ISSC Technologies Corp.

BM90

Bluetooth® 3.0 Multi-Speaker Stereo Audio Module

Features

System Specification

- Compliant with Bluetooth Specification v.3.0 + EDR in 2.4 GHz ISM band module
- It supports following profiles :
  - Hands Free 1.5
  - Headset 1.0
  - A2DP 1.0
  - AVRCP 1.0

Baseband Hardware

- Built-in 16MHz main clock input.
- Built-in internal ROM for program memory
- Support to connect to two hosts (phones, tablets…) with HFP or A2DP profiles simultaneously
- Adaptive Frequency Hopping (AFH) avoids occupied RF channels
- Fast Connection supported

RF Hardware

- Fully Bluetooth 3.0 + EDR system in 2.4 GHz ISM band.
- Combined TX/RX RF terminal simplifies external matching and reduces external antenna switches.
- Max. +4dBm output power with 20 dB level control from register control.
- Built-in T/R switch for Class 2/3 application
- To avoid temperature variation, temperature sensor with temperature calibration is utilized into bias current and gain control.
- Fully integrated synthesizer has been created. There requires no external VCO, varactor diode, resonator and loop filter.
- Crystal oscillation with built-in digital trimming for temperature/process variations.
- Built-in PCB antenna.

Audio processor

- Support A-Law or μ-Law PCM format, or CVSD (Continuous Variable Slope Delta Modulation) for SCO channel operation.
- Noise suppression
- Echo suppression
- SBC decoding
- Packet loss concealment
- Build-in one languages (English) voice prompts and 20 events for each one
- Support SCMS-T

Audio Codec

- 16 bit DAC and 16 bit ADC codec
- 94dB SNR DAC playback
- 85 dB SNR ADC.

Peripherals

- Built-in Lithium-ion battery charger (up to 350mA)
- Integrate 3V, 1.8V configurable switching regulator and LDO
- Built-in ADC for battery monitor and voltage sense.
- A line-in port for external audio input
- Two LED drivers
- Built-in 32Kb EEPROM

Flexible HCI interface

- High speed HCI-UART (Universal Asynchronous Receiver Transmitter) interface (up to 921600bps)

Package

- 15x29mm² 40 pins package

Description

BM90 multi-speaker stereo audio module is a compact, highly integrated module for Bluetooth v3.0 with Enhanced Data Rate 2.4GHz applications. This module is fully compliant with Bluetooth specification and completely backward-compatible with Bluetooth 2.0 or 1.2 systems.

It incorporates IS1690S multi-speaker stereo audio chip, 32Kb EEPROM, PCB antenna, and ISSC's own Bluetooth software stack to achieve the required BT v3.0 with EDR functions.

To provide the superior audio and voice quality, it also integrates a DSP co-processor, a PLL, and a CODEC dedicated for voice and audio applications.

For voice, not only basic CVSD encoding and decoding but also enhanced noise reduction and echo cancelation are implemented by the built-in DSP to reach the better quality in the both sending and receiving sides. For enhanced audio applications, SBC decoding functions can be also carried out by DSP to satisfy Bluetooth A2DP requirements.

In addition, to minimize the external components required for portable devices, a battery voltage sensor , battery charger, a switching regulator and LDO are integrated to reduce system BOM cost for various Bluetooth applications.

Applications

- Stereo headsets
- Portable speakerphones
- Multi speaker.

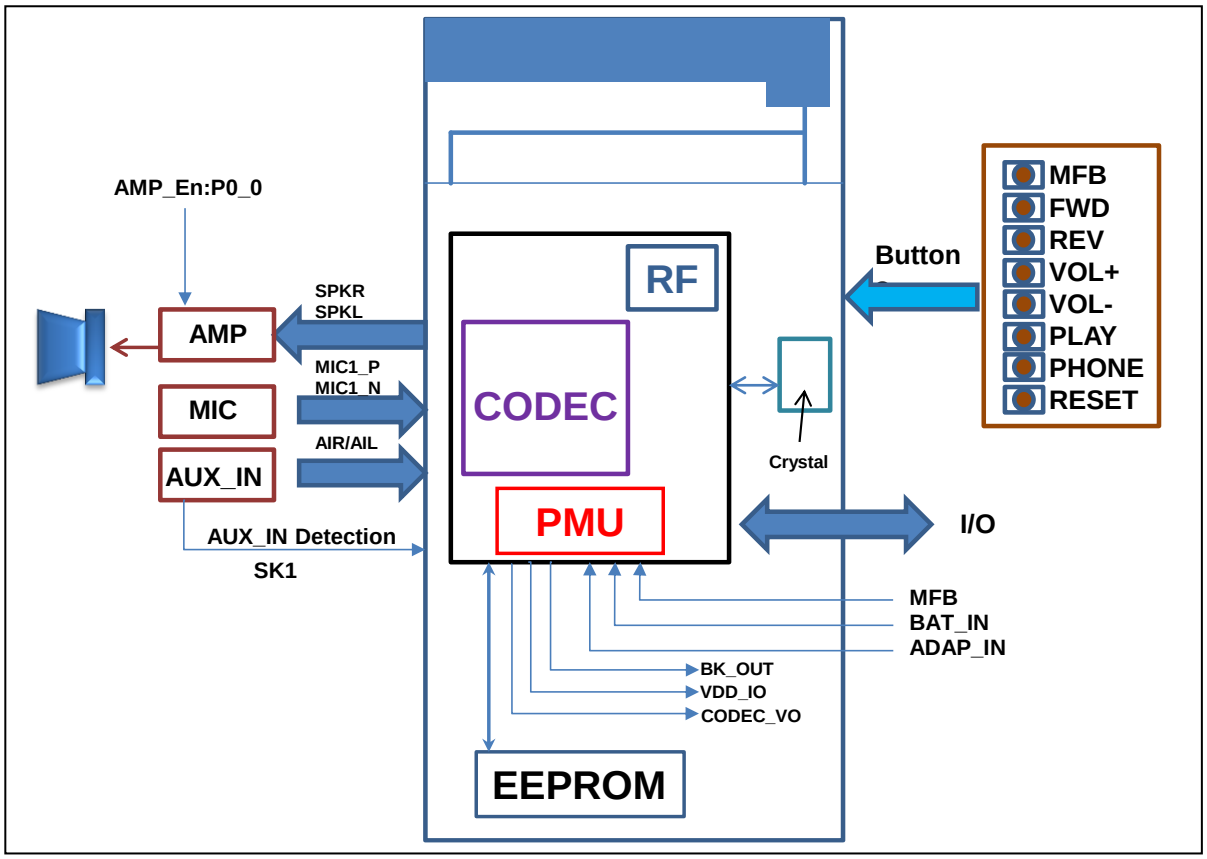
Table of Contents

Abbreviations List:
HFP: Hands-free Profile
AVRCP: Audio Video Remote Control Profile
A2DP: Advanced Audio Distribution Profile
PBAP: Phone Book Access Profile
HSP: Headset Profile
SPP: Serial Port Profile
NFC: Near Field Communication
SCMS-T:Serial Copy Management System

1.0 DEVICE OVERVIEW

BM90 multi-speaker stereo audio module integrate IS1690S multi-speaker stereo audio chip . Figure 1-1 shows the application block diagram.

FIGURE 1-1: APPLICATION BLOCK DIAGRAM



* PMU: Power Management Unit and all voltages generated internally.
* Aux in: analog line in signal.

Audio Interface

The module audio interface circuit consists of

- Stereo audio CODEC.
- One MIC. Input and Aux-in port
- Stereo outputs.

FIGURE 1-2: Analog audio interface block diagram

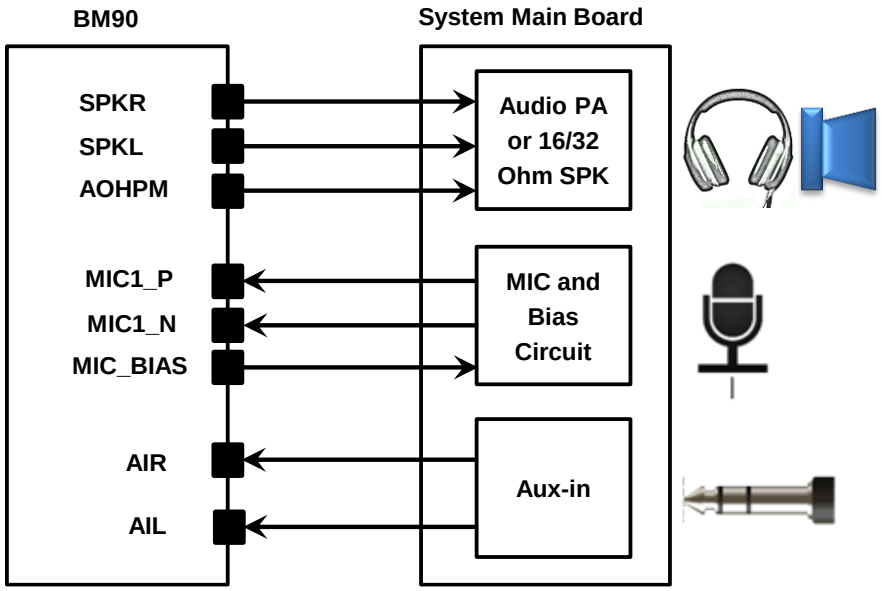
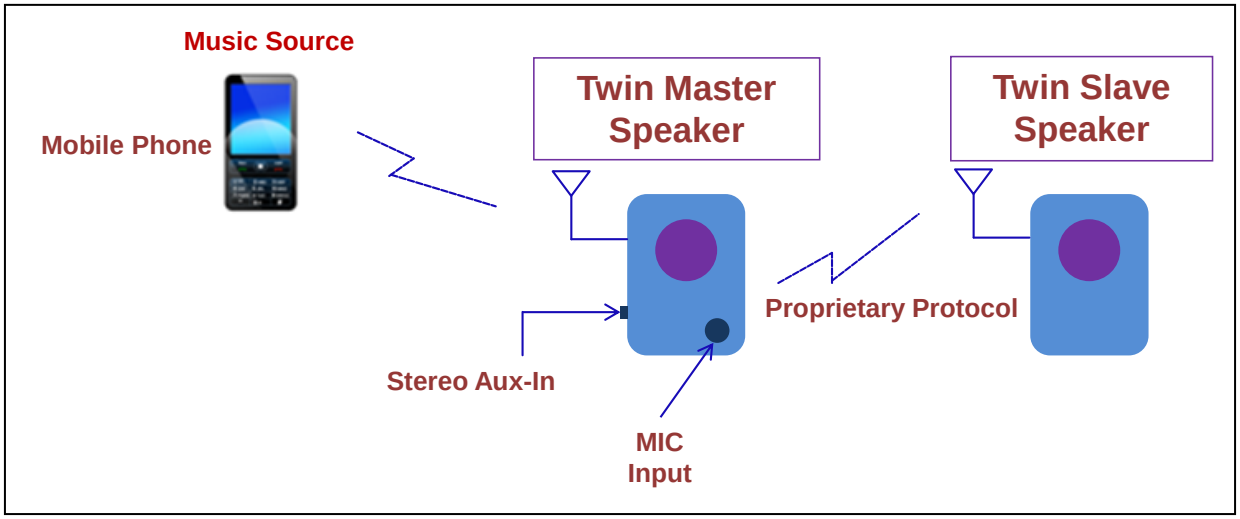


FIGURE 1-3: Twin Speaker Link block diagram



2.0 Key Features Table

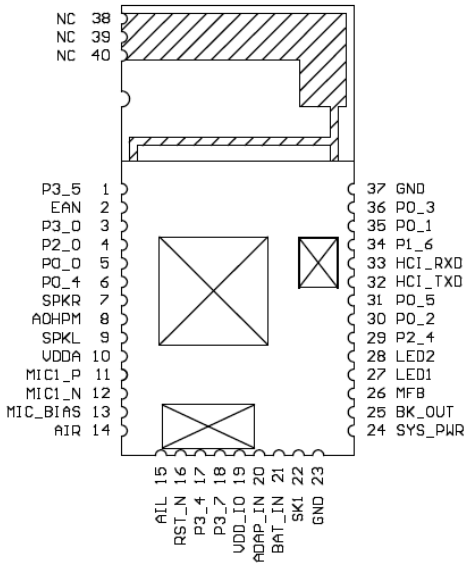
SPEC / Chip	BM90
Application	Multi-SPK
Stereo/Mono	Stereo
Pin count	40
Dimension (mm^2)	15X29
Audio DAC output	2-ch
DAC (cap-less) SNR@2.8V (dB)	-94
ADC SNR @2.8V (dB)	-85
I^2S digital interface	X
Analog aux-in	√
Mono MIC	1
Support external audio amplifier	√
Built-in class-D audio amplifier	X
UART	X
LED Driver	2
Internal DC-DC step-down regulator	√
DC 5V ADAPTER	√
Battery charger (350mA max)	√
IO for application	10
Switches support	6
Support NFC application	√
Voice prompt	√
Multi-tone	√
DSP sound effects	√
Built-in EEPROM	√
Profile	
A2DP	1.0
AVRCP	1.0
HFP	1.5
HSP	1.0
PBAP	X
SPP	X

√ :Support the feature

3.0 PIN DESCRIPTION

TABLE 3-1: BM90 PIN DESCRIPTION

Pin Diagram
(Top View)



Pin No.	Pin Type	Name	Description
1	I/O	P3_5	IO, default pull-high input Phone button
2	I	EAN	Embedded ROM/External Flash enable H: Embedded; L: External Flash
3	P	P3_0	IO, default pull-high input Low: N_SPK Role Master/Slave
4	I/O	P2_0	IO, default pull-high input System Configuration, H: Application L: Baseband(IBDK Mode)
5	I/O	P0_0	IO, default pull-high input . Audio amplifier enable
6	I/O	P0_4	IO, default pull-high input NFC
7	AO	SPKR	R-channel analog headphone output, for cap-less and single-ended application both
8	AO	AOHPM	Headphone common mode output/sense input. Cap-less application only.
9	AO	SPKL	L-channel analog headphone output, for cap-less and single-ended application both
10	AP	VDDA	Positive power supply/reference voltage for CODEC. Reserve for external cap to fine tune audio frequency response. Do not add external power to this pin.
11	AI	MIC1_P	Mic 1 mono differential analog positive input
12	AI	MIC1_N	Mic 1 mono differential analog negative input
13	AP	MIC_BIAS	Microphone biasing voltage

14	AI	AIR	Stereo analog aux in, R-channel
15	AI	AIL	Stereo analog aux in, L-channel
16	I/O	RST_N	System Reset Pin
17	I/O	P3_4	IO, default pull-high input. SLIDE SWITCH
18	I/O	P3_7	IO, default pull-high input. FWD button
19	P	VDD_IO	VDD_IO pin, for calibration only Do not add external power to this pin
20	P	ADAP_IN	Power adaptor DC 5V input
21	P	BAT_IN	Li-Ion Battery input, should be always connected even if the power is given on power Adaptor input.
22	I/O	SK1	Line-in detection
23	P	GND	Ground
24	P	SYS_PWR	System Power Output
25	P	BK_OUT	Buck feedback sense pin
26	P	MFB	Multi-Function Push Button key
27	P	LED1	LED Driver 1
28	P	LED2	LED Driver 2
29	I/O	P2_4	IO, default pull-high input. System Configuration, H: Boot Mode Low: N_SPK Role Master/Slave
30	I/O	P0_2	IO, default pull-high input. PLAY/PAUSE button
31	I/O	P0_5	IO, default pull-high input when system power on. After system power on, the IO function is by FW programming. REV button
32	O	HCI_TXD	HCI TX data
33	I	HXI_RXD	HCI RX data
34	I/O	P1_6	IO, default pull-high input. Volume down button
35	I/O	P0_1	IO, default pull-high input. Volume up button
36	I/O	P0_3	IO for 3rd LED optional.
37	P	GND	Ground.
38		NC	NC .
39		NC	NC .
40		NC	NC .

* I: signal input pin
*AI: analog signal input pin
* O: signal output pin
*AO: analog signal output pin
* I/O: signal input/output pin
* P: power pin
*AP: analog power pin

4.0 SPECIFICATIONS
4.1 SPECIFICATIONS

Table 4-1: Absolute Maximum Specifications

Symbol	Parameter	Min	Max	Unit
1V8	Digital core supply voltage	0	2.1	V
VCC_RF	RF supply voltage	0	2.1	V
SAR_VDD	SAR ADC supply voltage	0	2.1	V
VDDA/VDDAO	CODEC supply voltage	0	3.3	V
VDD_IO	I/O supply voltage	0	3.6	V
BK_VDD	BUCK supply voltage	0	4.3	V
3V1_IN	LDO Supply voltage	0	4.3	V
BAT_IN	Input voltage for battery	0	4.3	V
ADP_IN	Input voltage for adaptor	0	7.0	V
T_{STORE}	Storage temperature	-65	+150	ºC
$T_{OPERATION}$	Operation temperature	-20	+70	ºC

Table 4-2: Recommended operating condition

Symbol	Parameter	Min	Typical	Max	Unit
1V8	Digital core supply voltage	1.8	1.85	1.95	V
VDD_IO	I/O supply voltage	2.8	3.0	3.3	V
BAT_IN	Input voltage for battery	3	3.7	4.25	V
ADP_IN	Input voltage for adaptor	4.5	5	5.5	V

*Absolute and Recommended operating condition tables reflect typical usage for device.
*All these supply voltage are programmable by EEPROM parameters.

Table 4-3: Battery Charger

Parameter		Min	Typical	Max	Unit
Input Voltage		4.5	5.0	5.5	V
Battery trickle charge current (BAT_IN < trickle charge voltage threshold)			0.1C		mA
Maximum Battery Fast Charge Current Note: ENX2=0	Headroom > 0.7V (ADAP_IN=5V)	170	200	240	mA
	Headroom = 0.3V (ADAP_IN=4.5V)	160	180	240	mA
Maximum Battery Fast Charge Current Note: ENX2=1	Headroom > 0.7V (ADAP_IN=5V)	330	350	420	mA
	Headroom = 0.3V (ADAP_IN=4.5V)	180	220	270	mA
Trickle Charge Voltage Threshold			3		V
Float Voltage		4.158	4.2	4.242	V
Battery Charge Termination Current, (% of Fast Charge Current)			10		%

Note:
(1) C is set in EEPROM
(2) Headroom = $V_{ADAP\_IN} – V_{BAT}$
(3) ENX2 is not allowed to be enabled when $V_{ADAP\_IN} – V_{BAT} > 2V$
(4) The Li-Ion battery has operation temperature limiting condition which is depended on vender..
(5)These parameters are characterized but not tested in manufacturing.

Table 4-4: LED driver

Parameter	Min	Typical	Max	Unit
Open-drain Voltage			5.1	V
Open-drain Current			5.5	mA
Intensity Control		16		step
Current Step		0.35		mA
Power Down Open-drain Current			1	μA
Shutdown Current			1	μA

*Test condition: SAR_VDD=1.8V, temperature=25 ºC.
*These parameters are characterized but not tested in manufacturing.

Table 4-5: Digital IO

Parameters	MIN	TYP	MAX	Unit
Input Voltage	2.7	3	3.6	V
V_{IH} (Input High Voltage)	2.0		Vdd	V
V_{IL} (Input Low Voltage)	0		0.8	V
Input Reference Resistor				
R_{PU} (Pull-Up Resistor)		50K		Ohm
R_{PD} (Pull-Down Resistor)		50K		Ohm
Output Voltage				
V_{OH} (Output High Voltage)	2.4		Vdd	V
V_{OL} (Output Low Voltage)	0		0.4	V

*These parameters are characterized but not tested in manufacturing.

Table 4-6: Audio codec Digital to Analogue Converter

T= 25°C, VDDA/VDDAO=2.8V, 1KHz sine wave input, Bandwidth = 20~20KHz					
Parameter (Condition)		**Min.**	**Typ.**	**Max.**	**Unit**
Over-sampling rate			128		f_s
Resolution			16		Bits
Output Sample Rate		8		48	KHz
Signal to Noise Ratio **Note: 1** (SNR @line-load) for 48kHz			94		dB
Signal to Noise Ratio (SNR @earphone load 16Ω load, 0dBFS input relative to digital silence)				94	dB
Digital Gain		-54		0	dB
Analog Gain		-28		3	dB
Analog Gain Resolution			1		dB
Output Voltage Full-scale Swing (AVDD=2.8V)			792		mV rms
Maximum Output Power (16Ω load)			34		mW
Maximum Output Power (32Ω load)			17		mW
Allowed Load	Resistive	8	16	O.C.	Ω
	Capacitive			500	pF
THD+N (16Ω load)				0.05	%

Note:
(1) f_{in}=1KHz, B/W=20~20KHz, A-weighted, THD+N < 0.01%, 0dBFS signal, Load=100KΩ
(2) These parameters are characterized but not tested in manufacturing.
* O.C. : open circuit.

Table 4-7: Audio codec Analogue to Digital Converter

T= 25°C, VDDA/VDDAO=2.8V, 1KHz sine wave input, Bandwidth = 20~20KHz					
Parameter (Condition)		**Min.**	**Typ.**	**Max.**	**Unit**
Resolution				16	Bits
Output Sample Rate		8		48	KHz
Signal to Noise Ratio **Note: 1** (SNR @MIC or Line-in mode)	8KHz		85		dB
	44.1KHz/48KHz		85		
Digital Gain		-54		4.85	dB
MIC Boost Gain			20		
Analog Gain				26	dB
Input full-scale at maximum gain (differential)			4		mV rms
Input full-scale at minimum gain (differential)			800		mV rms
3dB bandwidth			20		KHz
Microphone mode (input impedance)			6	10	KΩ
THD+N (microphone input) @30mVrms input			0.04		%

Note:
(1) f_{in}=1KHz, B/W=20~20KHz, A-weighted, THD+N < 1%, 150mVpp input
(2)These parameters are characterized but not tested in manufacturing.

Table 4-8: Transmitter section for BDR

Parameter	Min	Typ	Max	Bluetooth specification	Unit
Maximum RF transmit power		3	4.0	-6 to 4	dBm
RF power control range		20		≥16	dB
20dB bandwidth for modulated carrier		900		≤1000	KHz

*****Test condition: VCC_RF= 1.8V, temperature=25 ºC.
*The RF Transmit power is calibrated during production using MP Tool software and MT8852 Bluetooth Test equipment.

Table 4-9: Transmitter section for EDR

	Min	Typ	Max	Bluetooth specification	Unit
Relative transmit power		-1.6		-4 to 1	dB

*****Test condition: VCC_RF= 1.8V, temperature=25 ºC.
*The RF Transmit power is calibrated during production using MP Tool software and MT8852 Bluetooth Test equipment.

Table 4-10: Receiver section for BDR

	Min	Typ	Max	Bluetooth specification	Unit
Sensitivity at 0.1% BER		-90		≤-70	dBm

*****Test condition: VCC_RF= 1.8V, temperature=25 ºC.

Table 4-11: Receiver section for EDR

	Modulation	Min	Typ	Max	Bluetooth specification	Unit
Sensitivity at 0.01% BER	π/4 DQPSK		-91		≤-70	dBm
	8DPSK		-83		≤-70	dBm

*****Test condition: VCC_RF= 1.8V, temperature=25 ºC.

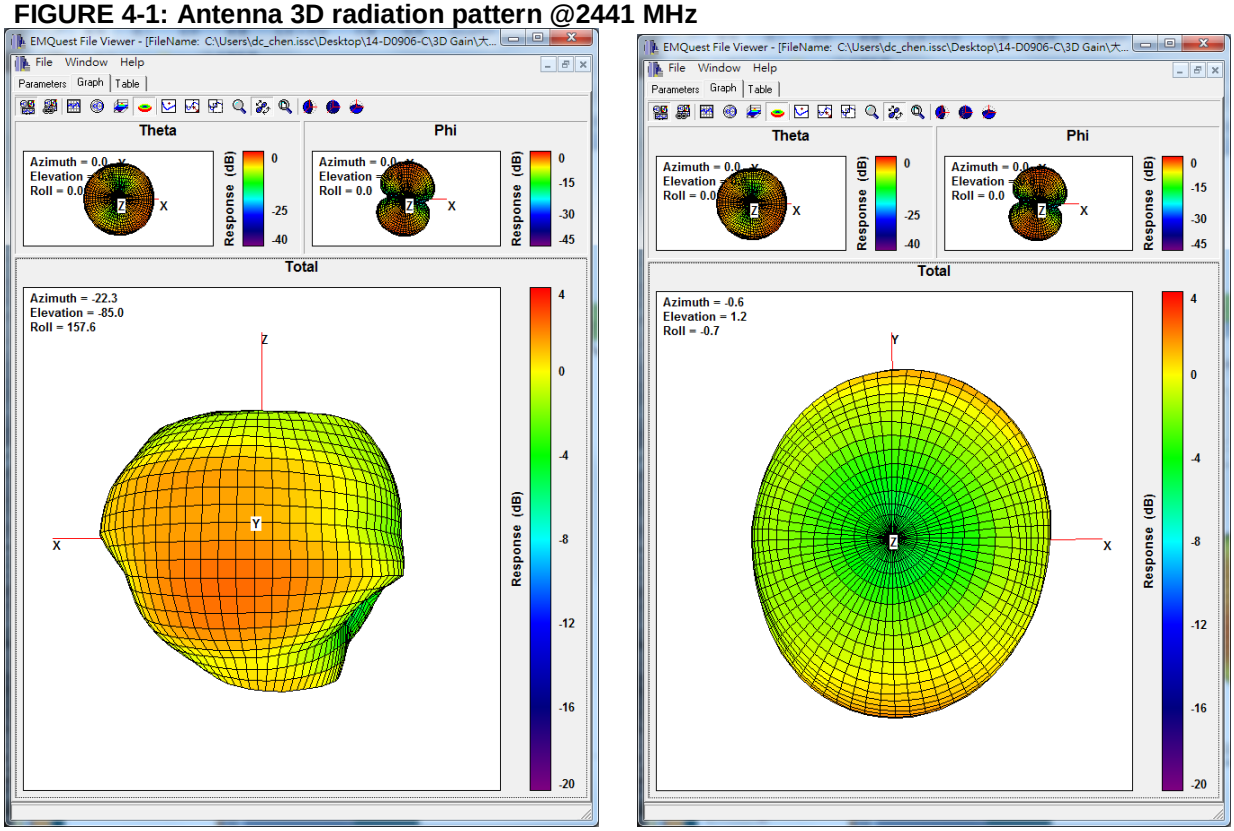
4.2 PRINTED ANTENNA PERFORMANCE

Table 4-12: Antenna Parameters

Parameters	MIN	TYP	MAX	Unit
Antenna gain		2		dBi
Efficiency	70		80	%

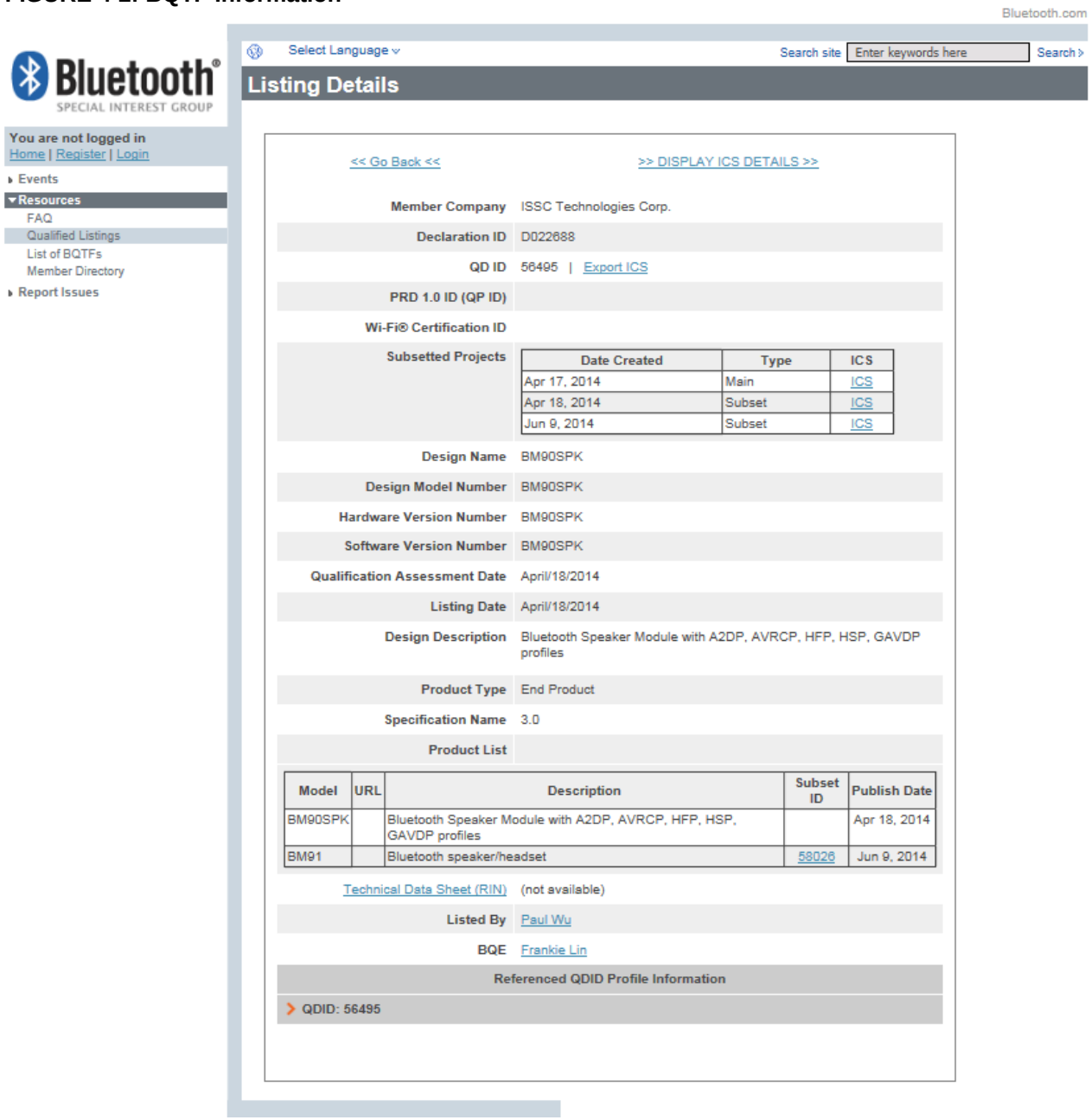
Note: The antenna gain and efficiency is measured on ISSC evaluation board, and will vary over PCB form factor and host PCB design. Therefore, it is recommended to verify the antenna performance on final host PCB..

FIGURE 4-1: Antenna 3D radiation pattern @2441 MHz



4.3 BQTF INFORMATION

FIGURE 4-2: BQTF Information



4.4 CURRENT CONSUMPTION

Table 4-13: Single Mode current consumption

Test Condition: T= 25°C, BAT_IN=3.8V, codec without loading				
Normal Operation	**Min**	**Typ**	**Max**	**Unit**
Off mode			10	uA
Standby mode		0.83		mA
Link mode		0.49		mA
SCO link		17.4		mA
A2DP link @ 1KHz Tone		23		mA

* For reference.

Table 4-14: Twin Mode: Master current consumption

Test Condition: T= 25°C, BAT_IN=3.8V, codec without loading				
	Min	**Typ**	**Max**	**Unit**
Off mode			10	uA
Standby mode		2		mA
Link mode		0.63		mA
SCO link		18.06		mA
A2DP link @ 1KHz Tone		27.8		mA

* For reference.

Table 4-15: Twin Mode: Slave current consumption

Test Condition: T= 25°C, BAT_IN=3.8V, codec without loading				
	Min	**Typ**	**Max**	**Unit**
Off mode			10	uA
Standby mode		0.75		mA
Link mode		0.7		mA
SCO link		9.4		mA
A2DP link @ 1KHz Tone		23.2		mA

* For reference.

5.0 APPLICATIONS
5.1 EXTERNAL CONFIGURATION

Figure 5-1 shows the configuration interface on BM90. It is recommended to include a pin header on the main PCB for development .
Configuration modes are entered accordingly to the system configuration I/O pins as shown in Table5-1
Pin 2_0 , P2_4 and EAN pin have internal pull-up.

FIGURE 5-1: External Configuration Header Connections

(Here is the interface connect example of the BM90)

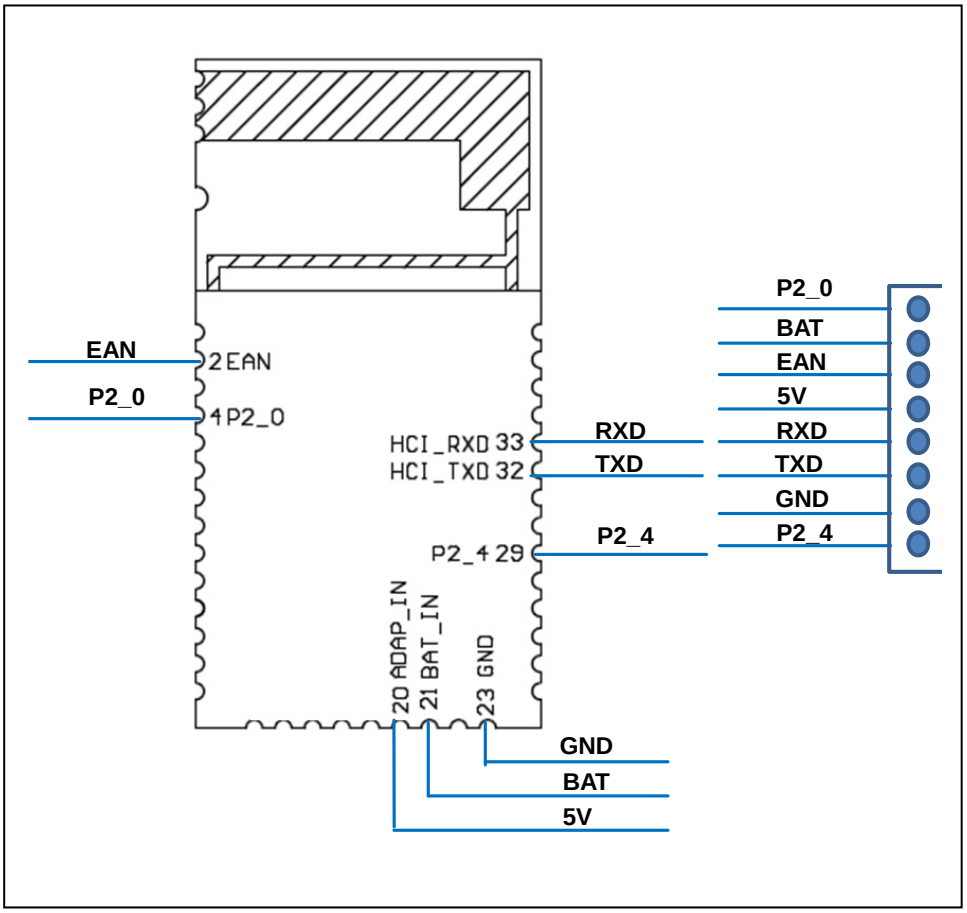
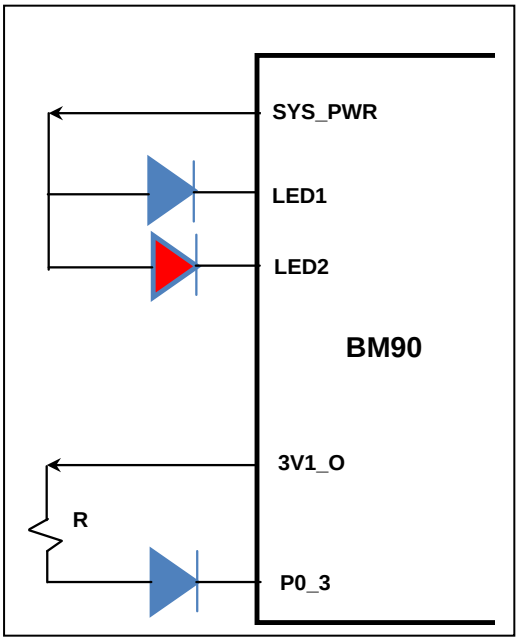


TABLE 5-1: SYSTEM CONFIGURATION SETTINGS

P2_0	P2_4	EAN	Operational Mode
High	High	High	Normal operation
Low	High	High	Test (Write EEPROM)
Low	Low	High	Write Flash (Firmware programming)

5.2 LED DRIVER

There are two dedicate LED drivers to control the LEDs. They provide enough sink current (16 step control and 0.35mA for each step) that LED can be connected directly with BM90. If the third LED is necessary, use P0_3 to light up LED, an external resistor to fine tune the driving current is necessary. Under this configuration, the power source must be VDD_IO, and the LED brightness could be adjusted by R(resister). When use P0_3 to light up LED, UI tool need to be modified, too.



5.3 FUNCTION OF PIN

BM90 audio chip provides six general purpose IOs for key functions. The corresponding key functions are saved in EEPROM. The first button must be power key. The power on/off functions only can be set on MFB pin. There are four different operations for every button. They are short click, long click, double click and combinations.

TABLE 5-2: IOs for Buttons

Button Name	Default Functions	IO name
Button 0	Power / MFB	PWR
Button 1	Volume UP	P0_1
Button 2	Volume DN	P1_6
Button 3	PLAY/PAUSE	P0_2
Button 4	REV	P0_5
Button 5	FWD	P3_7

Some signals were generated to indicate or control outside devices. The most popular applications are NFC for easy pairing, external audio amplifier for louder speaker.

TABLE 5-3: IOs for added functions

Functions	IO configurable features
Slide switch	P3_4
PHONE	P3_5
NFC detect	P0_4
External amplifier enable	P0_0
3rd LED	P0_3

5.4 Adaptive Frequency Hopping (AFH)

FW will scan and use background noise power to determine 20 channels to stand for good channels. Adaptive Frequency Hopping (AFH) avoids occupied RF channels

5.5 MULTI-SPEAKER

IS1690S is designed for stereo Bluetooth multi speaker & speaker phone application with stereo aux in input function.

5.5.1 TWIN SPEAKER LINK TECHNOLOGY INTRODUCTION

Twin Speaker can be configured as

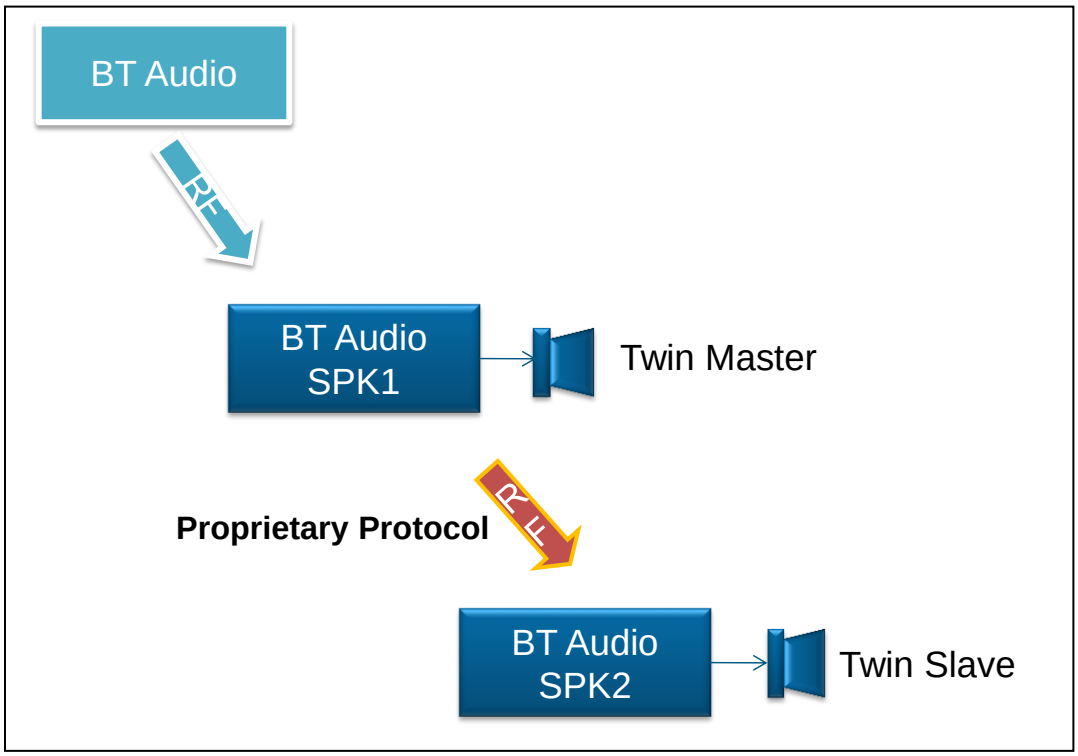
- Double Mode: Both Speakers output the mixed L and R channel.
- Stereo Mode: Both Speakers output the separated L and R channel

5.5.1.1 TWIN SPEAKER LINK

Figure 11-1 illustrates the concept of Twin Speaker link technology. In order to speed up the Twin Speaker link establishment and optimize the audio synchronization, Twin Speaker Link is a Bluetooth proprietary A2DP link between both Twin Master and Twin Slave Speakers.

- Twin_Master:
  - It can be setup the standard HF, A2DP and AVRCP link with host Bluetooth devices like mobile phone and Notebook.
  - It will also take the responsibility to setup proprietary A2DP link with the other Twin_Slave speaker.
  - Once the Twin Speaker Link is established, Twin_Master will redirect the A2DP media packets and control signaling to Twin_Slave Speaker.
  - Notice: The voice channel (SCO link) and HF operation can be executed by Twin_Master operating only.
- Twin_Slave:
  - It can only be operated with Twin_Master by proprietary A2DP protocol. It cannot be connected by standard A2DP protocol.
  - Once the Twin Speaker Link is established, it can feedback the specific status and event to Twin_Master. These status and events include button operation, low battery voltage, power off event etc.

Figure 5-2 A2DP Twin Speaker Link Diagram



5.6 Mounting Details

BM90 physical dimensions are shown in Figure 5-4. Figure 5-5 shows the recommended PCB footprint and the recommended module placement is shown in Figure 5-6. There should be no top copper layer near the test pin area shown in Figure 5-6. On the main PCB, the areas under the antenna should not contain any top, inner layer, or bottom copper. A PCB cut-out is recommended as shown in Figure 5-6. A low-impedance ground plane will ensure the best radio performance (best range, lowest noise). Figure 5-6 shows the minimum ground plane area to the left and right of the module for the best antenna performance. The ground plane can be extended beyond the minimum recommended as need for the main PCB EMC noise reduction. For the best range performance, keep all external metal structures away from the antenna by at least 15 mm.

5.7 Module Dimension

FIGURE 5-3: BM90 module

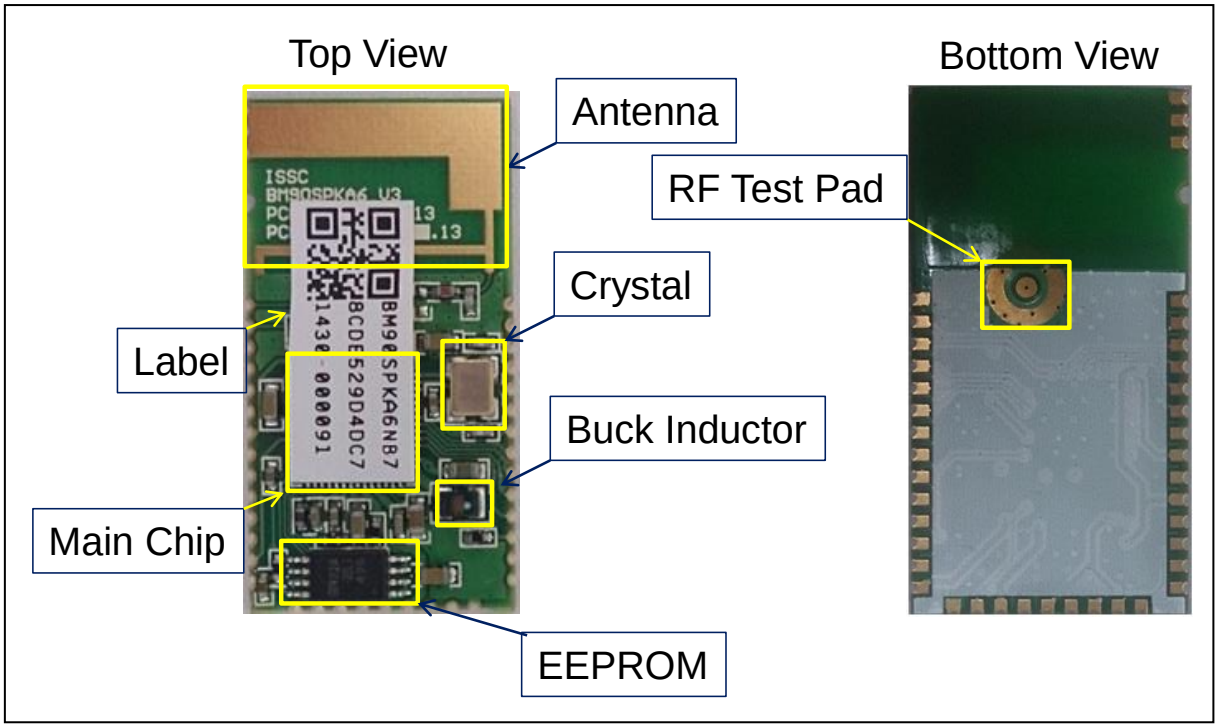
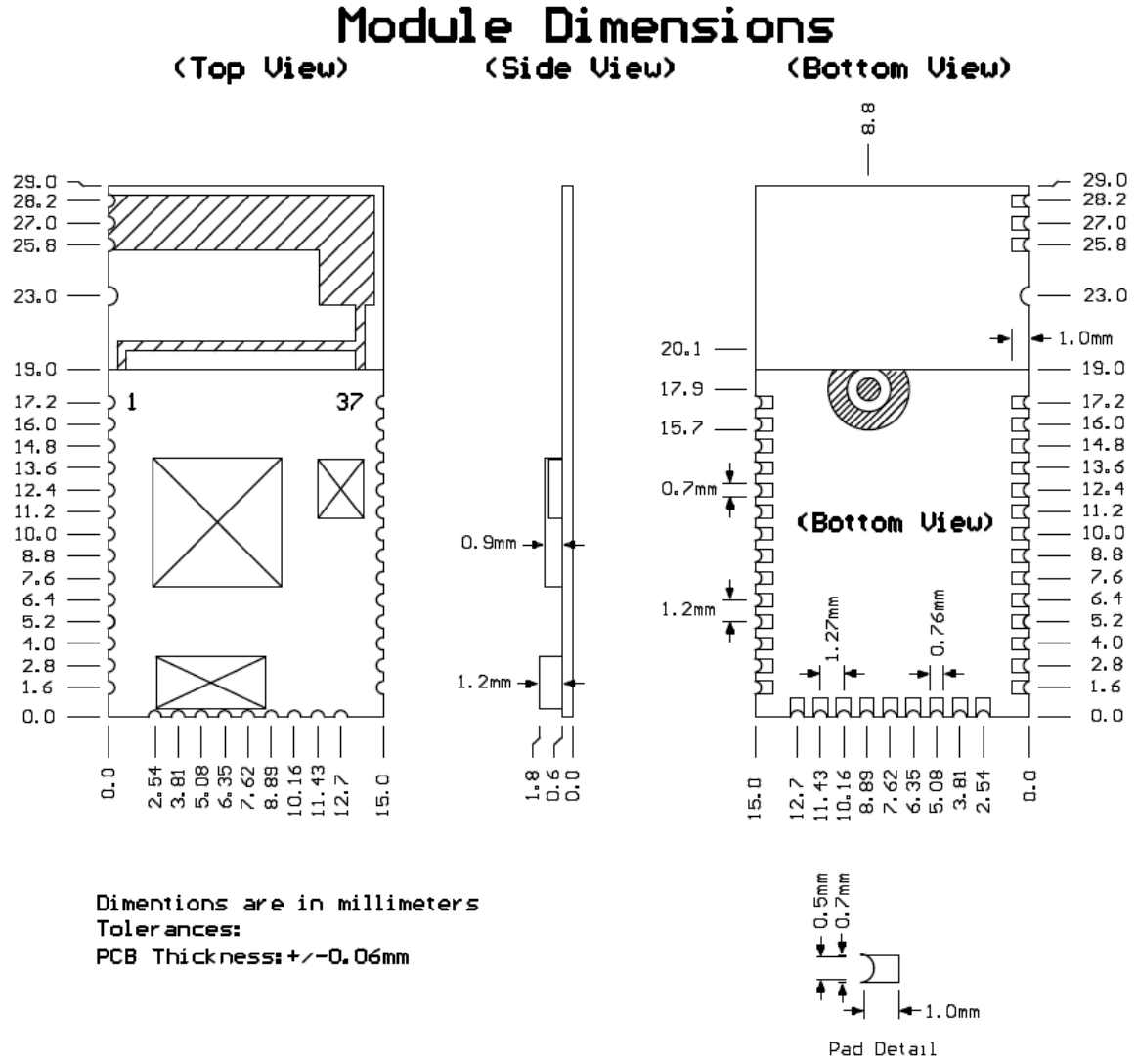


FIGURE 5-4: Outline Dimension



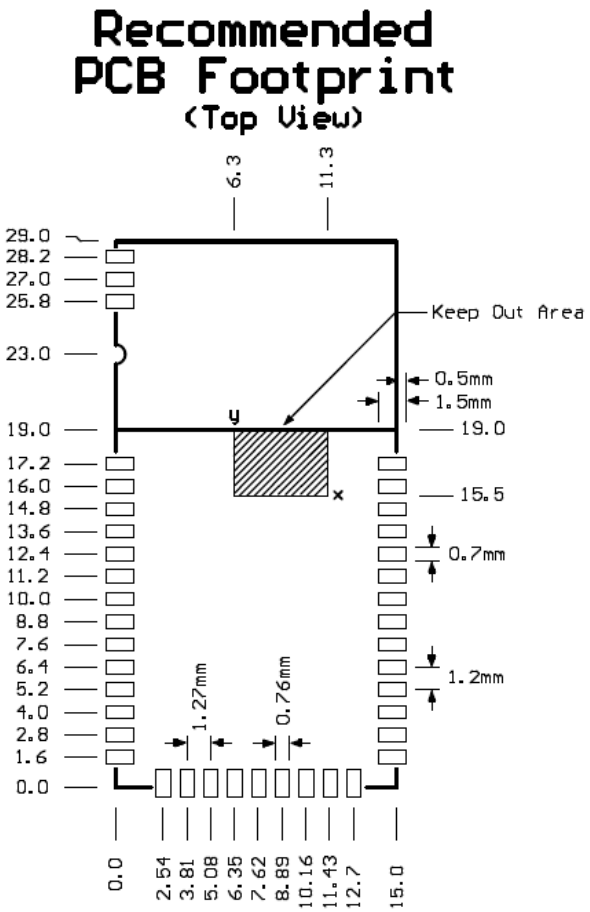
PCB dimension:

X : 15.1 mm

Y : 29.2 mm

Tolerances: 0.25 mm

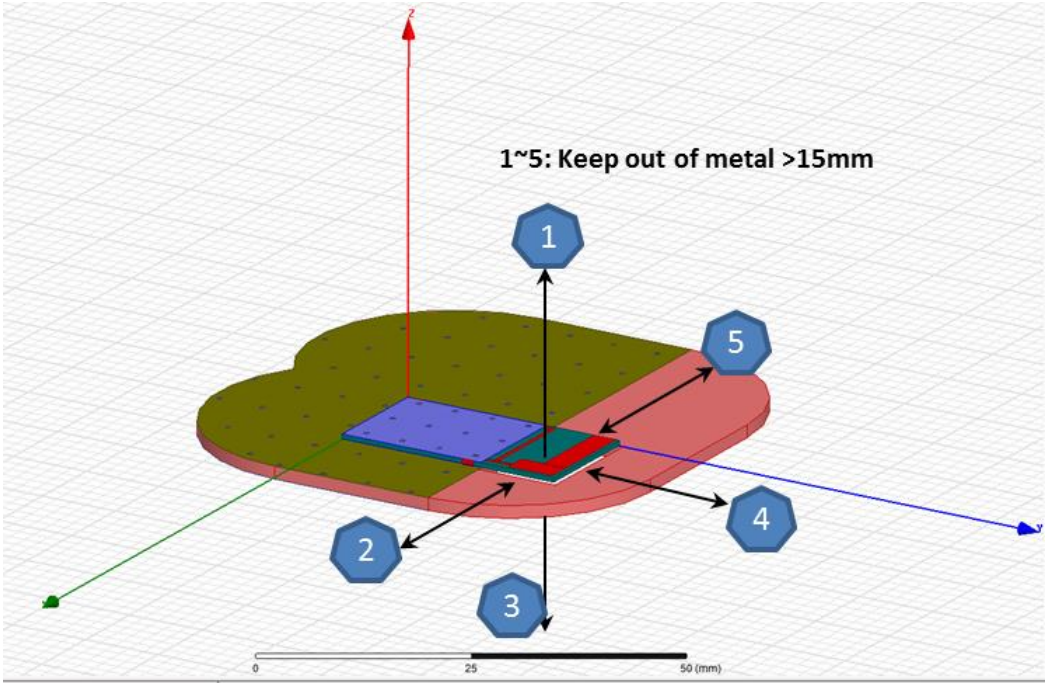
FIGURE 5-5: Module Foot print

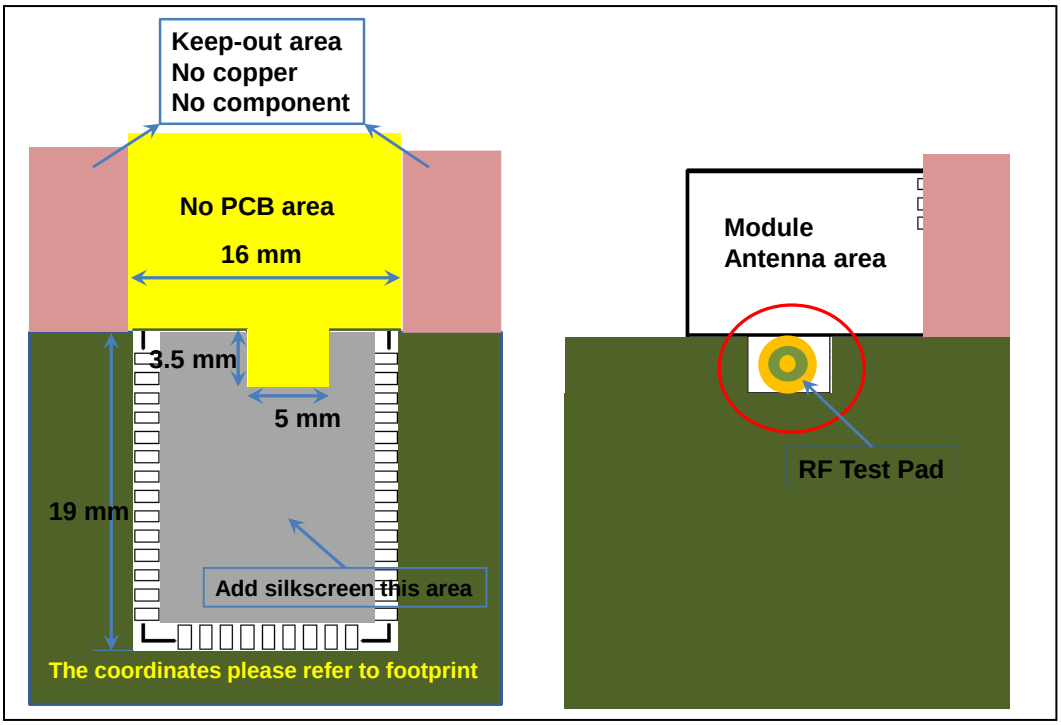


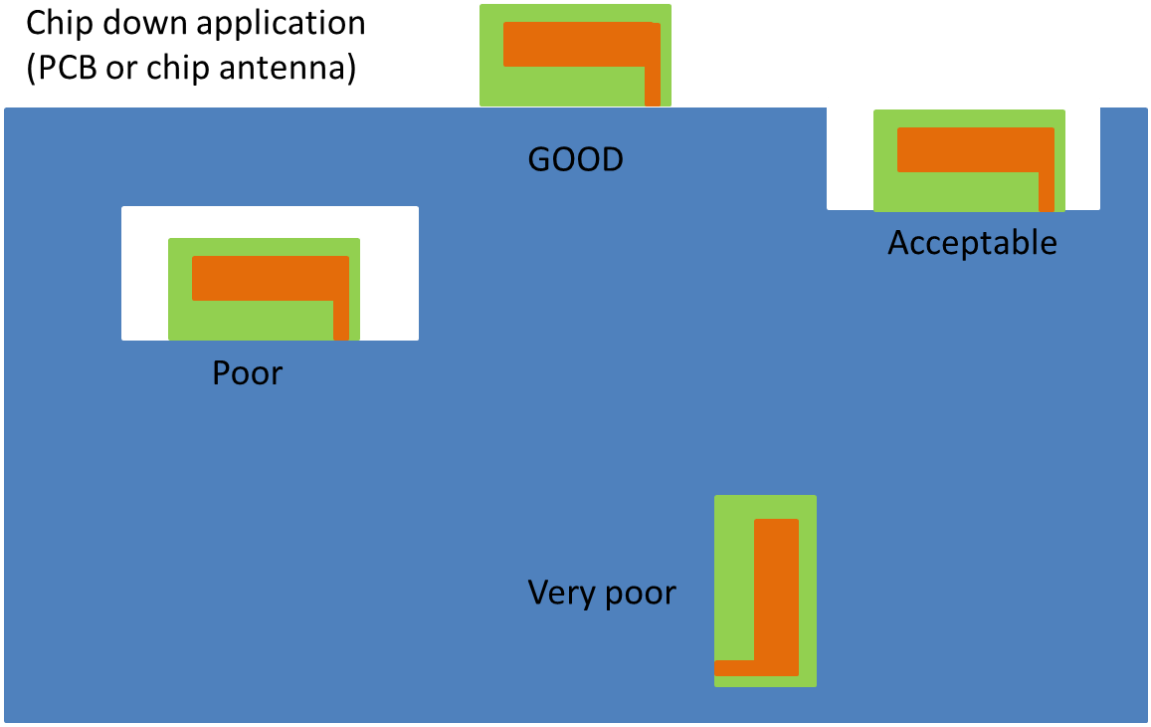
5.8 Main Board Antenna Area Layout Guide

Antenna keep out area is very important.

FIGURE 5-6: Mother Board Antenna Area Layout Guide







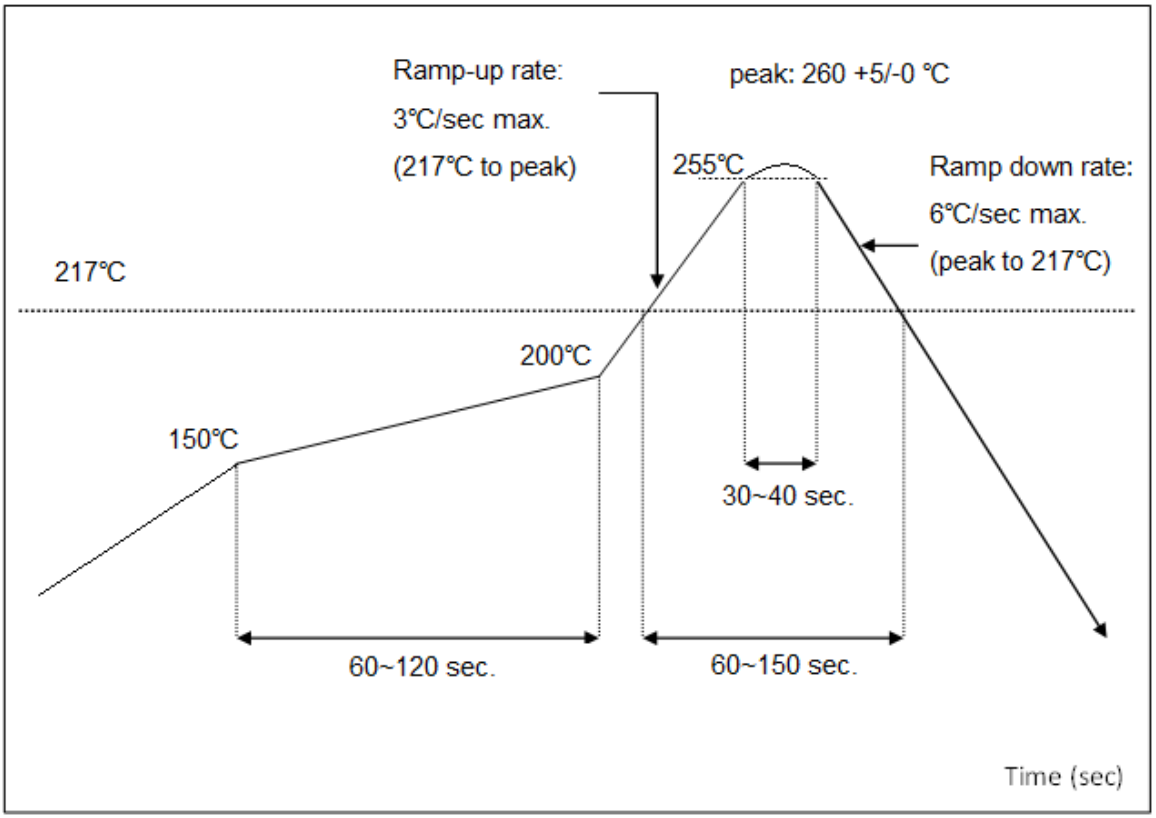
For more detail free space of antenna placement design, you can reference the design rule of antenna produce vendor.

5.9 RFLOW PROFILE

5.9.1Soldering Recommendations

Standard : IPC/JEDEC J-STD-020
Condition :
Preheat：150~200℃ 、60~120 seconds
Average ramp-up rate (217℃ to peak): 3℃/sec max.
Temperature maintained above 217℃ ：60~150 seconds
Time within 5℃ of peak temperature: 30 ~ 40 seconds.
Peak temperature：260 +5/-0 ℃
Ramp-down rate (peak to 217℃) : 6℃/sec. max.
Time 25℃ to peak temperature : 8 minutes max.
Cycle interval：5 minutes

FIGURE 5-7: Reflow profile



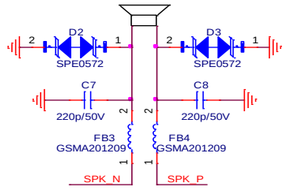
* For reference.

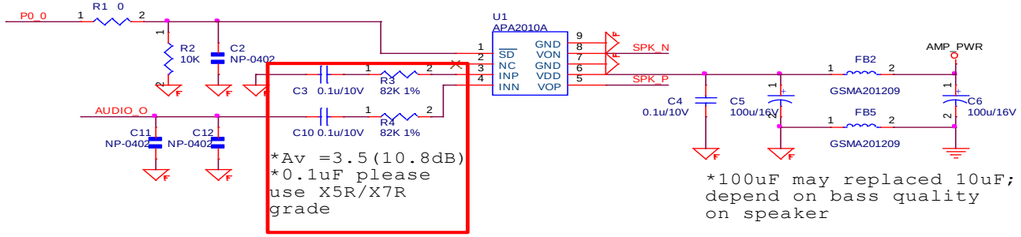
BM90 module was assembled using standard lead-free reflow profile IPC/JEDEC J-STD-020. The module can be soldered to the main PCB using standard leaded and lead-free solder reflow profiles. To avoid damaging of the module, the recommendations are listed as follows:

- Refer to Microchip Technology Application Note AN233 Solder Reflow Recommendation (DS00233) for the soldering reflow recommendations
- Refer to the solder paste data sheet for specific reflow profile recommendations
- Use no-clean flux solder paste
- Do not wash as moisture can be trapped under the shield
- Use only one flow. If the PCB requires multiple flows, apply the module on the final flow

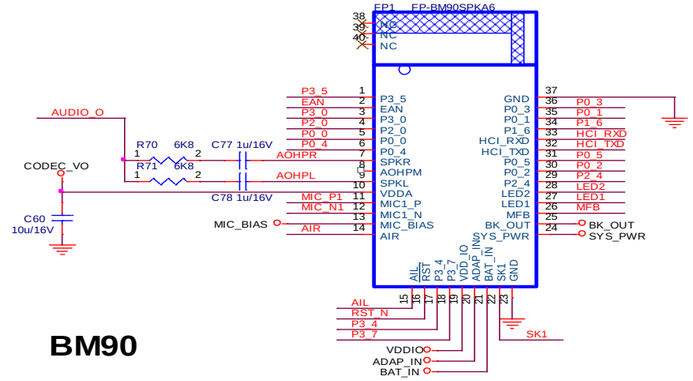
.

SPEAKER OUTPUT PATH



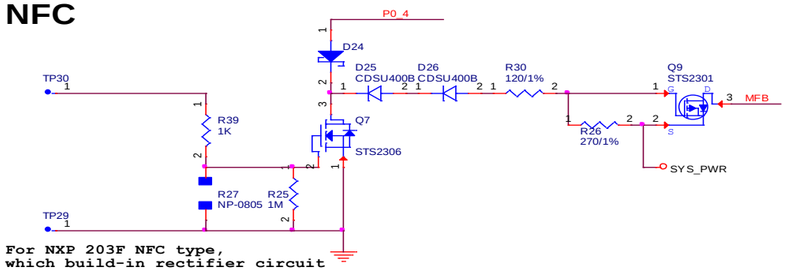


Single-ended input mode AMP

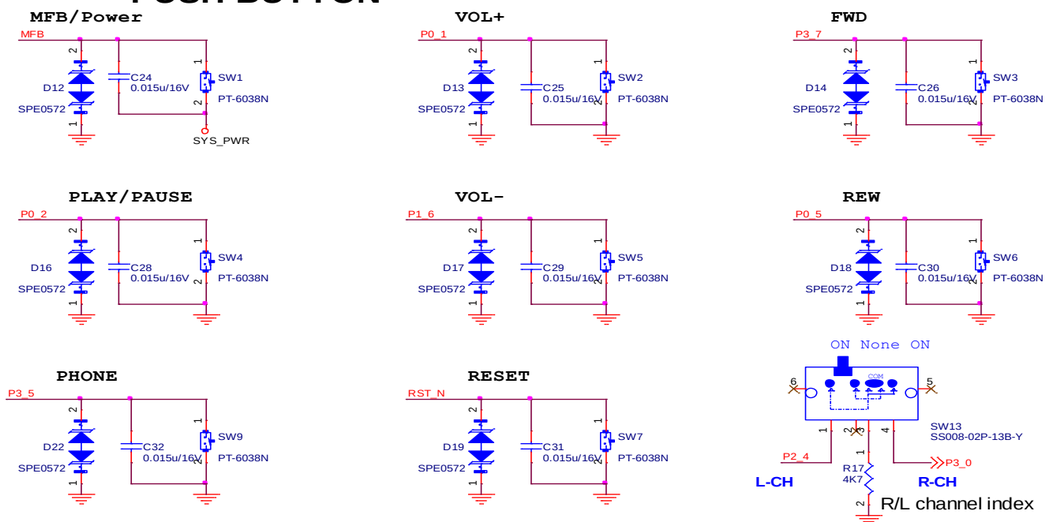


BM90

NFC

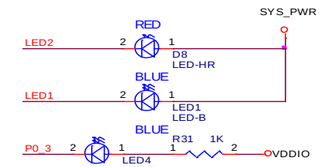


PUSH BUTTON

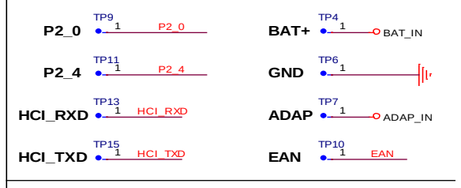


All ESD diodes in this schematics are reserved for testingand canbe removed if ESD can be pass without adding it.

LED



For FW/EEP update



Slide switch

POWER

AUX-IN

LINE-IN DETECTION

Line In Silence Detect

MIC

GPIO vs. APPLICATIO FUNCTION

P00	Audio AMP Enable
P01	Volume up
P02	Play/Pause
P03	3rd LED / DRC INDICATION
P04	NFC
P05	REW
P16	Volume down
P20	System Configuration
P24	System Configuration / N_SPK Role / L-CH
P30	N_SPK Role / R-CH
P34	SLIDE SWITCH
P37	FWD
P35	Phone
SK1	Line-in detection

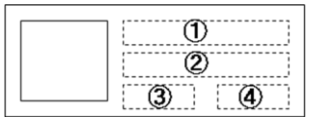
MICROCHIP
5F, No.5, Industry E. Rd.VII, Hsinchu Science Park,
Hsinchu City 30077, Taiwan
TEL. 886-3-5778385

Board Name	BM90 reference circuit	P/N ????
Size C	Title BM90 reference circuit	Rev 2.2
Date: Friday , March 06, 2015	Sheet 1 of 1	

7.0 PACKING INFORMATION

7.1 QR code label information

Label Size:15±1.5 mm *6±1.5 mm



①Device Name: BMxxxxxxxxxx (12digits)

②MAC ID: xxxxxxxxxxxx (12 digits)

③Date Code: xxxx (4 digits)

④Customer Code No: xxxxxx (6 digits)

Customer Part No example: BM90SPKA6NBB-C58096

↓ ↓

Device Name Customer code no.

Module Weight

(Test condition: module with QR label)

0.95g ± 10%

7.2 Storage standard

1. Calculated shelf life in sealed bag: 24 months at < 40 ℃ and <90% relative humidity (RH)
2. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be Mounted within 168 hours of factory conditions <30℃/60% RH

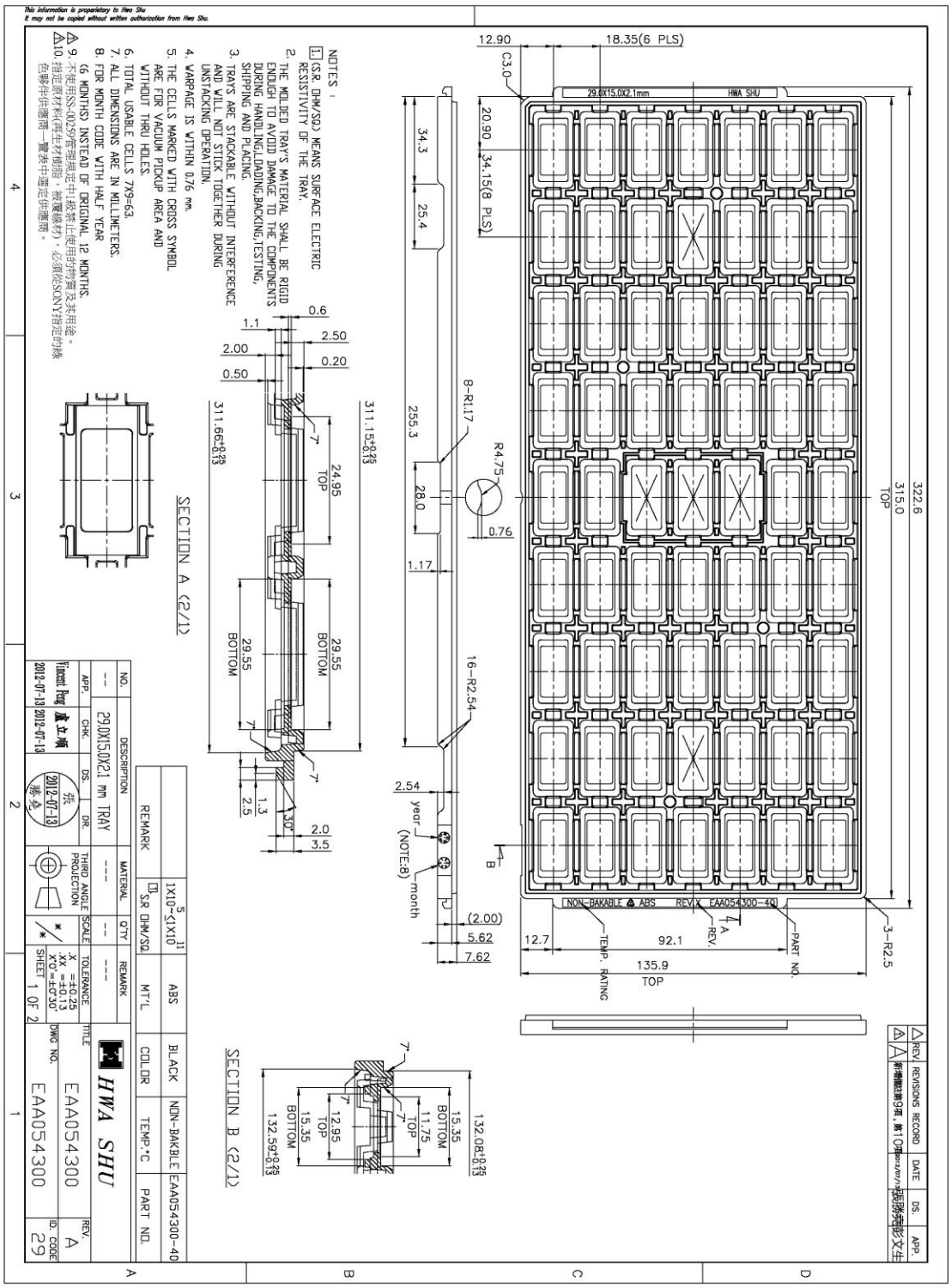
7.3 Ordering Information

Device	Module		Order Number
	Size	Shipment Method	
BM90SPKA6NBB Bluetooth 3.0 EDR Wireless Speaker Module	29*15 mm	Tray	

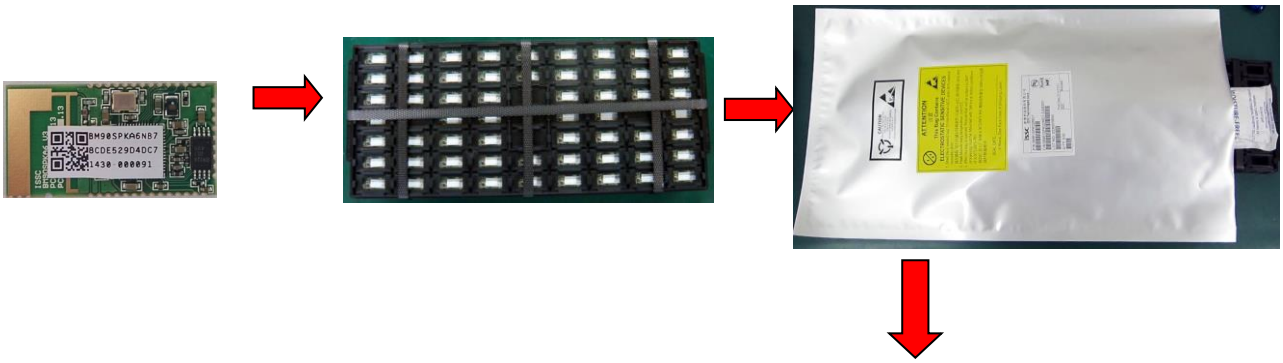
Note:

Minimum Order Quantity is 630pcs Tray.

7.4 Tray Dimensions

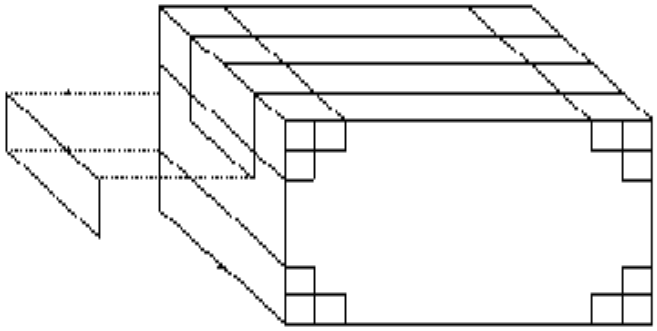


7.5 Packing Method



Inner box: Q'ty (630 Pcs)
Dimensions: 36*16*9.5 cm

Bar Code Label Example
P/N: Part No.*(device name)*
C/N: Customer Part No.*(Part no. - customer code no.)*
Lot No: Lot ID
Q'ty: box or Carton Module's Q'ty



Carton: Q'ty (3780 Pcs)
Dimensions: 38*35*30 cm