

PRODUCT SPECIFICATION

CSR8670 Full function Bluetooth Module

BSM-700

Lite-On P/N: 2170000002KD

Version 1.3

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Project Leader: Daniel KW Yang **Approved by:** Daniel KW Yang

Change History

Revision	Date	Author	Change List
Version 1.0	2014 / 01 / 13	Javon Tseng	Preliminary
Version1.1	2014 /01 / 24	Daniel	<ol style="list-style-type: none"> 1. Add pinout dimensions 2. Remove NC (Pin57) and connect AIO[0] to PIN 57. 3. Remove PIO0 (Pin4) and connect AIO[1] to PIN 4 4. Add PIO_3 to PIN60
Version1.2	2014 /02 / 06	Javon	<ol style="list-style-type: none"> 1. Update Block Diagram 2. Update Application block diagram 3. Update main board schematic
Version1.3	2014 /04 / 03	Javon	<ol style="list-style-type: none"> 1. Add Packing Model 2. Update Current Consumption 3. Update Package Dimensions 4. Update RF Characteristics 5. Update Interface Specifications 6. Update Layout

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1 Product Overview

1.1 Description

BSM-700 is a LGA type Bluetooth module which using CSR Chipset CSR8670C-IBBH-R

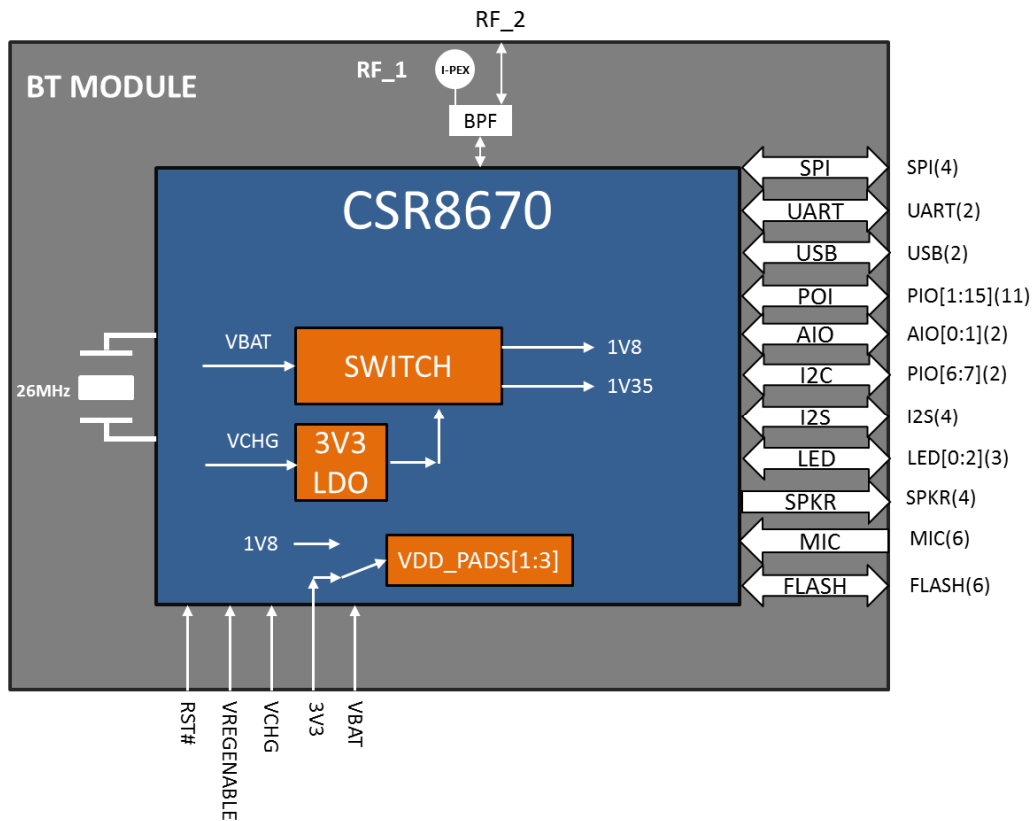
1.2 Features

- Bluetooth® v4.0 specification fully qualified software
- Radio includes integrated balun
- Class II (Max +4 dBm, 2.5mW)
- High-sensitivity Bluetooth receiver
- 16Mb internal flash memory (64-bit wide,45ns)
- Integrated 16-bit Stereo Audio CODEC
- Embedded Kalimba DSP Co-Processor.
- Support for CSR's latest CVC technology for narrow-band and wideband voice connections including wind noise reduction
- Audio interfaces: I²S, PCM and SPDIF
- Serial interfaces: UART, USB 2.0 full-speed, I²C
- Integrated dual switch-mode regulators, linear regulators and battery charger
- 3 hardware LED controllers (for RGB) and ability to drive LCD segment display directly
- Green (RoHS compliant and no antimony or halogenated flame retardants)

1.3 General Specifications

Standard	Bluetooth v3.0 EDR, 4.0 LE Compliant.
Bus Interface	Data: UART / USB Voice: PCM/I2S/Stereo Analog in/out
Form Factor	22mm x 18mm x 2.5mm LGA (Land Grid Array) pads reliable PCB mounting.
Data Rate	1 Mbps, 2Mbps and Up to 3Mbps
Frequency Range	2.402 ~ 2.480 GHz
Transmit Output Power	-6 ~ +4 dBm Class 2 Device
Receive Sensitivity	BER < 0.1% BER at -80 dBm
Operating Voltage	3.1V~3.6V I/O supply voltage
Antenna Type	Option1:I-pex connector Option2:Feed point

1.4 Block Diagram



1.5 Pin Configuration

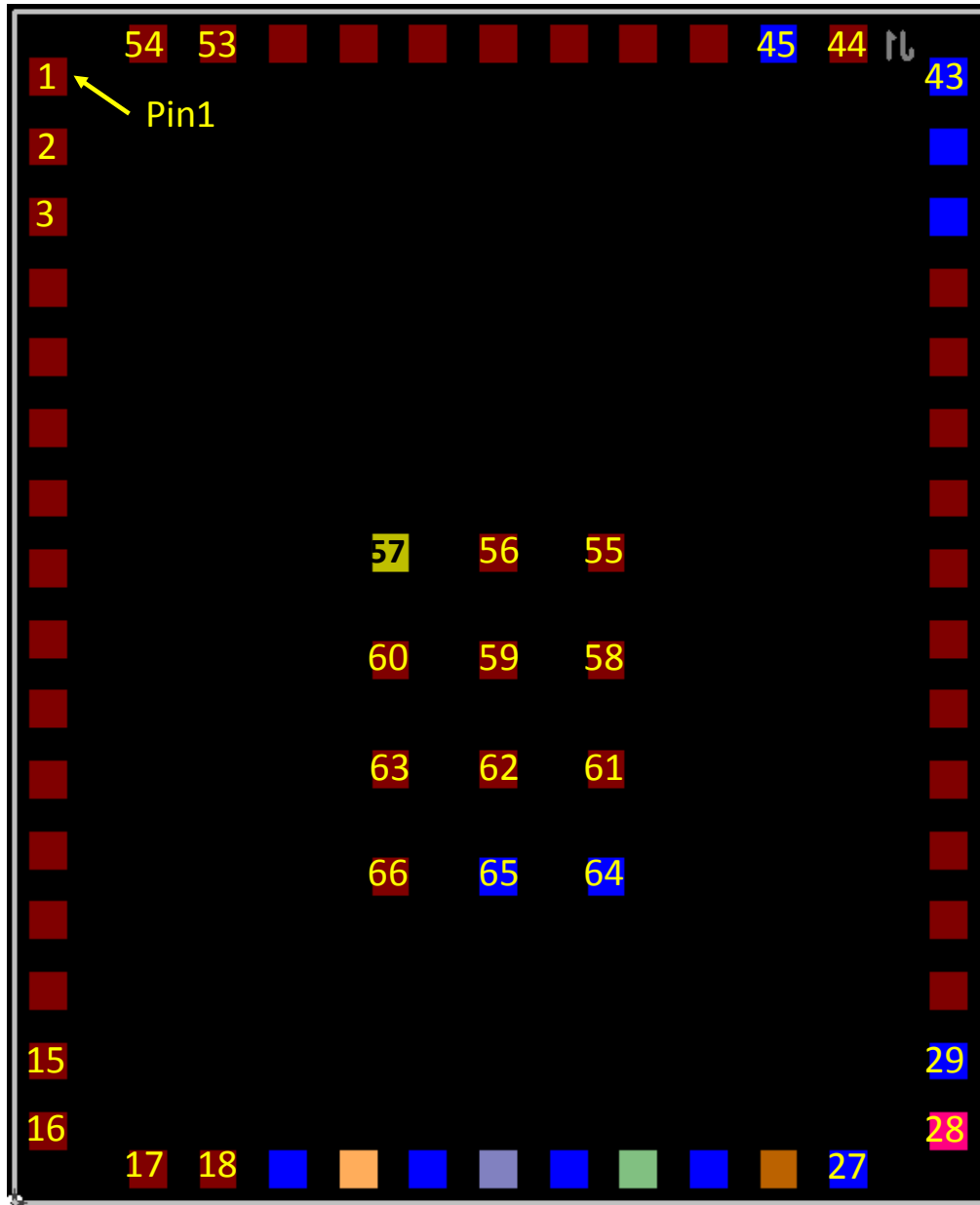
No	Definition	Description	Type
1	UART_RX	UART data in	Bidirectional with strong pull-up
2	UART_TX	UART data output	Bidirectional with weak pull-up
3	LED_0	LED driver[0]	Open drain
4	AUO[1]	Programmable input / output line	Analogue programmable input / output line
5	LED_2	LED driver[2]	Open drain
6	PIO_6_I2C_SCK	Programmable input / output line	Bidirectional with weak pull-down
7	USB_D+	USB data plus with selectable internal 1.5kΩ pull-up resistor	Bidirectional
8	USB_D-	USB data minus	Bidirectional
9	PIO_2	Programmable input / output line	Bidirectional with weak pull-down

10	PIO_14	Programmable input / output line	Bidirectional with weak pull-down
11	PIO_10	Programmable input / output line	Bidirectional with weak pull-down
12	PIO_1	Programmable input / output line	Bidirectional with weak pull-down
13	PIO_4	Programmable input / output line	Bidirectional with weak pull-down
14	PIO_15	Programmable input / output line	Bidirectional with weak pull-down
15	PIO_11	Programmable input / output line	Bidirectional with weak pull-down
16	PIO_5	Programmable input / output line	Bidirectional with weak pull-down
17	LED_1	LED driver[1]	Open drain
18	PIO_7_I2C_SDA	Programmable input / output line	Bidirectional with weak pull-down
19	GND	Ground	
20	1V8	External 3.3V enable control	Output
21	GND	Ground	
22	VDDIO	Positive supply for I/O	Power input
23	GND	Ground	
24	3V3	Positive supply for USB ports	Power input
25	GND	Ground	
26	VBAT	Battery positive terminal	Power input
27	GND	Ground	
28	USB_5V	Battery charger input	Power input
29	GND	Ground	
30	VREGENABLE	Regulator enable input for system on	Input
31	MIC_IN_LN	Microphone input negative, left	Analogue in
32	MIC_IN_LP	Microphone input positive, left	Analogue in
33	MIC_BIAS_A	Microphone bias A	Analogue out
34	MIC_IN_RN	Microphone input negative, right	Analogue in
35	MIC_IN_RP	Microphone input positive, right	Analogue in
36	MIC_BIAS_B	Microphone bias B	Analogue out
37	BT_SPKR_RN	Speaker output negative, right	Analogue out
38	BT_SPKR_RP	Speaker output positive, right	Analogue out
39	BT_SPKR_LN	Speaker output negative, left	Analogue out
40	BT_SPKR_LP	Speaker output positive, left	Analogue out

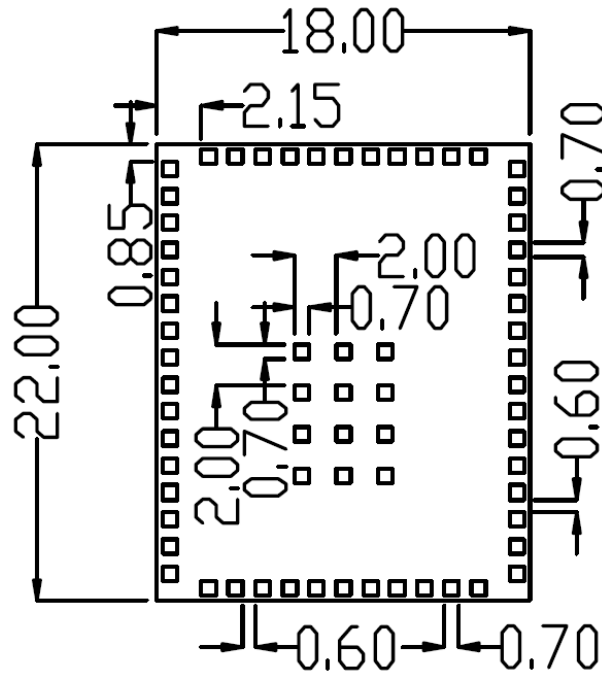
41	GND	Ground	
42	GND	Ground	
43	GND	Ground	
44	Antenna2	External Antenna with RF PAD	RF PAD
45	GND	Ground	
46	SPI_CLK	SPI clock	Input with weak pull-Down
47	SPI_MOSI	SPI data in	Input with weak pull-Down
48	BT_I2S_IN	I2S data in	Bidirectional with weak pull-down
49	BT_I2S_BCLK	I2S data clock	Bidirectional with weak pull-down
50	BT_I2S_LRCLK	I2S data sync	Bidirectional with weak pull-down
51	BT_I2S_OUT	I2S data out	Bidirectional with weak pull-down
52	SPI_MISO	SPI data out	Output with weak pull-down
53	RST#	Reset if low. Input de-bounced so must be low for >5ms to cause a reset.	Input with strong pull-up
54	SPI_CS#	Chip select for SPI, active low.	Input with strong pull-up
55	FLASF_IO2	Serial quad I/O flash data bit 2 Alternative function PIO[27]	Bidirectional with strong pull-down
56	FLASF_CS#	SPI flash chip select. Alternative function PIO[23]	Bidirectional with strong pull-down
57	AIO[0]	Programmable input / output line	Analogue programmable input / output line
58	FLASF_IO1	Serial quad I/O flash data bit 1. Alternative function PIO[26]	Bidirectional with strong pull-down
59	FLASF_CLK	SPI flash clock. Alternative function PIO[21]	Bidirectional with strong pull-down
60	PIO_3	Programmable input / output line	Bidirectional with weak pull-down
61	FLASF_IO0	Serial quad I/O flash data bit 0. Alternative function PIO[25]	Bidirectional with strong pull-down
62	FLASF_IO3	Serial quad I/O flash data bit 3. Alternative function PIO[28]	Bidirectional with strong pull-down
63	PIO_12	Programmable input / output line	Bidirectional with weak pull-down
64	GND	Ground	
65	GND	Ground	
66	PIO_13	Programmable input / output line	Bidirectional with weak pull-down

1.6 Pinout Diagram

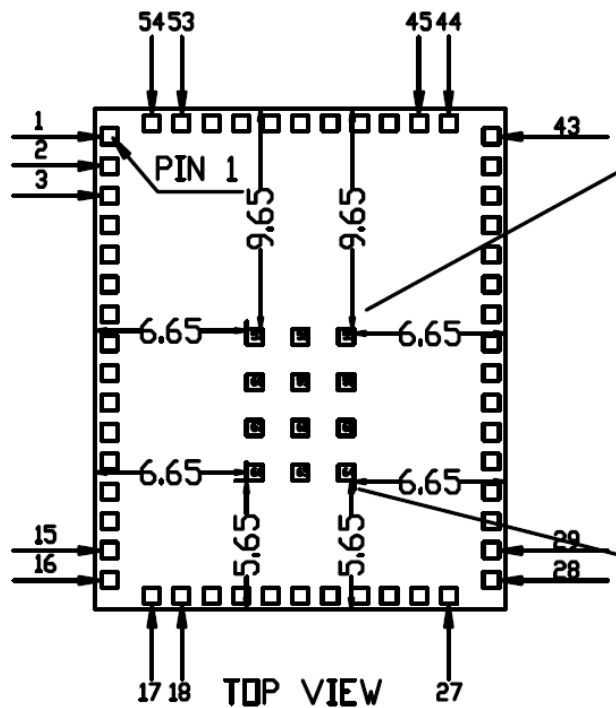
(TOP view)



1.7 Package Dimensions



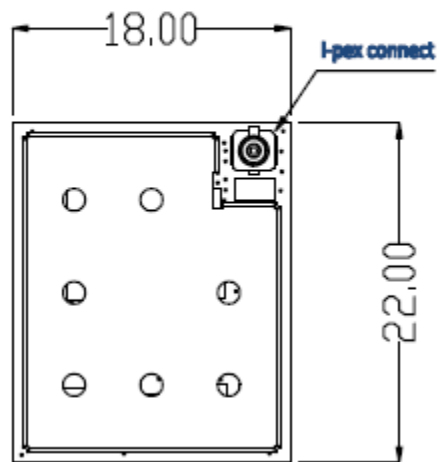
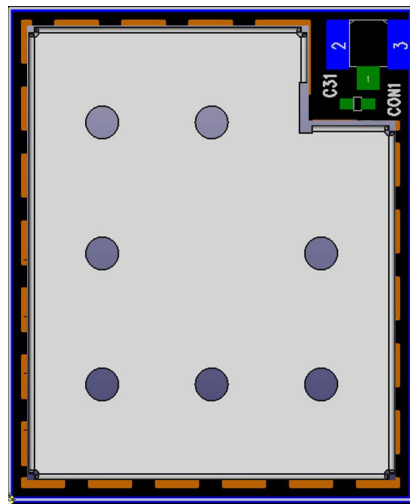
BOTTOM VIEW



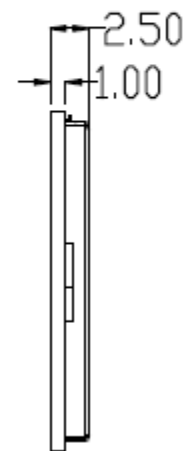
TOP VIEW

1.8 Dimension

Dimension of BSM-700 : 22 x 18 x 2.5mm



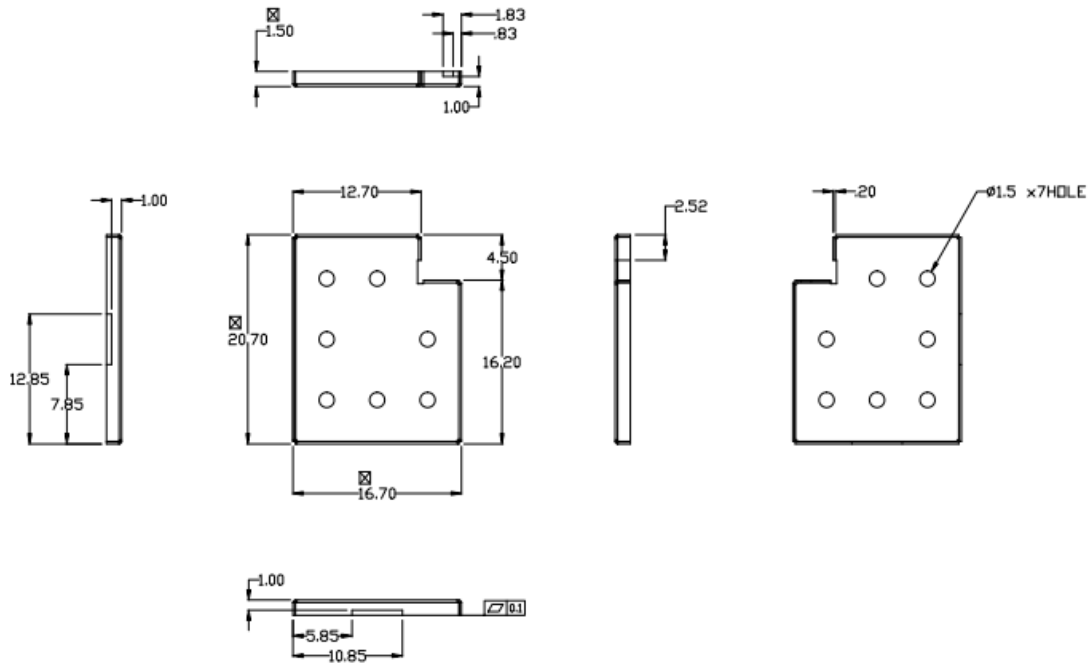
TOP VIEW



1.9 Shielding

Dimension of shielding : 20.7 x 16.7 x 1.5mm

Hole : 1.5mm



2 Electrical Characteristics

2.1 Absolute Maximum Ratings

Rating	Min	Max	Unit
USB_5V	-0.40	5.75	V
VBAT	-0.40	4.40	V
3V3	-0.40	3.60	V
VDDIO	-0.40	3.60	V

2.2 Guaranteed Operating Temperature

Operating

Operating Temperature: -40 to 85 °C

Storage

Temperature: -40 to 105 °C

2.3 Recommended Operating Conditions

Rating	Min	TYP	Max	Unit
USB_5V	4.75	5.00	5.75	V
VBAT	2.80	3.70	4.30	V
3V3	3.10	3.30	3.60	V
VDDIO	3.10	3.30	3.60	V
1V8	1.70	1.80	1.95	V
1V35	1.30	1.35	1.40	V

2.4 Input/Output Terminal Characteristics

Rating	Min	TYP	Max	Unit
VIL input logic level low	-0.4	-	0.4	V
VIH input logic level high	0.7xVDDIO	-	VDDIO+0.4	V
VOL output logic level low, IOL = 4.0mA	-	-	0.4	V
VOH output logic level high, IOH = -4.0mA	0.75xVDDIO	-	3.60	V

2.5 RF Characteristics

2.5.1 Radio Characteristics - Basic Data Rate

RF Characteristics	Bluetooth Specification with		Unit
	I-PEX	SMA	
Maximum RF transmit power	-6 to 4	-6 to 4	dBm
Sensitivity at 0.1% BER	TYP. -80dB	TYP. -80dB	dBm

2.5.2 Radio Characteristics - Enhanced Data Rate

RF Characteristics	Bluetooth Specification with		Unit
	I-PEX	SMA	
Sensitivity at 0.01% BER	TYP. -80dB	TYP. -80dB	dBm

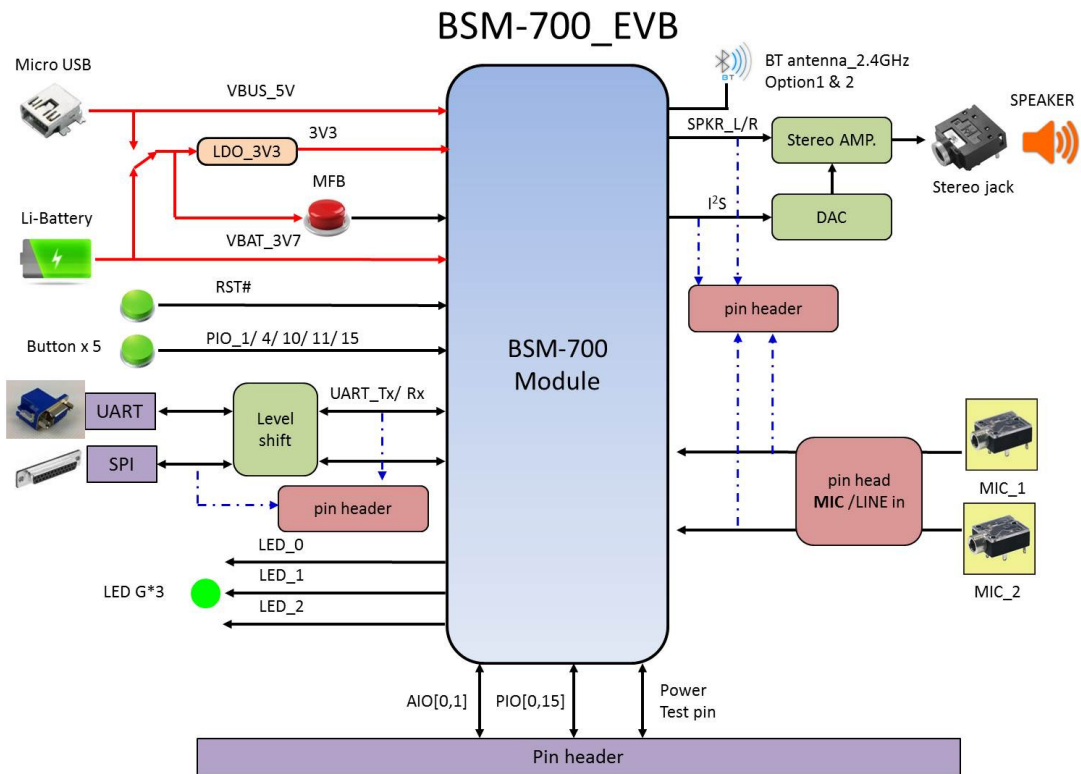
2.5.3 Radio Characteristics - Low Energy

RF Characteristics	Bluetooth Specification with		Unit
	I-PEX	SMA	
Sensitivity at 30.8% BER	TYP. -80dB	TYP. -80dB	dBm

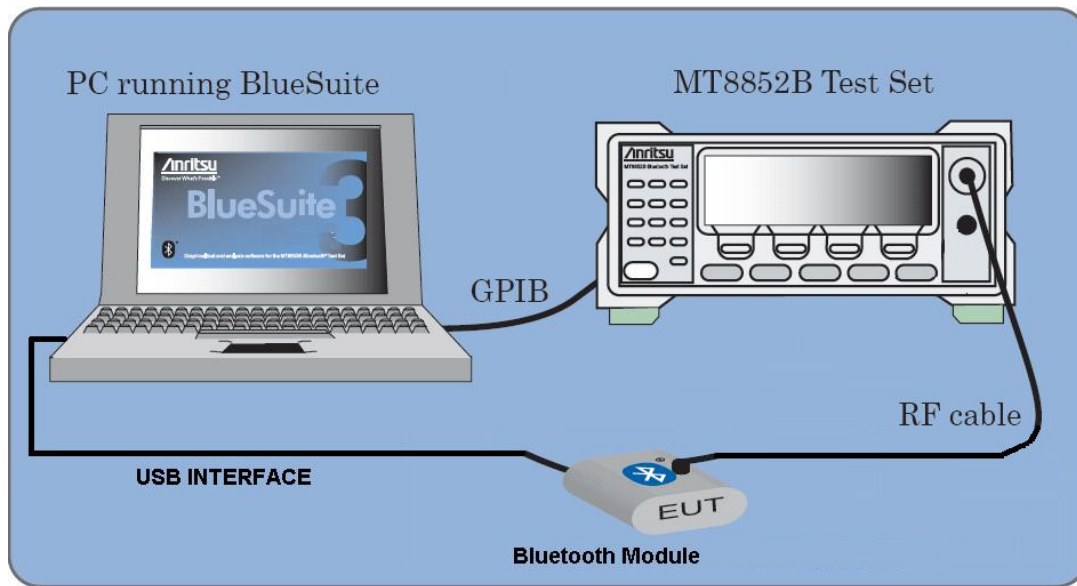
2.6 Current Consumption (Design reference)

Mode	Max.	Avg.	Min	Unit
Idle	0.465	0.183	0.054	mA
ACL	8.940	0.482	0.057	mA
SOC	16.0	13.0	12.3	mA
eSOC	14.6	12.7	12.4	mA

2.7 Application block diagram



3 RF Measurement Environment System



3.1 Internal Flash

PSR and File System for MP build: V0.2

3.2 System Area

Index	Name	Description	Value
0x01EA	UART_BITRATE	Baud Rate	delete or "0"
0x01F9	HOST_INTERFACE	Host I/F Configuration	0001 (UART link running BCSP)
0x0246	CLOCK_REQUEST_ENABLE		delete
0x212C	PATCH50		0000 C47D 5714 0018 FF2B FFOE D800 7918 009E 0018 FF2B FFOE C500 8018 00E2 7080
0x212D	PATCH51		0002 5B79 0014 E700 9525 011B 0626 089A 0AF4 0218 FF2B FFOE 5B00 4318 009E 0014 011B 0826 0218 FF2B FFOE 5C00 8218 00E2 A63A
0x212E	PATCH52		0002 D0A7 0316 0318 FF2B FFOE 2300 0618 009E E199 14F4 E119 0812 8000 00C0 10F0 061B 0212 0100 FFC0 0780 0AF0 0316 0010 0318 FF2B FFOE 3800 1318 009E F70F 0218 FF2B FFOE D100 AC18 00E2 CF53
0x212F	PATCH53		0003 C916 0114 0027 0517 2B00 A484 06F0 2B00 A914 0527 0114 02E0 0014 0127 0014 0227 0323 E315 0318 FF2B FFOE C900 1D18 00E2 CB5F
0x2130	PATCH54		0002 CA7A 0018 FF2B FFOE 8400 CB18 009E EA00 5F11 0100 0080 0524 0100 00B0 EA00 5F21 0218 FF2B FFOE CA00 7D18 00E2 2513
0x2131	PATCH55		0003 FE75 EB00 C114 0218 FF2B FFOE 6700 E718 009E EA00 6714 0218 FF2B FFOE 6700 E718 009E 0318 FF2B FFOE FE00 7A18 00E2 0C6F
0x2134	PATCH58		0001 1A6F 051B 0116 0284 03F0 0310 0122 0110 071B 0100 8922 0118 FF2B FFOE 1A00 7318 00E2 D58C
0x2135	PATCH59		0001 14D1 FF40 0627 0523 091B 0116 0284 07F0 0310 0122 5F16 4800 00B4 5F26 0118 FF2B FFOE 1500 D418 00E2 F7FE
0x212F	PATCH60		0003 F9A5 0318 FF2B FFOE F900 F018 009E E199 04F4 4000 FF14 F90F 0318 FF2B FFOE

0x21FB	PATCH107	F900 7318 00E2 AEC3 F000 3215 0800 00B4 F000 3225 F000 3215 F800 FFC4 F000 3225 F000 3215 0800 00B4 F000 3225 00E2 49E0
0x2200	PATCH112	F100 CF15 01B4 F100 CF25 00E2 9DD1

3.3 RF Area

Index	Name	Description	Value
0x0017	LC_MAX_TX_POWER	Maximum Tx power	0000 (0dBm)
0x003C	RX_MR_SAMP_CONFIG		0426
0x216D	BT_MIXER_CTRIM_CHAN0_MAX		0007
0x2175	BT_TX_MIXER_CTRIM_OFFSET		1111 0000 0000 0000 fff0
0x241A	BT_POWER_TABLE_V0		2217 0050 2c48 0050 ec00 2417 0040 2e48 0040 f000 2317 0030 2d48 0030 f400 2317 0020 2d48 0020 f800 2417 0010 2d48 0010 fc00 2717 0000 3049 0000 0000
0x03DA	TEMPERATURE_VS_DELTA_INTERNAL_PA		ffec 0001 0019 0000 004b 000a
0x21E1	TEMPERATURE_VS_DELTA_INTERNAL_PA_MR		ffec ffff 0019 0000 004b 0007

3.4 User Area

Index	Name	Description	Value
0x267	MOD_MANUF9	Serial Number and Hardware Version	YYMMDDLSSSSH YY : Year (0C => 2012) MM : Month (range : 01 - 0C) DD : Date (range : 01 - 1F) LL : Line Number (range : 01 - FF) SSSS : Serial Number (range : 0001 - FFFF) HH : Hardware (04 : MP)

4 Interface Specifications

4.1 UART Interface

Parameter		Possible Values
Baud rate	Minimum	1200 baud ($\leq 2\%$ Error)
		9600 baud ($\leq 1\%$ Error)
	Maximum	4M baud ($\leq 1\%$ Error)
Parity		None, Odd or Even
Number of stop bits		1 or 2
Bits per byte		8

4.2 USB Interface

BSM-700 has a full-speed (12Mbps) USB interface for communicating with other compatible digital devices.

The USB interface on BSM-700 acts as a USB peripheral, responding to requests from a master host controller. BSM-700 supports the Universal Serial Bus Specification, Revision v2.0 (USB v2.0 Specification)

4.3 Digital Audio Interface

The audio PCM interface on the BSM-700 supports:

- On-chip routing to Kalimba DSP
- Continuous transmission and reception of PCM encoded audio data over Bluetooth.
- Processor overhead reduction through hardware support for continual transmission and reception of PCM data.
- A bidirectional digital audio interface that routes directly into the baseband layer of the firmware.
- Hardware on BSM-700 for sending data to and from a SCO connection.
- PCM interface master, generating PCM_SYNC and PCM_CLK.
- PCM interface slave, accepting externally generated PCM_SYNC and PCM_CLK.
- Various clock formats including:
 - Long Frame Sync
 - Short Frame Sync
 - GCI timing environments
- 13-bit or 16-bit linear, 8-bit μ -law or A-law companded sample formats.
- Receives and transmits on any selection of 3 of the first 4 slots following PCM_SYNC.

5 Notes on operation

5.1 Power-on Sequence

We recommend that the power supplies are all powered at the same time.

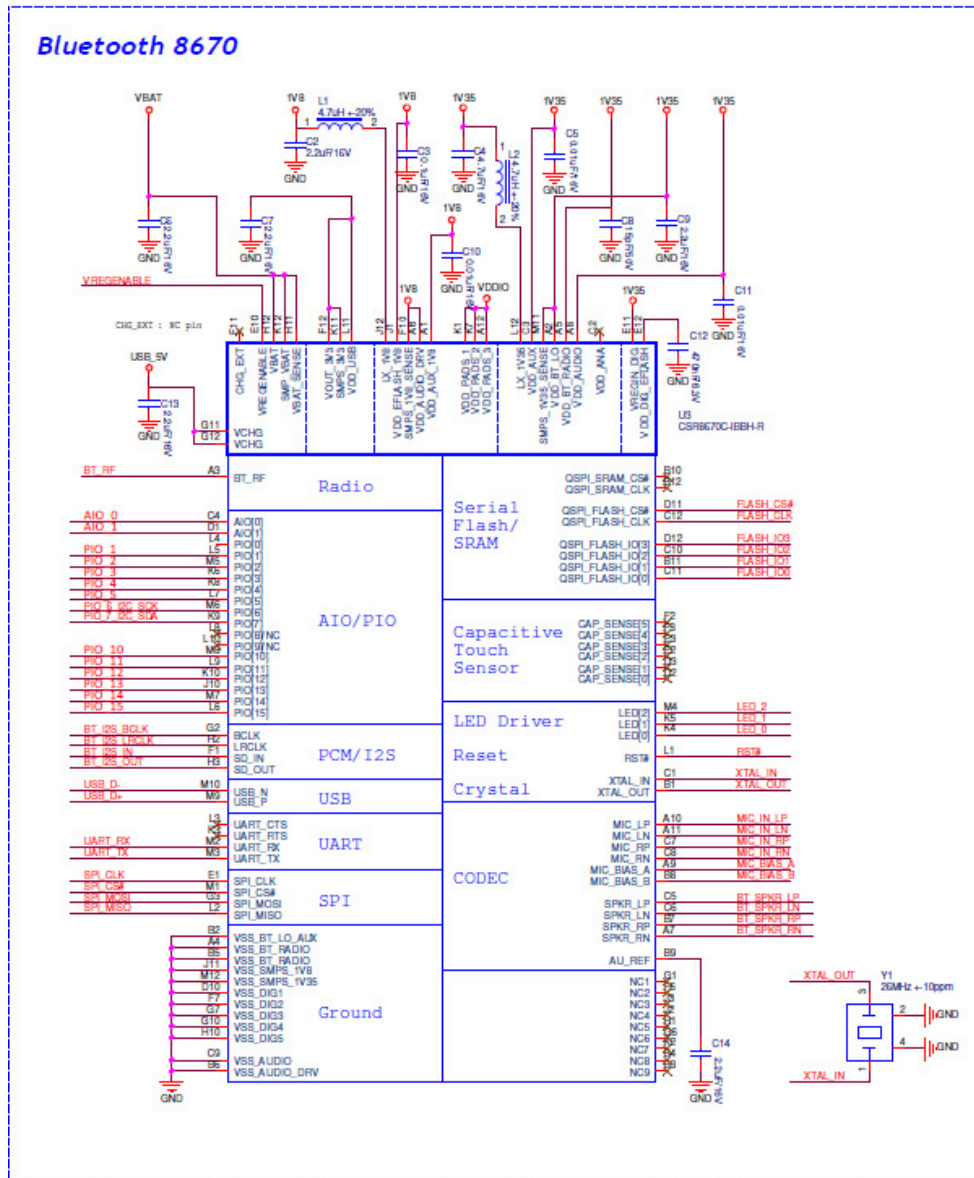
5.2 IO State at Reset and Recommended Termination Handling

The RESET# pin is an active low reset. Assert the reset signal for a period >5ms to ensure a full reset. The RESET # pin is pulled down internally until the power on, then the pull switches to a strong pull up.

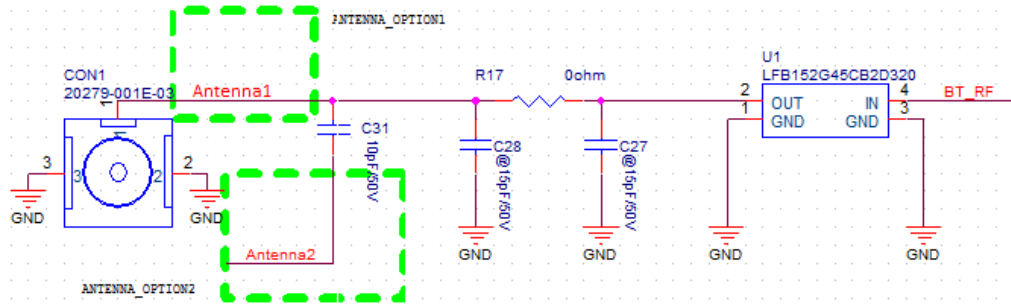
Pin Name / Group	I/O Type	Full Chip Reset
USB_DP	Digital bidirectional	N/A
USB_DN	Digital bidirectional	N/A
UART_RX	Digital bidirectional with PU	Strong PU
UART_TX	Digital bidirectional with PU	Weak PU
SPI_CS#	Digital input with PU	Strong PU
SPI_CLK	Digital input with PD	Weak PD
SPI_MISO	Digital tristate output with PD	Weak PU
SPI_MOSI	Digital input with PD	Weak PD
I2S_OUT	Digital bidirectional with PD	Weak PD
I2S_SYNC	Digital bidirectional with PD	Weak PD
I2S_BCLK	Digital bidirectional with PD	Weak PD
RST#	Digital input with PU	Strong PU
PIO[15:0]	Digital bidirectional with PD	Weak PD
FLASH_IO[3:0]	Digital bidirectional with PD	Strong PD
FLASH_CS#	Digital bidirectional with PU	Strong PU
FLASH_CLK	Digital bidirectional with PD	Strong PD

6 Schematic

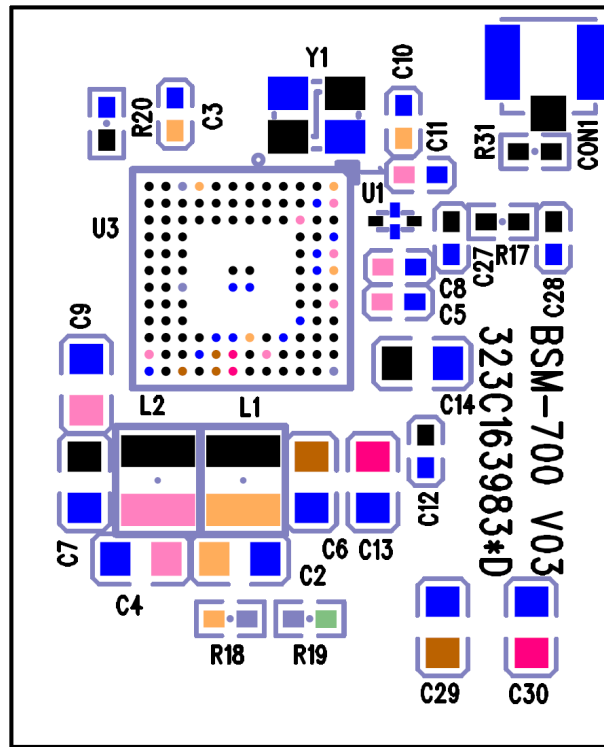
6.1 Main Block:



6.2 RF

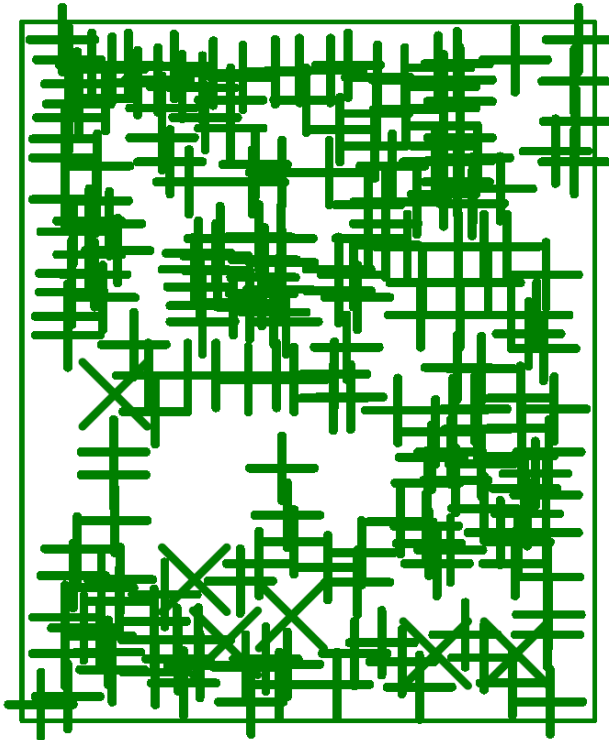
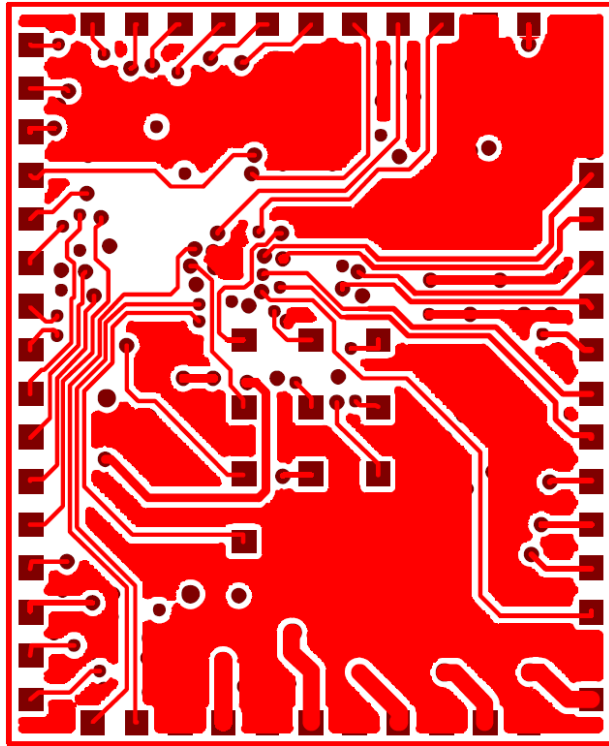


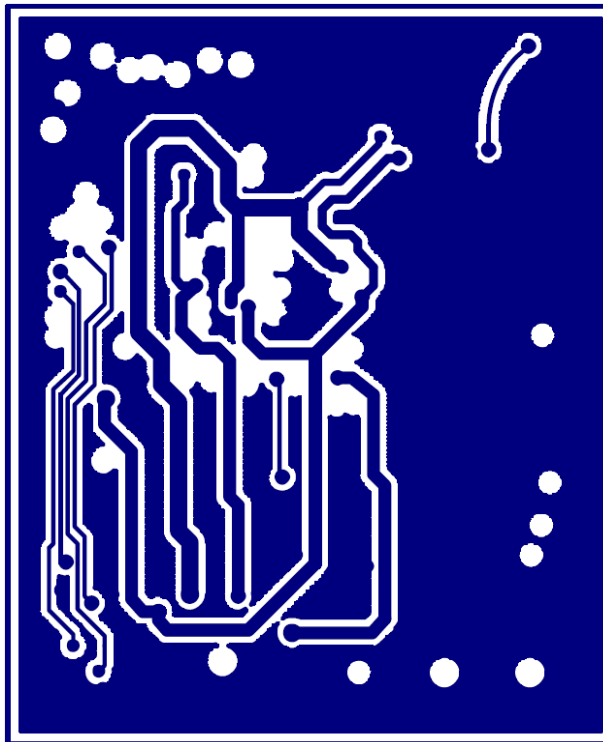
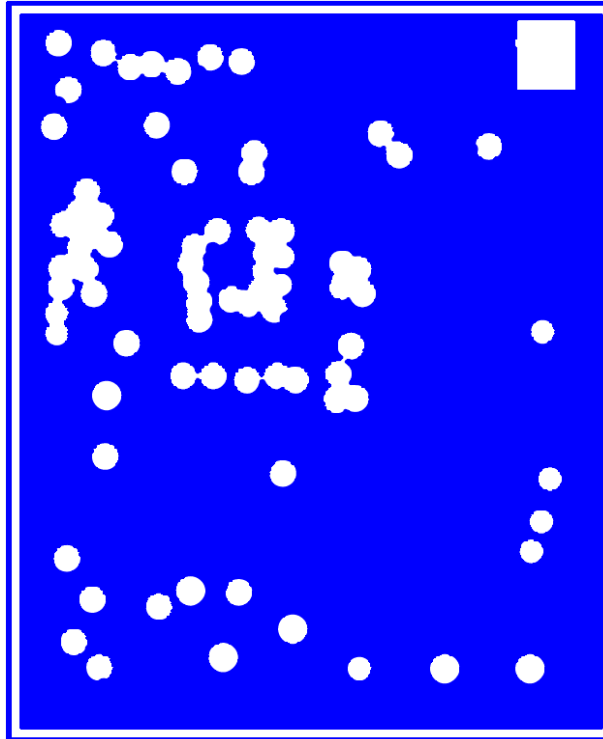
7 Placement

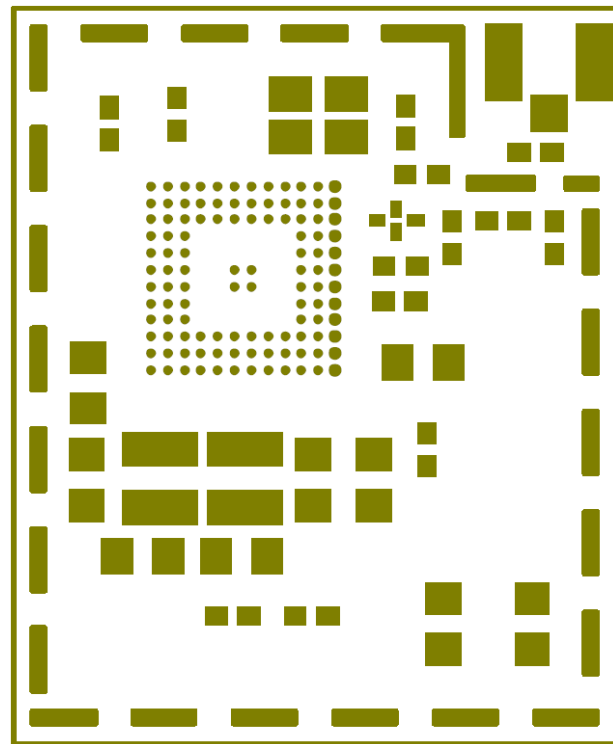
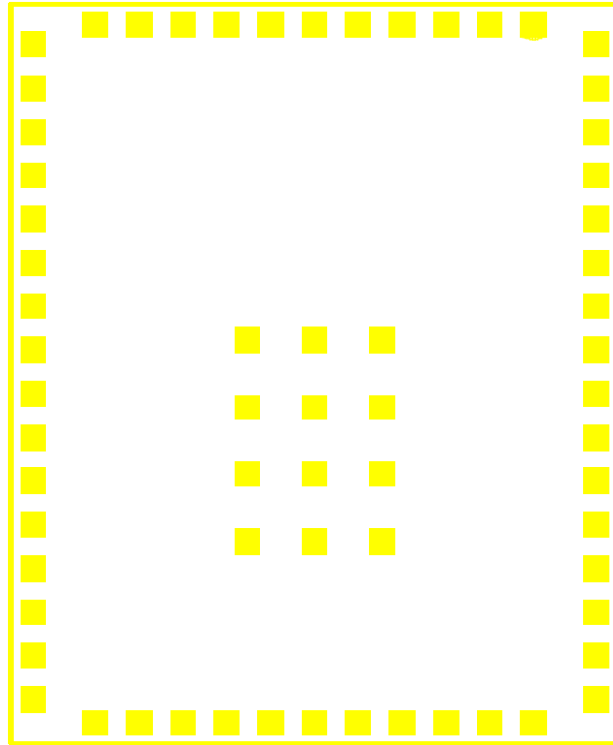


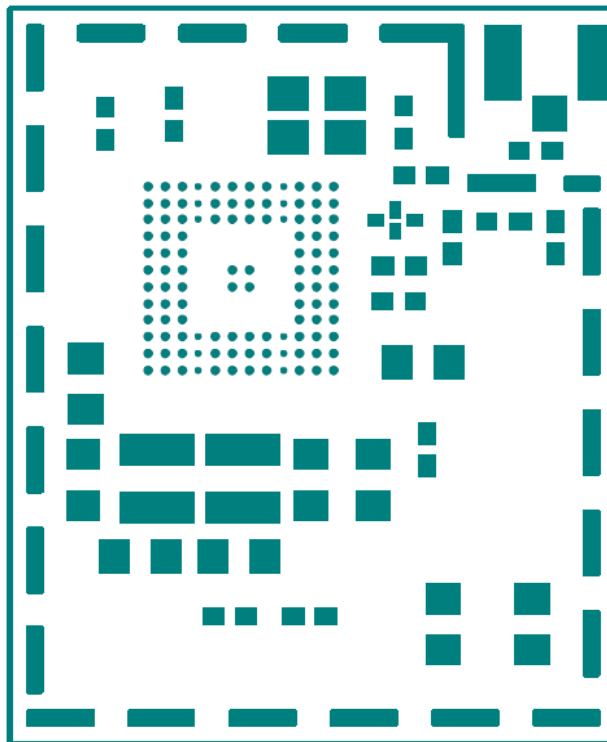
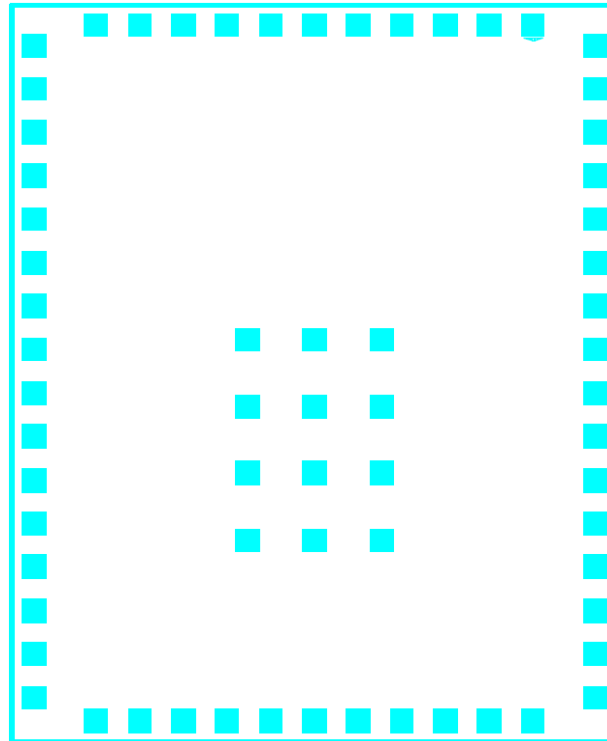
No.	Function	Ref
1	Bluetooth Main IC	U3
2	X'tal 26MHz	Y1
3	Band Pass Filter	U1

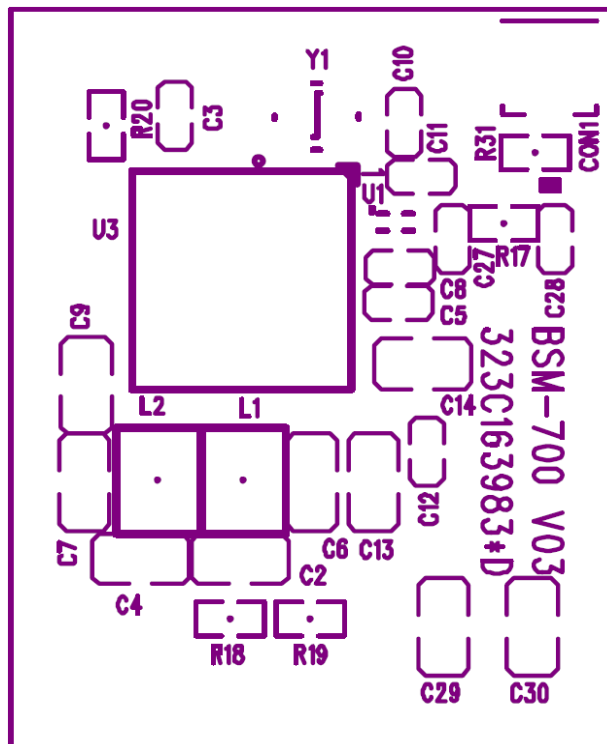
8 Layout

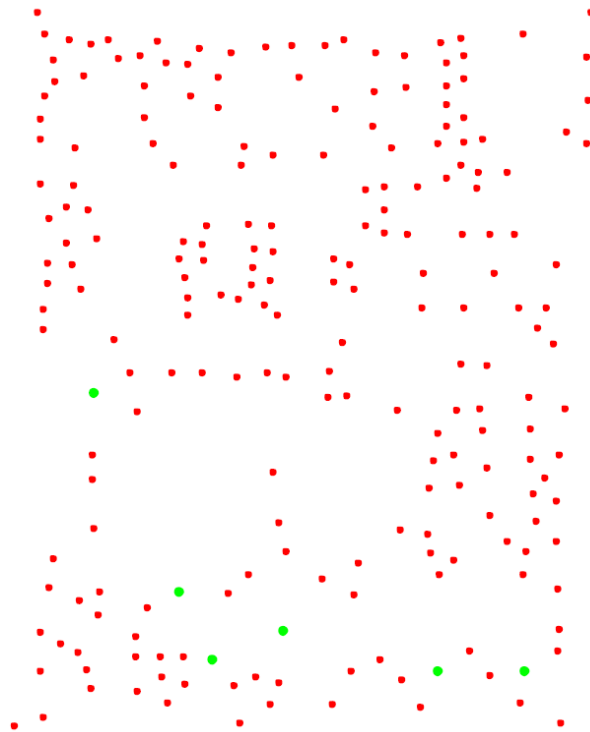
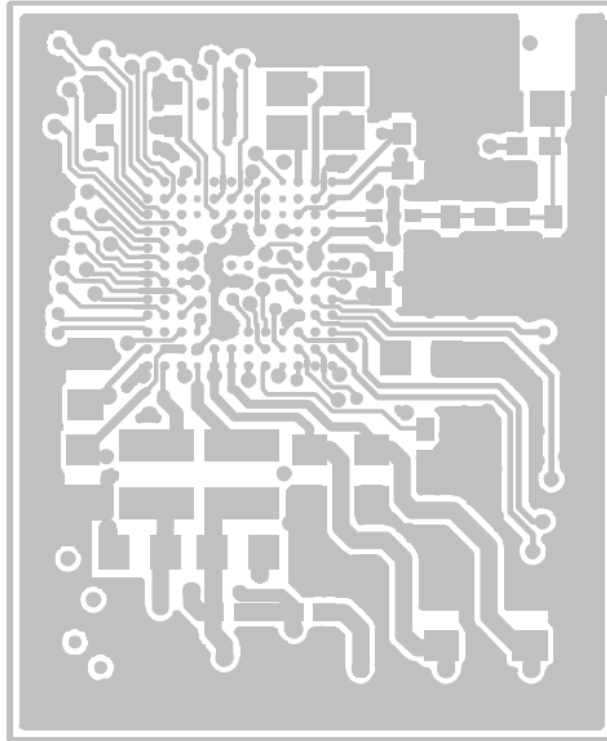






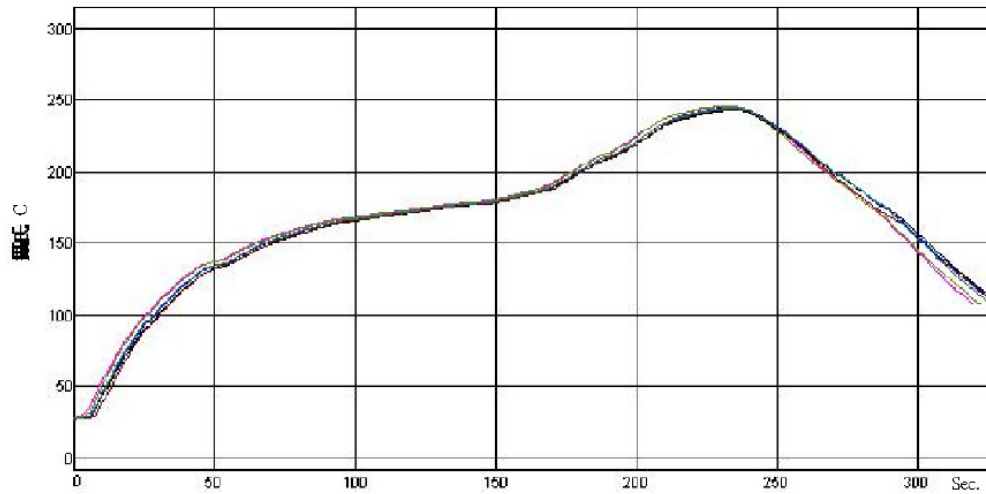






9 Reflow Condition

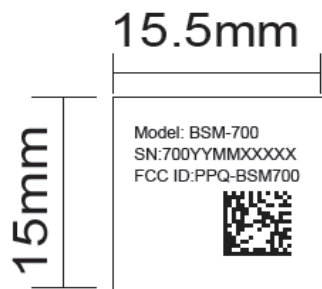
9.1 Reflow temperature profile



NO	Item	Temperature(°C)	Time(sec)
1	Reflow Time	Time of above 220	30~60sec
2	Peak Temperature	245 °C max	

10 Marking and Packing Model

10.1 Marking



SN條碼使用二維碼ECC200,等級為B級
顯示內容為700YYMMXXXXX
編碼原則為：

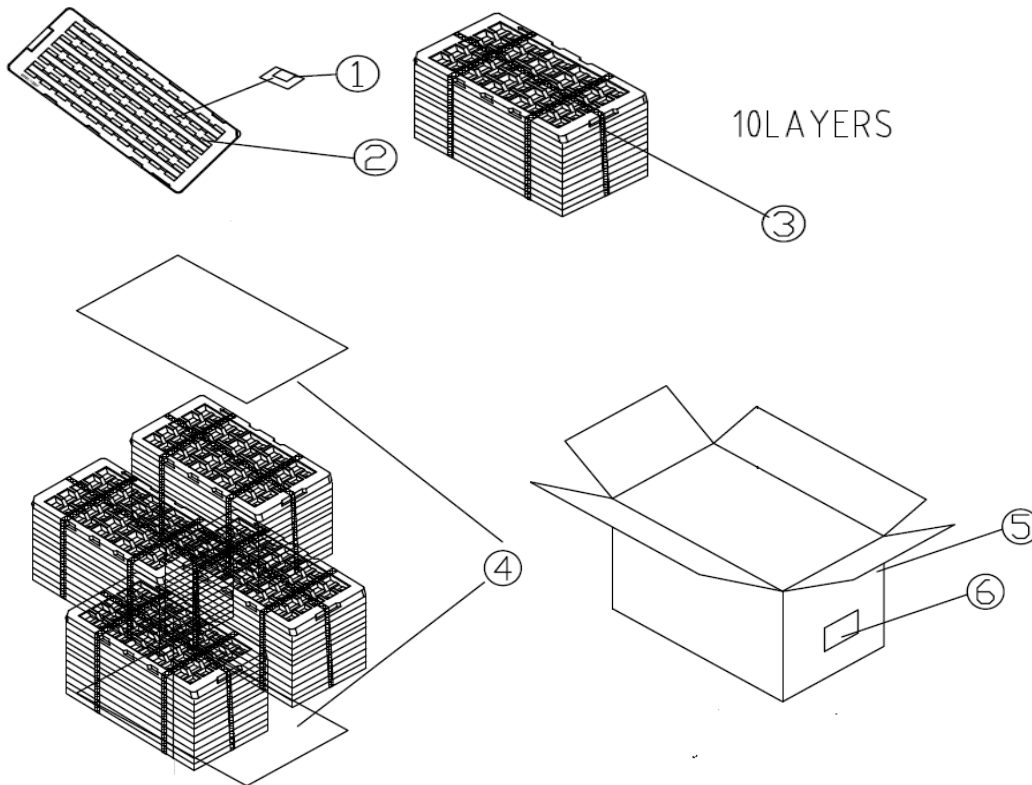
700	YY	MM	XXXXX
固定碼	西元年 後兩碼	月： 1月：01 2月：02 ...	流水號00001-FFFFF(十六進制) 月底清零

9月：09
10月：0A
11月：0B
12月：0C

3:1

(客戶):***
(空白label):50900007433D
(材質): M-8511
(顏色): Black
(上光方式): NO

10.2 Packing Model



1 carton=10Layer*4=(9*40+1*0)*4=1440pcs

ITEM	P/N	DESCRIPTION	QTY
1	xxxxxxx	product	1
2	5230000501ZD/1D	Clamshell	10/360
3	5210000004ZD	Straps	1.73m/360
4	5160000928XD/1D	Carton sheet	2/1440
5	5030000231XD/1D	Carton	1/1440
6	MM10834260D	Carton label	1/1440

11 Criteria for Reliability Test

No.	Item	Condition	Unit
1	High Temperature High Humidity Storage Test	1. Temperature/Humidity: 75°C±2°C 95%±3RH 2. Test Time: 24Hrs	10pcs
2	Low Temperature Storage Test	1. Temperature: -40°C±2°C 2. Test Time: 24Hrs	10pcs
3	3.1 Thermal Shock Test	1. High Temperature: 85°C 15mins 2. Low Temperature: -40°C 15mins 3. Temperature Rate: 25°C/Min 4. Duration: 200cycles	4pcs
	3.1-1 X-Section Analysis	1. Environment: 21°C 50%RH 2. Test location: ANT1, U2, XTAL1, U5	2pcs
4	Temperature Profile Test	1. Temperature: 70°C & 25°C 2. Test Time: 6Hrs/Temp 3. Ping IP test 4. Test location: U2, U5, XTAL1,	2pcs
5	Operational With Temperature Cycle Test	1. High Temperature/Humidity: 70°C 90%RH 1H 2. Low Temperature: 0°C 1H 3. Raise Time: 2°C/min Descend Time: 1°C/min 4. Duration: 10Cycles	2pcs
6	Power Cycling Test	1. Test Temperature/Humidity: 70°C 90%RH 24Hrs & 25°C 50%RH 24Hrs 2. Fixture: Power on 29mins & Power off 1min 3. Duration: 0.5H/Cycle ,Total 48Cycles	2pcs
7	Vibration Test	1. Vibration Wave: sine 2. Vibration Frequency: 10-300-10HZ 1G 3. Vibration Axis: Z Axis 4. Test time: 1Hr	2pcs

12 FCC Compliance and Advisory Statement

12.1 Class B: (Section 15.105)

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

CAUTION: (Section 15.21)

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

12.2 Labeling requirements

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

12.3 RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

12.4 End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: PPQ-BSM700"

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator, but should not be distributed to the end user.

- 1) This device is intended for OEM integrators only.
- 2) Please see the full Grant of Equipment document for other restrictions.

This radio transmitter FCC ID: PPQ-BSM700 has been approved by FCC to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Walsin	RFDPA520900SMAB601	Dipole Antenna	4.78 dBi for 2.4 GHz
2	Walsin	RFFPA301015IMAB301	Dipole Antenna	1.27 dBi for 2.4 GHz

Note: The antenna connector is I-pex type.