

MELANGE SYSTEMS PVT LTD

TarangMini™ SM20LR03 Hardware Specification Document

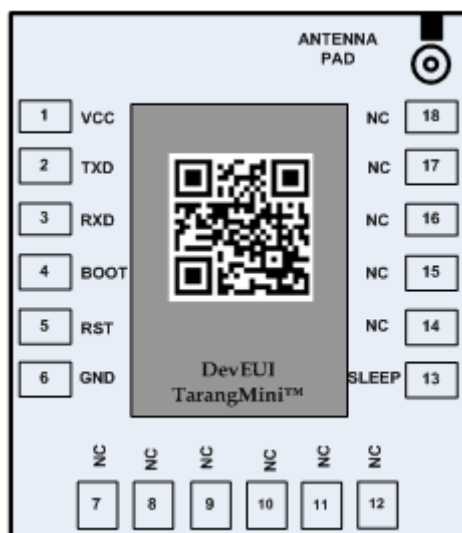
Document Version: 2.0
Hardware Version: 3.0
Release Date: 04-July-2018

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1. Module Interface Details

TarangMini™ module has 18-pin (3 X 6) 2mm pitch **Castellated Pads / Through- Hole Pins** distributed in three rows at the module edges. This connector / pads are used for interfacing the module with a microcontroller / RS232 level converter / USB to serial base board



2. Pin Definition

Pin	Name	Type	Function
1	VCC	P	Module Power Supply (3.0V to 3.6V)
2	DOUT	O	Serial data output from TarangMini
3	DIN	I	Serial data input to TarangMini
4	BOOT	I	H- Firmware update; L- Normal operation
5	RESET	I	Reset module (Active Low)
6	GND		Ground
7	NC		Reserved
8	NC		Reserved
9	NC		Reserved
10	NC		Reserved
11	NC		Reserved
12	NC		Reserved
13	Sleep	I	Ext. Interrupt (Sleep)
14	NC		Reserved
15	NC		Reserved
16	NC		Reserved
17	NC		Reserved
18	NC		Reserved

Note: * Do not connect any of the “Reserved pins”

3. Technical Specification

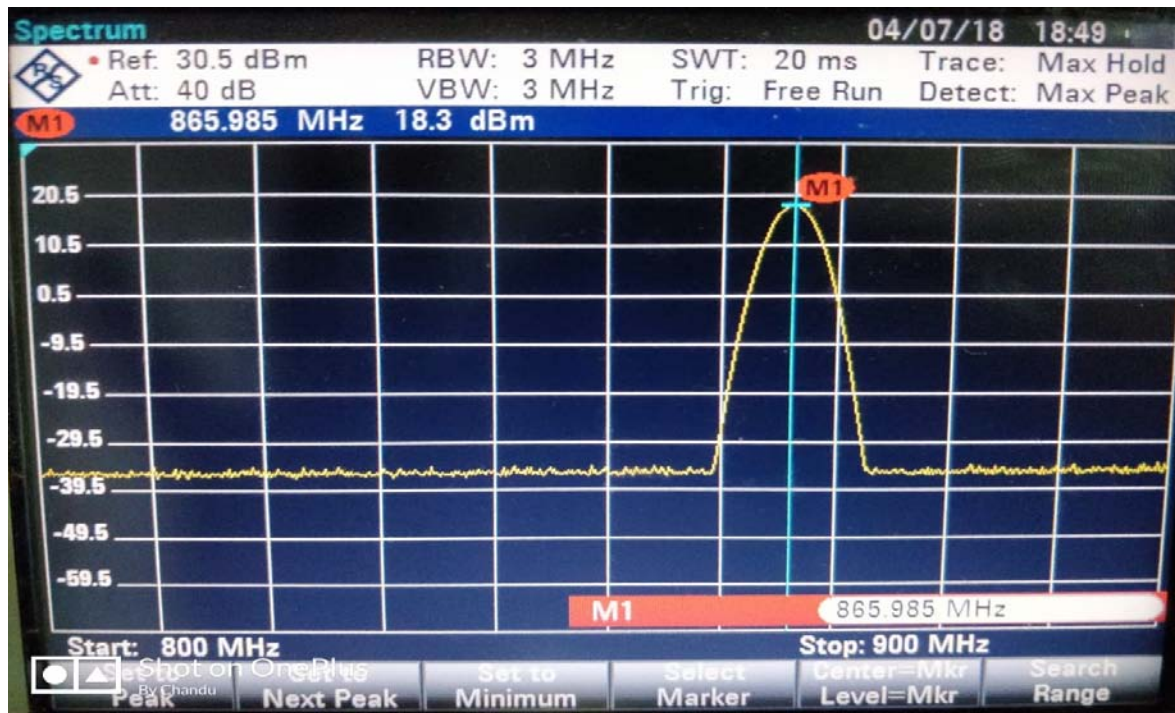
Specification	TarangMini Module
Supply Voltage	3.0 to 3.6 V
Transmit Frequencies (MHz)	865.0625, 865.4025, 865.9850
Receive Frequency (MHz)	866.55
Maximum Transmit Power (dBm)	18.5
Transmit Current (mA)	125 @ 18.5 dBm
Receive Current (mA)	< 15
Sleep Current (uA)	< 5
Receiver Sensitivity (dBm)	-126 (at SF=8, BW=125KHz) at 1% PER
Calculated Maximum EIRP (dBm)	18.5 (at Spring Antenna Gain = 0dBi)
SNR	12 (at RxBW=125KHz, SF=8, NF=9)
Operating Temperature Range	-10 to +70 degree C
Storage Temperature Range	-40 to +85 degree C

Note: Power supply = 3.3 V to 3.6 V, Frequency of operation as specified in above table, Bandwidth = 125 KHz, Spreading Factor =8, Packet length = 40 Bytes, Modulation = LoRa

4. Electrical Specifications

Sl. No	Parameter	Min	Max
1	Voltage on any pin with respect to VSS(V)	3.0	3.6
2	Voltage on VDD with respect to VSS(V)	3.0	3.6
3	Voltage on RESET with respect to VSS(V)	3.0	3.6
4	GPIO sink/source current each (mA)	-	±8
5	Total GPIO sink/source current (mA)		80
6	RAM Data Retention Voltage (in Sleep mode or Reset state)(V)	2	
7	VDD Start Voltage to ensure internal Power-on Reset signal(V)	2.2	-
8	Brown-out Reset Voltage(V)	2	2.2
9	Logic Input Low Voltage(V)	-	0.8
10	Logic Input High Voltage	2.7	-

5. LoRaWAN™ Power Spectrum



6. Input Voltage vs. Transmit Current with Max Power Level

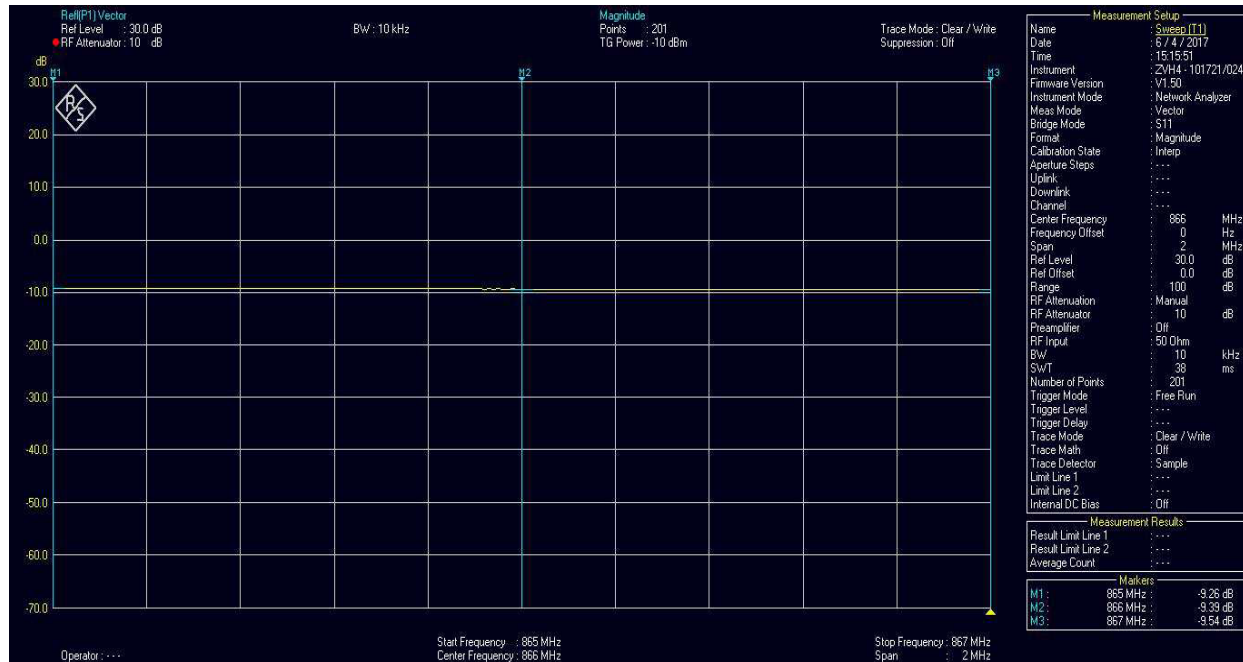
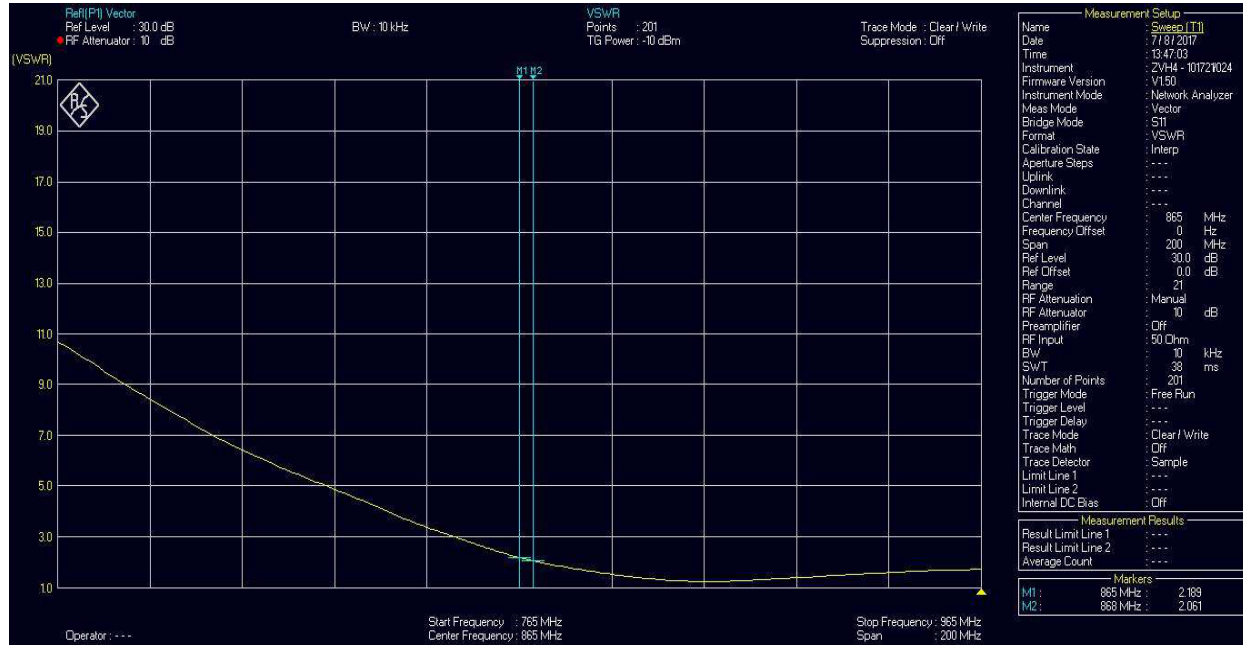
Typical Module Voltage Levels (V) with MAX output power level	* Typical Module Power Levels (dBm) (Conducted Mode) +/- 0.5 dB tol.	Typical Module Transmit Currents (mA) (Conducted Mode) +/- 5 mA tol.	** Typical Module Transmit Currents (mA) (Radiated Mode) +/- 5 mA tol.
3	18	122	123.5
3.3	18.2	123.5	126
3.6	18.5	124	128

* +/-0.5 dB due to the output power variations from the base transceiver.

** Current measurement results with on-board antenna are concluded based on the tests conducted on 5 modules. Tested modules are used latest LoRaWAN™ firmware with MAX power and different input voltage levels. The Helical Antenna is mounted in its standard configuration (vertically on the module). Standard TarangMini™ interface card is used for the measurements.

7. Helical Antenna

TarangMini™ SM20LR03 on-board antenna is Omni directional antenna with 0dBi gain. The VSWR and Return loss plots of the antenna are given below.

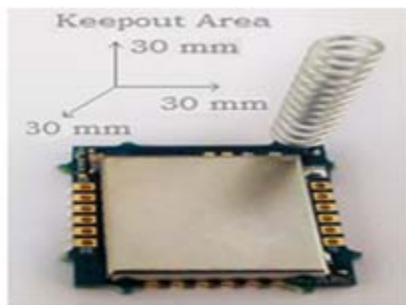


8. Helical Antenna Placement & Orientations

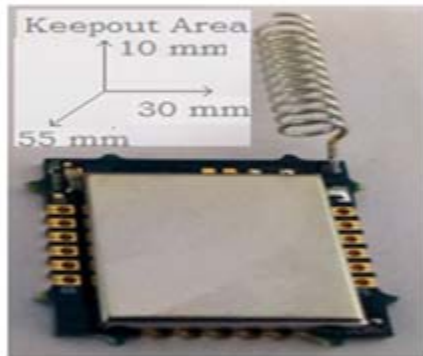
The following pictures illustrate different antenna orientations and recommended keep-out area for the host PCB and enclosures.

Note: Antenna radiation pattern may get affected by obstructions (especially metallic) present in the RF path, variation is depended on the size and position of the obstruction.

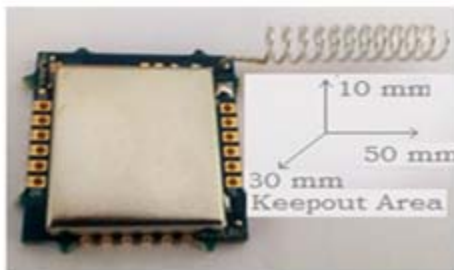
Below placement guideline does not guarantee 18.5 dBm EIRP and same radiation pattern in all the direction when the module is placed in an enclosure/PCB with materials that obstruct the RF path (even if the obstruction is farther than the recommended keep-out area). It also has dependency on the receiver antenna polarization



**Vertically
mounted helical antenna**

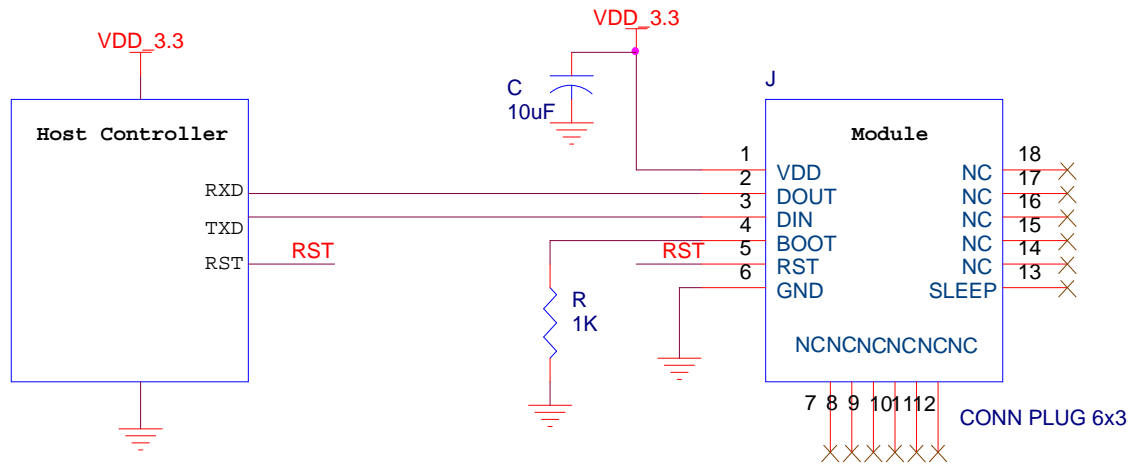


**Horizontally
mounted helical antenna**

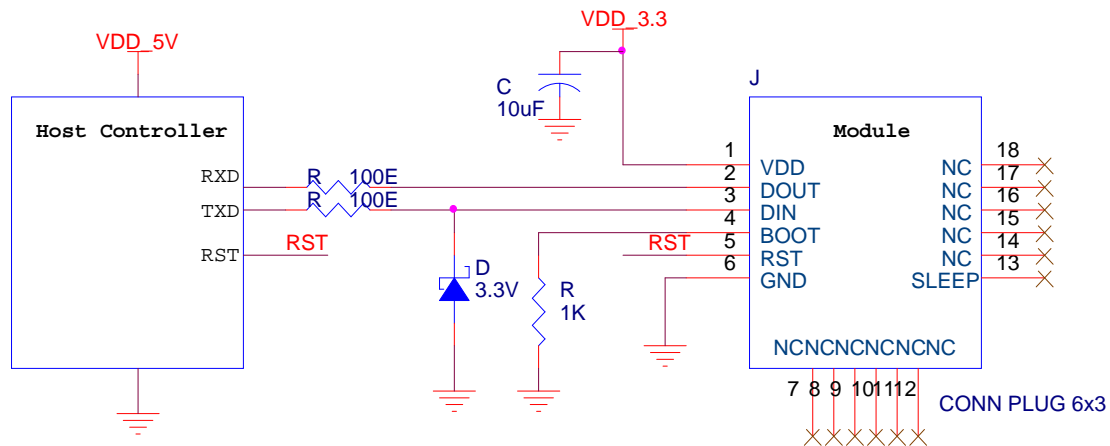


**Horizontally
mounted helical antenna**

9. TarangMini™ SM20LR03 interface with a Microcontroller

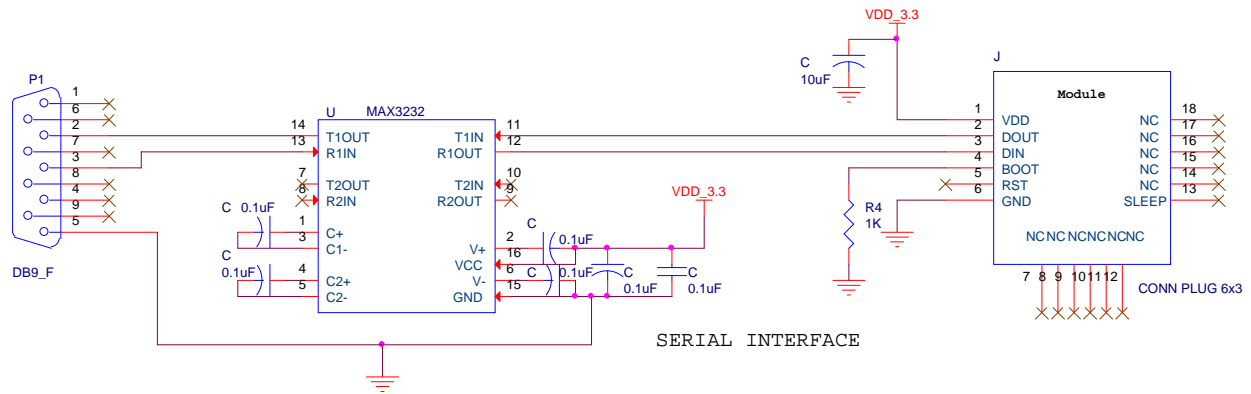


Microcontroller with 3.3V UART



Microcontroller with 5V UART

10. TarangMini™ SM20LR03 interface with a PC



11. Module Pin Configuration

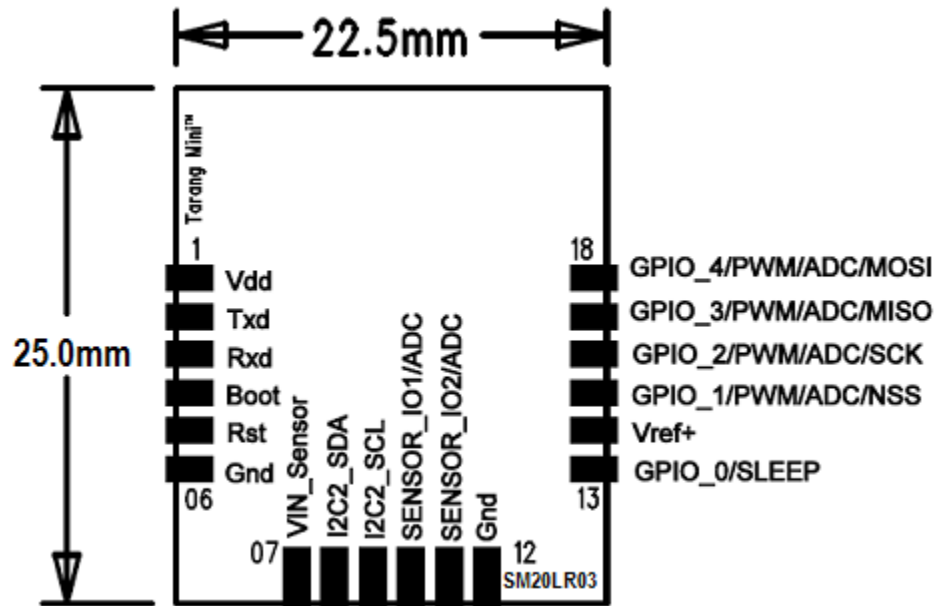


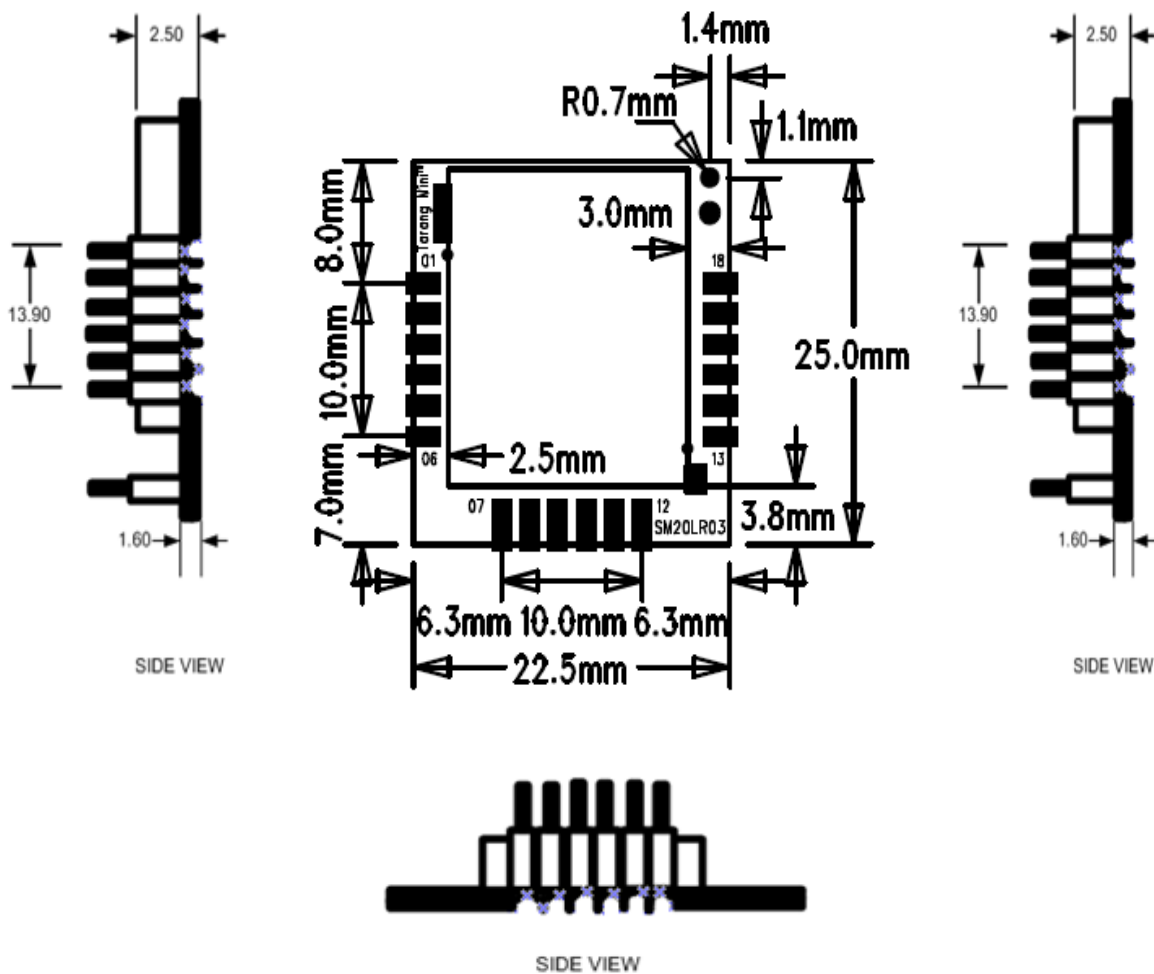
Figure-1

Note: Above pin configuration illustrates the module pin-out and capabilities. All other pin functions except UART and Sleep are not supported in the standard module firmware. Please contact Melange Systems for customized firmware requirements

12. Mechanical Dimensions and Footprint

Module PCB is 1.6mm thick with castellated mounting pads on the edge along with through hole provision. Figure 3(a & b) is the recommended host PCB Footprint.

a. TarangMini™ SM20LR03 - Module Dimensions

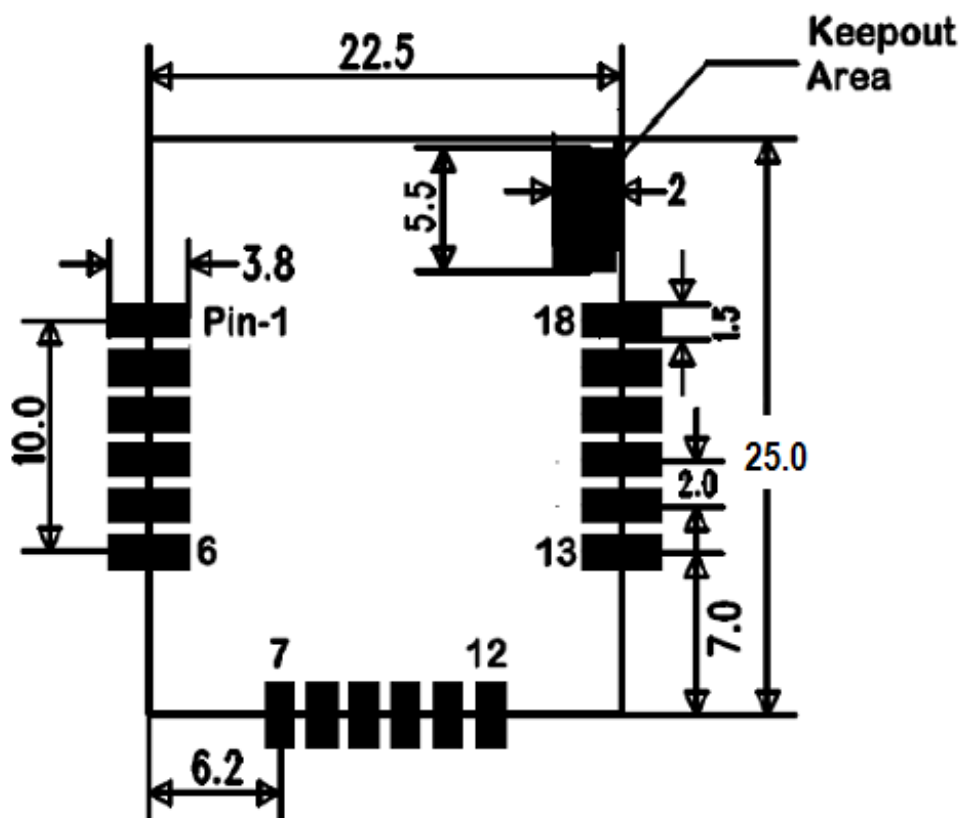


ALL DIMENSIONS ARE IN MM

DO NOT SCALE

Figure-2

b. Recommended PCB Footprint – SMD Mounting

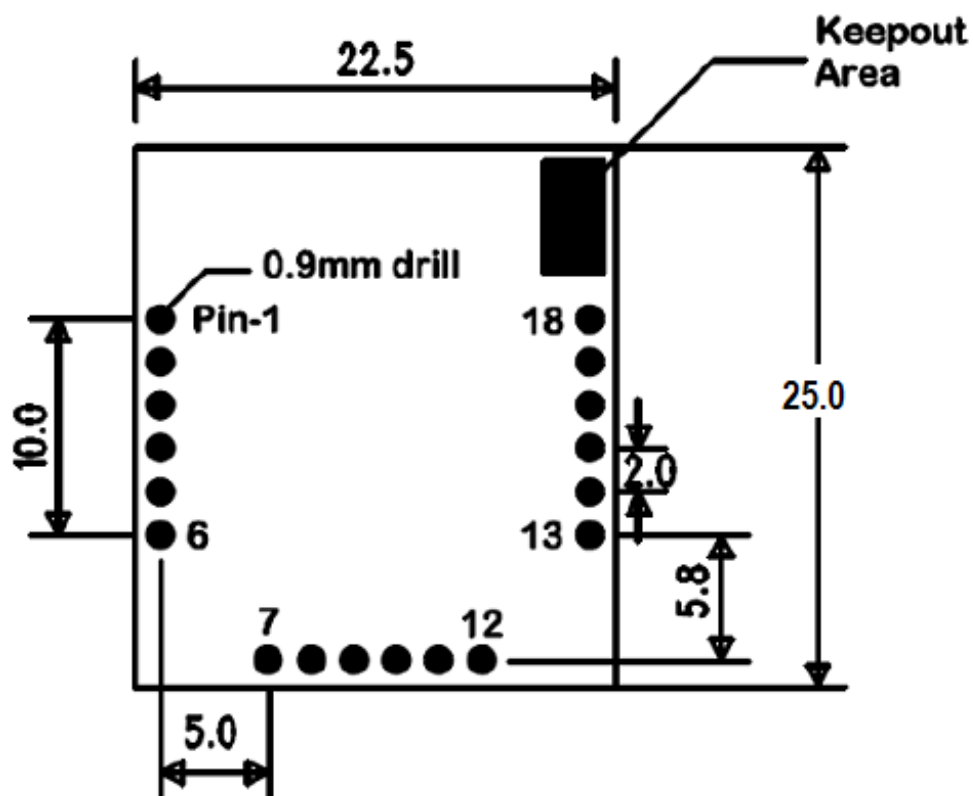


All dimensions are in Units MM

Figure-3a

Note: Do not extend the host PCB top copper ground plane under the module for best RF performance.

c. Recommended PCB Footprint - Through-Hole Mounting



All dimensions are in Units MM

Figure - 3b

Note: Do not extend the host PCB top copper ground plane below the module keep out area for best RF Performance.

13. Module Firmware and Code loading

a. Pre-requisites

- Download the TMFT software for Windows: Available from <http://melangesystems.com/tmft/tmft.rar>
- Firmware upgrading tool: Write a request mail to Melange Systems (info@melangesystems.com)
- Binary Files: Write a request mail to Melange Systems (info@melangesystems.com)

b. Code Loading Process

On TarangMini Demo board,

- Insert the module
- Select the Boot pin high [Slide Switch]
- Apply reset on the board

On Code Loader Tool,

- Install the Tool
- Select Port Settings
- Select Comm. Port: desired com port
- Set Baud Rate to 115200
- Click Next Button
- Click Next Button
- Click Select the target_..... (target auto detected)
- Click Next Button
- Select Download to device option
- Browse the firmware_.bin file [ex: MSPL_LoRaWAN_xxxxxxxxxxxxxxxxx.bin]
- Click Next Button
- Download Successful (Any interruptions during the process, please mail the details to info@melangesystems.com)