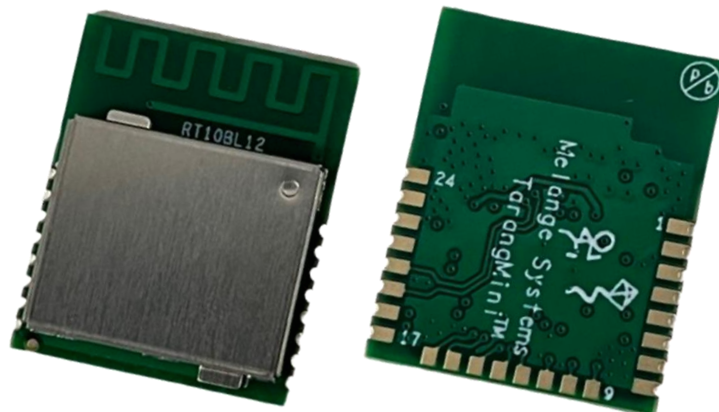


TarangMini™ RT10BL12

Bluetooth® Dual-Mode Module



Revision History

Version	Date	Notes
0p1	29-12-2023	Initial release

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PRODUCT DESCRIPTION

TarangMini™ RT10BL12 is a new generation Bluetooth® Dual mode module from Melange Systems. These highly integrated Ultra-low power devices are built around Realtek RTL8763ESE.

Powered by Realtek Real-M300, 32-bit ARMv8M mainline processor the module features extremely simple interfacing options to provide wireless capabilities to any embedded products in industrial and automotive segments. TarangMini™ RT10BL12 supports Bluetooth® v5.3 stack and multiple profiles based on customer's choice.



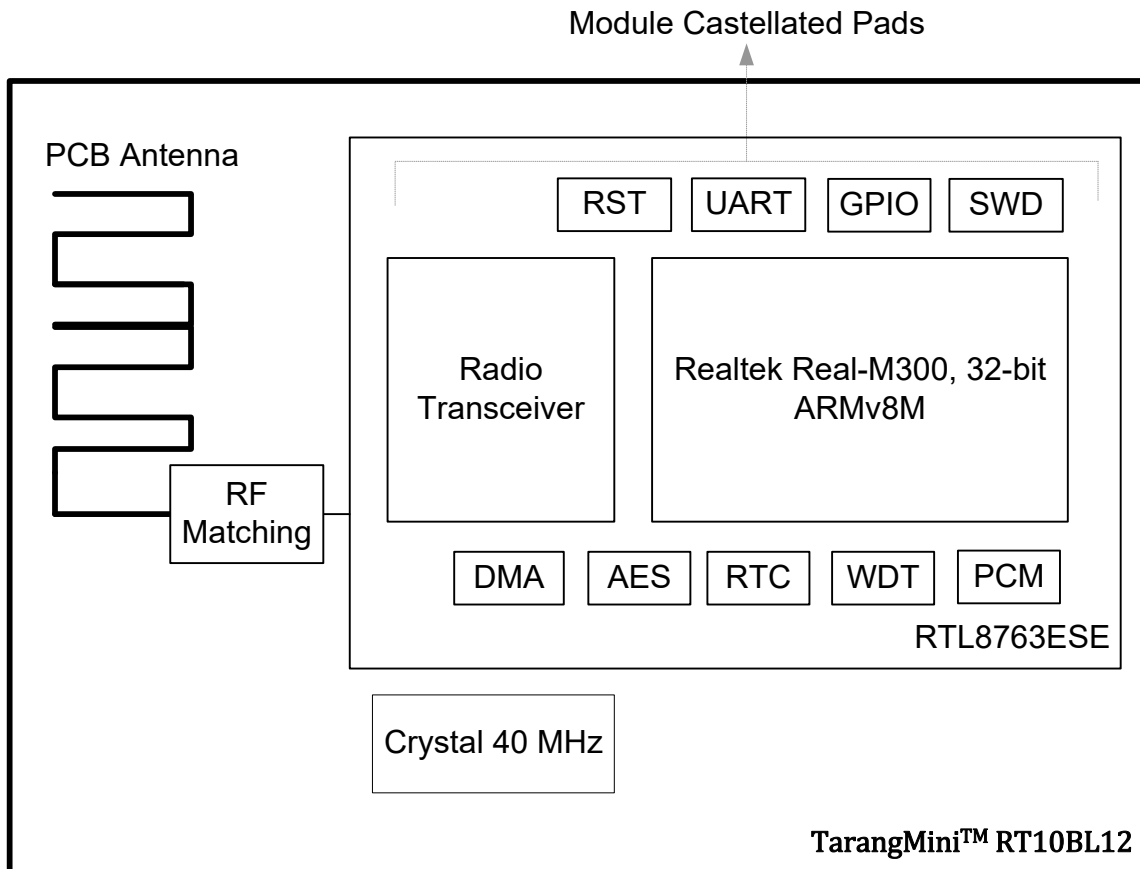
FEATURES

- Built-in Bluetooth® 5.3 stack and application profiles with simple API host interface on UART.
- Supports transparent UART mode (like SPP) for data transfer requirements (Default)
- Supports HFP 1.7, HSP 1.2, A2DP 1.3, AVRCP 1.6, SPP 1.2 and PBAP 1.0
- **Application and profile customization support for large volume procurements**
- Compact footprint (20 mm x 16 mm)
- AES-128 Encryption Processor
- 2.4 GHz wireless operation supports BR/EDR/LE-1M/LE-2M.
- Wide power supply range (3.1V to 4.2V)
- Ultra-low power consumption.
- Wide temperature range (-40 to +105 degree C)
- Programmable RF transmit power up to +10 dBm.
- Excellent receiver sensitivity
- Rich peripheral support - UART, I2C, I2S/PCM, SPI, SWD
- Castellated SMT pads for easy and reliable PCB mounting
- Environmentally friendly, RoHS compliant
- WPC ETA Certification (for India operations) *

APPLICATIONS

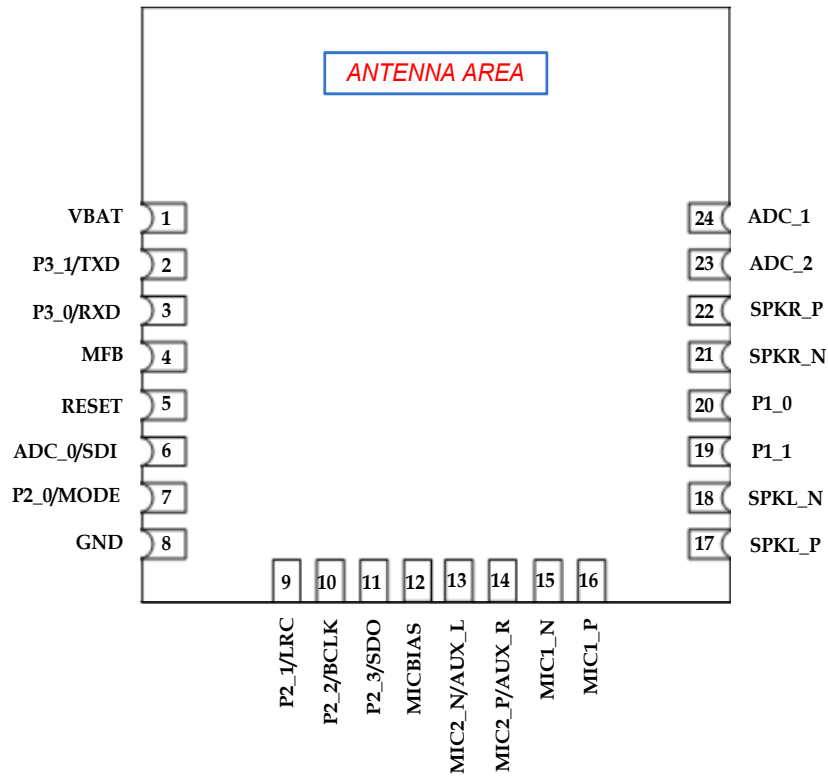
- Beacon Applications
- Remote Control
- Industrial Controls
- Smart Home Automation
- Electronic Instrument Cluster
- Asset Tracking
- Health Care Applications
- Home Appliances

1. Functional Block Diagram



2. Module Interface Details

TarangMini™ RT10BL12 module has 24-pin (3 X 8) 1.27 mm pitch **Castellated & SMD pads** distributed in three rows at the module edges. These connector / pads are used for interfacing the module with a microcontroller / RS232 level converter / USB to serial base board.



3. Pin Definition

Pin	Name	Type	Function
1	VBAT	Power Supply	Supply Voltage
2	P3_1/TXD	UART Transmit	Serial data OUT from Tarang
3	P3_0/RXD	UART Receive	Serial data IN to Tarang
4	MFB	I_PU	RSVD
5	RESET	I_PU	Reset module (Active low)
6	ADC_0/SDI	I/O	I2S_SDI
7	P2_0/MODE	I	H: APP mode L: HCI mode
8	GND	Power Supply	Ground
9	P2_1/LRC	I/O	I2S_LRC
10	P2_2/BCLK	I/O	I2S_BCLK
11	P2_3/SDO	I/O	I2S_SDO
12	MICBIAS	PO, AH	RSVD
13	MIC2_N/AUX_L	AH	RSVD
14	MIC2_P/AUX_R	AH	RSVD
15	MIC1_N	AH	RSVD
16	MIC1_P	AH	RSVD
17	SPKL_P	AH	RSVD
18	SPKL_N	AH	RSVD
19	P1_1/SWCLK	I/O	GPIO/DEBUG
20	P1_0/SWDIO	I/O	GPIO/DEBUG
21	SPKR_N	AH	RSVD
22	SPKR_P	AH	RSVD
23	ADC_2	I/O	RSVD
24	ADC_1/HOST_WAKE	I/O	GPIO

- GPIO functionalities are defined based on the chosen firmware. Unused I/Os can be left open.
- Reset input with internal pull up high, low active with at least 10ms to trigger module reset
- Reset is an active-low signal and can be utilized based on the application needs, otherwise, it can be left floating.
- GPIO (General purpose input output), GPI (General purpose input), I/O (Input Output), A (Analog), O (Output), I (Input), GPO (General purpose output), PU (Pull High Inside), PO (Power Output), AH (Analog and digital hybrid programmable), RSVD (Reserved/Floating)
- GPIO Configurable pull high/low state

4. Absolute Maximum Ratings

Parameter	Min	Max	Unit
Supply Voltage	0	5.5	V
Voltage on a pin	-	3.6	V
Storage Temperature	-40	+105	°C

- Stresses beyond the Absolute Maximum Ratings may cause permanent damage to the device
- These are stress ratings only, not the recommended operating ratings. Please refer Recommended Operating Condition section for safe functional operation range
- Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability
- All voltage values are with respect to ground

5. Recommended Operating Conditions

Parameter	Min	Max	Unit
Supply Voltage	3.1	4.5	V
Operating Temperature	-40	+105	°C

6. Power Consumption

@VBAT 3.3 V, Temp 25°C, Freq 2440 MHz

Parameter	Typical Value
Transmit Mode	< 40 mA (@ 10 dBm)

7. Radio Characteristics

@VBAT 3.3 V, Temp 25°C, Freq 2440 MHz

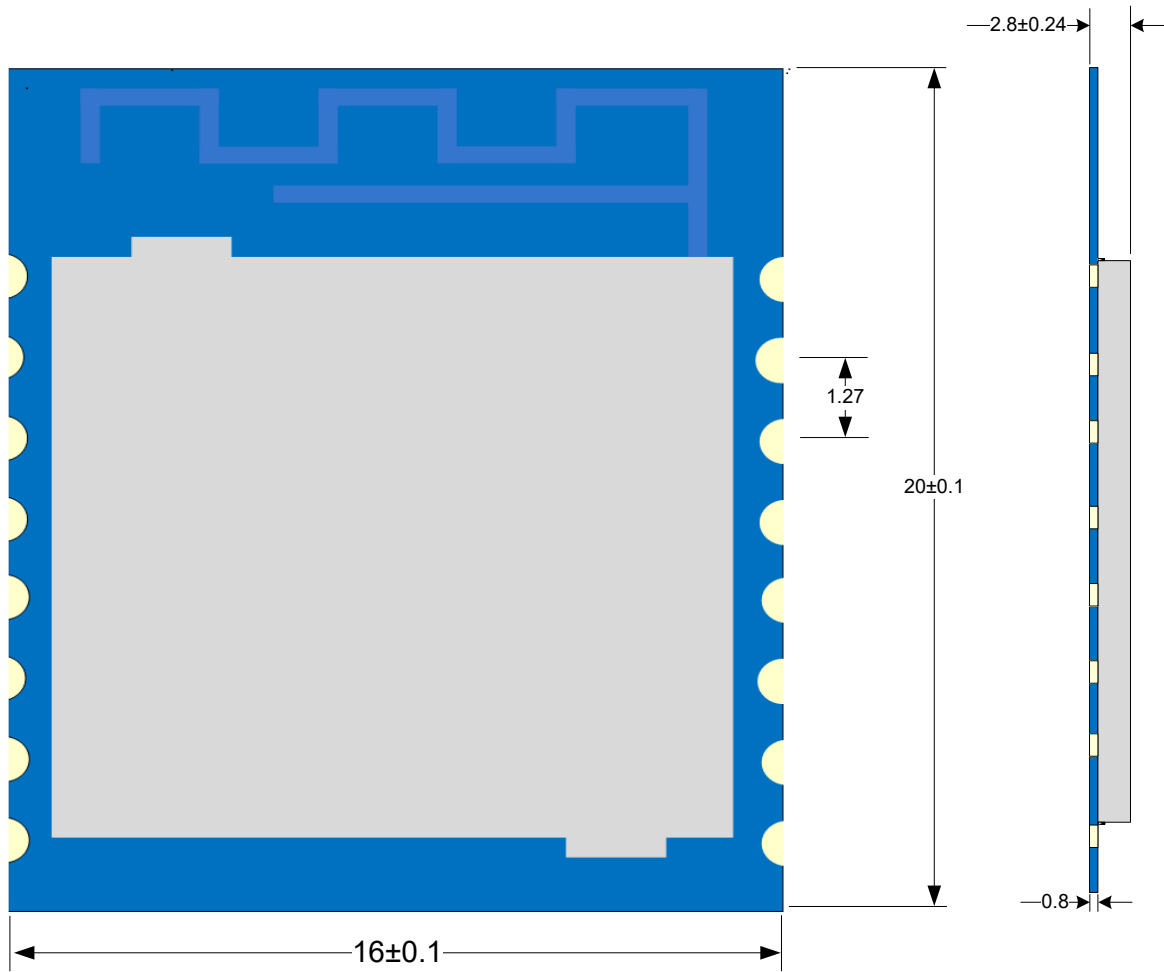
Parameter	Typical Value
Frequency Band	2400 - 2483.5 MHz
Modulation	GFSK
Transmit Power	+10 dBm (@ 1Mbps)
Receiver Sensitivity (LE-1M)	-98 dBm (@ 1Mbps)

8. DC Characteristics - Digital IO

Parameter	Min	Typ	Max	Unit
Input low voltage (VIL)	-0.4	-	0.4	V
Input high voltage (VIH)	0.7xVDDIO	-	VDDIO+0.4	V
Output low voltage (VDDIO=3V)	-	-	0.4	V
Output high voltage (VDDIO=3)	VDDIO-0.4	-	-	V
Internal Pull up on Reset Pin		100		KΩ

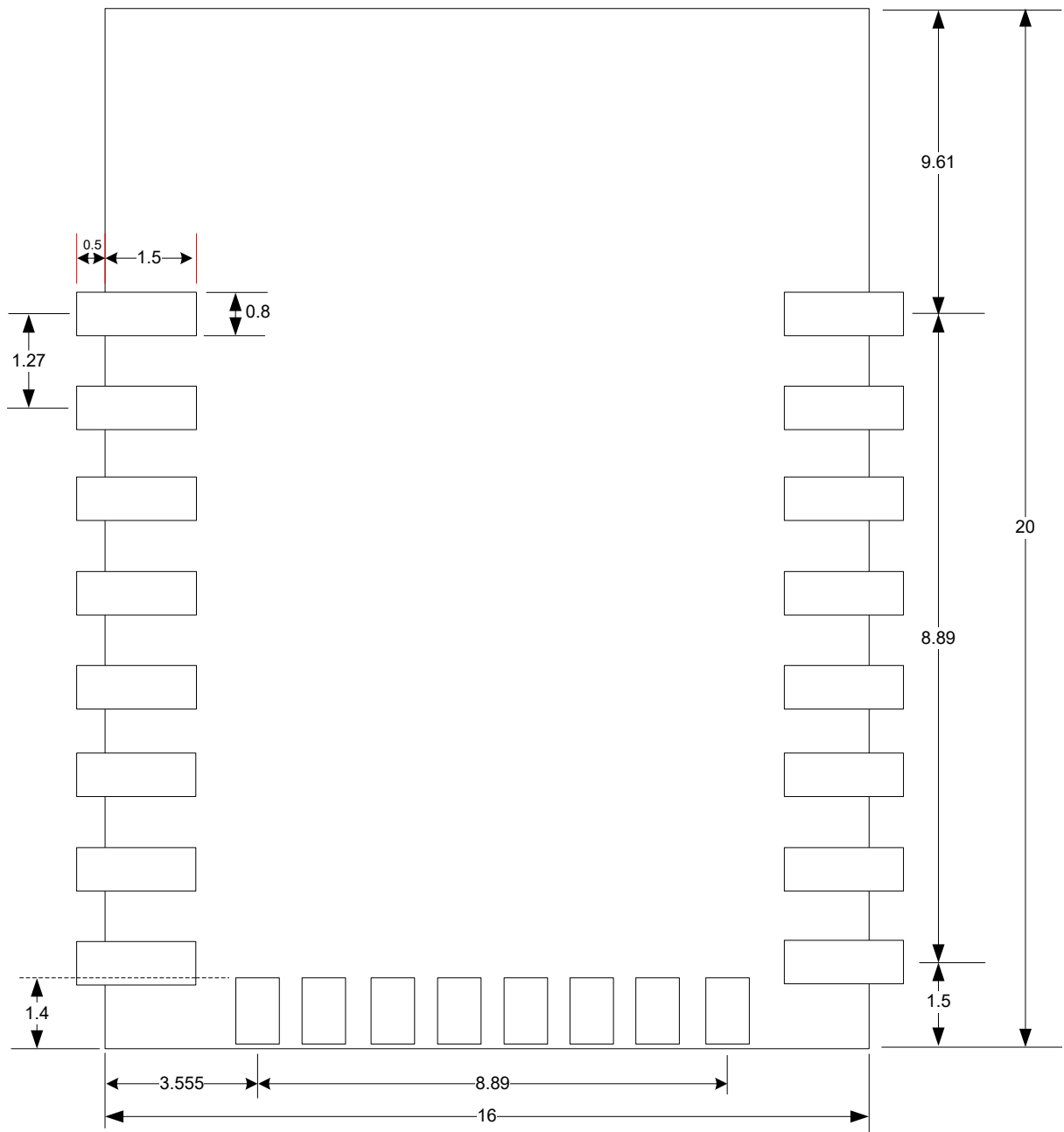
9. Mechanical Dimensions and Footprint

a. TarangMini™ RT10BL12 Mechanical Dimensions



TOP VIEW

b. TarangMini™ RT10BL12 Host PCB Land Pattern



<TOP Through View>

All units are in mm

c. Placement Recommendation (Host PCB)

Figure 1: BLE Module recommended placement (into Host PCB) with Antenna portion overhang.

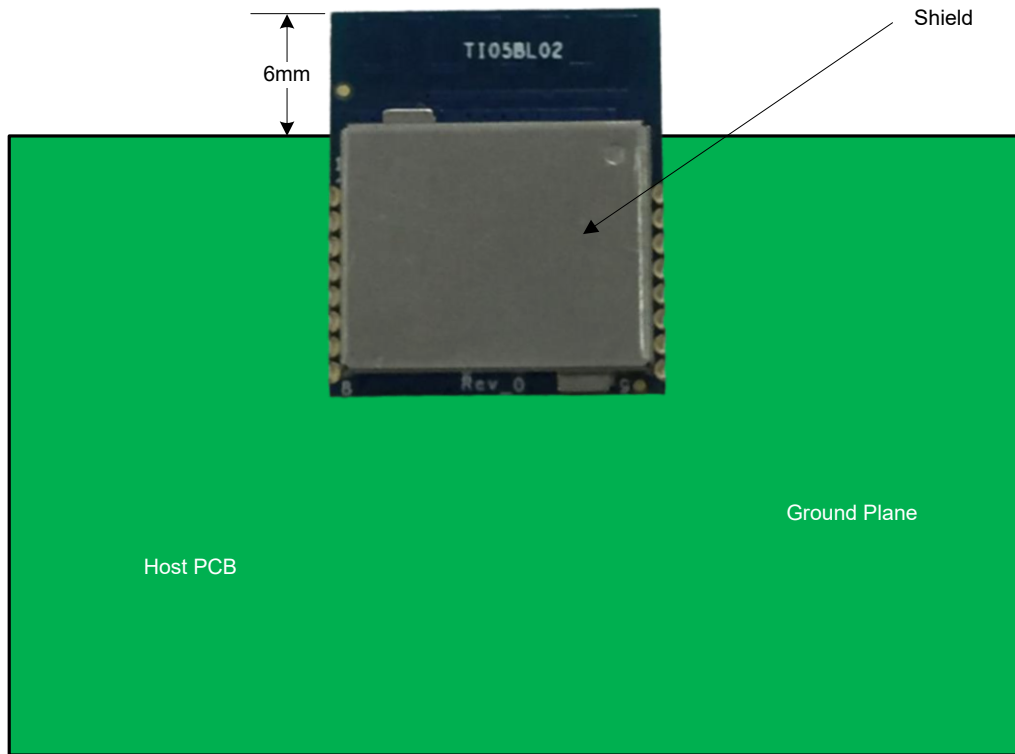
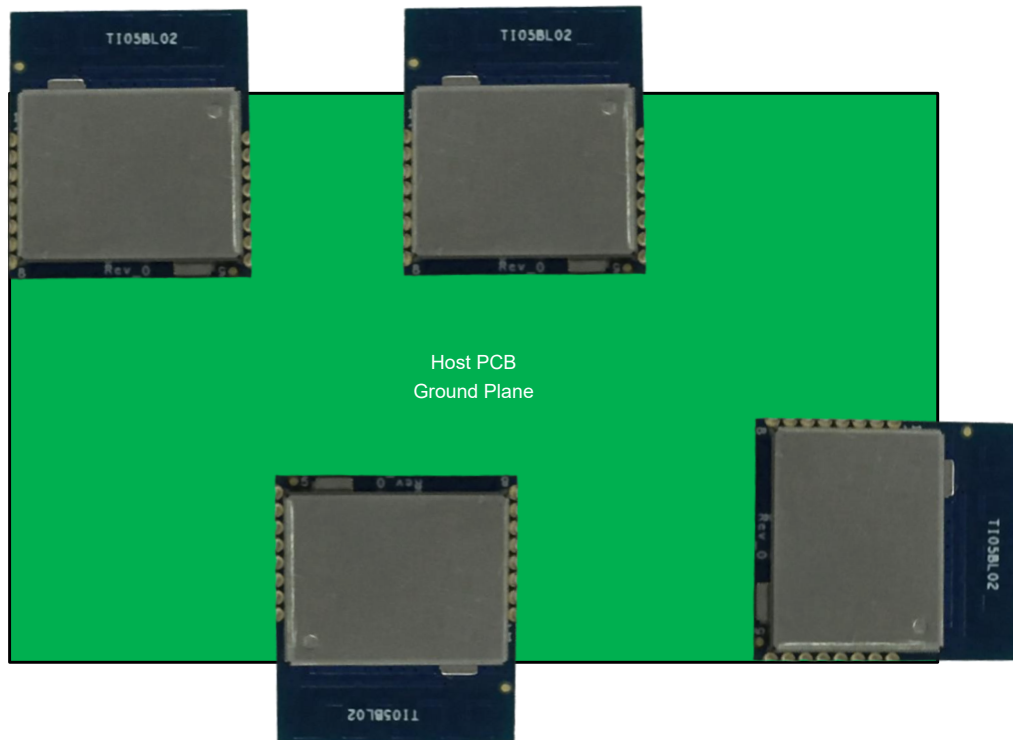


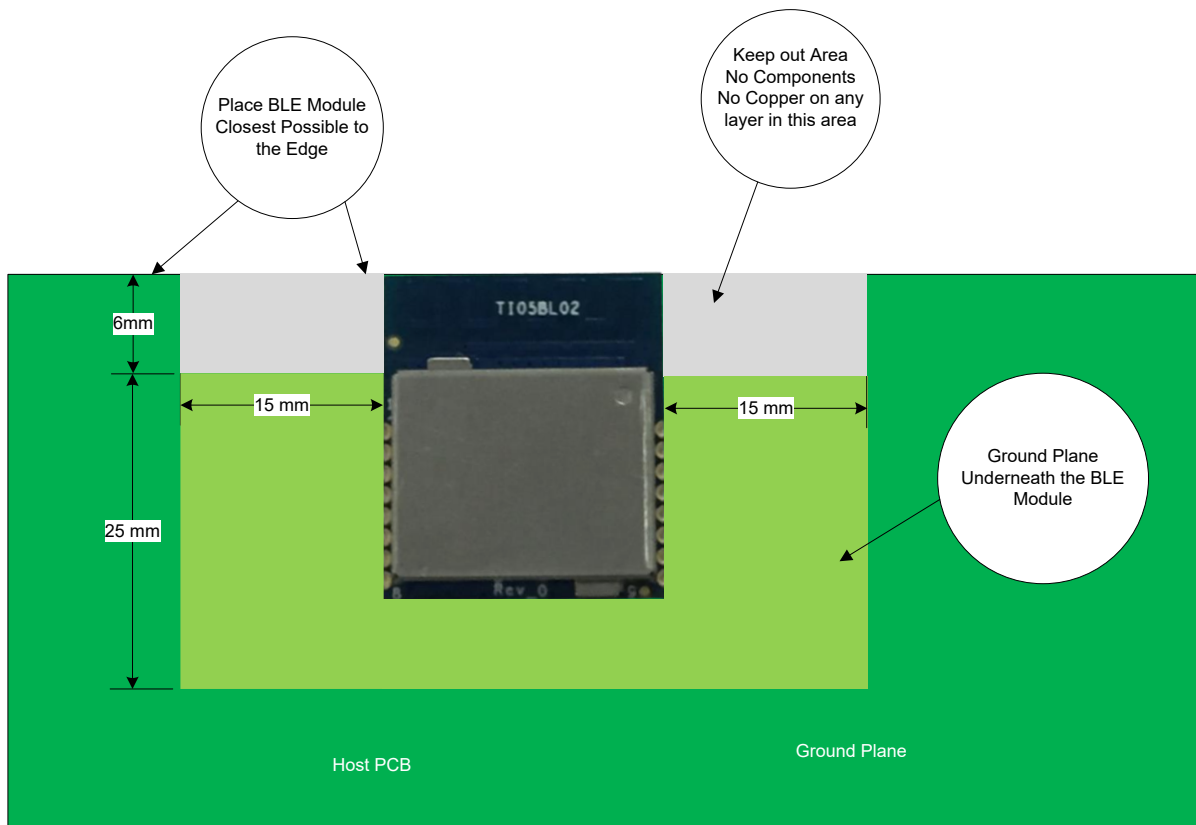
Figure 2: BLE Module recommended placement (into Host PCB) with Antenna portion overhang –Options.



Basic Guidelines:

- Never place the ground plane or route copper traces directly underneath the antenna portion of the module
- Never place the antenna close to metallic objects
- Keep wiring, components, and objects away from antenna.
- Do not place the antenna in a metallic or metalized plastic enclosure.
- Enclosure walls should be 1cm or more away from the antenna in all directions.
- If possible, mount antenna overhanging the edge of the host board.
- If antenna cannot be mounted in overhanging position, then provisions must be made to keep area clear of copper as recommended in diagram (see figure 3)

Figure 3: BLE Module recommended placement (into Host PCB) with Antenna portion NOT overhang.

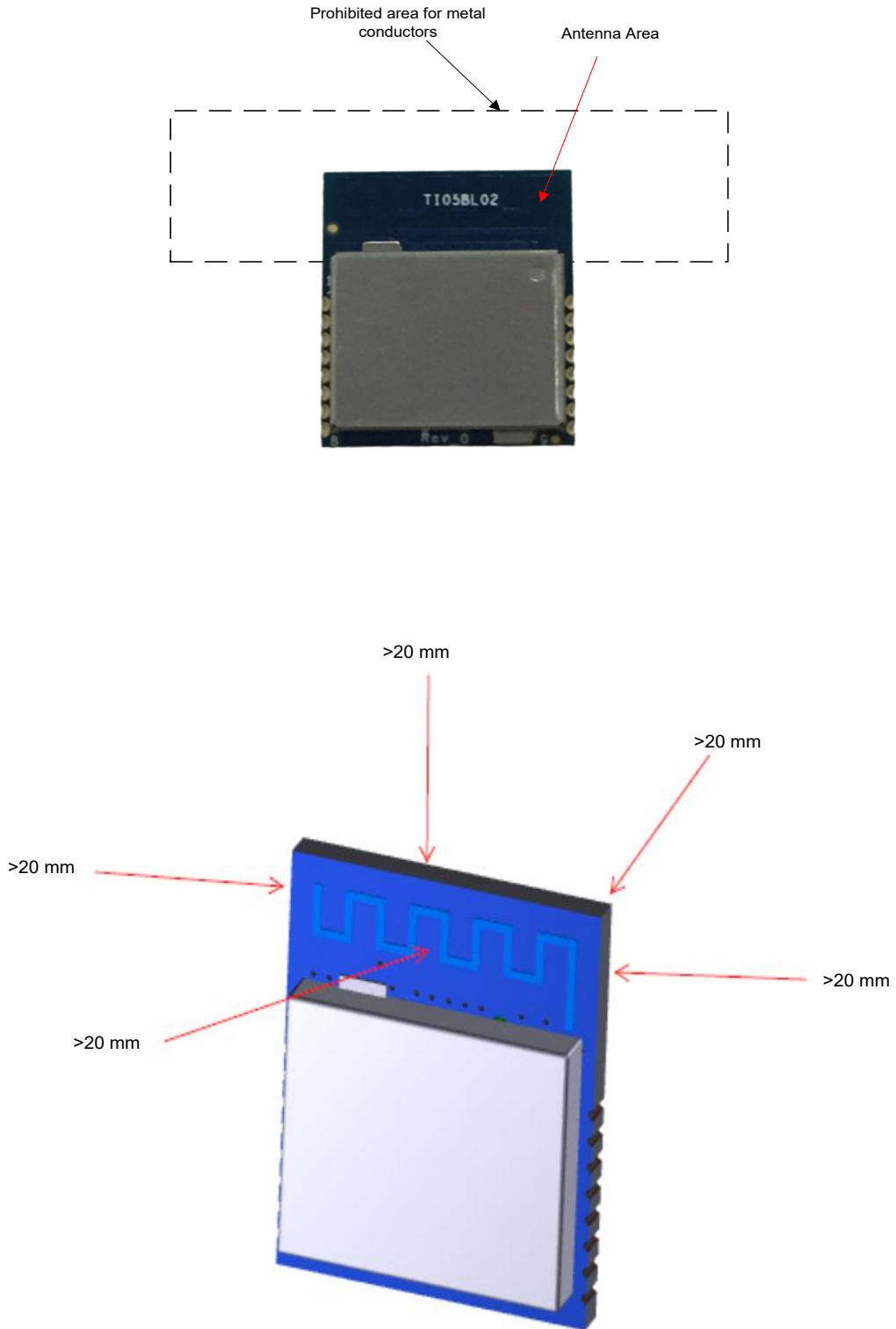


Layout of other components around antenna:

If any components containing metal conductor or conductive substance are placed close to the antenna, it might obstruct radio wave radiation, which can reduce communication distance significantly.

Keep the antenna away from metal conductors in accordance with below (See Figure 4)

Figure 4: Antenna portion is away from the metal conductors.



10. I2S/PCM Interface

TarangMini™ RT10BL12 embeds I2S digital audio interface, which can be configured to bridge the internal audio codec or connect to external DSP core (or audio amplifier/audio codec). The digital audio interfaces can operate in PCM/I2S mode.

The sampling rate is programmable for internal audio codec and external device with I2S connection.

- Support I2S, Left-justified, PCM mode-A, PCM mode-B.
- Configurable 16/20/32-bit data resolution (Audio data length)
- Configurable 16/20/24/32-bit word length (Channel length)
- Sampling rate:
192K/96K/88.2K/48K/44.1K/32K/24K/22.05K/16K/12K/11.025K/8KHz
- Supports sampling rate up to 96KHz for programmable.
- Supports I2S master mode and I2S slave mode.
- Does not support master clock (MCLK) output.

11. Other design notes

- ❖ Recommend adding a capacitor (100nF//10uF) in close to the main power source of the module.
- ❖ A level translator should be used if the power domain of the Host controller is different.
- ❖ The Main UART interface is used to upgrade the firmware through the module's internal boot-loader by default. The interface signals required for this process are VBAT, TXD, RXD, MODE, RESET and GROUND.

12. Soldering Recommendations

TarangMini™ RT10BL12 modules are manufactured following standard lead-free reflow profile IPC/JEDEC J-STD-020. This module can be soldered to the host PCB using standard leaded and lead-free solder reflow profiles. Follow the below recommendation to avoid damaging the module.

- ✓ Do not exceed peak temperature of 235°C ~ 245°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.