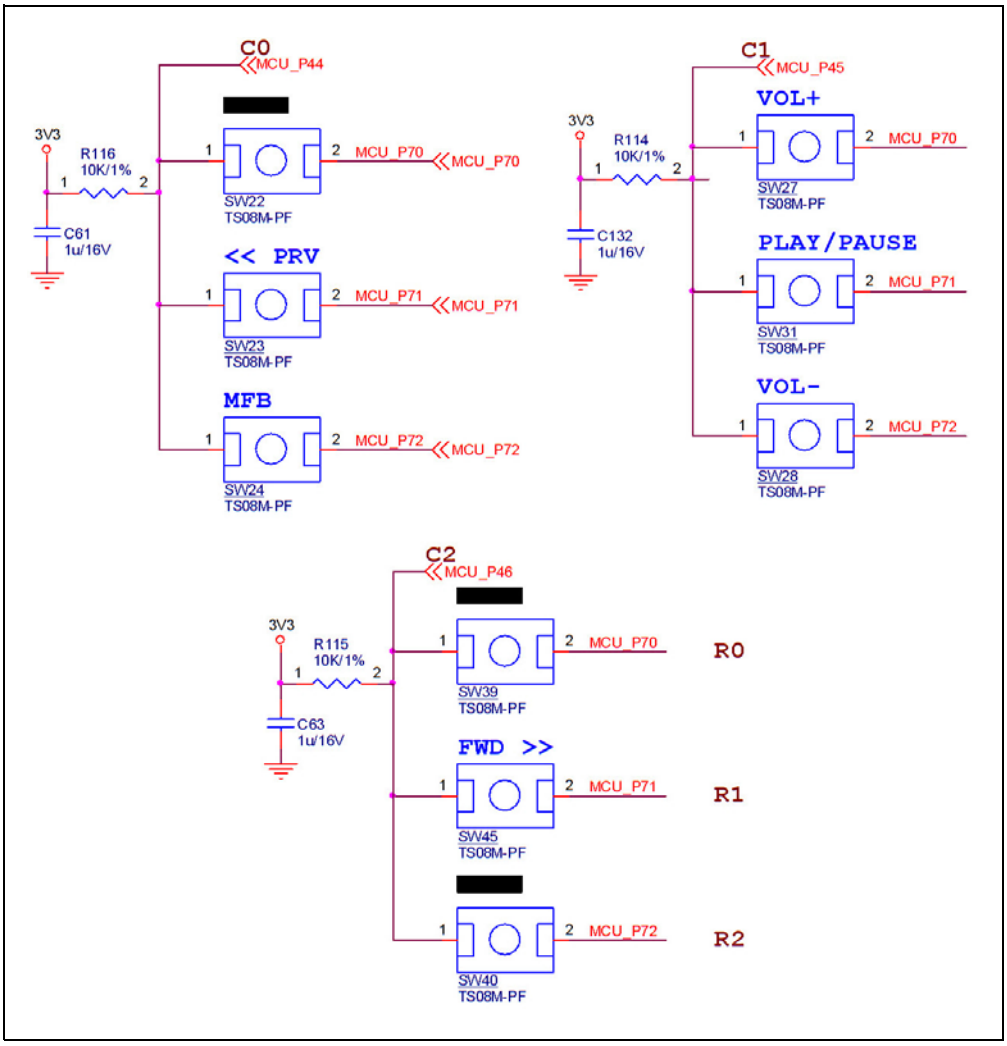


FIGURE A-17: PUSH BUTTONS



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