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**BM64 Evaluation Board (EVB)
User's Guide**

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BM64 EVB USER'S GUIDE

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

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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.

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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 > Save</i></u>
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'
<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) { ... }
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.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p>Note: This is a standard note box.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> <p style="text-align: center;">CAUTION</p> <p>This is a caution note.</p> </div> <p>Note 1: This is a note used in a table.</p>

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
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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
- **Programmiers** – 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.

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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”](#)

[1.2 “BM64 EVB Features”](#)

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

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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

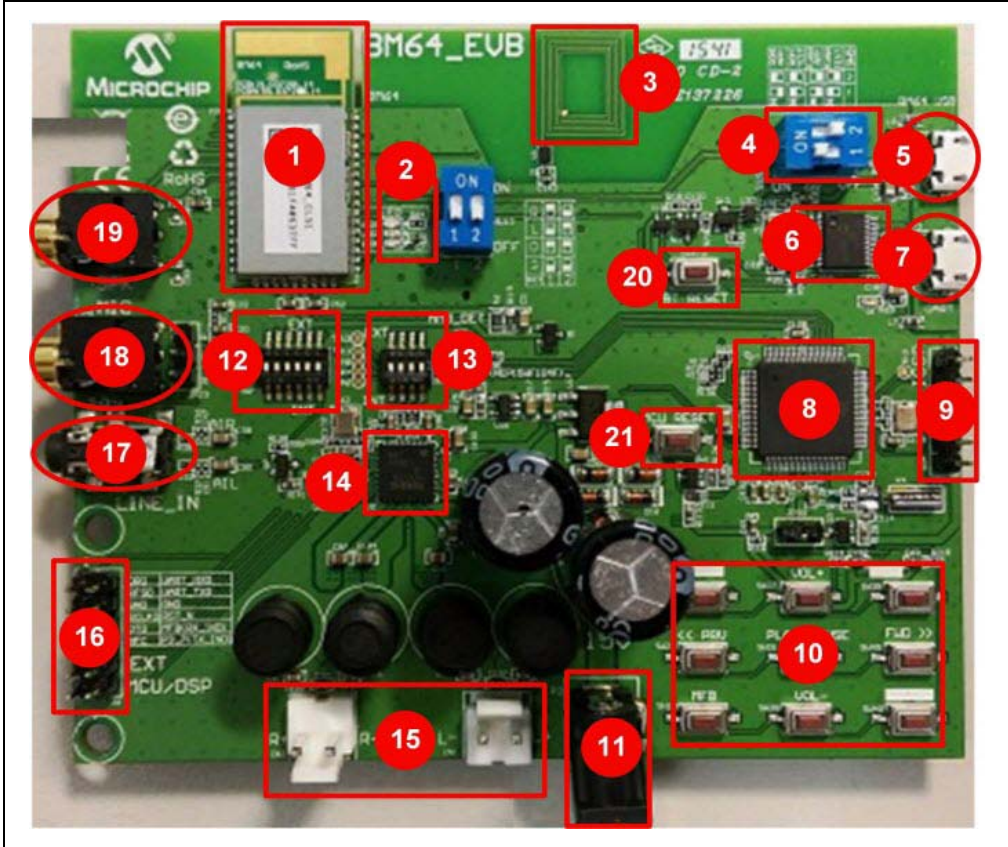
[Figure 1-1](#) illustrates the top view of the BM64 EVB with the following components:

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”](#).

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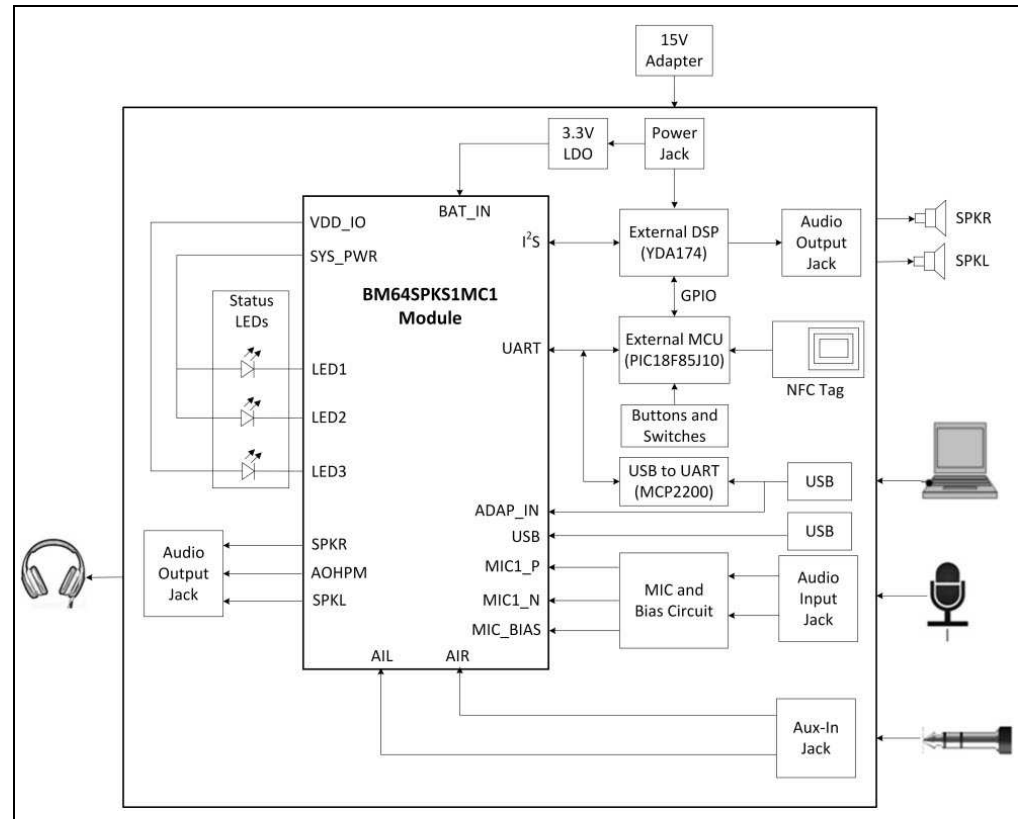
FIGURE 1-1: BM64 EVB (TOP VIEW)



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





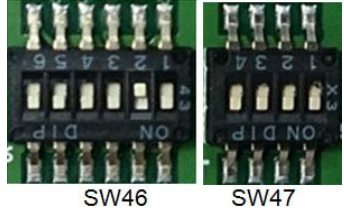
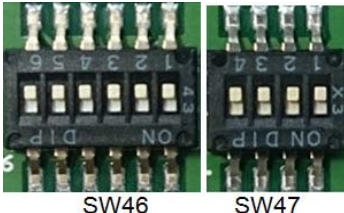
Mode	Switch Positions	Pin Definition
Flash Test Mode		1: ON (P2_0: LOW) 2: OFF (EAN: LOW)
Flash Application Mode		1: OFF (P2_0: HIGH) 2: OFF (EAN: LOW)
ROM Test Mode		1: ON (P2_0: LOW) 2: ON (EAN: HIGH)
ROM Application Mode		1: OFF (P2_0: HIGH) 2: ON (EAN: HIGH)

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

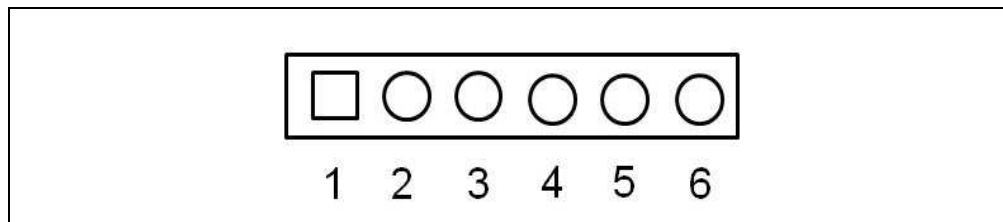


TABLE 2-3: ICSP HEADER J5

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

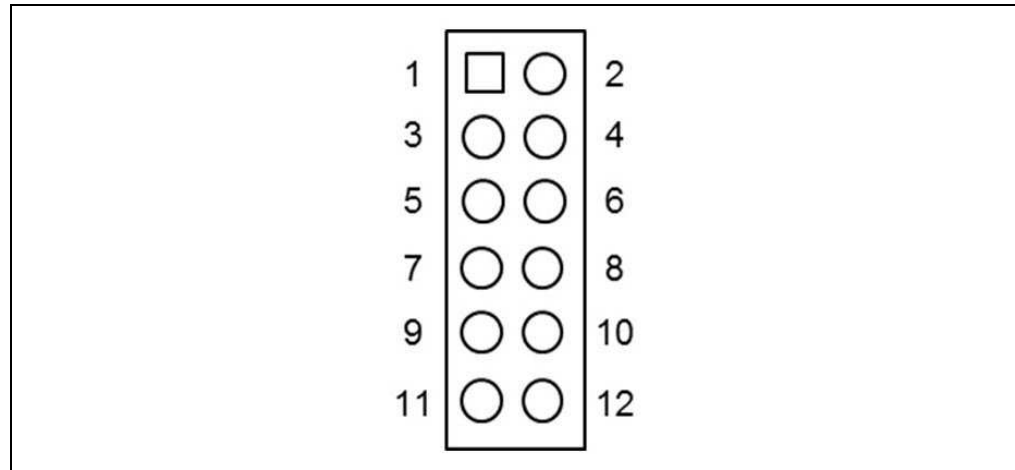


TABLE 2-4: EXTERNAL MCU/DSP HEADER J6

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

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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

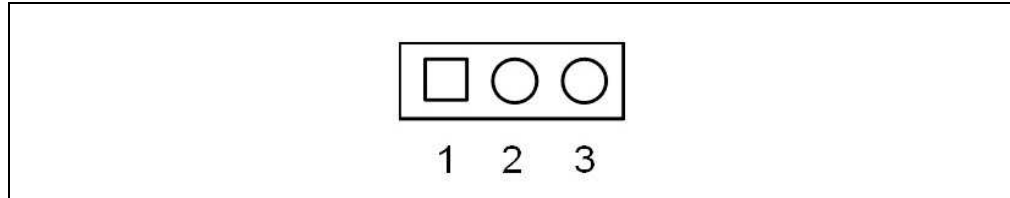


TABLE 2-5: MIC JP23

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”**
- 3.2 “Getting Started with BM64 EVB”**
- 3.3 “Application Demonstration”**
- 3.4 “Configuring BM64 Module”**
- 3.5 “Updating EEPROM Parameters”**
- 3.7 “Updating MCU Parameters”**

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

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 Microchip web site at: www.microchip.com/mplab/mplab-x-ide.

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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](#).

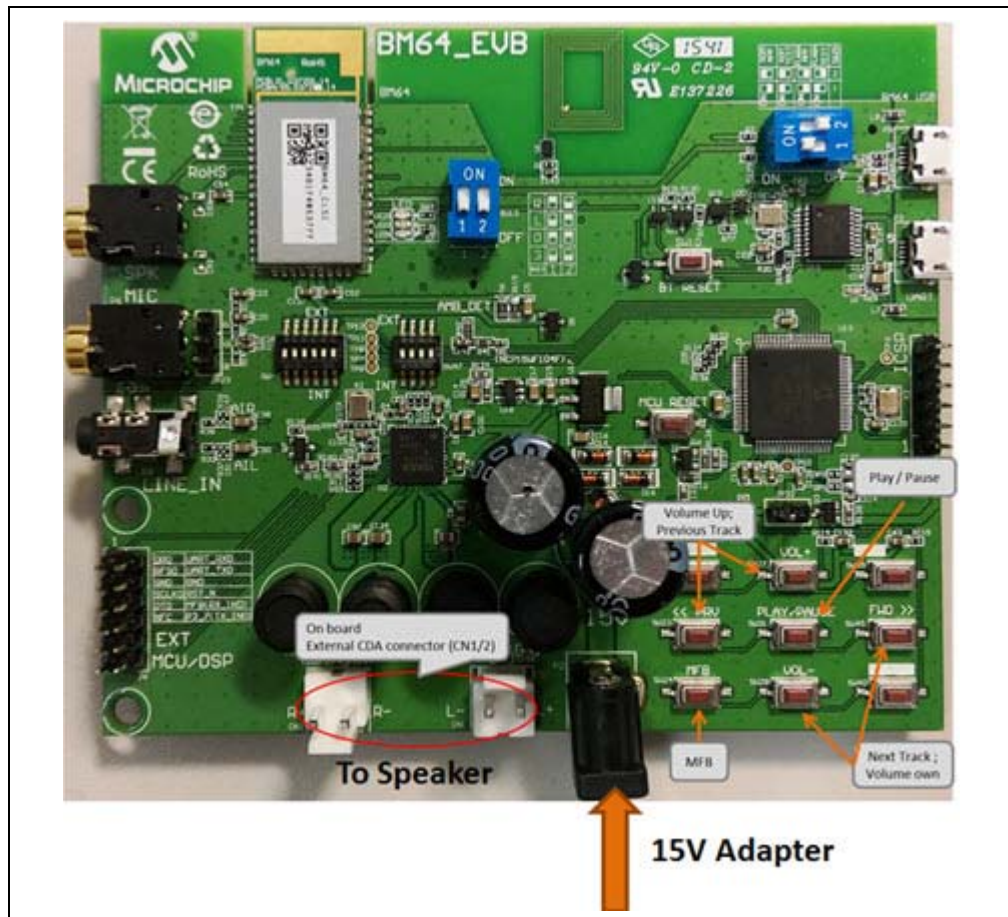
FIGURE 3-1: SW9 IN FLASH APPLICATION MODE



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](#).

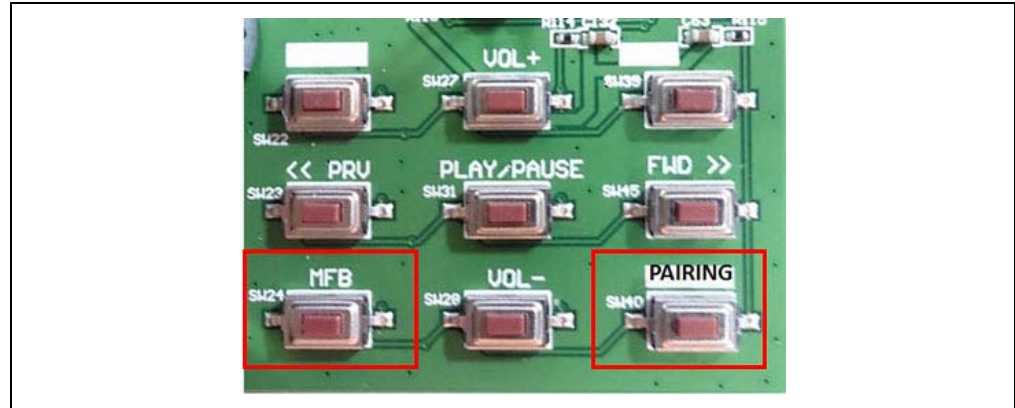
Note: Do not plug-in the USB cable.

FIGURE 3-2: USING THE EVALUATION BOARD



4. [Figure 3-3](#) illustrates the various push buttons on the BM64 EVB. To turn the Bluetooth on, long press SW24 (MFB), then LED1 (blue) and LED2 (red) will blink.
5. Next long press SW40 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 discoverable.

FIGURE 3-3: SW24 AND SW40



6. Turn on the host device Bluetooth (PC or smartphone) and it will display a list of discoverable Bluetooth devices. The BM64 EVB is displayed as “Dual_SPK”/ “LE_Dual_SPK”; select the device to establish the connection.
7. Once the BM64 EVB is connected to the host device, LED1 (blue) blinks fast. This indicates that the BM64 EVB is in pairing mode.
8. When the BM64 EVB is paired with the host device, LED1 (blue) blinks twice at regular intervals. 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, then LED1 (blue) and LED2 (red) will blink once at regular intervals.
The audio control buttons are used to:
 - Control the volume of the audio output (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)