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# **BM20 Bluetooth® Evaluation Board User's Guide**

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**Abbreviations List:**

**HFP:** Hands-free Profile

**AVRCP:** Audio Video Remote Control Profile

**A2DP:** Advanced Audio Distribution Profile

**HSP:** Headset Profile

**NFC:** Near Field Communication

## 1 OVERVIEW

### 1.1 INTRODUCTION

This user's guide describes the hardware and software setup for the BM20 Bluetooth® Evaluation Board.

This board contains the hardware needed to evaluate the BM20 Bluetooth module. The BM20 module is mounted to an evaluation board that demonstrates the module's key features. The evaluation board contains:

- Stereo audio output
- Easy access to IO pins
- 6 push buttons to control audio playback
- Status LEDs
- The BM20 supports the following Bluetooth profiles: A2DP, AVRCP, and HFP/HSP
- A2DP stereo audio (Sink mode with support for Sub-Band Coding (SBC)),
- AVRCP media player remote control
- HFP/HSP for accepting a phone call support.

For data sheet and other details related to BM20 module, refer to the Microchip web site at <http://www.microchip.com>.

This chapter discusses the following topics:

- [BM20 Evaluation Board Features](#)
- [BM20 Evaluation Board Contents and Part Details](#)

### 1.2 BM20 EVALUATION BOARD FEATURES

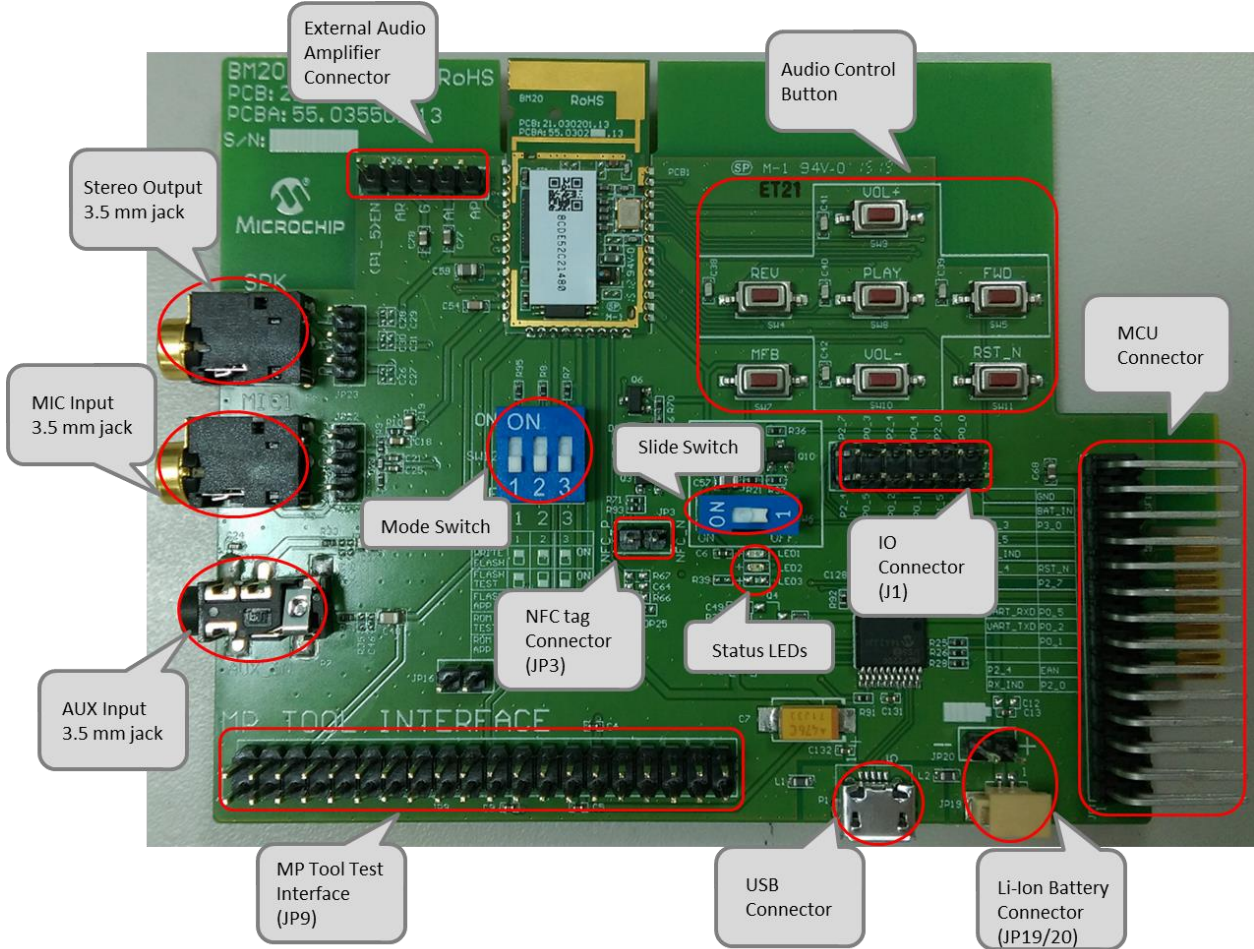
The BM20 Evaluation Board has the following features:

- Fully qualified Bluetooth version 4.1 module, fully compatible with Bluetooth version 3.0, 2.0, 1.2 system.
- Embedded BM20 module with postage-stamp size form factor of 15 x 29 x 2.5 mm (include shielding case)
- Embedded Bluetooth stack profiles: A2DP, AVRCP, and HFP/HSP
- Stereo audio output for highest quality audio
- Castellated SMT pads for easy and reliable PCB mounting
- Environmentally friendly, RoHS compliant
- Bluetooth SIG certified

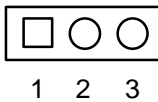
## 1.3 BM20 EVALUATION BOARD CONTENTS

BM20 Evaluation Board contains the following components as shown in [Figure 1-1](#) which describes the evaluation board's interfaces and connectors. [Table 1-1](#) describes the various components of the evaluation board.

FIGURE 1-1: BM20 EVALUATION BOARD

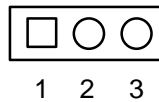


Audio Output (JP23)



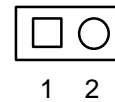
Pin	Description
1	AOHPL
2	AOHPM
3	AOHPR

MIC (JP22)



Pin	Description
1	MIC_P1
2	AGND
3	MIC_N1

NFC tag connector (JP3)

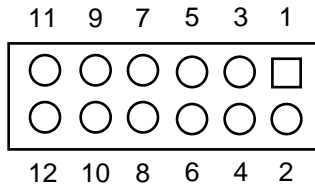


Pin	Description
1	NFC_P
2	NFC_N

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

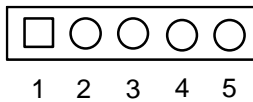
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IO Connector (J1)



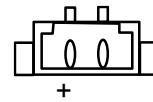
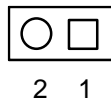
Pin	Description
1	P0_0
2	P3_0
3	P2_0
4	P1_5
5	P0_4
6	P0_1
7	P2_4
8	P0_2
9	P0_3
10	P0_5
11	P2_7
12	P2_4

External AMP. Connector (JP26)



Pin	Description
1	EXT_AMP_EN
2	SPKR
3	AGND
4	SPKL
5	AMP_POWER

Battery connector (JP20) and Jack (JP19)  
(Alternative for BAT\_IN)



Pin	Description
1	BAT_IN
2	GND

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

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TABLE 1-1:BM20 EVALUATION BOARD HARDWARE

Hardware Component	Description
BM20	Bluetooth® 4.1 Module
USB Connector	DC 5V input, USB to UART for EEPROM R/W
BAT connector & Jack	JP20 and JP19 , alternative for BAT_IN
Audio Out	Audio 3.5 mm jack for audio playback(P6). External AMP Connector JP26
Audio In	Audio 3.5 mm jack for Mono microphone input(P5) and AUX input(P7)
Status LEDs	Red and Blue LEDs show the pairing/connection status
MFB Button	Switch to turn on/off BM20 module (SW7; Button 0 in UI)
Play/Pause Button	Button to play or pause the audio playback (SW8; Button1 in UI)
Previous Track Button	Button to skip track backwards (SW4; Button 5 in UI)
Next Track Button	Button to skip track forwards(SW5; Button 4 in UI)
Volume Up Button	Button to increase volume (SW9; Button 2 in UI)
Volume Down Button	Button to decrease volume (SW10; Button 3 in UI)
Reset Button	Reset system (SW11)
NFC Tag Connector	NFC Tag connector.(For NFC tag without Rectifier Circuit)(JP3)
MP Tool Interface	Interfaces connect to VICTORIA board when use MP Tool
MCU Interface	Interfaces connect to PIC32 Platform.

## 2. Getting Started

### 2.1 INTRODUCTION

This chapter describes how the BM20 Evaluation Board works. Certain hardware and utilities are essential to support the evaluation/development of demo applications. This chapter discusses the following topics:

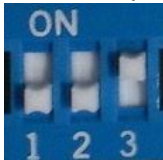
- Hardware Requirements
- Software/Utility Requirements
- Module Configuration

### 2.2 HARDWARE REQUIREMENTS

#### 2.2.1 HARDWARE SETUP

To setup the evaluation hardware, perform the following steps:

1. Make sure pin 1 / 2 / 3 of “SW12” in “Off / Off / On” state make .system in application mode.



2. Connect the portable mini-speaker 3.5 mm to the stereo audio out connector (P6).

#### 2.2.2 USING THE EVALUATION BOARD

1. Connect Li-Ion batteries to JP20 or JP19.
2. Click MFB button to turn-on and enter pairing mode. The status LEDs will blink. Now the BM20 Evaluation board should be discoverable.
3. Turn on Bluetooth device manager on a host device (PC or smartphone), the host device will display a list of discoverable Bluetooth devices. The board display as “EDDY SHS”.
4. If the pairing with the device is successful, BM20 evaluation board can connect to the host device. Once connected, BM20 evaluation board enables Advanced Audio Distribution Profile (A2DP) for audio playback and Audio Video Remote Control Profile (AVRCP) for player control.

### 2.3 APPLICATION DEMONSTRATION

#### 2.3.1 AUDIO DEMONSTRATION

In this demonstration, user can play an audio stream on both BM20 evaluation boards using a computer or smartphone. The following are the steps to perform the demonstration.

1. Connect BM20 evaluation board to a host device (PC or smartphone) that has an audio source.
2. Connect headphones (or mini-speakers) to BM20 evaluation board P6.
3. Open the audio source on the host device. Microchip recommends using media player.(e.g. Microsoft Media Player, iTunes, and Android).
4. Start the audio stream on the media player.

When BM20 evaluation board is connected to an audio source compatible with Bluetooth AVRCP, the audio control buttons are use to:

- Control the volume of audio output.
- Go to the previous track.



# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

- Go to the next track.
- Start / stop playing the current track.

FIGURE 1-2: BM20 EVALUATION BOARD AUDIO CONTROL BUTTONS

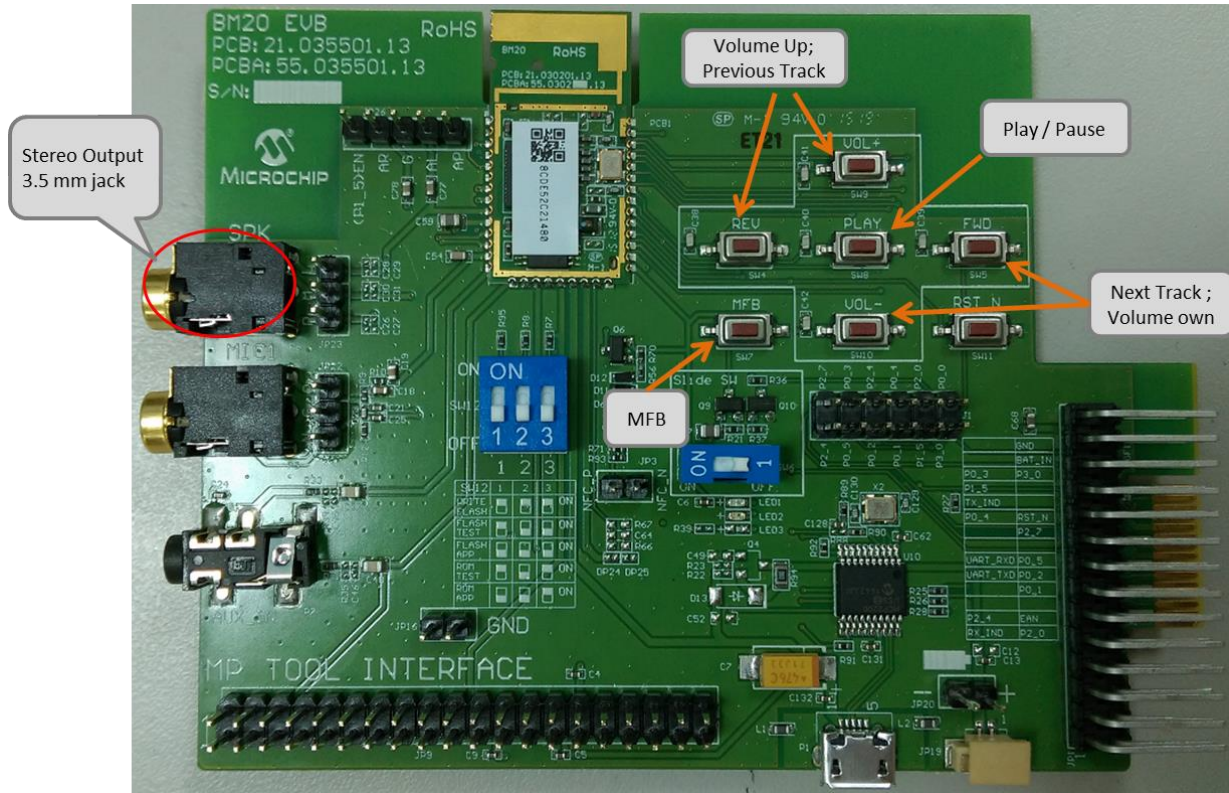
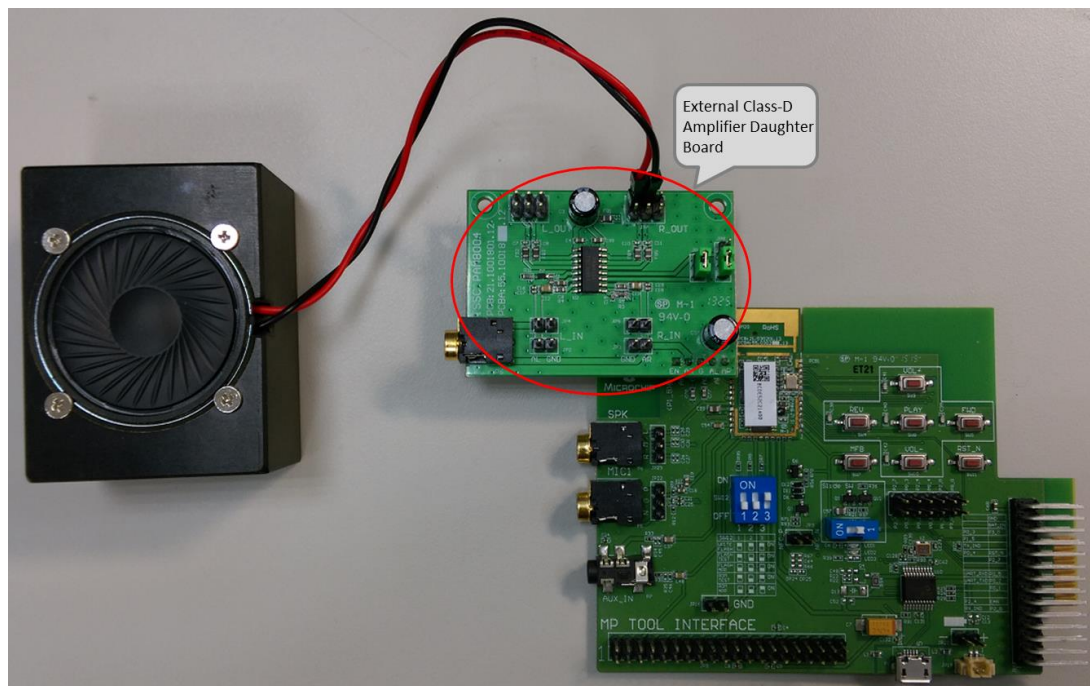


FIGURE 1-3: BM20 EVALUATION BOARD WITH EXTERNAL CLASS-D AMPLIFIER  
(It need modify the setting in UI to support external amplifier)



## 2.3.2 HSP/HFP DEMONSTRATION

In this demonstration, user can explore the hands-free profile setting to receive an incoming voice call from a

paired smartphone. This demonstration requires a microphone. It would be good to use a PC headset/microphone (with two-plugs). The following are the steps to perform the demonstration.

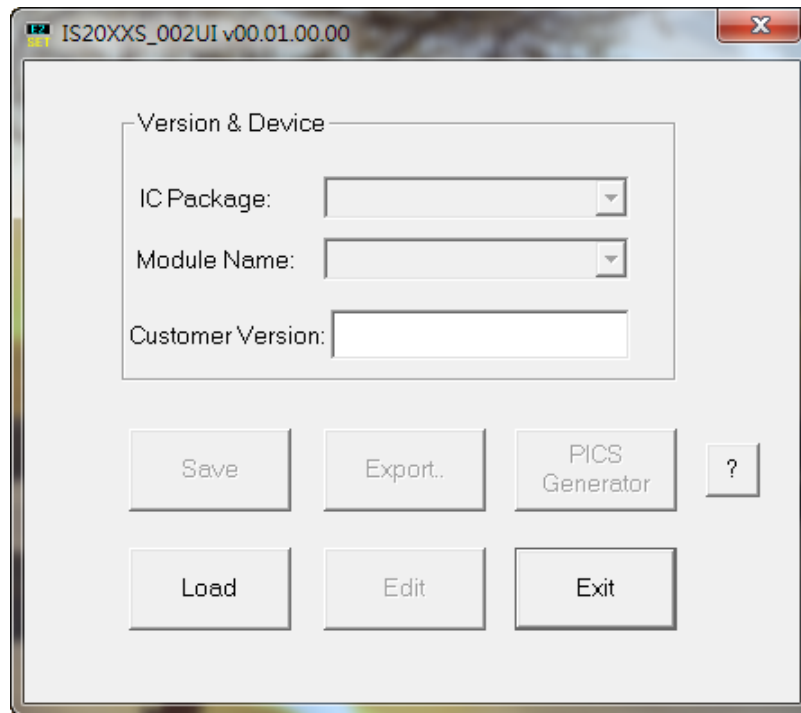
1. Connect the headset/microphone to BM20 evaluation board's audio out connector (P6) and MIC input (P5) respectively.
2. Connect BM20 evaluation board to a smartphone that supports the A2DP and HFP/HSP Bluetooth profiles.
3. From another one phone, initiate a call to the smartphone that is paired with BM20 evaluation board. The A2DP stream pauses and the ringtone plays on the headset/microphone.
4. Click button "MFB" on BM20 evaluation board to accept the incoming call.

## **2.4 SOFTWARE/UTILITY REQUIREMENTS**

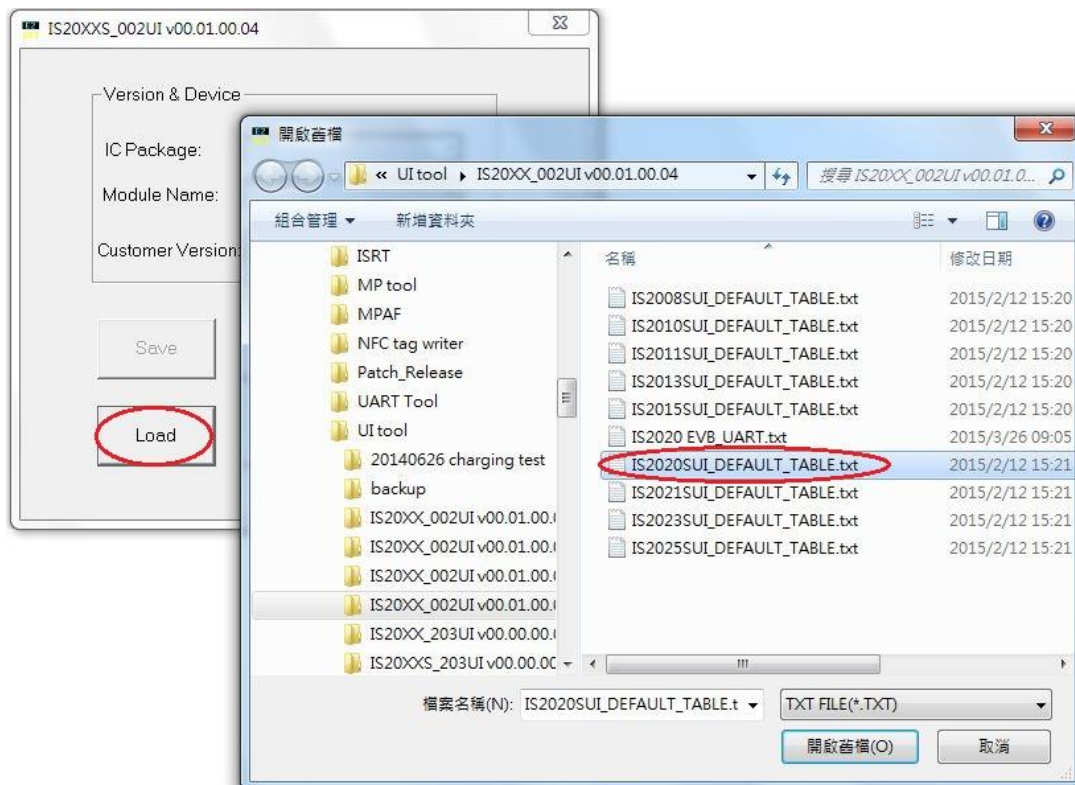
### **2.4.1 UI SETTING**

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

**Step1.** Open UI tool



**Step2.** Firstly, you can load default UI setting or previous setting file.



**Step3.** Click "Edit" to modify the settings meet your needs.

Version & Device

IC Package: IS2020S\_002\_SHS

Module Name:

Customer Version:

Save Export PICS Generator ?

Load Edit Exit

**Step4.** In the main settings, it can enable or disable supported profile or function which system need.  
Click "Next" for other setting.

Supported Profile

HFP  A2DP  AVRCP  SPP  PBAP

AVRCP Controller

AVRCP Target

Button

Btn0(MFB)  Btn1(P02)  Btn2(P27)  Btn3(P05)

Btn4(P01)  Btn5(P03)

Slide Switch  AUX In  Buzzer

NFC Detect  External Amp.  UART Command

High Active  Rx IND

Low Active  Tx IND

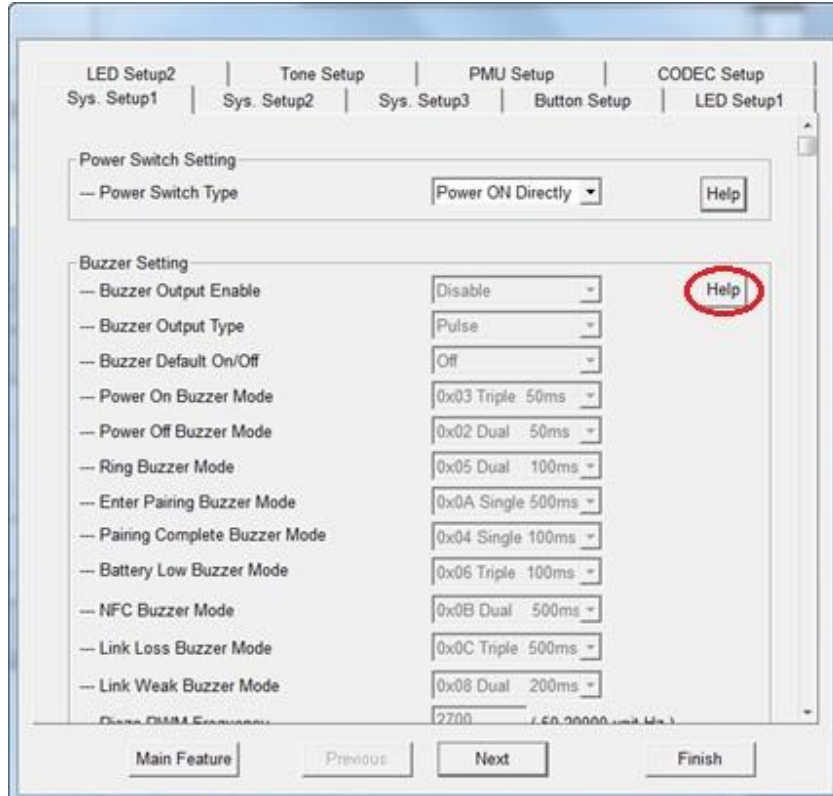
Internal Amplifier

Cancel Next

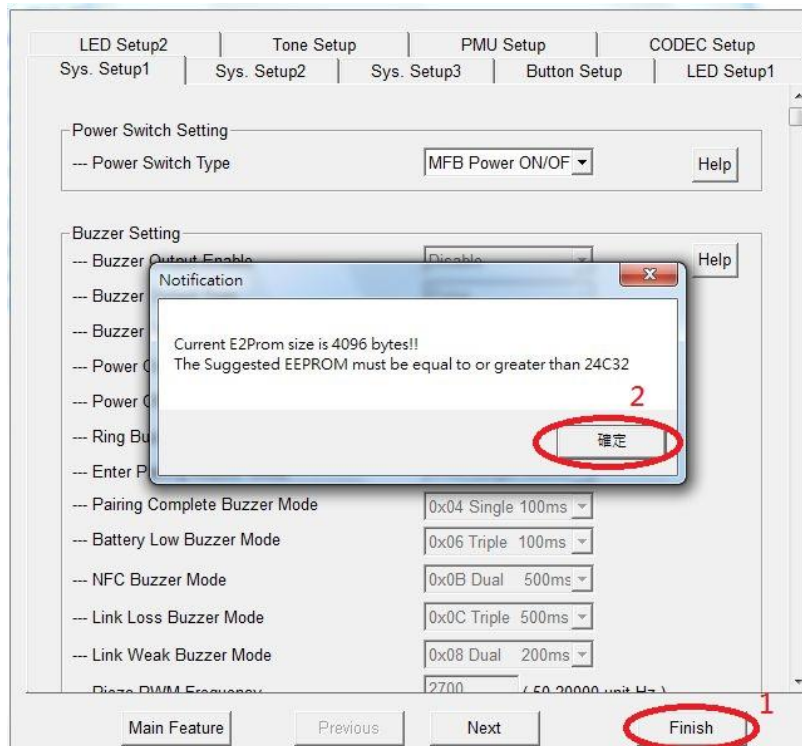
**Step5.** You can do system and functional setting in these pages.

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

Click “Help” you can get more detail information.



**Step6.** After finish parameter set up, click “Finish” button and a message will remind you check EEPROM size on your system.



**Step7.** Click "Save" button to save these UI parameter as a ".txt" file



The screenshot shows a configuration window titled "Version & Device". It contains three input fields: "IC Package:" with a dropdown menu showing "IS2020S\_002\_SHS", "Module Name:" with an empty dropdown menu, and "Customer Version:" with an empty text box. Below these fields are several buttons: "Save" (circled in red), "Export..", "PICS Generator", "?", "Load", "Edit", and "Exit".

**Step8.** We will use MPET tool to merge it with EEPROM table and use EEPROM tool load these parameter to system.

## 2.4.2 DSP TOOL SETTING

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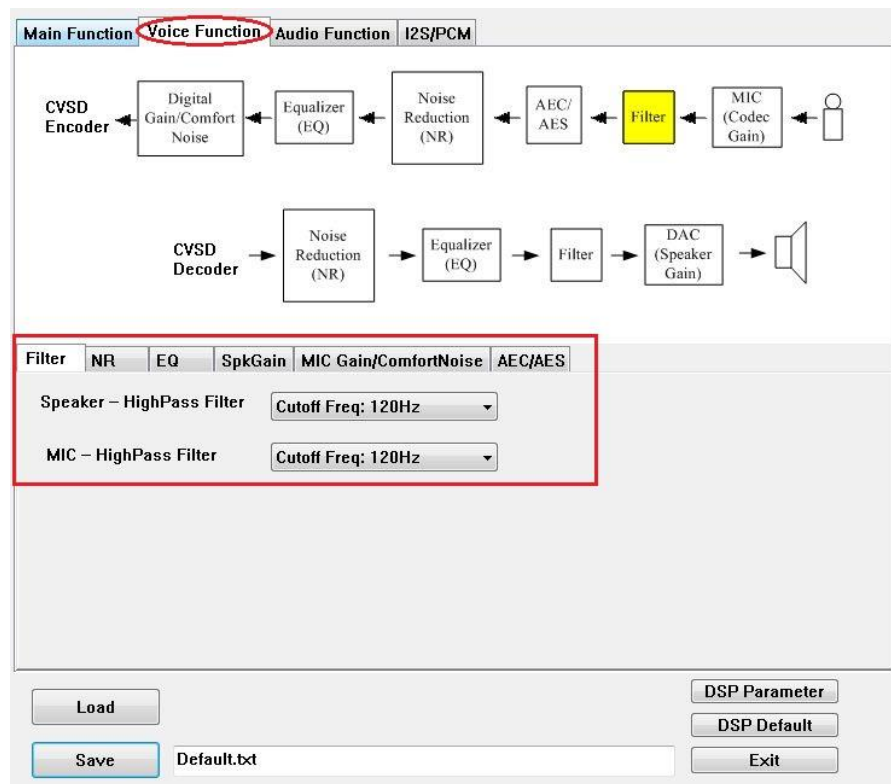
# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

**Step1.** Open DSP tool

**Step2.** Select IC version “IS2020\_XXX\_SHS” (XXX is the version of chip, e.g. IS2020S-203)



**Step3.** You can setup all voice and audio function in these pages.



**Step4.** Click “Save” button to save these DSP parameter as a “.txt” file after finish all DSP setting.

Then use MPET tool to merge it with EEPROM table and use EEPROM tool load these parameter to system.

The screenshot displays the MPET tool interface with the 'Audio Function' tab selected. The top navigation bar includes 'Main Function', 'Voice Function', 'Audio Function', and 'I2S/PCM'. A block diagram shows the audio signal path: SBC/AAC Decoder → Audio Effect → Equalizer (EQ) → DAC (Speaker Gain) → Speaker. The 'LineIn' block is highlighted in yellow and receives input from 'Audio Input'. Below the diagram, the 'LineIn' configuration panel is shown with a red border, containing the following settings:

Parameter	Value
Silence Detection Threshold	0x1A:-84dB0v
Initial LineIn SPK Gain	0x0A
LineIn MaxLevel	F
LineIn MinLevel	0
LineIn ADC Gain	-6dB, 0x00

At the bottom of the interface, there are buttons for 'Load', 'Save', 'DSP Parameter', 'DSP Default', and 'Exit'. The 'Save' button is circled in red, and the filename 'Default.txt' is displayed in the adjacent text field.

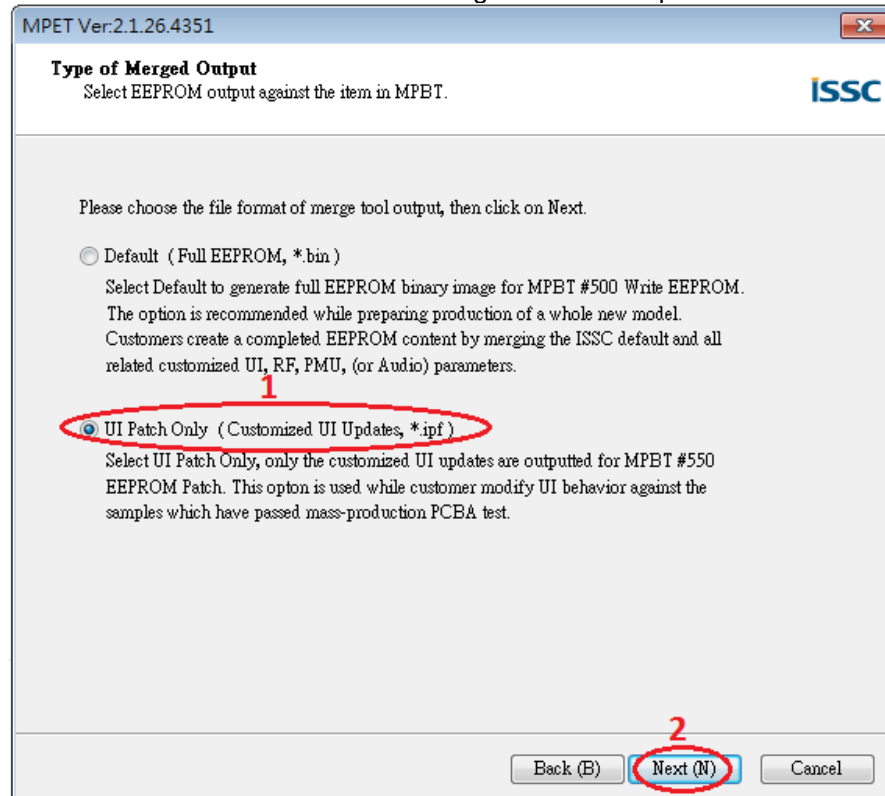
## 2.4.3 MERGE TOOL SETTING



**Step1.** Open MPET tool, click “Next” to set up.

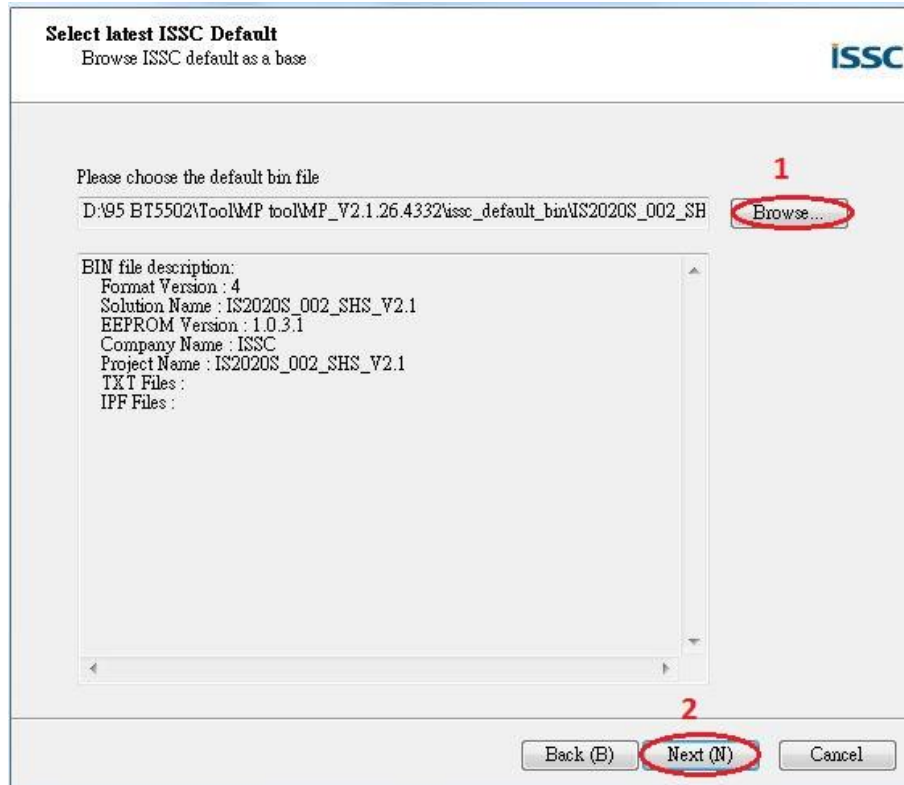


**Step2.** Select “Default” to use full EEPROM table to merge UI and DSP parameter.

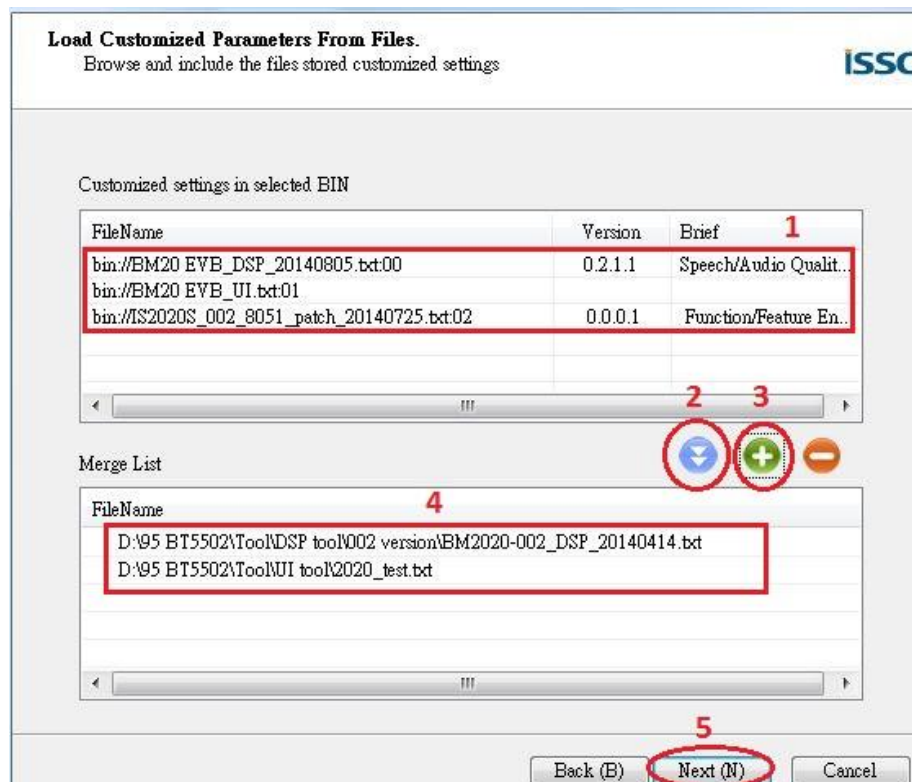


**Step3.** Select the bin file (full EEPROM table) and click “ Next”

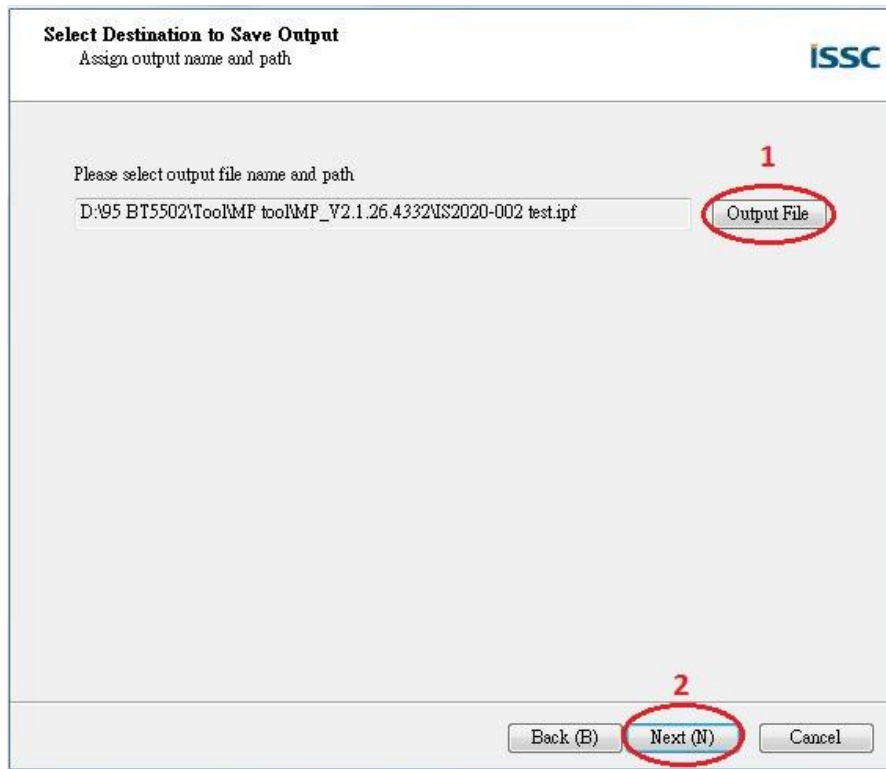
# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE



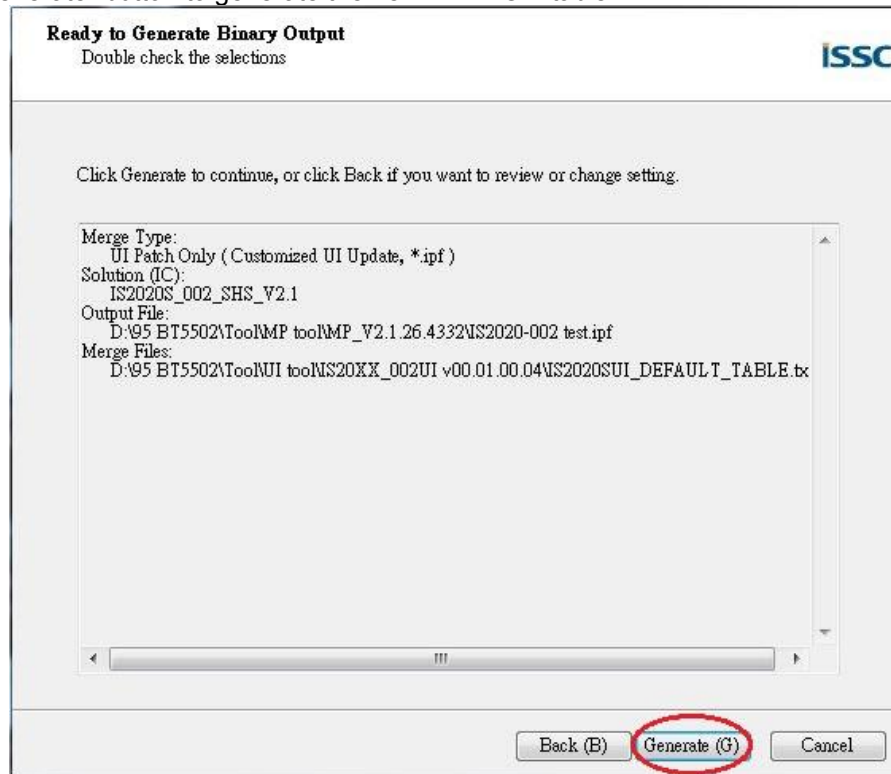
**Step4.** If the bin file had included UI, DSP or patch code parameter, you can see them in block 1 as the figure below. If you want keep the in your new system, you can select the item which you want to keep and use “pull down” button to add them to merge list. If you want to add new parameter (e.g. UI and DSP parameter), click “+” button to add these files into tool for merge with EEPROM table.



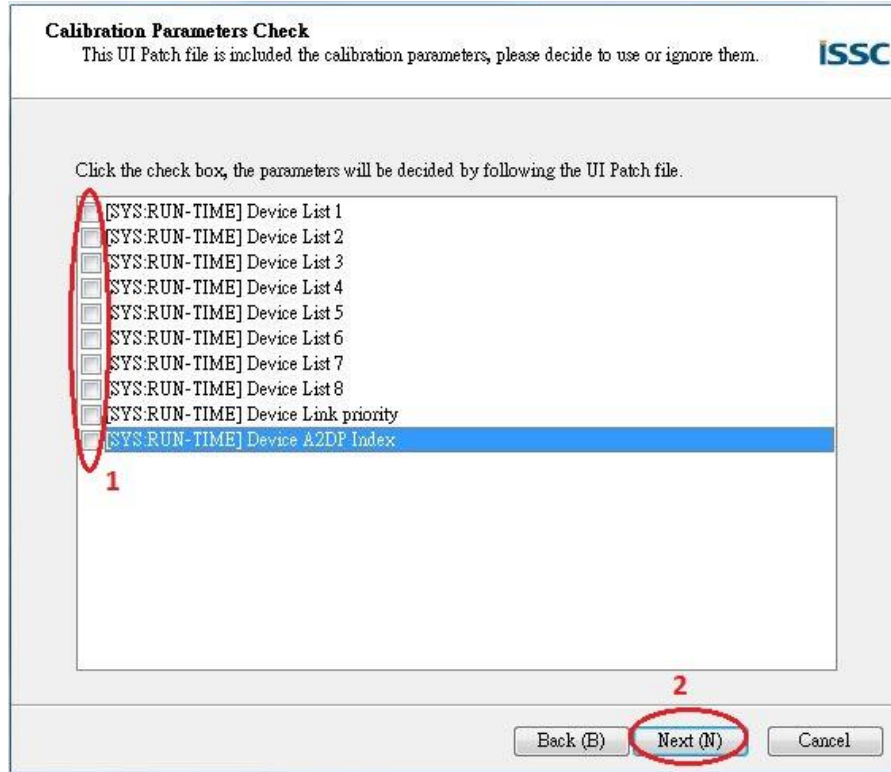
**Step5.** Select an output path and create a name for the merged EEPROM table.



**Step6.** Click “Generate” button to generate the new EEPROM table.



**Step7.** Select if you want use new setting of these parts.



**Step8.** Now you have a merged patch file (\*.ipf file).



## 2.4.4 Procedure to Update EEPROM Parameters

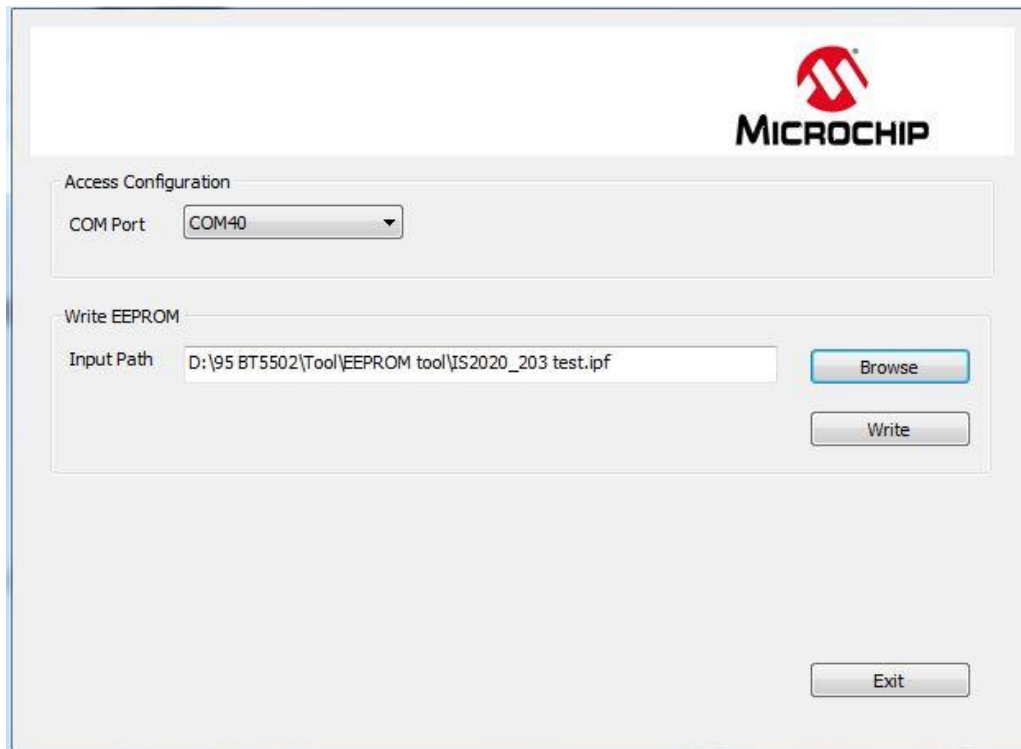


**Step 1.** Make sure SW12 in “ROM TEST” mode.

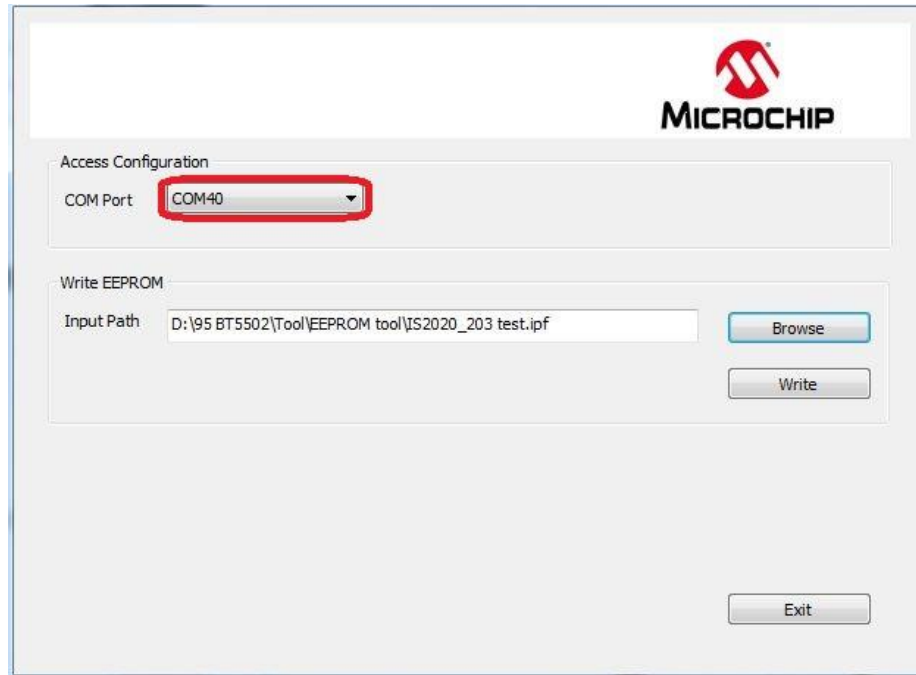


**Step 2.** Connect EVB “P1” port and PC by USB cable. **LED1** & **LED2** on EVB will keep lighting.

**Step 3.** Run the **E2PROM\_tool.exe** program and a window will be come up as below

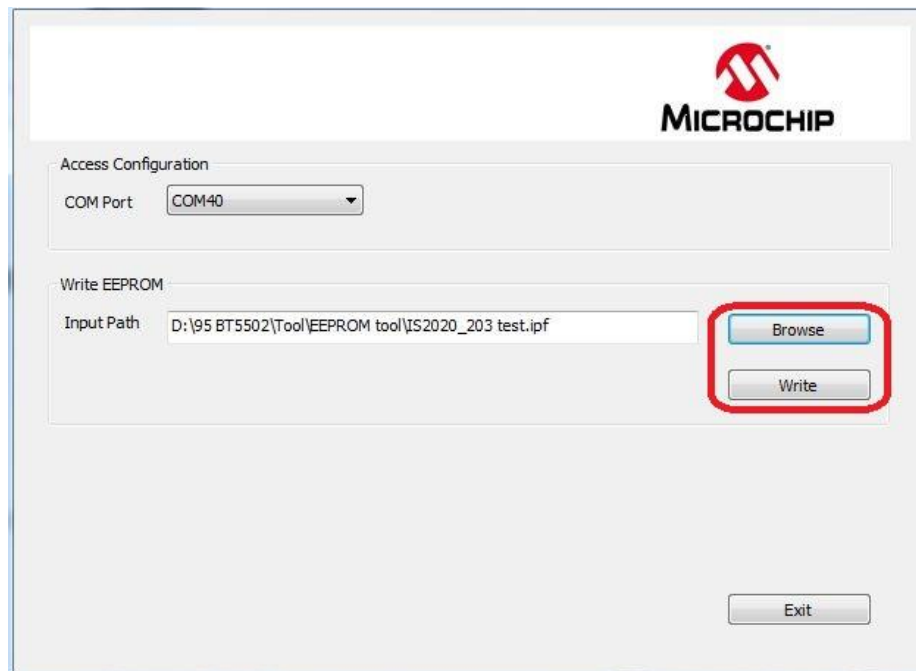


**Step 4.** Specify the **COM Port**.

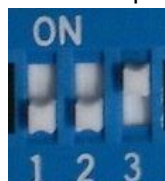


**Step5.** Press "Browse" to choose the file where you want to write EEPROM table or patch file.

**Step6.** Press "Write" to write these setting to EEPROM



**Step7.** After finish data update, remove USB cable and make SW12 to "ROM APP" mode and reboot.



Now EVB can use the new setting after updated EEPROM parameter.

## 2.5 MODULE CONFIGURATION

### 2.5.1 Mode Settings

Setting in Mode Switch:

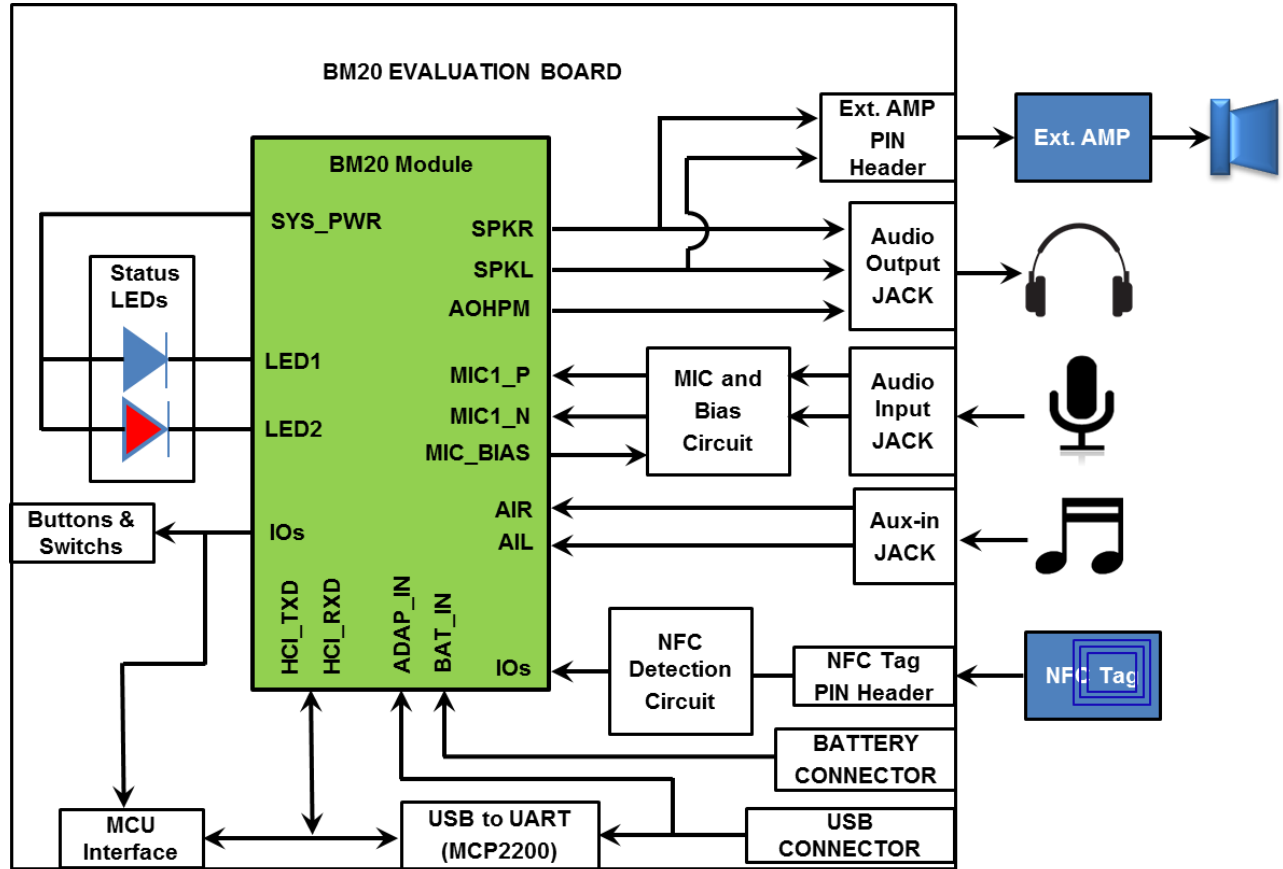
For ROM chip application

Mode	SW12 Setting	Switch 12 PIN Definition
Test Mode		1: ON (P2_0: LOW) 2: OFF (P2_4: HIGH) 3: ON (EAN: HIGH)
Application Mode		1: OFF (P2_0: HIGH) 2: OFF (P2_4: HIGH) 3: ON (EAN: HIGH)

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

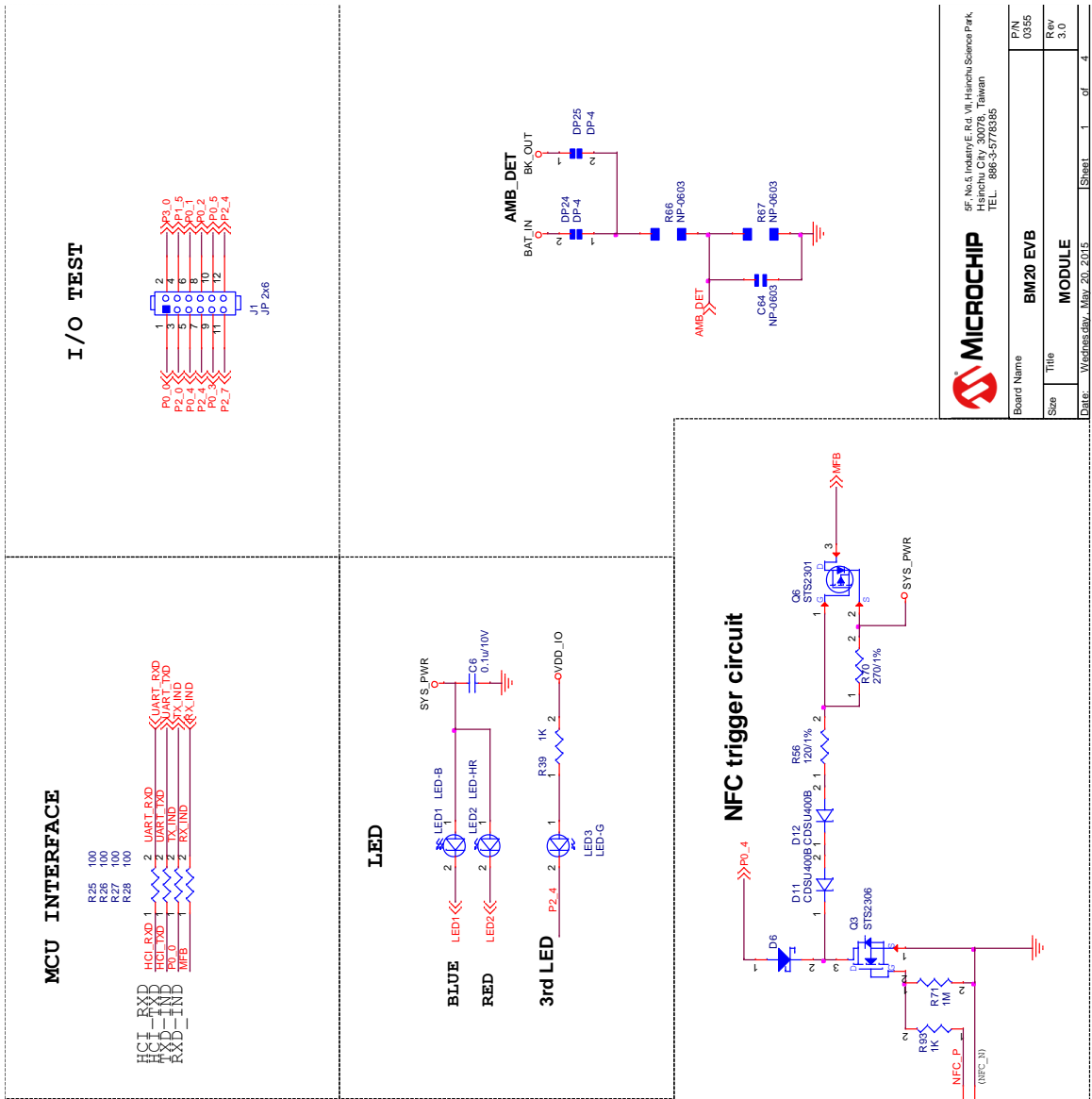
## APPENDIX A. BM20 AUDIO EVALUATION BOARD SCHEMATICS

EVB block diagram





# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

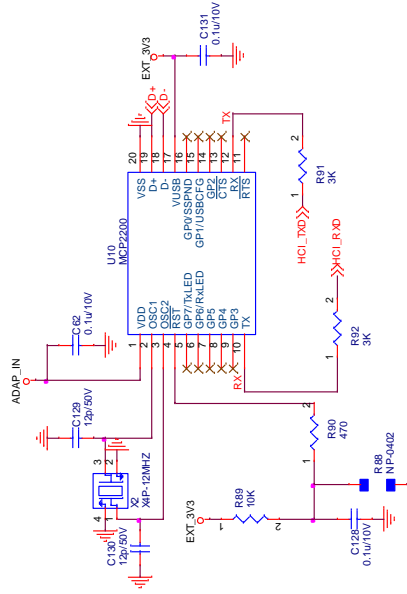
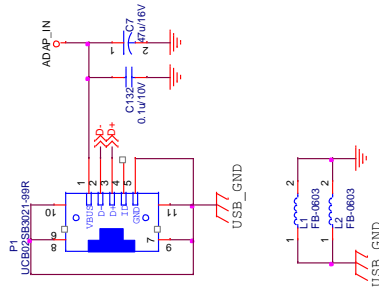


		9F, No. 8, Industry E Rd. VII, Hsinchu Science Park, Hsinchu City 30078, Taiwan TEL: 886-3-5778385	
Board Name	BM20 EVB	P/N	0355
Title	MODULE	Rev	3.0
Date	March 20, 2015	Sheet	1 of 4

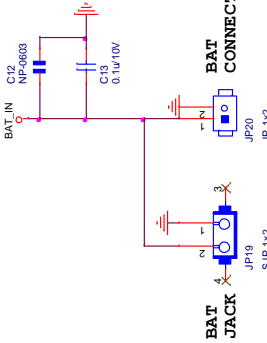
GPIO Description	
Slide Switch	P00
Volume up	P27
Volume down	P05
NFC	P04
FWD	P01
Play/Pause	P02
REV	P03
System Configuration	P20
System Configuration	P24
Line-in detect	P30

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

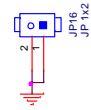
## DC POWER SOURCE



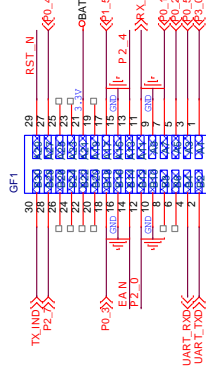
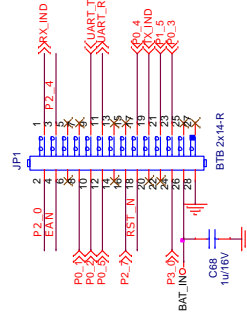
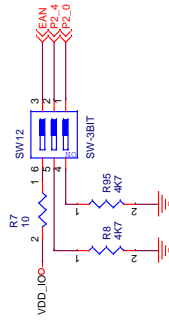
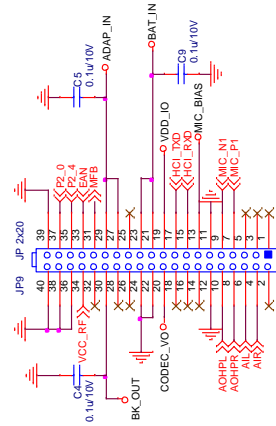
## BATTERY CONNECTOR



## TEST GND

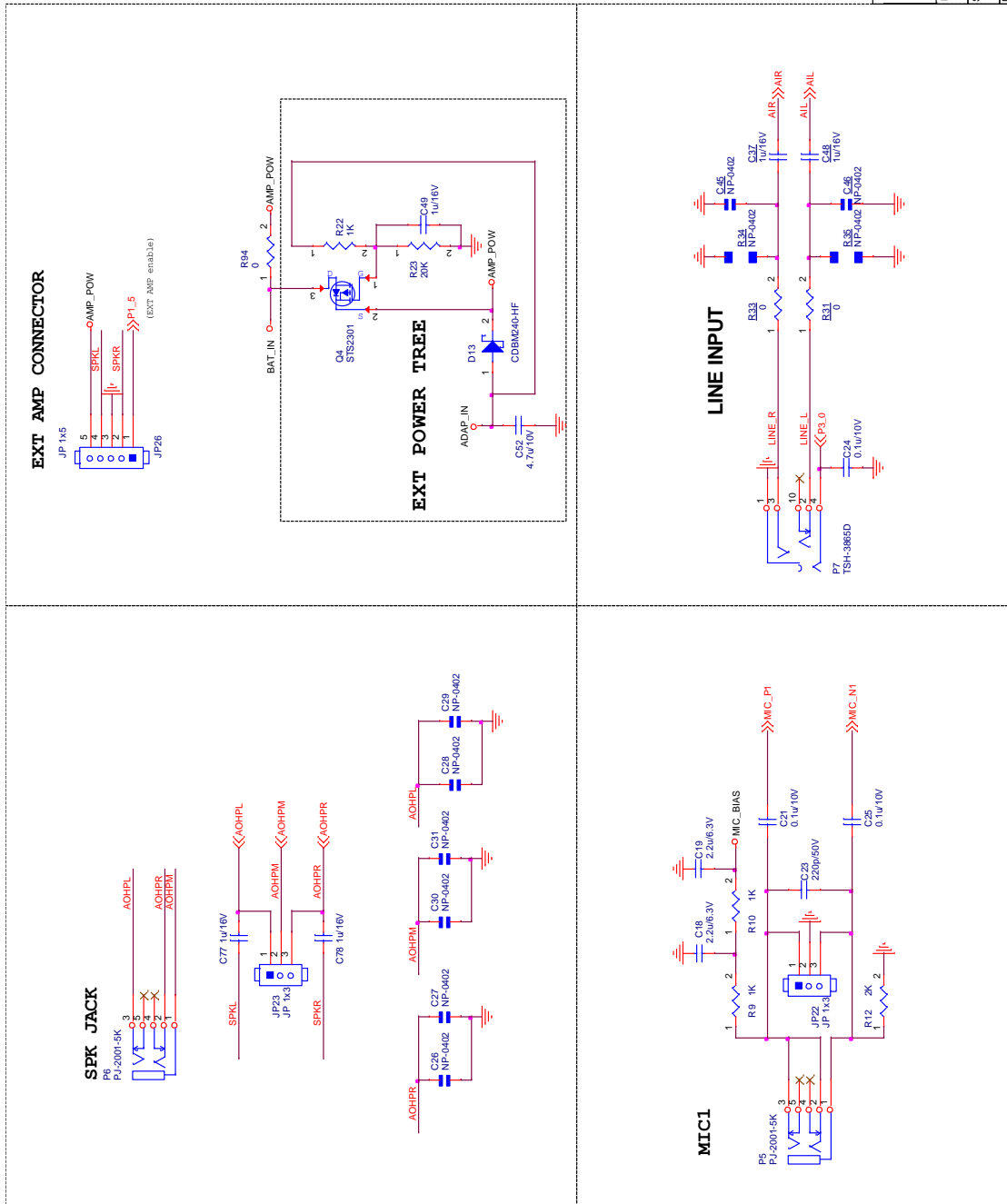


## VICTORIA/EDGAR II INTERFACE



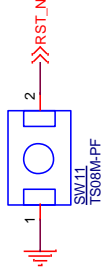
		GF- No.5, Industry E. Rd. VII, Hsinchu Science Park Hsinchu City, Hsinchu County, Taiwan TEL : 886-3-5783385
Board Name	BM20 EVB	PN 035
Size	POWER / UART HCI	Rev 3.0
Date	Wednesday, May 20, 2015	Sheet 2 of 4

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE

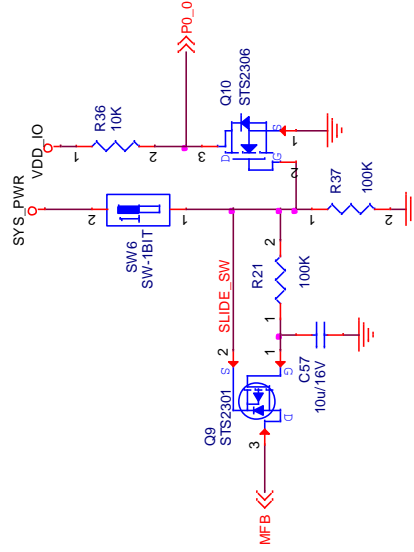


		5F, No.5, Indusya E. Rd. VII, Hardsu Science Park Jember, Jawa Timur, Indonesia TEL. : 886-32778385	
		Board Name	BM20 EVB
Size	Title	Rev	3.0
Date	Wednesday, May 20, 2015	Sheet	3 of 4

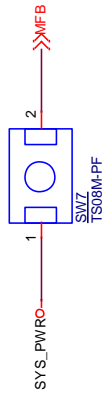
## RESET PUSH BUTTON



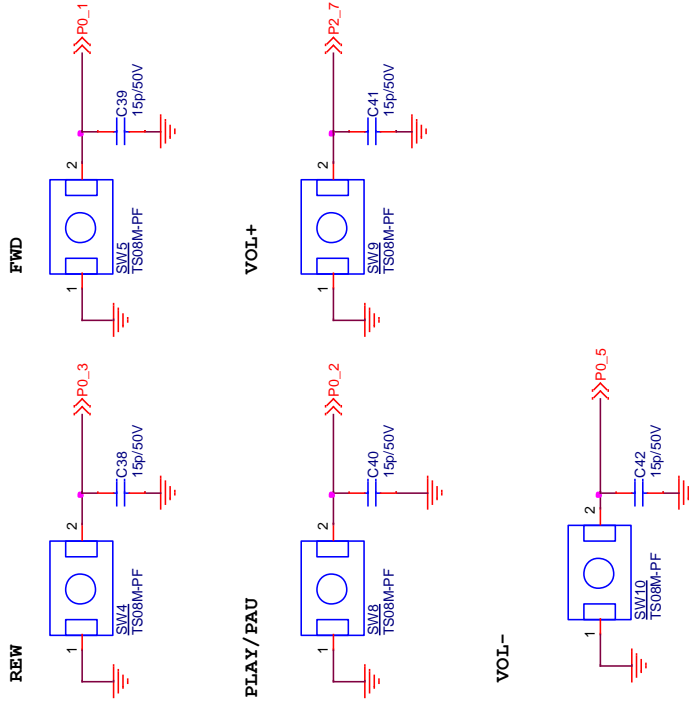
## SLIDE SWITCH



## MFB



## MUSIC CONTROL PUSH BUTTON



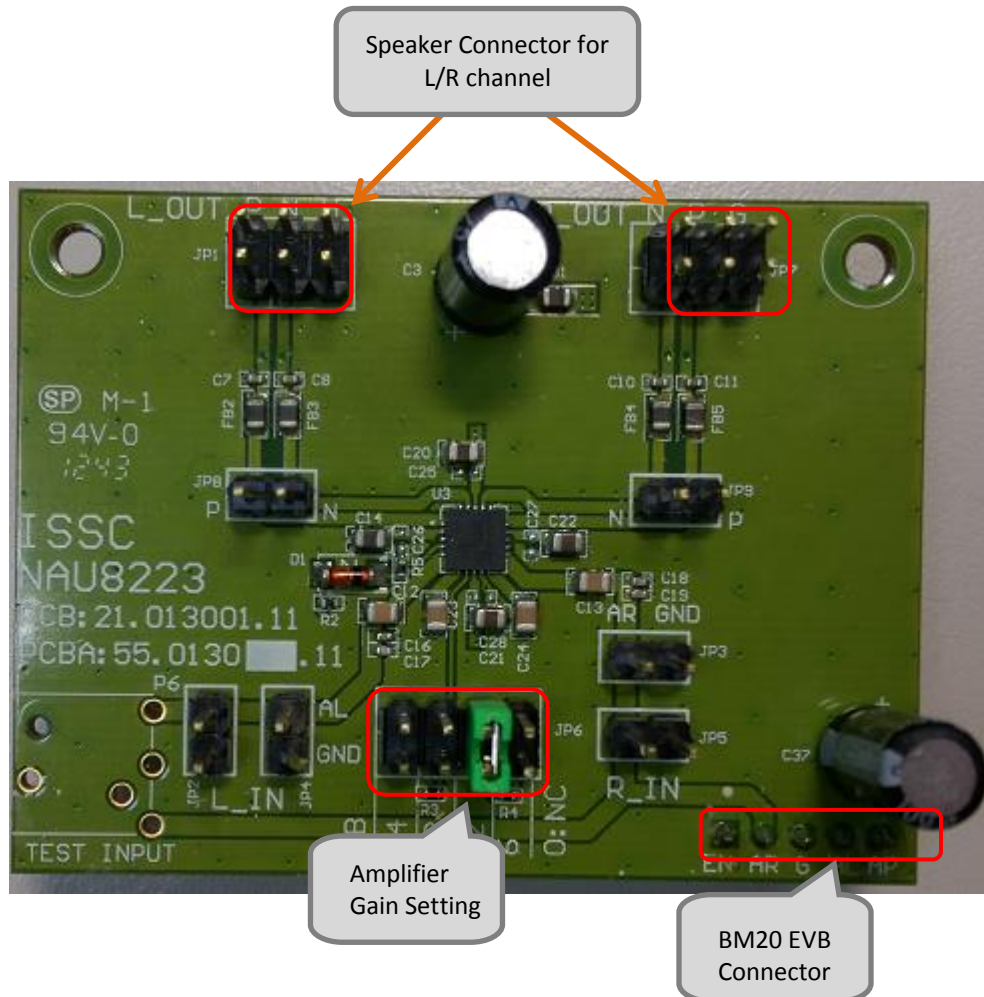
5F, No.5, Industry/E. Rd. VIII Hsinchu Science Park  
Hsinchu City 30078, Taiwan  
TEL: 886-3-5778385

Board Name	BM20 EVB	P/N	0355
Title	PUSH BUTTON/SWITCH	Rev	3.0
Date: Wednesday, May 20, 2015	Sheet 4	of	4

## APPENDIX B. CLASS D AMPLIFIER DAUGHTER BOARD

BM20 EVB reserves an interface (JP26) to connect with an external class D amplifier daughter board for speaker application demonstration.

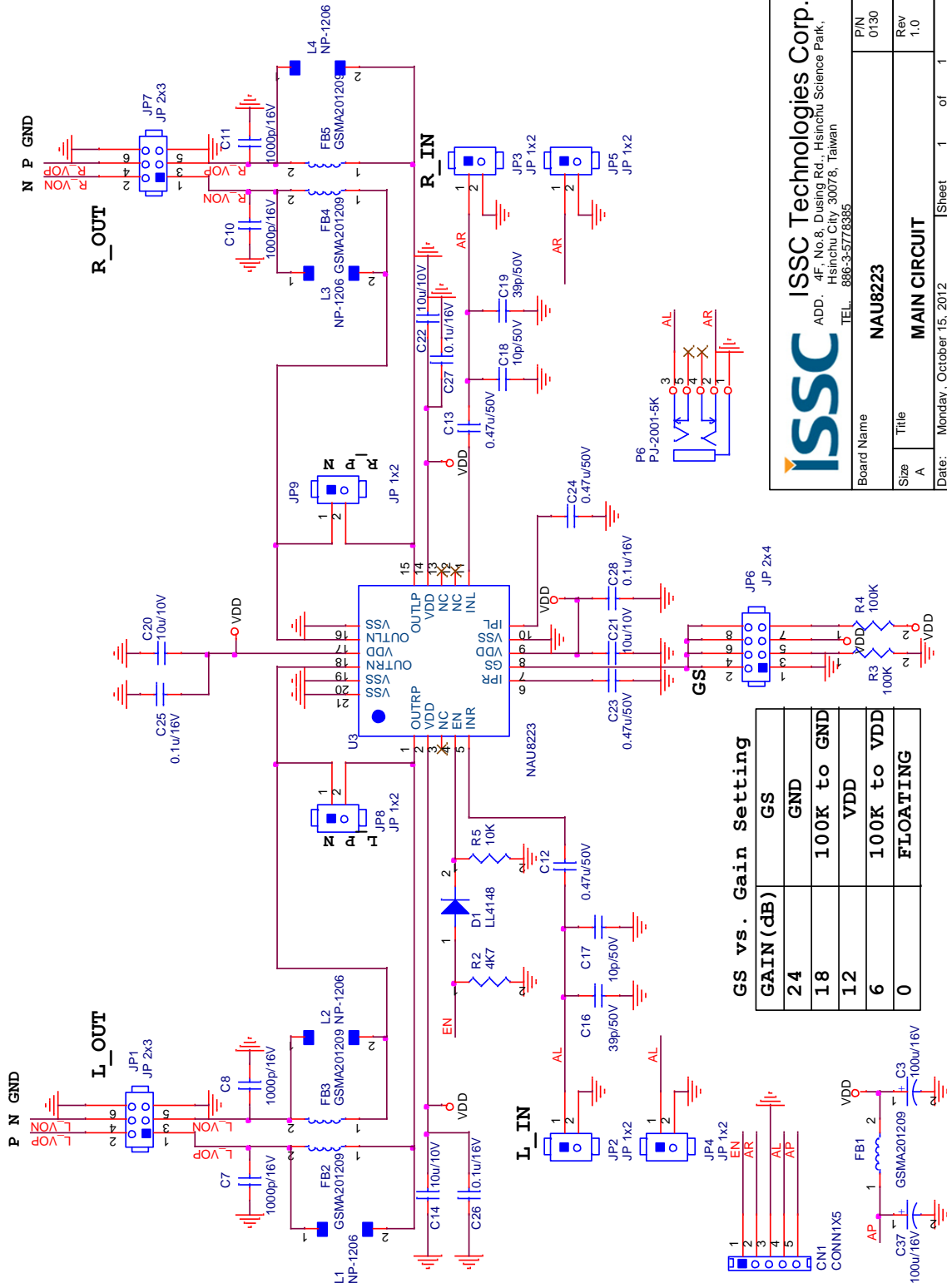
Here is a daughter board example of NAU8223 3.1W class D amplifier.



On the daughter board, we reserve pin header for amplifier gain setting, L/R channel speaker connector and BM20 EVB connector. It can be connected with BM20 EVB to emulate a speaker application.

The schematics of the daughter board as below:

# BM20 BLUETOOTH EVALUTATION BOARD USER'S GUIDE



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Board Name	<b>NAU8223</b>	
P/N	0130	
Rev	1.0	
<b>MAIN CIRCUIT</b>		
Date:	Monday, October 15, 2012	Sheet 1 of 1