
BM83 Bluetooth® Audio Development Board User's Guide

Introduction

The BM83 Bluetooth Audio Development Board (BM83 EVB) enables the user to evaluate and demonstrate the functionality of the BM83 audio module and IS2083BM System-on-Chip (SoC). This board is a complete, all-in-one solution to develop multiple Bluetooth audio applications including portable speakers and headphones. The BM83 EVB features an on-board PIC32 for Host MCU mode applications, an external codec to improve audio quality, a digital microphone to capture voice audio, indicator LEDs and buttons for ease of development.

In addition to the BM83 EVB, the IS2083 SDK and IS208x_Config_GUI_Tool (Config Tool) are provided to customize the audio processing settings.

Features

- BM83 module, qualified for Bluetooth 5.0 specifications
- On-board microcontroller (PIC32MX450F256L) for easy operation and feature demonstration
- Plug-in module (PIM) socket for external microcontroller (MCU)
- STMicroelectronics codec (STA369BW) Daughter Board
- Digital Microphone (Knowles' SPH0641LU4H-1) Daughter Board
- J-Link 6-Pin Adapter Board for IS2083BM debugging
- On-board keypad matrix (audio control buttons) that can be controlled either by the BM83 module or the on-board PIC32 MCU, which makes it easy for playback control
- Aux-in, MIC-In, and Stereo out ports
- On-board thermistor
- 2 LEDs for the Bluetooth subsystem and various other LEDs configurable by the on-board MCU
- JTAG program/debug port, USB to UART port, XPRO header interfaces
- Li-ion battery connector, 15V DC power jack and USB power source

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1. Quick References

1.1 Reference Documentation

For further study, refer to the following:

- *BM83 Bluetooth® Stereo Audio Module Data Sheet*
- *IS2083 Bluetooth® Stereo Audio SoC Data Sheet*
- *IS2083 SDK User's Guide* ([DS50002894](#))
- *BM83 Host MCU Firmware Development Guide*
- *IS2083 Bluetooth® Audio Application Design Guide*
- *IS2083 SDK Debugger User's Guide*
- *IS2083 Reference Design Application Note*

Note: For a complete list of development support tools and documentation, visit <http://www.microchip.com/BM83>.

1.2 Hardware Requirements

- BM83 Bluetooth® Audio Development Board (BM83 EVB)
- BM83 module mounted on BM83 Carrier Board
- Bluetooth-enabled smartphone:
 - Android™ device running on Android 4.3 or later version
 - iOS: iPhone® 4S or later version
- Windows® host PC with USB port
- Speaker, microphone or headset
- Type-A to Micro-B USB cable
- STA369BW Audio Daughter Board
- Digital Microphone Daughter Board
- 15V DC power adapter
- MPLAB® REAL ICE™/MPLAB ICD 3/PICKit™ 3
- J-Link 6-Pin Adapter Board

1.3 Software Requirements

Note: For the following software tools and firmware files, refer to <http://www.microchip.com/BM83>.

- IS2083 firmware
- Host MCU firmware
- isUpdate tool
- Config GUI tool
- MPLAB Integrated Development Environment (MPLAB X IDE) tool
- Microchip Bluetooth Audio Application for smartphone

Note: MPLAB X IDE is available for download from Microchip website at: <http://www.microchip.com/mplab/mplab-x-ide>.

1.4 Acronyms/Abbreviations

Table 1-1. Acronyms/Abbreviations

Acronyms/Abbreviations	Description
A2DP	Advanced Audio Distribution Profile
AAC	Advanced Audio Codec
ADC	Analog-to-Digital Converter
AEC	Acoustic Echo Cancellation
AFH	Adaptive Frequency Hopping
ANCS	Apple Notification Center Service
API	Application Programming Interfaces
AVRCP	Audio/Video Remote Control Profile
AW	Audio Widening
BDR	Basic Data Rate
BER	Bit Error Rate
BLE	Bluetooth Low Energy
BOM	Bill of Materials
BPF	Band Pass Filter
BR	Basic Rate
CVSD	Continuous Variable Slope Delta
DAC	Digital-to-Analog Converter
DFU	Device Firmware Upgrade
DIS	Device Information Service
DLE	Data Length Extension
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quadrature Phase Shift Keying
DR	Receive Data
DSP	Digital Signal Processor
DT	Transmit Data
EDR	Enhanced Data Rate
EMC	Electromagnetic Compatibility
EVB	Evaluation Board
FET	Field Effect Transistor
GAP	General Access Profile
GATT	General Attribute Profile
GFSK	Gaussian Frequency Shift Keying
GPIO	General Purpose Input Output
GUI	Graphical User Interface
HFP	Hands-free Profile
HPF	High Pass Filter
HSP	Headset Profile

.....continued

Acronyms/Abbreviations	Description
HW	Hardware
I2C/I ² C	Inter-Integrated Circuit
I2S/I ² S	Inter-IC Sound
IC	Integrated Circuit
ICSP	In-Circuit Serial Programming
IDE	Integrated Development Environment
IF	Intermediate Frequency
IPE	Integrated Programming Environment
JTAG	Joint Test Action Group
LDO	Low-Dropout
LED	Light Emitting Diode
LNA	Low-Noise Amplifier
LPA	Linear Power Amplifier
LSB	Least Significant Bit
MAC	Medium Access Control
MB DRC	Multiband Dynamic Range Compression
MCLK	Master Clock
MCU	Microcontroller
MEMS	Micro-Electro-Mechanical Systems
MFB	Multi-function Button
Modem	Modulator-demodulator
MPA	Medium Power Amplifier
mSBC	Modified Sub-band Coding
MSPK	Multi-speaker
NR	Noise Reduction
OTA	Over-the-Air
PBAP	Phone Book Access Profile
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PDM	Pulse Density Modulation
PIM	Plug-in Module
PLC	Packet Loss Concealment
PMU	Power Management Unit
POR	Power-on Reset
PWM	Pulse Width Modulation
RF	Radio Frequency
RFS	Receive Frame Sync
RoHS	Restriction of Hazardous Substances
RSSI	Received Signal Strength Indicator
RX	Receiver

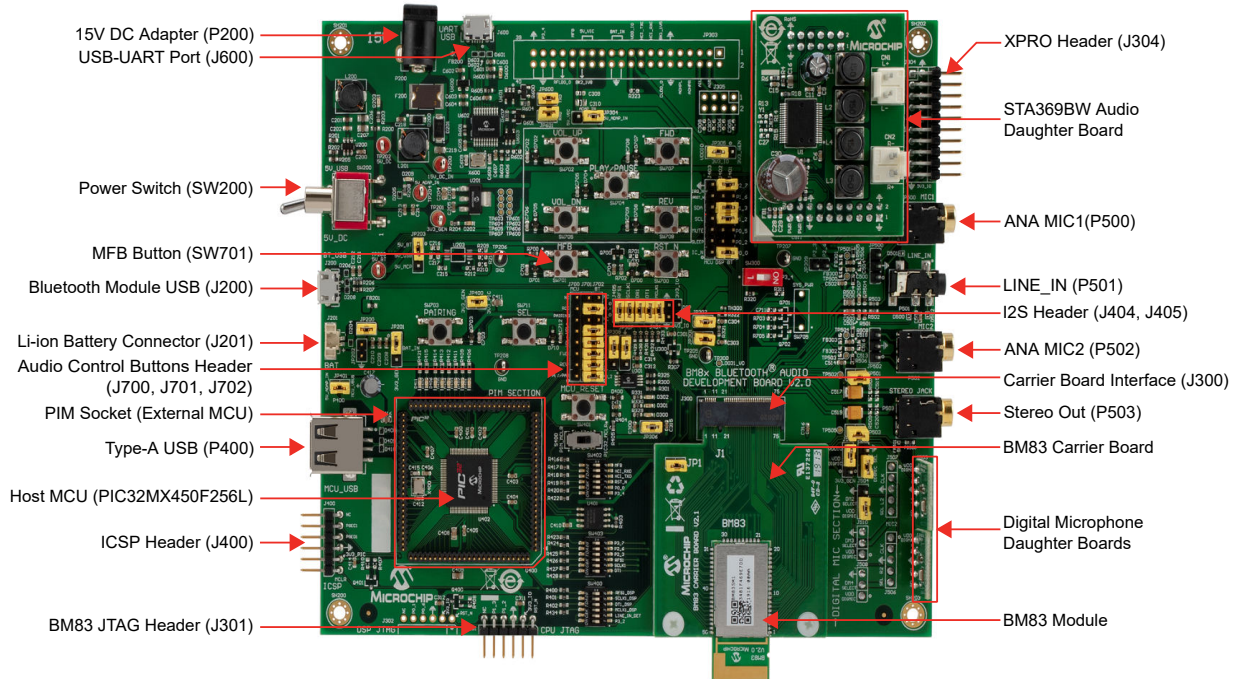
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Acronyms/Abbreviations	Description
SAR	Successive Approximation Register
SBC	Sub-band Coding
SCO	Synchronous Connection-oriented
SDK	Software Development Kit
SIG	Special Interest Group
SNR	Signal-to-Noise Ratio
SoC	System-on-Chip
SPP	Serial Port Profile
SW	Software
TX	Transmitter
UART	Universal Asynchronous Receiver-Transmitter
UI	User Interface
USB	Universal Serial Bus
VB	Virtual Bass Enhancement
VCO	Voltage-controlled Oscillator
WDT	Watchdog Timer

2. Kit Overview

This section provides an overview of the BM83 EVB. The following figure illustrates the top view of the BM83 EVB with its components.

Figure 2-1. BM83 EVB Components

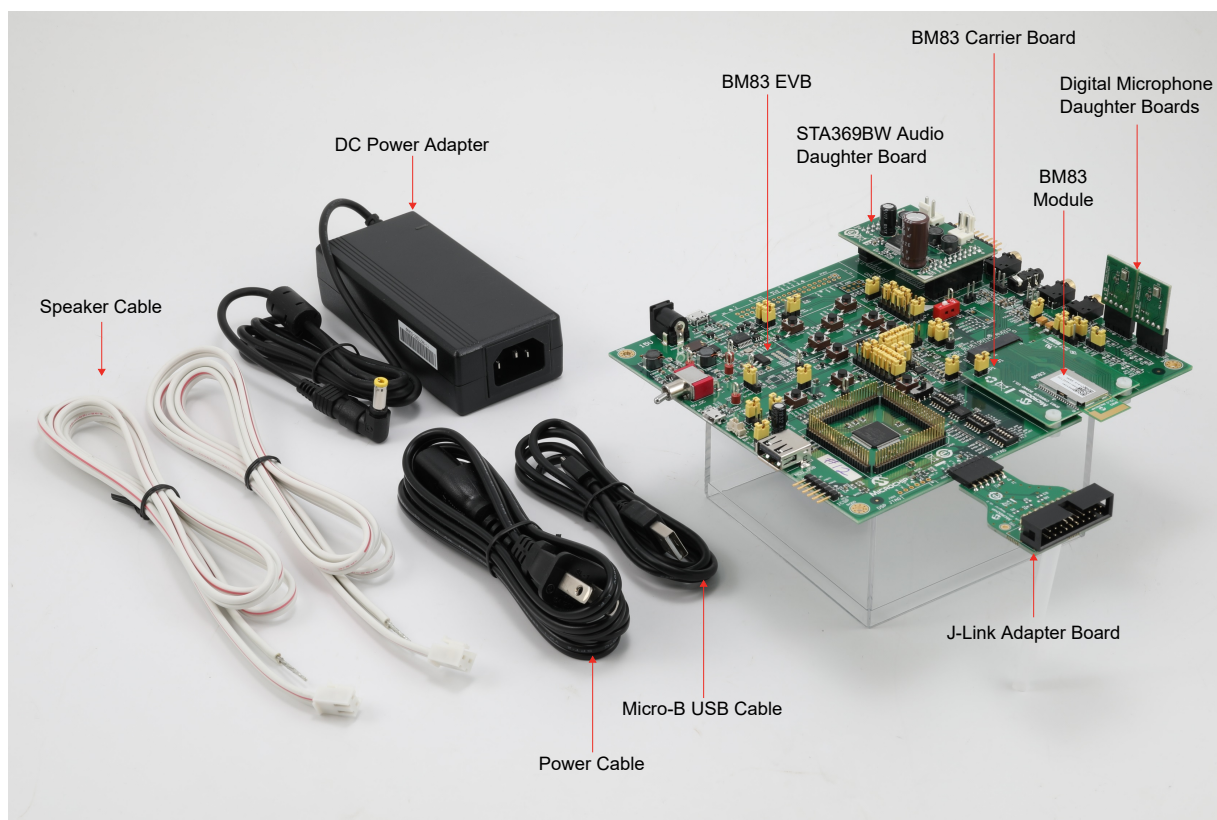


2.1 Kit Contents

The BM83 EVB includes the following:

- One BM83 EVB that contains a BM83 module (BM83SM1-00AA) mounted on a BM83 Carrier Board
- One 15V DC power adapter
- One pair of speaker cables
- One Type-A to Micro-B USB cable
- One STA369BW Audio Daughter Board
- Two Digital Microphone Daughter Boards
- One J-link 6-pin Adapter Board

Figure 2-2. Kit Contents

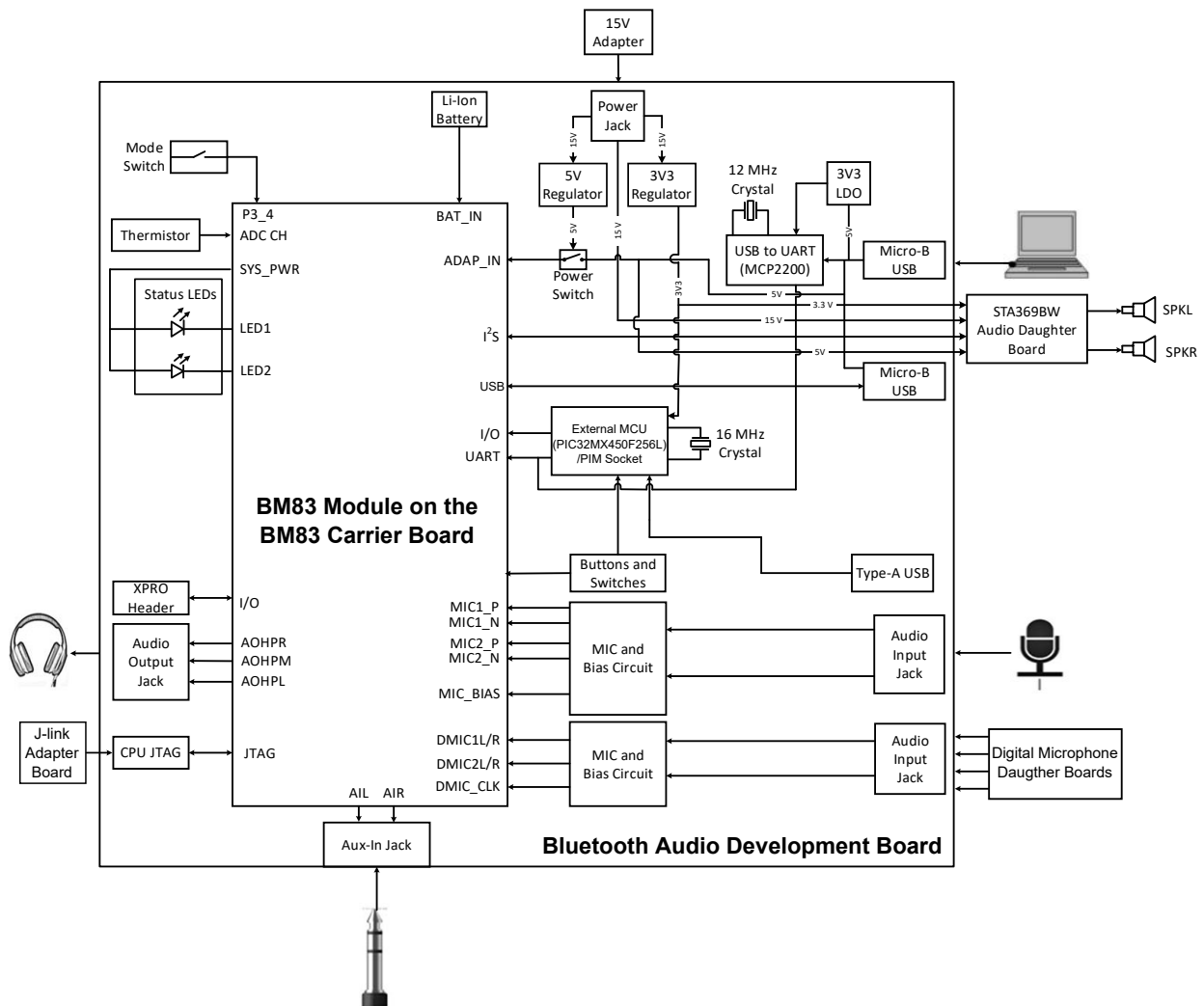


Note: If any part of the BM83 EVB is missing, contact your Microchip sales office for assistance. A list of Microchip offices for sales and service is provided on the back page of this document.

3. Hardware

This chapter describes the hardware features of the BM83 EVB. The BM83 EVB includes a range of peripheral components.

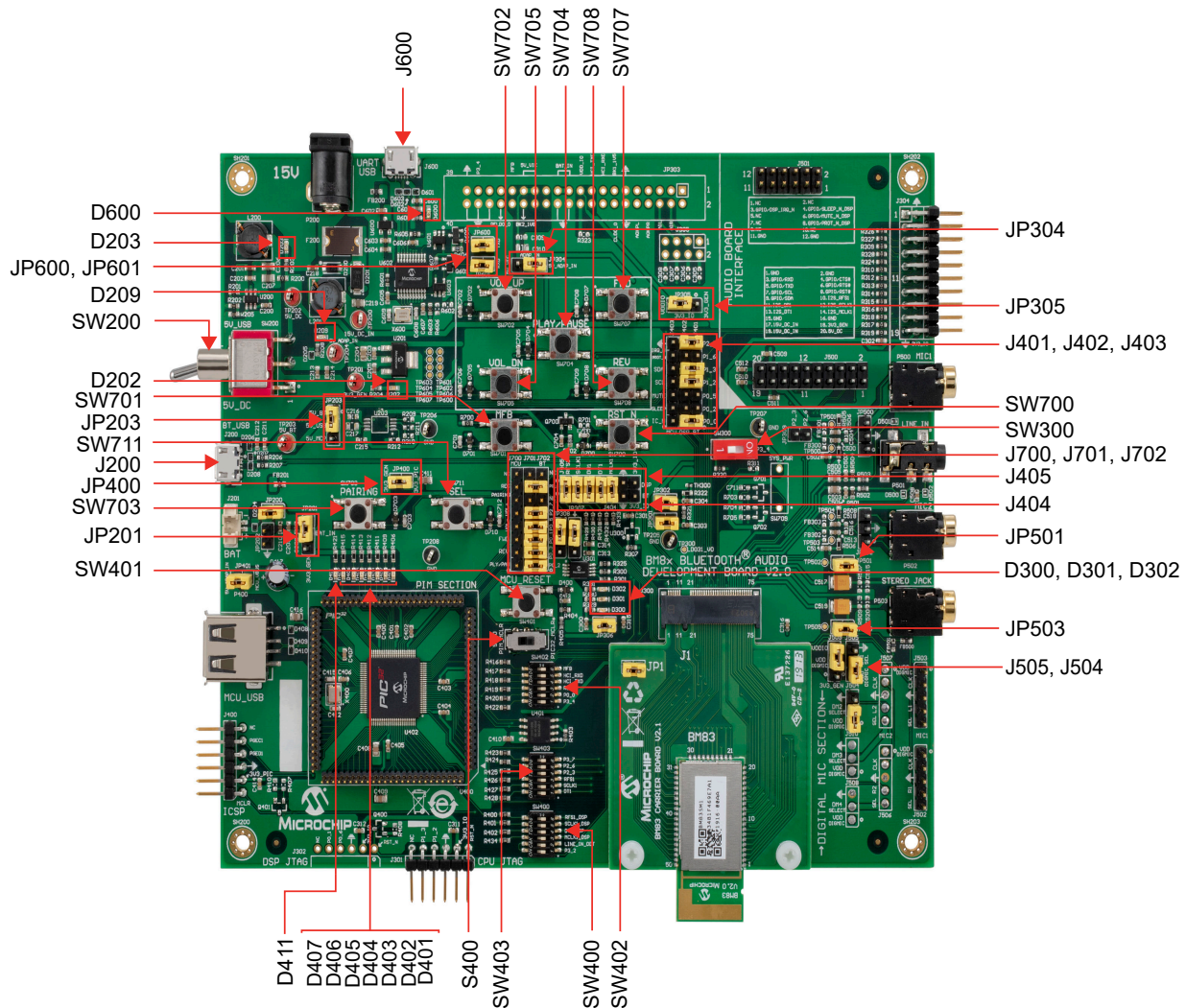
Figure 3-1. Block Diagram



3.1 Hardware Features

The following sections provide detailed information on the BM83 EVB components. To locate these components in the BM83 EVB, refer to [Figure 2-1](#) and [Figure 3-2](#).

Figure 3-2. BM83 EVB Switches, LEDs, and Jumpers



Legends: Dxxx - LEDs JPxxx/Jxxx - Jumpers Sxxx/SWxxx - Switches/Push buttons

3.1.1 Power Supply

The BM83 EVB can be powered using any one of the following:

- Li-ion battery (J201) – when using a battery input, mount a jumper on JP200 and pin 1 and 2 of JP201. Do not mount a jumper on JP202. JP202 is a provision for connecting a battery power source with 2.54 mm connector.
- 15V DC power adapter (P200)
- USB (J200 and J600) – USB cable is connected to the PC which provides 5V (USB_5V)

Note: Power switch (SW200) is utilized to switch between two 5V power sources available on board:

- 5V_DC: derived from 15V DC
- 5V_USB: supplied by 5V USB source

Note: To locate these power sources available on the BM83 EVB, refer to [Figure 2-1](#).

3.1.2 USB Connectivity

The USB ports for BM83 EVB are:

- Micro-B USB port (J600 UART USB) – USB signals are converted to UART by the serial converter MCP2200, which is connected to BM83 module.
- Micro-B USB port (J200 BT_USB) – USB signals are directly connected to the BM83 module.
- Type A USB port (P400- MCU_USB) – USB signals are directly connected to host MCU (PIC32MX450F256L).

Note: To locate these USB ports available on the BM83 EVB, refer to [Figure 2-1](#).

3.1.3 Switches and Push Buttons

The functions of the switches and push buttons on the BM83 EVB are:

- S400 – Switch to select between on-board PIC32 MCU or external Plug-in Module (PIM)
- SW200 – Power switch to switch between 5V_DC and 5V_USB
- SW300 – Mode selection switch for configuring BM83 module into Application mode or Test mode
- SW400 – Microcontroller to Bluetooth control switch
- SW401 – Reset button for the host MCU (MCU_RESET)
- SW402 – Microcontroller to Bluetooth control switch
- SW403 – Microcontroller to Bluetooth control switch
- SW700 – Reset button for BM83 module (RST_N)
- SW701 – Multifunction button (MFB)
- SW702 – Increase volume (VOL_UP)
- SW703 – Enter into pairing mode (PAIRING)
- SW704 – Play or pause the audio playback (PLAY/PAUSE)
- SW705 – Decrease volume (VOL_DN)
- SW707 – Skip the audio track forward (FWD)
- SW708 – Skip the audio track backward (REV)
- SW711 – Select button (SEL), turns on the system and puts the system into Pairing mode during Host MCU mode application demonstration

Note: To locate these switches and push buttons available on the BM83 EVB, refer to [Figure 3-2](#).

The following table provides the settings of mode selection switch (SW300) for configuring the BM83 module in various operating modes.

Table 3-1. Mode Selection Switch (SW300) Details

Mode	Pin Description
Test mode	SW300 is placed in ON (P3_4: Low) position
Application mode	SW300 is placed in OFF (P3_4: Floating) position

3.1.4 LEDs

All the on-board LEDs are categorized into three main types:

- Power LEDs:
 - Red (D600 and D202)
 - Green (D209 and D203)
- LEDs driven by the BM83 module:
 - Red (D301)
 - Blue (D300)
- Host MCU (PIC32) related LEDs:
 - Green (D401-D407)
 - Green (D411)

Note: To locate these LEDs available on the BM83 EVB, refer to [Figure 3-2](#).

3.1.5 Headers

The following headers are available on the BM83 EVB.

Note: To locate these headers available on the BM83 EVB, refer to [Figure 2-1](#).

3.1.5.1 I2S Header

I2S header (J405) provides the interface to connect an STA369BW Audio Daughter Board to the BM83 module. The following table provides the pin details of I2S header.

Table 3-2. I2S Header (J405) Pin Details

Pin Number	Pin Name
1	RFS1
2	SCLK1
3	DR1
4	DT1
5	MCLK1
6	GND
7	3V3_IO

Note: Connect J405 and J404 to enable I2S interface with the STA369BW Audio Daughter Board.

3.1.5.2 Audio Daughter Board Interface Header

The Audio Daughter Board interface headers (J500 and J501) provide the interface to use the STA369BW Audio Daughter Board. The [Table 3-3](#) and [Table 3-4](#) tables provide the pin details of these headers.

Table 3-3. Audio Daughter Board Interface Header (J500) Pin Details

Pin Number	Pin Name	Pin Number	Pin Name
1	GND	11	I2S_DR1
2	GND	12	I2S_SCLK1
3	GPIO/RxD	13	I2S_DT1
4	GPIO/CTS#	14	I2S_MCLK1
5	GPIO/TxD	15	GND
6	GPIO/RTS#	16	GND
7	GPIO/SCL	17	15V_DC_IN
8	GPIO/RST#	18	3V3_GEN
9	GPIO/SDA	19	15V_DC_IN
10	I2S_RFS1	20	5V_DC

Table 3-4. Audio Daughter Board Interface Header (J501) Pin Details

Pin Number	Pin Name	Pin Number	Pin Name
1	NC	7	NC
2	NC	8	GPIO/PROT_N_DSP
3	GPIO/DSP_IRQ_N	9	NC
4	GPIO/SLEEP_N_DSP	10	NC

.....continued

Pin Number	Pin Name	Pin Number	Pin Name
5	NC	11	GND
6	GPIO/MUTE_N_DSP	12	GND

3.1.5.3 Audio Control Button Headers

The audio control button headers (J700, J701, J702) provide the mechanism to control the audio function buttons either by the BM83 module (Embedded mode) or on-board PIC32 MCU (Host MCU mode). The following tables provide the header pin description Embedded and Host MCU mode configurations.

Table 3-5. Audio Control Button Headers (J700, J701, and J702) Pin Description ⁽¹⁾

Pin Number	Pin Name	Description
1	PLY/PAU	Play or pause
2	REV	Reverse
3	FWD	Forward
4	VOL-	Volume down
5	VOL+	Volume up
6	PAIRING	Used for pairing the module with a smartphone (only for Host MCU mode)
7	Sel	Not used
8	NC	Not connected

1. To locate these headers on the BM83 EVB, refer to [Figure 2-1](#).

Table 3-6. Embedded Mode Audio Control Button Header Configurations (J700, J701, and J702) ⁽¹⁾

Pin Number	Jumper Names and Positions			Description
	J700	J701	J702	
1	Open	Mount a jumper on J701 and J702		Audio streaming is controlled by the BM83 module in Embedded mode.
2	Open	Mount a jumper on J701 and J702		
3	Open	Mount a jumper on J701 and J702		
4	Open	Mount a jumper on J701 and J702		
5	Open	Mount a jumper on J701 and J702		
6	Open	Open	Open	
7	Open	Mount a jumper on J701 and J702		
8	Open	Open	Open	

1. To locate these headers on the BM83 EVB, refer to [Figure 2-1](#).

Table 3-7. Host MCU Mode Audio Control Button Header Configurations (J700, J701, and J702) ⁽¹⁾

Pin Number	Jumper Names and Positions			Description
	J700	J701	J702	
1	Mount a jumper on J700 and J701		Open	Audio streaming is controlled by on-board PIC32MX450F256L MCU in Host MCU mode.
2	Mount a jumper on J700 and J701		Open	
3	Mount a jumper on J700 and J701		Open	
4	Mount a jumper on J700 and J701		Open	
5	Mount a jumper on J700 and J701		Open	
6	Mount a jumper on J700 and J701		Open	
7	Mount a jumper on J700 and J701		Open	
8	Open	Open	Open	

1. To locate these headers on the BM83 EVB, refer to [Figure 2-1](#).

3.1.5.4 BM83 Carrier Board Interface

The following table provides the pin details of J300 and the BM83 module interface with the BM83 EVB.

Table 3-8. Carrier Board Interface (J300) Pin Details

Pin Name	Pin Number		Pin Name
BK1_O_1V5	1	2	MCLK1
LED3	3	4	DT1
NC	5	6	DR1
RST_N	7	8	SCLK1
DP	9	10	RFS1
DM	11	12	GND
GND	13	14	P3_7
GND	15	16	P3_5
P2_7	17	18	NC
P1_3	19	20	BK2_O_1V8
P1_2	21	22	NC
P0_5	23	24	P0_1
P0_2	25	26	P0_0
P0_3	27	28	P2_3
P0_6	29	30	P0_7
LED2	31	32	UART_TXD
P1_6	33	34	UART_RXD
LED1	35	36	SK2_KEY_AD
P3_4	37	38	PWM
SK1_AMB_DET	39	40	MFB

.....continued

Pin Name	Pin Number		Pin Name
NA	41	42	DMIC2_R
NA	43	44	DMIC2_L
P3_2	45	46	VDD_IO
GND	47	48	SYS_PWR
MIC_BIAS	49	50	BAT_IN
MIC_P1	51	52	ADAP_IN
MIC_N1	53	54	NC
AIL	55	56	P2_6
AIR	57	58	DMIC1_R
MIC_P2	59	60	DMIC1_L
MIC_N2	61	62	DMIC_CLK
AOHPL	63	64	GND
AOHPM	65	66	GND
AOHPR	67	—	—

3.1.5.5 ICSP Header

ICSP header (J400) provides the programming/debugging interface for the on-board PIC32 MCU (PIC32MX450F256L). To locate this header on the BM83 EVB, refer to [Figure 2-1](#). The following table provides the ICSP header pin description.

Table 3-9. ICSP Header (J400) Pin Description

Pin Number	Description
1	Reset (MCLR)
2	Power supply (3V3_PIC)
3	Ground (GND)
4	Data (PGED1)
5	Clock (PGEC1)
6	Not connected (NC)

3.1.5.6 Xplained PRO Header

The BM83 EVB provides 20-pin XPRO header (J304) to interface with XPRO platform. The following table provides the pin details of XPRO header.

Table 3-10. XPRO Header (J304) Pin Details

Pin Name	Pin Number		Pin Name
NC	1	2	GND
SK2_KEY_AD	3	4	SK1_AMB_DET
NA	5	6	NA
PWM	7	8	P0_0
P0_6	9	10	P3_5

.....continued

Pin Name	Pin Number		Pin Name
P1_3	11	12	P1_2
UART_RXD	13	14	UART_TXD
P0_7	15	16	P2_6
P2_3	17	18	P1_6
GND	19	20	3V3_IO

3.1.5.7 Digital Microphone Headers

The 5-pin digital microphone header provides an interface to BM83 EVB and the Digital Microphone Daughter Board. The pin description is provided in the following table.

Table 3-11. Digital Microphone Headers (J1, J503, and J502) Pin Description

Pin Number	Digital Microphone Daughter Board	BM83 EVB		Pin Description
	Pin Name (J1)	Pin Name (J503)	Pin Name (J502)	
1	VDD	VDD DIGMIC	VDD DIGMIC	Power supply from BM83 EVB
2	CLOCK	DMIC1_CLK	DMIC1_CLK	Clock input to the microphone from BM83 module
3	GND	GND	GND	Ground
4	DATA	DMIC1_L	DMIC1_R	PDM output from the microphone to BM83 module
5	SEL	DM1 SELECT	DM2 SELECT	Select input for microphone

4. Embedded Mode Quick Demo

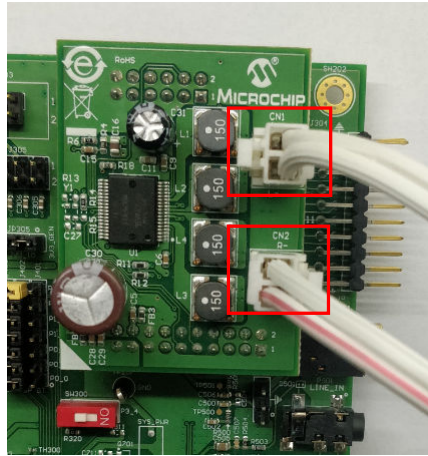
This section provides a quick demo to stream audio using the BM83 module in Embedded mode.

Perform the following steps:

Note: The BM83 EVB is preconfigured for the Embedded mode quick demo.

1. Unbox the kit and connect the speaker cables to the STA369BW Audio Daughter Board at CN1 and CN2, and connect the cables to the speaker.

Figure 4-1. Speakers Connected to the STA369BW Audio Daughter Board



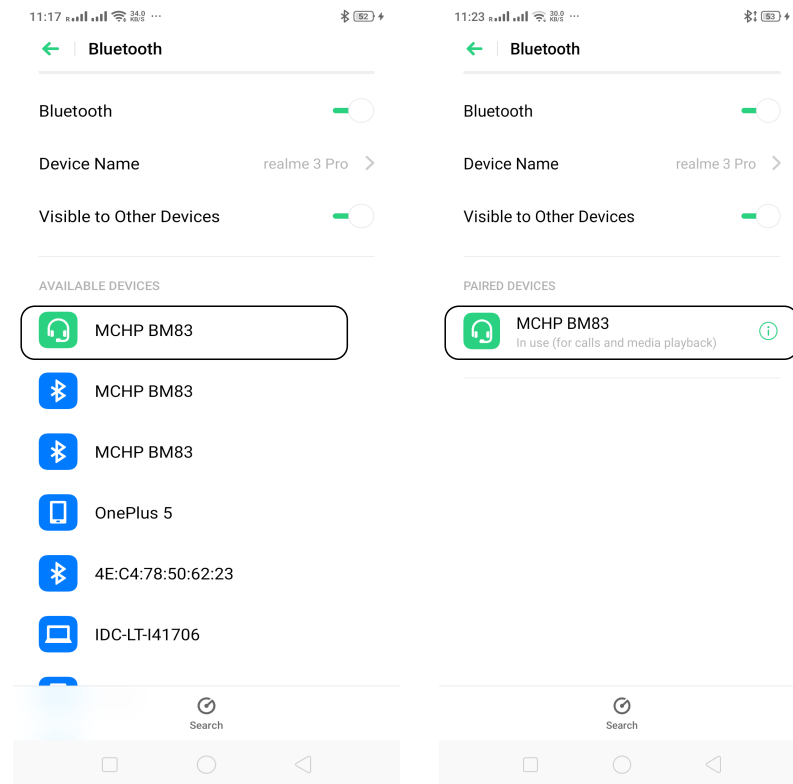
2. The SW200 switch is set to 5V_USB position as shown in the following figure.

Figure 4-2. SW200 Switch Position



3. Connect the 15V DC adapter at DC power jack P200. Notice that the Green LED (D203) and the Red LED (D202) turn ON.
4. Set the SW200 switch to 5V_DC position. Notice that the Green LED (D209) turns ON.
5. Long press **MFB** button (SW701) for minimum 4-5 seconds until the Blue LED (D300) and Red LED (D301) start blinking alternately. Observe the sound on the speakers.
6. Release **MFB** button.
7. Perform the following steps to pair the BM83 module with a smartphone:
 - 7.1. Turn ON the smartphone's Bluetooth to scan for the available devices.
 - 7.2. Tap on "MCHP BM83" from the scan results. Pair to connect the device.
 - 7.3. On successful pairing, the MCHP BM83 device must be visible under the "PAIRED DEVICES" as shown in the following figure.

Figure 4-3. Pairing and Connection



- 7.4. Stream the audio from the smartphone to the BM83 module over Bluetooth connection, and listen to it over the speakers.
8. Control the audio with the following buttons:
 - 8.1. Press **VOL_UP** button (SW702) to increase the volume.
 - 8.2. Press **VOL_DN** button (SW705) to reduce the volume.
 - 8.3. Press **Play** button (SW704) to play the audio.
 - 8.4. Press **Pause** button (SW704) to pause the audio.
 - 8.5. Press **FWD** button (SW707) to jump to next audio file.
 - 8.6. Press **REV** button (SW708) to jump to previous audio file.
 - 8.7. Press **MFB** button (SW701) for a minimum of 4-5 seconds to turn OFF the system.

5. Firmware Update

This section describes the firmware update of the BM83 module over UART and USB DFU.

5.1 Firmware Update over UART

To update the firmware of the BM83 module, the user must ensure the hardware settings and configurations described in the following table.

Table 5-1. BM83 EVB Firmware Update Settings

Jumpers and Switches ⁽¹⁾	Description
JP600 and JP601	<ul style="list-style-type: none"> Mount a jumper on JP600 (TXD) Mount a jumper on JP601 (RXD)
JP304	Mount a jumper on “ADAP_IN” and “5V_ADAP_IN” pins of JP304 pin2 and pin3
JP203	Mount a jumper on 5V_USB and 5V_MCP pins of JP203 pin2 and pin3
SW300	Put SW300 switch to ON position for Test mode
SW200	Put SW200 switch to 5V_USB position
JP305	Mount a jumper on “3V3_IO” and “VDDIO” pins of JP305
J600	Connect the USB cable from a PC to J600

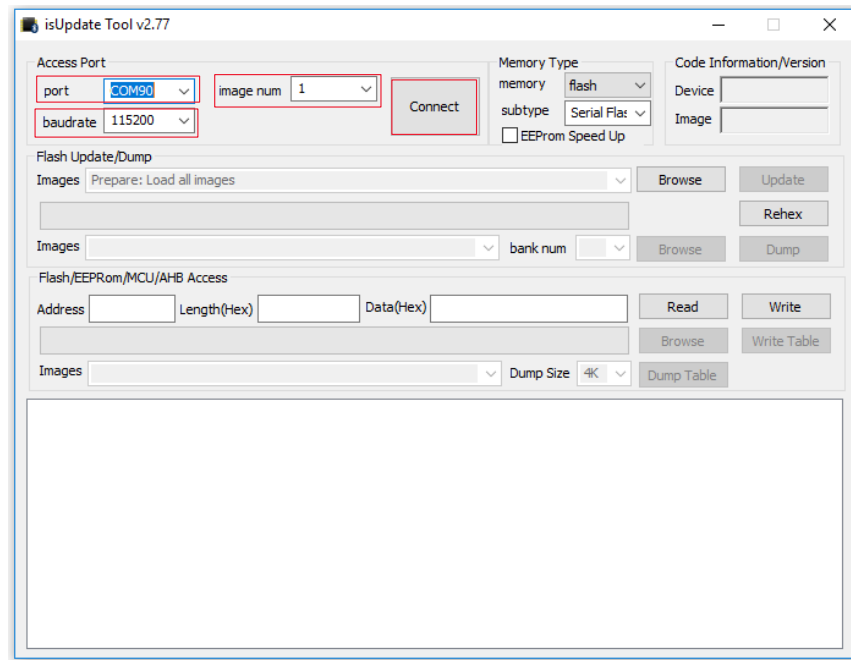
1. To locate these jumpers, switches, and power sources on the BM83 EVB, refer to [Figure 3-2](#) and [Figure 2-1](#).

Perform the following steps to load the firmware files onto the BM83 module using isUpdate tool.

Note: Download isUpdate tool from <http://www.microchip.com/BM83>.

1. Connect the BM83 EVB Micro-B USB port J600 over USB cable to the PC.
Note: Be sure to disconnect the 15V power supply before connecting the USB cable.
2. Observe that the Red LED (D600), Green LED (D209), and Blue LED (D300) turn ON.
3. Open the isUpdate tool. Select the appropriate COM port, set the baud rate to 115200, and image num to 1 as shown in the following figure.
4. Click **Connect**.

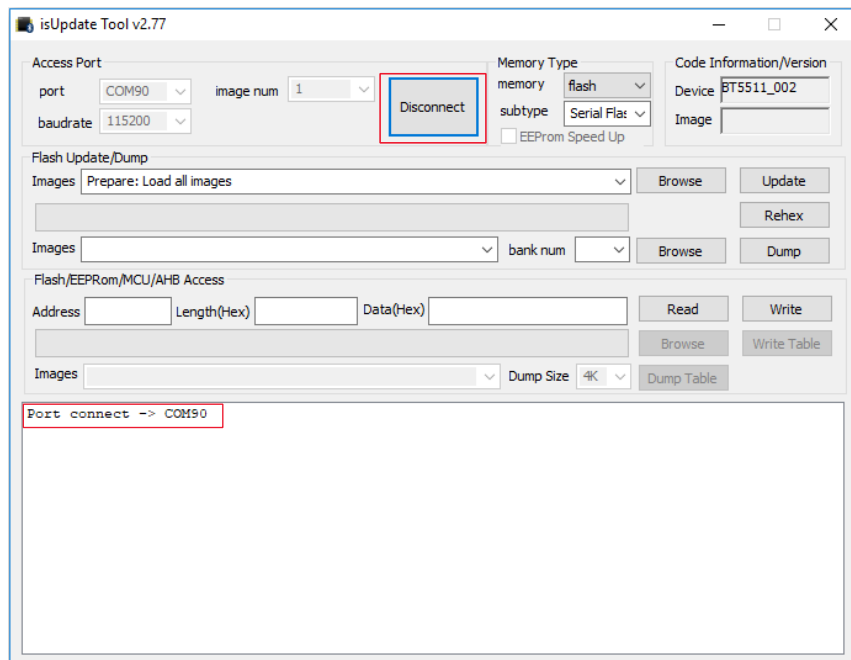
Figure 5-1. isUpdate Tool Window



Note: In isUpdate tool, image num values must be equal to the number of images to be programmed on the device. For example, to program firmware (image1), DSP (image2), and configuration (image3), the image num value must be selected as 3.

5. The message on console and the transition of Connect button to Disconnect indicates that the connection is established successfully between the PC and the BM83 module.

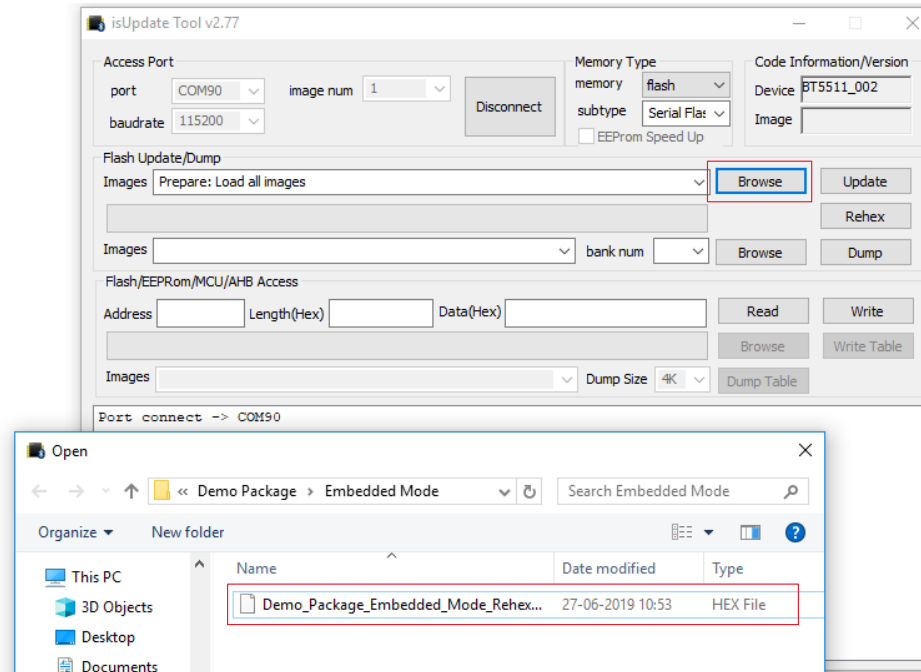
Figure 5-2. Connection Established



- Once the connection is established, click **Browse** and locate the firmware image provided in the release package.

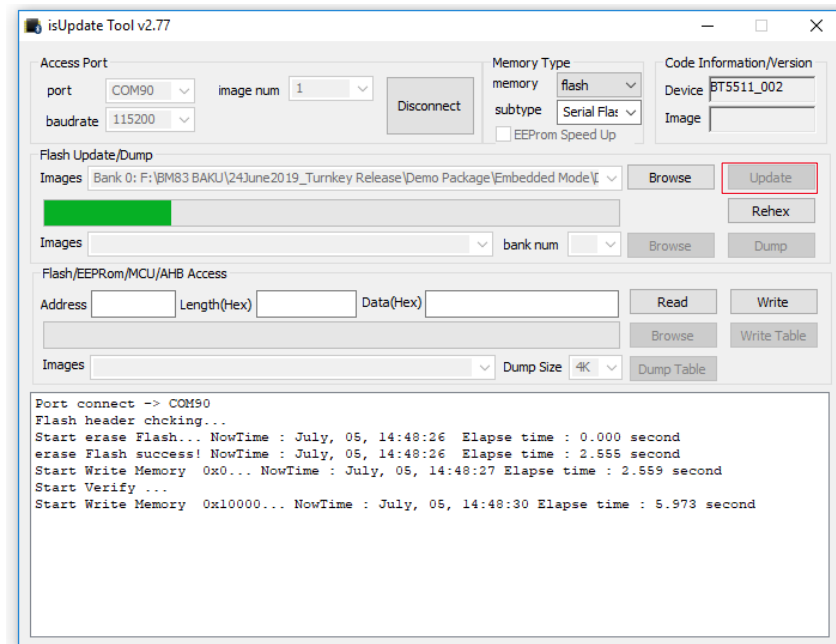
Note: The Embedded mode firmware images are available in the package, refer to <http://www.microchip.com/BM83>.

Figure 5-3. Browsing and Loading the Files



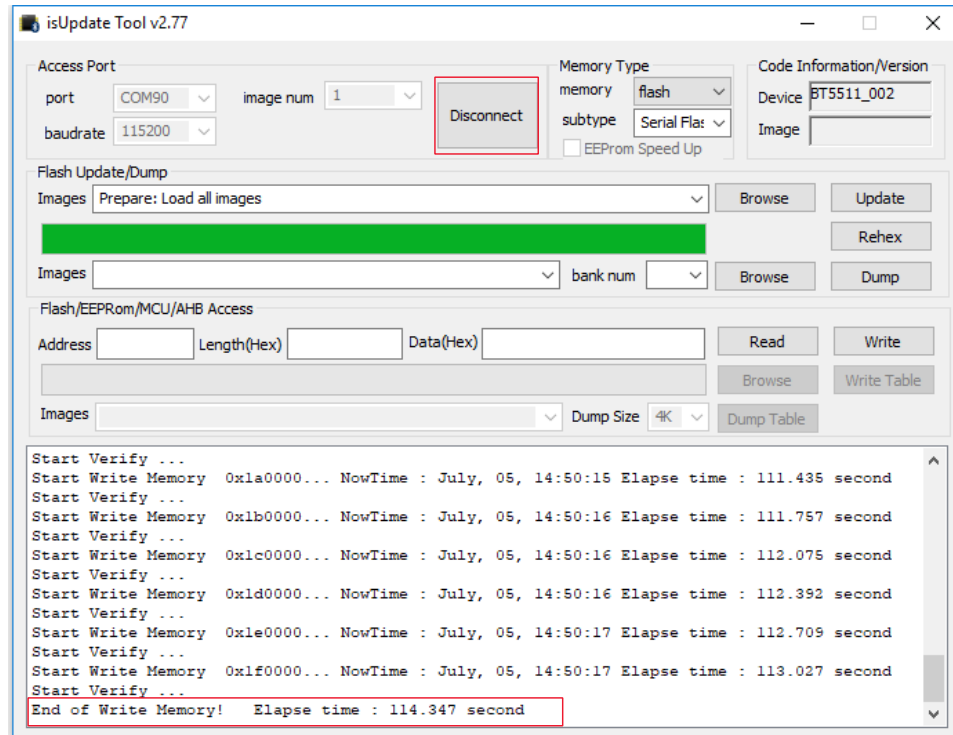
- Click **Update** to load the firmware to BM83 module and observe the progress.

Figure 5-4. Updating the Firmware



- Click **Disconnect** and close the isUpdate tool after a successful firmware update.

Figure 5-5. Process Completed



- Remove the USB cable.

5.2 Firmware Update over USB

Use the isUpdate tool to perform a firmware update on the BM83 module through USB Device Firmware Upgrade (DFU). The BM83 EVB should be in Application mode. For firmware update over the USB, the user must ensure the hardware settings and configurations described in the following table.

Table 5-2. BM83 EVB Firmware Update Settings

Jumpers and Switches ⁽¹⁾	Description
JP304	Mount a jumper on “ADAP_IN” and “5V_ADAP_IN” pins of JP304 pin2 and pin3
JP203	Mount a jumper on 5V_USB and 5V_BT pins of JP203 pin1 and pin2
SW200	Put SW200 switch to 5V_USB position
SW300	Put SW300 switch to OFF position for Application Mode
J200	Connect the USB cable from a PC to J200
JP305	Mount a jumper on “3V3_IO” and “VDD_IO” pins of JP305

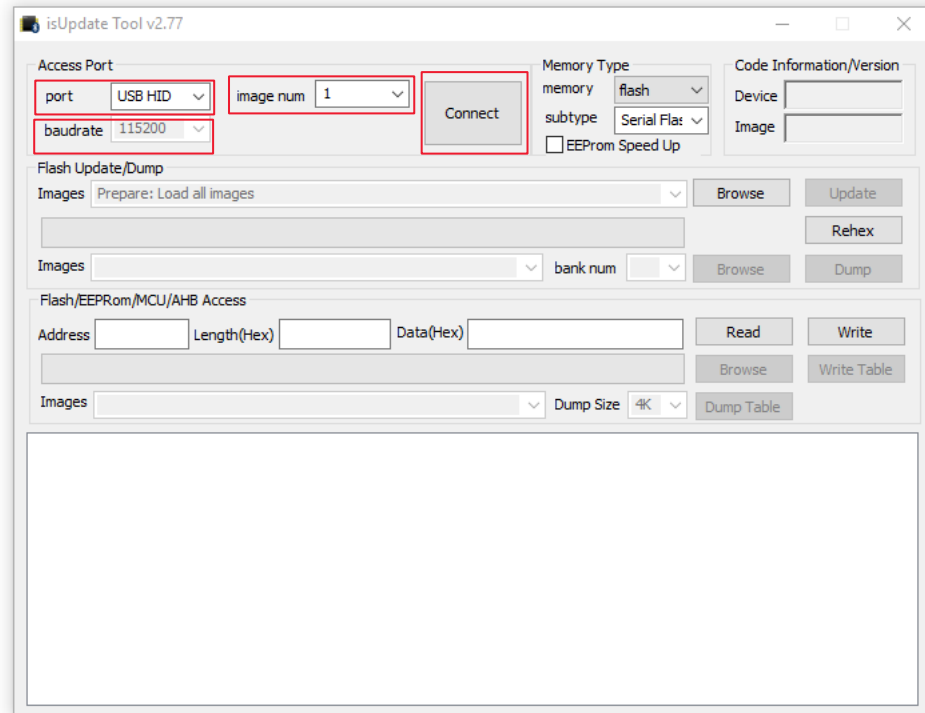
- To locate these jumpers, switches, and power sources on the BM83 EVB, refer to [Figure 3-2](#) and [Figure 2-1](#).

Perform the following steps to load the firmware files onto the BM83 module using the isUpdate tool. Ensure that the SW200 switch is in 5V_DC before connecting USB cable to J200 USB port.

- Connect the BM83 EVB Micro-B USB port J200 over USB cable to the PC.
Note: Be sure to disconnect the 15V power supply before connecting the USB cable.
- Observe that the Green LED (D209) and Red LED (D202) turn ON.
- Set the SW200 switch to 5V_USB.

4. Open the isUpdate tool. Select the port as USB HID, set the baud rate to 115200, and image num to 1 as shown in the following figure.
5. Click **Connect**.

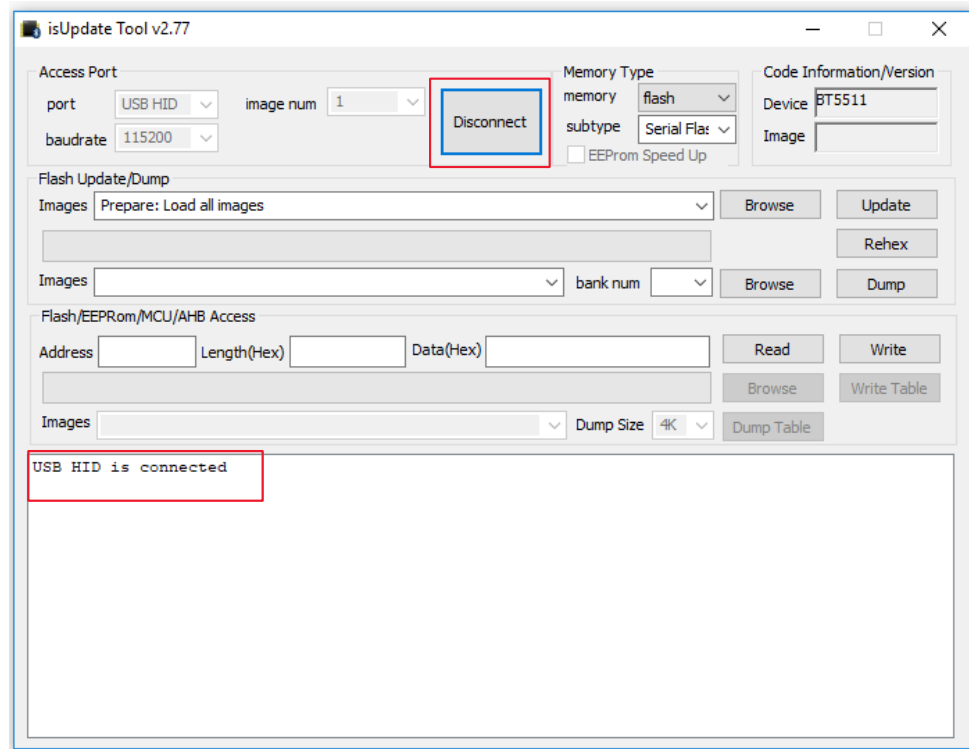
Figure 5-6. Loading the Firmware Files



Note: In isUpdate tool, image num value must be equal to the number of images to be programmed on the device. For example, to program firmware (image1), DSP (image2), and configuration (image3), the image num value must be selected as 3.

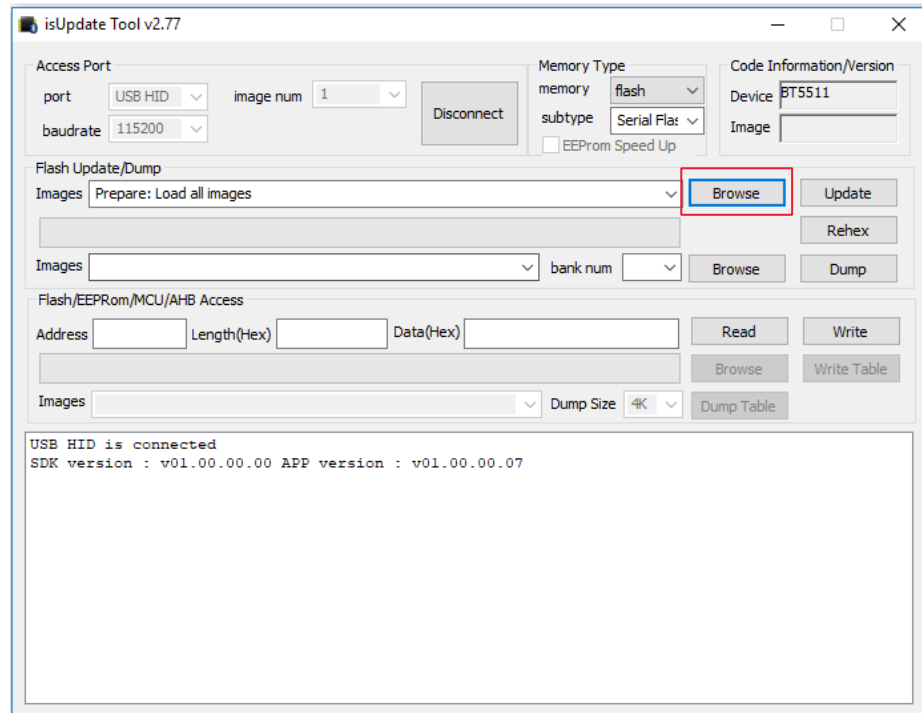
6. The message on console and the transition of Connect button to Disconnect indicates that the connection is established successfully between the PC and the BM83 module.

Figure 5-7. Connection Established



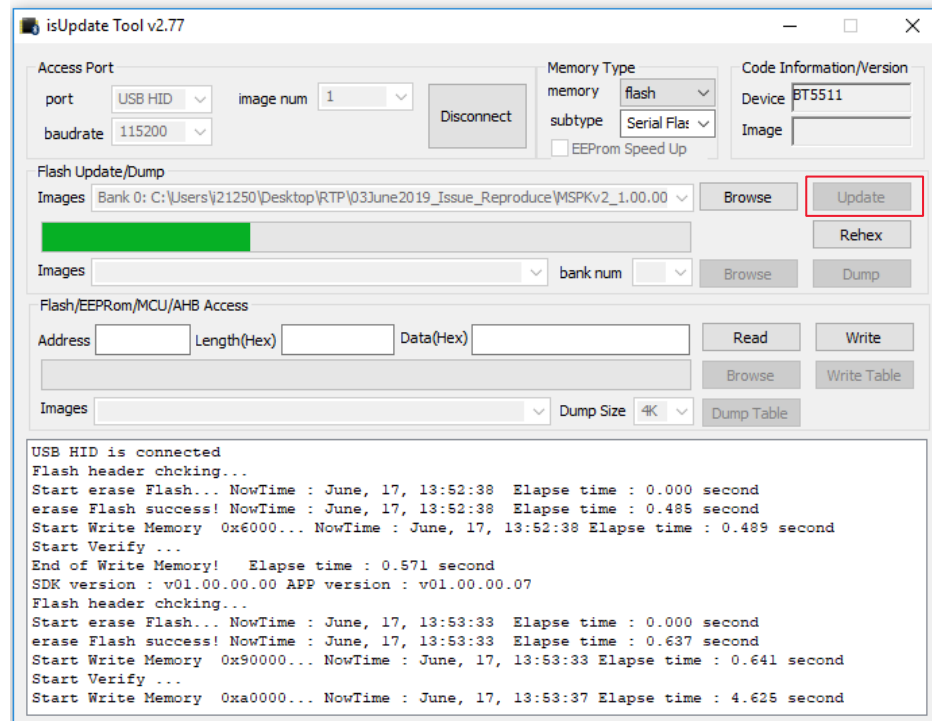
- Once the connection is established, click **Browse** and open the firmware image provided in the release package.
Note: The Embedded mode firmware images are available in the package, refer to www.microchip.com/BM83.

Figure 5-8. Browsing and Loading the Files



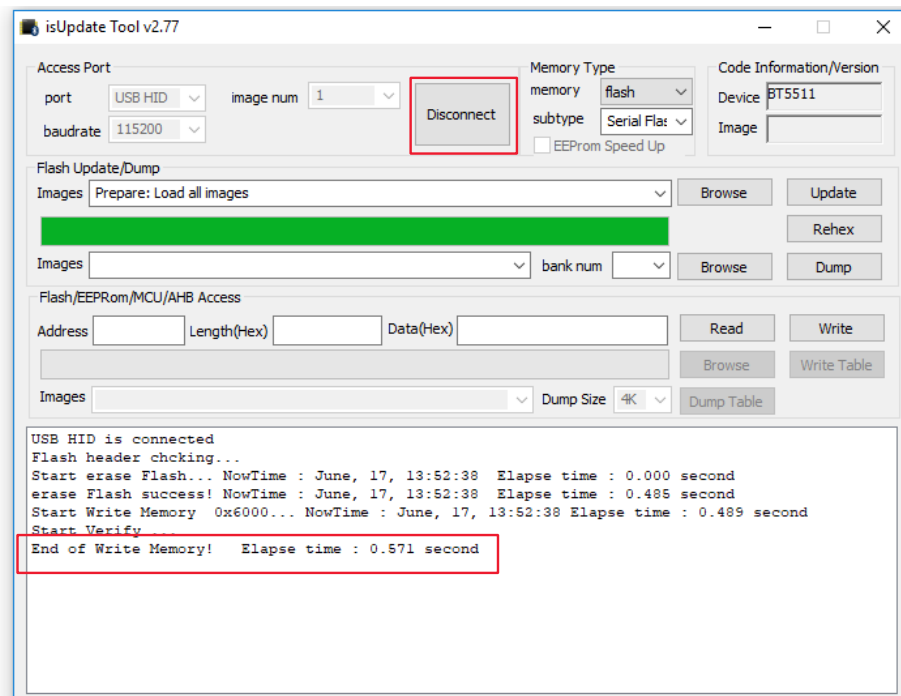
- Click **Update** to update the firmware and observe the progress.

Figure 5-9. Updating the Firmware



- Click **Disconnect** and close the isUpdate tool after a successful firmware update.

Figure 5-10. Process Completed



- Remove the USB cable.

6. Customizing Module Parameters

6.1 Config Tool Setup

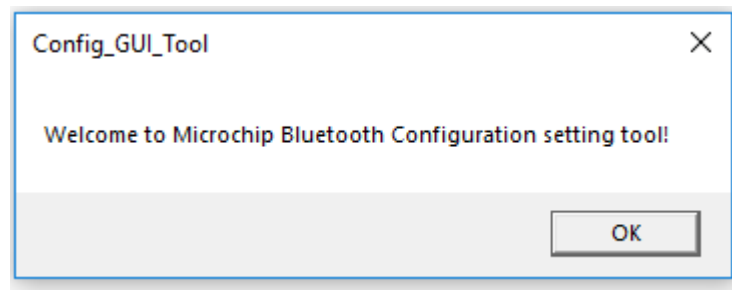
The IS208x_Config_GUI_Tool Config Tool setup is a configuration tool that allows the user to change the BM83 module parameters such as device name, Bluetooth Low Energy connection settings, LED configuration, enable/disable Pairing mode and other functions.

Note: For this demonstration, Config Tool version IS208x_Config_GUI_Tool v1.0.11 is used. Refer to the latest version at <http://www.microchip.com/BM83>. For additional details on the Config Tool, refer to *IS208x Config GUI Tool User's Guide*.

To configure the GUI parameters, perform the following steps:

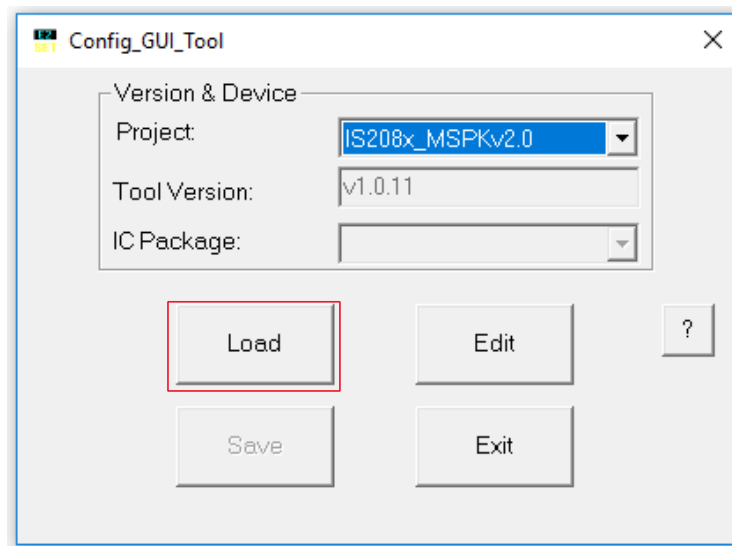
1. Open the Config Tool and click **OK** to configure the parameters.

Figure 6-1. Config Tool - Welcome Window



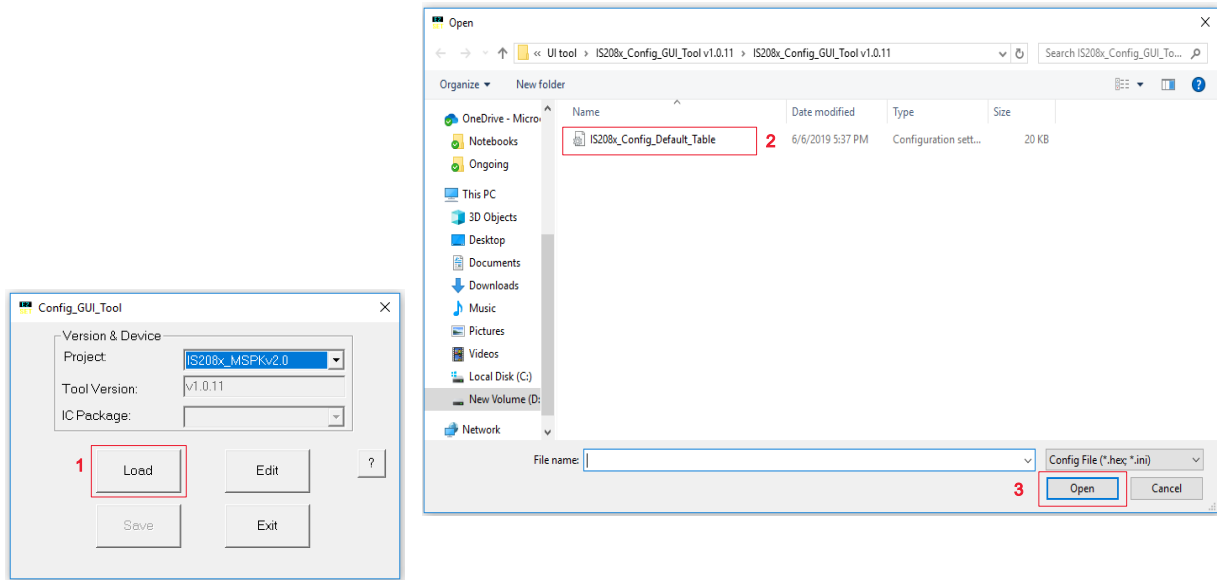
2. In the Config Tool, click **Load**.

Figure 6-2. Config Tool



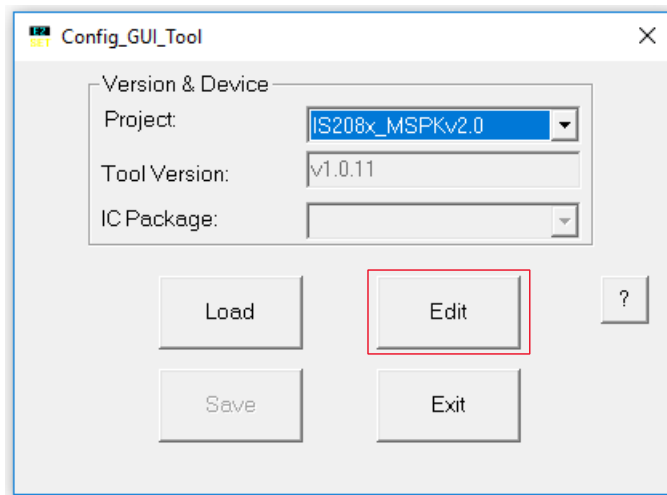
3. From the Open window, select the default GUI parameters file (provided with the UI tool) for this module (BM83), and then click **Open**, see the following figure.

Figure 6-3. Loading Default GUI Parameters



4. After loading the GUI parameters, click **Edit** to customize the GUI parameters on the Main Feature window.

Figure 6-4. Editing Parameters



5. In the Main Feature window, the user can enable or disable the features required for their application. Select the “Embedded Mode” option (see [Figure 6-5](#)) and click **Next**.

Note:

- For Host MCU mode, select the “Host MCU Mode”.
- For Embedded mode, select the “Embedded Mode”.

Figure 6-5. Main Feature Settings

IS208x_Config_Default_Table.ini - Config_GUI_Tool

Supported Profile

☒ HFP/HSP ☒ A2DP ☒ AVRCP ☒ SPP ☐ PBAP ☐ iAP

☒ AVRCP Controller ☐ iAP2

☒ AVRCP Target

Function Enable and GPIO Assignment

☐ Charge OK Led Ind. 0x21: GPIO_NULL

☐ AUX-IN Led Ind. 0x21: GPIO_NULL

☒ AUX-IN Detect 0x1A: GPIO_P32

☐ CP Reset (iAP) 0x21: GPIO_NULL

☒ Host MCU Mode ☒ **Embedded Mode**

☐ Tx IND 0x21: GPIO_NULL

Audio(SBC) Indication 0x21: GPIO_NULL Low Active

Voice(SCO) Indication 0x21: GPIO_NULL Low Active

Ring Tone Indication 0x1D: GPIO_P35 Low Active

Incoming Call Indication 0x21: GPIO_NULL Low Active

External Amplifier Indication 0x21: GPIO_NULL High Active

HF Link Indication 0x21: GPIO_NULL Low Active

A2DP Link Indication 0x1D: GPIO_P35 Low Active

Button Event Trigger Indication 0x21: GPIO_NULL Low Active

Back Next

6. In the System and Functional Settings window, go to **Sys. Setup1** tab to power ON/OFF the Bluetooth system. Select MFB Power ON/OFF in the “Power Switch Type” section.

Figure 6-6. Options in Sys. Setup1 Tab

IS208x_Config_Default_Table.ini - Config_GUI_Tool

Button Setup | PMU Setup | CODEC Setup | iAP/SPP Setup | BLE Setup | MSPK Setup | DSP Feature Setup
Sys. Setup1 | Sys. Setup2 | Sys. Setup3 | LED Setup1 | LED Setup2 | LED Setup3 | Tone Setup

Power Switch Setting

--- Power Switch Type: MFB Power ON/OFF (selected), Power ON Directly, MFB Power ON/OFF

Uart Setting

--- UART Command: Disable

--- UART Baudrate: 0x03: 115200

--- CPU Idle Mode: Enable

--- Wake Up Delay Time: 30 (0~254; 0: disable; unit:0.3125 ms)

--- Disable Wait for ACK: Disable

OTA DFU Setting

--- OTA DFU Key: 22222222222222222222222222222222 (16 Bytes)

--- OTA DFU service: Enable

Main Feature | Previous | Next | Finish

7. In the **Sys. Setup2** tab, the user can change the following as shown in the [Figure 6-7](#):

- Device name – add the device name in the text box available under “Name Frag Segment” section.
- Pairing mechanism – select Enable for the pairing mechanism available under “Simple Pairing” drop-down menu.

Figure 6-7. Options in Sys. Setup2 Tab

IS208x_Config_Default_Table.ini - Config_GUI_Tool

Button Setup | PMU Setup | CODEC Setup | iAP/SPP Setup | BLE Setup | MSPK Setup | DSP Feature Setup
Sys. Setup1 | **Sys. Setup2** | Sys. Setup3 | LED Setup1 | LED Setup2 | LED Setup3 | Tone Setup

Name Frag Segment

--- Name Fragment (64 Char)

Security

--- Simple Pairing

--- PIN Code (4 Char)

Misc Option

--- Enable Pairing as Standby Mode

--- Enter Pairing Mode When Power On

--- Suspend Stream When SCO Established

--- Class of Device

--- Report Battery Status to Smart Phone

--- Link Application

--- Always Answer Incoming Call

--- Auto Answer Incoming Call When Link Back

--- Hang Up a Call When Switch Off

Main Feature Previous Next Finish

8. In the **CODEC Setup** tab, select Internal codec from the “CODEC Output Type” drop-down menu.

Figure 6-8. Options in CODEC Setup Tab

IS208x_Config_Default_Table.ini - Config_GUI_Tool

Sys. Setup1 | Sys. Setup2 | Sys. Setup3 | LED Setup1 | LED Setup2 | LED Setup3 | Tone Setup | Button Setup | PMU Setup | **CODEC Setup** | iAP/SPP Setup | BLE Setup | MSPK Setup | DSP Feature Setup

CODEC Function

--- Speaker Output	Capless Speaker Output	Help
--- Enable LR Sound Channel Swap	L/R Normal	
--- Enable LR Sound Mix	Disable	
--- DSP CODEC Always On Enable	Disable	
--- Close CODEC Time	8 (1 - 254 unit : 0.64s)	
--- CODEC Output Type	External codec with I2S1	
--- Audio SRC	External codec with I2S1	
--- Voice SRC	Internal codec	
--- Tone Stereo	Enable	
--- Voice Stereo	Enable	

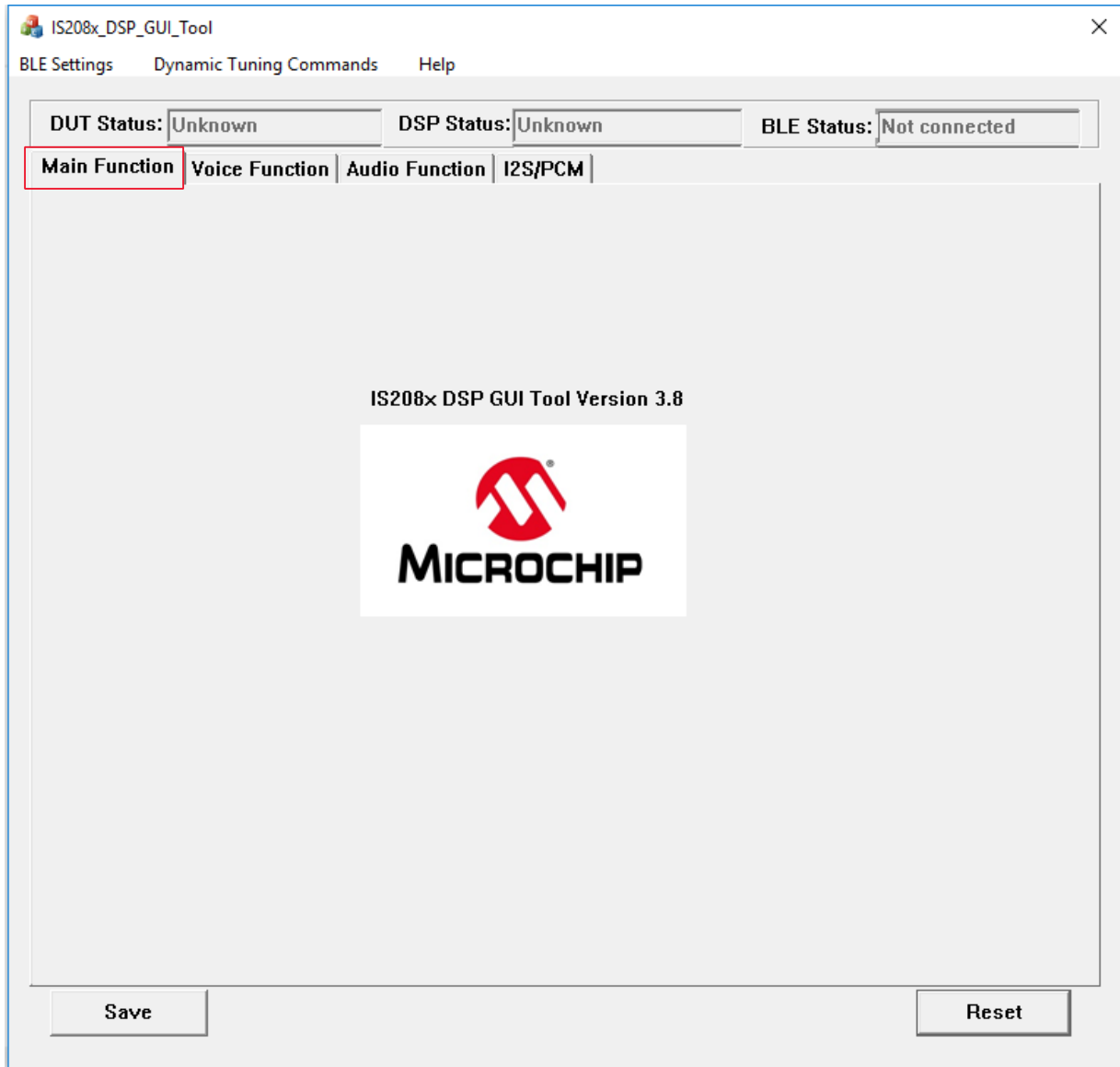
Line-In Setting

--- Line In Priority	Line In > SBC	Help
--- Line In Mute/Unmute	Disable	

Main Feature Previous Next Finish

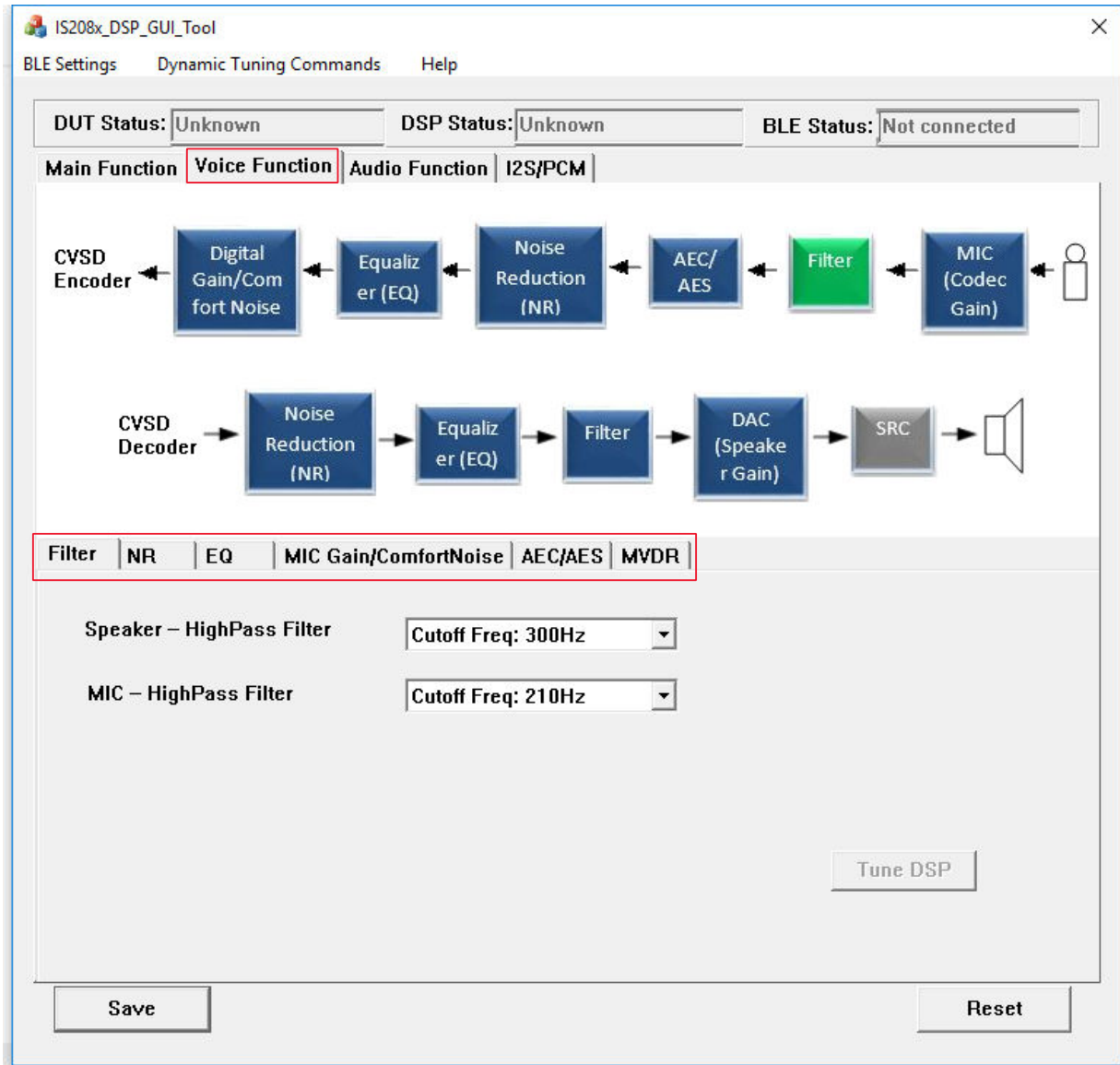
9. Click **Finish** after modifying these settings. IS208x_DSP_GUI_Tool window opens as shown in the following figure.

Figure 6-9. Main Function Tab



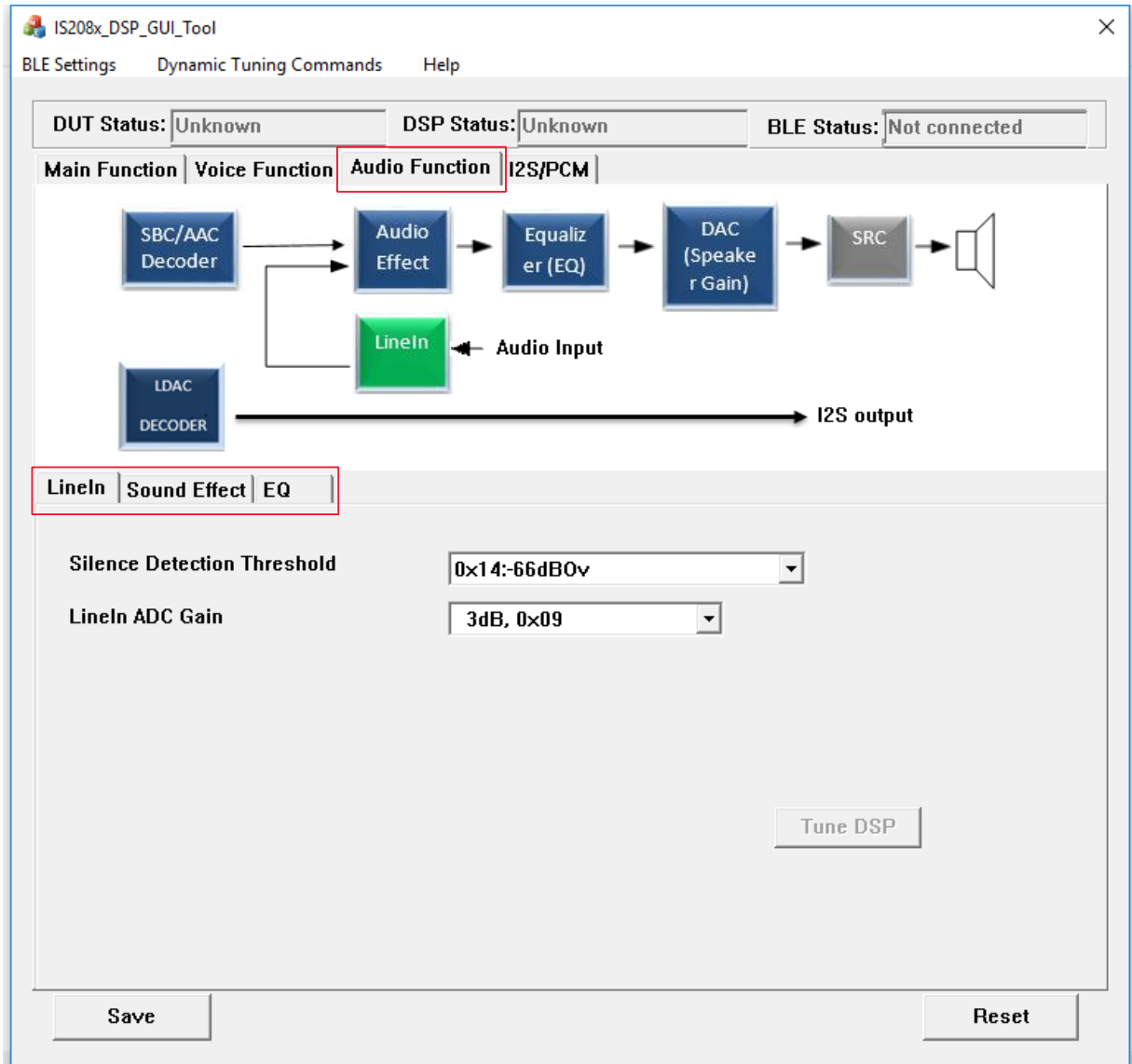
10. In the **Voice Function** tab, the user can set the required parameters as highlighted in the following figure.

Figure 6-10. Voice Function Tab



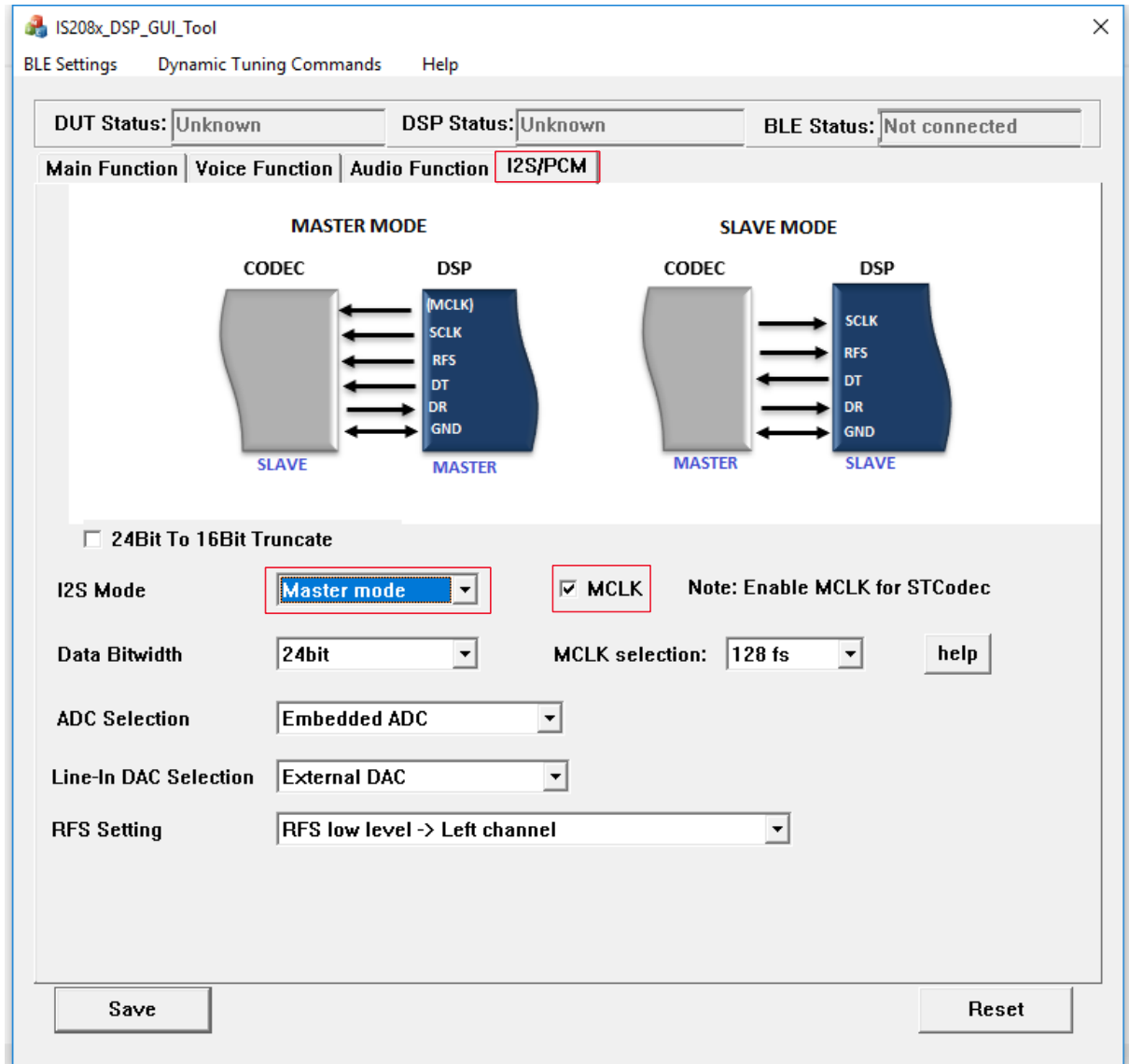
11. In the **Audio Function** tab, the user can set the required parameters as highlighted in the following figure.

Figure 6-11. Audio Function Tab



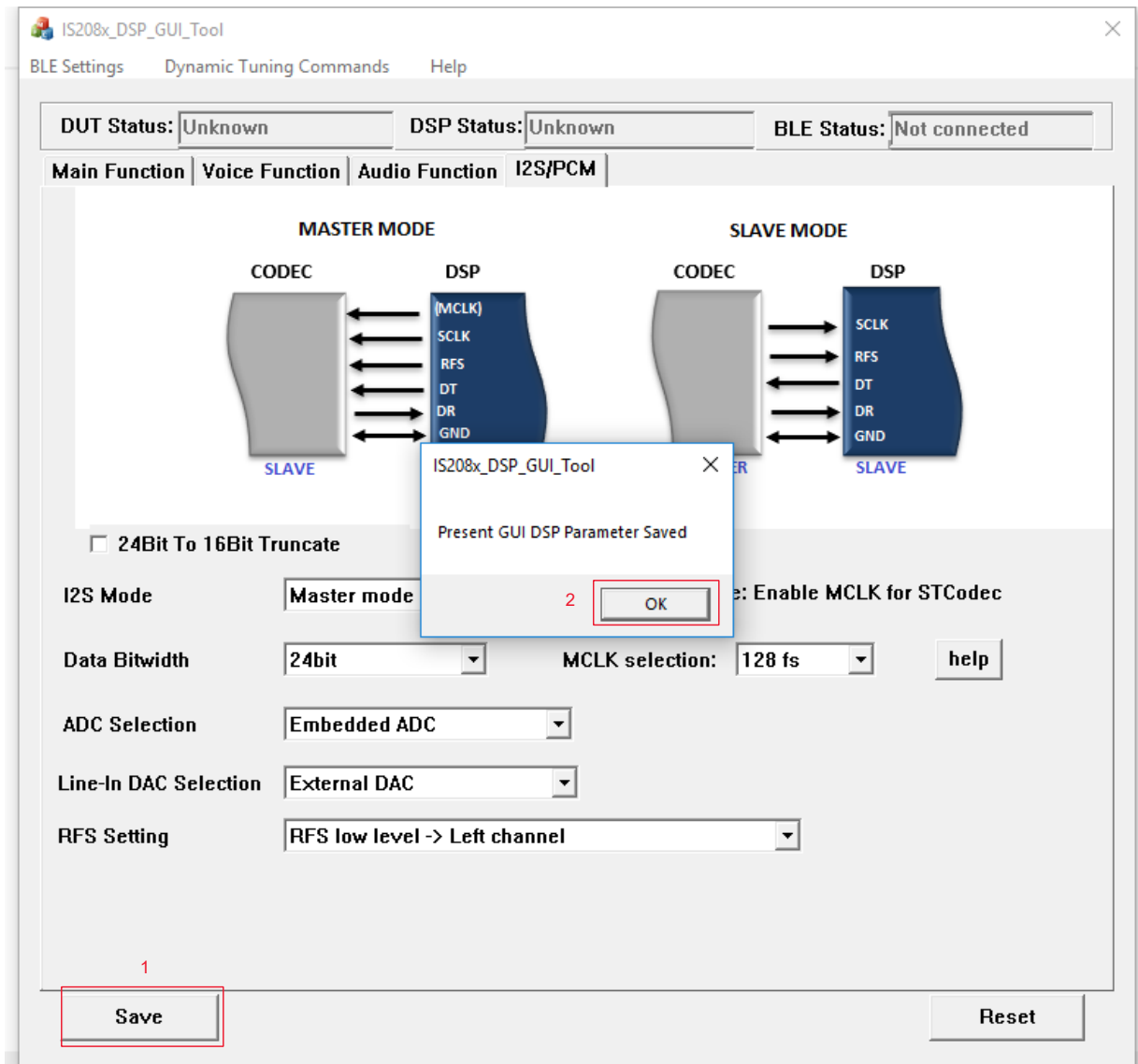
12. In the **I2S/PCM** tab, the user can set the required parameters as highlighted in the following figure.

Figure 6-12. I2S/PCM Tab



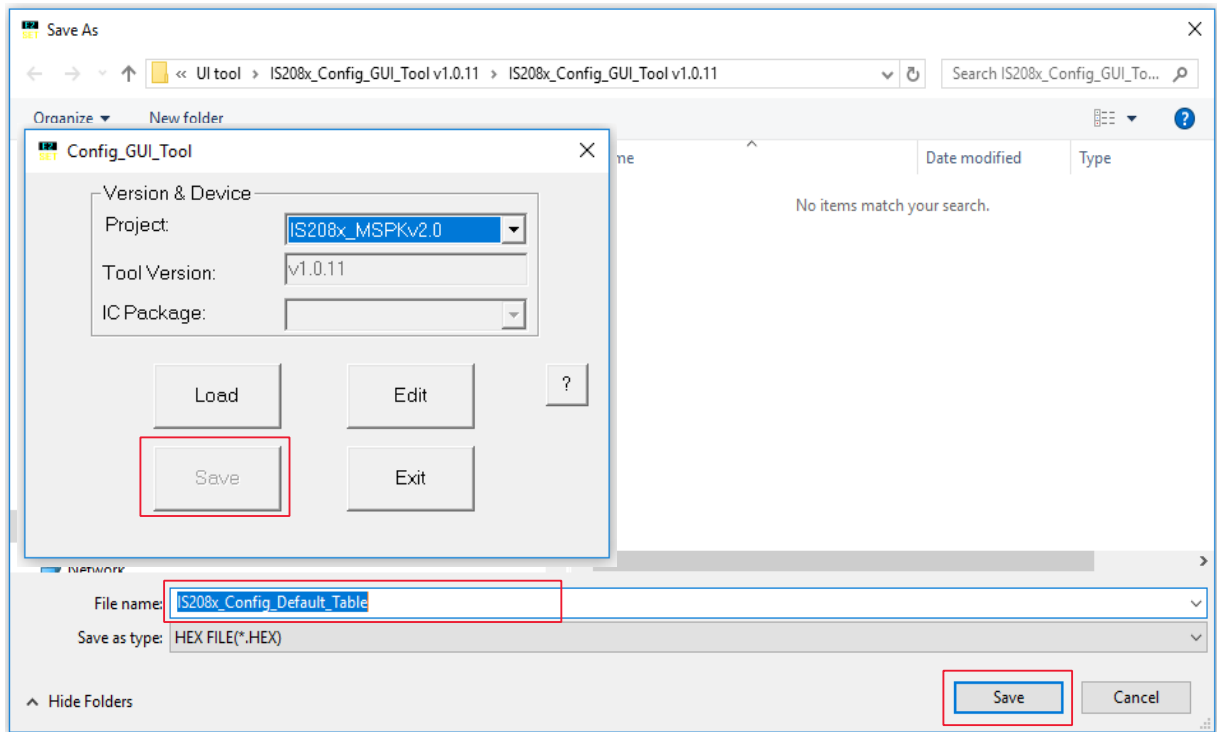
13. Click **Save** to save the changed parameters onto a file and click **OK** on the confirmation window (see the following figure).

Figure 6-13. Saving Parameters



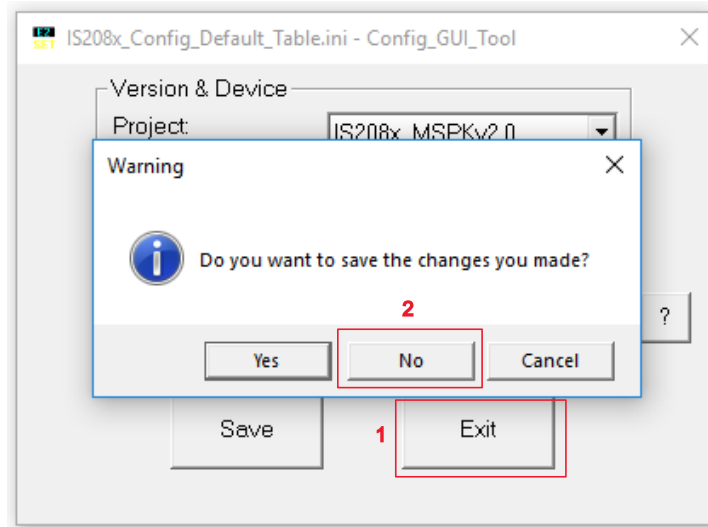
14. Click **Save** to save the file in .HEX format as shown in the following figure.

Figure 6-14. Save as a HEX File



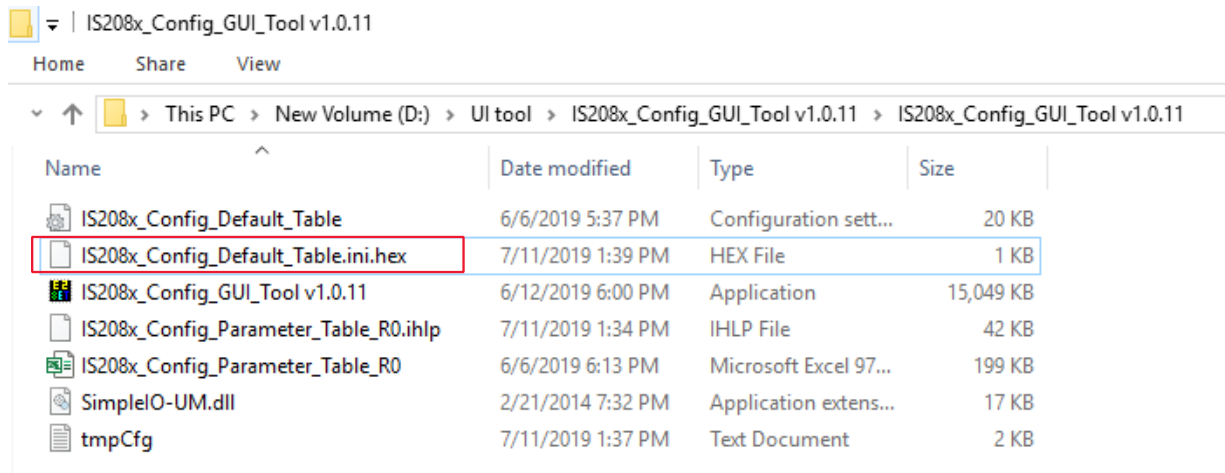
15. Click **Exit** followed by **No** as shown in the following figure.

Figure 6-15. Exiting the GUI Tool



After saving the file, the user can see an additional .hex file in the GUI tool folder as shown in the following figure.

Figure 6-16. Generated HEX File



Note: For Embedded mode with internal codec demo, refer to [14. Appendix H: Bluetooth Audio Demonstration in Embedded Mode with Internal Codec](#).

7. Appendix A: BM83 EVB Reference Schematics

Figure 7-1. USB Connector Schematic

USB CONNECTOR

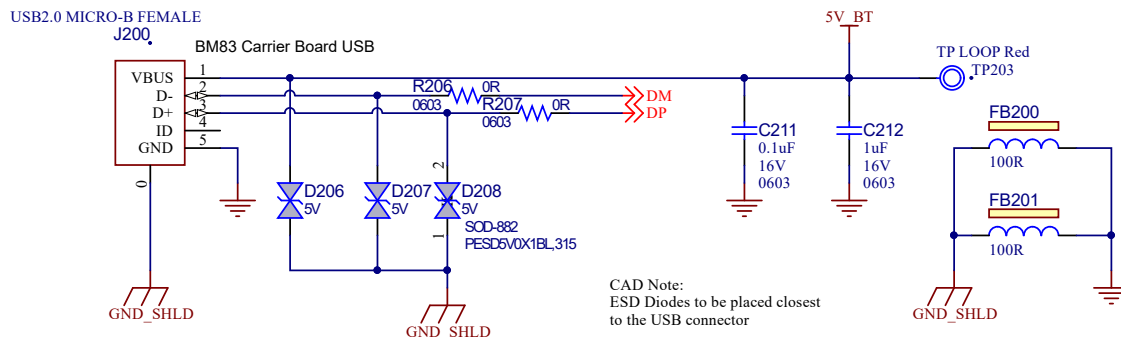


Figure 7-2. BM83 Module Interface (over BM83 Carrier Board)

MODULE INTERFACE

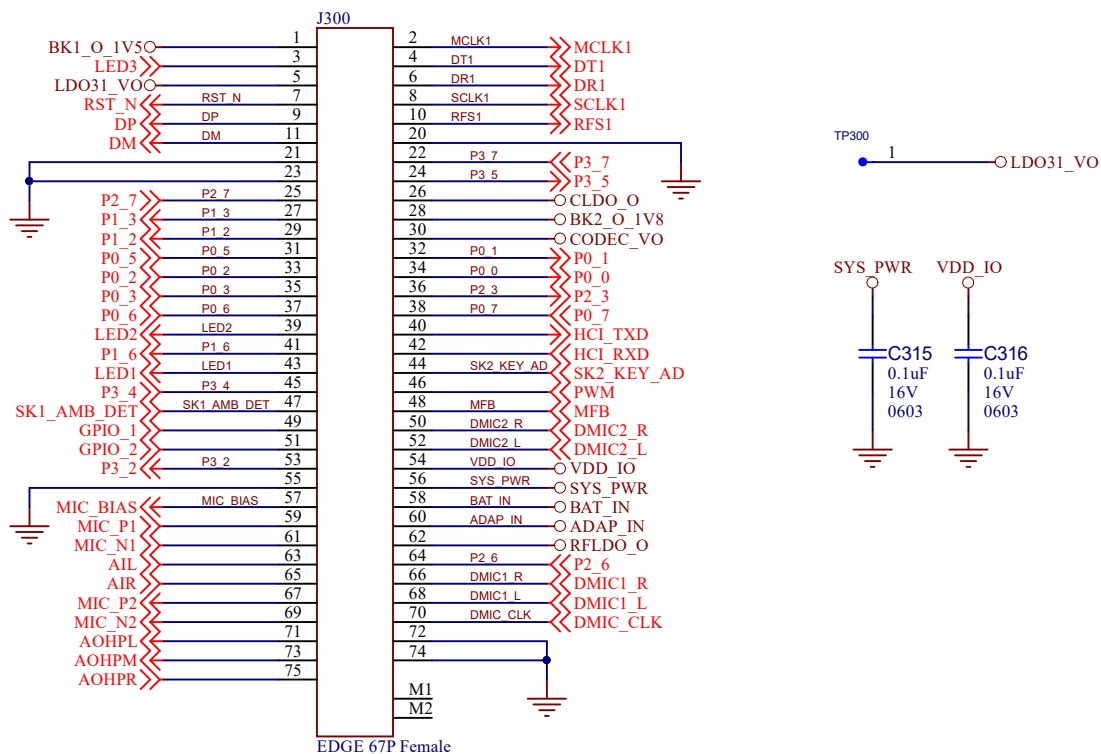


Figure 7-3. 5V Power Switch

5V POWER SWITCH

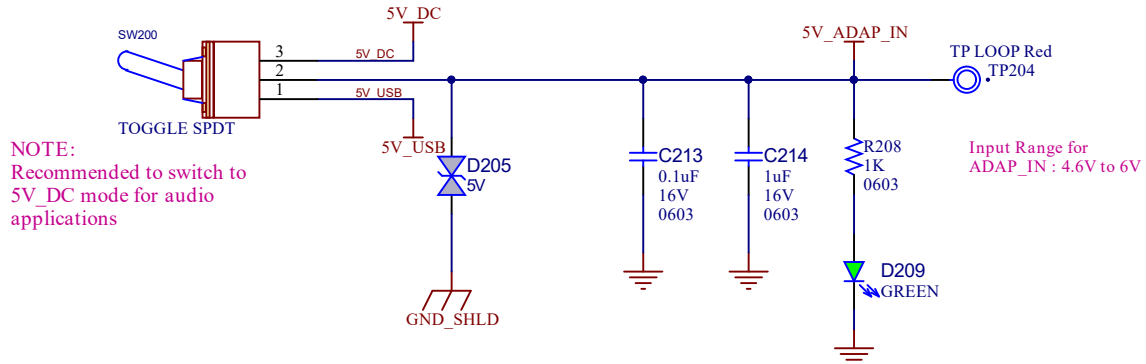


Figure 7-4. USB-UART Converter

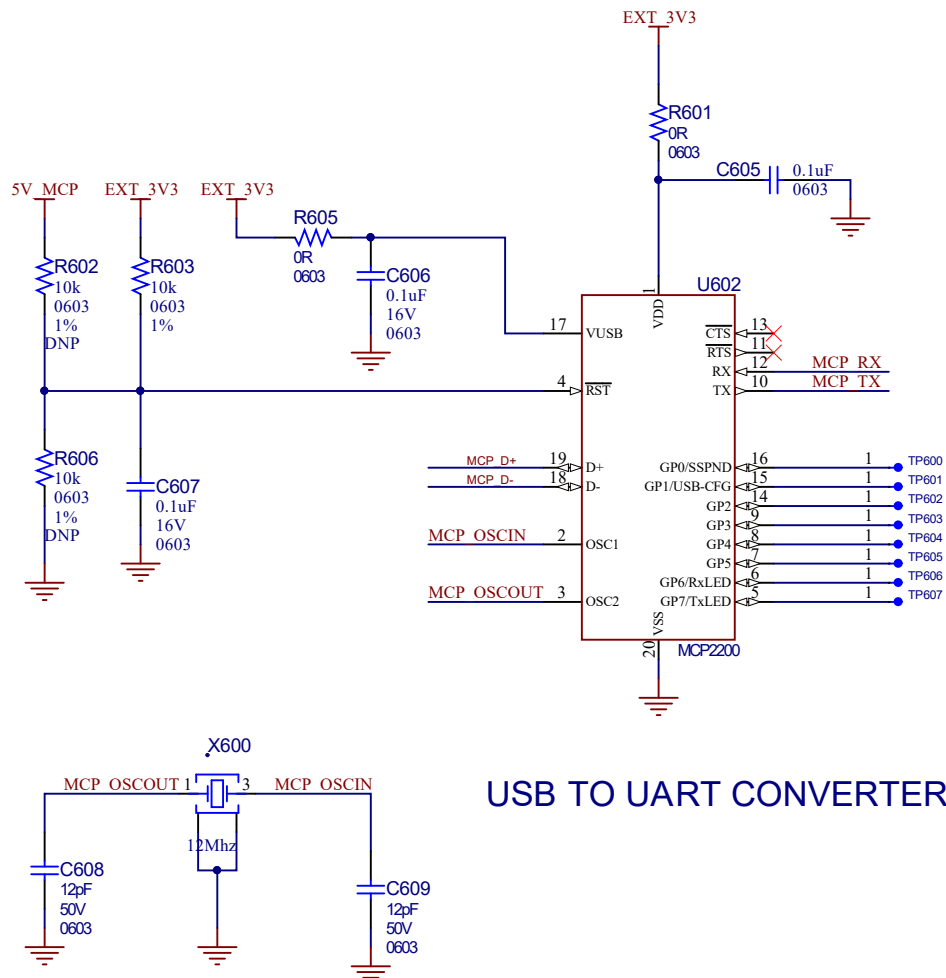


Figure 7-5. Reset IC

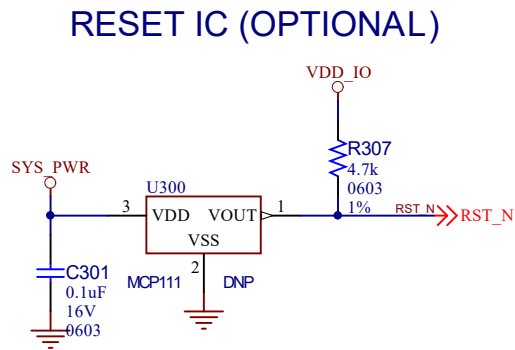


Figure 7-6. Reset

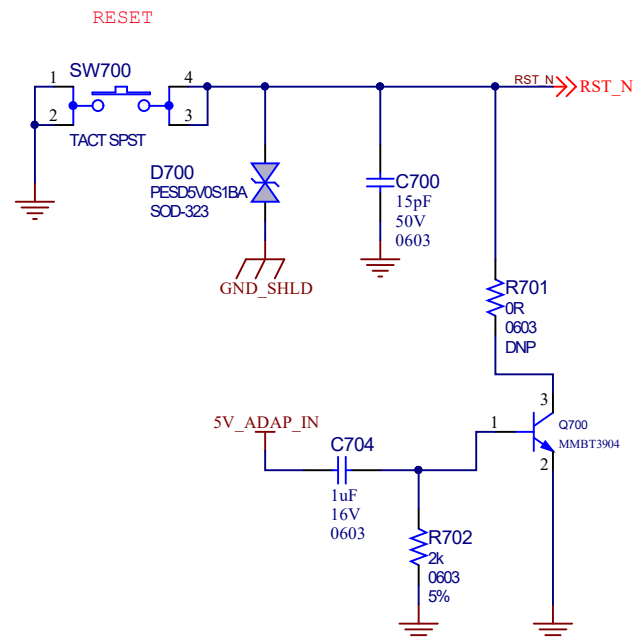


Figure 7-7. Push Button Interface

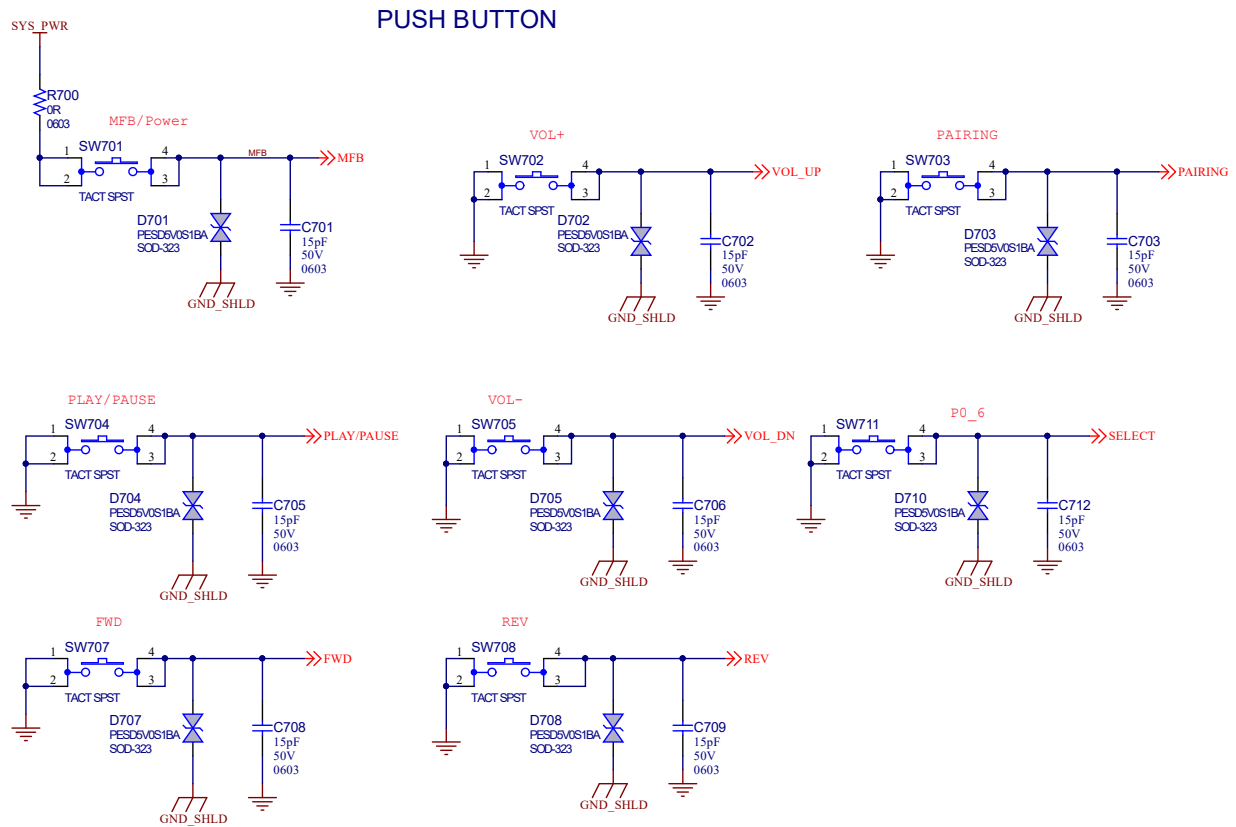


Figure 7-8. PIM Socket

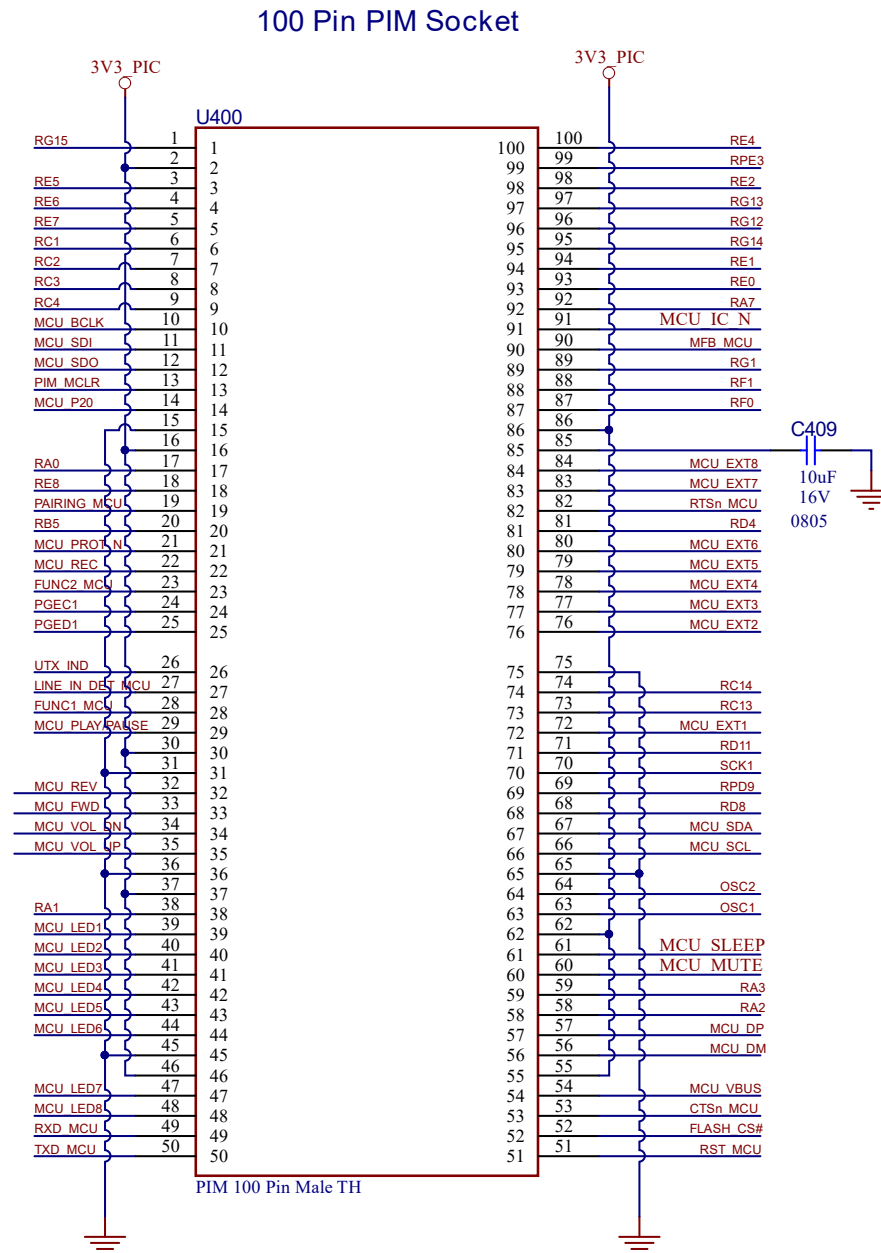


Figure 7-9. Microphone

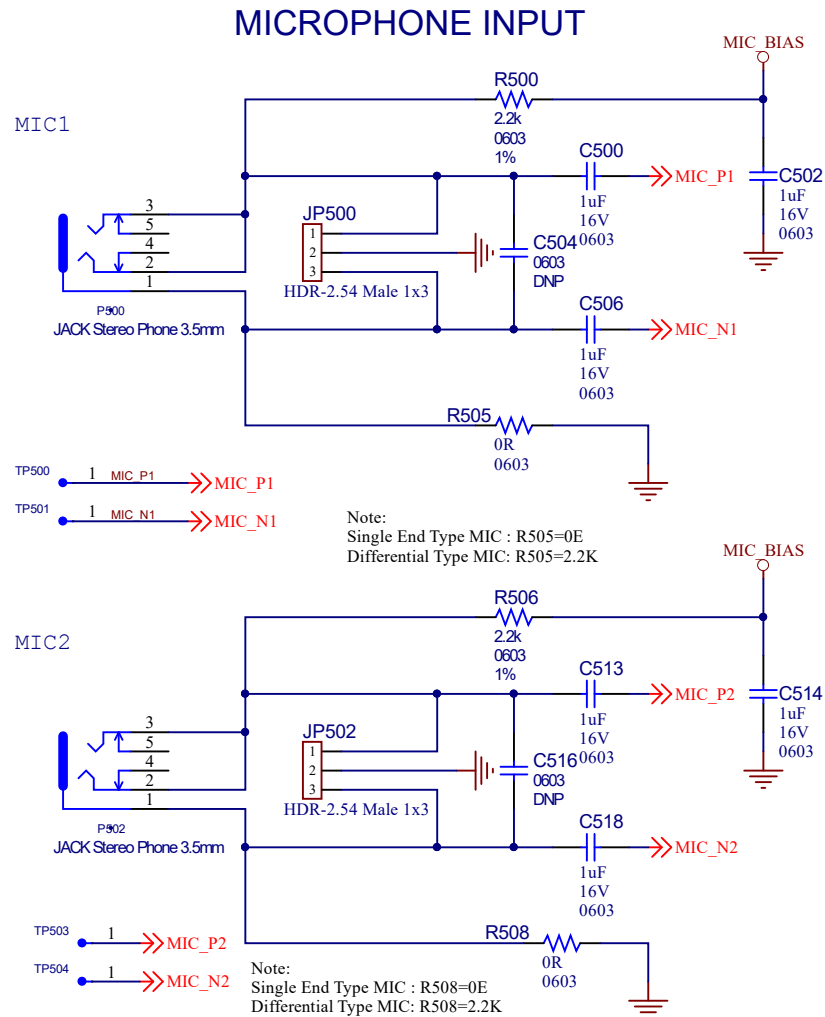


Figure 7-10. MCU to Bluetooth Switch

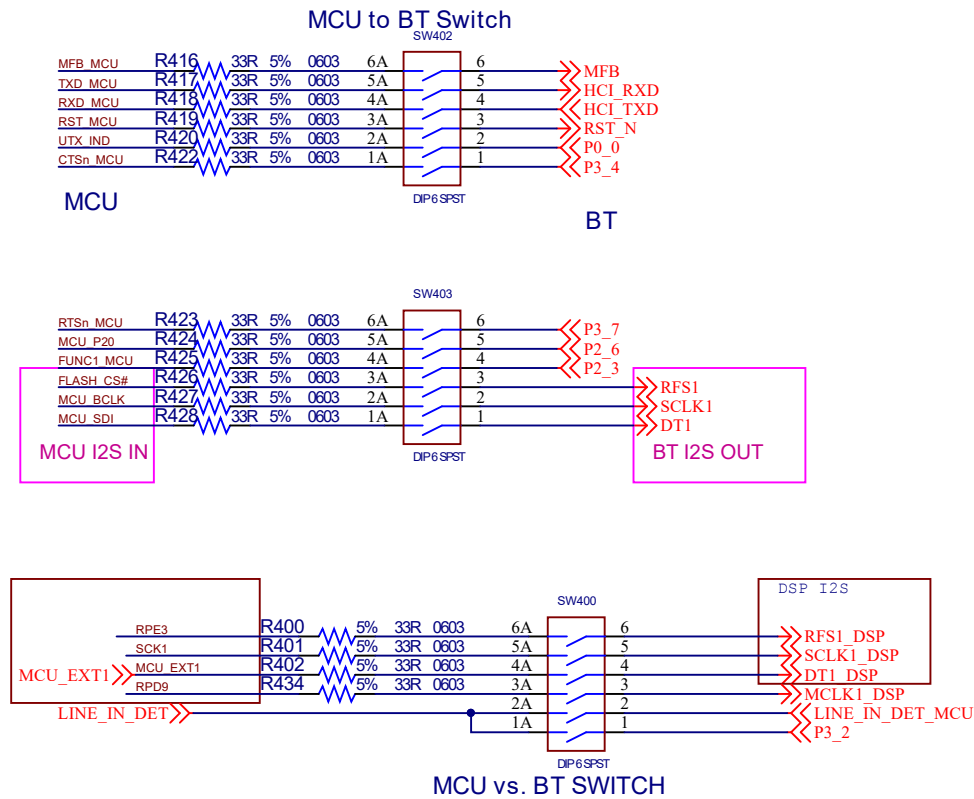


Figure 7-11. PIC32MX450F256L Pin Configuration

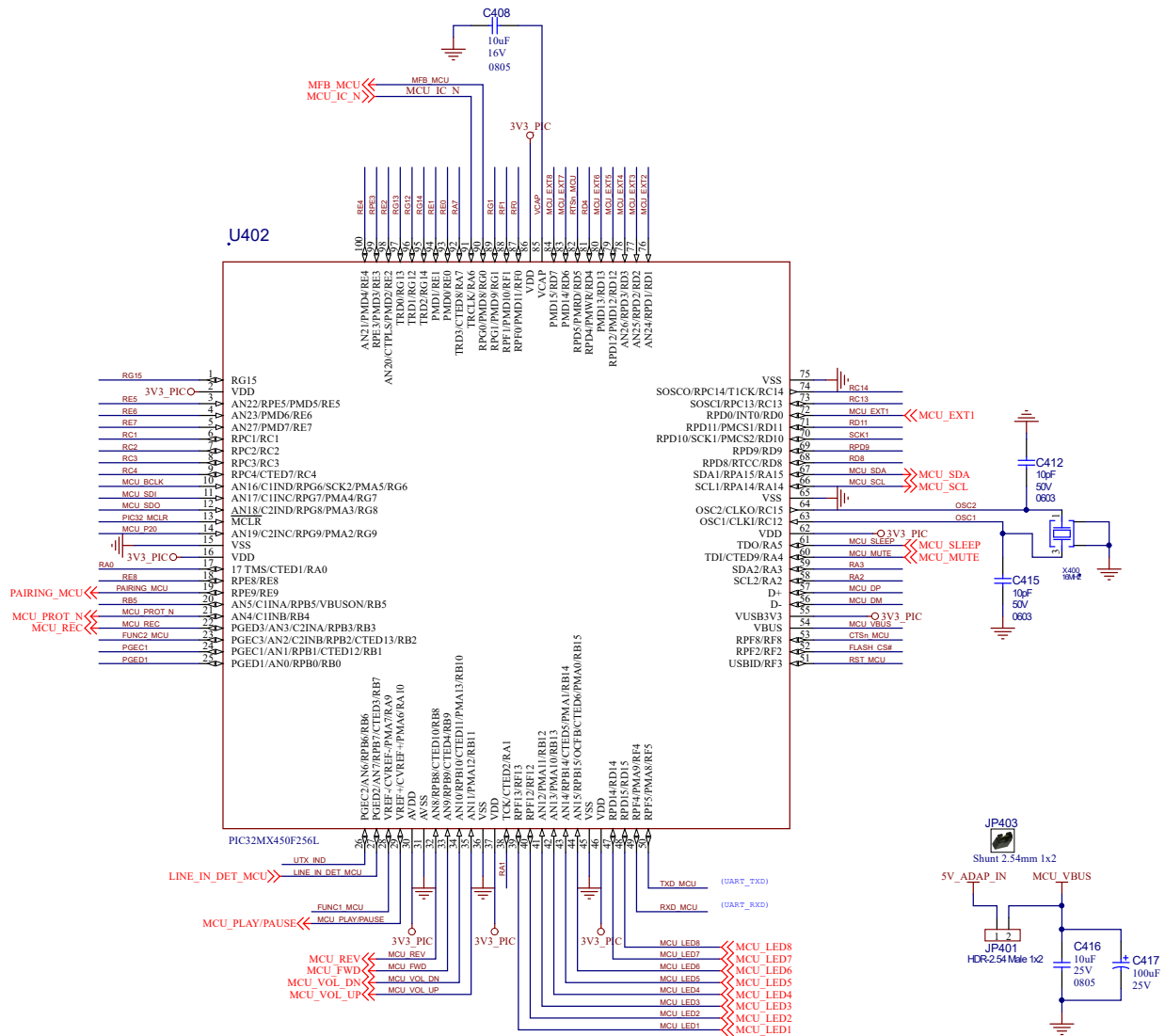
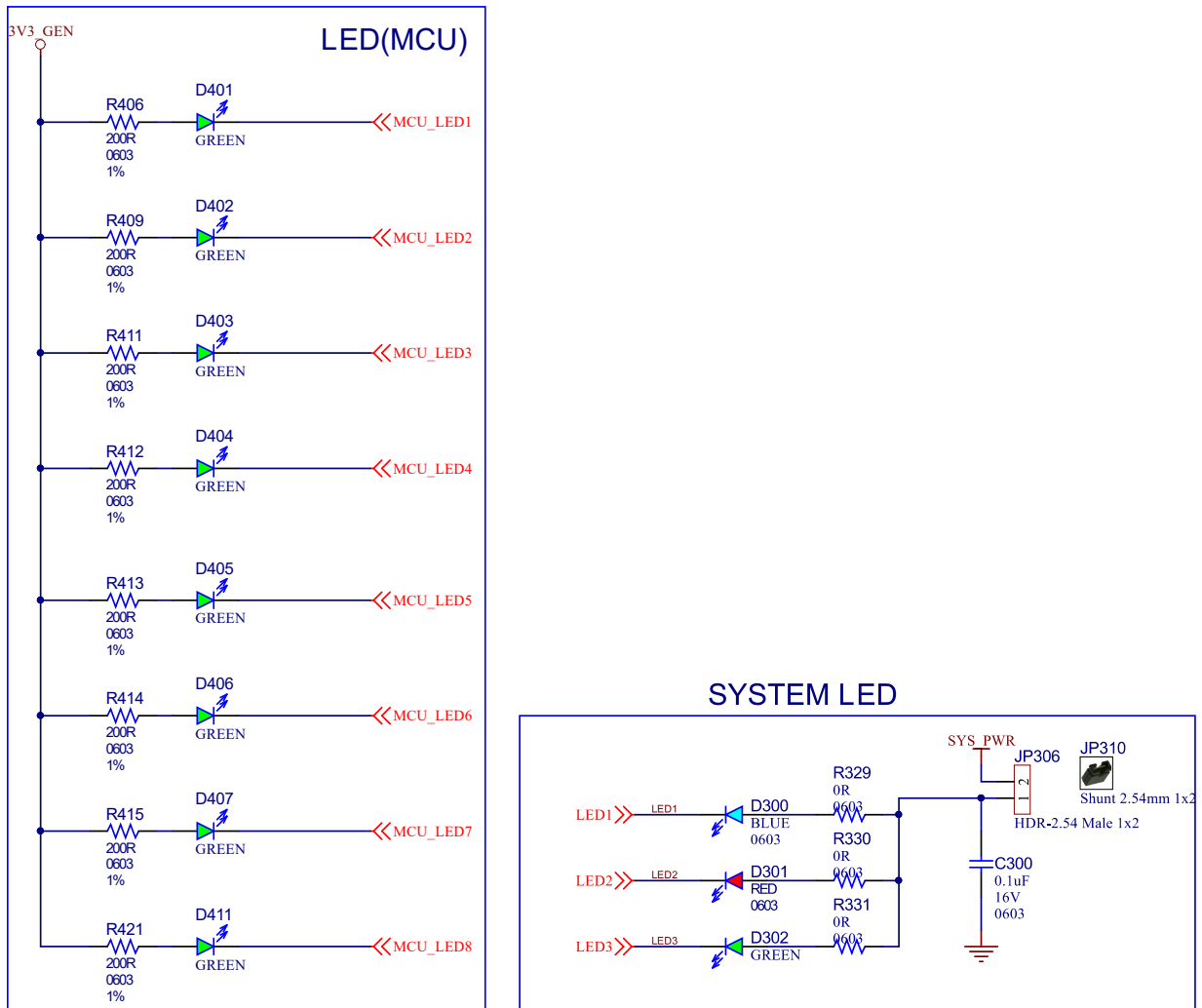


Figure 7-12. LED Interface



[illegible]

I2S HEADER

The diagram illustrates the I2S Header connections for two modules: BT (left) and DSP (right). Both modules are connected to an HDR-2.54 Male 1x7 header.

BT Module Connections:

- Pin 1: R429 (33R 5% 0603) to RFS1
- Pin 2: R430 (33R 5% 0603) to SCLK1
- Pin 3: R431 (33R 5% 0603) to DR1
- Pin 4: R432 (33R 5% 0603) to DT1
- Pin 5: R433 (33R 5% 0603) to MCLK1
- Pin 7: 3V3_IO

DSP Module Connections:

- Pin 1: RFS1_DSP
- Pin 2: SCLK1_DSP
- Pin 3: DR1_DSP
- Pin 4: DT1_DSP
- Pin 5: MCLK1_DSP
- Pin 7: 3V3_IO

Legend:

- Receive Frame Sync
- Serial clock
- Serial data receive
- Serial data transmit

Figure 7-15. I2C Interface

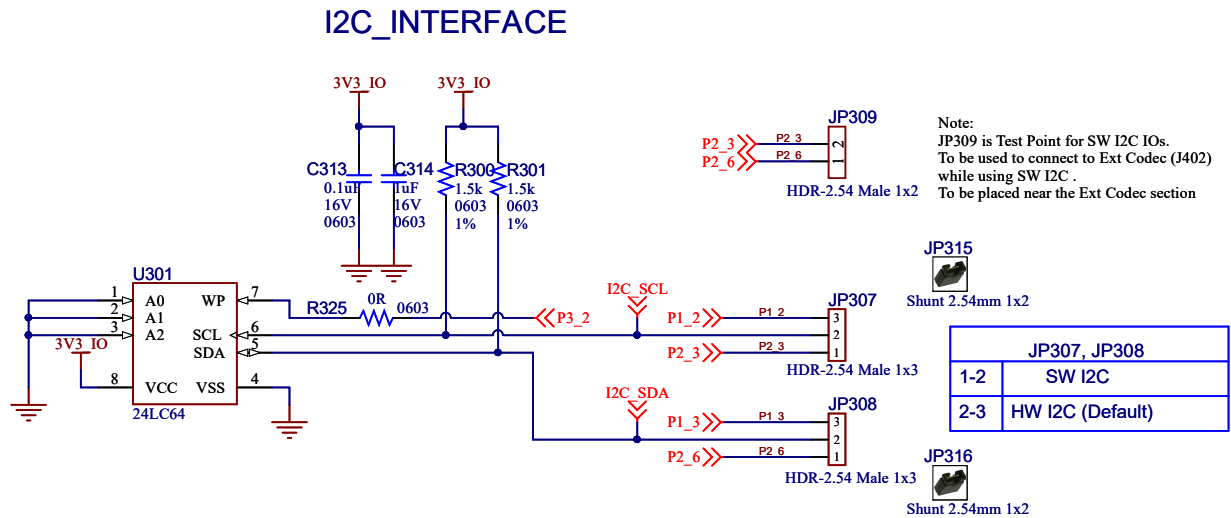


Figure 7-16. BT –DSP–MCU Interface

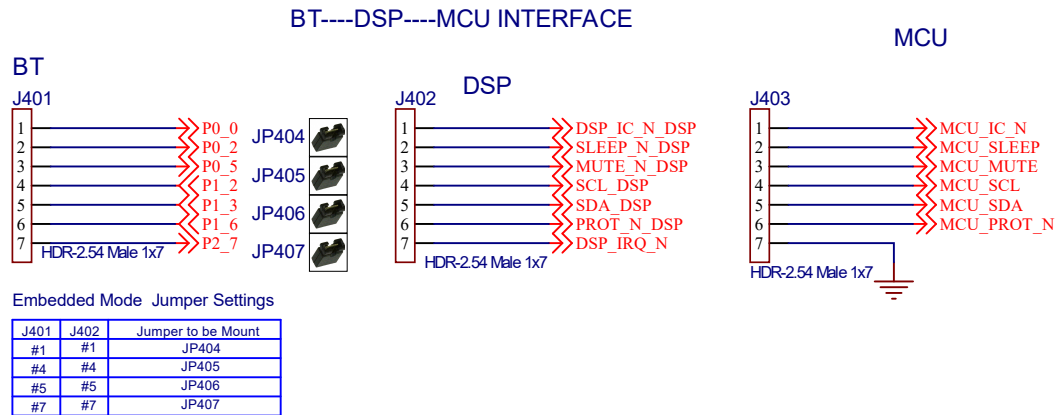


Figure 7-17. Digital MIC and Interface

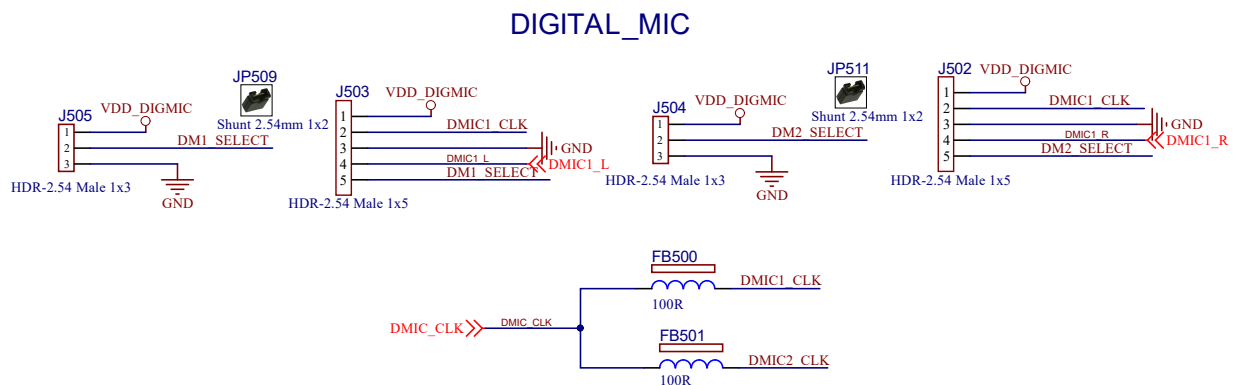


Figure 7-18. CPU JTAG Header

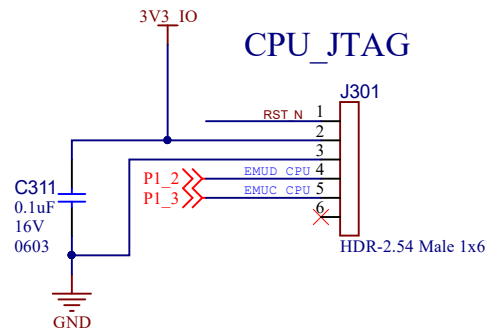


Figure 7-19. XPRO Header

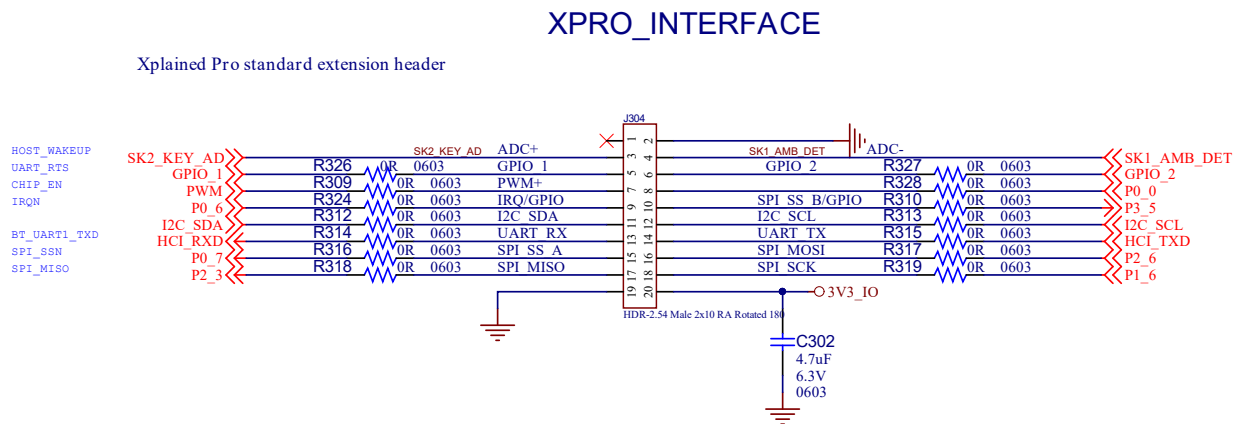


Figure 7-20. Button Control Jumper

BUTTON CO-USE JUMPER



J701<-->J702 Default Configuration
J701<-->J700 For MCU Button Control

CAD Note:
Place these 3 headers close to each other

Figure 7-21. Stereo AUX Line Input, Audio Headset Output, Audio Board Interface

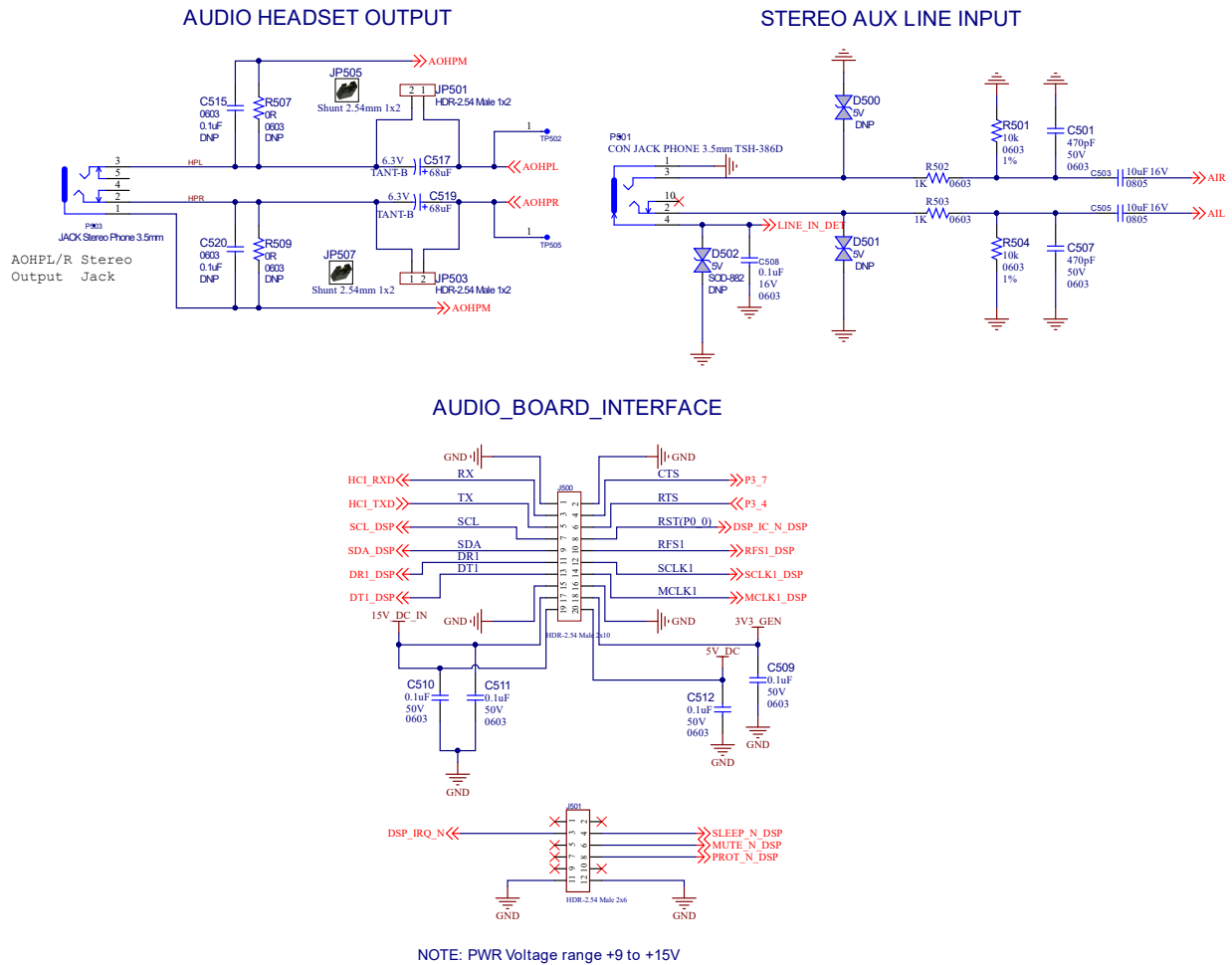


Figure 7-22. Temperature Sensor

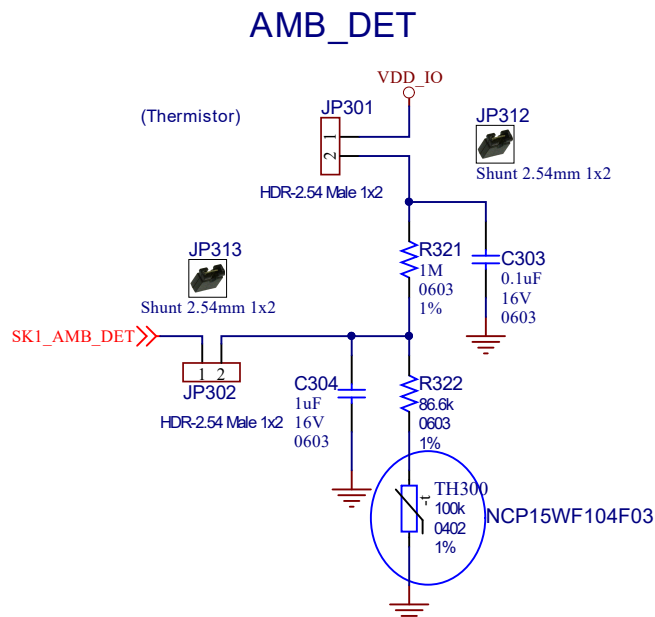
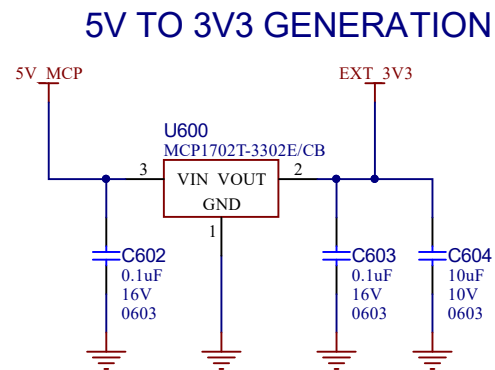


Figure 7-23. 5V to 3V3 Generation for USB-UART Section



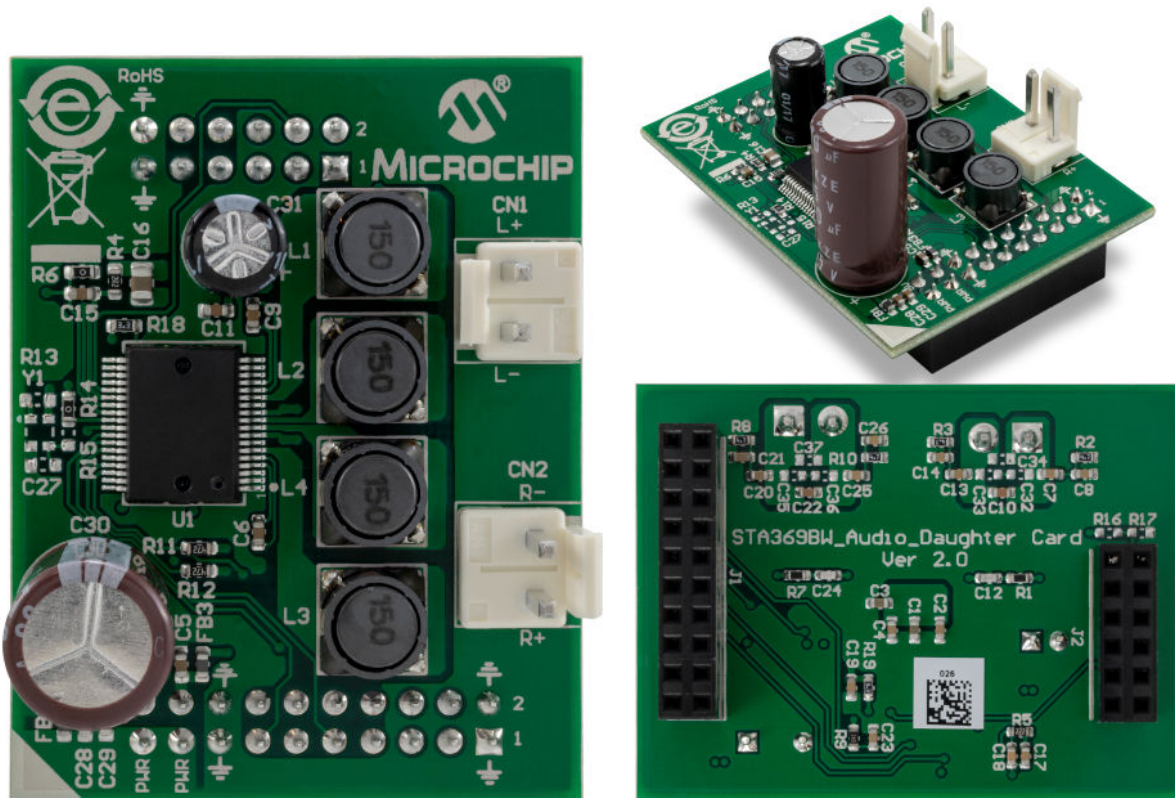
8. Appendix B: STA369BW Audio Daughter Board

The STA369BW Audio Daughter Board is a high-performance stereo codec board, which is suitable for adding audio input and output capabilities to the Bluetooth Audio development platforms.

The STA369BW Audio Daughter Board has the following components:

- STMicroelectronics codec (STA369BW)
- Female 20-pin dual-row header (J1)
- Female 12-pin dual-row header (J2)
- Audio out connectors (CN1 and CN2)

Figure 8-1. STA369BW Audio Daughter Board



The following table provides the pin description of Audio Daughter Board headers.

Table 8-1. 20-Pin Audio Daughter Board Header (J1) Pin Details

Pin Name	Pin Number		Pin Name
GND	1	2	GND
UART_RXD	3	4	UART_CTS
UART_TXD	5	6	UART_RTS
I2C_SCL	7	8	RST
I2C_SDA	9	10	I2S_RFS1
I2S_DR1	11	12	I2S_SCLK1
I2S_DT1	13	14	I2S_MCLK1

.....continued

Pin Name	Pin Number		Pin Name
GND	15	16	GND
PWR	17	18	3V3
PWR	19	20	5V

Table 8-2. 12-Pin Audio Daughter Board Header (J2) Pin Details

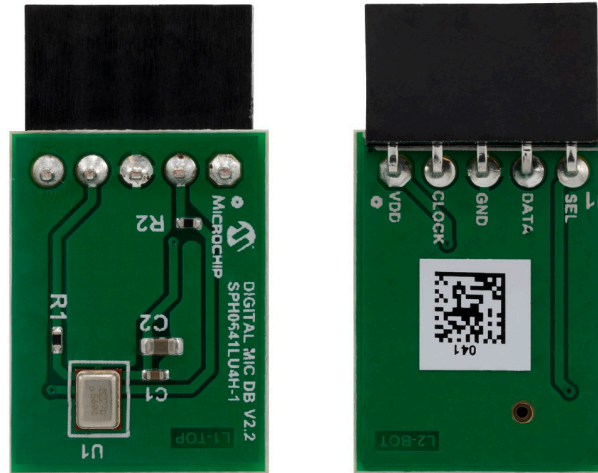
Pin Name	Pin Number		Pin Name
NC	1	2	3V3
DSP_IRQ_N	3	4	PWRDN
NC	5	6	MUTE_N
NC	7	8	INT
NC	9	10	NC
GND	11	12	GND

9. Appendix C: Digital Microphone Daughter Board

The Digital Microphone Daughter Board has the following components:

- On-board Knowles' Digital Microphone SPH0641LU4H-1
- Female 5-pin 1x5 header (J1) to interface to BM83 EVB (J503 and J502)

Figure 9-1. Digital Microphone Daughter Board - Top and Bottom View



The following table provides the pin description of the Digital Microphone header.

Table 9-1. Digital Microphone Headers (J1, J503, and J502) Pin Description

Pin Number	Digital Microphone Daughter Board	BM83 EVB		Pin Description
	Pin Name (J1)	Pin Name (J503)	Pin Name (J502)	
1	VDD	VDD DIGMIC	VDD DIGMIC	Power supply from BM83 EVB
2	CLOCK	DMIC1_CLK	DMIC1_CLK	Clock input to the microphone from BM83 module
3	GND	GND	GND	Ground
4	DATA	DMIC1_L	DMIC1_R	PDM output from the microphone to BM83 module
5	SEL	DM1 SELECT	DM2 SELECT	Select input for microphone

Note:

1. BM83 module supports 1 stereo Digital Microphone (left and right) terminated at J503 and J502 headers respectively.
2. The VDD power supply for Digital Microphone operation is provided over J509 header on the BM83 EVB.
3. The Select pin should not be left floating and should be connected to high or low. This is achieved by 3-pin headers J505 and J504 on BM83 EVB.
4. For more details on using Digital Microphone with the BM83, refer to *IS208x Config UI Tool User's Guide*.

10. Appendix D: J-Link 6-Pin Adapter Board

J-Link 6-Pin Adapter Board is designed to connect to its targets through a 20-pin cable, provided with the J-Link. However, BM83 EVB uses a 6-pin connector supporting 2-wire JTAG.

Figure 10-1. J-Link 6-Pin Adapter Board



The following table provides the pin description of J-Link 6-Pin Adapter Board.

Table 10-1. J-Link 6-Pin Adapter Board Pin Description

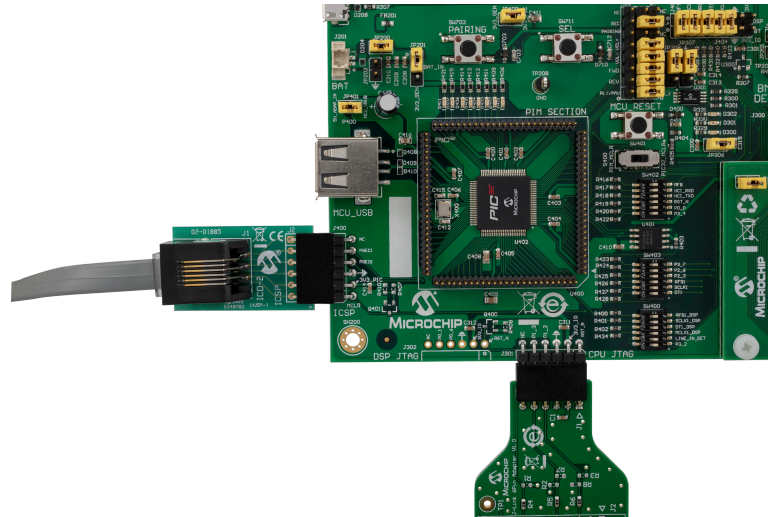
Pin Number	Pin Name on J-Link Adapter Board	Pin Name on BM83 EVB	Pin Description
1	Reset_n	Reset_n	Reset
2	3V3	3V3_IO	Power supply from BM83 EVB
3	GND	GND	Ground
4	TDI	P1_2	CPU-2 Wire Debug Data
5	TCK	P1_3	CPU-2 Wire Debug Clock
6	NC	NC	NC

11. Appendix E: Updating PIC32 MCU Parameters

Perform the following steps to load the .Hex file to the MCU:

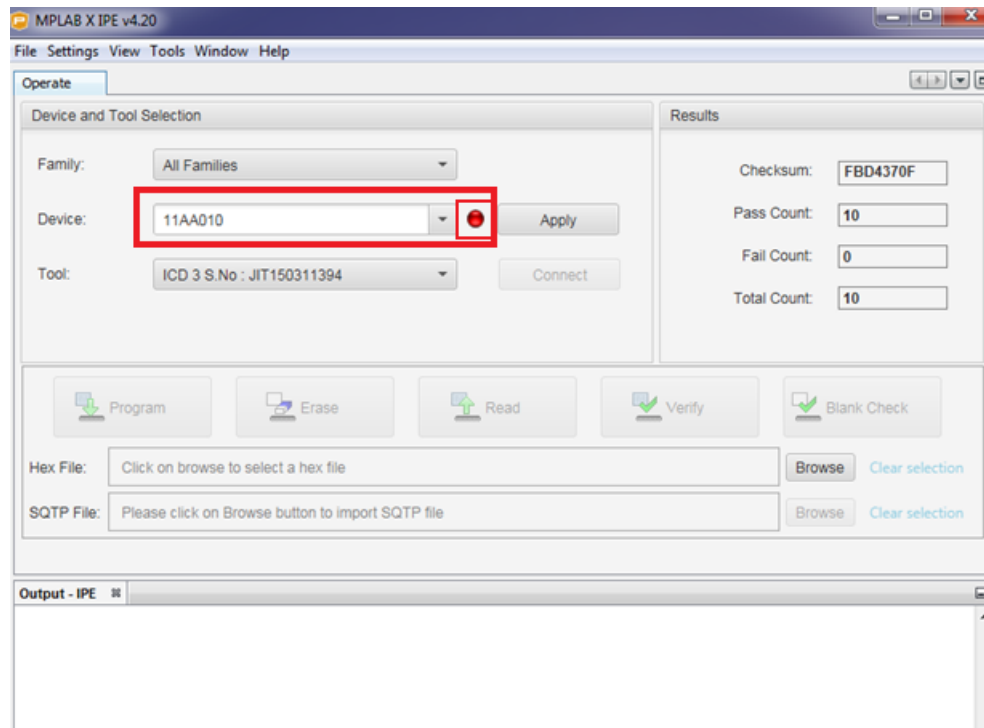
1. Set SW200 switch to 5V_DC position.
2. Plug the 15V DC power adapter into the P200 jack for supplying power to the host MCU.
3. Connect the MPLAB ICD 3 to ICSP header J400 and PC.

Figure 11-1. ICD 3 Interface at the ICSP Header



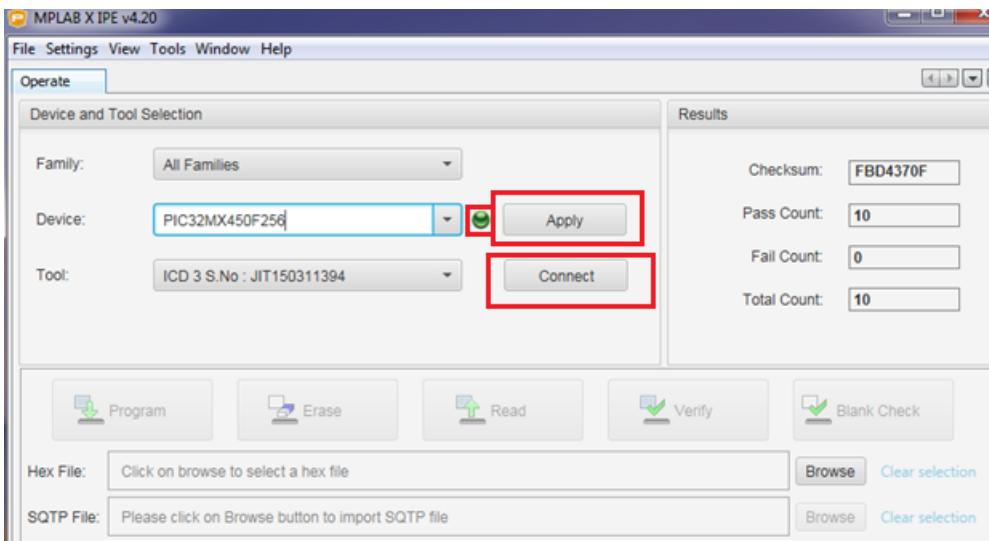
4. Ensure that jumpers on JP400 and JP401 are mounted.
Note: Download and install the latest version of MPLAB X IDE tool, which is available at www.microchip.com/mplab/mplab-x-ide.
5. Open the MPLAB X IDE tool.
6. Under the Device drop-down menu, select the MCU (PIC32MX450F256L) that is present on the BM83 EVB. The red dot indicates that the selected device does not match.

Figure 11-2. MPLAB X IPE Window



7. Successful device connection is indicated by a green dot. Click **Apply** followed by **Connect**.

Figure 11-3. Search for On-board Microcontroller



8. After the connection is established, click **Browse** and locate the MCU firmware file from the software folder. Then click **Program** as shown in the following figure.

Figure 11-4. Connect and Program

Family: All Families

Device: PIC32MX450F256L

Tool: ICD 3 S.No : J1T150311394

Checksum: FBD4370F

Pass Count: 10

Fail Count: 0

Total Count: 10

Program Erase Read Verify Blank Check

Hex File: Click on browse to select a hex file

SQTP File: Please click on Browse button to import SQTP file

Output - IPE

Connecting to MPLAB ICD 3...

Currently loaded firmware on ICD 3

Firmware Suite Version.....01.51.07 *

Firmware type.....PIC32MX

Switching to firmware suite 01.51.12

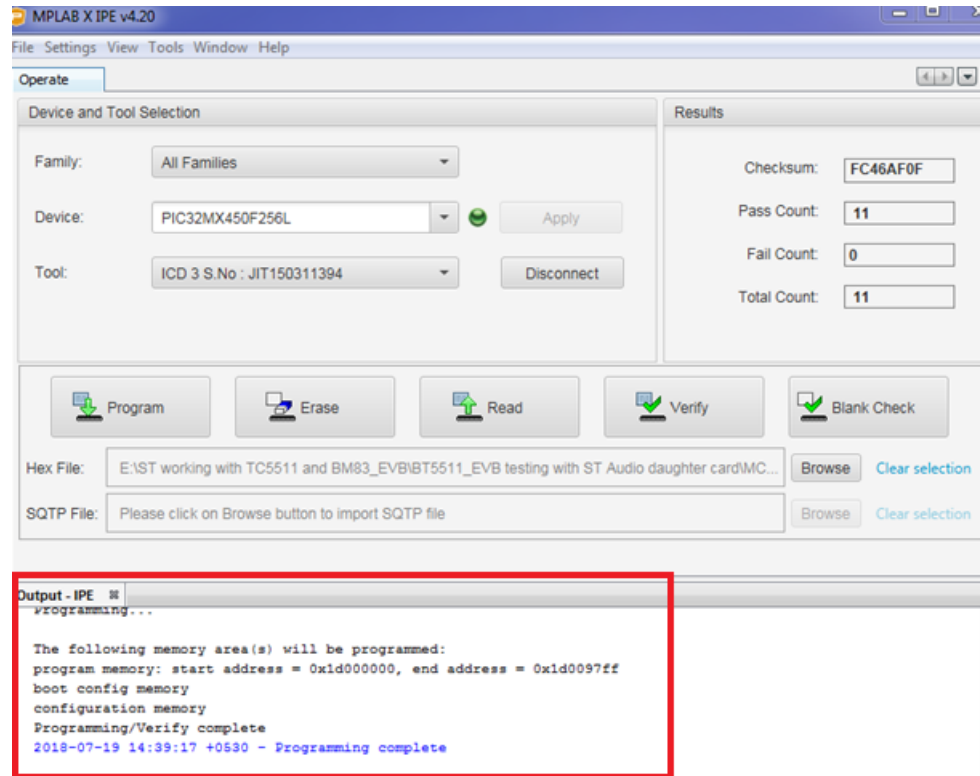
Target voltage detected

Target device PIC32MX450F256L found.

Device ID Revision = A1

9. After the programming is complete, observe the Output – IPE window on the console.
Note: MCU firmware version V1.4.1 is used for the demonstration.

Figure 11-5. Verify the Log



10. Remove the 15V adapter.

12. Appendix F: Hardware Setup for Application Demo in Host MCU Mode

Note: The host MCU (on-board PIC32 MCU) is connected to the BM83 module over UART. The host MCU is controlling the BM83 module and driving the I2S audio out from the BM83 to an STA369BW Audio Daughter Board.

Perform the following hardware changes for the Host MCU mode application demo:

Note: To locate these switches, jumpers, and headers on the BM83 EVB, refer to [Figure 2-1](#) and [Figure 3-2](#).

1. Mount a jumper on the pin2 (3V3_IO) and pin3 (VDDIO) of JP305.
2. Set the SW200 switch to 5V_DC position to enable the 5V supply to ADAP_IN.
3. Mount a jumper on the 3V3_GEN pin and 3V3_PIC pin of the JP400 to enable 3.3V to PIC.
4. Jumper settings on J402 and J403 to enable BM83 module to control DSP (audio codec):
 - 4.1. Mount a jumper on pin1 of J402 and J403.
 - 4.2. Mount a jumper on pin2 of J402 and J403.
 - 4.3. Mount a jumper on pin3 of J402 and J403.
 - 4.4. Mount a jumper on pin4 of J402 and J403.
 - 4.5. Mount a jumper on pin5 of J402 and J403.
 - 4.6. Mount a jumper on pin6 of J402 and J403.
 - 4.7. Open pin7 of J402 and J403.
5. Jumper settings on J700 and J701 to enable BM83 module to control the audio control buttons:
 - 5.1. Mount a jumper on pin1 of J700 and J701.
 - 5.2. Mount a jumper on pin2 of J700 and J701.
 - 5.3. Mount a jumper on pin3 of J700 and J701.
 - 5.4. Mount a jumper on pin4 of J700 and J701.
 - 5.5. Mount a jumper on pin5 of J700 and J701.
 - 5.6. Mount a jumper on pin6 of J700 and J701.
 - 5.7. Mount a jumper on pin6 of J700 and J701.
 - 5.8. Open pin8 of J700 and J701.
6. Mount a jumper on pin2 and pin3 of JP201.
7. Set SW400 switches as follows:
 - 7.1. RFS1_DSP to OFF position.
 - 7.2. SCLK1 to OFF position.
 - 7.3. DT1_DSP to OFF position.
 - 7.4. MCLK1_DSP to OFF position.
 - 7.5. LINE_IN_DET to ON position.
 - 7.6. P3_2 to OFF position.
8. Set SW402 switches as follows:
 - 8.1. MFB to OFF position.
 - 8.2. HCI_RXD to ON position.
 - 8.3. HCI_TXD to ON position.
 - 8.4. RST_N to OFF position.
 - 8.5. P0_0 to ON position.
 - 8.6. P3_4 to ON position.
9. Set SW403 switches as follows:
 - 9.1. P3_7 to ON position.
 - 9.2. P2_6 to OFF position.
 - 9.3. P2_3 to OFF position.
 - 9.4. RFS1 to OFF position.
 - 9.5. SCLK1 to OFF position.
 - 9.6. DT1 to OFF position.
10. Jumper settings on J404 and J405 to connect BM83 module and STA369BW codec (ST) over I2S interface:

- 10.1. Mount a jumper on pin1 of J404 and J405.
- 10.2. Mount a jumper on pin2 of J404 and J405.
- 10.3. Mount a jumper on pin3 of J404 and J405.
- 10.4. Mount a jumper on pin4 of J404 and J405.
- 10.5. Mount a jumper on pin5 of J404 and J405.
- 10.6. Open pin6 of J404 and J405.
- 10.7. Open pin7 of J404 and J405.
11. Put the S400 switch to PIC32_MCLR position.
12. Put the SW300 switch to OFF position.

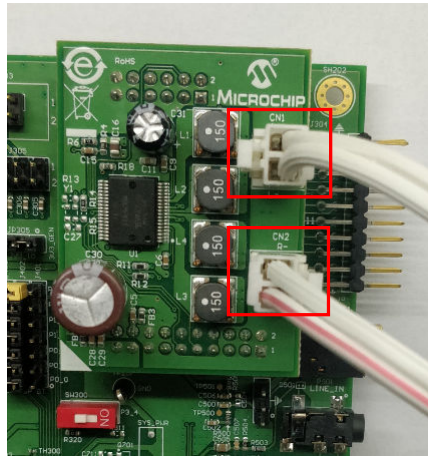
Note: In order to perform the following demo, the user must flash the Host mode firmware into the BM83 module as well as PIC32 MCU, as illustrated in the preceding sections.

12.1 Host MCU Mode Quick Demo

Perform the following steps to stream audio using the BM83 module in Host MCU mode.

1. Connect the speakers to the STA369BW Audio Daughter Board at CN1 and CN2.

Figure 12-1. Speakers Connected to the STA369BW Audio Daughter Board



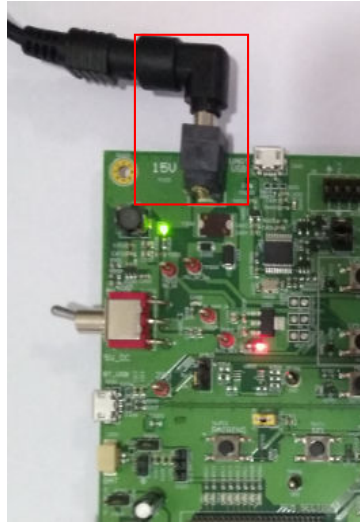
2. The SW200 switch is set to 5V_USB position as shown in the following figure.

Figure 12-2. SW200 Switch Position



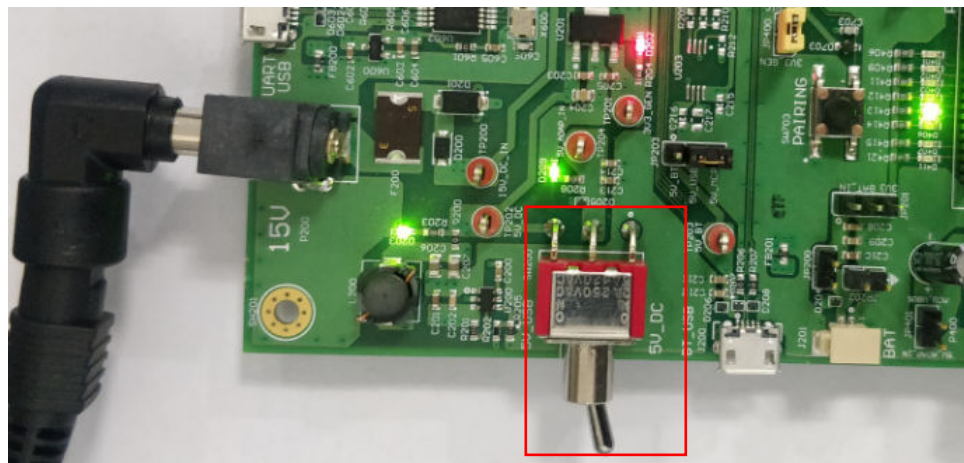
3. Connect the 15V DC adapter at DC power jack P200. Notice that the green LED (D203) and red LED (D202) turn ON as shown in the following figure.

Figure 12-3. 15V DC Adapter Plugged In



4. Change the SW200 switch to 5V_DC position. Notice that the green LEDs (D209 and D405) turn ON, as shown in the following figure.

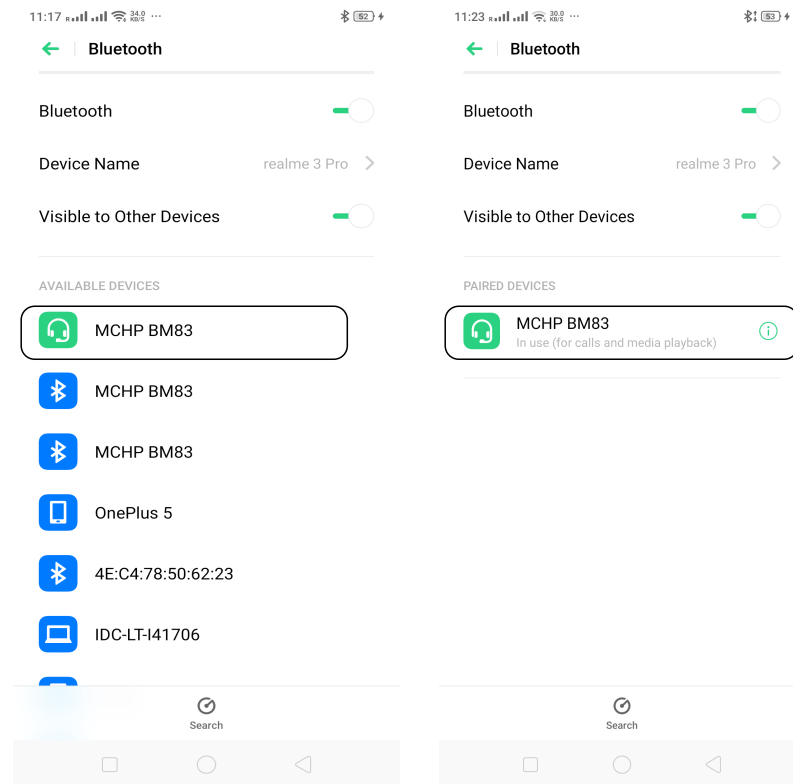
Figure 12-4. LED Indication as SW200 is Turned to 5V_DC position



5. Long press **SEL** button (SW711) to turn on the system. Observe the sound on the speakers and the following LED behavior:
 - Green LED (D401) turns ON
 - Blue (D300) and green (D402) LEDs blink
6. Long press **SEL** button (SW711) to make the BM83 module discoverable to other devices. Observe the sound on the speakers and the alternate blinking of red LED (D301) and blue LED (D300).
7. Follow the steps to pair the BM83 module with a smartphone:
 - 7.1. Turn on the smartphone's Bluetooth to scan for the available devices.
 - 7.2. Select the module device name "BM83" from the scan results. Pair and then connect the device.
 - 7.3. On successful pairing, see the device name with status as **Connected**.

Note: This demonstration uses the EA1 demo version of the firmware.

Figure 12-5. Pairing and Connection



- 7.4. Stream the audio from the smartphone to the BM83 over Bluetooth connection, and listen to it over the speakers.
8. Control the audio with the following buttons:
 - 8.1. Press **VOL_UP** button(SW702) to increase the volume.
 - 8.2. Press **VOL_DN** button (SW705) to reduce the volume.
 - 8.3. Press **Pause** button (SW704) to pause the audio.
 - 8.4. Press **Play** button (SW704) to play the audio.
 - 8.5. Press **FWD** button (SW707) to jump to next audio file.
 - 8.6. Press **REV** button (SW708) to jump to previous audio file.
 - 8.7. Press **SEL** button (SW711) to turn OFF the system.

13. Appendix G: Hardware Setup for Application Demo in Embedded Mode

Note: In this mode of operation, the BM83 module is driving the I2S audio out to the STA369BW Audio Daughter Board. The BM83 module is connected to the external codec over I2S and I2C.

Perform the following hardware changes for the Embedded mode application demo.

Note: To locate these switches, jumpers, and headers on the BM83 EVB, refer to [Figure 2-1](#) and [Figure 3-2](#).

1. Mount a jumper on the 3V3_IO pin and VDDIO pins of the JP305 pin 2 and pin3.
2. Put the SW200 switch to 5V_DC position to enable the 5V supply to ADAP_IN.
3. Jumper settings on J401 and J402 enable BM83 module to control the STA369BW Audio Daughter Board:
 - 3.1. Mount a jumper on pin1 of J401 and J402.
 - 3.2. Open pin2 of J401 and J402.
 - 3.3. Open pin3 of J401 and J402.
 - 3.4. Mount a jumper on pin4 of J401 and J402.
 - 3.5. Mount a jumper on pin5 of J401 and J402.
 - 3.6. Open pin6 of J401 and J402.
 - 3.7. Mount a jumper on pin7 of J401 and J402.
4. Jumper settings on J701 and J702 to enable BM83 module to control the audio control buttons:
 - 4.1. Mount a jumper on pin1 of J701 and J702.
 - 4.2. Mount a jumper on pin2 of J701 and J702.
 - 4.3. Mount a jumper on pin3 of J701 and J702.
 - 4.4. Mount a jumper on pin4 of J701 and J702.
 - 4.5. Mount a jumper on pin5 of J701 and J702.
 - 4.6. Open pin6 of J701 and J702.
 - 4.7. Mount a jumper on pin7 of J701 and J702.
 - 4.8. Open pin8 of J701 and J702.
5. Mount jumper on the JP201 pin2 and pin3.
6. Set SW400 switches as follows:
 - 6.1. RFS1_DSP to OFF position.
 - 6.2. SCLK1 to OFF position.
 - 6.3. DT1_DSP to OFF position.
 - 6.4. MCLK1_DSP to OFF position.
 - 6.5. LINE_IN_DET to OFF position.
 - 6.6. P3_2 to ON position.
7. Set SW402 switches as follows:
 - 7.1. MFB to OFF position.
 - 7.2. HCI_RXD to OFF position.
 - 7.3. HCI_TXD to OFF position.
 - 7.4. RST_N to OFF position.
 - 7.5. P0_0 to OFF position.
 - 7.6. P3_4 to OFF position.
8. Set SW403 switches as follows:
 - 8.1. P3_7 to OFF position.
 - 8.2. P2_6 to OFF position.
 - 8.3. P2_3 to OFF position.
 - 8.4. RFS1 to OFF position.
 - 8.5. SCLK1 to OFF position.
 - 8.6. DT1 to OFF position.

9. Jumper settings on J404 and J405 to connect BM83 module I2S with STA369BW Audio Daughter Board I2S:
 - 9.1. Mount a jumper on pin1 of J404 and J405.
 - 9.2. Mount a jumper on pin2 of J404 and J405.
 - 9.3. Mount a jumper on pin3 of J404 and J405.
 - 9.4. Mount a jumper on pin4 of J404 and J405.
 - 9.5. Mount a jumper on pin5 of J404 and J405.
 - 9.6. Open pin6 of J404 and J405.
 - 9.7. Open pin7 of J404 and J405.
10. Put the SW300 switch to OFF position.
11. By default, the board is configured with hardware (HW) I2C settings. For more details on the software (SW) I2C settings, refer to *I2C Interface* section in the *IS2083 SDK User's Guide* ([DS50002894](#)).
12. Mount a jumper on pin2 and pin3 of the JP203.

With the above settings, the user can plug in the 15V DC adapter and perform the application demo in Embedded mode with the appropriate firmware image. This firmware image for the Embedded mode is available at www.microchip.com/BM83.

14. Appendix H: Bluetooth Audio Demonstration in Embedded Mode with Internal Codec

Note:

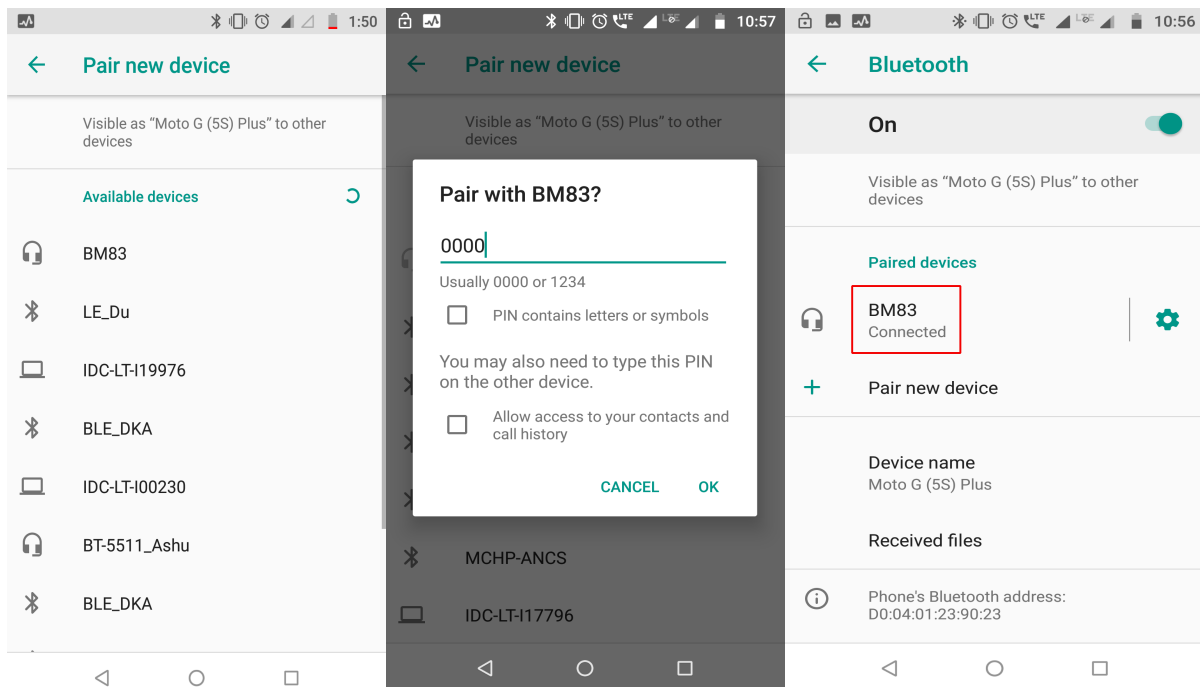
1. In this mode of operation, the BM83 module uses internal codec to drive the audio.
2. Do not connect 15V adapter at DC power jack P200.
3. Use the internal codec config file for this demo, for more details, refer to [6.1 Config Tool Setup](#).

In this demonstration, the user can stream audio on the BM83 EVB using a smartphone. Perform the following hardware settings on the BM83 EVB for Embedded mode with internal codec audio demo after updating the firmware:

1. Turn OFF the SW300 switch.
2. Mount a jumper at 5V_ADAP_IN and ADAP_IN of JP304.
3. Ensure to mount JP501 and JP503 (stereo out). Connect headphones or a speaker at stereo jack P503.
4. Set the SW200 switch to 5V_USB.
5. Plug the USB cable at J600. Observe that the Red LED (D600) and the Green LED (D209) turn ON.
Note: Red LED (D300) and Blue LED (D301) do not glow in this case.
6. Long press **MFB** button (SW701) to turn ON the system and keep pressing the **MFB** button to enter into Pairing mode. Once the system is turned ON, the Red LED (D301) and the Blue LED (D300) blink alternately to indicate that the device has entered into Pairing mode.
7. The following steps help in pairing between BM83 module and a smartphone:
 - 7.1. Turn ON the smartphone's Bluetooth to scan for the discoverable devices.
 - 7.2. Select the module device name "BM83" from the scan results.
 - 7.3. Enter 0000 as passcode to pair the smartphone with the BM83 module. The passcode is not required if simple pairing is enabled in the Config Tool.

The smartphone displays "Connected" upon successful pairing as highlighted in the following figure. The audio can be listened over the headphones.

Figure 14-1. Pairing BM83 with Smartphone



15. Document Revision History

Revision	Date	Section	Description
A	07/2019	Document	Initial Revision

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