

Bluetooth® 4.2 Stereo Audio Module

Features

- Qualified for Bluetooth v4.2 specifications
- Worldwide regulatory certifications are planned
- Supports HFP 1.6, HSP 1.2, A2DP 1.3, SPP 1.2, AVRCP 1.6
- Supports Bluetooth (BR/EDR/BLE) specifications (FW dependent)
- Stand-alone module with on-board PCB antenna and Bluetooth stack
- Supports high resolution up to 24-bit, 96 kHz audio data format
- Supports to connect two hosts with HFP/A2DP profiles simultaneously
- Transparent UART mode for seamless serial data over UART interface
- Supports virtual UART cable transport between host MCU and smartphone applications by Bluetooth SPP or BLE link
- Easy to configure with Windows® GUI or directly by external MCU
- Supports firmware field upgrade
- Supports 1 microphone
- Compact surface mount module:
 - BM62: 29 x 15 x 2.5 mm
 - BM64: 32 x 15 x 2.5 mm
- Castellated surface mount pads for easy and reliable host PCB mounting
- RoHS compliant
- Ideal for portable battery operated devices
- Internal battery regulator circuitry

RF/Analog

- Frequency spectrum: 2.402 GHz to 2.480 GHz
- Receive sensitivity: -90 dBm (2 Mbps EDR)
- Class 2 output power (+2 dBm typical) for BM62, BM64 and Class 1 output power (+15 dBm typical) for BM64

DSP Audio Processing

- Supports 64 kbps A-Law, μ -Law PCM format/ Continuous Variable Slope Delta (CVSD) Modulation for SCO channel operation
- Supports 8/16 kHz noise suppression
- Supports 8/16 kHz echo cancellation
- SBC and optional AAC decoding

- Packet loss concealment (PLC)
- Supports Serial Copy Management System (SCMS-T) content protection

FIGURE 1: BM62 MODULE

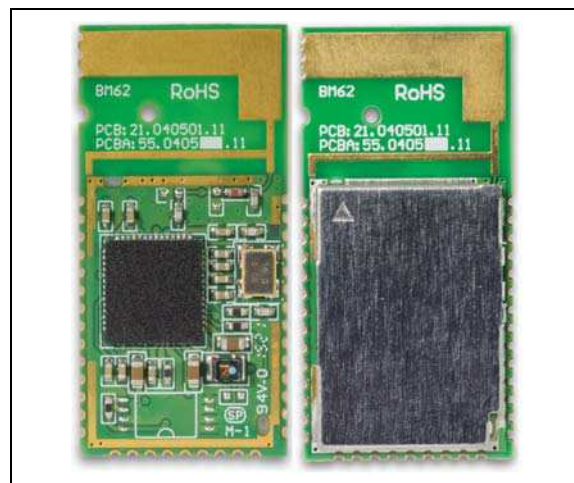
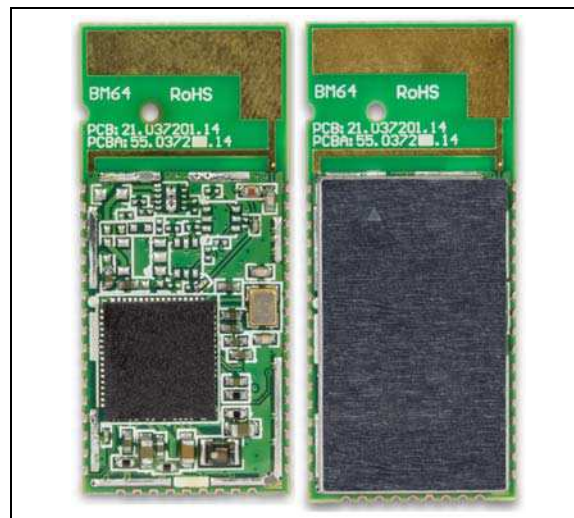


FIGURE 2: BM64 MODULE



Audio Codec

- SBC and optional AAC decoding
- 20-bit digital-to-analog (DAC) with 96 dB SNR
- 16-bit analog-to-digital (ADC) with 90 dB SNR
- Up to 24-bit, 96 kHz I²S digital audio

BM62/64

Peripherals

- Built-in lithium-ion and lithium-polymer battery charger (up to 350 mA)
- Integrated 1.8V and 3V configurable switching regulator and low-dropout (LDO)
- Built-in ADC for battery monitoring and voltage sense
- Built-in ADC for charger thermal protection
- Built-in undervoltage protection (UVP)
- An AUX-In port for external audio input
- Two LED drivers
- Multiple I/O pins for control and status

HCI Interface

- High-speed HCI-UART interface (supports up to 921,600 bps)

MAC/Baseband Processor

- Supports Bluetooth 4.2 dual mode (FW dependent)
 - BR/EDR transport for audio, voice, and SPP data exchange
 - BLE transport for proprietary transparent service and ANCS data exchange

Operating Condition

- Operating voltage: 3.2V to 4.2V
- Operating temperature: -20°C to +70°C

Compliance

- Bluetooth SIG QDID: 83345 (BM62, BM64 Class 2) and 83336 (BM64 Class 1)
- Certifications planned for the United States (FCC), Canada (IC), European Economic Area (CE), Korea (KCC), Taiwan (NCC), Japan (JRF), and China (SRRC)

Applications

- Soundbar and Subwoofer
- Bluetooth speaker
- Multi-speaker

Description

The BM62/64 Stereo Audio module is a fully qualified Bluetooth 4.2 dual-mode module for designers to add wireless audio and voice applications to their products. The BM62/64 module is a Bluetooth Special Interest Group (SIG) certified module that provides a complete wireless solution with Bluetooth stack, integrated PCB antenna, and worldwide radio certifications in a compact surface-mount package.

The BM62/64 module has several SKUs. The BM62 is a Class 2 device and the BM64 is available in both Class 1 and Class 2 versions.

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BM62/64

NOTES:

1.0 DEVICE OVERVIEW

The BM62 and BM64 Stereo Audio modules are built around Microchip Technology IS2062 and IS2064 SoCs.

The IS2062/64 SoC integrates the Bluetooth 4.2 dual-mode radio transceiver, Power Management Unit (PMU), crystal and DSP. Users can configure the

BM62/64 module using the UI tool and DSP tool, a Windows-based utility. Figure 1-1 illustrates a typical example of the BM62 module which is connected to an external audio amplifier and the MCU.

FIGURE 1-1: APPLICATION USING BM62 MODULE

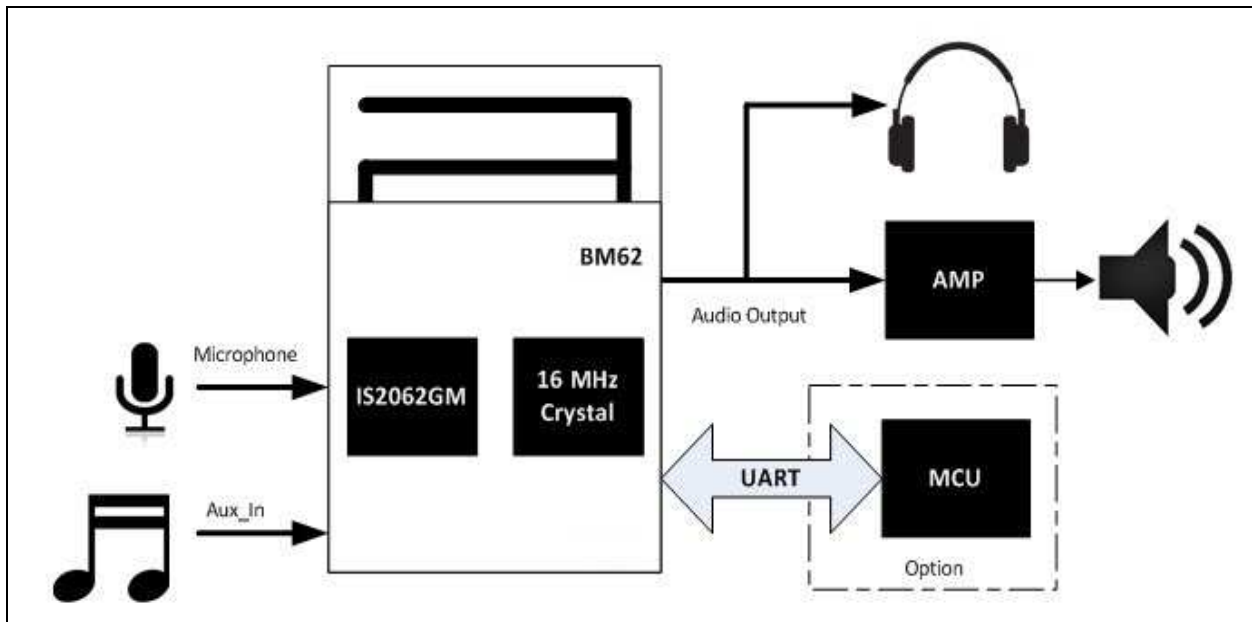
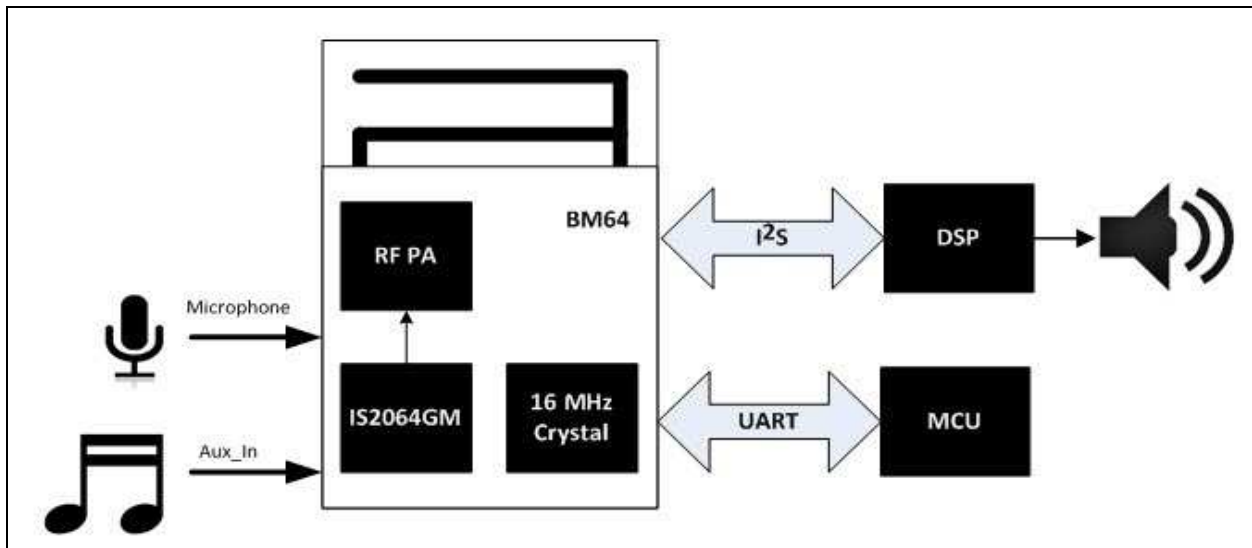


Figure 1-2 illustrates a typical example of the Class 1 BM64 module which is connected to an external MCU and a DSP/codec.

FIGURE 1-2: APPLICATION USING BM64 MODULE



BM62/64

Figure 1-3 and Figure 1-4 illustrate the BM64 module in Soundbar or Subwoofer applications.

FIGURE 1-3: SOUNDBAR AND SUBWOOFER APPLICATIONS USING BM64

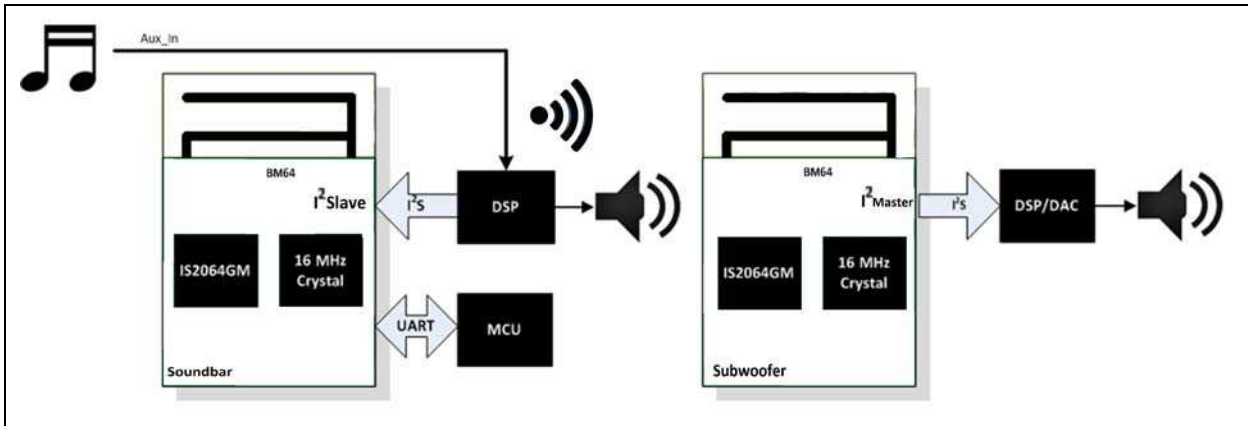


FIGURE 1-4: SOUNDBAR AND SUBWOOFER APPLICATIONS USING BM64, SMARTPHONE

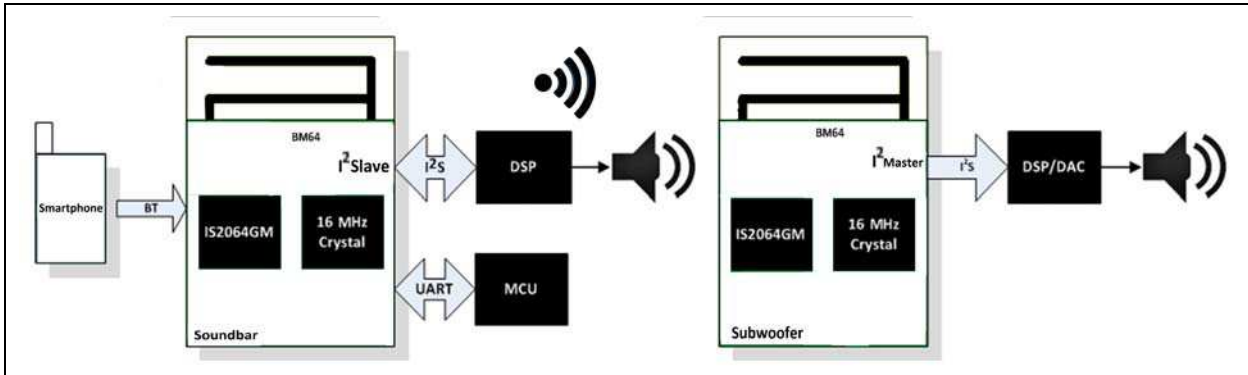


Figure 1-5 illustrates the BM64 module in a multi-speaker application.

FIGURE 1-5: MULTI-SPEAKER APPLICATION USING BM64

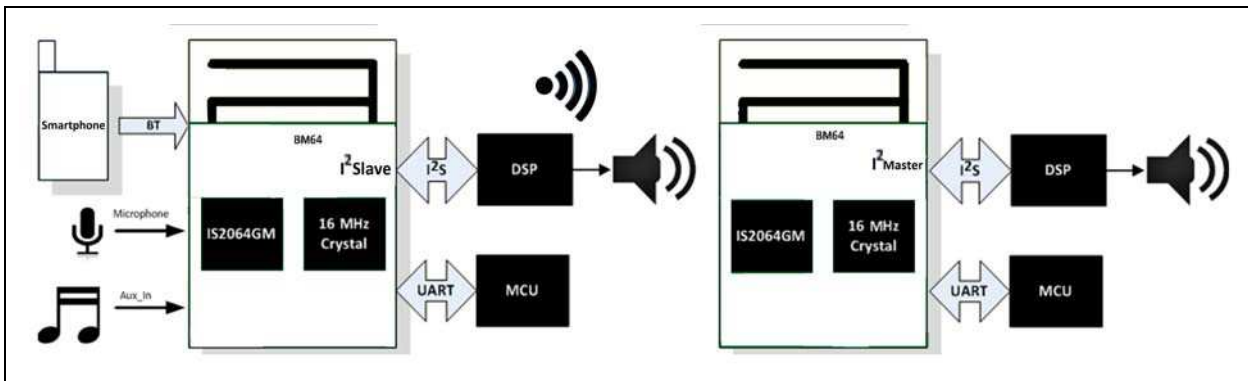


Table 1-1 provides the key features of the BM62/64 module.

TABLE 1-1: BM62/64 KEY FEATURES

Feature	BM62 CLASS2	BM64 CLASS2	BM64 CLASS1
Application	Headset/Speaker	Multi-speaker/Soundbar/Subwoofer	
Stereo/mono	Stereo	Stereo	Stereo
Pin count	37	43	43
Dimensions (mm ²)	15 x 29	15 x 32	15 x 32
PCB antenna	Yes	Yes	Yes
Tx power (typical)	2 dBm	2 dBm	15 dBm
Audio DAC output	2 Channel	2 Channel	2 Channel
DAC (single-ended) SNR at 2.8V (dB)	-98	-98	-98
DAC (capless) SNR at 2.8V (dB)	-98	-98	-98
ADC SNR at 2.8V (dB)	-92	-92	-92
I ² S digital interface	No	Yes	Yes
Analog AUX-In	Yes	Yes	Yes
Mono MIC	1	1	1
External audio amplifier interface	Yes	Yes	Yes
UART	Yes	Yes	Yes
LED driver	2	2	2
Internal DC-DC Step-down regulator	Yes	Yes	Yes
DC 5V adapter input	Yes	Yes	Yes
Battery charger (350 mA max.)	Yes	Yes	Yes
ADC for thermal charger protection	Yes	Yes	Yes
Undervoltage protection (UVP)	Yes	Yes	Yes
GPIO	10	12	12
Button support	6	6	6
NFC (triggered by external NFC)	Yes	Yes	Yes
EEPROM	Yes	Yes	Yes
Customized voice prompt	Store in EEPROM		
Multi-tone	Yes	Yes	Yes
DSP sound effect	Yes	Yes	Yes
Bluetooth profiles			
HFP	1.6	1.6	1.6
AVRCP	1.6	1.6	1.6
A2DP	1.3	1.3	1.3
HSP	1.2	1.2	1.2
SPP	1.2	1.2	1.2

BM62/64

Figure 1-6 illustrates the pin diagram of the BM62 module.

FIGURE 1-6: BM62 PIN DIAGRAM

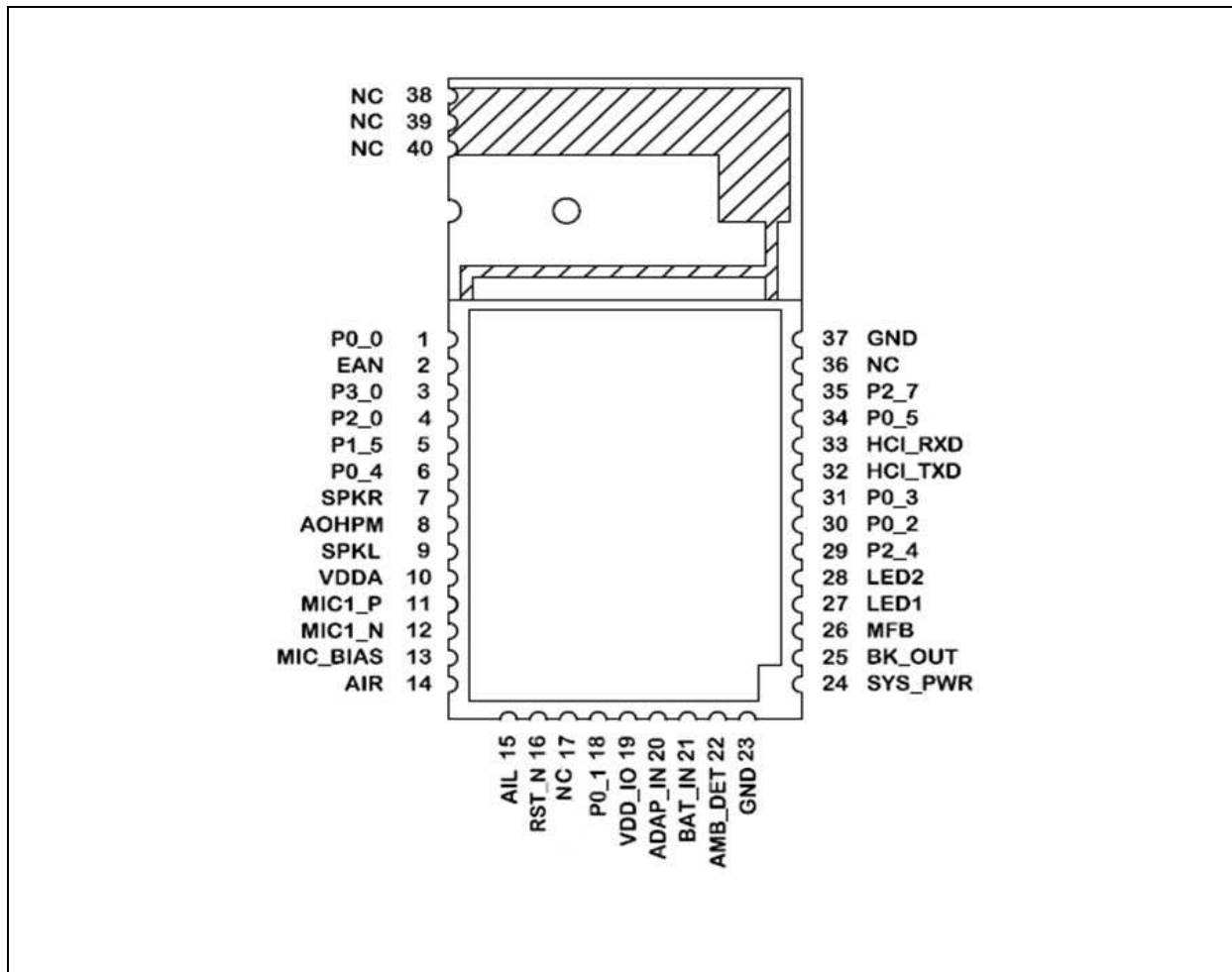


Table 1-2 provides the pin description of the BM62 module.

TABLE 1-2: BM62 PIN DESCRIPTION

Pin No	Pin Type	Pin Name	Description
1	I/O	P0_0	Configurable control or indication pin (internally pulled-up if configured as an input) <ul style="list-style-type: none"> Slide switch detector UART TX_IND
2	I	EAN	External address-bus negative System configuration pin along with the P2_0 and P2_4 pins, used to set the module in any one of the following three modes: <ul style="list-style-type: none"> Application mode (for normal operation) Test mode (to change EEPROM values) Write Flash mode (to enter a new firmware into the module), refer to Table 5-1 ROM: Must be pulled high to VDD_IO Flash: Must be pulled down with 4.7 kOhm to GND
3	I/O	P3_0	Configurable control or indication pin (Internally pulled-up, if configured as an input) AUX-In detector
4	I/O	P2_0	System configuration pin along with P2_4 and EAN pins, used to set the module in any one of the following three modes: <ul style="list-style-type: none"> Application mode (for normal operation) Test mode (to change EEPROM values), Write Flash mode (to enter a new firmware into the module), refer to Table 5-1
5	I/O	P1_5	Configurable control or indication pin (Internally pulled-up, if configured as an input) <ul style="list-style-type: none"> NFC detection pin Out_Ind_1 Slide switch detector
6	I/O	P0_4	Configurable control or indication pin (Internally pulled-up, if configured as an input) <ul style="list-style-type: none"> NFC detection pin Out_Ind_1
7	O	SPKR	Analog headphone output, right channel
8	O	AOHPM	Headphone common mode output/sense input
9	O	SPKL	Analog headphone output, left channel
10	P	VDDA	Analog reference voltage. Do not connect, for internal use only
11	I	MIC1_P	MIC1 mono differential analog positive input
12	I	MIC1_N	MIC1 mono differential analog negative input
13	P	MIC1_BIAS	Electric microphone biasing voltage
14	I	AIR	Right-channel, single-ended analog input
15	I	AIL	Left-channel, single-ended analog input
16	I	RST_N	System Reset (active-low)
17	-	NC	No connection

BM62/64

TABLE 1-2: BM62 PIN DESCRIPTION (CONTINUED)

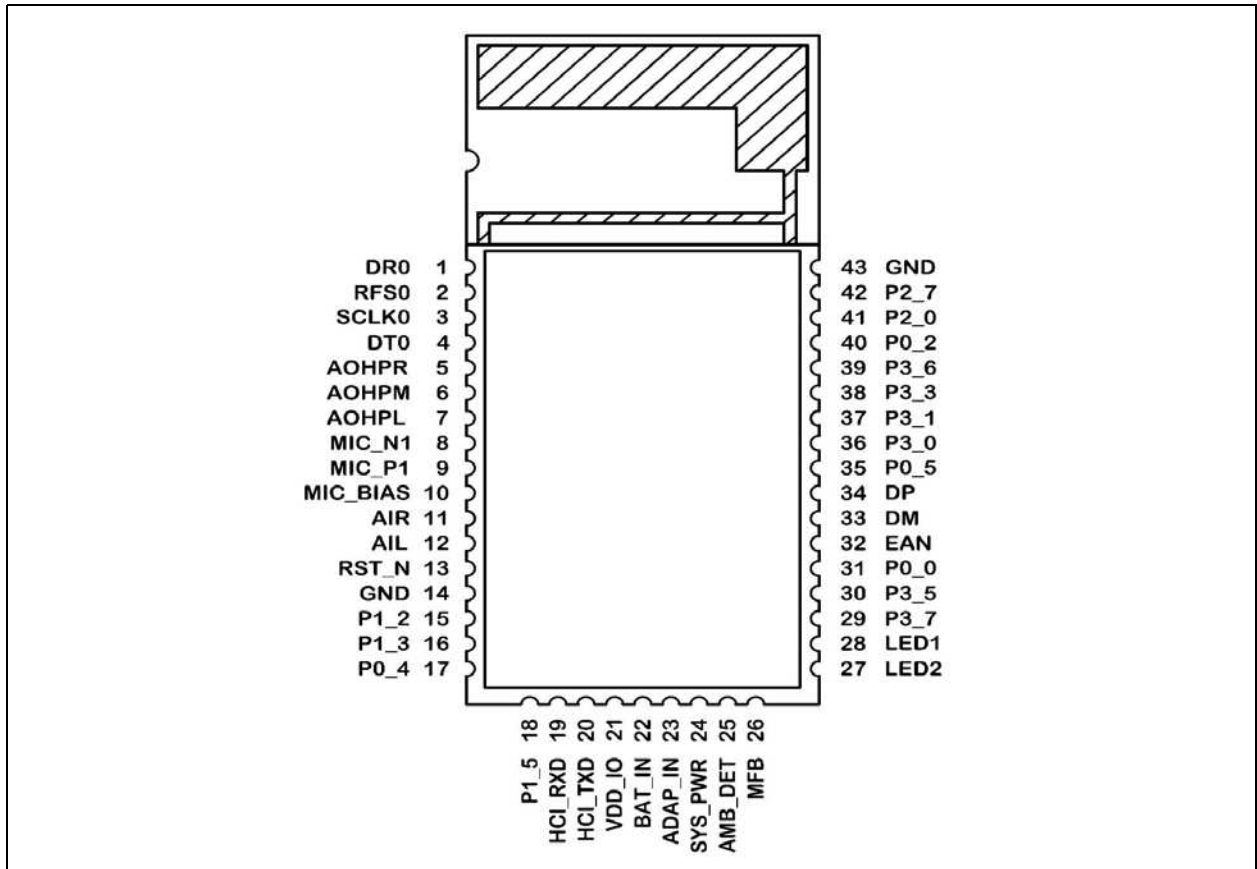
Pin No	Pin Type	Pin Name	Description
18	I/O	P0_1	Configurable control or indication pin (Internally pulled-up, if configured as an input) FWD key
19	P	VDD_IO	I/O positive supply. Do not connect. For internal use only
20	P	ADAP_IN	5V power adaptor input
21	P	BAT_IN	Battery input, voltage range: 3.2V to 4.2V
22	P	AMB_DET	Analog input for ambient temperature detection
23	P	GND	Ground reference
24	P	SYS_PWR	System power output
25	P	BK_OUT	1.8V buck output. Do not connect to other devices. For internal use only,
26	I	MFB	Multi-function button
27	I	LED1	LED Driver 1
28	I	LED2	LED Driver 2
29	I/O	P2_4	System configuration pin along with P2_0 and EAN pins, used to set the module in any one of the following three modes: <ul style="list-style-type: none"> • Application mode (for normal operation) • Test mode (to change EEPROM values) • Write Flash mode (to enter the new firmware into the module), refer to Table 5-1
30	I/O	P0_2	Configurable control or indication pin (Internally pulled-up if configured as an input) Play/Pause key as the default setting
31	I/O	P0_3	Configurable control or indication pin (Internally pulled-up if configured as an input) <ul style="list-style-type: none"> • REV key • Buzzer signal output • Out_Ind_2
32	I/O	HCI_TXD	HCI UART data output
33	I/O	HCI_RXD	HCI UART data output
34	I/O	P0_5	Configurable control or indication pin (Internally pulled-up if configured as an input) Volume-down key (default)
35	I/O	P2_7	Configurable control or indication pin (Internally pulled-up if configured as an input) Volume-up key (default)
36	-	NC	No connection
37	P	GND	Ground reference
38	-	NC	No connection
39	-	NC	No connection
40	-	NC	No connection

Legend: I= Input pin O= Output pin I/O= Input/Output pin P= Power pin

Note: These pins can be configured using the UI tool, a Windows utility.

Figure 1-7 illustrates the pin diagram of the BM64 module.

FIGURE 1-7: BM64 PIN DIAGRAM



BM62/64

Table 1-3 provides the BM64 pin descriptions.

TABLE 1-3: BM64 PIN DESCRIPTION

Pin No	Pin Type	Name	Description
1	I	DR0	I ² S interface: Digital left/right data
2	I/O	RFS0	I ² S interface: Left/right clock
3	I/O	SCLK0	I ² S interface: Bit clock
4	O	DT0	I ² S interface: Digital left/right data
5	O	AOHPR	Headphone output, right channel
6	O	AOHPM	Headphone common mode output/sense input
7	O	AOHPL	Headphone output, left channel
8	I	MIC_N1	MIC1 mono differential analog negative input
9	I	MIC_P1	MIC1 mono differential analog positive input
10	P	MIC_BIAS	Electric microphone biasing voltage
11	I	AIR	Right-channel single-ended analog input
12	I	AIL	Left-channel single-ended analog input
13	I	RST_N	System Reset (active-low)
14	P	GND	Ground reference
15	I/O	P1_2	EEPROM clock SCL
16	I/O	P1_3	EEPROM data SDA
17	I/O	P0_4	Configurable control or indication pin (Internally pulled-up if configured as an input) NFC detection pin, active-low, Out_Ind_1
18	I/O	P1_5	Configurable control or indication pin (Internally pulled-up if configured as an input) <ul style="list-style-type: none"> • NFC detection pin • SLIDE SWITCH detector, active-high • Out_Ind_1. • Multi-SPK Master/Slave mode control (FW dependent)
19	I	HCI_RXD	HCI-UART data input
20	O	HCI_TXD	HCI-UART data output
21	P	VDD_IO	I/O positive supply. Do not connect, for internal use only
22	P	BAT_IN	Battery input. Voltage range: 3.2V to 4.2V
23	P	ADAP_IN	5V power adaptor input
24	P	SYS_PWR	System power output
25	P	AMB_DET	Analog input for ambient temperature detection
26	I	MFB	Multi-function button and power-on key UART RX_IND, active high
27	I	LED2	LED driver 2
28	I	LED1	LED Ddriver 1
29	I/O	P3_7	Configurable control or indication pin (Internally pulled-up if configured as an input) UART TX_IND, active-low
30	I/O	P3_5	Configurable control or indication pin (Internally pulled-up if configured as an input) Slide switch detector, active-high
31	I/O	P0_0	Configurable control or indication pin (Internally pulled-up if configured as an input) Slide switch detector, active-high, Out_Ind_0

TABLE 1-3: BM64 PIN DESCRIPTION (CONTINUED)

Pin No	Pin Type	Name	Description
32	I	EAN	External address-bus negative System configuration pin along with the P2_0 pin used to set the module in any one of these modes: <ul style="list-style-type: none"> • Application mode (for normal operation) • Test mode (to change EEPROM values) • Write Flash mode (to enter new firmware into the module) refer to Table 5-1 ROM: Must be pulled high to VDD_IO Flash: must be pulled down with 4.7 kOhm to GND
33	I/O	DM	Differential data-minus USB
34	I/O	DP	Differential data-plus USB
35	I/O	P0_5	Configurable control or indication pin (Internally pulled-up if configured as an input) Volume-down key (default)
36	I/O	P3_0	Configurable control or indication pin (Internally pulled-up if configured as an input) AUX-In Detector
37	I/O	P3_1	Configurable control or indication pin (Internally pulled-up if configured as an input) REV key (default), active low
38	I/O	P3_3	Configurable control or indication pin (Internally pulled-up if configured as an input) FWD key, active-low
39	I/O	P3_6	Configurable control or indication pin (Internally pulled-up if configured as an input) Multi-SPK Master/Slave mode control, FW dependent
40	I/O	P0_2	Configurable control or indication pin (Internally pulled-up if configured as an input) Play/Pause key as the default setting
41	I/O	P2_0	System configuration pin along with EAN pin, used to set the module in any one of the following modes: <ul style="list-style-type: none"> • Application mode (for normal operation) • Test mode (to change EEPROM values) • Write Flash mode (to enter the new firmware into the module), refer to Table 5-1
42	I/O	P2_7	Configurable control or indication pin (Internally pulled-up if configured as an input) Volume-up key (default)
43	P	GND	Ground reference

Legend: I= Input pin O= Output pin I/O= Input/Output pin P= Power pin

Note: These pins can be configured by using the UI tool, a Windows utility.

BM62/64

NOTES:

2.0 AUDIO

The input and output audios have different stages and each stage can be programmed to vary the gain response characteristics. For microphone, both single-ended inputs and differential inputs are supported. To maintain a high quality signal, a stable bias voltage source to the condenser microphone's FET is provided. DC blocking capacitors can be used at both positive and negative sides of a input. Internally, this analog signal is converted to 16-bit, 8 kHz linear PCM data.

2.1 Digital Signal Processor

A Digital Signal Processor (DSP) is used to perform speech and audio processing. The advanced speech features, such as acoustic cancellation and noise reduction are in-built. To reduce nonlinear distortion

and help echo cancellation, an outgoing signal level to the speaker will exceed the threshold (and therefore likely to create echo). This may result in suppression of the signal. Adaptive filtering is also applied to track the echo path impulse in response to provide echo free and full-duplex user experience. The embedded noise reduction algorithm helps to extract clean speech signals from the noisy inputs captured by microphones and improves mutual understanding in communication. Advanced audio features, such as multi-band dynamic range control, parametric multi-band equalizer, audio widening and virtual bass are in-built. The audio effect algorithms are to improve the user's audio listening experience in terms of better quality after audio signal processing.

Figure 2-1 and Figure 2-2 illustrate the processing flow of speaker-phone applications for speech and audio signal processing.

FIGURE 2-1: SPEECH PROCESSING

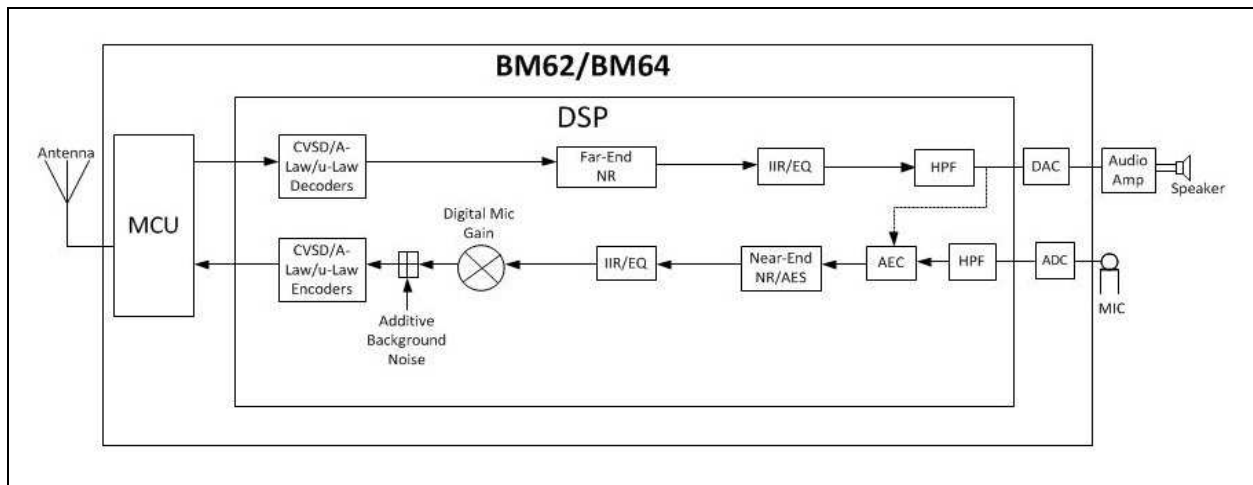
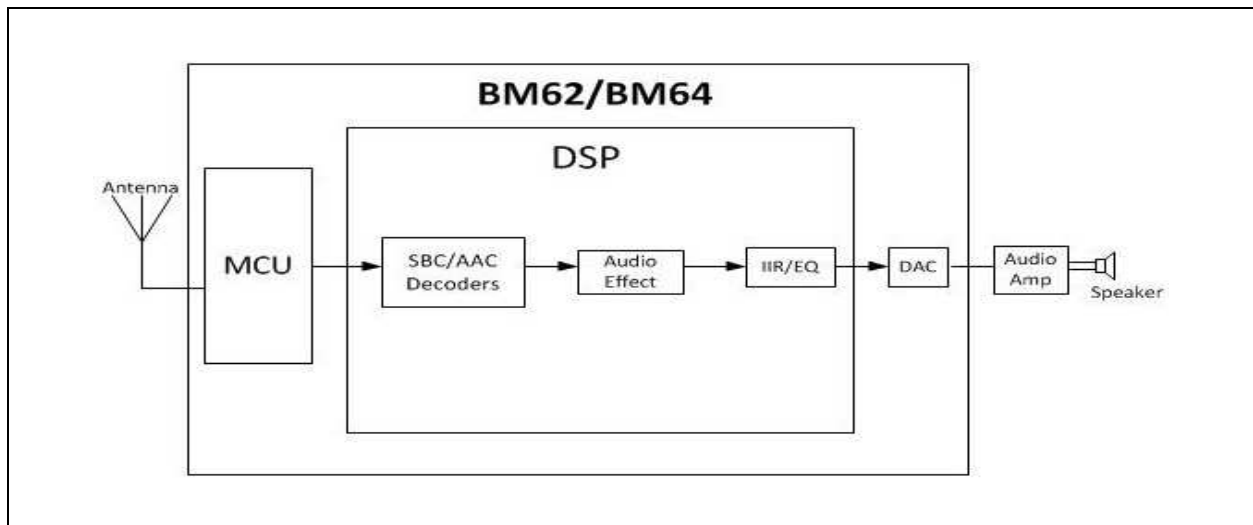


FIGURE 2-2: AUDIO PROCESSING



BM62/64

The DSP parameters can be configured using the DSP tool. For additional information, refer to the “IS206X DSP Application Note”.

Note: The DSP tool is a windows-based configuration tool, which is available for download from the Microchip web site at: www.microchip.com/BM62 and www.microchip.com/BM64.

2.2 Codec

The built-in codec has a high signal-to-noise ratio (SNR) performance. This built-in codec consist of an analog-to-digital converter (ADC), a digital-to-analog converter (DAC) and an additional analog circuitry. Figure 2-3 through Figure 2-6 illustrate the dynamic range and frequency response of the codec.

FIGURE 2-3: CODEC DAC DYNAMIC RANGE

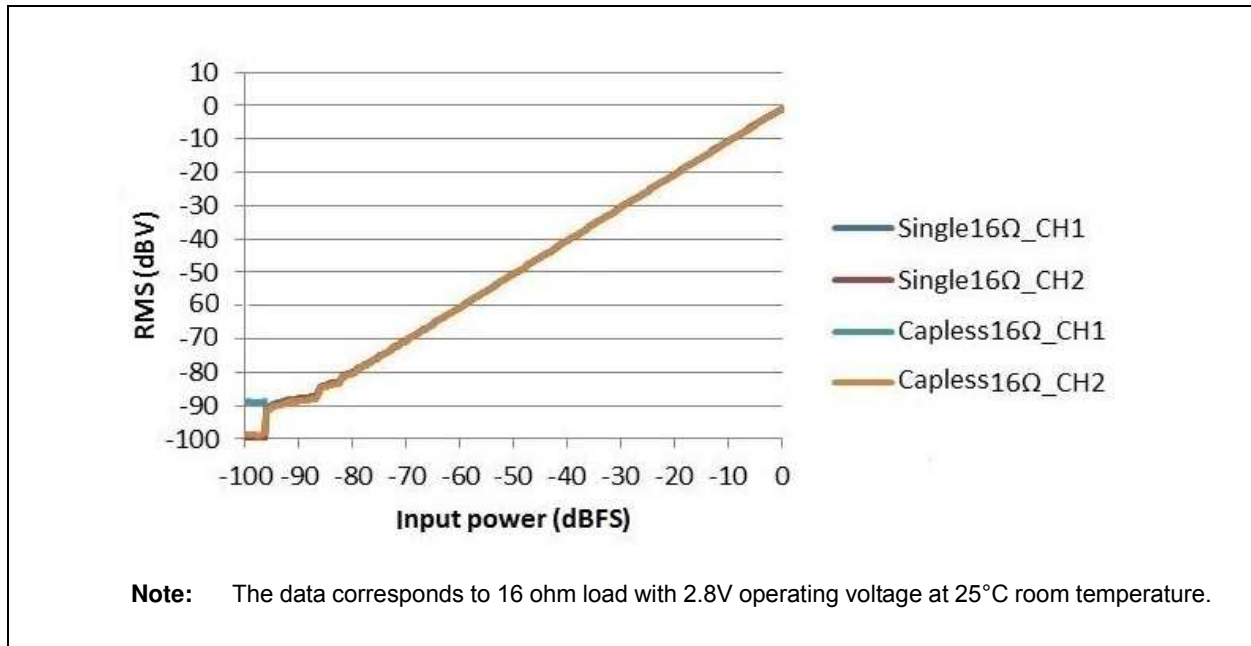


FIGURE 2-4: CODEC DAC THD+N VERSUS INPUT POWER

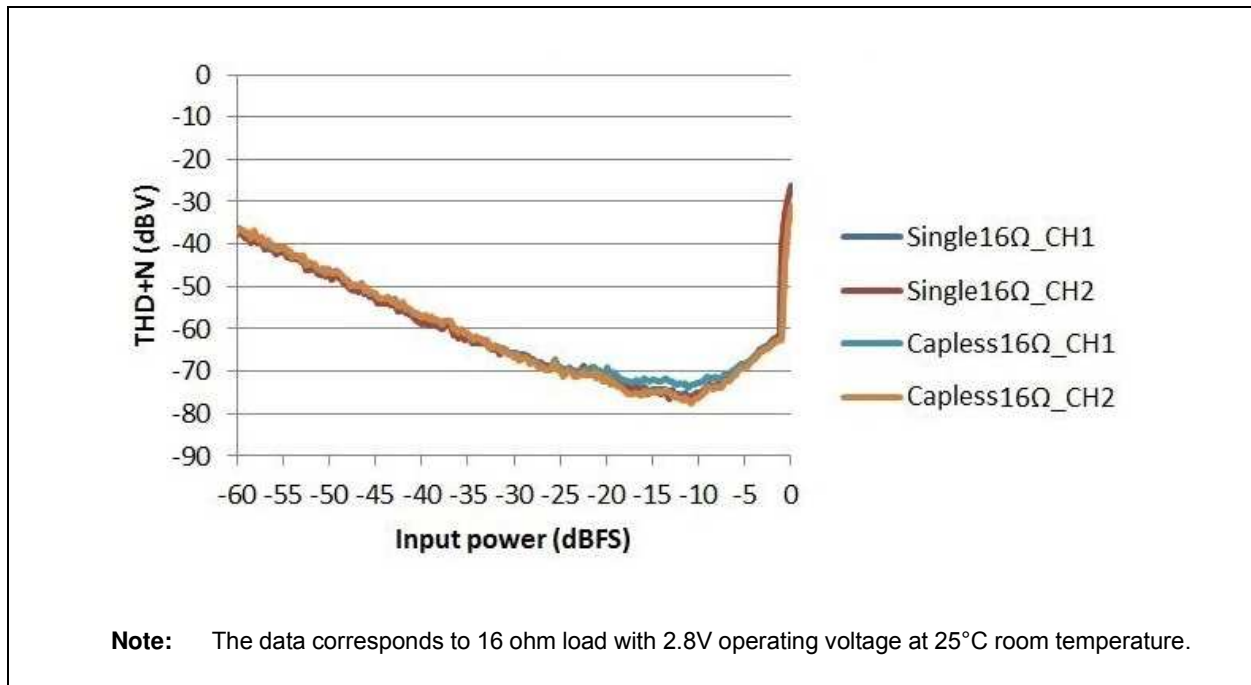


FIGURE 2-5: CODEC DAC FREQUENCY RESPONSE (CAPLESS MODE)

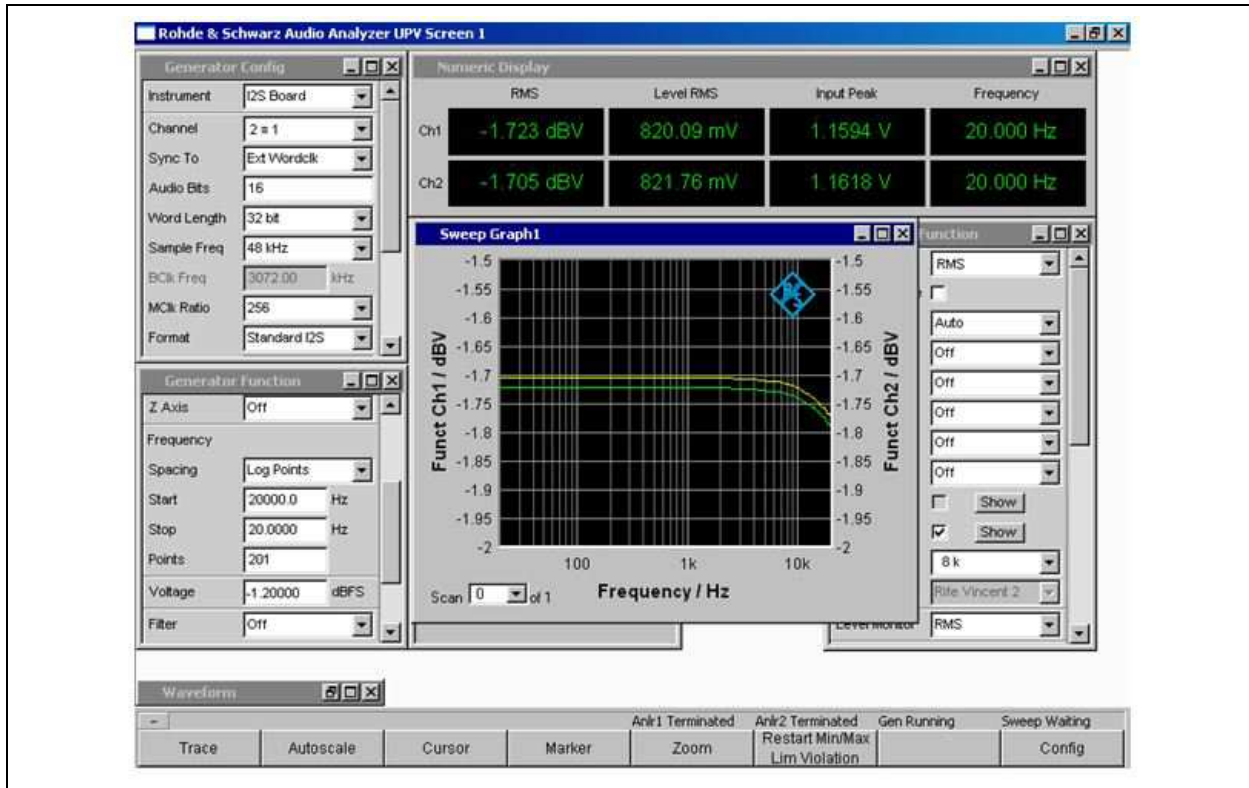
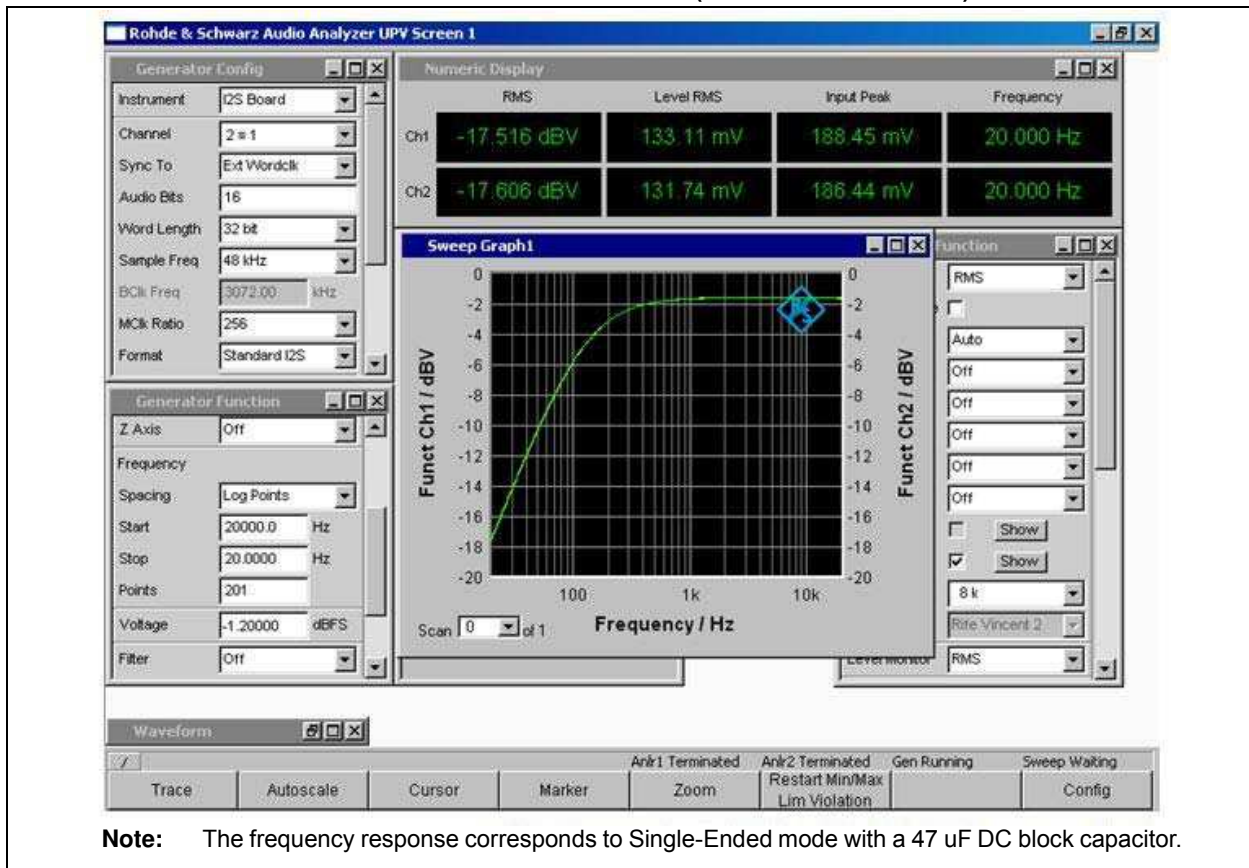


FIGURE 2-6: CODEC DAC FREQUENCY RESPONSE (SINGLE-ENDED MODE)



BM62/64

2.3 Auxiliary Port

The BM62/64 module supports one analog (line-in) signal from external audio source. The analog (line-in) signal can be processed by the DSP to generate different sound effects (Multi-band dynamic range compression and audio widening), which can be set up by using the DSP tool.

2.4 Analog Speaker Output

The BM62/64 module supports the following speaker output modes:

- Capless mode — Commended for headphone applications in which capless output connection helps to save the BOM cost by avoiding a large DC blocking capacitor. [Figure 2-7](#) illustrates the analog speaker output capless mode.
- Single-ended mode — Used for driving an external audio amplifier where a DC blocking capacitor is required. [Figure 2-8](#) illustrates the analog speaker output single-ended mode.

FIGURE 2-7: CAPLESS MODE

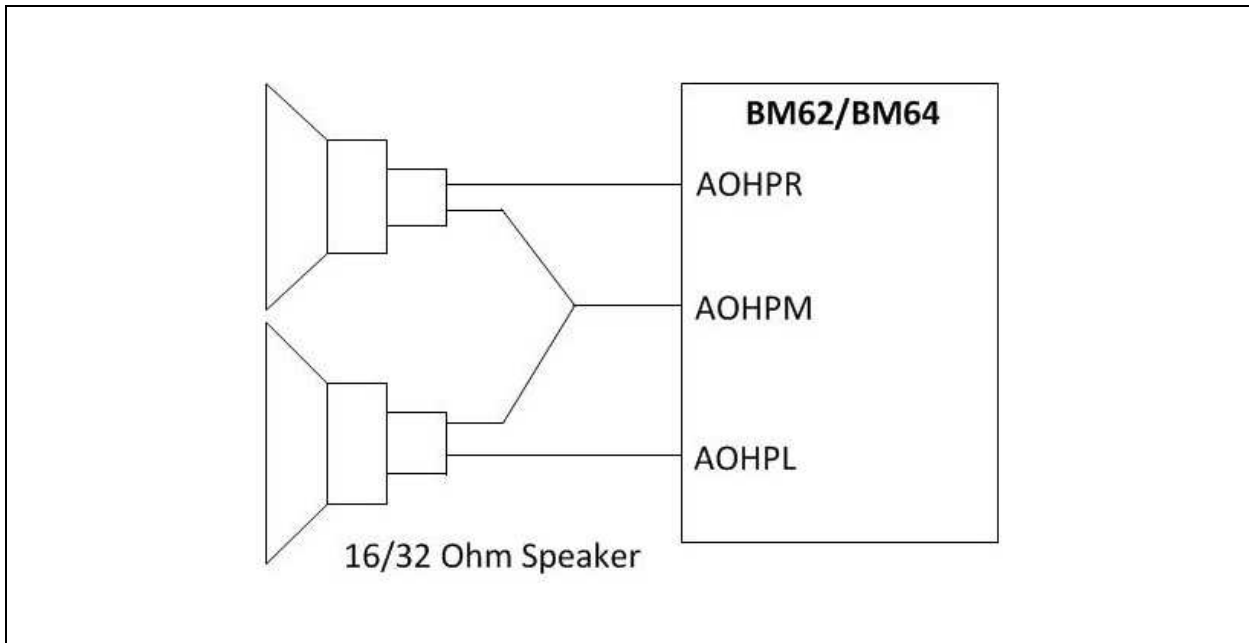
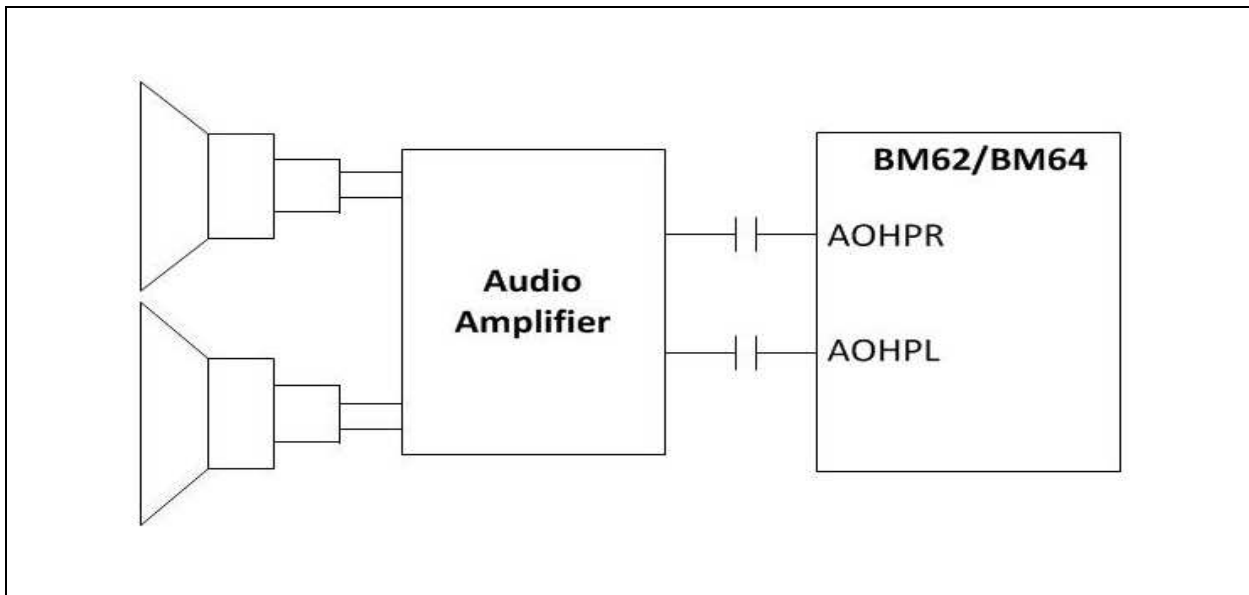


FIGURE 2-8: SINGLE-ENDED MODE



3.0 TRANSCIVER

The BM62/64 module is designed and optimized for Bluetooth 2.4 GHz system. It contains a complete radio frequency transmitter/receiver section. An internal synthesizer generates a stable clock for synchronizing with another device.

3.1 Transmitter

The internal power amplifier (PA) has a maximum output power of +4 dBm. This is applied for Class 2 or Class 3 radios without an external RF PA.

The transmitter performs IQ conversion to minimize the frequency drift.

3.2 Receiver

The low-noise amplifier (LNA) operates with TR-combined mode for single port application. It can save a pin on package without having an external Tx/Rx switch.

The ADC is used to sample the input analog signal and convert it into digital signal for de-modulator analysis. A channel filter has been integrated into receiver channel before the ADC, which is used to reduce the external component count and increase the anti-interference capability. The image rejection filter is used to reject image frequency for low-IF architecture. This filter for low-IF architecture is intended to reduce external Band Pass Filter (BPF) component for super heterodyne architecture.

Received Signal Strength Indicator (RSSI) signal feedback to the processor is used to control the RF output power to make a good trade-off for effective distance and current consumption.

3.3 Synthesizer

A synthesizer generates a clock for radio transceiver operation. There is a VCO inside, with a tunable internal LC tank that can reduce variation for components. A crystal oscillator with internal digital trimming circuit provides a stable clock for synthesizer.

3.4 Modem

For Bluetooth 1.2 specification and below, 1 Mbps was the standard data rate based on Gaussian Frequency Shift Keying (GFSK) modulation scheme. This basic rate modem meets Basic Data Rate (BDR) requirements of Bluetooth 2.0 with Enhanced Data Rate (EDR) specification.

For Bluetooth 2.0 and above specifications, EDR has been introduced to provide data rates of 2 Mbps, 3 Mbps and 1 Mbps. For baseband, both BDR and EDR utilize the same 1 MHz symbol rate and 1.6 kHz slot rate. For BDR, symbol 1 represents 1-bit. However, each symbol in the payload part of EDR packet represents 2/3 bits. This is achieved by using two different modulations, $\pi/4$ DQPSK and 8 DPSK.

3.5 Adaptive Frequency Hopping (AFH)

The BM62/64 module has AFH function to avoid RF interference. It has an algorithm to check the nearby interference and to choose clear channel for transceiver Bluetooth signal.

BM62/64

NOTES:

4.0 POWER MANAGEMENT UNIT

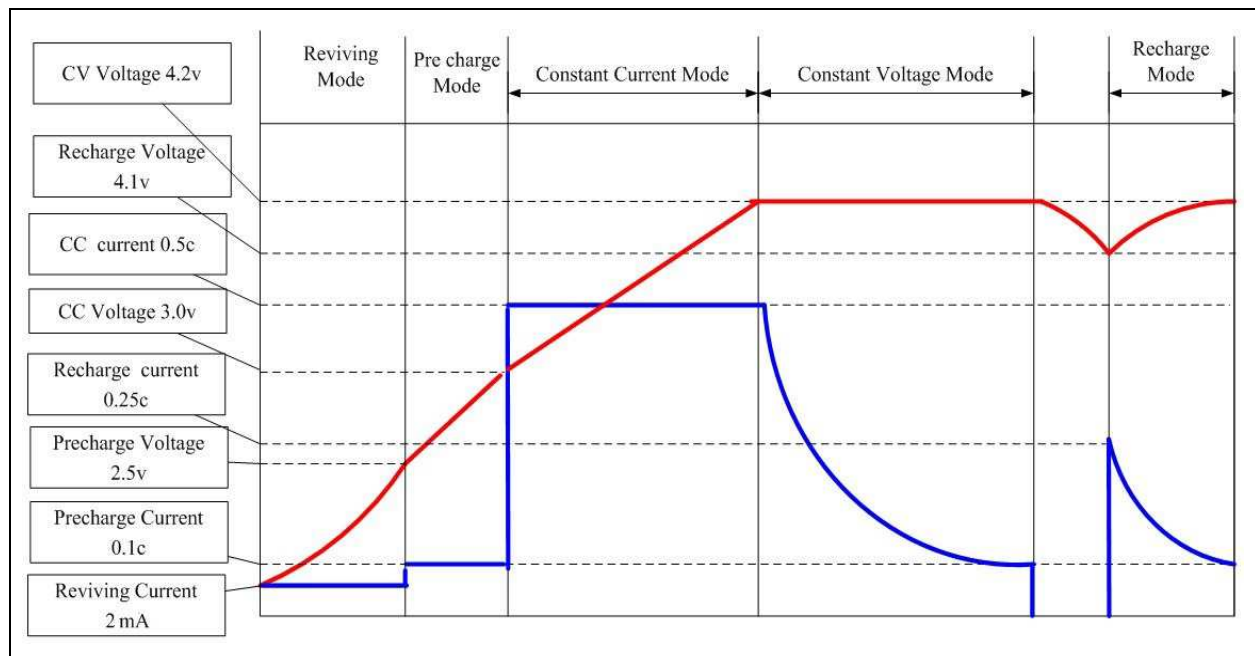
The on-chip Power Management Unit (PMU) has two main features: lithium-ion and lithium-polymer battery charger, and voltage regulation. A power switch is used to switch over the power source between the battery and adaptor. Also, the PMU provides current to drive two LEDs.

4.1 Charging a Battery

The BM62/64 module has a built-in battery charger which is optimized for lithium-ion and lithium-polymer batteries.

The charger includes a current sensor for charging control, user programmable current regulation, and high accuracy voltage regulation. The charging current parameters are configured by the UI tool. Reviving, pre-charging, constant current and constant voltage modes, and re-charging functions are included. The maximum charging current is 350 mA. [Figure 4-1](#) illustrates the charging curve of a battery.

FIGURE 4-1: CHARGING CURVE



4.2 Voltage Monitoring

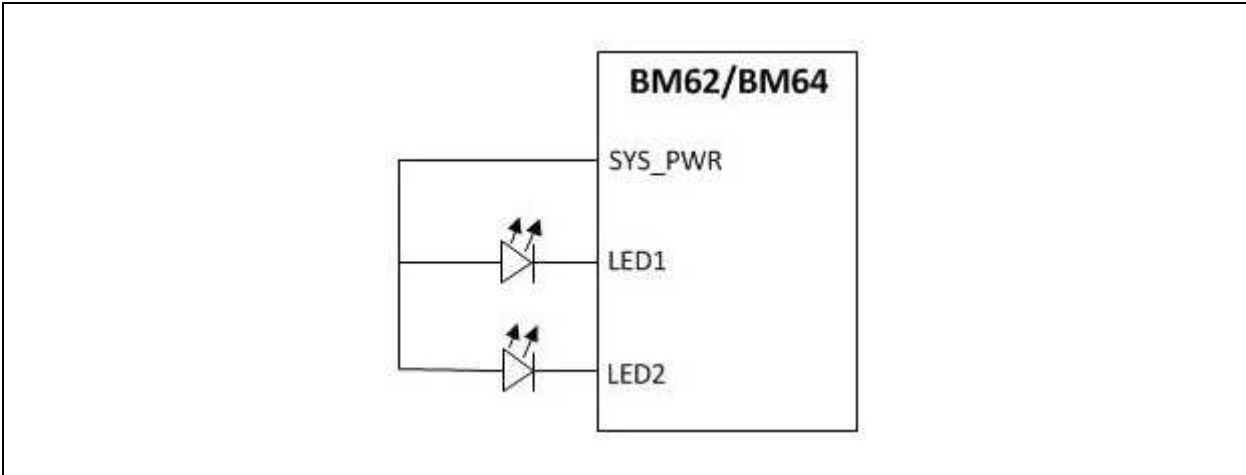
A 10-bit, successive approximation ADC (SAR ADC) provides a dedicated channel for voltage level detection. The warning level can be programmed by using the UI tool. The ADC provides a granular resolution to enable the MCU to take control over the charging process.

4.3 LED Driver

Two dedicated LED drivers control the LEDs. They provide enough sink current (16 step control and 0.35 mA for each step), thus LEDs can be connected directly with the BM62/64 module. LED settings can be configured using the UI tool. [Figure 4-2](#) illustrates the LED drivers in the BM62/64 module.

BM62/64

FIGURE 4-2: LED DRIVER



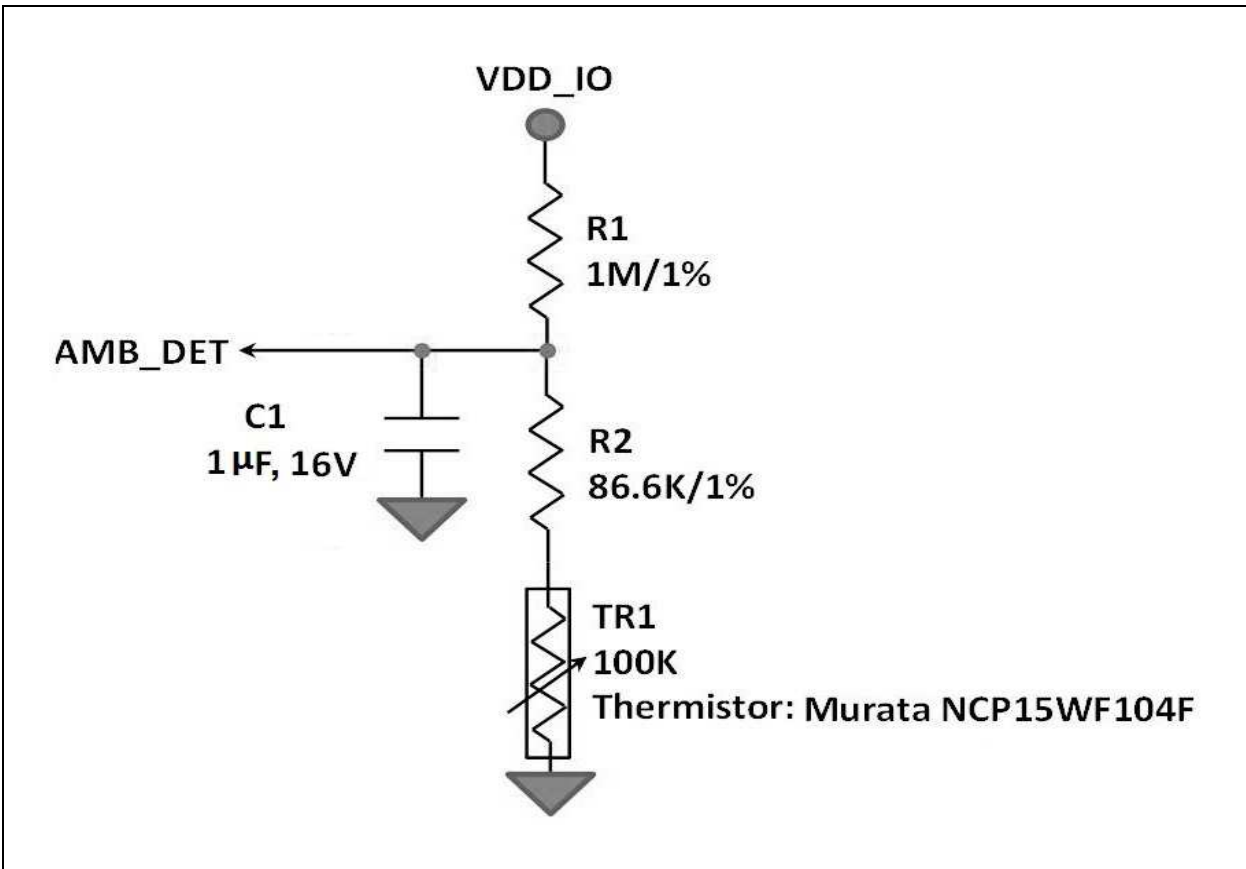
4.4 Under Voltage Protection

When the SYS_PWR voltage is less than 2.9V, the system will shutdown.

4.5 Ambient Detection

The BM62/64 module has a built-in ADC for charger thermal protection. Figure 4-3 illustrates the suggested circuit and thermistor, Murata NCP15WF104F. The charger thermal protection can avoid battery charge in restricted temperature range. The upper and lower limits for temperature values can be configured using the UI tool.

FIGURE 4-3: AMBIENT DETECTION



5.0 APPLICATION INFORMATION

5.1 Host MCU Interface

The BM62/64 module supports UART commands. The UART commands enable an external MCU to control the BM62/64 module. Figure 5-1 illustrates the UART interface between the BM62/64 module and MCU.

An external MCU can control the BM62/64 module over the UART interface and wake-up the module with the MFB pins, P0_0 (BM62) and P3_7 (BM64).

Refer to the "UART_CommandSet" document for a list of functions the BM62/64 module supports, and how to use the UI tool to configure UART and UART Command Set tool.

Note: The UART Command set tool (SPKCommandSetTool v160.xx) is available for download from the Microchip web site at: www.microchip.com/BM62 and www.microchip.com/BM64.

FIGURE 5-1: HOST MCU INTERFACE OVER UART

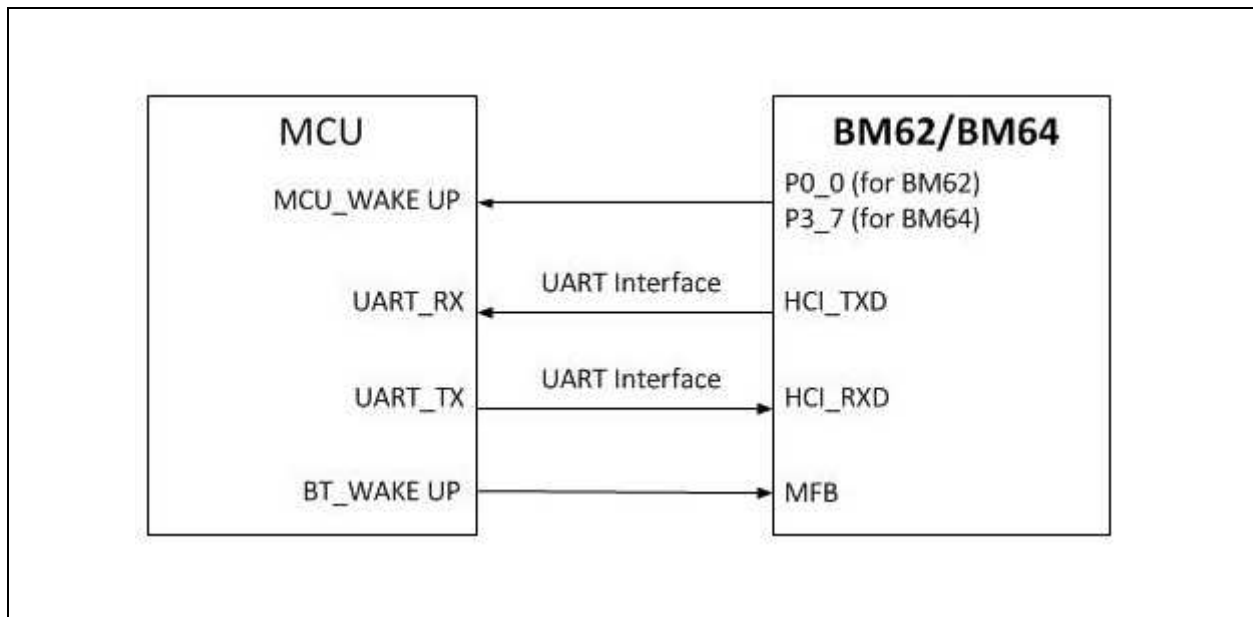


Figure 5-2 through Figure 5-7 illustrate the various UART control signal timing sequences.

FIGURE 5-2: POWER ON/OFF SEQUENCE

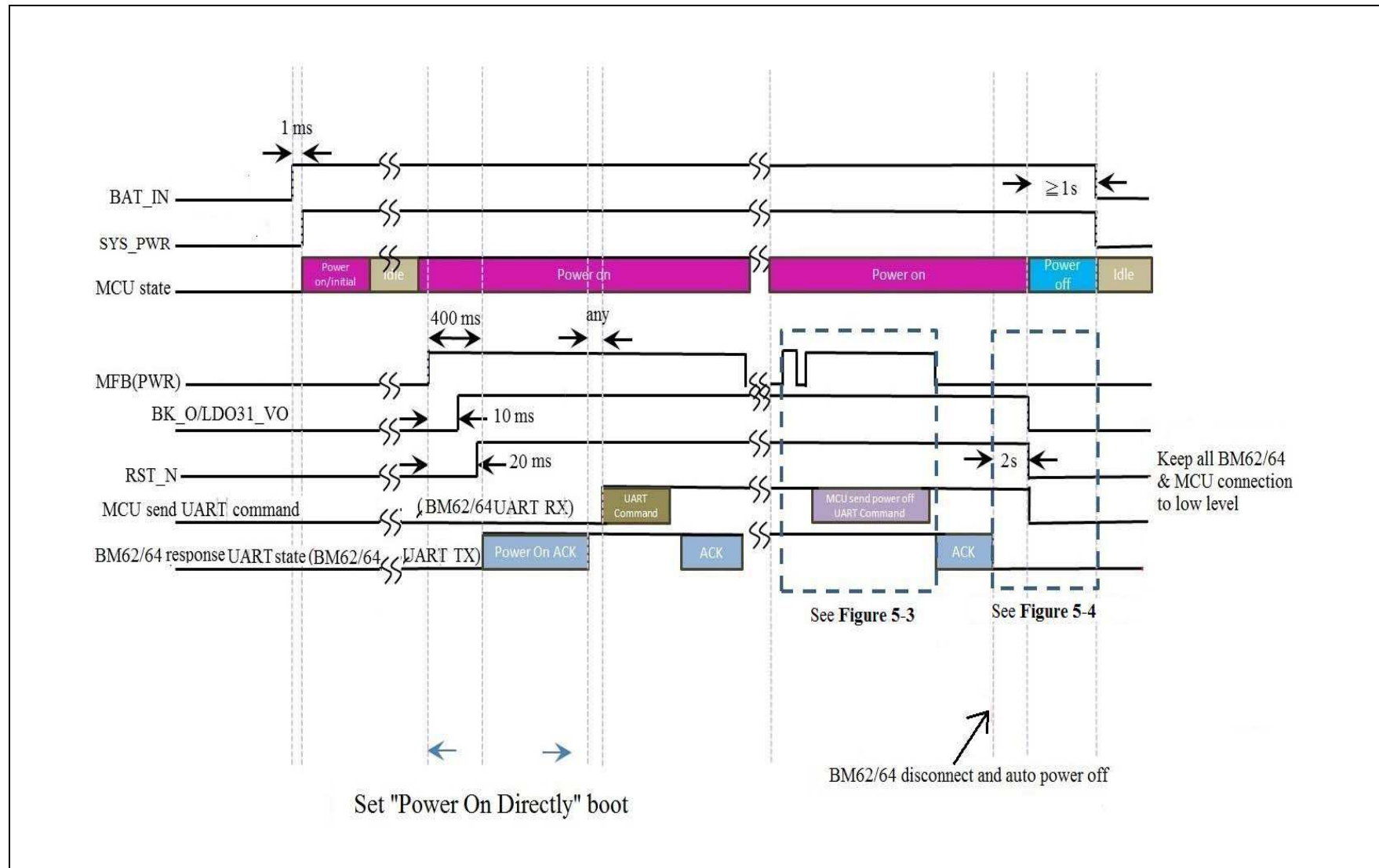


FIGURE 5-3: RX TIMING SEQUENCE (POWER- ON STATE)

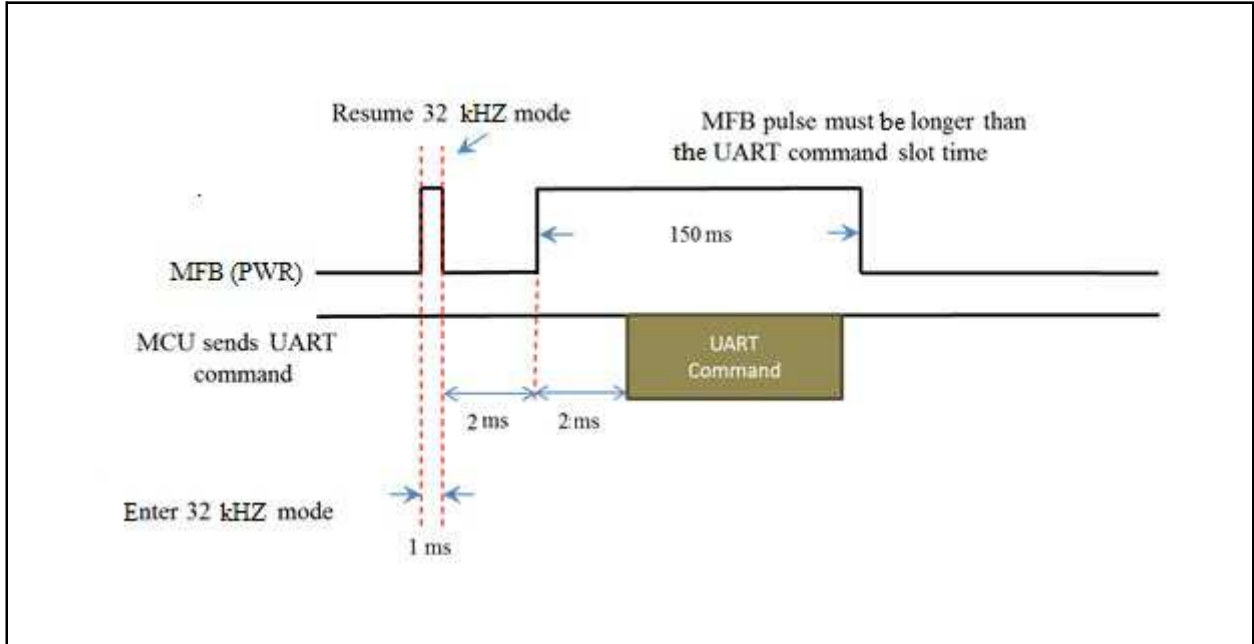
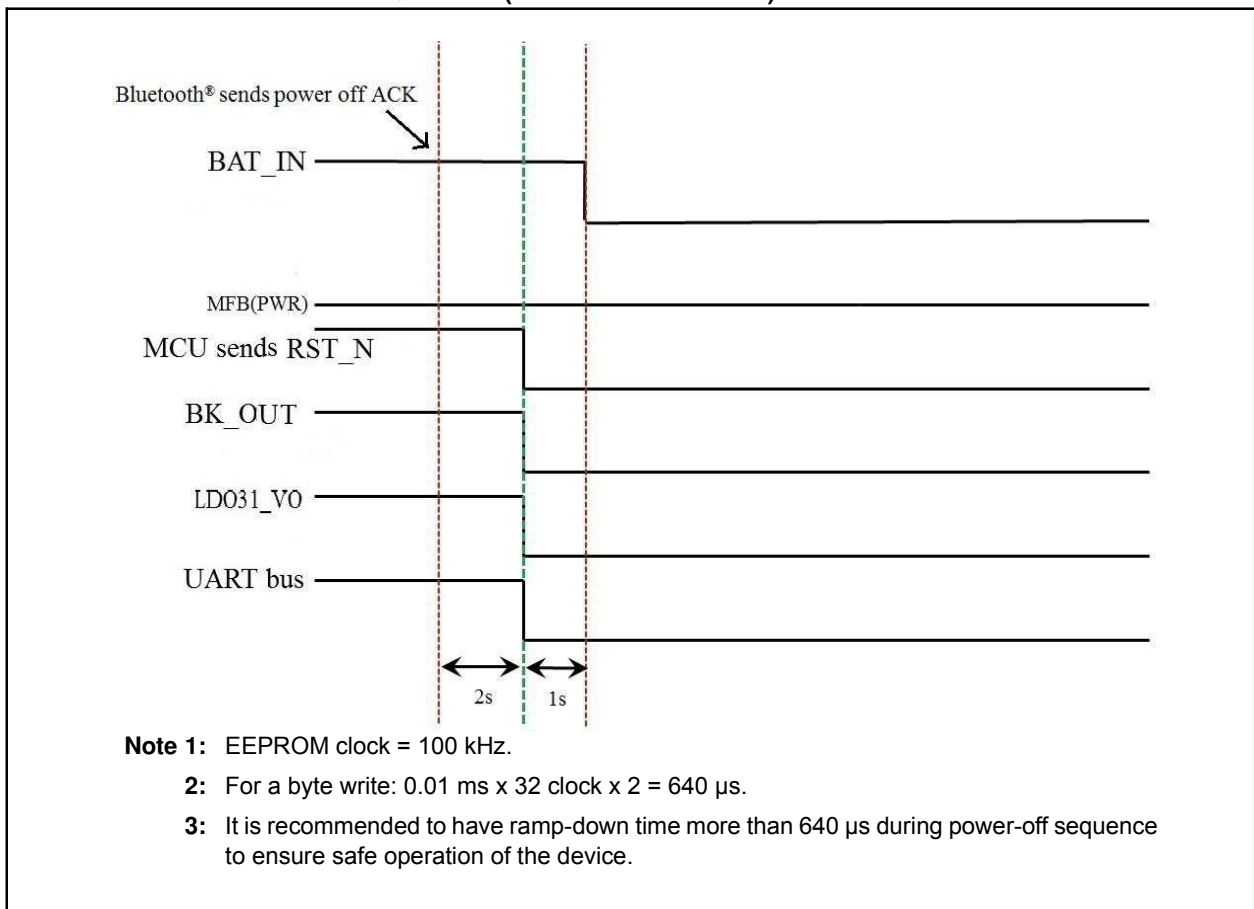


FIGURE 5-4: TIMING SEQUENCE (POWER OFF STATE)



BM62/64

FIGURE 5-5: TIMING SEQUENCE OF POWER ON (NACK)

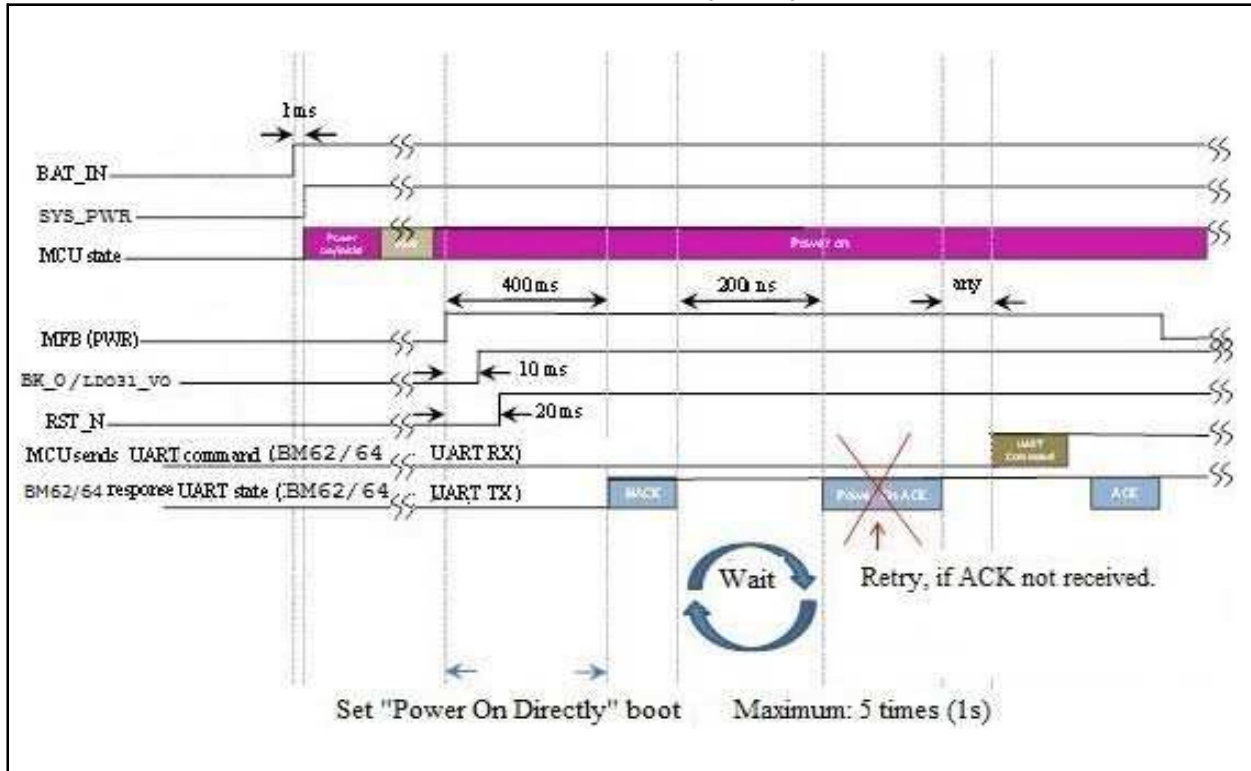


FIGURE 5-6: RESET TIMING SEQUENCE IN NO RESPONSE FROM MODULE TO HOST MCU

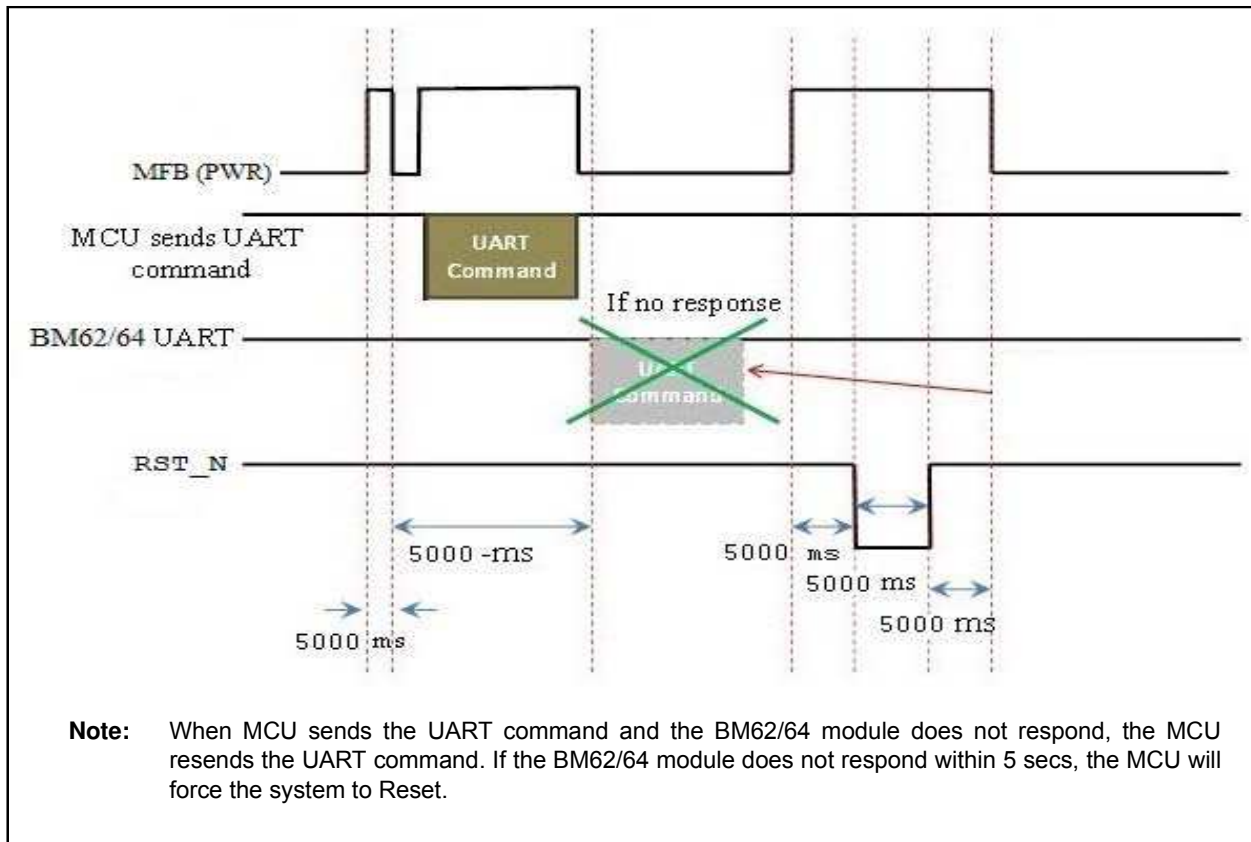
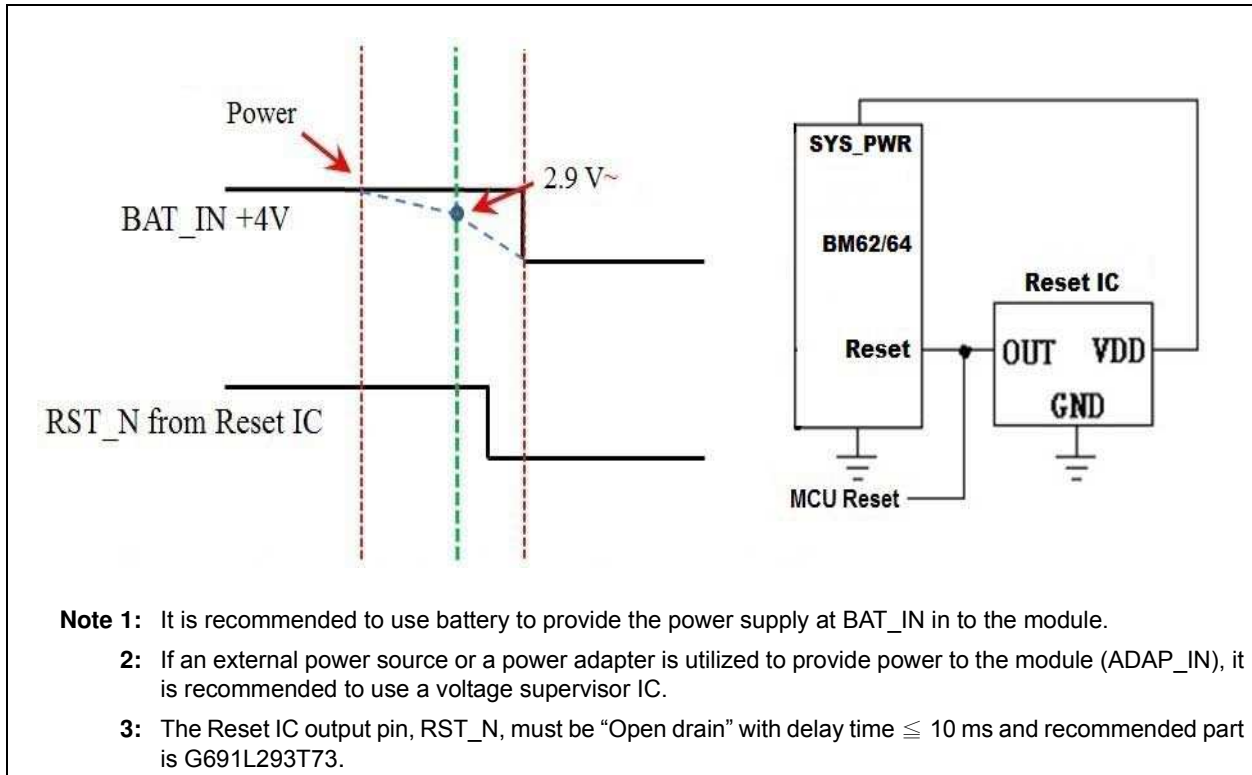


FIGURE 5-7: TIMING SEQUENCE OF POWER DROP PROTECTION



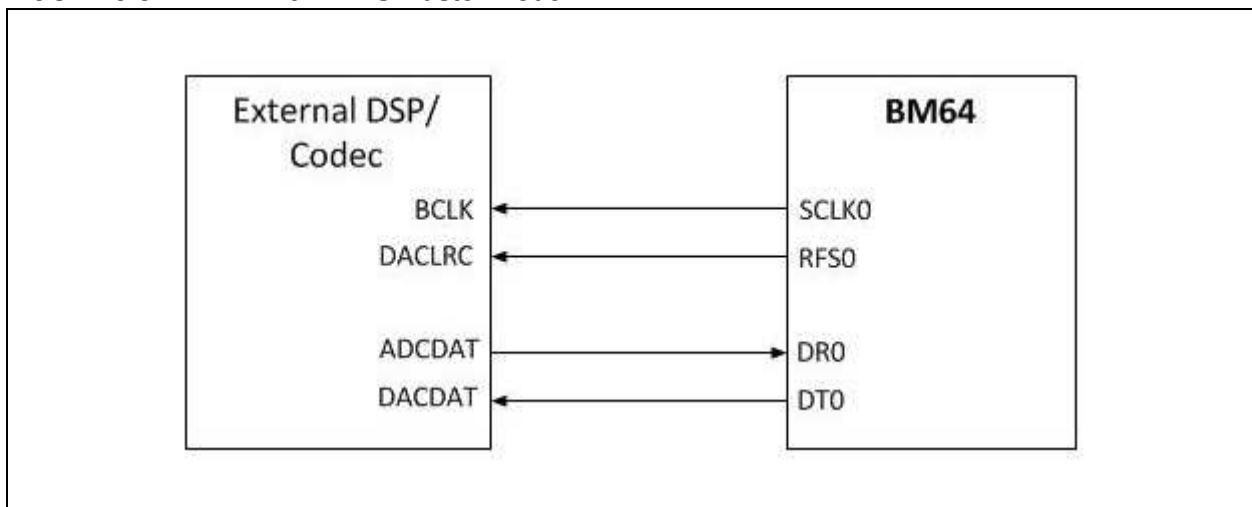
5.2 I²S Mode Application

The BM64 module provides an I²S digital audio output interface to connect with the external codec/DSP. It provides 8, 16, 44.1, 48, 88.2, and 96 kHz sampling rate for 16-bit and 24-bit data formats. The I²S setting can be configured by using the UI and DSP tools.

Figure 5-8 and Figure 5-9 illustrate the I²S signal connection between the BM64 module and an external DSP. Use the DSP tool to configure the BM64 module as a Master/Slave.

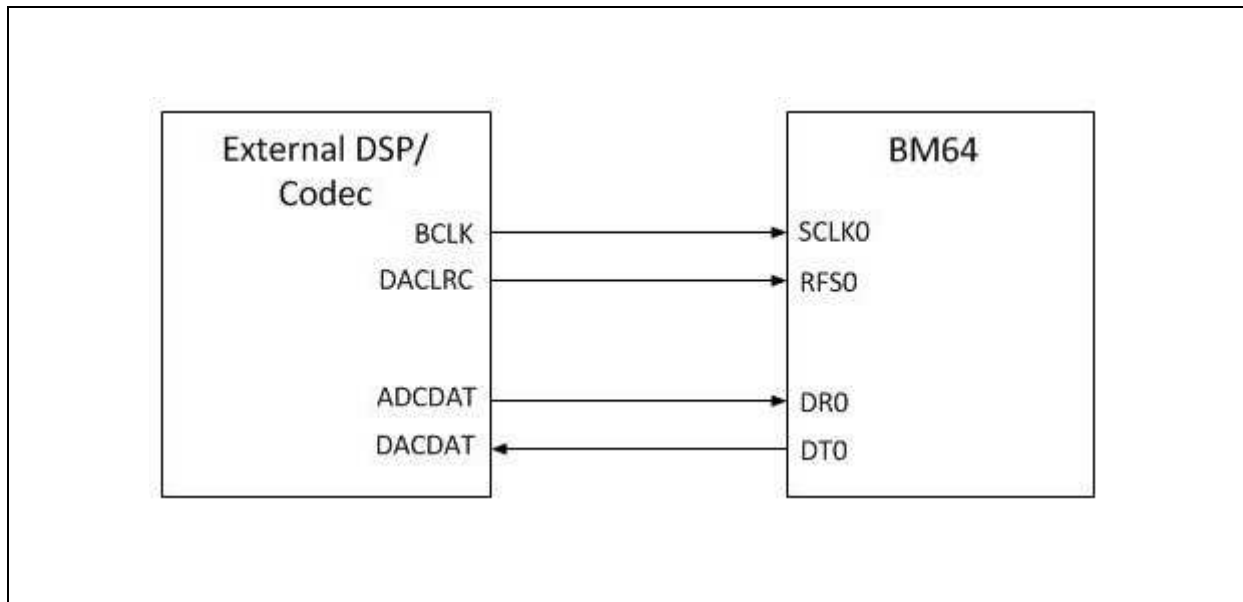
For additional information on timing specifications, refer to [8.2 “Timing specifications”](#).

FIGURE 5-8: BM64 in I²S Master Mode



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FIGURE 5-9: SLAVE MODE REFERENCE CONNECTION



Note: The UI and DSP tools can be downloaded from the Microchip web site: www.microchip.com/BM62 and www.microchip.com/BM64.

5.3 Reset

The BM62/64 module provides a watchdog timer (WDT) to Reset the chip. It has an integrated Power-on Reset (POR) circuit that resets all circuits to a known Power-on state. This action can also be driven by an external Reset signal which is used to control the device externally by forcing it into a POR state. The RST_N signal input is active-low and no connection is required in most applications.

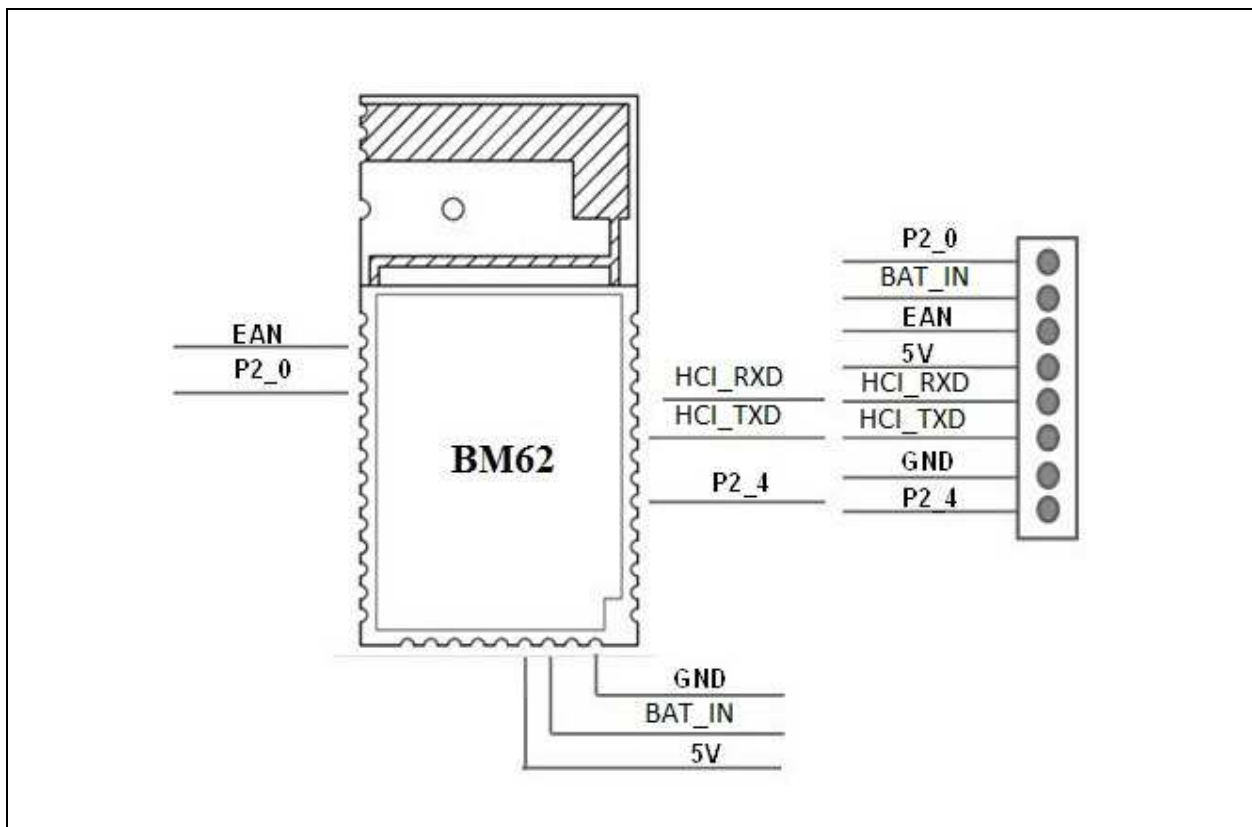
5.4 External Configuration and Programming

The BM62/64 module can be configured using an external configuration tool (EEPROM tool) and firmware is programmed using a programming tool (Flash tool).

Note: The EEPROM tool and Flash tool are available for download from the Microchip web site at: www.microchip.com/BM62 and www.microchip.com/BM64.

Figure 5-10 illustrates the configuration and firmware programming interface on the BM62 module. It is recommended to include a header pin on the main PCB for development.

FIGURE 5-10: EXTERNAL PROGRAMMING HEADER CONNECTIONS



Configuration and firmware programming modes are entered according to the system configuration I/O pins. Table 5-1 provides the system configuration settings. The P2_0, P2_4 and EAN pins have internal pull up.

TABLE 5-1: SYSTEM CONFIGURATION SETTINGS

P2_0	P2_4	EAN	Operating Mode
High	High	Low (Flash), High (ROM)	APP mode (Normal operation)
Low	High	Low (Flash), High (ROM)	Test mode (Write EEPROM)
Low	Low	High	Write Flash (BM62 only)

5.5 Reference Circuit

Figure 5-11 through Figure 5-14 illustrate the BM62 module reference circuit for a stereo headset application.

FIGURE 5-11: BM62 REFERENCE CIRCUIT FOR STEREO HEADSET

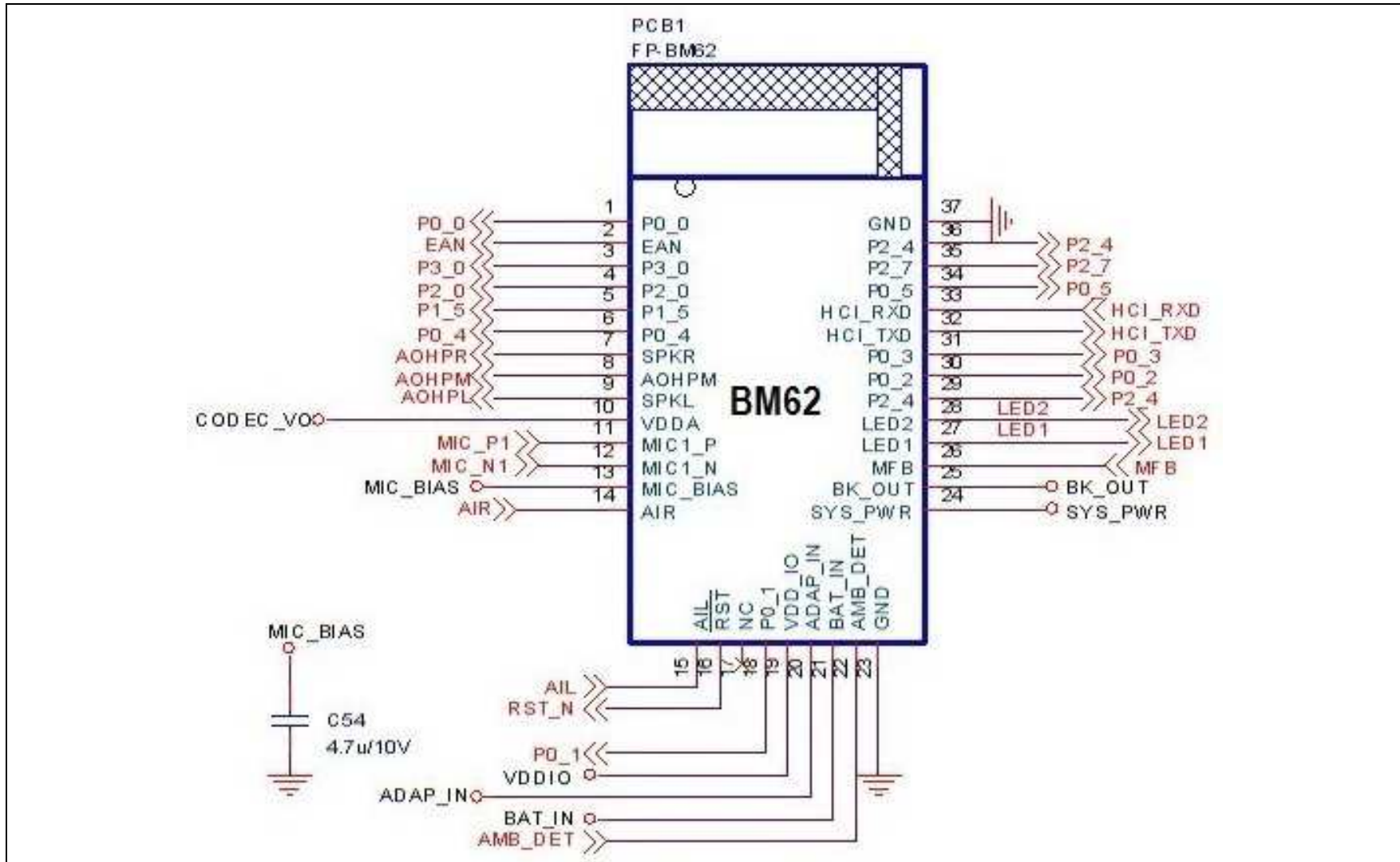
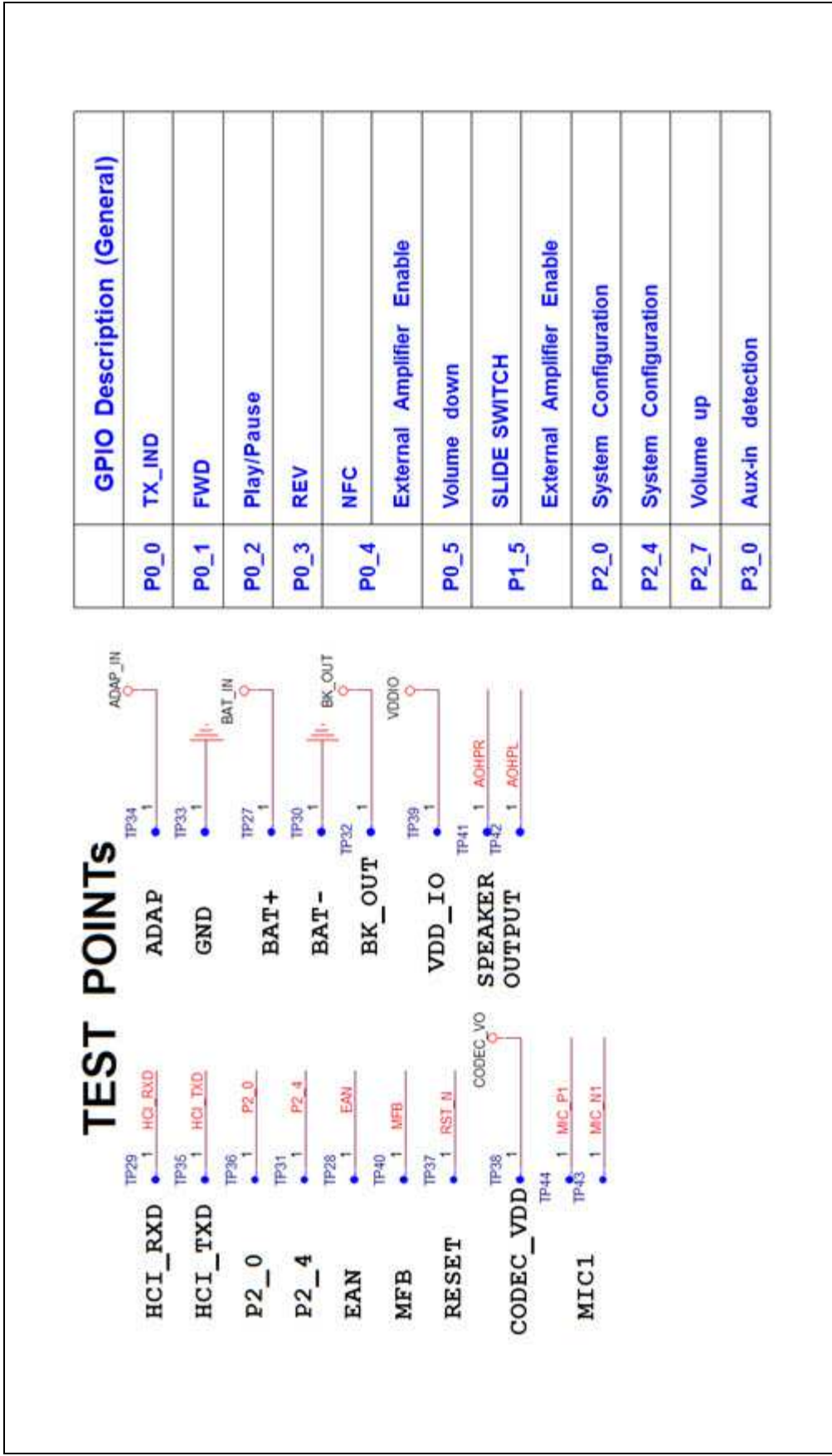


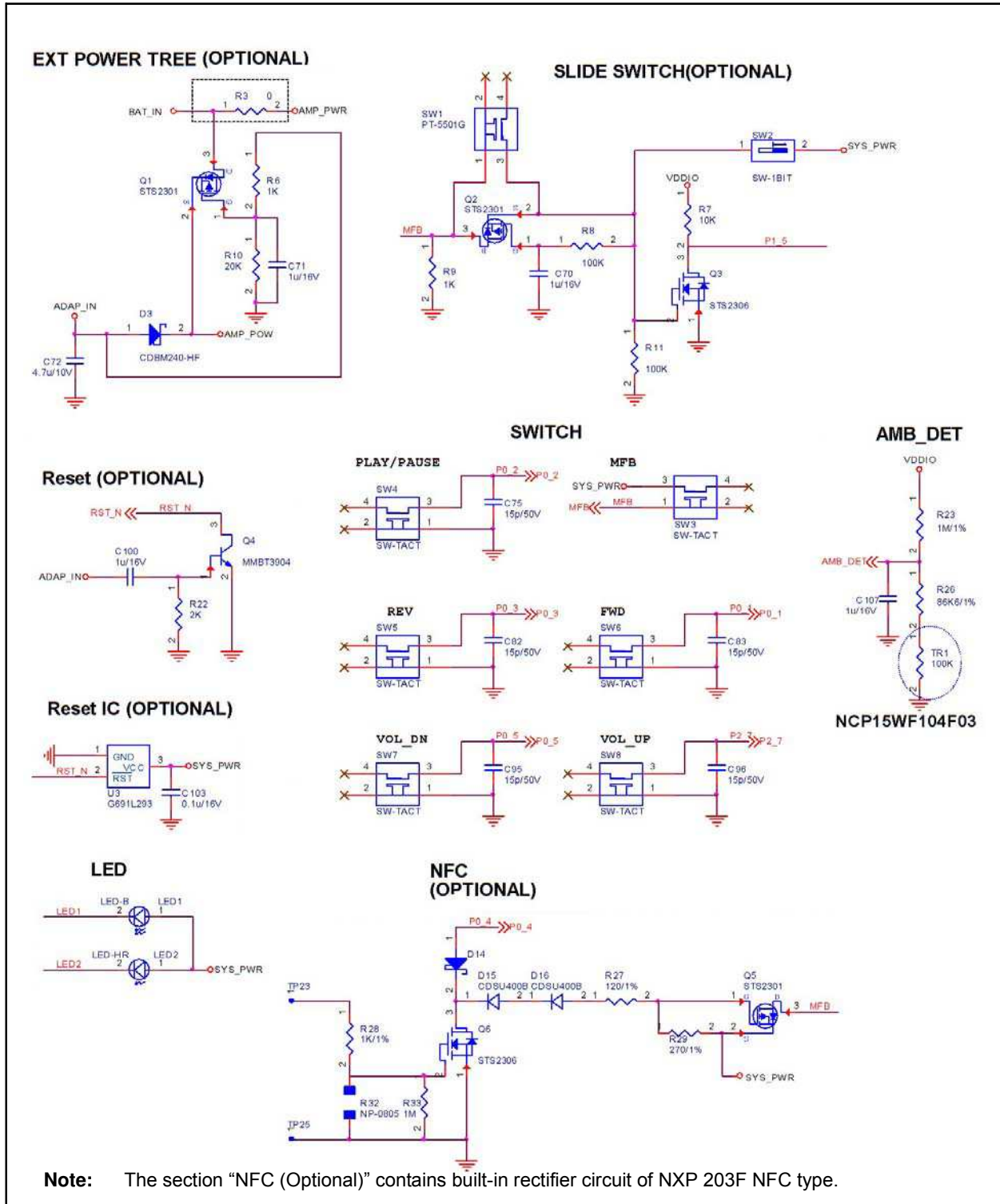
FIGURE 5-12: BM62 REFERENCE CIRCUIT FOR STEREO HEADSET



	GPIO Description (General)
P0_0	TX_IND
P0_1	FWD
P0_2	Play/Pause
P0_3	REV
P0_4	NFC
	External Amplifier Enable
P0_5	Volume down
P1_5	SLIDE SWITCH
	External Amplifier Enable
P2_0	System Configuration
P2_4	System Configuration
P2_7	Volume up
P3_0	Aux-in detection

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FIGURE 5-13: BM62 REFERENCE CIRCUIT FOR STEREO HEADSET



Note: The section "NFC (Optional)" contains built-in rectifier circuit of NXP 203F NFC type.

FIGURE 5-14: BM62 REFERENCE CIRCUIT FOR STEREO HEADSET

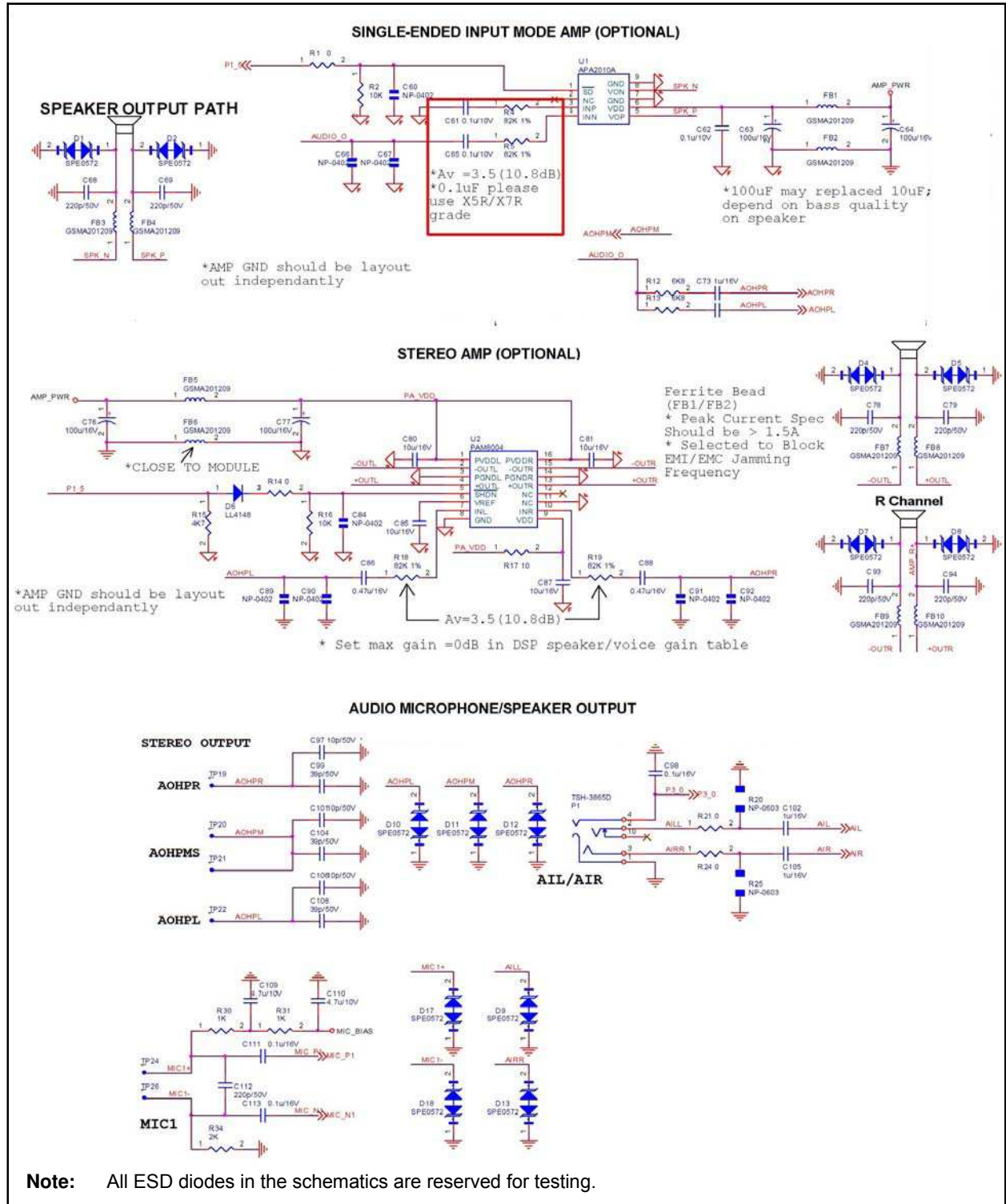


Figure 5-15 through Figure 5-18 illustrate the BM64 reference circuit for a stereo headset application.

FIGURE 5-15: BM64 REFERENCE CIRCUIT FOR STEREO HEADSET

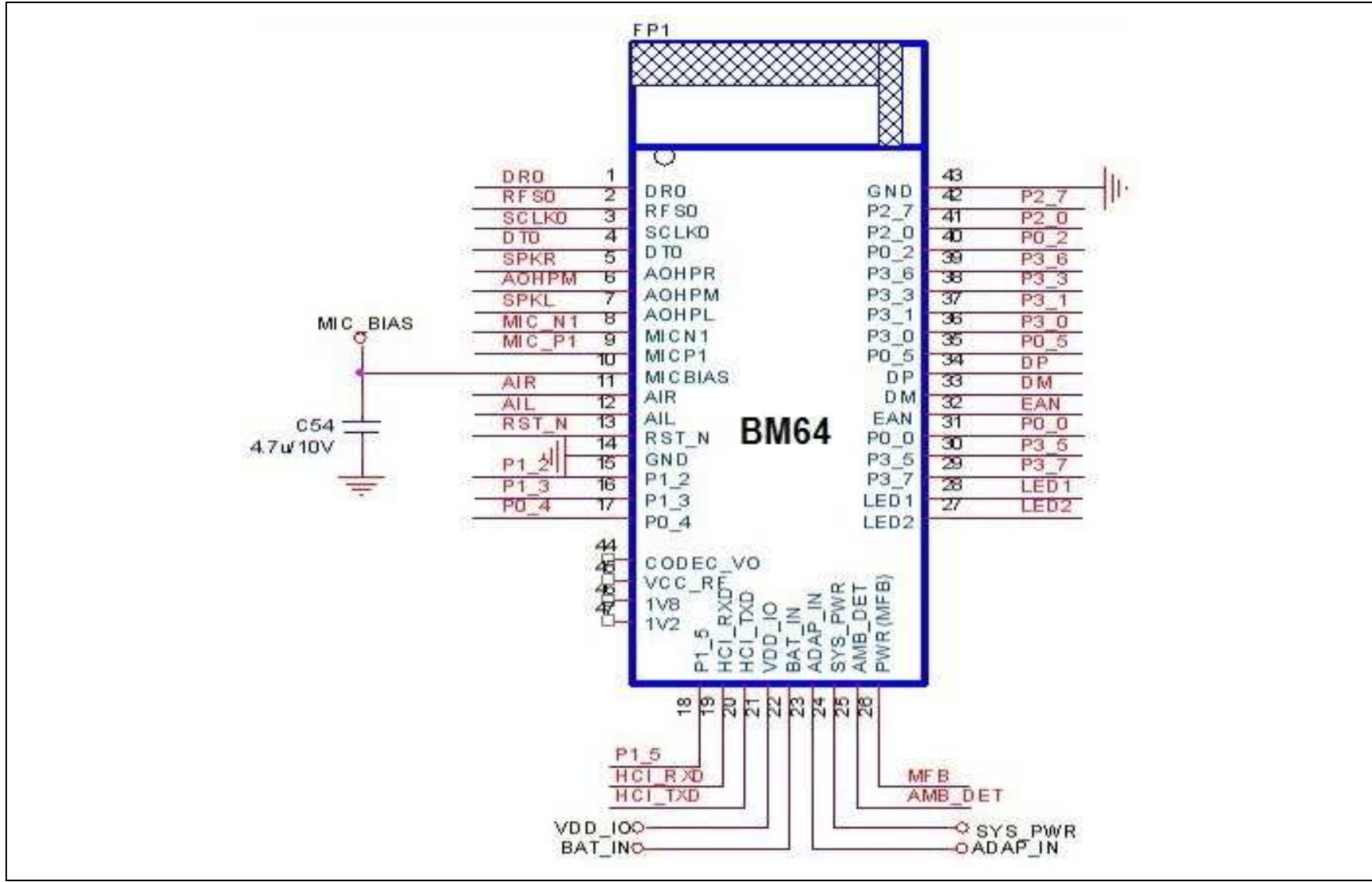
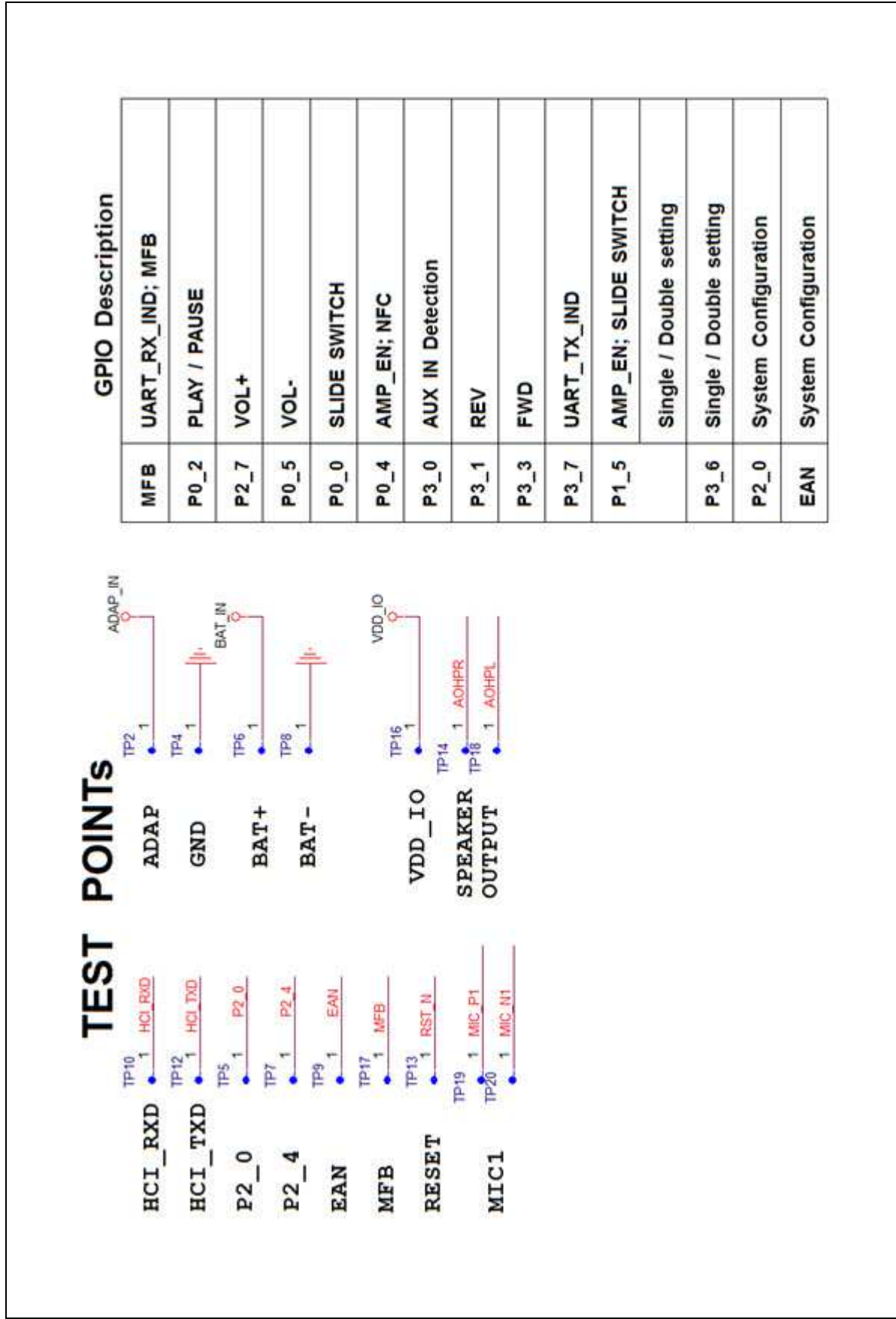


FIGURE 5-16: BM64 REFERENCE CIRCUIT FOR STEREO HEADSET



GPIO Description

MFB	UART_RX_IND; MFB
P0_2	PLAY / PAUSE
P2_7	VOL+
P0_5	VOL-
P0_0	SLIDE SWITCH
P0_4	AMP_EN; NFC
P3_0	AUX IN Detection
P3_1	REV
P3_3	FWD
P3_7	UART_TX_IND
P1_5	AMP_EN; SLIDE SWITCH
	Single / Double setting
P3_6	Single / Double setting
P2_0	System Configuration
EAN	System Configuration

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FIGURE 5-17: BM64 REFERENCE CIRCUIT FOR STEREO HEADSET

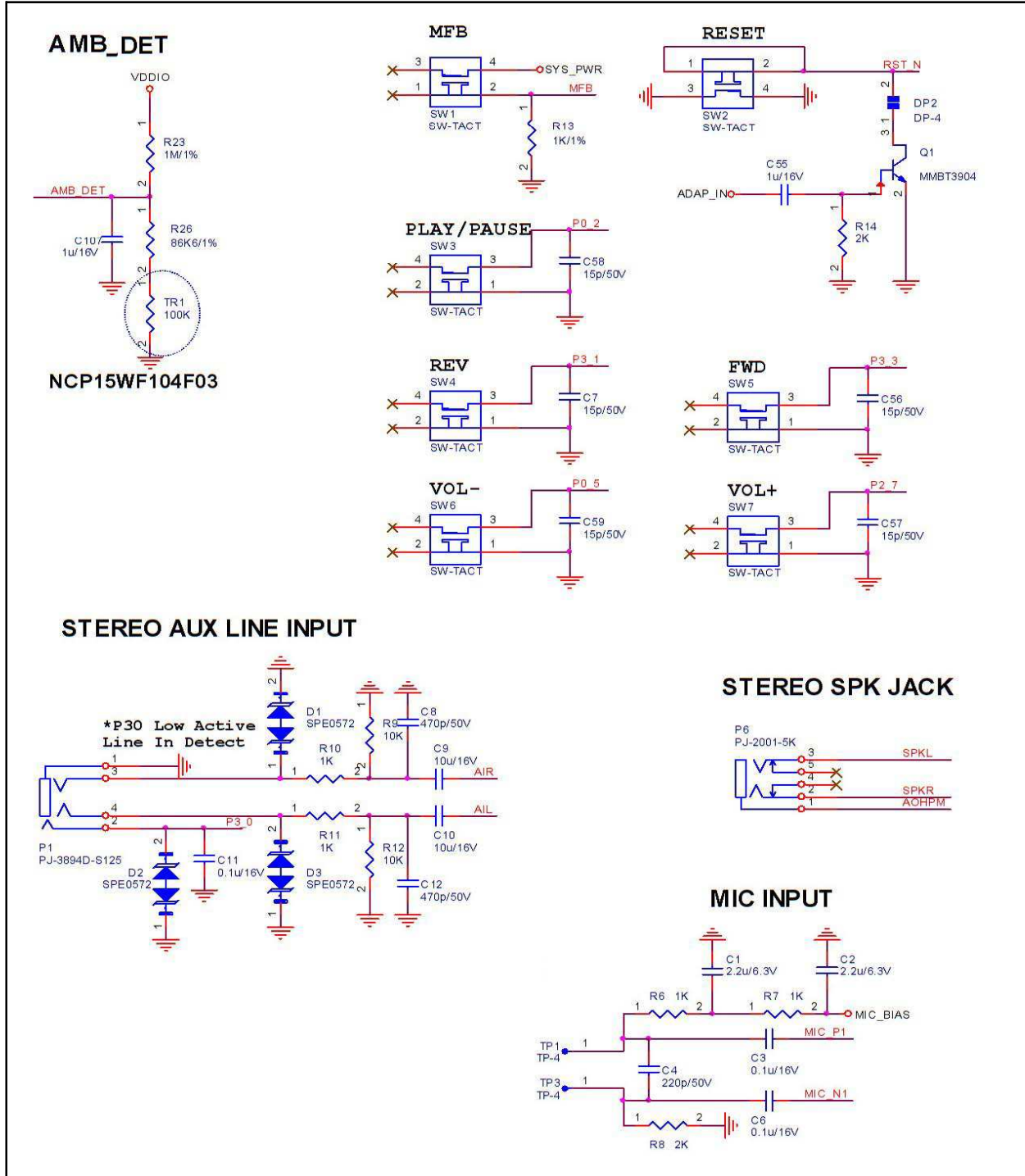
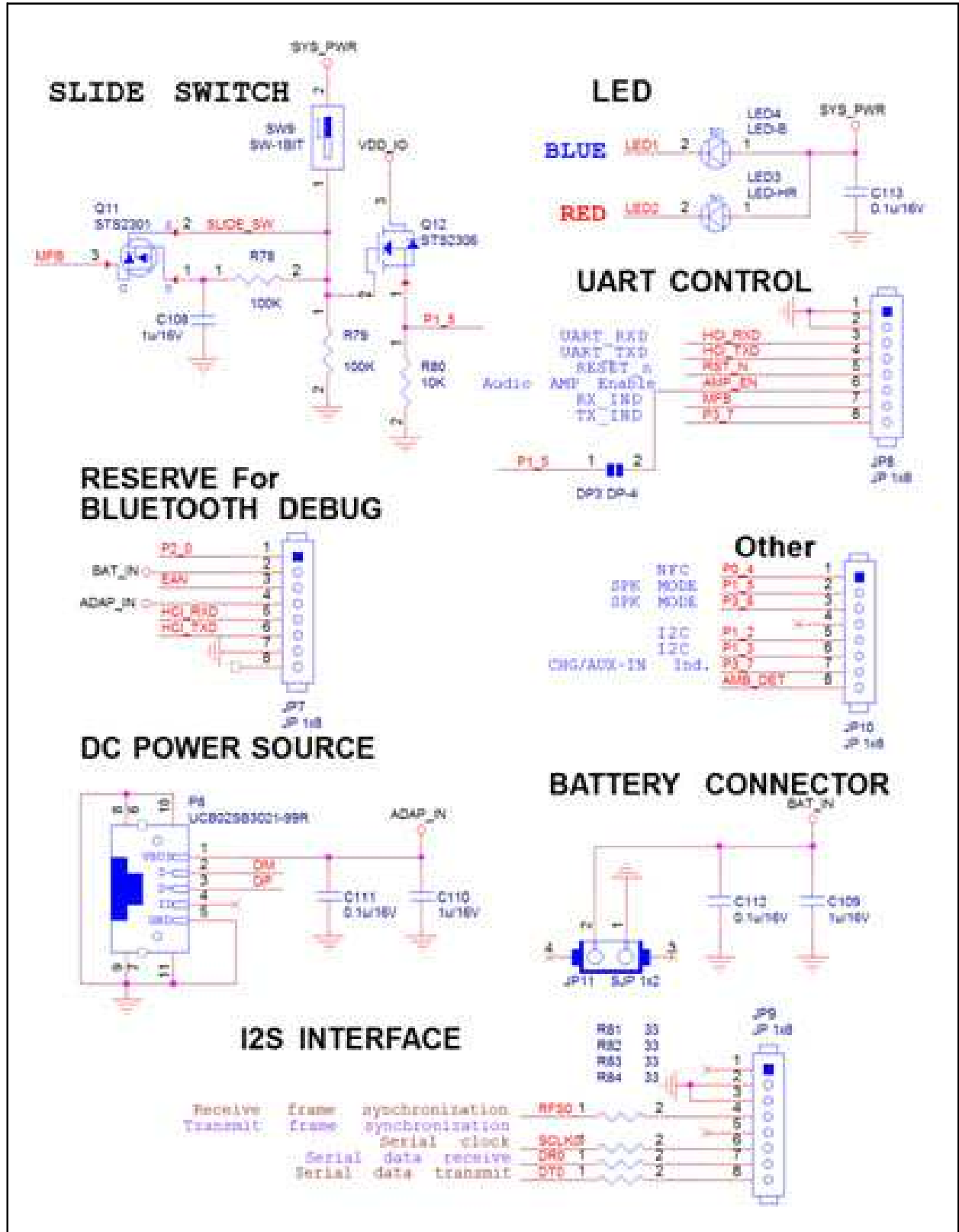


FIGURE 5-18: BM64 REFERENCE CIRCUIT FOR STEREO HEADSET



BM62/64

NOTES:

6.0 PRINTED ANTENNA INFORMATION

Figure 6-2 illustrates the radiation pattern of the PCB printed antenna.

6.1 Antenna Radiation Pattern

The BM62/64 module has one PCB printed antenna, see Figure 6-1.

FIGURE 6-1: KEEP OUT AREA RECOMMENDED FOR ANTENNA

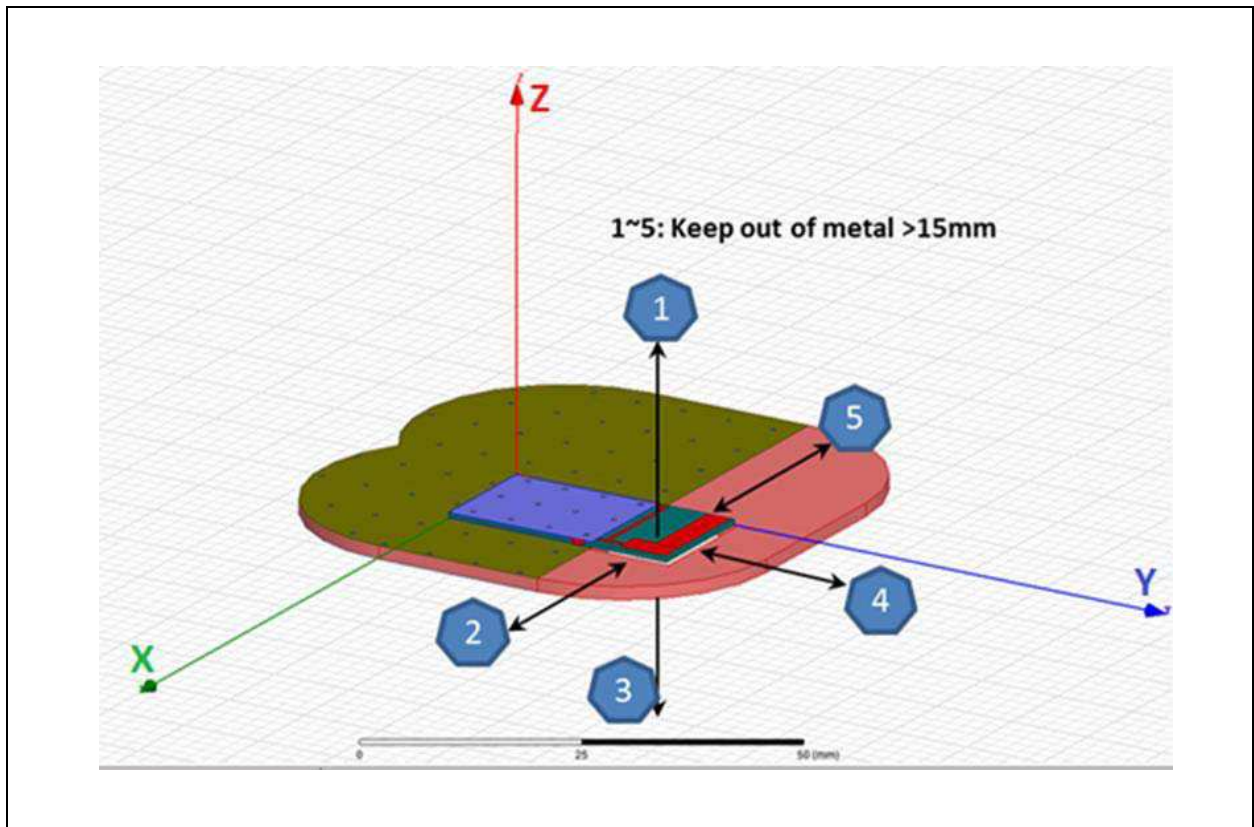


FIGURE 6-2: ANTENNA 3D RADIATION PATTERN AT 2441 MHz

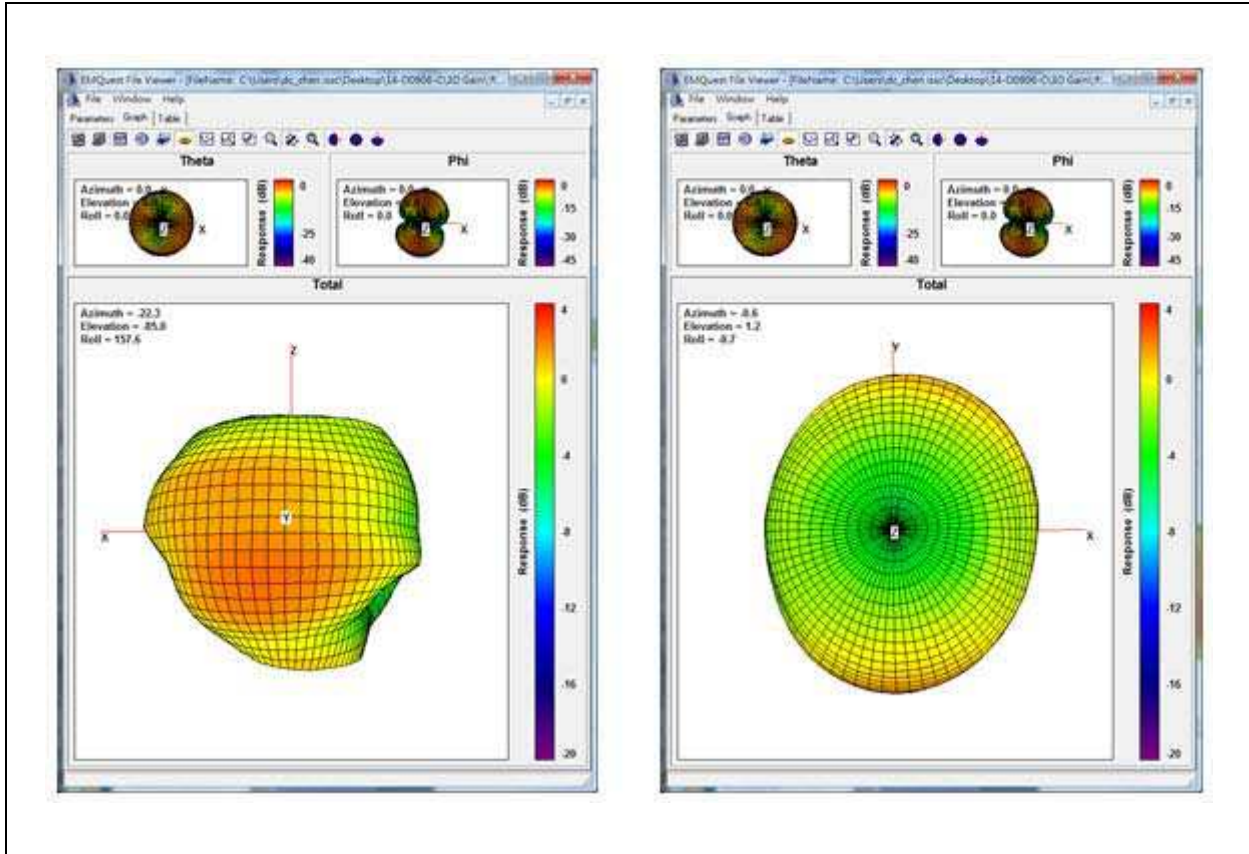


TABLE 6-1: BM62/64 ANTENNA CHARACTERISTICS

Parameter	Values
Frequency	2400 MHz ~ 2480 MHz
Peak Gain	1.927 dBi
Efficiency	73.41%

6.2 Module Placement Guidelines

For a Bluetooth product, the antenna placement affects the performance of the whole system. The antenna requires free space to radiate RF signals and it cannot be surrounded by the ground plane. Microchip recommends that the areas underneath the antenna on the host PCB must not contain copper on top, inner, or bottom layer as illustrated in [Figure 6-1](#).

A low-impedance ground plane will ensure the best radio performance (best range, lowest noise). The ground plane can be extended beyond the minimum recommendation, as required for the main PCB EMC noise reduction. For the best range performance, keep all external metal at least 15 mm away from the on-board PCB trace antenna.

[Figure 6-3](#) and [Figure 6-4](#) illustrate examples of good and poor placement of the BM62/64 module on a host board with GND plane.

FIGURE 6-3: MODULE PLACEMENT GUIDELINES

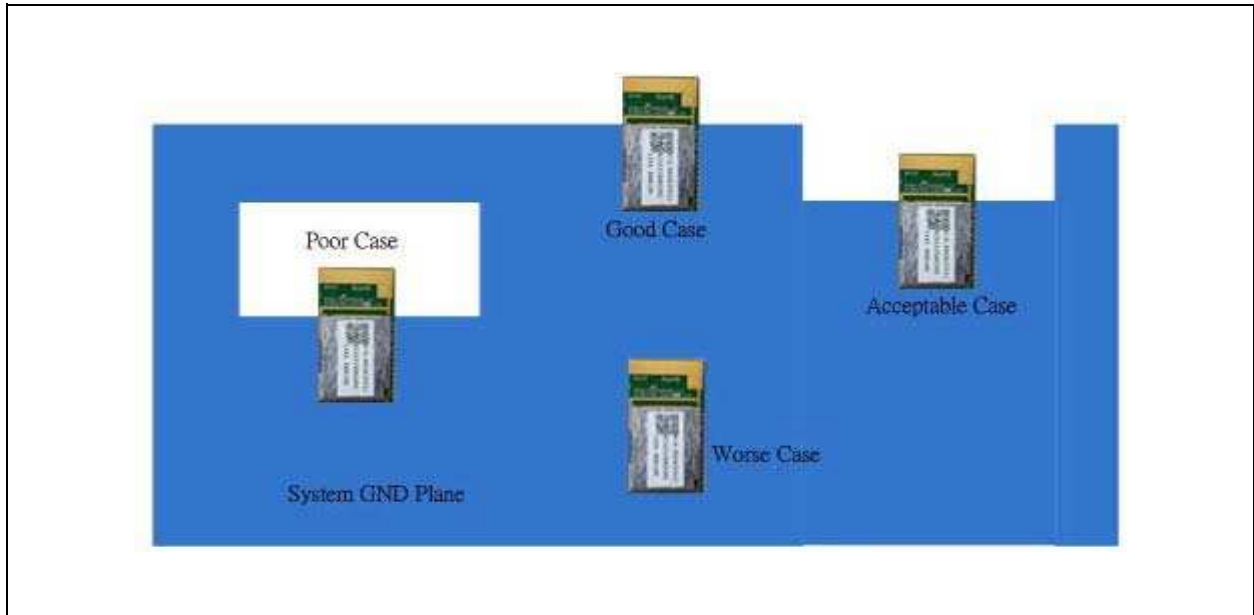
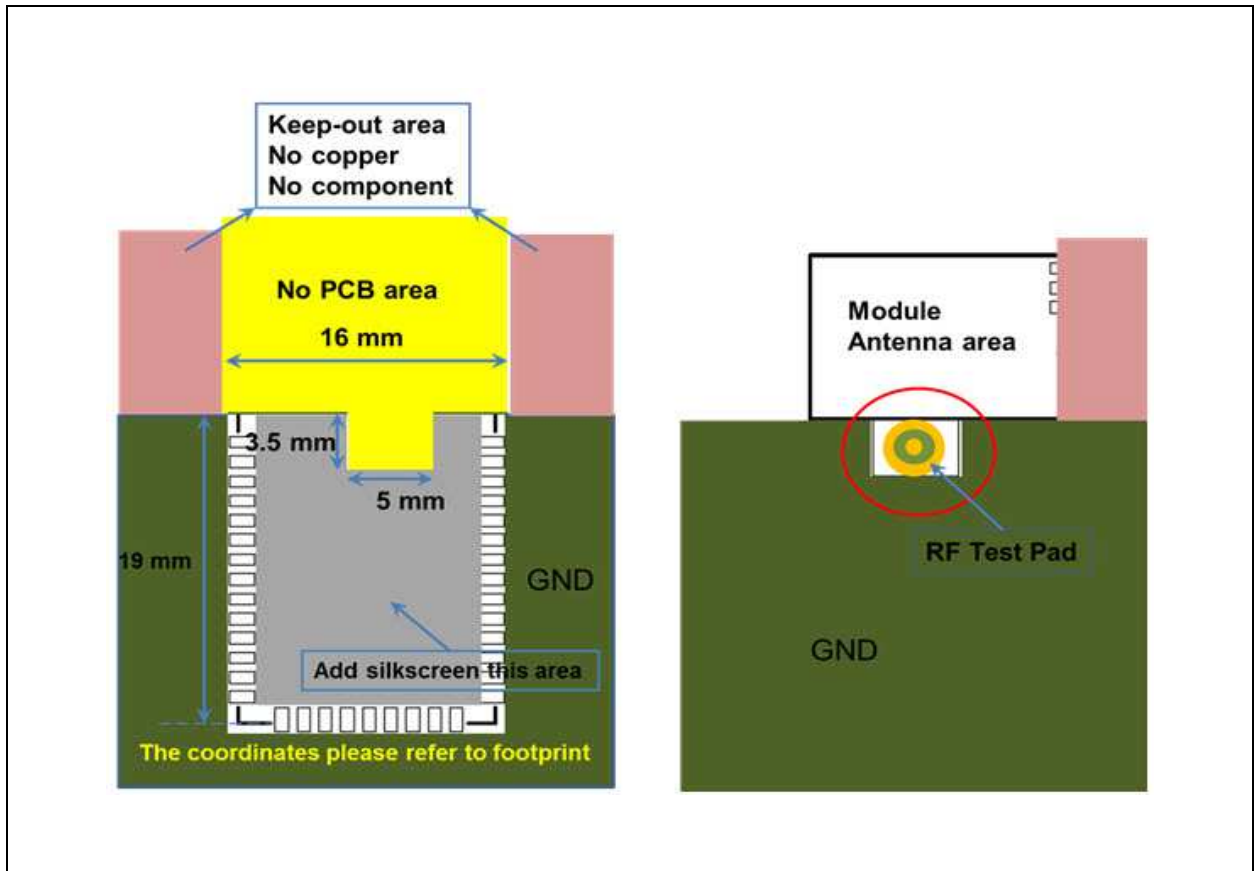


FIGURE 6-4: GND PLANE ON MAIN APPLICATION BOARD



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NOTES:

7.0 PHYSICAL DIMENSIONS

Figure 7-1 illustrates the BM62 module PCB dimension and Figure 7-2 illustrates the BM64 module PCB dimension.

FIGURE 7-1: BM62 PCB DIMENSION

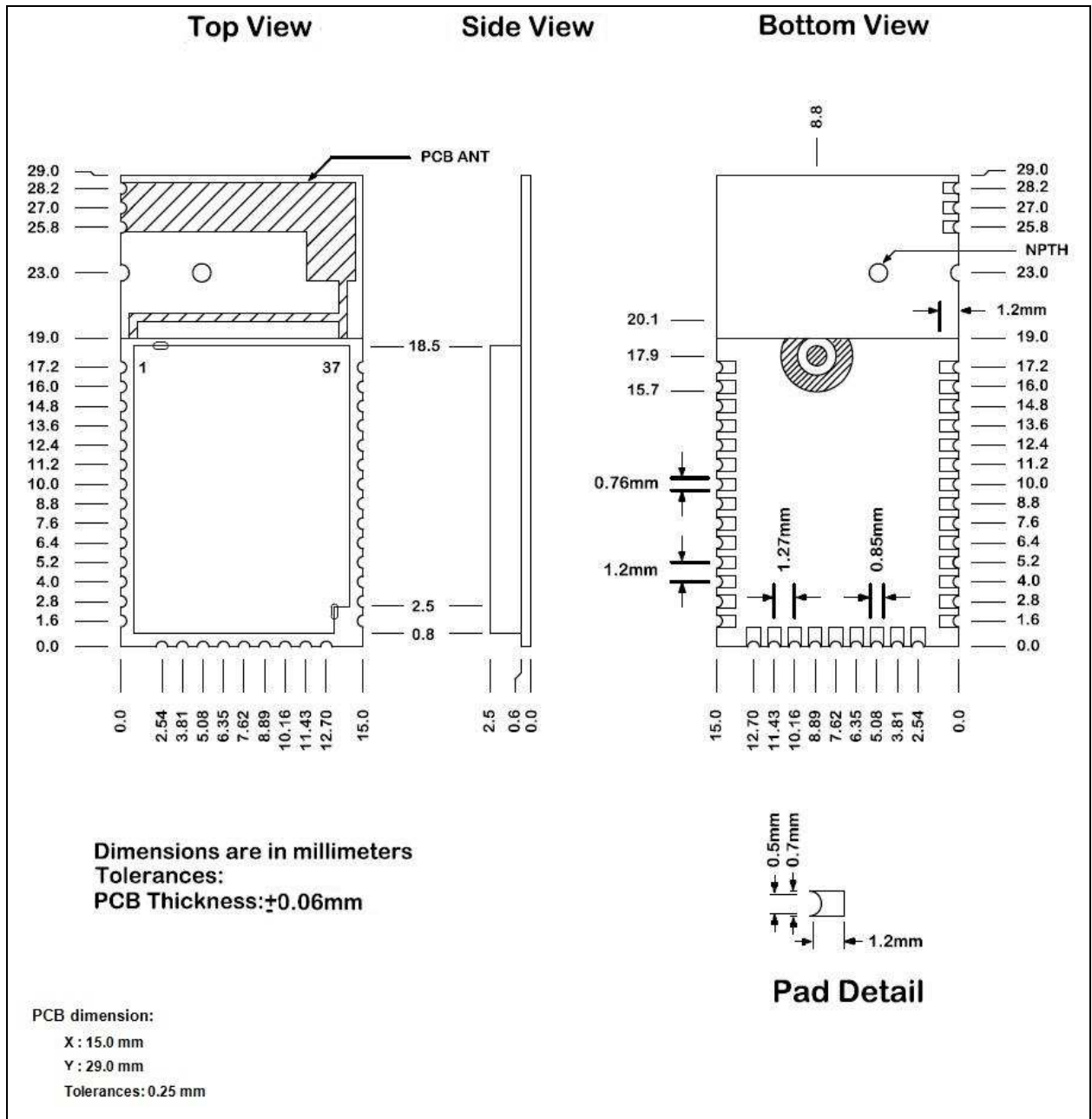
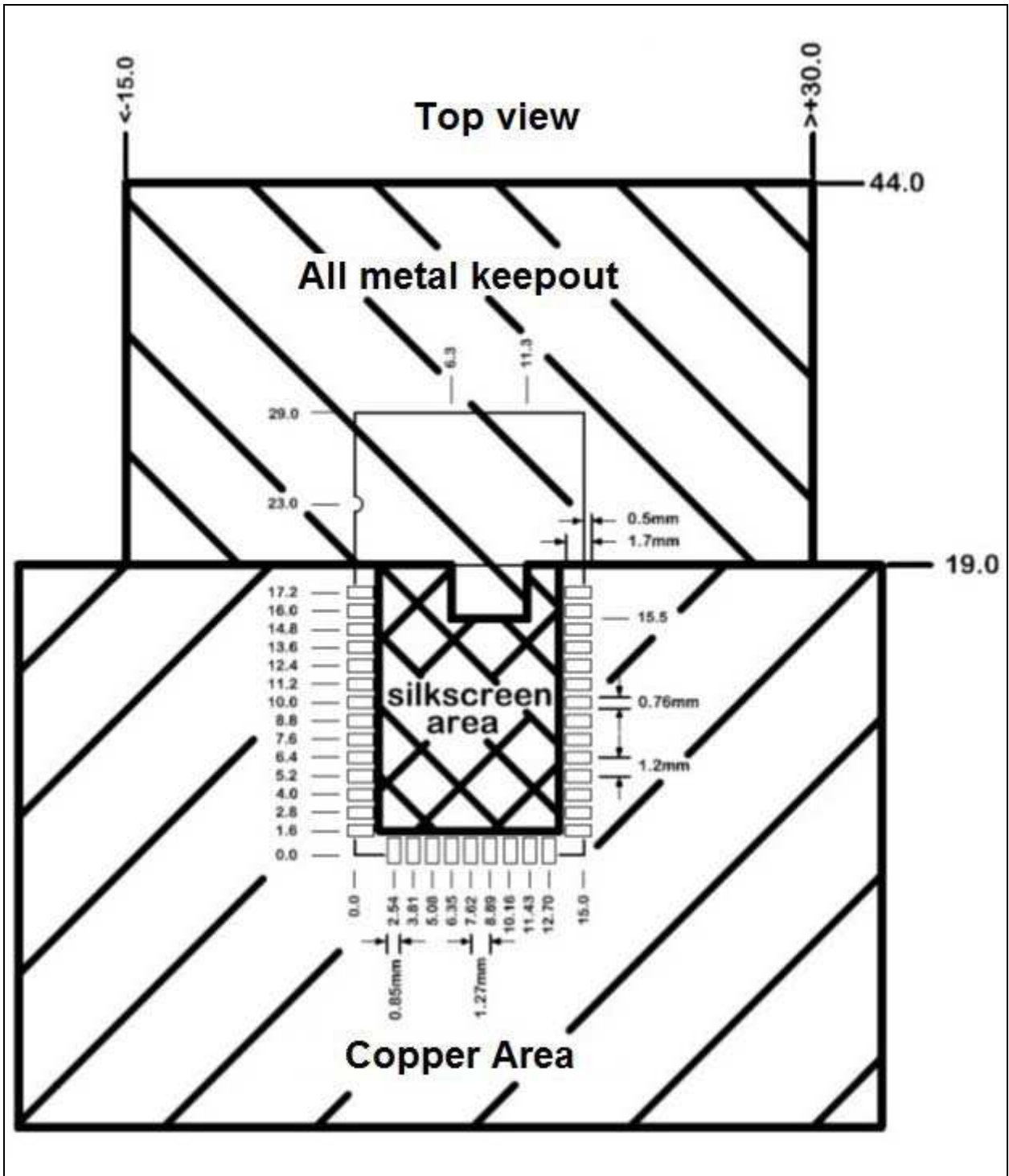


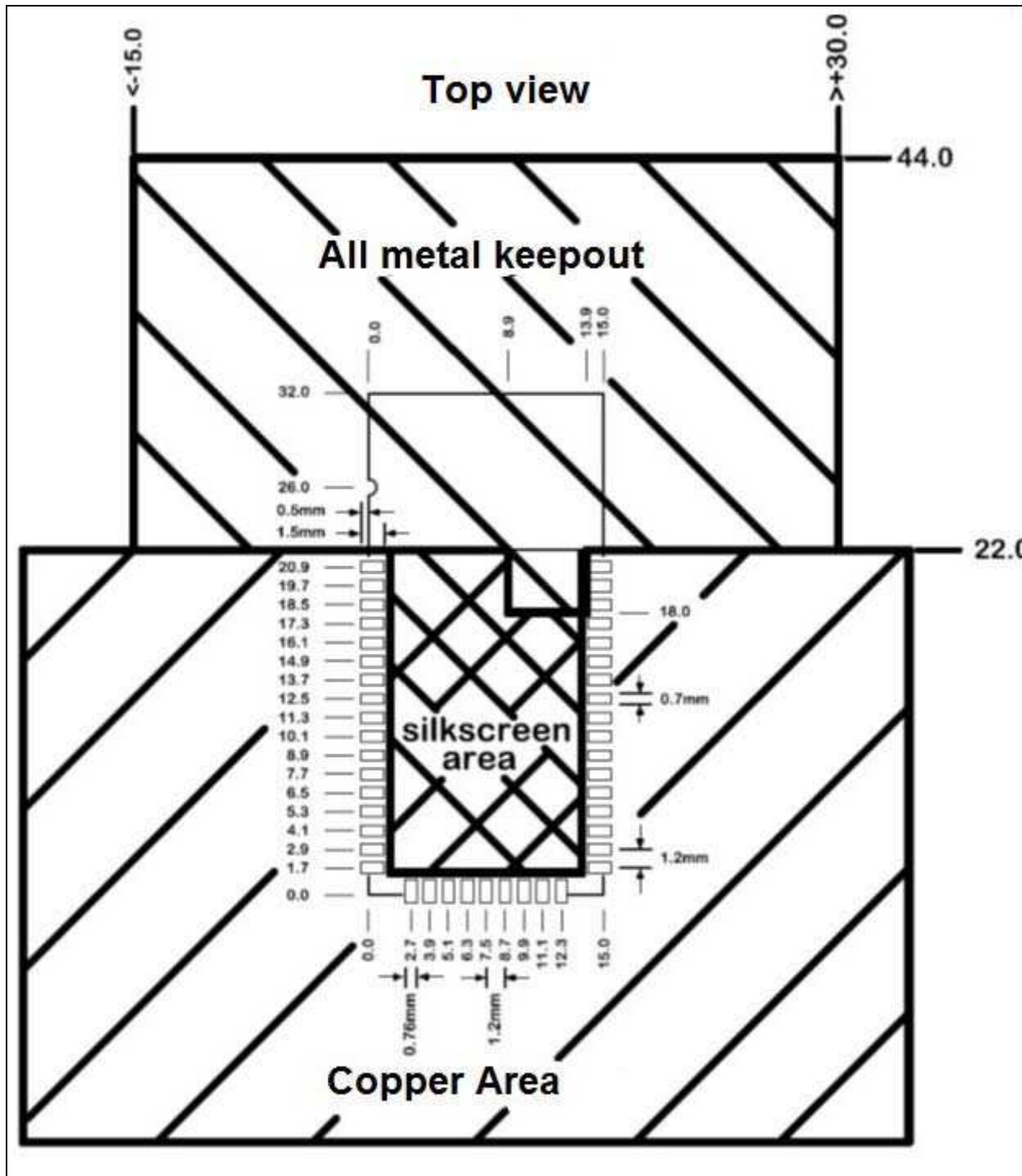
Figure 7-3 illustrates the recommended PCB footprint for the BM62 module, and Figure 7-4 illustrates the recommended PCB footprint for the BM64 module.

FIGURE 7-3: RECOMMENDED BM62 PCB FOOTPRINT



BM62/64

FIGURE 7-4: RECOMMENDED BM64 PCB FOOTPRINT



8.0 ELECTRICAL CHARACTERISTICS

This section provides an overview of the BM62/64 stereo audio module electrical characteristics. Additional information will be provided in future revisions of this document as it becomes available.

Absolute maximum ratings for the BM62/64 devices are listed below. Exposure to these maximum rating conditions for extended periods may affect device reliability. Functional operation of the device at these or any other conditions, above the parameters indicated in the operation listings of this specification, is not implied.

8.1 Absolute Maximum Ratings

Ambient temperature under bias.....	-20°C to +70°C
Voltage on VDD with respect to Vss	-0.3V to +3.6V
Maximum output current sink by any I/O pin.....	12 mA
Maximum output current sourced by any I/O pin.....	12 mA

Note: Stresses listed under “**Absolute Maximum Ratings**” may cause permanent damage to the device. This is a stress rating only. The functional operation of the device at those or any other conditions and those indicated in the operation listings of this specification, is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

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TABLE 8-1: RECOMMENDED OPERATING CONDITION

Symbol	Parameter	Min	Typical	Max	Unit
BAT_IN	Input voltage for battery	3.2	3.8	4.2	V
ADAP_IN	Input voltage for adaptor	4.5	5	5.5	V
T _{OPERATION}	Operation temperature	-20	+25	+70	°C

Note 1: Absolute and Recommended operating condition tables reflect typical usage for device.

TABLE 8-2: I/O AND RESET LEVEL

Parameter	Min	Typical	Max	Unit
I/O supply voltage (VDD_IO)	3.0	3.3	3.6	V
I/O voltage levels				
VIL input logic levels low	0	—	0.8	V
VIH input logic levels high	2.0	—	3.6	V
VOL output logic levels low	—	—	0.4	V
VOH output logic levels high	2.4	—	—	V
RST_N				
Threshold voltage	—	1.6	—	V

Note 1: These parameters are characterized but not tested in manufacturing.

TABLE 8-3: BATTERY CHARGER

Parameter	Min	Typical	Max	Unit	
ADAP_IN Input Voltage	4.5	5.0	5.5	V	
Supply current to charger only	—	3	4.5	mA	
Maximum Battery Fast Charge Current	Headroom > 0.7V (ADAP_IN = 5V)	—	350	—	mA
	Headroom = 0.3V~0.7V (ADAP_IN = 4.5V)	—	175 (Note 2)	—	mA
Trickle Charge Voltage Threshold	—	3	—	V	
Battery Charge Termination Current, (% of Fast Charge Current)	—	10	—	%	

Note 1: Headroom = VADAP_IN – VBAT

2: When VADAP_IN – VBAT > 2V, the maximum fast charge current is 175 mA for thermal protection.

3: These parameters are characterized but not tested in manufacturing.

TABLE 8-4: LED DRIVER

Parameter	Min	Typical	Max	Unit
Open-drain Voltage	—	—	3.6	V
Programmable Current Range	0	—	5.25	mA
Intensity Control	—	16	—	step
Current Step	—	0.35	—	mA
Power Down Open-drain Current	—	—	1	µA
Shutdown Current	—	—	1	µA

Note 1: Test condition: BK_O = 1.8V with temperature +25 °C.

2: These parameters are characterized but not tested in manufacturing.

TABLE 8-5: AUDIO CODEC ANALOG TO DIGITAL CONVERTER

T = 25 °C, VDD = 2.8V, 1 kHz sine wave input, Bandwidth = 20 Hz~20 kHz

Parameter (Condition)	Min	Typical	Max	Unit
Resolution	—	—	16	Bit
Output Sample Rate	8	—	48	kHz
Signal to Noise Ratio (Note 1) (SNR at MIC or Line-in mode)	—	92	—	dB
Digital Gain	-54	—	4.85	dB
Digital Gain Resolution	—	2~6	—	dB
MIC Boost Gain	—	20	—	dB
Analog Gain	—	—	60	dB
Analog Gain Resolution	—	2.0	—	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)	—	24	—	kOhm
THD+N (microphone input) at 30 mV/rms input	—	0.02	—	%

Note 1: $f_{in} = 1$ kHz, B/W = 20~20 kHz, A-weighted, THD+N < 1%, 150 mV_{pp} input.

2: These parameters are characterized but not tested in manufacturing.

TABLE 8-6: AUDIO CODEC DIGITAL TO ANALOG CONVERTER

T = 25 °C, VDD = 2.8V, 1 kHz sine wave input, Bandwidth = 20 Hz~20 kHz

Parameter (Condition)	Min	Typical	Max	Unit	
Over-sampling rate	—	128	—	f_s	
Resolution	16	—	20	Bit	
Output Sample Rate	8	—	48	kHz	
Signal to Noise Ratio (Note 1) (SNR at capless mode) for 48 kHz	—	98	—	dB	
Signal to Noise Ratio (Note 1) (SNR at single-ended mode) for 48 kHz	—	98	—	dB	
Digital Gain	-54	—	4.85	dB	
Digital Gain Resolution	—	2~6	—	dB	
Analog Gain	-28	—	3	dB	
Analog Gain Resolution	—	1	—	dB	
Output Voltage Full-scale Swing (AVDD = 2.8V)	495	742.5	—	mV/rms	
Maximum Output Power (16 Ohm load)	—	34.5	—	mW	
Maximum Output Power (32 Ohm load)	—	17.2	—	mW	
Allowed Load	Resistive	—	16	O.C.	Ohm
	Capacitive	—	—	500	pF
THD+N (16 Ohm load) (Note 2)	—	0.05	—	%	
Signal to Noise Ratio (SNR at 16 Ohm load) (Note 1)	—	98	—	dB	

Note 1: $f_{in} = 1$ kHz, B/W = 20~20 kHz, A-weighted, THD+N < 0.01%, 0dBFS signal, Load = 100 kOhm

2: $f_{in} = 1$ kHz, B/W = 20~20 kHz, A-weighted, -1dBFS signal, Load=16 Ohm

3: $f_{in} = 1$ kHz, B/W = 20~20 kHz, A-weighted, THD+N < 0.05%, 0dBFS signal, Load = 16 Ohm

4: These parameters are characterized but not tested in manufacturing.

TABLE 8-7: TRANSMITTER SECTION FOR BDR AND EDR

Parameter	Min	Typical	Max	Bluetooth specification	Unit	
Maximum RF transmit power	Class 1	—	15.0 ⁽³⁾	—	< 20	dBm
	Class 2	—	2 ⁽³⁾	—	-6 to 4	dBm
EDR/BDR Relative transmit power	-4	-1.8	1	-4 to 1	dB	

Note 1: The RF Tx power has modulation value.

2: The RF Transmit power is calibrated during production using the MP tool and MT8852 Bluetooth Test equipment.

3: Test condition: VCC_RF = 1.28V, temperature +25 °C.

TABLE 8-8: RECEIVER SECTION FOR BDR AND EDR

	Modulation	Min	Typical	Max	Bluetooth specification	Unit
Sensitivity at 0.1% BER	GFSK	—	-89	—	≤-70	dBm
Sensitivity at 0.01% BER	$\pi/4$ DQPSK	—	-90	—	≤-70	dBm
	8DPSK	—	-83	—	≤-70	dBm

Note 1: Test condition: VCC_RF = 1.28V with temperature +25 °C.

2: These parameters are characterized but not tested in manufacturing.

TABLE 8-9: SYSTEM CURRENT CONSUMPTION OF BM62

System Status	Typical ⁽¹⁾	Max	Unit
System-Off mode	—	10	μA
Stop advertising (Samsung S5 (SM-G900I)/Android 4.4.2)			
Stand-by mode	0.57	—	mA
Link mode	0.5	—	mA
ESCO link	15.1	—	mA
A2DP link	14.3	—	mA
Stop advertising (iPhone 6/iOS 8.4)			
Stand-by mode	0.6	—	mA
Link mode	0.6	—	mA
SCO link	15.3	—	mA
A2DP link	15.4	—	mA

Note 1: The measurement data corresponds to Firmware v1.0.

2: Mode definition: Stand-by mode: Power-on without Bluetooth link; Link mode: With Bluetooth link in low-power mode.

3: Current consumption values are considered with the BM62 validation board as test platform, BAT_IN = 3.8V. The distance between the smartphone and EVB is 30 cm, and the speaker is without loading.

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8.2 Timing specifications

Figure 8-1 and Figure 8-2 illustrate the clock and data timing diagram of the BM62/64 module.

FIGURE 8-1: TIMING DIAGRAM FOR I²S MODES (MASTER/SLAVE)

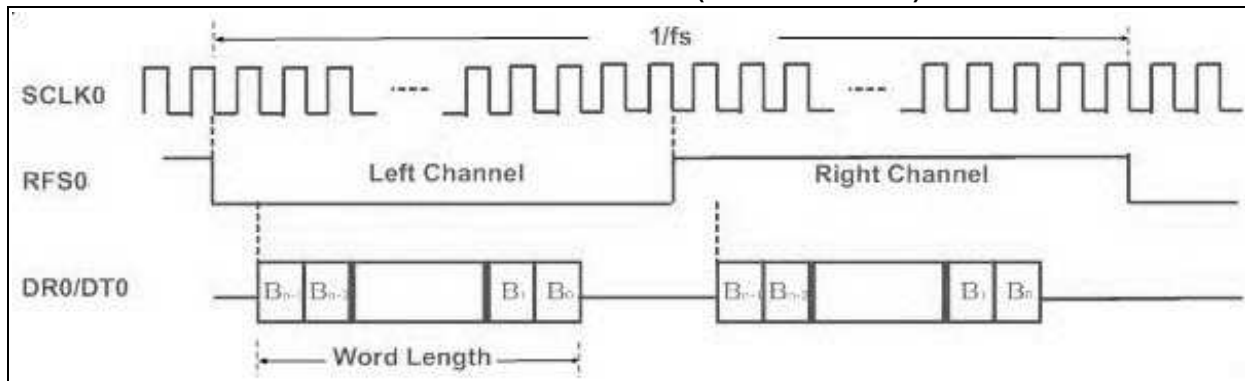
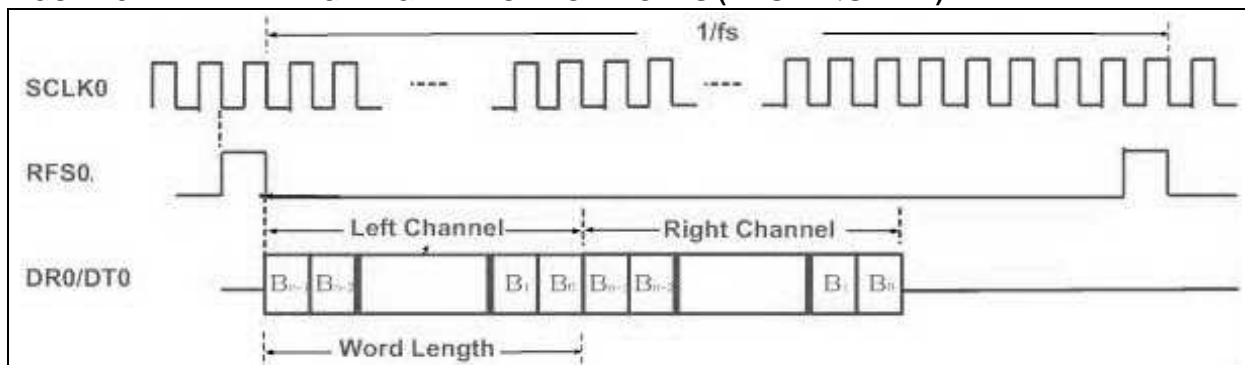


FIGURE 8-2: TIMING DIAGRAM FOR PCM MODES (MASTER/SLAVE)



Note 1: f_s : 8 kHz, 16 kHz, 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz and 96 kHz.

Note 2: SCLK0: $64 \cdot f_s / 256 \cdot f_s$.

Note 3: Word Length: 16-bit and 24-bit.

Figure 8-3 illustrates the audio interface timing diagram and Table 8-10 provides the audio interface timing specifications.

FIGURE 8-3: AUDIO INTERFACE TIMING DIAGRAM

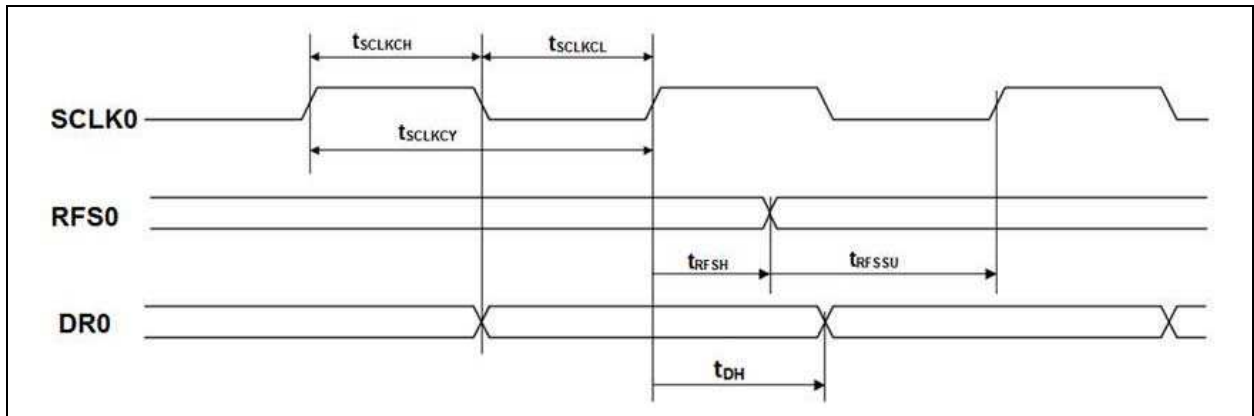


TABLE 8-10: AUDIO INTERFACE TIMING SPECIFICATIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
SCLK0 duty ratio	d _{SCLK}	—	50	—	%
SCLK0 cycle time	t _{SCLKCY}	50	—	—	ns
SCLK0 pulse width high	t _{SCLKCH}	20	—	—	ns
SCLK0 pulse width low	t _{SCLKCL}	20	—	—	ns
RFS0 set-up time to SCLK0 rising edge	t _{RFSSU}	10	—	—	ns
RFS0 hold time from SCLK0 rising edge	t _{RFSH}	10	—	—	ns
DR0 hold time from SCLK0 rising edge	t _{DH}	10	—	—	ns

Note: Test Conditions: Slave Mode, $f_s = 48$ kHz, 24-bit data and SLK0 period = 256 f_s .

BM62/64

NOTES:

9.0 SOLDERING RECOMMENDATIONS

The BM62/64 module is assembled using a standard lead-free reflow profile, IPC/JEDEC J-STD-020. The BM62/64 module can be soldered to the main PCB using a standard leaded and lead-free solder reflow profiles.

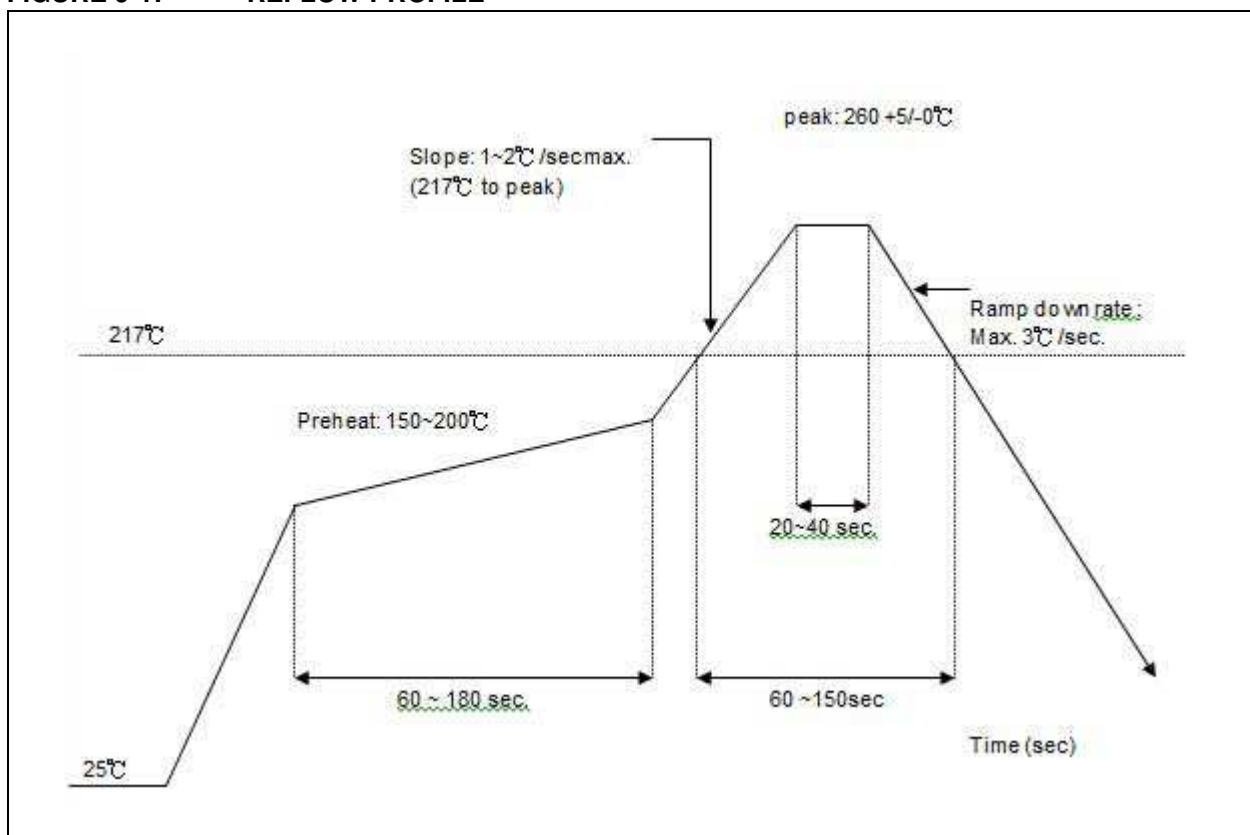
To avoid the damage to the module, follow these recommendations:

- Refer to Microchip Technology Application Note "AN233 Solder Reflow Recommendation" (DS00233) for the soldering reflow recommendations

- Do not exceed peak temperature (T_p) of +250 °C
- 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.

Figure 9-1 illustrates the reflow profile of the BM62/64 module.

FIGURE 9-1: REFLOW PROFILE



BM62/64

NOTES:

10.0 ORDERING INFORMATION

Table 10-1 provides the ordering information of the BM62/64 module.

TABLE 10-1: BM62/64 MODULE ORDERING INFORMATION

Module	Microchip IC	Description	Shield	Part No.
BM62	IS2062GM	Bluetooth 4.2 Stereo Audio module, Class 2 with RF shield	Yes	BM62SPKS1MC2
BM62	IS2062GM	Bluetooth 4.2 Stereo Audio module, Class 2 without RF shield	No	BM62SPKA1MC2
BM64	IS2064GM	Bluetooth 4.2 Stereo Audio module, Class 2 with RF shield	Yes	BM64SPKS1MC2
BM64	IS2064GM	Bluetooth 4.2 Stereo Audio module, Class 2 without RF shield	No	BM64SPKA1MC2
BM64	IS2064GM	Bluetooth 4.2 Stereo Audio module, Class 1 with RF shield	Yes	BM64SPKS1MC1
BM64	IS2064GM	Bluetooth 4.2 Stereo Audio module, Class 1 without RF shield	No	BM64SPKA1MC1

Note: The BM62/64 module can be purchased through a Microchip representative.
Go to Microchip web site www.microchip.com for current pricing and a list of distributors for the product.

BM62/64

NOTES:

APPENDIX A: CERTIFICATION NOTICES

Note: This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be offered for sale or lease, or sold or leased, until authorization is obtained.

The BM62/64 stereo audio module will cover regulatory approval for following countries:

- United States; FCC ID: (In progress)
- Canada, IC ID: (In progress)
- Europe: (In progress)
- Japan: (In progress)
- Korea: (In progress)
- Taiwan; NCC No: (In progress)
- China: CMIIT ID: (In progress)

A.1 REGULATORY APPROVAL

This section outlines the regulatory information for the BM62/64 stereo audio module for the following countries:

- United States
- Canada
- Europe
- Japan
- Korea
- Taiwan
- China
- Other Regulatory Jurisdictions

A.2 United States

The BM62/64 stereo audio module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” modular approval in accordance with Part 15.212 Modular Transmitter approval. Modular approval allows the user to integrate the BM62/64 module into a finished product without obtaining subsequent and separate FCC approvals for intentional radiation, provided no changes or modifications are made to the module circuitry. Changes or modifications could void the user’s authority to operate the equipment. The user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

The finished product is required to comply with all applicable FCC equipment authorizations regulations, requirements and equipment functions not associated with the transmitter module portion. For example, compliance must be demonstrated to regulations for other transmitter components within the host product; The requirements for unintentional radiators (Part 15 Sub-

part B “Unintentional Radiators”), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification, or Declaration of Conformity) (e.g., transmitter modules may also contain digital logic functions) as appropriate.

A.2.1 LABELING AND USER INFORMATION REQUIREMENTS

The BM62/64 stereo audio module has been labeled with its own FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording as follows:

Contains Transmitter Module FCC ID:
or
Contains FCC ID:
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

A user’s manual for the finished product must include the following 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

Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748 available at the FCC Office of Engi-

neering and Technology (OET) Laboratory Division
Knowledge Database (KDB)
<http://apps.fcc.gov/oetcf/kdb/index.cfm>

A.1.3 RF EXPOSURE

All transmitters regulated by FCC must comply with RF exposure requirements. KDB 447498 General RF Exposure Guidance provides guidance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC).

From the FCC Grant: Output power listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with FCC multi-transmitter product procedures.

A.1.4 HELPFUL WEB SITES

Federal Communications Commission (FCC):
<http://www.fcc.gov>

FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB):
<http://apps.fcc.gov/oetcf/kdb/index.cfm>

A.2 Canada

The BM62/64 stereo audio module has been certified for use in Canada under Industry Canada (IC) Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247. Modular approval permits the installation of a module in a host device without the need to recertify the device.

A.2.1 LABELING AND USER INFORMATION REQUIREMENTS

Labeling Requirements for the host device (from Section 3.1, RSS-Gen, Issue 4, November 2014): The host device shall be properly labeled to identify the module within the host device.

The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains transmitter module IC:

User Manual Notice for License-Exempt Radio Apparatus (from Section 8.4 RSS-Gen, Issue 4, November 2014): User manuals for license-exempt radio appara-

tus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmitter Antenna (from Section 8.3 RSS-Gen, Issue 4, November 2014): User manuals for transmitters shall display the following notice in a conspicuous location:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain must be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

The above notice may be affixed to the device instead of displayed in the user manual.

A.2.2 RF EXPOSURE

All transmitters regulated by IC must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).

A.2.3 HELPFUL WEB SITES

Industry Canada: <http://www.ic.gc.ca/>

A.3 Europe

The BM62/64 stereo audio module is an R&TTE Directive assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The BM62/64 stereo audio module has been tested to R&TTE Directive 1999/5/EC Essential Requirements for Health and Safety (Article (3.1(a)), Electro Magnetic Compatibility (EMC) (Article 3.1(b)), and Radio (Article 3.2) and are summarized in **TABLE A-1:“EUROPEAN COMPLIANCE TESTING”**. A notified body opinion has also been issued.

The R&TTE Compliance Association provides guidance on modular devices in document *Technical Guidance Note 01* available at http://www.rtteca.com/html/download_area.htm

Note: To maintain conformance to the testing listed in **TABLE A-1:“EUROPEAN COMPLIANCE TESTING”**, the module shall be installed in accordance with the installation instructions in this data sheet and shall not be modified.

When integrating a radio module into a completed product the integrator becomes the manufacturer of the final product and is therefore responsible for demonstrating compliance of the final product with the essential requirements of the R&TTE Directive.

A.3.1 LABELING AND USER INFORMATION REQUIREMENTS

The label on the final product which contains the BM62/64 stereo audio module must follow CE marking requirements. The R&TTE Compliance Association *Technical Guidance Note 01* provides guidance on final product CE marking.

A.3.2 ANTENNA REQUIREMENTS

From R&TTE Compliance Association document *Technical Guidance Note 01*:

Provided the integrator installing an assessed radio module with an integral or specific antenna and installed in conformance with the radio module manufacturer's installation instructions requires no further evaluation under Article 3.2 of the R&TTE Directive and does not require further involvement of an R&TTE Directive Notified Body for the final product. [Section 2.2.4]

The European Compliance Testing listed in **TABLE A-1:“EUROPEAN COMPLIANCE TESTING”** was performed using the PCB Trace antenna.

TABLE A-1: EUROPEAN COMPLIANCE TESTING

Certification	Standards	Article	Laboratory	Report Number	Date
Safety	EN60950-1:2006/A11:2009+A1:2010+A12:2011+A2:2013	[3.1(a)]	—	—	—
Health	ETSI EN 300 328 V1.9.1 EN62479:2010			—	—
EMC	EN300 489-1 V1.9.2	[3.1(b)]		—	—
	EN301 489-17 V2.2.1			—	—
Radio	ETSI EN 300 328 V1.9.1	(3.2)	—	—	
Notified Body	—	—	—	—	—

A.3.3 HELPFUL WEBSITES

A document that can be used as a starting point in understanding the use of Short Range Devices (SRD) in Europe is the European Radio Communications Committee (ERC) Recommendation 70-03 E, which can be downloaded from the European Radio Communications Office (ERO) at: <http://www.ero.dk/>

Additional helpful web sites are:

- Radio and Telecommunications Terminal Equipment (R&TTE): http://ec.europa.eu/enterprise/rtte/index_en.htm
- European Conference of Postal and Telecommu-

nications Administrations (CEPT):

<http://www.cept.org>

- European Telecommunications Standards Institute (ETSI): <http://www.etsi.org>
- European Radio Communications Office (ERO): <http://www.ero.dk>
- The Radio and Telecommunications Terminal Equipment Compliance Association (R&TTE CA): <http://www.rtteca.com/>

A.4 Japan

The BM62/64 stereo audio module has received type certification and is labeled with its own technical conformity mark and certification number as required to conform to the technical standards regulated by the Ministry of Internal Affairs and Communications (MIC) of Japan pursuant to the Radio Act of Japan.

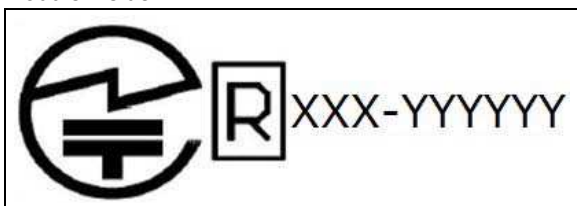
Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed. Additional testing may be required:

- If the host product is subject to electrical appliance safety (for example, powered from an AC mains), the host product may require Product Safety Electrical Appliance and Material (PSE) testing. The integrator must contact their conformance laboratory to determine if this testing is required.
- There is an voluntary Electromagnetic Compatibility (EMC) test for the host product administered by VCCI: http://www.vcci.jp/vcci_e/index.html

A.4.1 LABELING AND USER INFORMATION REQUIREMENTS

The label on the final product which contains the BM62/64 stereo audio module must follow Japan marking requirements. The integrator of the module must refer to the labeling requirements for Japan available at the Ministry of Internal Affairs and Communications (MIC) website.

The BM62/64 stereo audio module is labeled with its own technical conformity mark and certification number. The final product in which this module is being used must have a label referring to the type certified module inside:



A.4.2 HELPFUL WEB SITES

Ministry of Internal Affairs and Communications (MIC): <http://www.tele.soumu.go.jp/e/index.htm>

Association of Radio Industries and Businesses (ARIB): <http://www.arib.or.jp/english/>

A.5 Korea

The BM62/64 stereo audio module has received certification of conformity in accordance with the Radio Waves Act. Integration of this module into a final prod-

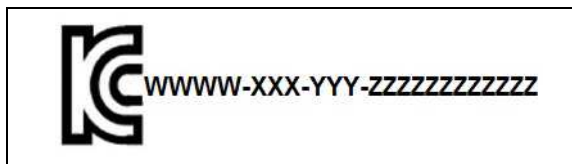
uct does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed.

A.5.1 LABELING AND USER INFORMATION REQUIREMENTS

The label on the final product which contains the BM62/64 stereo audio module must follow KC marking requirements. The integrator of the module must refer to the labeling requirements for Korea available on the Korea Communications Commission (KCC) website.

The BM62/64 stereo audio module is labeled with its own KC mark.

The final product requires the KC mark and certificate number of the module:



A.5.2 HELPFUL WEB SITES

Korea Communications Commission (KCC): <http://www.kcc.go.kr>

National Radio Research Agency (RRA): <http://rra.go.kr>

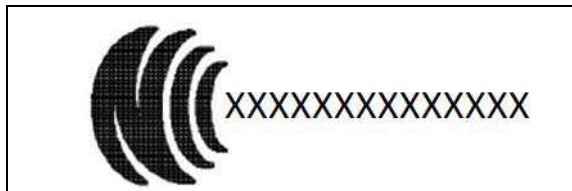
A.6 Taiwan

The BM62/64 stereo audio module has received compliance approval in accordance with the Telecommunications Act. Customers seeking to use the compliance approval in their product must contact Microchip Technology sales or distribution partners to obtain a Letter of Authority.

Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed.

A.6.1 LABELING AND USER INFORMATION REQUIREMENTS

The BM62/64 stereo audio module is labeled with its own NCC mark and certificate number as follows:



The user's manual must contain below warning (for RF device) in traditional Chinese:

注意！

依據 低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，

公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計

之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；

經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信規定作業之無線電信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性

電機設備之干擾。

A.6.2 HELPFUL WEB SITES

National Communications Commission (NCC):
<http://www.ncc.gov.tw>

A.7 China

The BM62/64 stereo audio module has received certification of conformity in accordance with the China MIIT Notice 2014-01 of State Radio Regulation Committee (SRRC) certification scheme. Integration of this module into a final product does not require additional radio certification, provided installation instructions are followed and no modifications of the module are allowed.

A.7.1 LABELING AND USER INFORMATION REQUIREMENTS

The BM62/64 stereo audio module is labeled with its own CMIIT ID as follows:

CMIIT ID: XXXXXXXXXXXX

When Host system is using an approved Full Modular Approval (FMA) radio: The host must bear a label containing the statement “This device contains SRRC approved Radio module CMIIT ID XXXXXXXXXXXX”.

A.8 Other Regulatory Jurisdictions

Should other regulatory jurisdiction certification be required by the customer, or the customer need to recertify the module for other reasons, contact Microchip for the required utilities and documentation.

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NOTES:

APPENDIX B: REVISION HISTORY

Revision A (May 2016)

This is the initial released version of this document.

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NOTES:

THE MICROCHIP WEB SITE

Microchip provides online support via our WWW site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

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- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the web site at: <http://microchip.com/support>

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NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

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Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
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Technical Support:
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Web Address:
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San Jose, CA
Tel: 408-735-9110

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Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

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Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon

Hong Kong
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Fax: 852-2401-3431

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Fax: 852-2401-3431

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Fax: 86-25-8473-2470

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