ISSC Technologies Corp.

BM20 Bluetooth®
Evaluation Board User's Guide

Index

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 wi 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

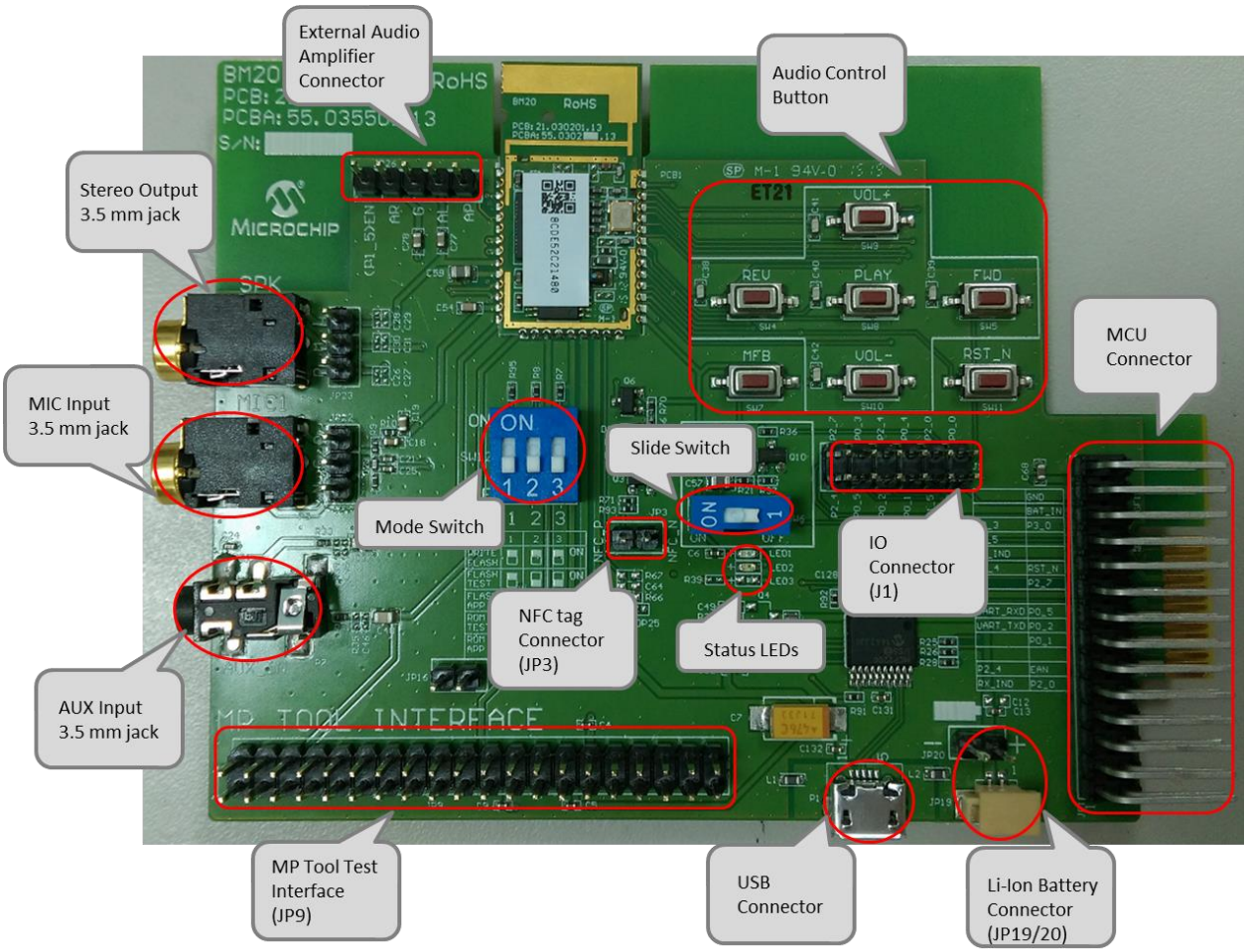
The BM20 Evaluation Board has the following features:

- 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)

1 2 3

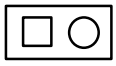
Pin	Description
1	AOHPL
2	AOHPM
3	AOHPR

MIC (JP22)

1 2 3

Pin	Description
1	MIC_P1
2	AGND
3	MIC_N1

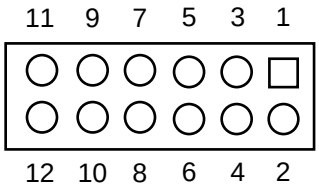
NFC tag connector (JP3)



1 2

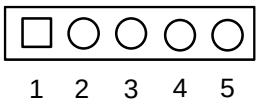
Pin	Description
1	NFC_P
2	NFC_N

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

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:

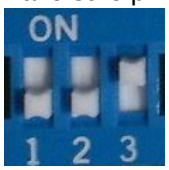
- Hardware Requirements
- Software/Utility Requirements
- Module Configuration

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.

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

FIGURE 1-2: BM20 EVALUATION BOARD AUDIO CONTROL BUTTONS

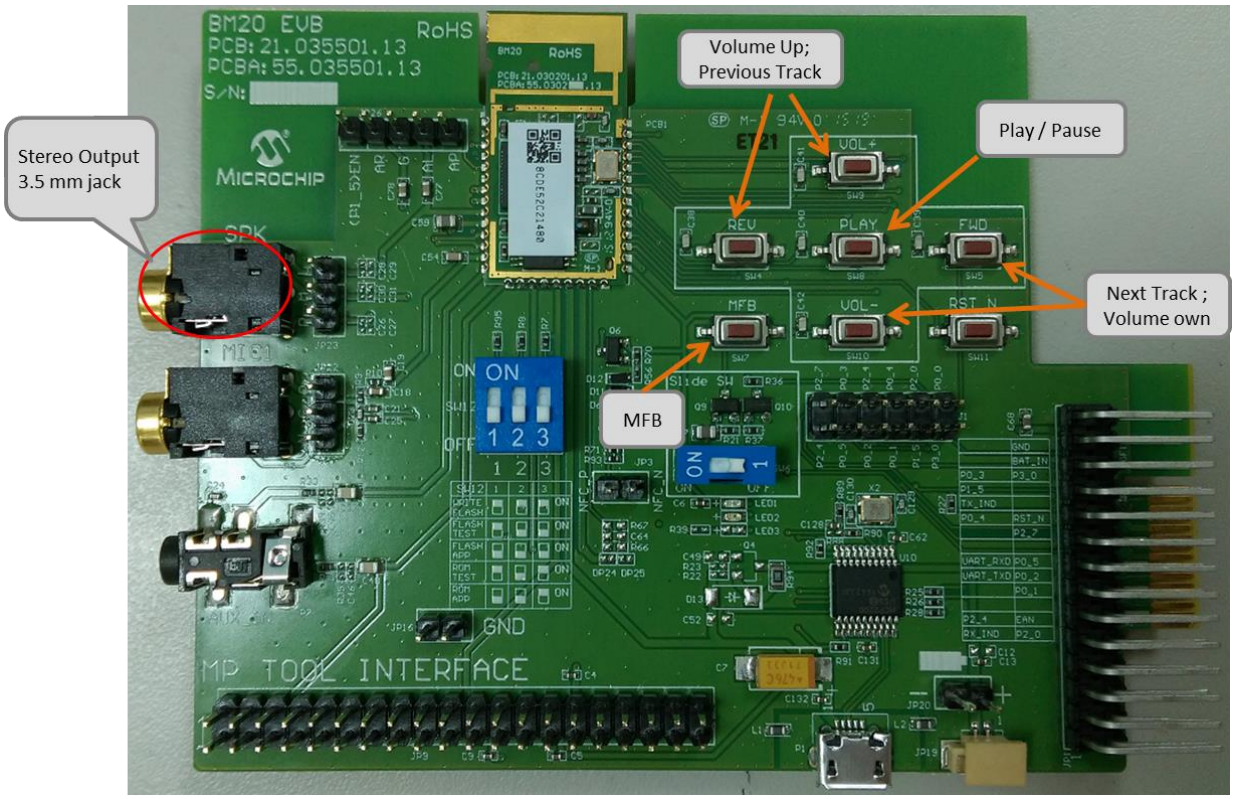
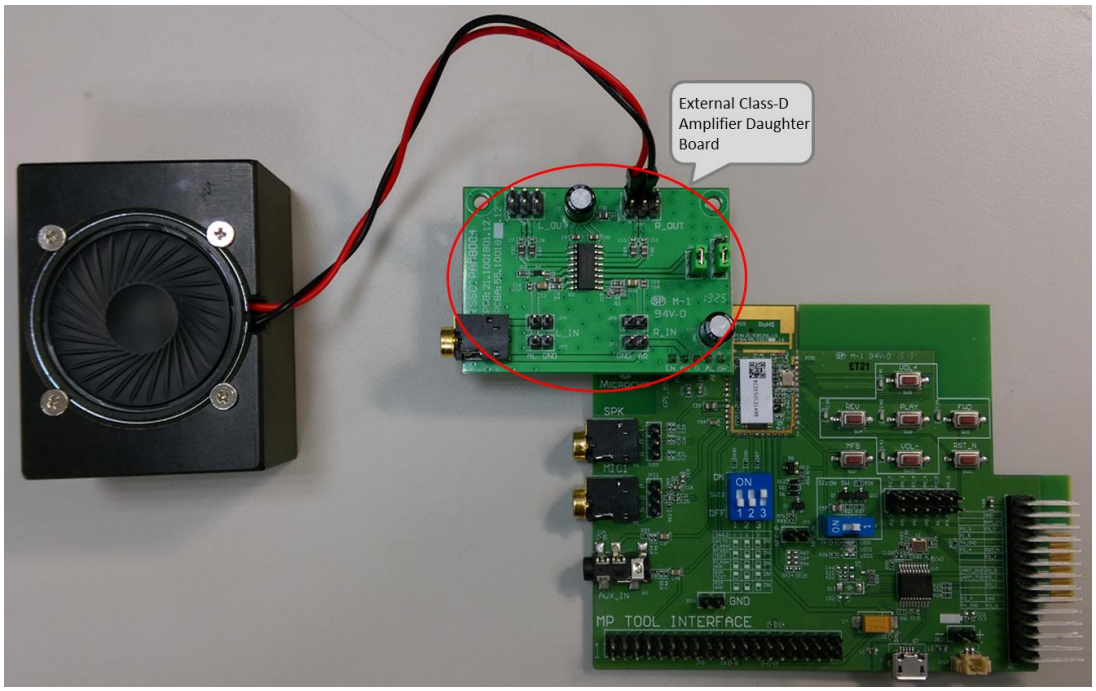


FIGURE 1-3: BM20 EVALUATION BOARD WITH EXTERNAL CLASS-D AMPLIFIER

(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

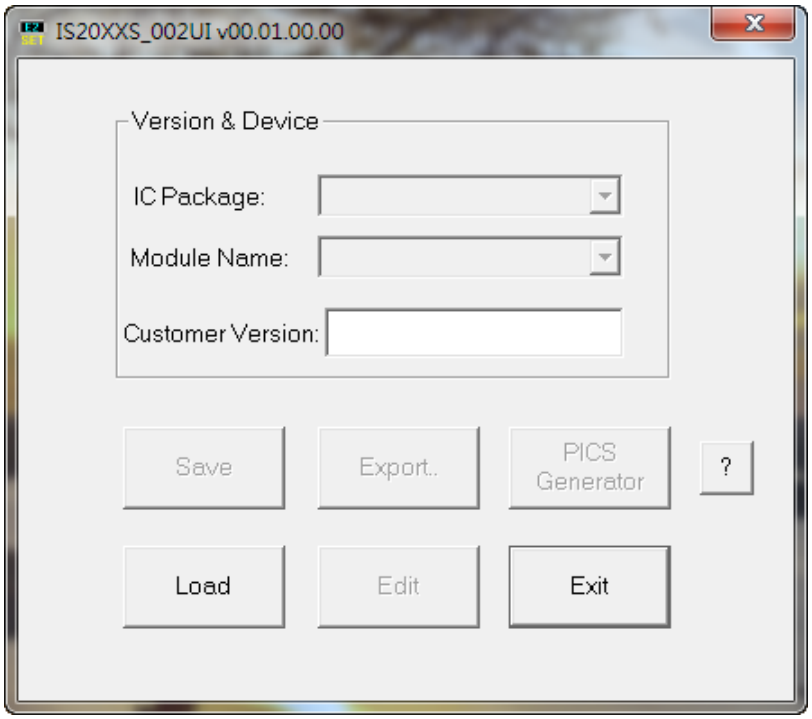
paired smartphone. This demonstration requires a microphone. It would be good to use a PC headset/microphone (with two-plugs). The following are the steps to perform the demonstration.

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.

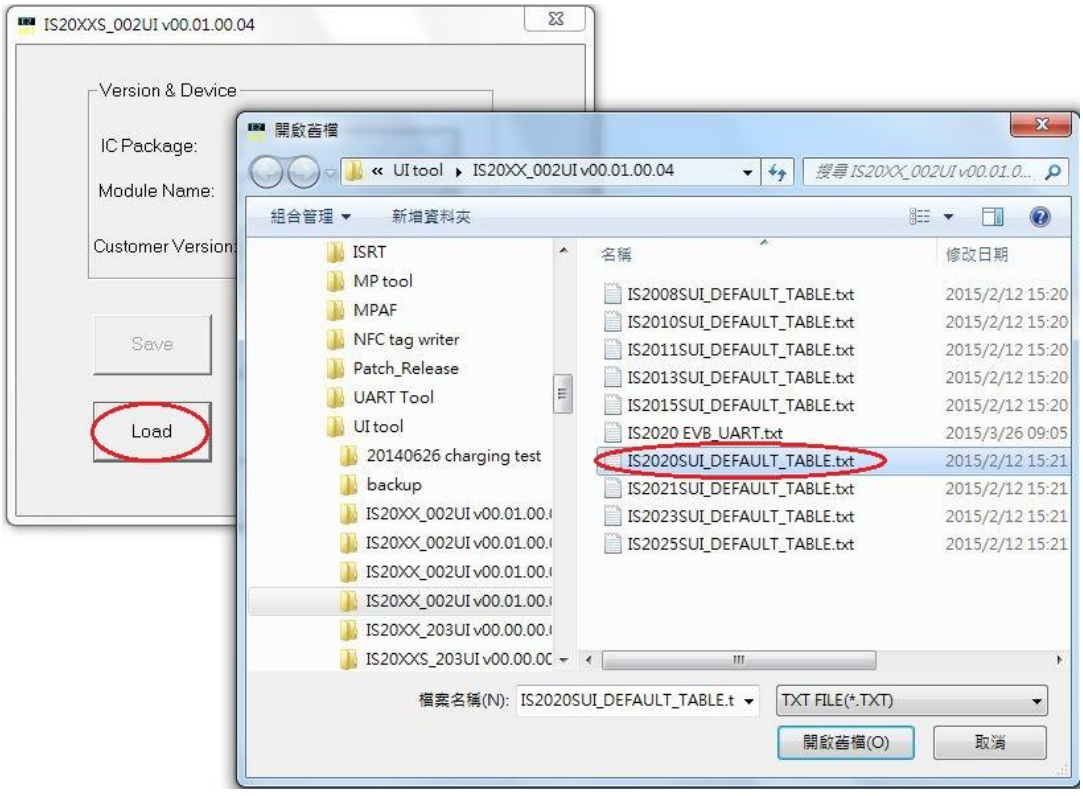
2.4 SOFTWARE/UTILITY REQUIREMENTS

2.4.1 UI SETTING

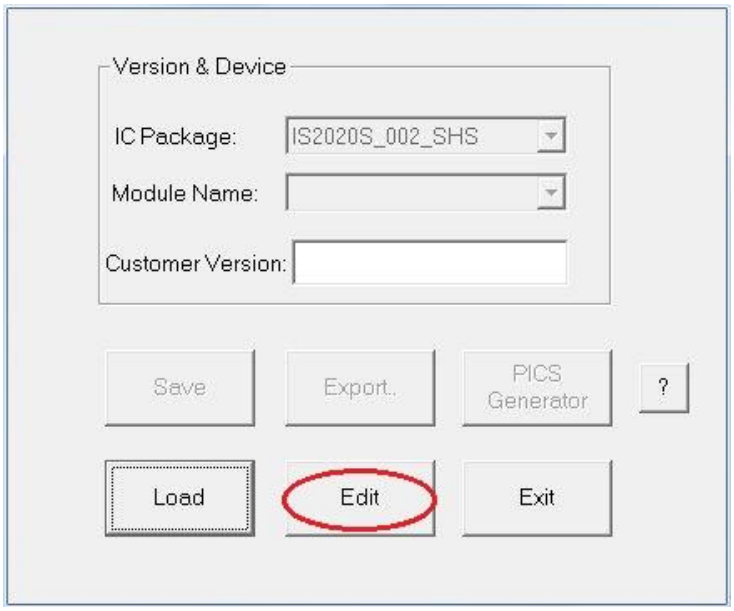
Step1. Open UI tool



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



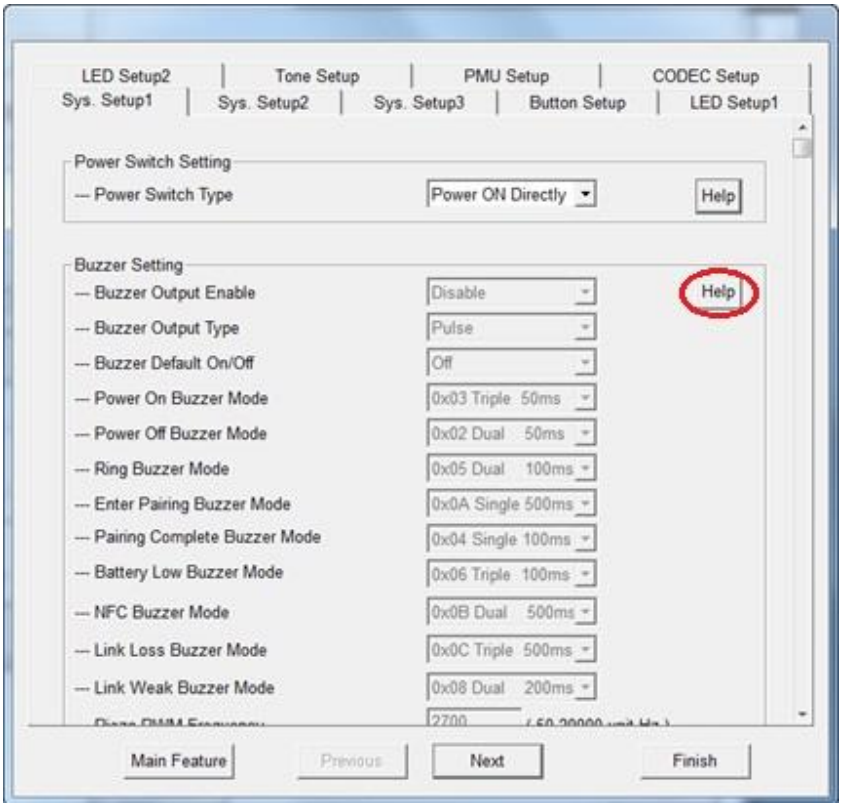
Step3. Click "Edit" to modify the settings meet your needs.



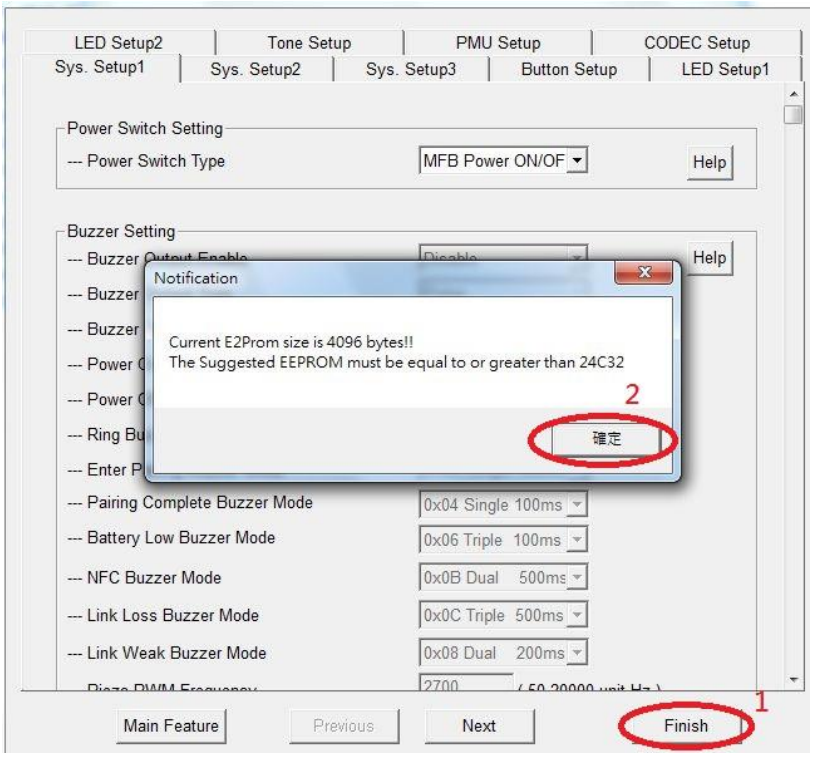
Step4. In the main settings, it can enable or disable supported profile or function which system need. Click "Next" for other setting.

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

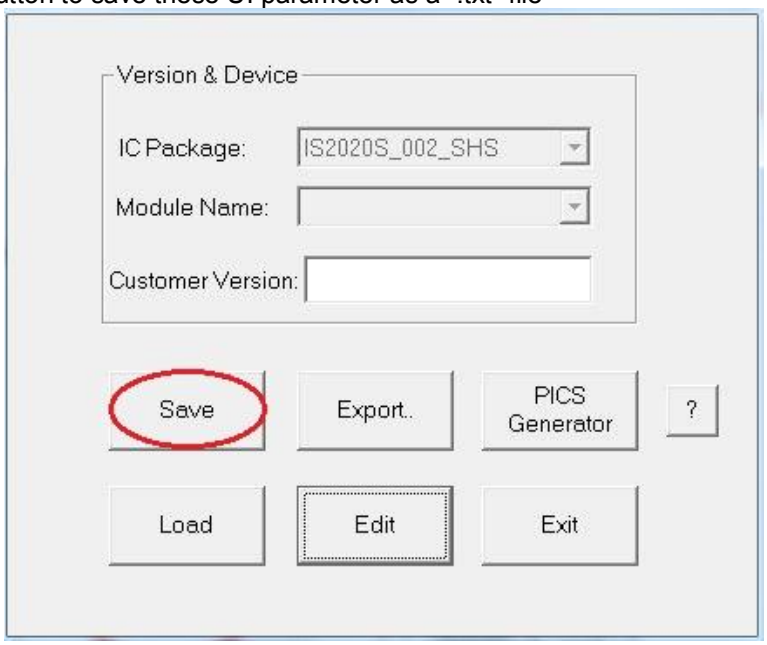
Click "Help" you can get more detail information.



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



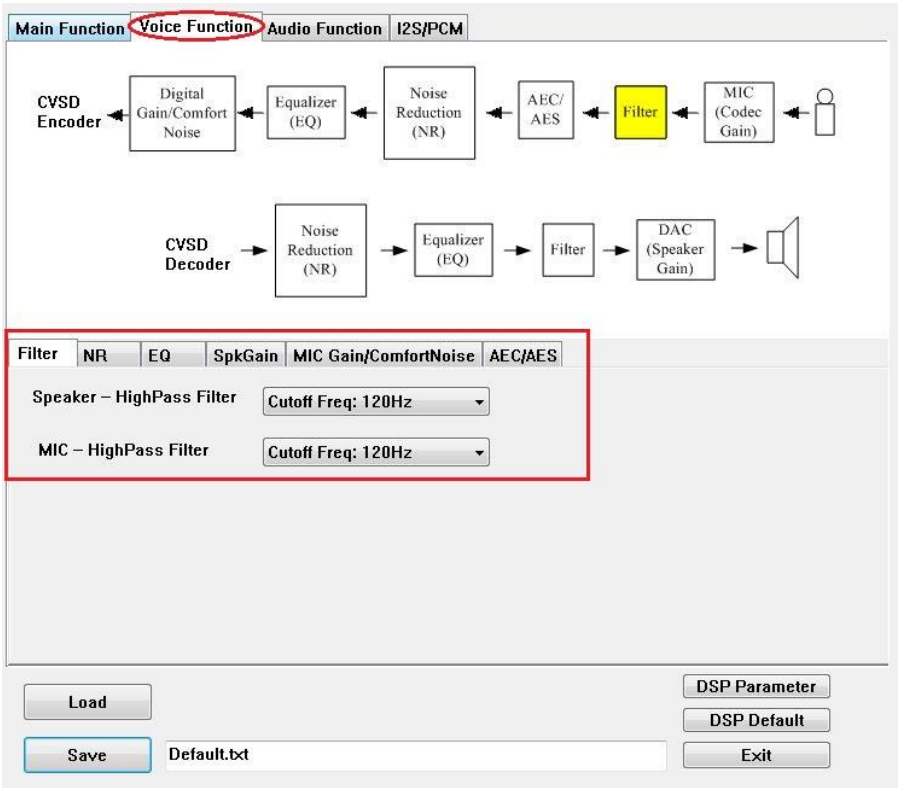
Step8. We will use MPET tool to merge it with EEPROM table and use EEPROM tool load these parameter to system.

2.4.2 DSP TOOL SETTING

Step1. Open DSP tool

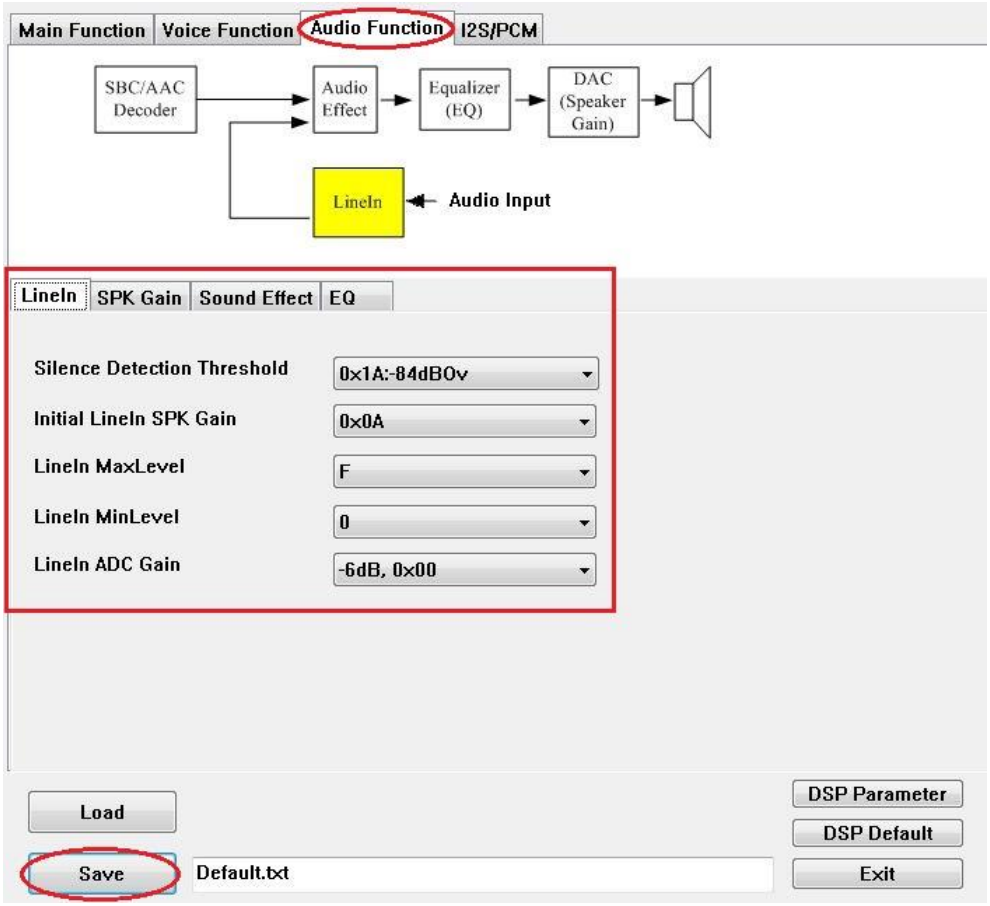
Step2. Select IC version "“IS2020_XXX_SHS" (XXX is the version of chip, e.g. IS2020S-203)

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.

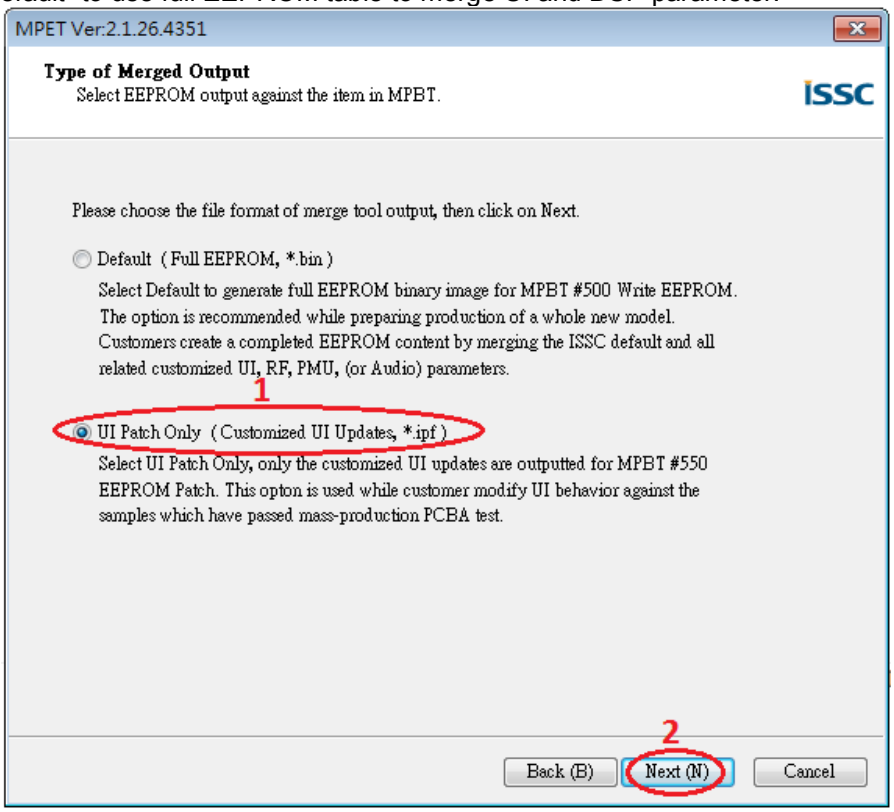
Then use MPET tool to merge it with EEPROM table and use EEPROM tool load these parameter to system.



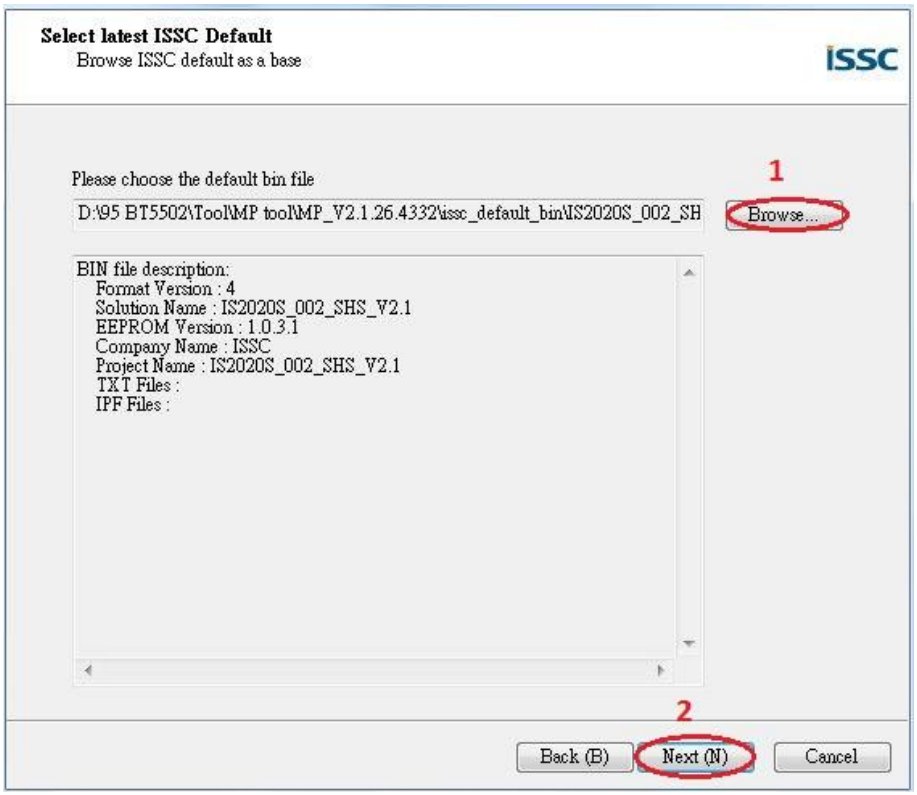
2.4.3 MERGE TOOL SETTING

Step1. Open MPET tool, click "Next" to set up.

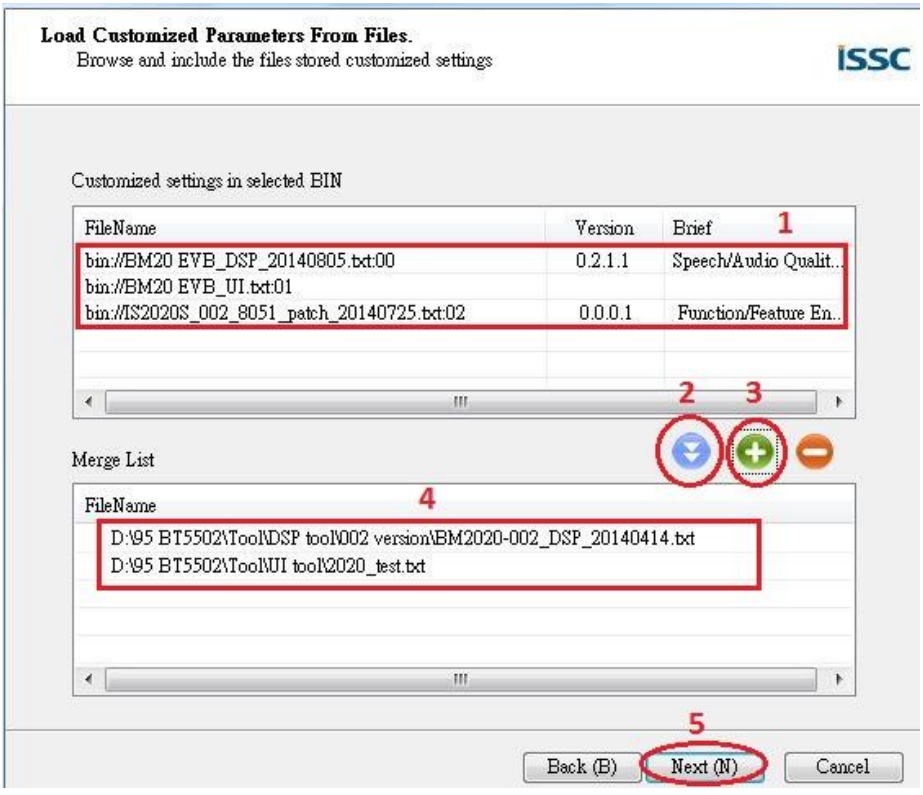
Step2. Select "Default" to use full EEPROM table to merge UI and DSP parameter.



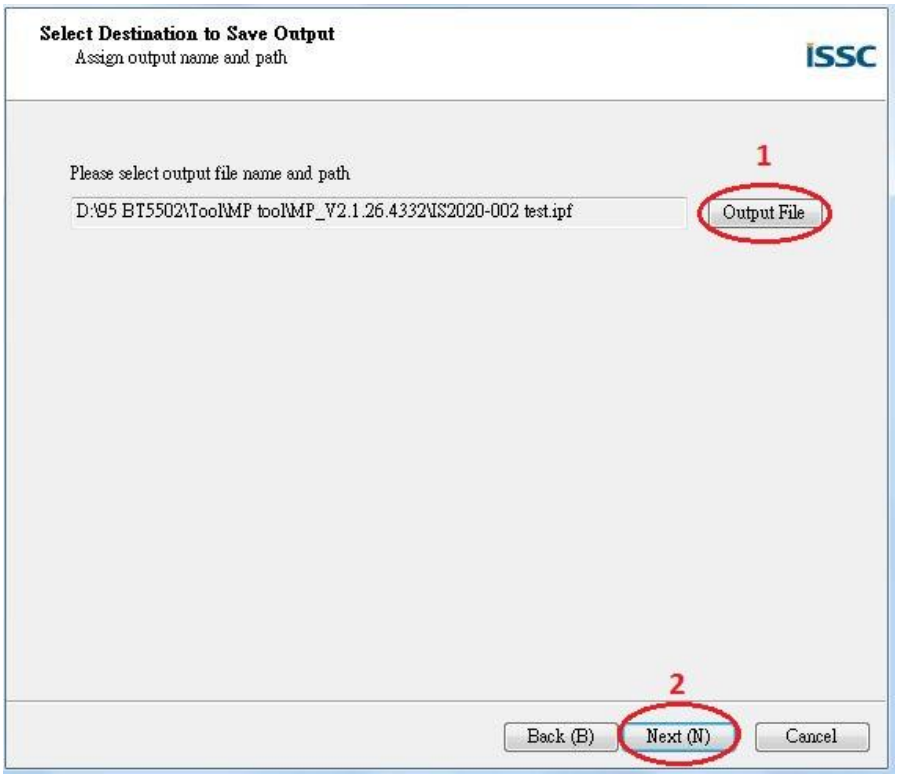
Step3. Select the bin file (full EEPROM table) and click " Next"



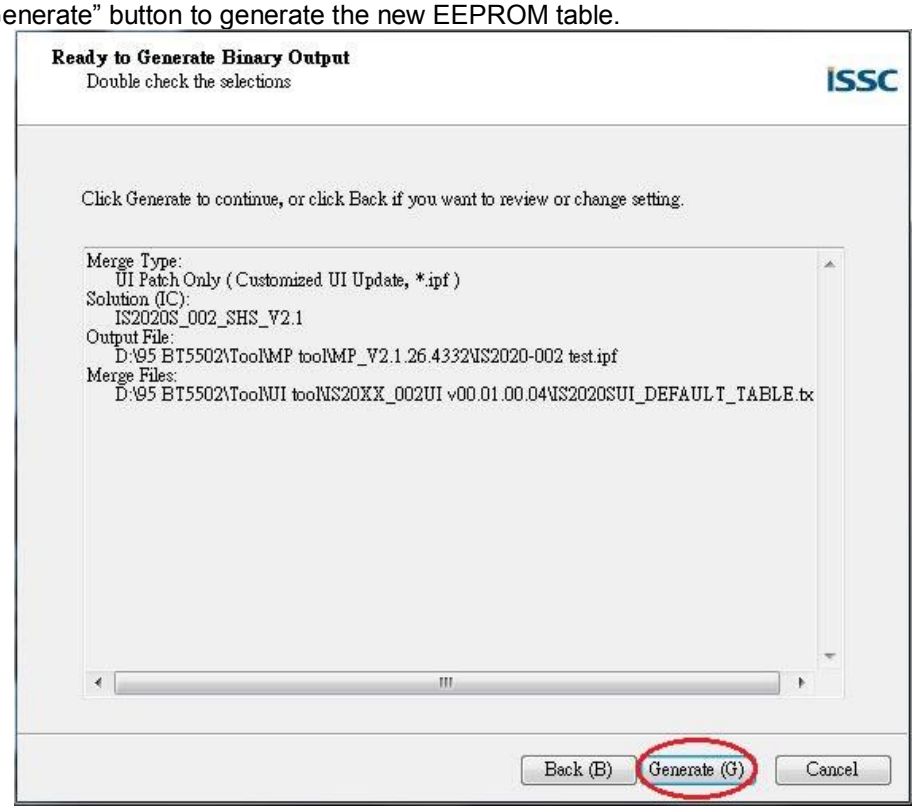
Step4. If the bin file had included UI, DSP or patch code parameter, you can see them in block 1 as the figure below. If you want keep the in your new system, you can select the item which you want to keep and use "pull down" button to add them to merge list. If you want to add new parameter (e.g. UI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



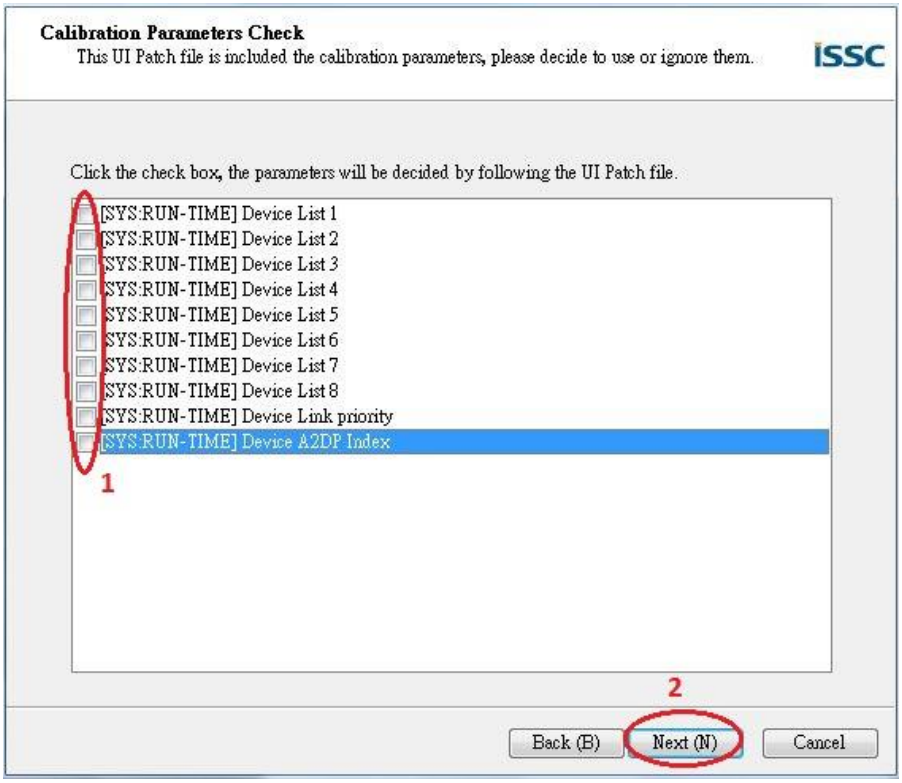
Step5. Select an output path and create a name for the merged EEPROM table.



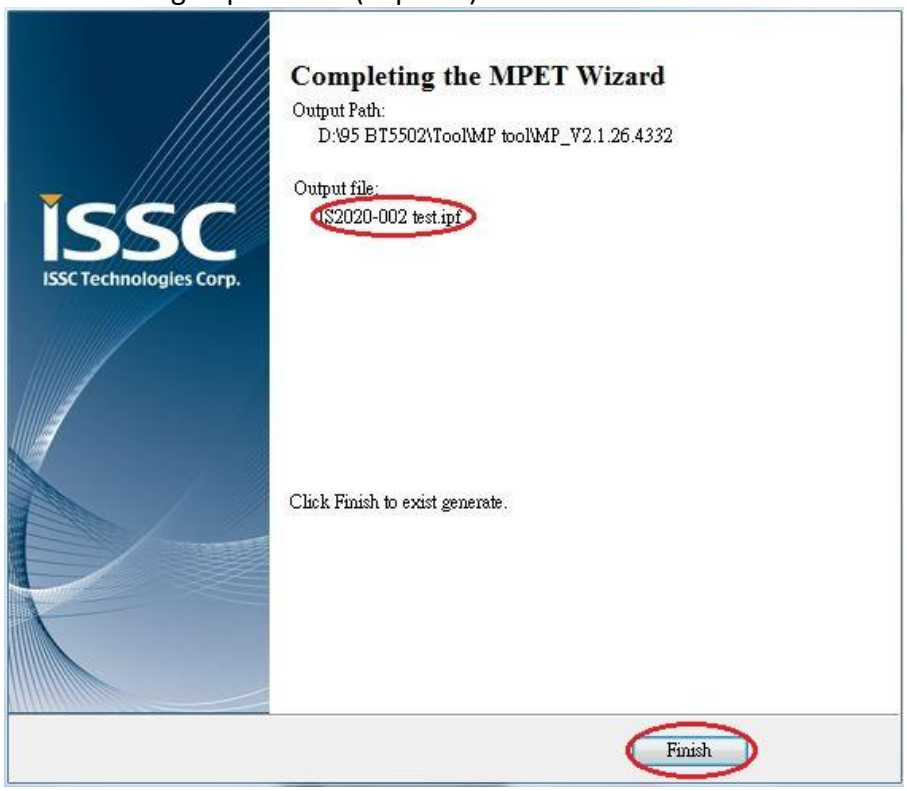
Step6. Click "Generate" button to generate the new EEPROM table.



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

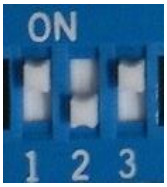


Step8. Now you have a merged patch file (*.ipf file).

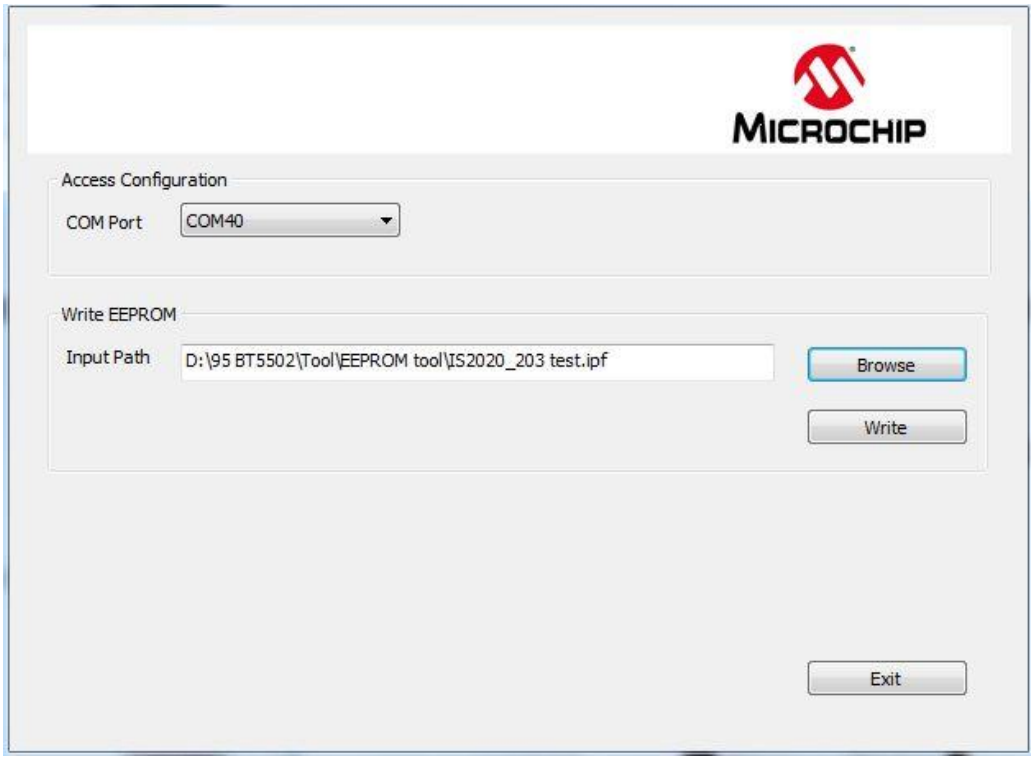


2.4.4 Procedure to Update EEPROM Parameters

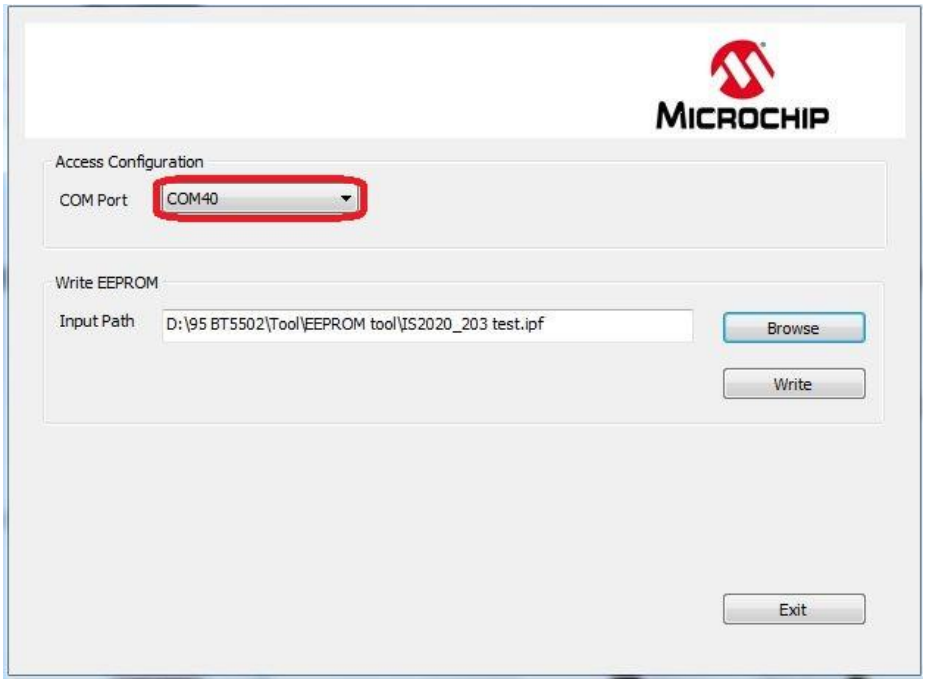
Step 1. Make sure SW12 in "ROM TEST" mode.



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

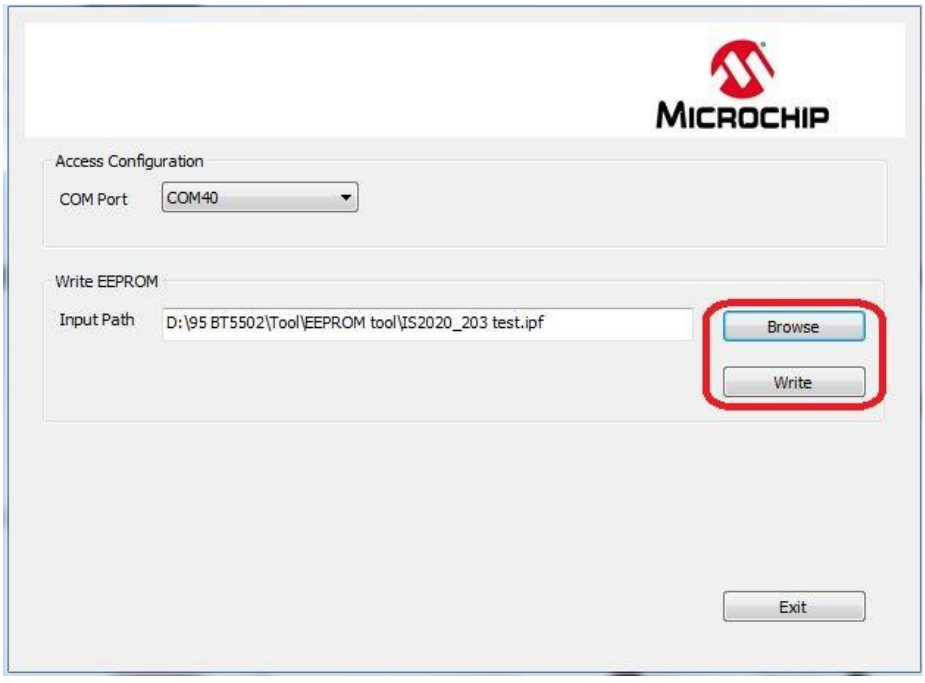


Step 4. Specify the **COM** Port**.**

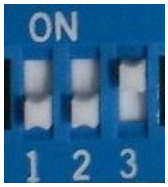


Step5. Press "Browse" to choose the file where you want to write EEPROM table or patch file.

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.



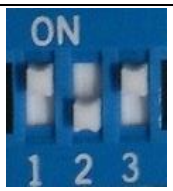
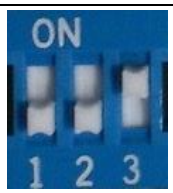
Now EVB can use the new setting after updated EEPROM parameter.

2.5 MODULE CONFIGURATION

2.5.1 Mode Settings

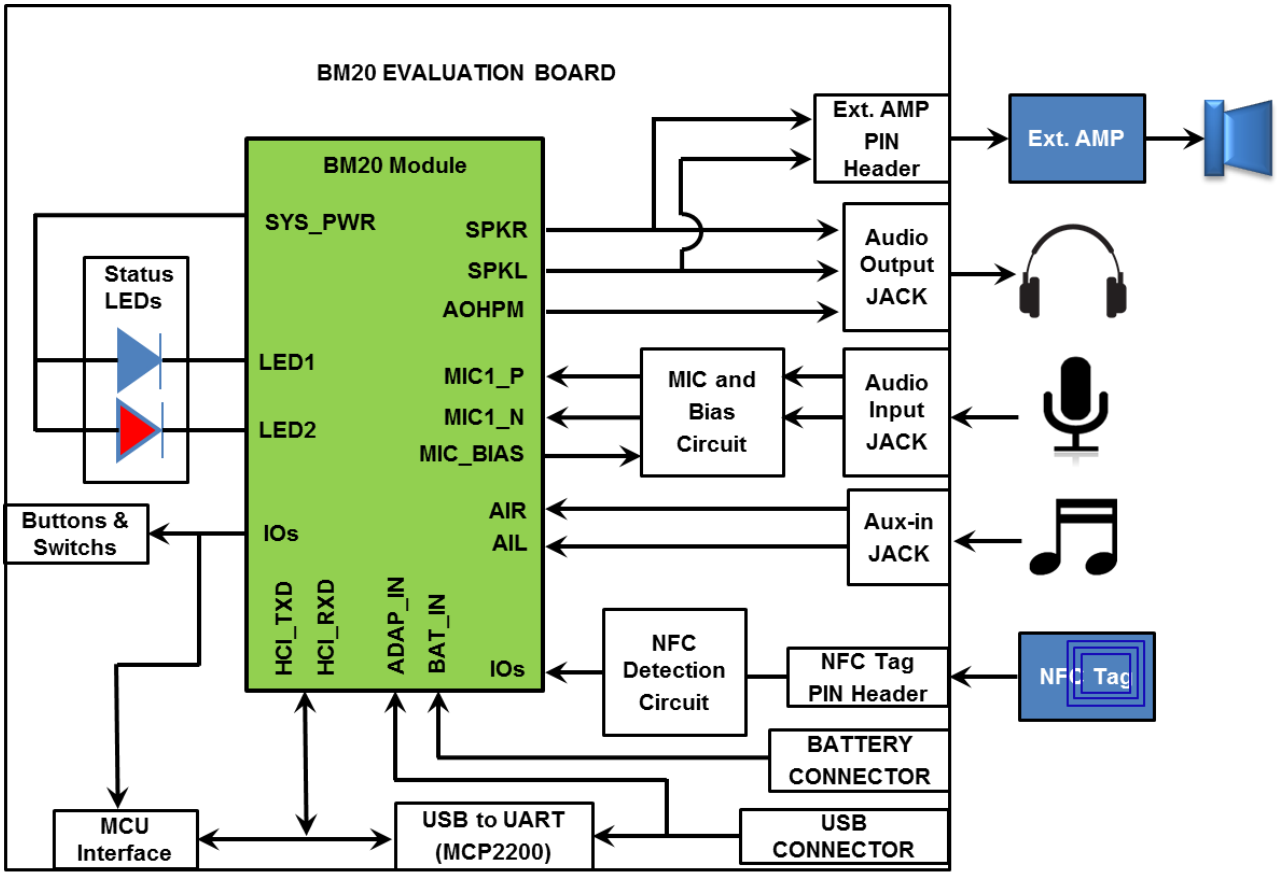
Setting in Mode Switch:

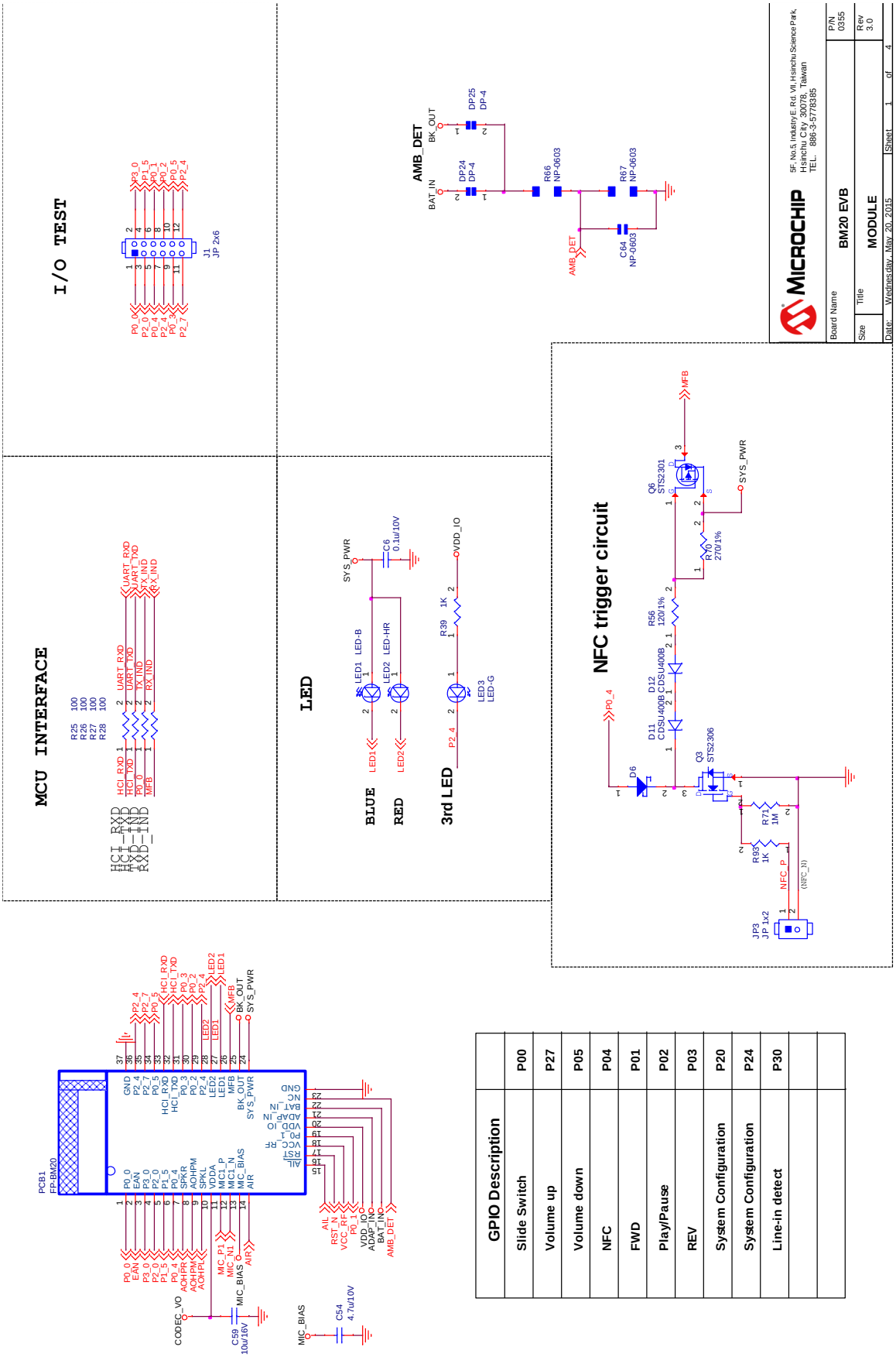
For ROM chip application

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)

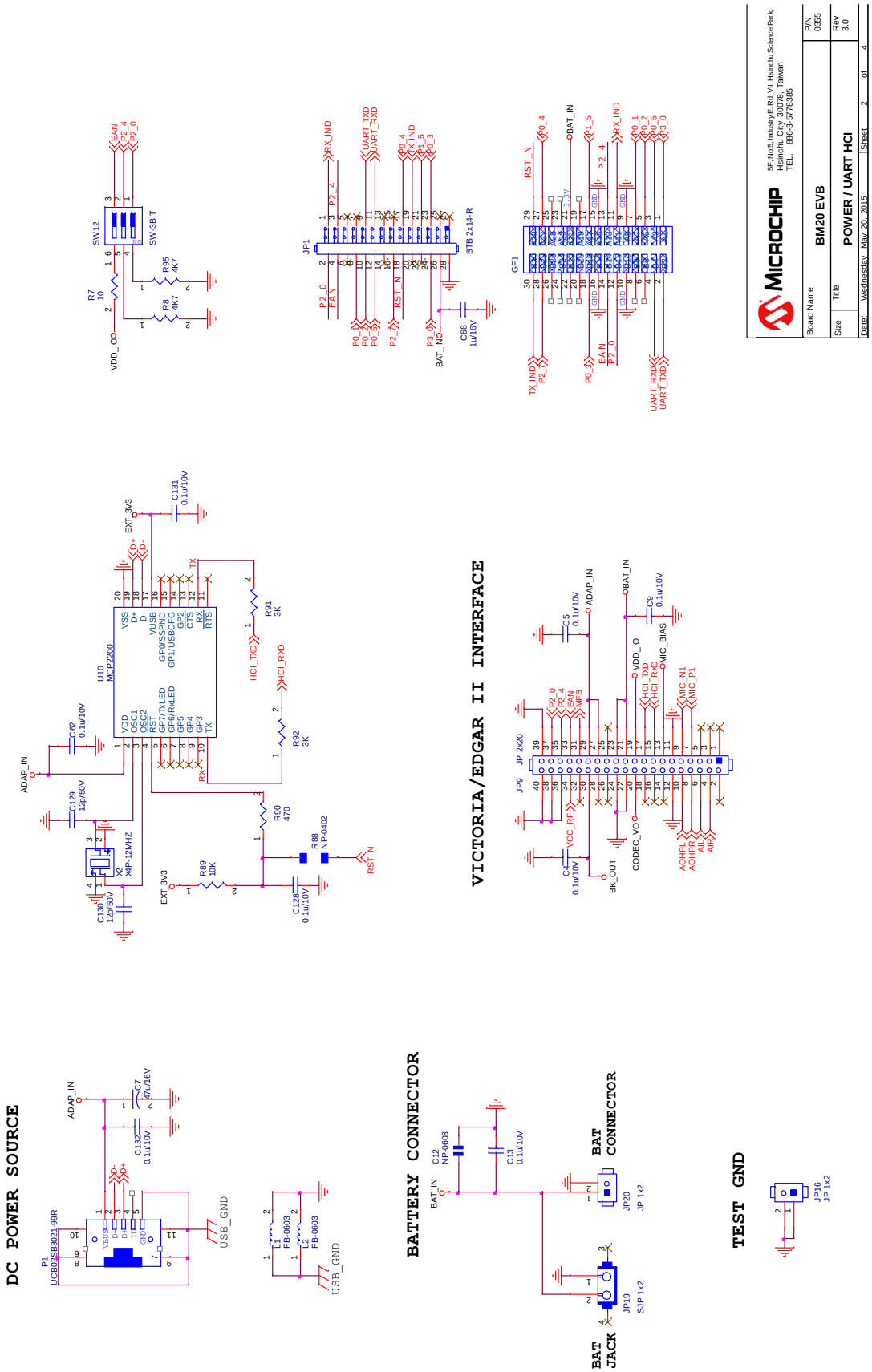
APPENDIX A. BM20 AUDIO EVALUATION BOARD SCHEMATICS

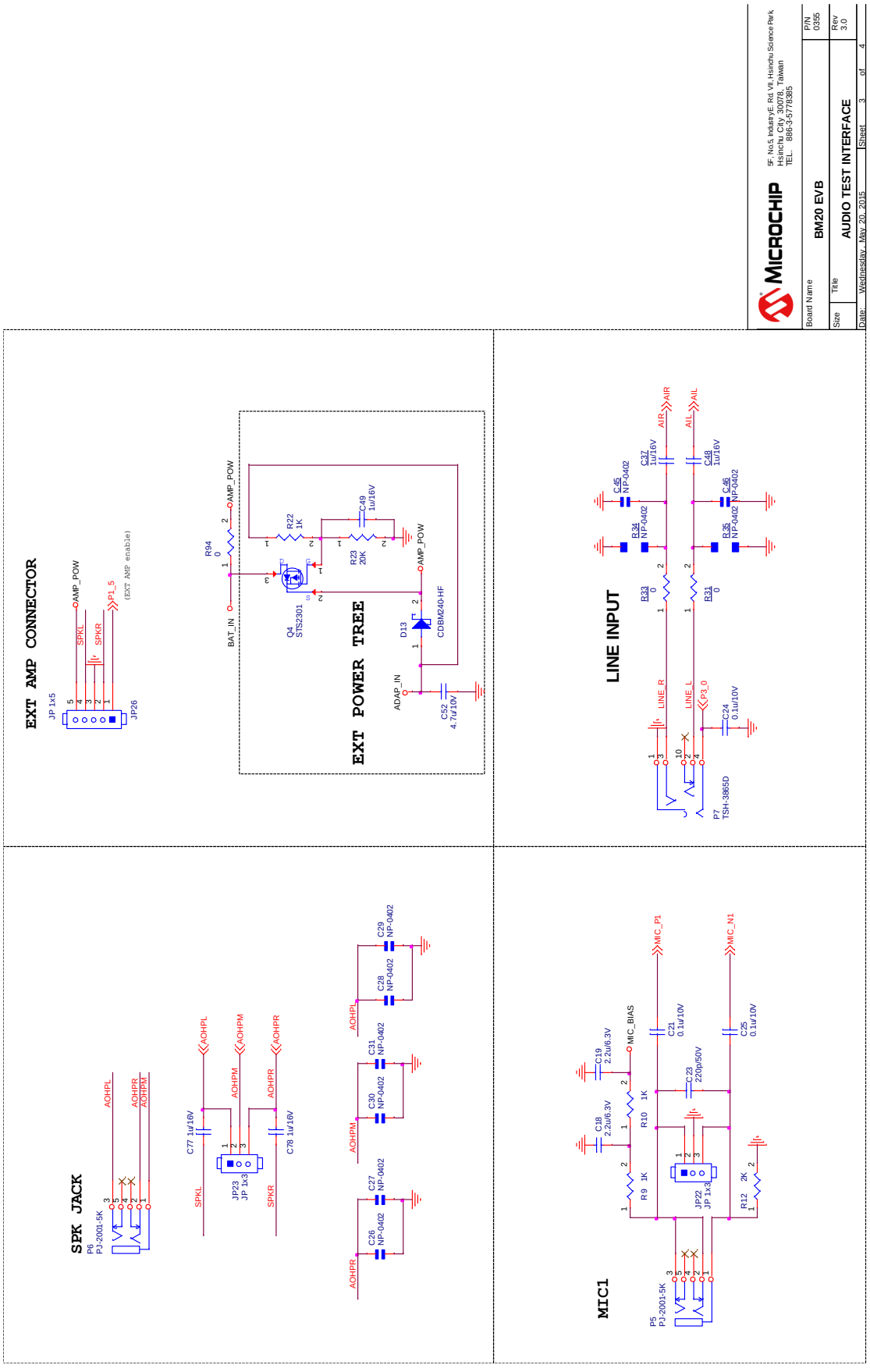
EVB block diagram

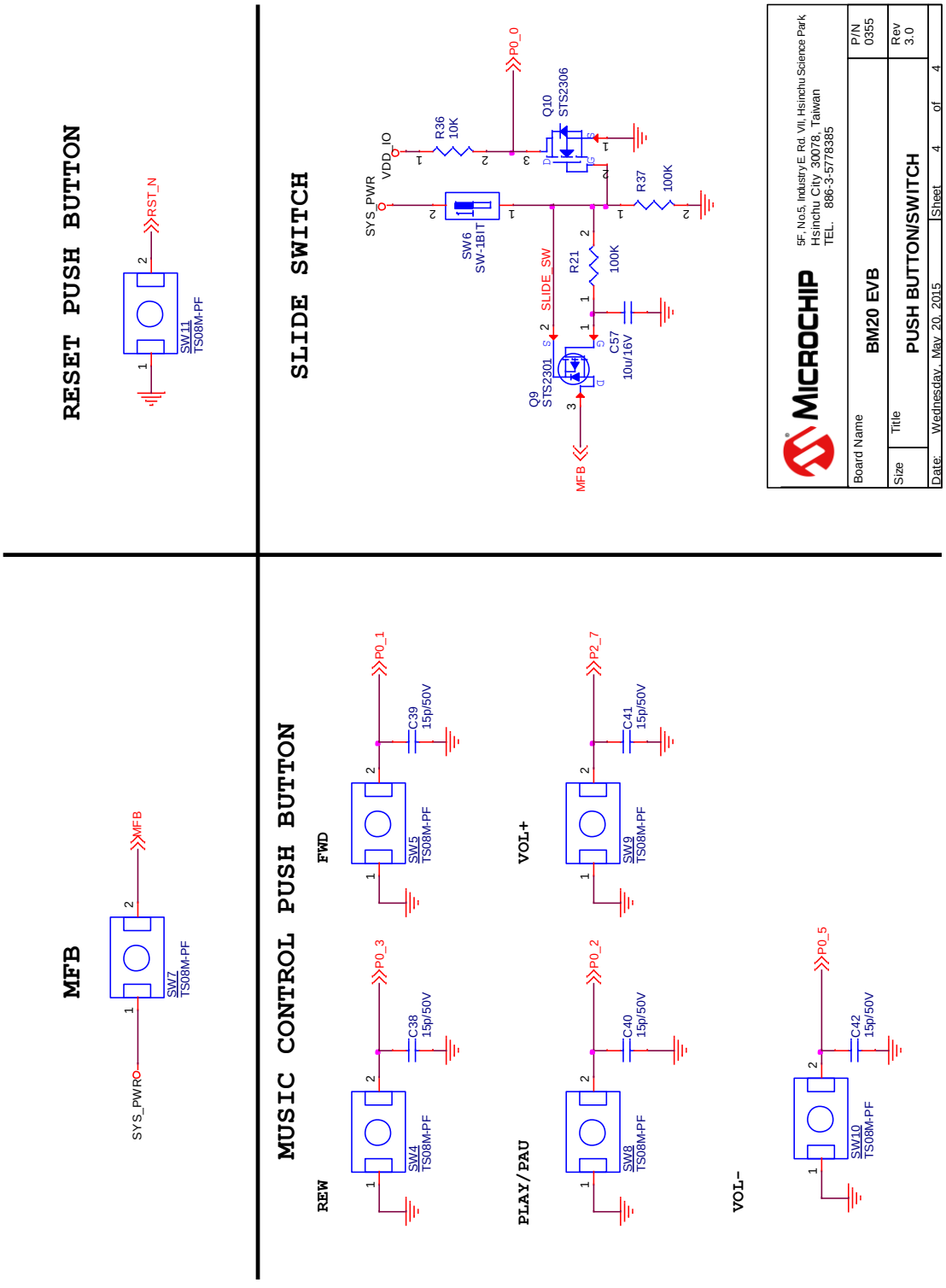




GPIO Description	
Slide Switch	P00
Volume up	P27
Volume down	P05
NFC	P04
FWD	P01
Play/Pause	P02
REV	P03
System Configuration	P20
System Configuration	P24
Line-in detect	P30


MICROCHIP
5F, No.5, Industry E. Rd. VII, Hsinchu Science Park
Hsinchu City 30078, Taiwan
TEL: 886-3-5778385
Board Name
BM20 EVB
P/N
0365
Title
POWER / UART HCI
Rev
3.0
Size
Date
Wednesday, May 20, 2015
Sheet
2
of
4
SW12
SW-3BIT
R7
10
R95
4K7
R8
4K7
VDD_IO
EAN
P2_4
P2_0
JP1
BTB 2x14-R
C68
1u/16V
BAT_IN
RX_IND
UART_TXD
UART_RXD
P0_4
P1_5
P0_3
P2_0
EAN
P0_1
P0_0
P2_7
RST_N
P3_0
GF1
RST_N
P0_4
BAT_IN
P1_5
P2_4
RX_IND
P0_1
P0_2
P0_5
P3_0
TX_IND
P2_7
P0_3
EAN
P2_0
UART_RXD
UART_TXD
U10
MCP2200
VSS
D+
D-
VUSB
GP0/SSPND
GP1/USBCFG
GP2
CTS
RX
RTS
VDD
OSC1
OSC2
RST
GP7/TxLED
GP6/RxLED
GP5
GP4
GP3
TX
C131
0.1u/10V
EXT_3V3
C62
0.1u/10V
ADAP_IN
C129
12p/50V
X4P-12MHZ
C130
12p/50V
R91
3K
R92
3K
R90
470
R89
10K
R88
NP-0402
RST_N
C128
0.1u/10V
HCI_TXD
HCI_RXD
VICTORIA/EDGAR II INTERFACE
JP9
JP 2x20
C5
0.1u/10V
ADAP_IN
C9
0.1u/10V
BAT_IN
C4
0.1u/10V
VCC_RF
BK_OUT
CODEC_VO
VDD_IO
MIC_BIAS
MIC_N1
MIC_P1
AOHPL
AOHPR
AIL
AIR
DC POWER SOURCE
P1
UCB02SB3021-99R
ADAP_IN
C7
47u/16V
C132
0.1u/10V
USB_GND
L1
FB-0603
L2
FB-0603
USB_GND
BATTERY CONNECTOR
BAT_IN
C12
NP-0603
C13
0.1u/10V
BAT
CONNECTOR
JP20
JP 1x2
BAT
JACK
JP19
SJP 1x2
TEST GND
JP16
JP 1x2

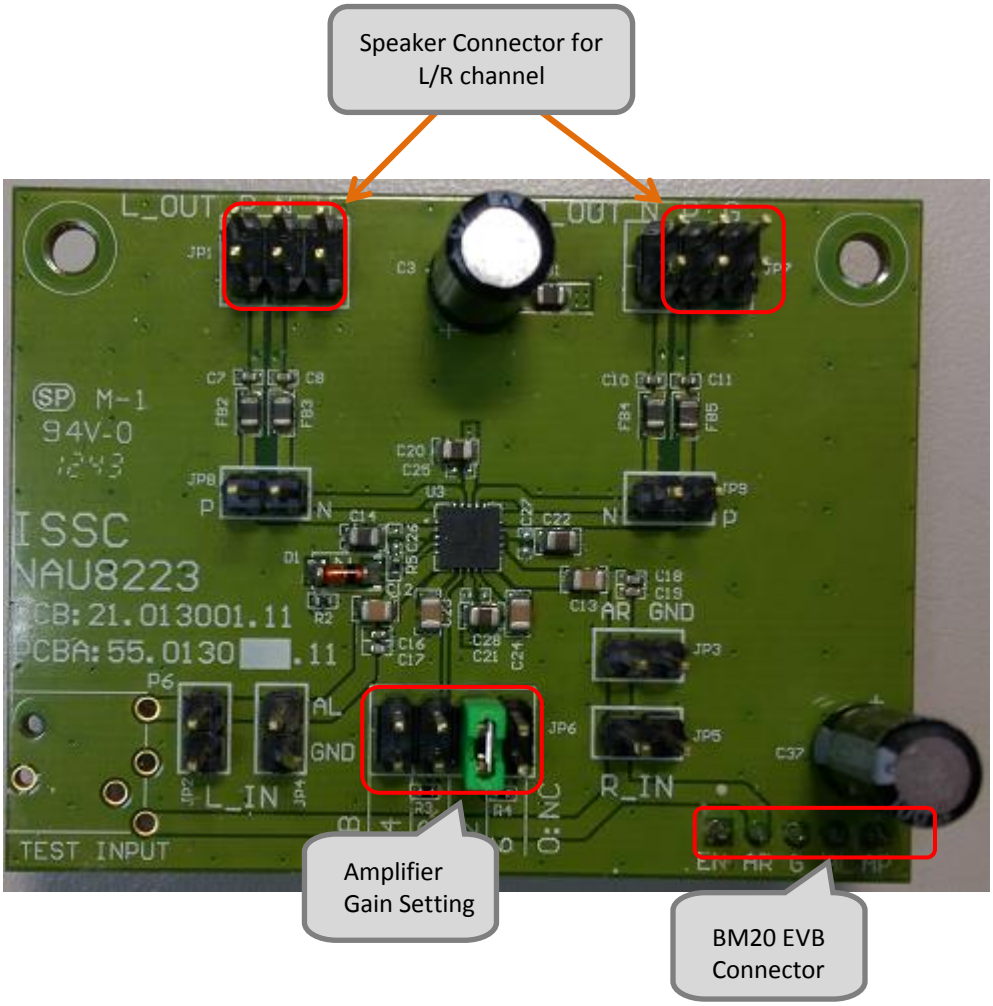

EXT AMP CONNECTOR
JP 1x5
AMP_POW
SPKL
SPKR
P1_5
(EXT AMP enable)
JP26
EXT POWER TREE
R94
0
AMP_POW
BAT_IN
R22
1K
C49
1u/16V
R23
20K
Q4
STS2301
D13
CDBM240-HF
ADAP_IN
C52
4.7u/10V
LINE INPUT
C45
NP-0402
C37
1u/16V
AIR
AIL
C48
1u/16V
C46
NP-0402
R34
NP-0402
R35
NP-0402
R33
0
R31
0
LINE_R
LINE_L
P3_0
C24
0.1u/10V
P7
TSH-3865D
SPK JACK
P6
PJ-2001-5K
AOHPL
AOHPR
AOHPM
C77 1u/16V
C78 1u/16V
JP23
JP 1x3
SPKL
SPKR
C29
NP-0402
C28
NP-0402
C31
NP-0402
C30
NP-0402
C27
NP-0402
C26
NP-0402
MIC1
P5
PJ-2001-5K
C18
2.2u/6.3V
C19
2.2u/6.3V
MIC_BIAS
R9
1K
R10
1K
C21
0.1u/10V
C23
220p/50V
JP22
JP 1x3
MIC_P1
MIC_N1
C25
0.1u/10V
R12
2K
MICROCHIP
5F, No.5, Industry E. Rd. VII, Hsinchu Science Park,
Hsinchu City, 30078, Taiwan
TEL: 886-3-5778385
Board Name
BM20 EVB
P/N
0355
Rev
3.0
Site
Title
AUDIO TEST INTERFACE
Date: Wednesday, May 20, 2015
Sheet 3 of 4


RESET PUSH BUTTON
RST_N
SW11
TS08M-PF
SLIDE SWITCH
P0_0
Q10
STS2306
VDD_IO
R36
10K
SYS_PWR
SW6
SW-1BIT
R37
100K
R21
100K
SLIDE_SW
Q9
STS2301
C57
10u/16V
MFB
MICROCHIP
5F, No.5, Industry E. Rd. VII, Hsinchu Science Park
Hsinchu City 30078, Taiwan
TEL: 886-3-5778385
Board Name
BM20 EVB
P/N
0355
Size
Title
PUSH BUTTON/SWITCH
Rev
3.0
Date:
Wednesday, May 20, 2015
Sheet
4
of
4
MFB
SYS_PWR
SW7
TS08M-PF
MUSIC CONTROL PUSH BUTTON
REW
P0_3
C38
15p/50V
SW4
TS08M-PF
FWD
P0_1
C39
15p/50V
SW5
TS08M-PF
PLAY/PAU
P0_2
C40
15p/50V
SW8
TS08M-PF
VOL+
P2_7
C41
15p/50V
SW9
TS08M-PF
VOL-
P0_5
C42
15p/50V
SW10
TS08M-PF

APPENDIX B. CLASS D AMPLIFIER DAUGHTER BOARD

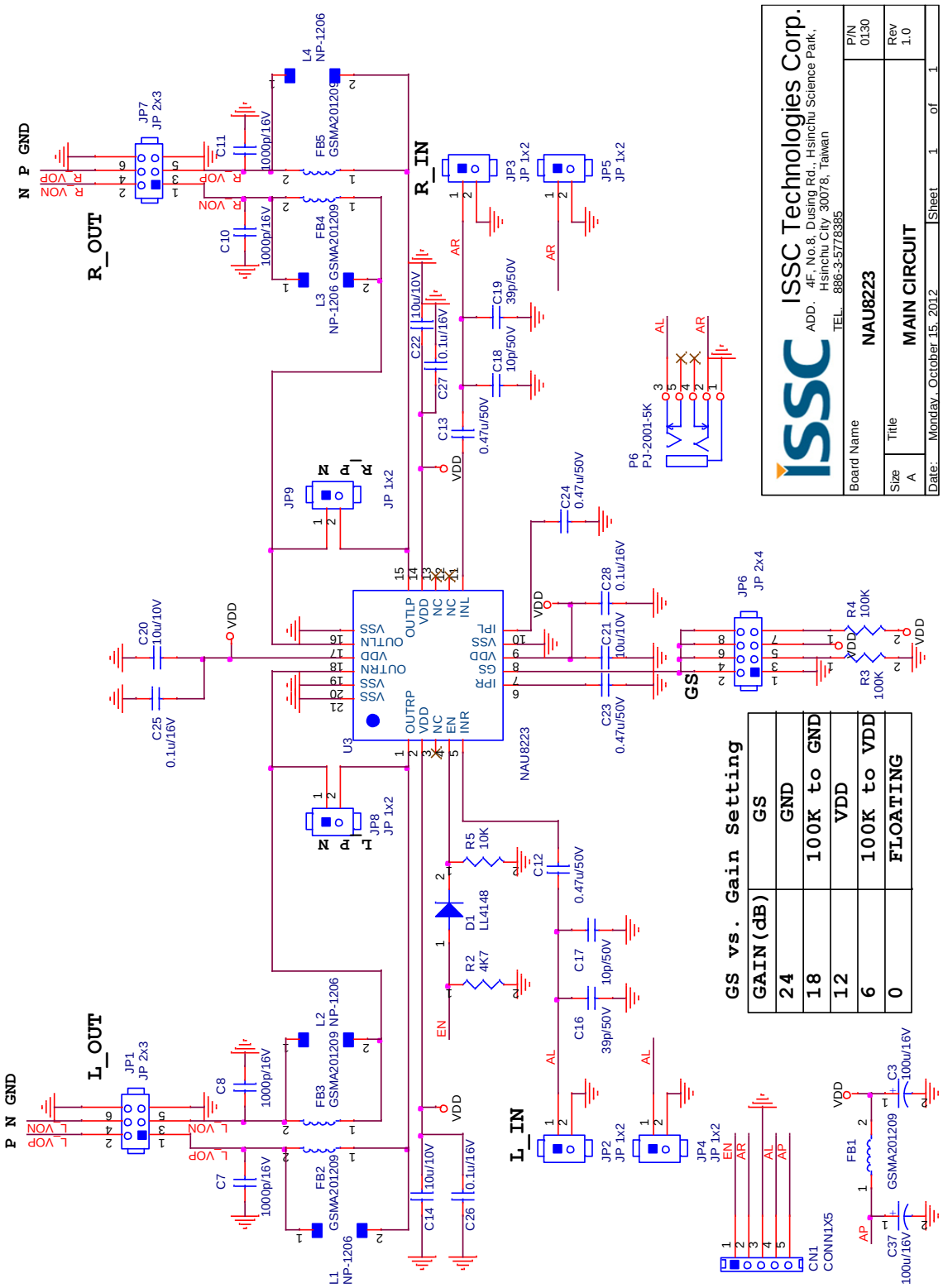
BM20 EVB reserves an interface (JP26) to connect with an external class D amplifier daughter board for speaker application demonstration.

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:


ISSC Technologies Corp.
ADD. 4F, No.8, Dusing Rd., Hsinchu Science Park, Hsinchu City 30078, Taiwan
TEL. 886-3-5778385
Board Name NAU8223
P/N 0130
Rev 1.0
Size A
Title MAIN CIRCUIT
Date: Monday, October 15, 2012
Sheet 1 of 1
NAU8223
GS vs. Gain Setting
GAIN(dB) GS
24 GND
18 100K to GND
12 VDD
6 100K to VDD
0 FLOATING
R_OUT
L_OUT
R_IN
L_IN
P N GND
N P GND
R_P N
L_P N
GS