Technical Description

The Equipment Under Test (EUT) is Sound Bar with Bluetooth which contains a pair of built-in stereo loudspeaker and power amplifier. It can accept both analog input sources (RCA aux-in and 3.5mm phone-jack line-in) and wireless Bluetooth device. The Bluetooth module in the EUT operating in the frequency range from 2402MHz to 2480MHz (79 channels with 1MHz channel spacing). The EUT is powered by 13VDC from an AC/DC adaptor. The AC/DC adaptor can accept 120VAC only.

Bluetooth Module
Modulation Type: GFSK **RF output power setting = -8dBm**
Antenna Type: Integral, Internal (PCB Trace)
Frequency Range: 2402MHz - 2480MHz, 1MHz channel spacing, 79 channels

The functions of main ICs are mentioned below.

1. BlueTooth module (BT3GMD-A30P):
1) U100 (BCM20771) acts as the 2.4GHz radio core of Bluetooth module (BT3GMD-A30P) which is integrating with audio CODEC.
2) C6, C5, L4, C3, L2, C1 and C7 act as antenna matching network.
3) Y2 provides system clock (oscillation frequency 26MHz).

2. Pre-amplifier Module:
1) IC3 (CSC2314) acts as the pre-amplifier which manipulate/control the input audio signals for the power amplifier. The pre-amplifier has the features of:
   - input selector for switching audio sources (RCA, line-in and Bluetooth)
   - Volume control
   - 2 Band Tone control (bass, treble)

3. Amplifier Module:
1) IC1 (TDA7491) acts as the 2X10W class-D power amplifier for the built-in stereo speakers.

4. MCU module :
1) IC6 (BJ8F101M20A) acts as main MCU for system control.

5. AC/DC Adaptor
1) U1 acts as the PWM controller.
2) Q1 (4N60) acts as the switching element.
3) U2 (817C) acts as the optocoupler providing feedback signal.
4) T1 acts as high frequency transformer.

Channel Frequency Table of Bluetooth Module

CH. NO.	FRE.	Hex Value		CH. NO.	FRE.	Hex Value		CH. NO	FRE.	Hex Value		CH. NO	FRE.	Hex Value
CH0	2402MHz	0		CH26	2428MHz	1A		CH52	2454MHz	34		CH78	2480MHz	4E
CH1	2403MHz	1		CH27	2429MHz	1B		CH53	2455MHz	35				
CH2	2404MHz	2		CH28	2430MHz	1C		CH54	2456MHz	36				
CH3	2405MHz	3		CH29	2431MHz	1D		CH55	2457MHz	37				
CH4	2406MHz	4		CH30	2432MHz	1E		CH56	2458MHz	38				
CH5	2407MHz	5		CH31	2433MHz	1F		CH57	2459MHz	39				
CH6	2408MHz	6		CH32	2434MHz	20		CH58	2460MHz	3A				
CH7	2409MHz	7		CH33	2435MHz	21		CH59	2461MHz	3B				
CH8	2410MHz	8		CH34	2436MHz	22		CH60	2462MHz	3C				
CH9	2411MHz	9		CH35	2437MHz	23		CH61	2463MHz	3D				
CH10	2412MHz	A		CH36	2438MHz	24		CH62	2464MHz	3E				
CH11	2413MHz	B		CH37	2439MHz	25		CH63	2465MHz	3F				
CH12	2414MHz	C		CH38	2440MHz	26		CH64	2466MHz	40				
CH13	2415MHz	D		CH39	2441MHz	27		CH65	2467MHz	41				
CH14	2416MHz	E		CH40	2442MHz	28		CH66	2468MHz	42				
CH15	2417MHz	F		CH41	2443MHz	29		CH67	2469MHz	43				
CH16	2418MHz	10		CH42	2444MHz	2A		CH68	2470MHz	44				
CH17	2419MHz	11		CH43	2445MHz	2B		CH69	2471MHz	45				
CH18	2420MHz	12		CH44	2446MHz	2C		CH70	2472MHz	46				
CH19	2421MHz	13		CH45	2447MHz	2D		CH71	2473MHz	47				
CH20	2422MHz	14		CH46	2448MHz	2E		CH72	2474MHz	48				
CH21	2423MHz	15		CH47	2449MHz	2F		CH73	2475MHz	49				
CH22	2424MHz	16		CH48	2450MHz	30		CH74	2476MHz	4A				
CH23	2425MHz	17		CH49	2451MHz	31		CH75	2477MHz	4B				
CH24	2426MHz	18		CH50	2452MHz	32		CH76	2478MHz	4C				
CH25	2427MHz	19		CH51	2453MHz	33		CH77	2479MHz	4D				

Features： **Bluetooth 3.0 Audio Module, Class 2**

Bluetooth Qualified

Version: V1.0

Mar 2012

The BT3GMD-A30P offers the following features:

● A2DP1.2 using SBC decoder for streaming audio over Bluetooth and AVRCP 1.4 for remote control functionality

● Configurable seven-band speaker equalization as well as ten presets allowing multiple music listening styles

● High quality 96 dB SNR DACs with 44.1 and 48 kHz sample rates for high-fidelity playback

● Single-chip Bluetooth 3.0 transceiver supporting Bluetooth 2.1 + Enhanced Data Rate (EDR) and Bluetooth 2.0, 1.2, and 1.1 backward compatibility

● Best-in-class Bluetooth radio with up to 8 dBm transmit power and -91dBm receive sensitivity

● Support for side tone and digital microphones

● Supports microphone and speaker HW equalization

● automatic volume control (AVC)

● Switching regulator, battery charger, and power management unit

● Supports fast charging, power dissipation monitoring, and optional charger voltage regulation

● Dual high quality 8 kHz and 16 kHz audio MIC inputs

● Multilanguage voice prompt

● Voice command recognition

Product Description:

The BT3GMD-A30P is a Bluetooth 3.0 Module solution integrating common components required for cost and performance-optimized stereo headset designs.

The BT3GMD-A30P also delivers differentiating features including enhanced audio quality, reduced charging times, A2DP, and multipoint connections through the integration of various noise suppression technologies, noise and echo reduction headset, for high-end

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

and cost and performance-optimized stereo headsets.

The BT3GMD-A30P supports Bluetooth SIG-compliant wideband speech implementation to greatly enhance the audio quality with both PCs and cell phones.

The BT3GMD-A30P supports the Bluetooth 3.0 standard, adding enhanced power control, simple and secure pairing, and enhanced inquiry response as value-added features for Bluetooth headsets. All major functional blocks required for a Bluetooth stereo headset, including switcher, charger, and stereo audio codec are

The module includes EEPROM, crystal, and PCB antenna.

Applications:

- High-End Stereo Wireless Headsets
- High-END Mono Headsets
- Hands-Free Car Kits
- Wireless Speakers

Functional Block Diagram:

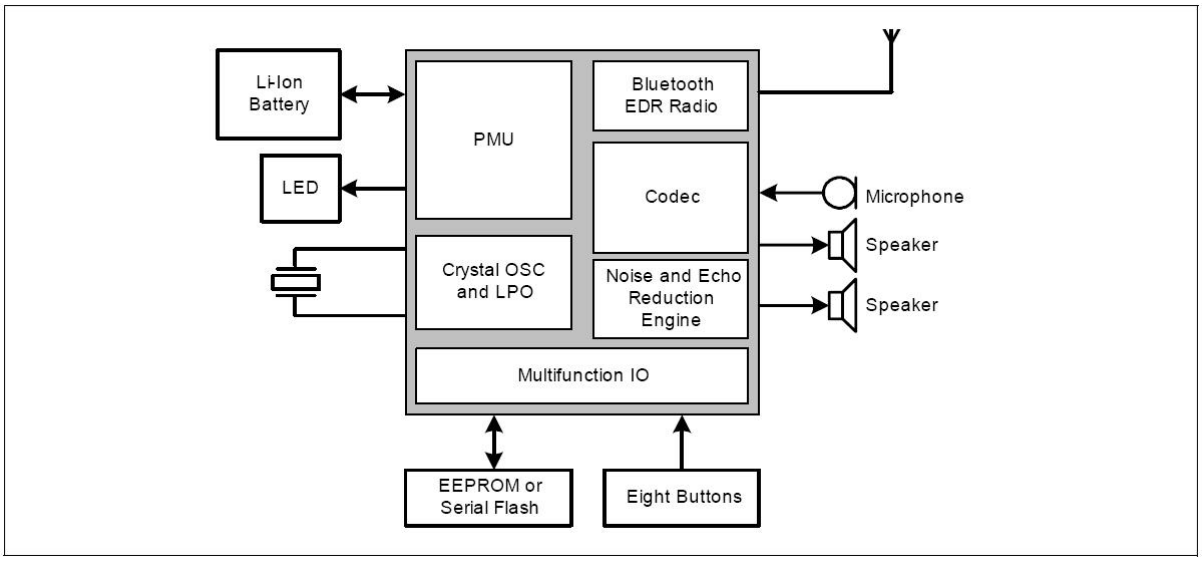

Figure 1: BT30MD-A30P Block Diagram

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Physical Description:

The BT30MD-A30P is a 13.5mm×22mm FR4 PCB with 30 pads located around the perimeter.

Table 1 shows the pinout diagram of the module.

PIN	Signal	PIN	Signal	PIN	Signal	PIN	Signal
1	GND	2	MICBAIS	3	MIC1_P	4	MIC1_N
5	NC	6	NC	7	SPKL_N	8	SPKL_P
9	SPKR_N	10	SPKR_P	11	RST	12	TXD
13	RXD	14	REV	15	FWD	16	VOUT
17	VBATT	18	NPNCNTL	19	VCHGAUX	20	VCHG
21	WAKEUP	22	LED2	23	LED1	24	Shutdown
25	VOL-	26	VOL+	27	LED3	28	MFB
29	PLAY	30	GND				

Table 1 Pin Location

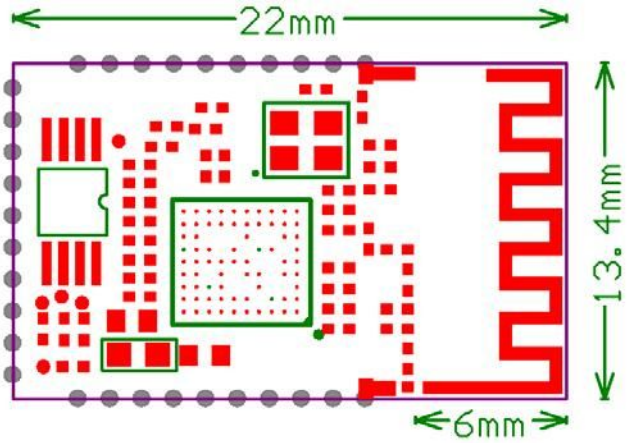

Figure 2: Module PCB Top View

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Table 2 Pin Function Descriptions

Pin Number	Pin Name	I/O	Power Domain	Description
1	GND	I	GND	Digital radio ground.
2	MICBAIS	O	MICAVDD	Microphone bias output.
3	MIC1_P	I	AUD_AVDD	Audio codec microphone differential positive input channel. Mic1 P.
4	MIC1_N	I	AUD_AVDD	Audio codec microphone differential negative input channel. Mic1 N.
5	NC			
6	NC			
7	SPKL_N	O	SPKAVDD	Speaker differential negative output channel 1.
8	SPKL_P	O	SPKAVDD	Speaker differential positive output channel 1.
9	SPKR_N	O	SPKAVDD	Speaker differential negative output channel 2.
10	SPKR_P	O	SPKAVDD	Speaker differential positive output channel 2.
11	RST	I	VDDO	Power-on reset, active low.
12	TXD	I/O	VDDO	General-purpose I/O.
13	RXD	I/O	VDDO	General-purpose I/O.
14	REV	I/O	VDDO	General-purpose I/O.
15	FWD	I/O	VDDO	General-purpose I/O.
16	VOUT	O	AVDD	3.3V Voltage output.
17	VBATT	I	VBAT	3.1-4.2V Input voltage.
18	NPNCNTL	O	VCHG	Base control for external PNP driver transistor through an NPN transistor,
19	VCHGAUX	I	VCHG	Power to the charger control system.
20	VCHG	I	VCHG	Charger supply input.
21	WAKEUP	I	AVDD_OUT	PMU wake-up and shut-down pin. MIA-LITE wakeup/system power-down signal.
22	LED2	O	VBAT	Connect the cathode of LED2. Anode can be connected to HVLDO.
23	LED1	O	VBAT	Output driver for LED. Connect the cathode of LED1. Anode can be connected to HVLDO.
24	Shutdown	I/O	VDDO	General-purpose I/O.
25	VOL-	I/O	VDDO	General-purpose I/O.
26	VOL+	I/O	VDDO	General-purpose I/O.
27	LED3	I/O	VDDO	General-purpose I/O.
28	MFB	I/O	VDDO	General-purpose I/O.
29	PLAY	I/O	VDDO	General-purpose I/O.
30	GND	I	GND	Digital radio ground.

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Supporting Documentions:

Reference Schematic:

The most recent schematic , bill of materil ,and layout file are available from the ITON Technology Limit. Contact your ITON representative for details.

Layout Considerations:

The BT30MD-A30P module is placed at the location where the antenna is away from the power supply(i.e.,BT1 Battery contacts)and any digital signal traces.. The antenna keep-out area which is 5mm around the parameter of the module region is shown in the red dotted box. PCB material and signal traces should not be placed within the antenna keep-out area to assure optimum antenna performance.

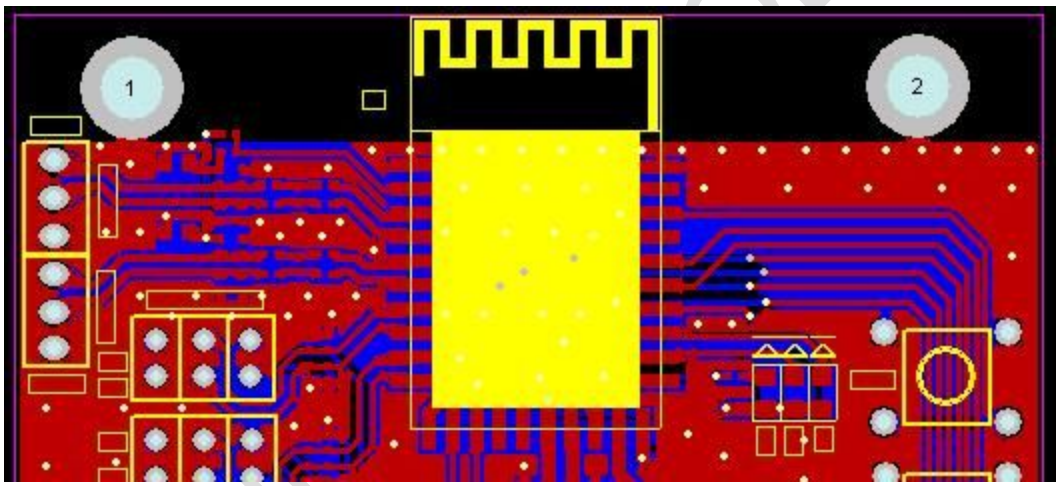

Figure 3: Design reference

Electrical Characteristics:

Table 3: Maximum Electrical Rating

Rating	*Symbol*	*Value*	*Unit*
Maximum DC supply voltage for I/O	VDDO	3.8	V
Maximum DC supply voltage for charger	VCHG	6.5	V
Maximum voltage on input or output pin	Vimax	Domain supply voltage [a] + 10%	V
Maximum transient voltage on input or output pin, 10% maximum duty time	Vimaxt	4.1	V
Minimum voltage on input or output pin	Vimin	VSS – 0.3v	V
Maximum voltage on LED	VLED-max	4.1	V
Storage temperature range	Tstg	–40 to +125	°C
Maximum battery input voltage	VBAT	4.5	V
Maximum charger power dissipation	Pmax (VCHG – VBAT)	390	mW

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Table 4:Power Supply Current (with a Nominal 3.7V Battery Voltage)

Operating Mode	*Typical*	*Unit*
Narrowband Speech Active mode (with 500 ms sniff interval)		
• HV3	9.1	mA
• 2EV3	8.0	mA
• EV3	8.9	mA
A2DP Active mode		
• 44.1kHz sampling rate, SBC (stereo, 8 sub bands, 16 blocks, 53 bit pool), 2DH5 packet type with 118 byte frame size	11.3	mA
Standby mode		
• Single HFP Sniff (640 ms interval)	200	µA
• Single HFP Sniff (500 ms interval)	207	µA
• Dual HFP Sniff (640 ms interval)	327	µA
• Dual HFP Sniff (500 ms interval)	332	µA
Deep Sleep (off) mode	3.0	µA

Notes:

- The currents are measured without an audio signal present.
- The currents are measured with Broadcom generic MMI, and LEDs are off.
- The standby current is measured with the device operating in Slave mode.

Table 5: Audio DAC Path Performance Specifications, 8 kHz and 16 kHz Sample Rate

Property	*Conditions*	*Minimum*	*Typical*	*Maximum*	*Unit*
Full-scale output signal level	0 dB driver gain 1 kHz tone at 0 dBFS 32Ω line load	–	3.2	–	Vppd
Output driver capability	0 dB driver gain 1 kHz tone at 0 dBFS 32Ω load	–	30	–	mW (rms)
Output load impedance	Nominal speaker load	16	32	–	Ω
Driver gain range	Adjustable gain	–18	–	0	dB
Driver step sizes	–	–	3	–	dB
Absolute gain error	Over 0 to –18 dB driver gain 1 kHz tone	–	1	–	dB
Idle channel tone	0 dB driver gain, no signal 32Ω load	–	–	–105	dBc
SNR	0 dB driver gain A-weight 20 kHz BW 32Ω load	90	96	–	dB
Dynamic range	0 dB driver gain A-weight, 20 kHz BW 1 kHz tone at –60 dBFS 32Ω load	–90	–96	–	dB
Total harmonic distortion (THD) + N	Po= 24 mW 0 dB driver gain A-weight, 20 kHz BW 32Ω load	–	–	–70	dB
	Po= 3 mW, 0 dB driver gain A-weight 20 kHz BW 32Ω load	–	–	–62	dB

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

RF Specification:

Table 6 : Receiver RF Specifications

Property	*Minimum*	*Typical*[a]	*Maximum*[b]	*Unit*
Receiver Section				
Frequency range	2402	–	2480	MHz
Rx Sensitivity				
GFSK, 0.1% BER, 1 Mbps	–	–89.5	–	dBm
pi/4-DQPSK, 0.01% BER, 2Mbps	–	–91.5	–	dBm
8-DPSK, 0.01% BER, 3 Mbps	–	–85.5	–	dBm
Maximum input	–	–	–10.0[c]	dBm
Interference Performance				
C/I co-channel (GFSK, 0.1% BER)	–	–	11.0	dB
C/I 1 MHz adjacent channel (GFSK, 0.1% BER)	–	–	0.0	dB
C/I 2 MHz adjacent channel (GFSK, 0.1% BER)	–	–	–30.0	dB
C/I ≥ 3 MHz adjacent channel (GFSK, 0.1% BER)	–	–	–40.0	dB
C/I image channel (GFSK, 0.1% BER)	–	–	–9.0	dB
C/I 1 MHz adjacent to image channel (GFSK,0.1% BER)	–	–	–20.0	dB
C/I co-channel (pi/4-DQPSK, 0.1% BER)	–	–	13.0	dB
C/I 1 MHz adjacent channel (pi/4-DQPSK, 0.1% BER)	–	–	0.0	dB
C/I 2 MHz adjacent channel (pi/4-DQPSK, 0.1% BER)	–	–	–30.0	dB
C/I ≥ 3 MHz adjacent channel (8-DPSK, 0.1% BER)	–	–	–40.0	dB
C/I image channel (pi/4-DQPSK, 0.1%BER)	–	–	–7.0	dB
C/I 1 MHz adjacent to image channel (pi/4-DQPSK,0.1% BER)	–	–	–20.0	dB
C/I co-channel (8-DPSK, 0.1% BER)	–	–	21.0	dB
C/I 1 MHz adjacent channel (8-DPSK, 0.1% BER)	–	–	5.0	dB
C/I 2 MHz adjacent channel (8-DPSK, 0.1% BER)	–	–	–25.0	dB
C/I ≥ 3 MHz adjacent channel (8-DPSK, 0.1% BER)	–	–	–33.0	dB
C/I image channel (8-DPSK, 0.1% BER)	–	–	0.0	dB
C/I 1 MHz adjacent to image channel (8-DPSK,0.1% BER)	–	–	–13.0	dB

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Table7: Transmitter RF Specifications

Property	*Minimum*	*Typical*	*Maximum*	*Unit*
Transmitter Section				
Frequency range	2402	–	2480	MHz
Maximum output power (Class 2 with V12 pin power to VDDTF pin, with TCA and TSSI)	–3	2	4	dBm
Maximum output power (Class 1 with 3.3V to VDDTF pin, with TCA and TSSI)[b]	5	8	12	dBm
In-Band Spurious Emission				
±500 kHz	–	–	–20.0	dBc
1.0 MHz < |M – N| < 1.5 MHz (EDR only)	–	–	–26.0	dBc
1.5 MHz < |M – N| < 2.5 MHz (EDR only)	–	–	–20.0	dBm
|M – N| > 2.5 MHz (EDR only)	–	–	–40.0[c]	dBm
Out-of-Band Spurious Emission				
30 MHz to 1 GHz	–	–80.0	–36.0[d]	dBm
1 GHz to 12.75 GHz	–	–	–30.0[e]	dBm
1.8 GHz to 1.9 GHz	–	–80.0	–47.0	dBm
5.15 GHz to 5.3 GHz	–	–90.0	–47.0	dBm
GPS Band Spurious Emissions and Noise Floor[f]				
1572.92 MHz to 1577.92 MHz (without SAW filter)	–	–150	–124	dBm/Hz
1572.92 MHz to 1577.92 MHz (with SAW filter)	–	–162	–146	dBm/Hz
Out-of-Band Noise and Spurious Emission without Band-pass Filter at Front End[f]				
746 MHz to 764 MHz (CDMA)	–	– 78	–	dBm
851 MHz to 894 MHz (CDMA)	–	– 68	–	dBm
925 MHz to 960 MHz (GSM)	–	– 68	–	dBm
1805 MHz to 1880 MHz (GSM)	–	– 70	–	dBm
1930 MHz to 1990 MHz (CDMA)	–	– 73	–	dBm
2110 MHz to 2170 MHz (WCDMA)	–	– 73	–	dBm
Out-of-Band Spurious Emission Noise Floor[f]				
746 MHz to 764 MHz	–	–140	–130	dBm/Hz
851 MHz to 894 MHz	–	–140	–130	dBm/Hz
925 MHz to 960 MHz	–	–140	–130	dBm/Hz
1805 MHz to 1880 MHz	–	–140	–130	dBm/Hz
1930 MHz to 1990 MHz	–	–140	–130	dBm/Hz

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Application Examples:

·Stereo Headphones

·Wireless stereo speakers

·Soundbars

·Mono Headsets

·Handsets

·and more…

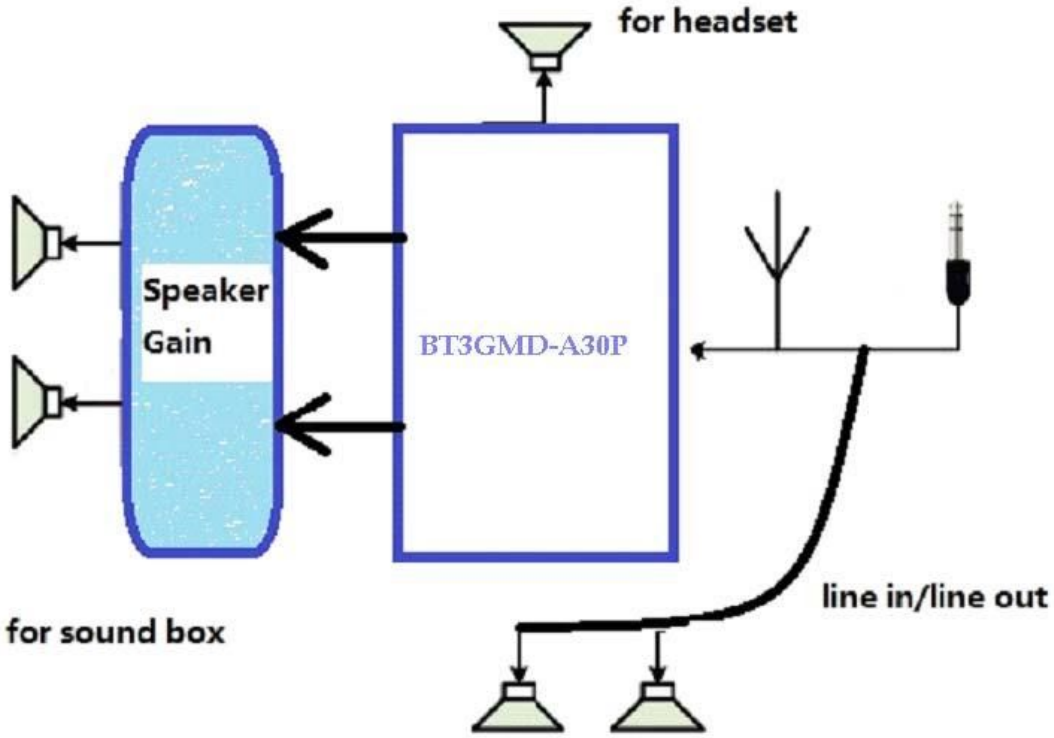

Figure 4 : Application

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534

Mechanical Specification:

Weight:

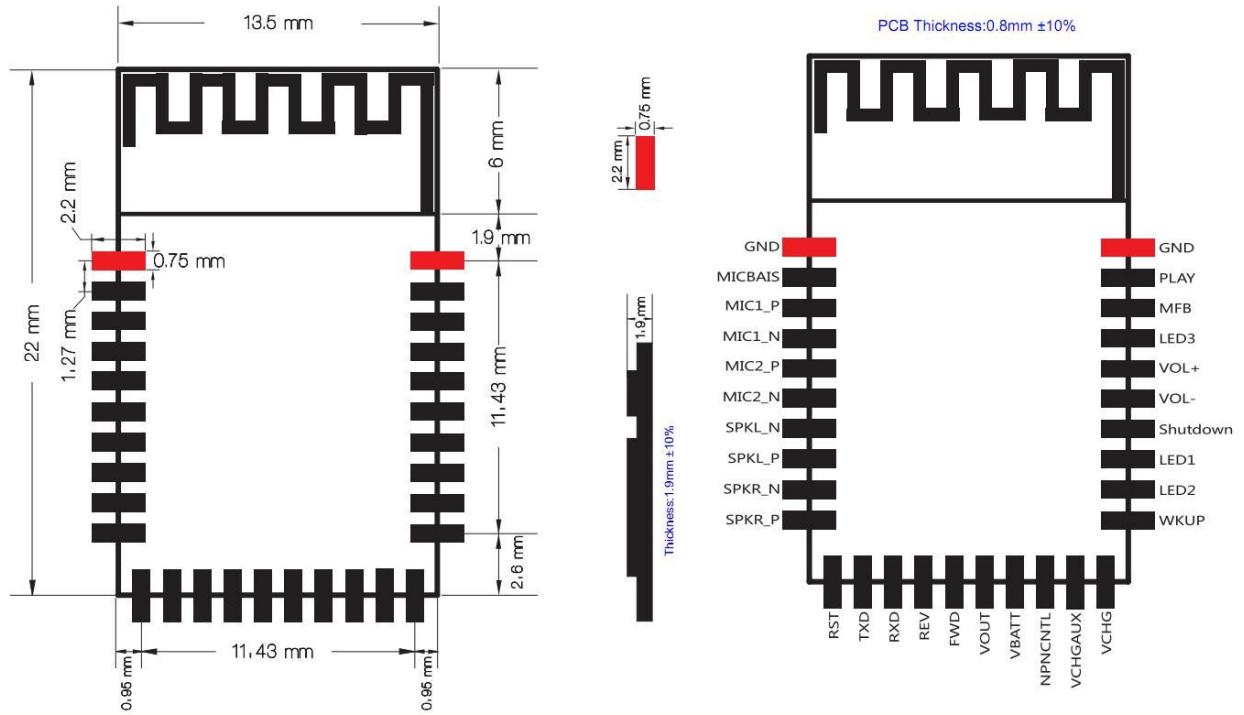

Figure 5: BT3GMD-A30P Module PCB Layout

Taiwan H/Q Add.: No.46, Aly. 108-3 , Ln. 445 , Sec. 2, Meishi Rd., Yangmei City, Taoyuan County 326, Taiwan (R.O.C.)
Tel: +886-3-4811534