TarangMini™ RT07BL11

Bluetooth® Low Energy (BLE) Module

Revision History

Version	Date	Notes
0p1	03-01-2024	Initial release

Contents

PRODUCT DESCRIPTION

TarangMini™ RT07BL11 is a new generation Bluetooth® Low Energy (BLE) module from Melange Systems. These highly integrated ultra-low power devices are built around Realtek RTL8762ESF-CG.

Powered by an ARM Cortex-M0+ processor the module features extremely simple interfacing options to provide wireless capabilities to any embedded products in industrial and automotive segments. TarangMini™ RT07BL11 supports Bluetooth® v5.2 stack and multiple profiles based on customer's choice.
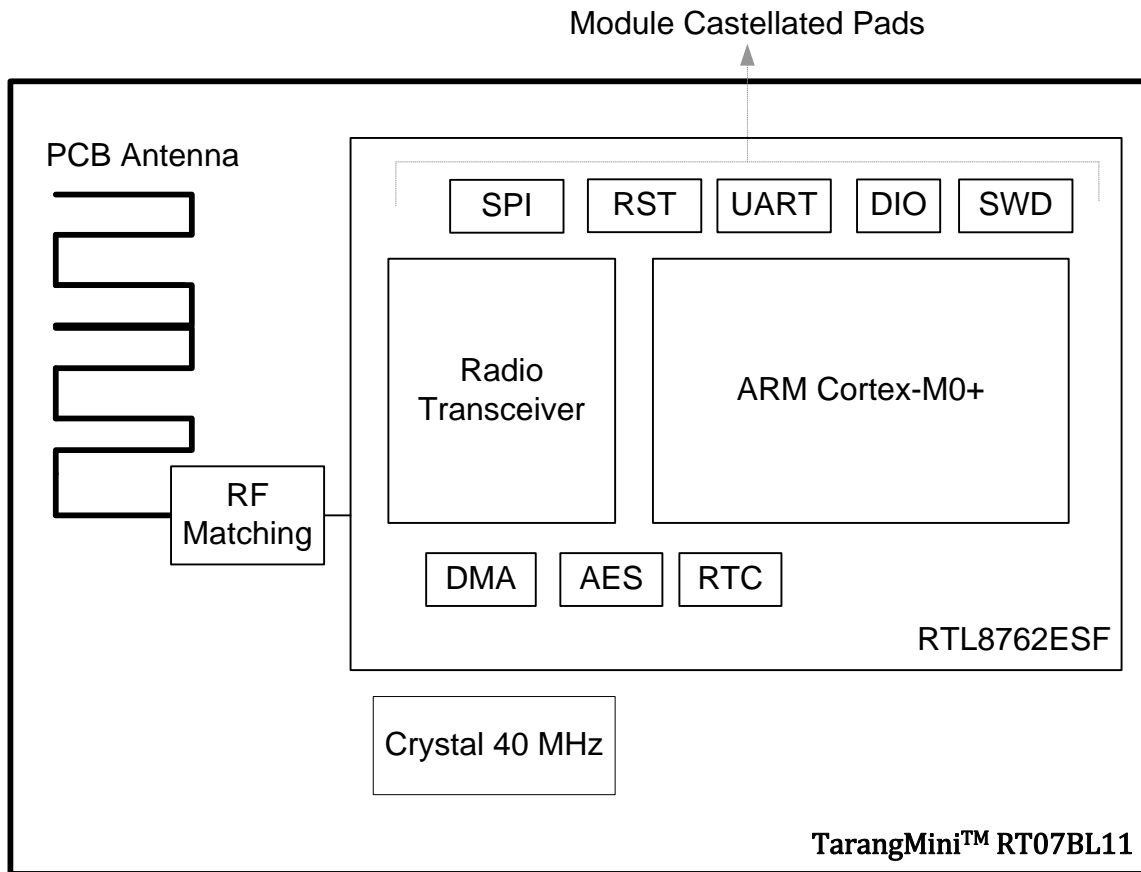
FEATURES

- Built-in Bluetooth® 5.2 stack and application profiles with simple API host interface on UART.
- Supports transparent UART mode (like SPP) for data transfer requirements (Default)
- Application and profile customization support for large volume procurements
- Compact footprint (20 mm x 16 mm)
- 2.4 GHz wireless operation supports up to 2Mbps air data rate.
- Wide power supply range (2 V to 3.6 V)
- Ultra-low power consumption.
- Wide temperature range (-40 to +85 degree C)
- Programmable RF transmit power up to +7.5 dBm.
- Excellent receiver sensitivity (–97 dBm)
- Rich peripheral support - UART, SPI, I2C, PWM, SWD
- Castellated SMT pads for easy and reliable PCB mounting.
- Environmentally friendly, RoHS compliant
- WPC ETA Certification (for India operations) *
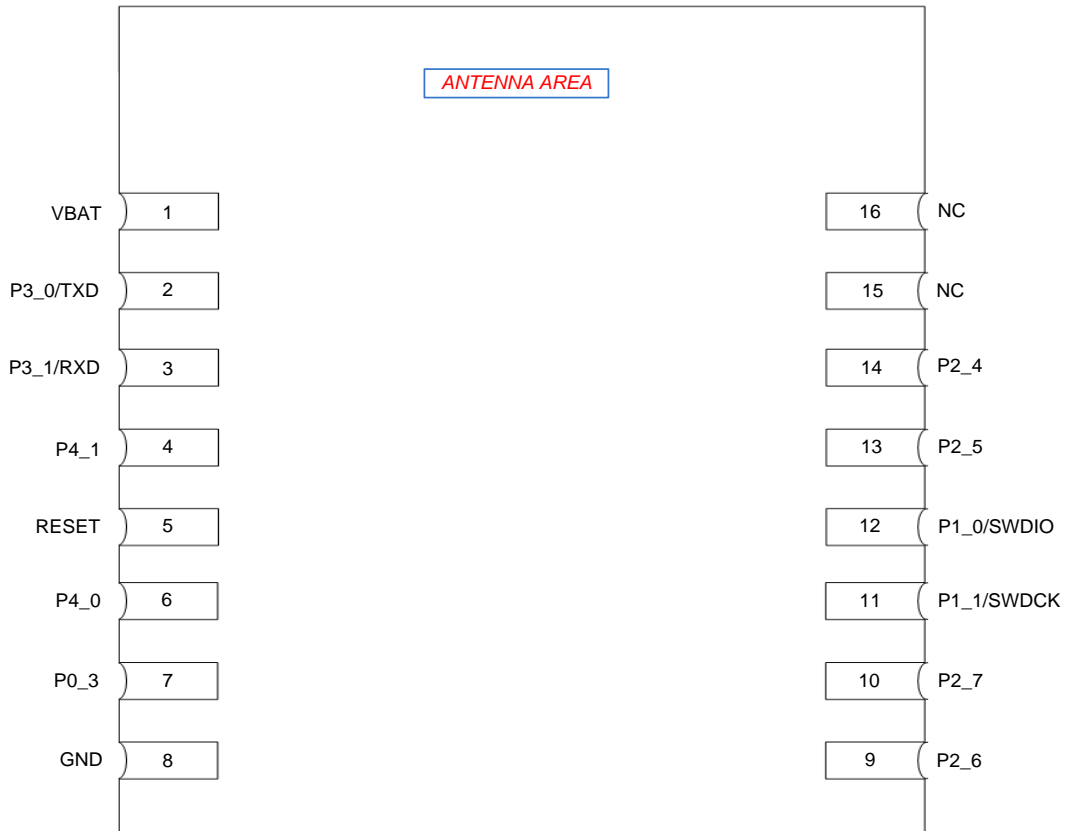
APPLICATIONS

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

1. Functional Block Diagram

Module Castellated Pads

PCB Antenna

| SPI | RST | UART | DIO | SWD |

Radio Transceiver

ARM Cortex-M0+

RF Matching

DMA | AES | RTC

RTL8762ESF

Crystal 40 MHz

TarangMini™ RT07BL11

2. Module Interface Details

TarangMini™ RT07BL11 module has 16-pin 1.27 mm pitch **Castellated Pads** distributed in two 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.

VBAT	1	16	NC
P3_0/TXD	2	15	NC
P3_1/RXD	3	14	P2_4
P4_1	4	13	P2_5
RESET	5	12	P1_0/SWDIO
P4_0	6	11	P1_1/SWDCK
P0_3	7	10	P2_7
GND	8	9	P2_6

ANTENNA AREA

3. Pin Definition

Pin	Name	Type	Function
1	VBAT	Power Supply	Supply Voltage
2	P3_0/TXD	UART Transmit	Serial data OUT from Tarang
3	P3_1/RXD	UART Receive	Serial data IN to Tarang
4	P4_1	I/O	RSVD
5	RESET	Reset function of the module	Reset module (Active low)
6	P4_0	I/O	RSVD
7	P0_3	I/O	RSVD
8	GND	Power Supply	Ground
9	P2_6	I/O	RSVD
10	P2_7	I/O	RSVD
11	P1_1/SWDCK	PROG	DEBUG
12	P1_0/SWDIO	PROG	DEBUG
13	P2_5	I/O	RSVD
14	P2_4	I/O	RSVD
15	NC	-	NC
16	NC	-	NC

- Digital I/O functionalities are defined based on the chosen firmware. Unused I/Os can be left open.
- All General Purpose I/O Support 8 mA drive capability
- I (Input), O (Output), RSVD (Reserved), NC (No Connection/Do Not connect)

4. Recommended Operating Conditions

Parameter	Min	Max	Unit
Supply Voltage	2	3.6	V
Operating Temperature	-40	+85	°C
Storage Temperature	-55	+125	°C

- Exposure to Maximum Rating conditions for extended periods may affect device reliability.
- Stresses beyond the Maximum Ratings may cause permanent damage to the device.
- Typical 3.3V

5. Power Consumption

@VBAT 3.3 V, Temp 25°C, Freq 2440 MHz

Parameter	Typical Value
Receive Mode	5.3 mA
Transmit Mode	5.9 mA (@ 0 dBm)
Transmit Mode	13.1 mA (@ 7.5 dBm)

6. Radio Characteristics

@VBAT 3.3 V, Temp 25°C, Freq 2440 MHz

Parameter	Typical Value
Frequency Band	2400 - 2480 MHz
Modulation	GFSK
Transmit Power	+7.5 dBm (@ 1Mbps)
Receiver Sensitivity	-97 dBm (@ 1Mbps)

7. DC Characteristics – Digital IO

| Parameter	Condition	Min.	Typ.	Max.	Unit
Internal Pull up on Reset Pin			10		kOhm
High level input voltage	VDDIO=3.3V	2	3.3	3.6	V
Low level input voltage	VDDIO=3.3V	-	0	0.9	V
High level output voltage	VDDIO=3.3V	2.97	-	3.3	V
Low level output voltage	VDDIO=3.3V	0	-	0.33	V
Pull High and Pull Low resistor	VDDIO=3.3V	-	10/100	-	kOhm

8. Mechanical Dimensions and Footprint

a. TarangMini™ RT07BL11 Mechanical Dimensions

All dimensions are in mm
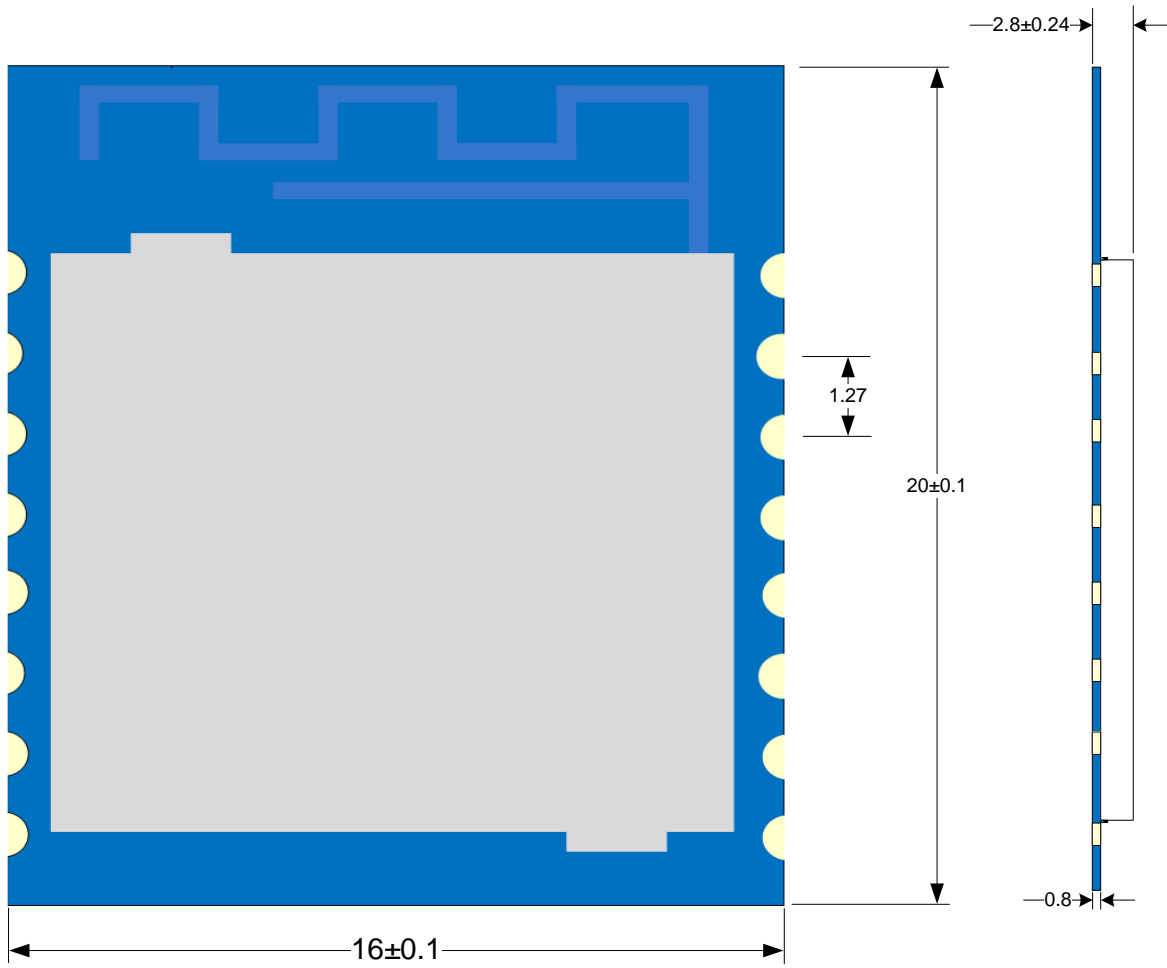
TOP VIEW

b. TarangMini™ RT07BL11 Recommended footprint

<TOP Through View>

All units are in mm
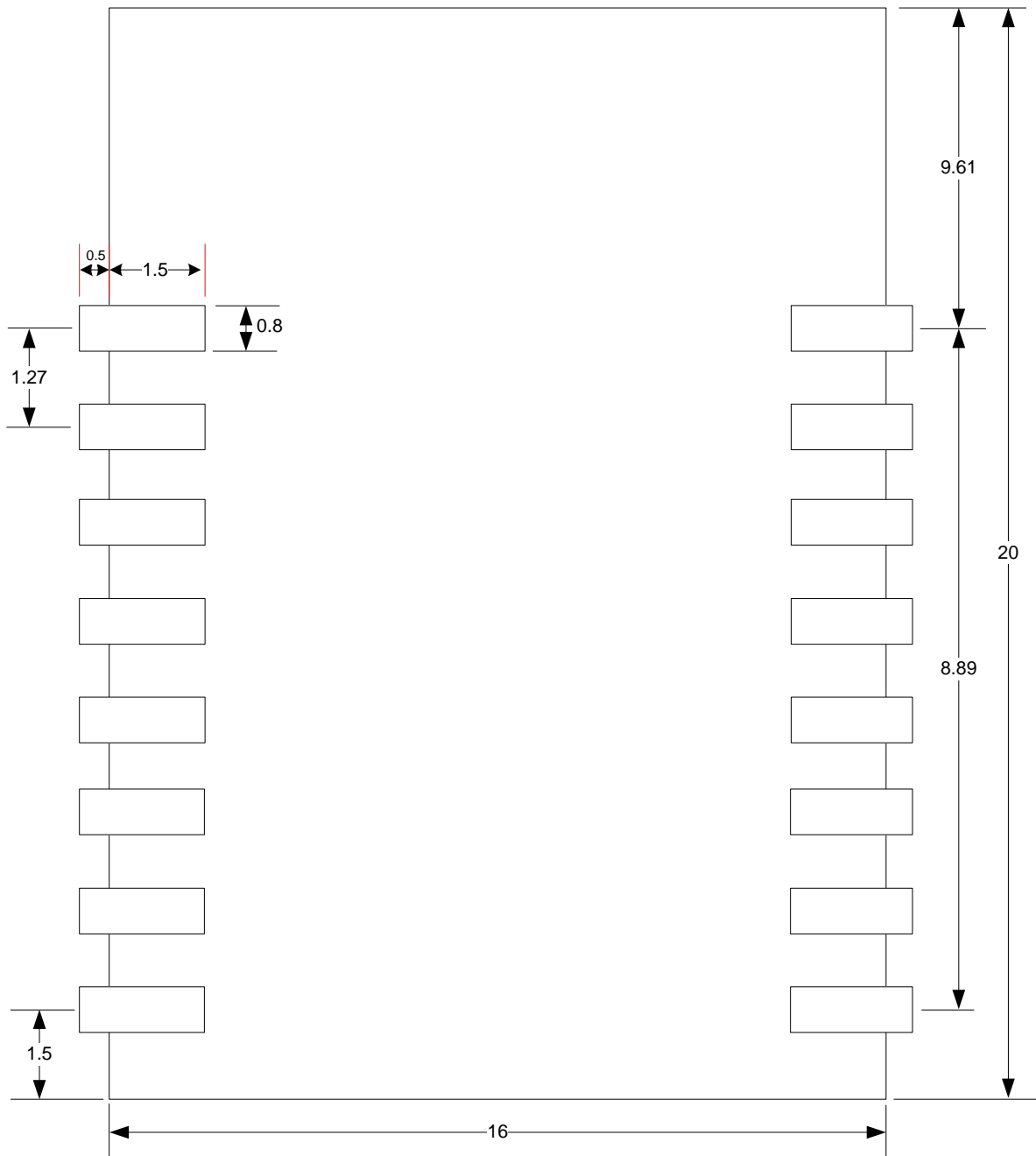
c. Placement Recommendation (Host PCB)

Figure 1: BLE Module recommended placement (into Host PCB) with Antenna portion overhang.
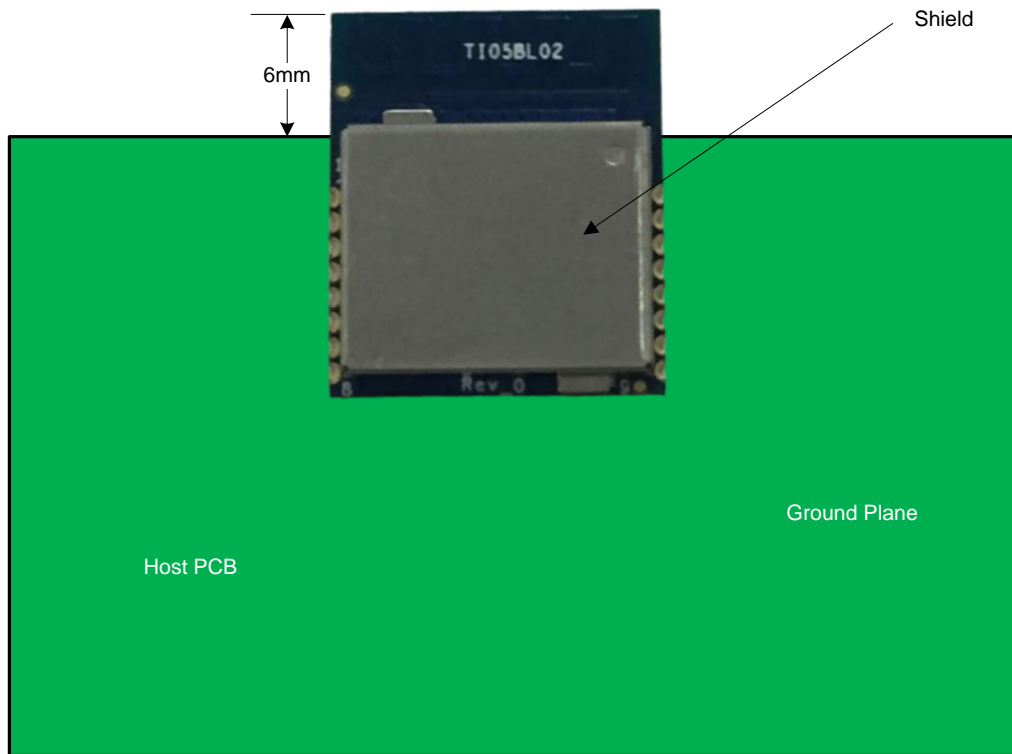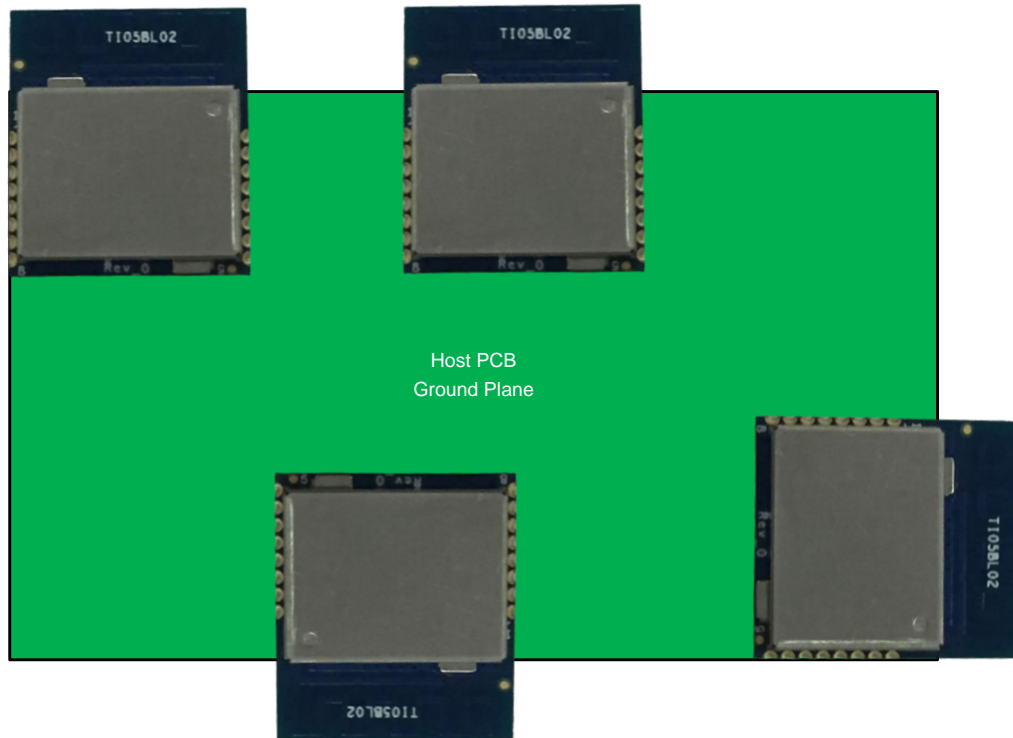
Figure 2: BLE Module recommended placement (into Host PCB) with Antenna portion overhang –Options.

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.
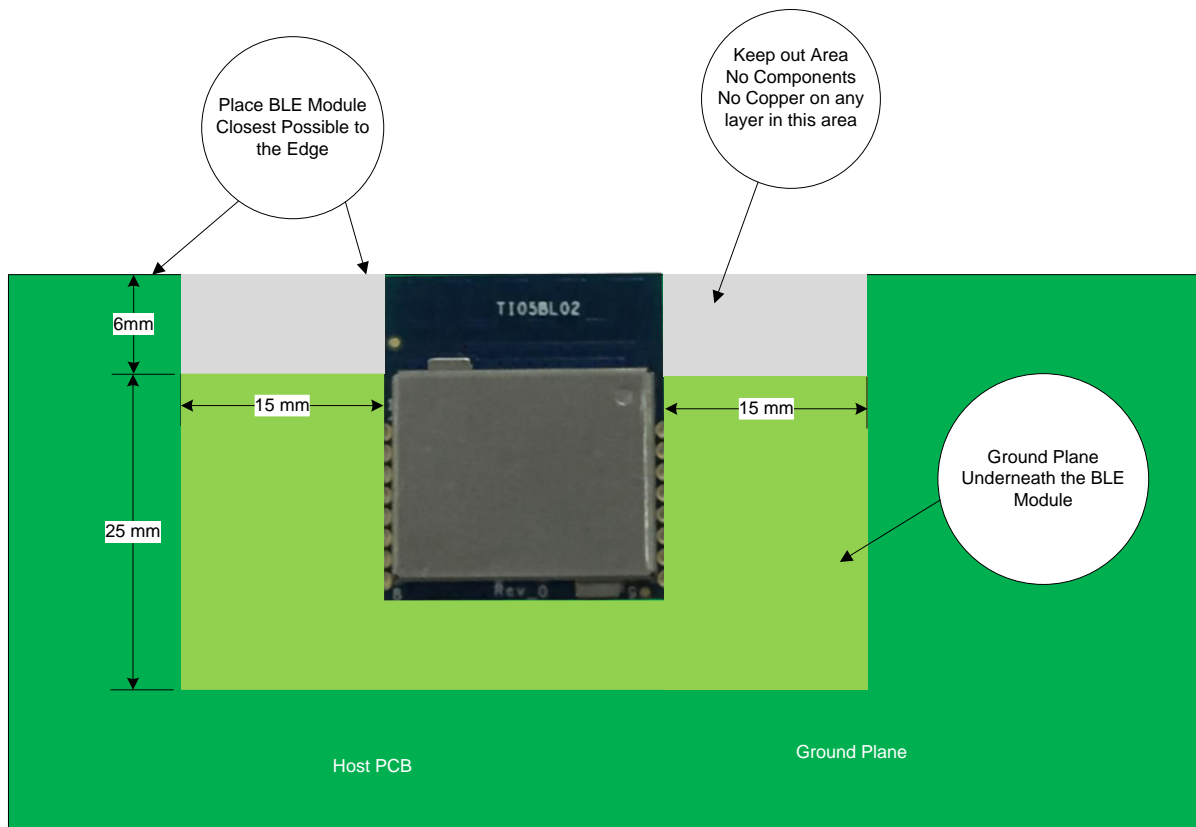

## Layout of other components around antenna:

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.
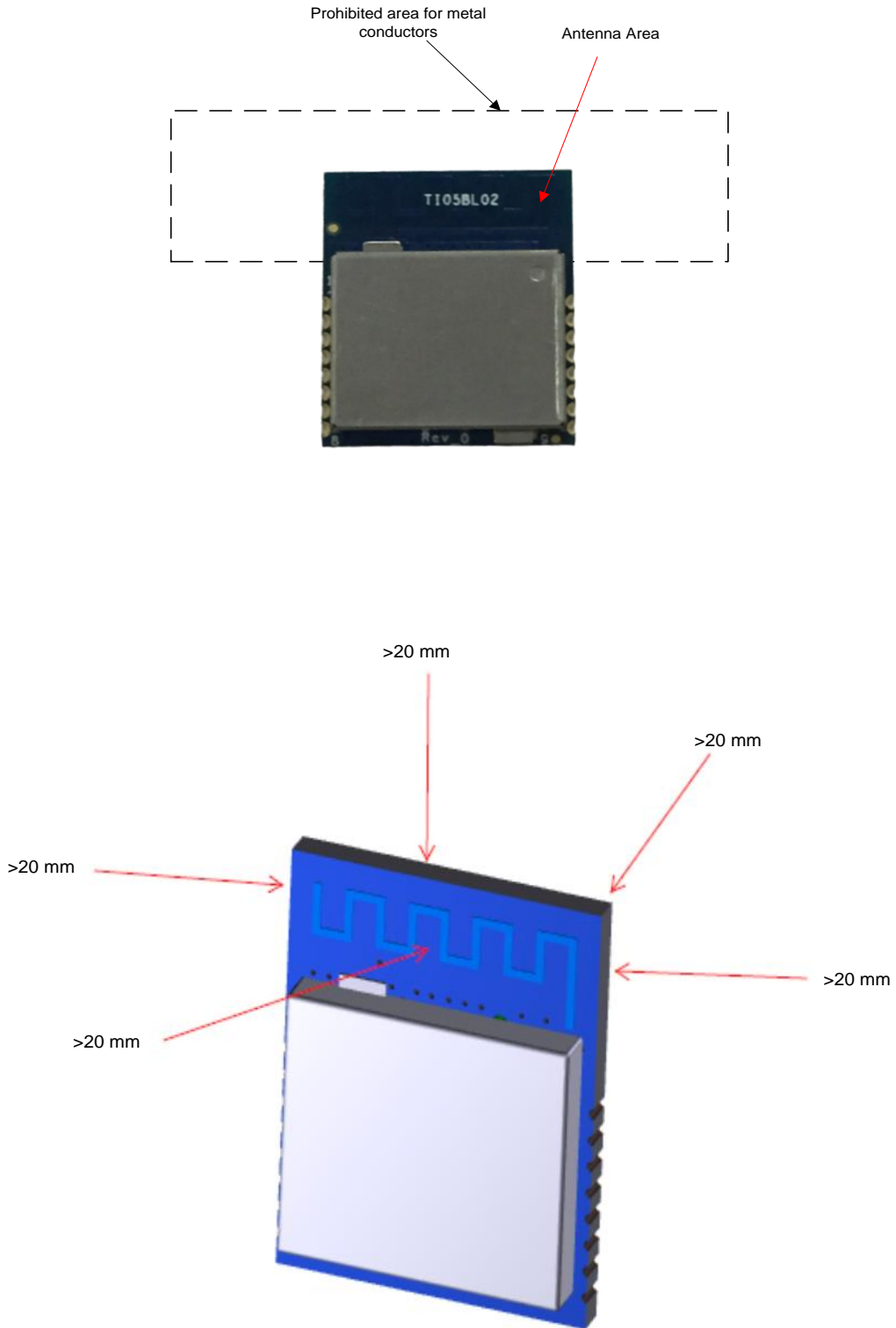
9. Typical Application Schematics
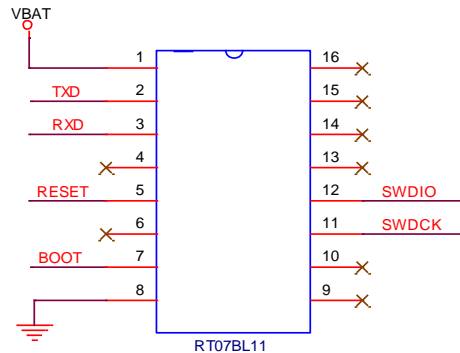
Note:

- ❖ If the power domain of the Host controller differs, it is necessary to use a level translator.
- ❖ By default, the primary UART is utilized to upgrade the firmware via the module's internal boot-loader. This process required the usage of interface signals such as VBAT, TXD, RXD, BOOT, RESET, and GROUND.
- ❖ To perform an external firmware upgrade, access to the test pad or edge connector is required. It is necessary to put the Host controller into a high impedance/tri-state while performing this access.
- ❖ Recommend adding a capacitor (100nF//10uF) in close to the main power source of the module

10. Soldering Recommendations

TarangMini™ RT07BL11 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.