Datasheet

TS MINI 250

Version 1.2

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Revision History

Revision	Date	Change Description
1.0	Jun-2025	Preliminary version
1.2	Jul-2025	Updated the external Radar antenna option

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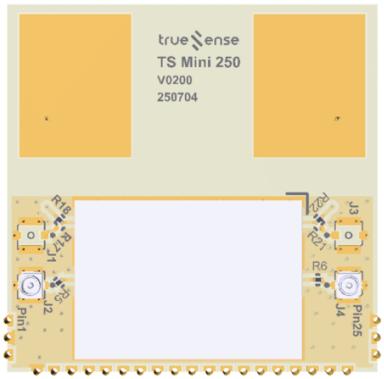
1. Introduction

TS MINI 250 is based on NXP Trimension™ SR250, with 2 embedded PCB Antennas, power management, clock control, BPF filter and peripheral components.
TS MINI 250 is pin to pin compatible with the DCU 150 module.

TS MINI 250 module is a 2D AoA solution without extra-antenna overhead, no phase/amplitude skew, no SPST insertion loss and low-cost design.

TS MINI 250 supports Radar processing algorithm enabling Presence Detection & 2D pre- processed CIR streaming allowing advanced ML/AI applications.

1.1. Key Features



Name	TS MINI 250
Antenna Type & Number	Onboard PCB Patch Antenna x2; 2 x I-PEX MHF-4L Receptacle Connector for optional external Ranging/Radar Antenna
Size	27.2mm x27.1mm x 3.3mm
Pin to Pin	with module DCU 150
Communication Interface	SPI
Main Chip	NXP sr250
Channel	UWB Ch 5 & Ch9
Frequency range	6.24GHz~8.24GHz
Supply Voltage	1.71V ~ 1.89V
Max Output Power (EIRP)	14dBm @ CH5 14.5dBm @CH9
Ranging Mode	ToF, 2D AOA, TDOA, RTLS
Radar Mode	OCPD,CIRs & Off CRP

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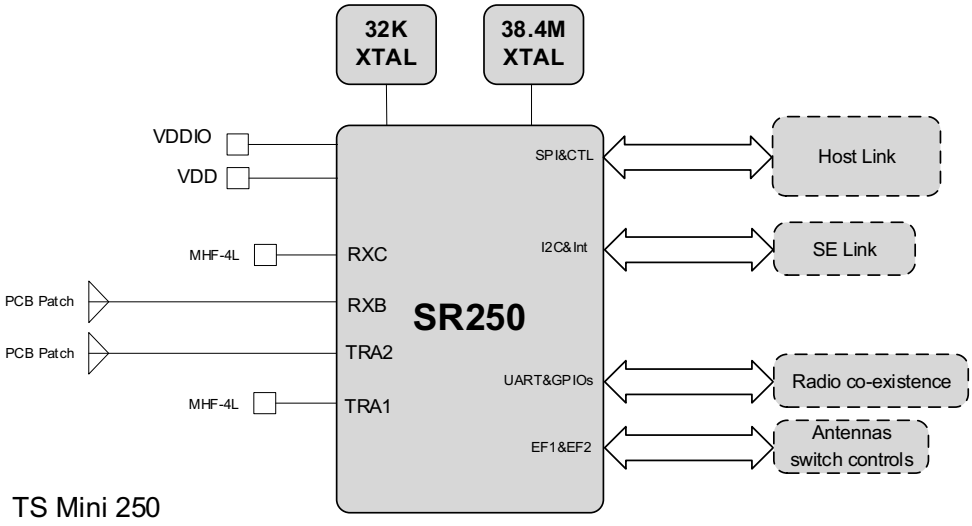
1.2. Applications

The perfect ANCHOR for High Precision RTLS (AoA), Industrial, Smart Home & Consumer applications. Smart Home Devices (Point & Trigger), Access Control (Physical and Logical) and Secure payments.
With the additional 2 Radar Antenna, it is possible to have Advanced Radar sensing with ML/AI applications such as: Breathing & Apnea Monitoring, Fall Detection, Behavior Analysis;

1.3. Block Diagram



TS Mini 250

2. Electrical characteristics

2.1. Recommended operating conditions

When the input voltage of the module is lower than the rated operating voltage, the operation will be unstable. Input voltage higher than the maximum rating will cause permanent damage to the module. At the same time, working under the maximum rating for a long time also affects the stability of the module.

Parameter	Min	Type	Max	Unit	Conditions/Notes
Operating Temperature	-30		+85	˚C	
Supply Voltage	1.71	1.8	1.89	V	
HIGH level input voltage (V_{IH})	1.26	1.8	2.3	V	
LOW level input voltage (V_{IL})	-0.6	-	0.54	V	
HIGH level output voltage (V_{OH})	1.4	-	1.8	V	
LOW level output voltage (V_{OL})	-	-	0.2	V	

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2.2. RF characteristics

Parameter		Min	Type	Max	Unit	Conditions/Notes
Frequency range		6240		8240	MHz	Channel 5 and 9
Channel bandwidth			500		MHz	
Max Power Output TX	Channel 5		14		dBm /500 MHz rms	
	Channel 9		14.5		dBm /500 MHz rms	
Rx Sensitivity (±10ppm carrier Offset)	Channel 5			-96.5	dBm	6.8 Mbit/s data rate, Dual RX, SP0 Frame with 20 byte payload, 1 % PER
	Channel 9			-96.5	dBm	6.8 Mbit/s data rate, Dual RX, SP0 Frame with 20 byte payload, 1 % PER

2.3. PCB patch Antenna Information

Antenna Type	PCB Patch
Antenna Polarization	Linear
Return Loss	>10dB
Peak Gain	1.54dBi min @CH5 2.4dBi min @CH9
Efficiency	50%
Antennas Isolation	>20dB
Frequency range	6.25 ~ 8.25GHz

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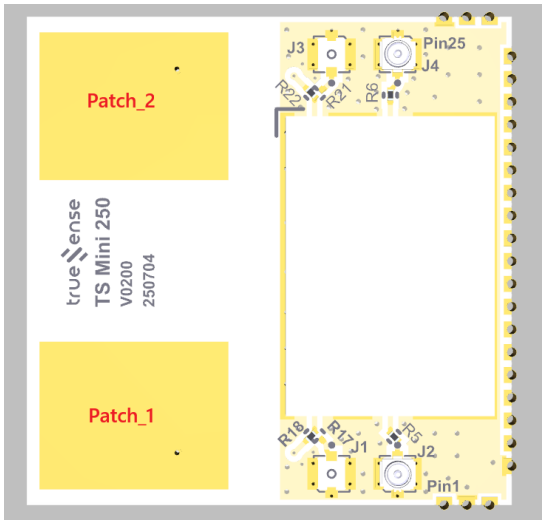

2.3.1 Return Loss



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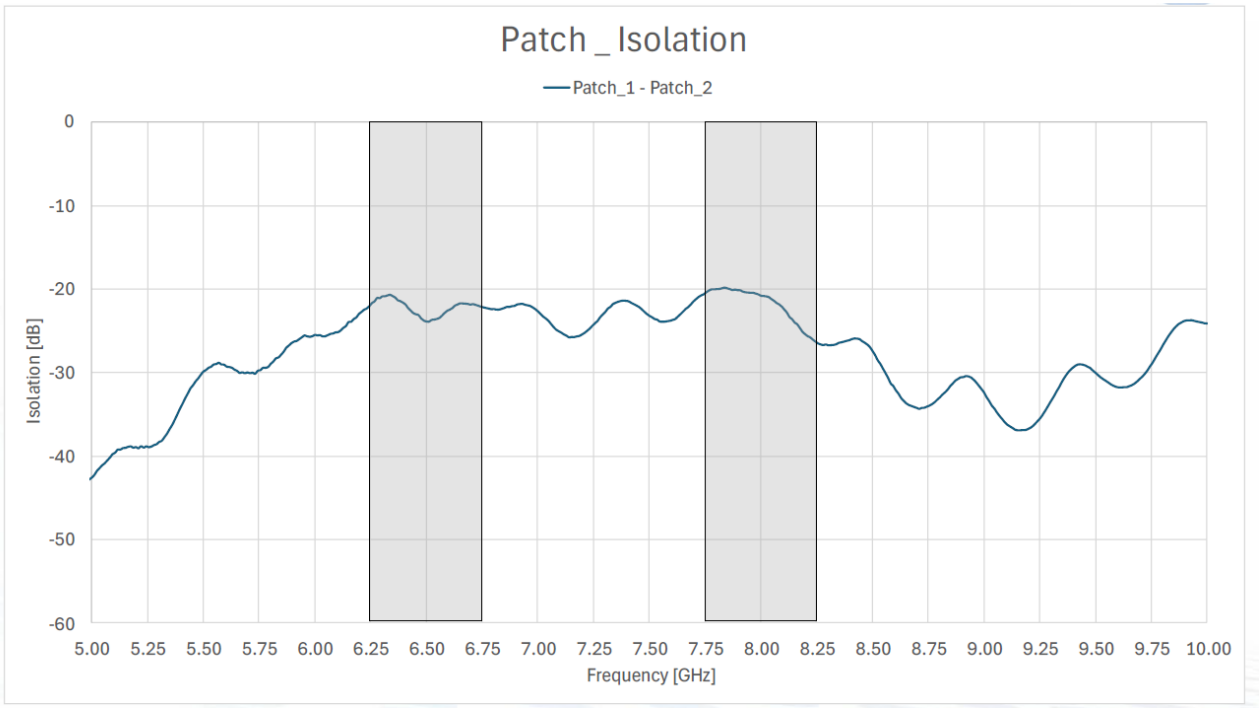
2.3.2 Isolation

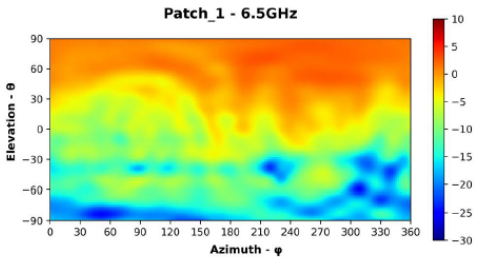


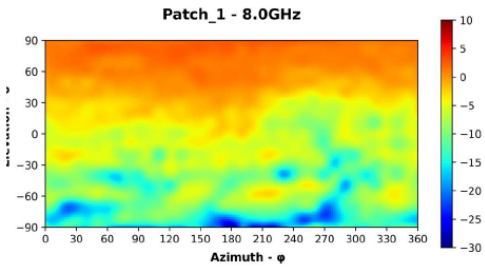
2.3.3 Radiation Pattern

Patch_1

Peak Gain & Efficiency:

		Frequency [GHz]	Peak Gain [dBi]	Tot. Efficiency [%]
Patch_1	CH5	6.25	1.54	50
		6.50	2.83	58
		6.75	2.14	56
	CH9	7.75	2.40	62
		8.00	2.71	62
		8.25	-	-





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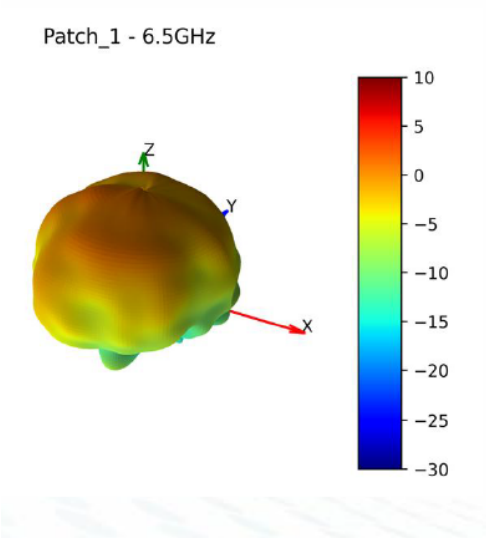
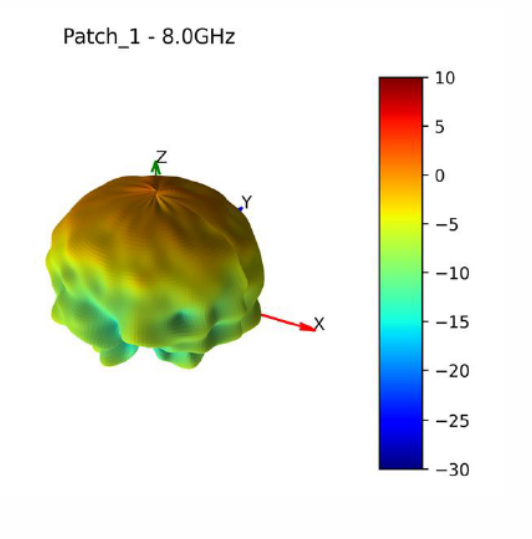
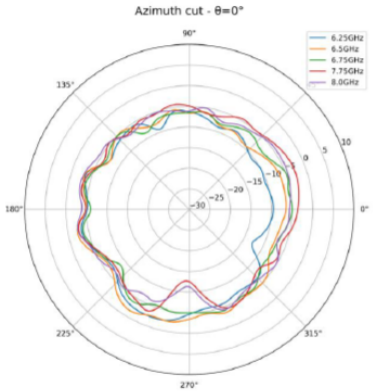
3D Radiation Patterns:



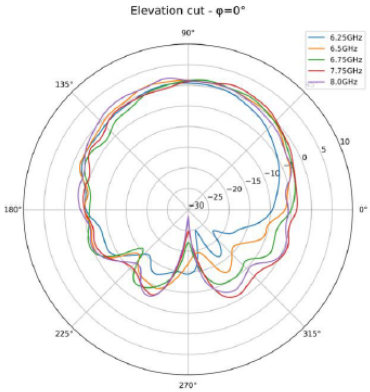


Polar Plots:

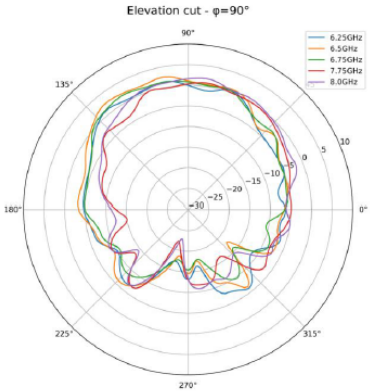
Azimuth θ = 0°



Azimuth φ = 0°



Azimuth φ = 90°



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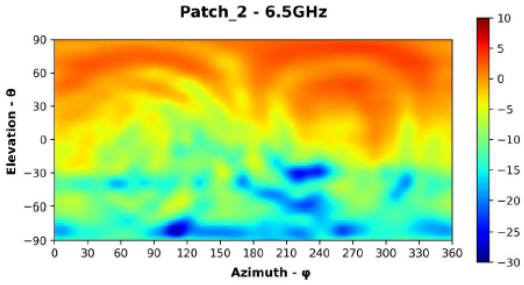
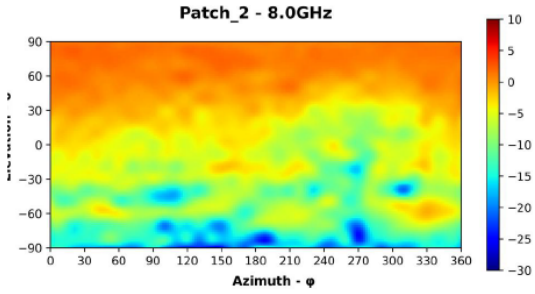
Patch_2

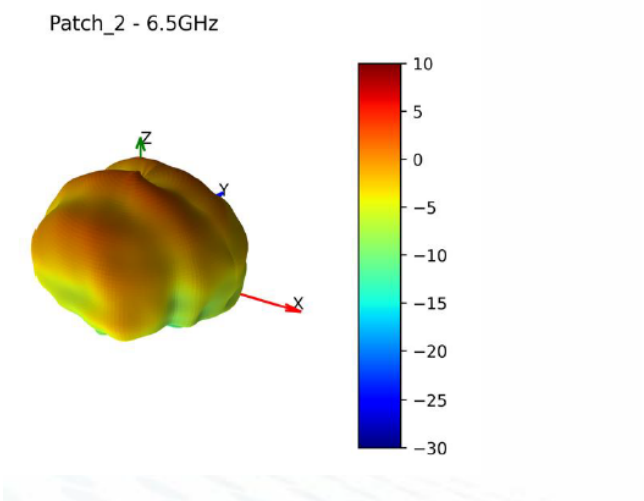
Peak Gain & Efficiency:

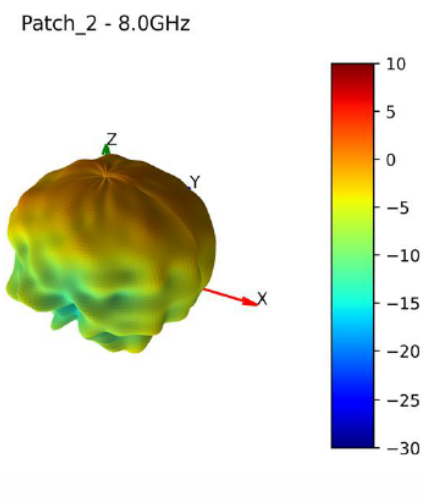
		Frequency [GHz]	Peak Gain [dBi]	Tot. Efficiency [%]
Patch_2	CH5	6.25	2.04	50
		6.50	3.63	61
		6.75	2.74	56
	CH9	7.75	3.00	65
		8.00	2.41	62
		8.25	-	-





3D Radiation Patterns:





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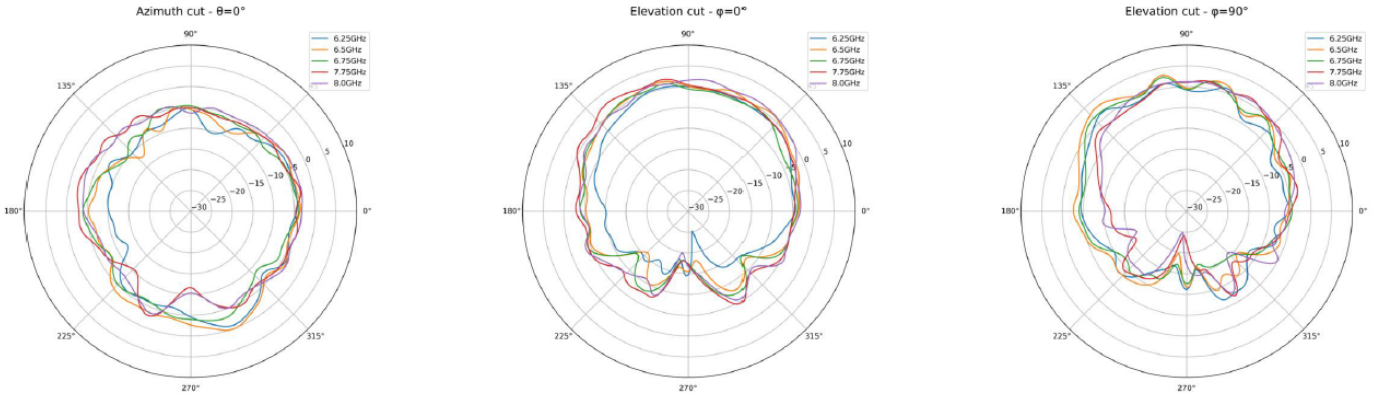
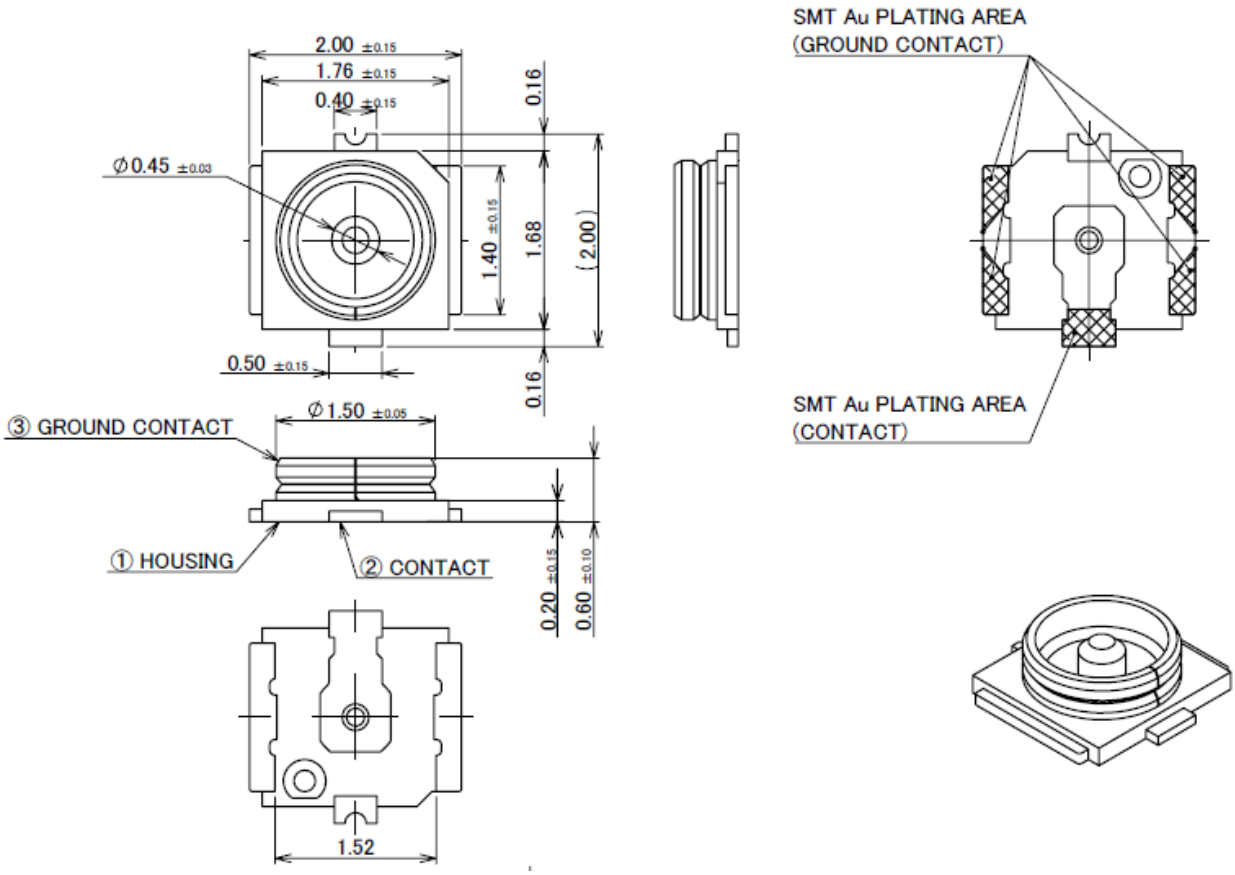
Polar Plots:

Azimuth θ = 0° Azimuth φ = 0° Azimuth φ = 90°



2.4 External Antenna Connector Size information

TS MINI 250 module adopts the fourth-generation external antenna connector shown in below figure, which is compatible with MHF-4 connector of I-PEX.



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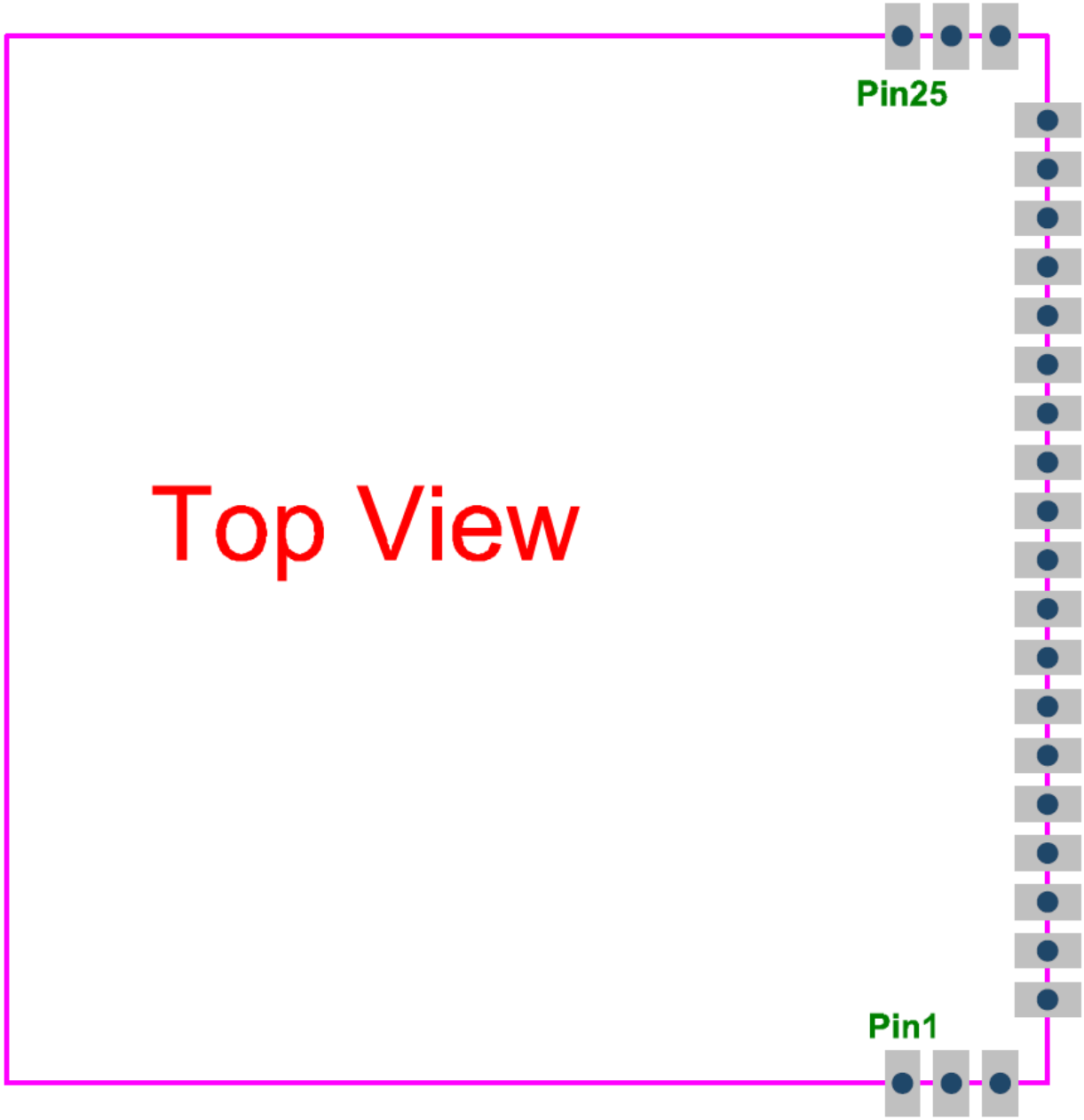
3 Module package

3.3 Pinout Description



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3.4 Pin Description Box

Pin	Pin Name	Pin Type	Description
1	NC		
2	GND	G	Ground
3	VDD_UWB	P	VDD Supply (1.8V, Legacy power supply mode)
4	GND	G	Ground
5	VDD_MCU_UWB	P	VDD Supply (1.8V, Legacy power supply mode)
6	VDDIO_UWB	P	Power Supply input for the Host Interface
7	NC		
8	UWB_RSTN	I	Reset pin
9	UWB_SPI_MISO	I/O	Host interface line 3 as SPI IO0 connection
10	UWB_SPI_SCK	I/O	Host interface line 1 as SPI clock (SCK) line
11	UWB_SPI_MOSI	I/O	Host interface line 4 as SPI IO1 connection
12	UWB_SPI_CS	I/O	Host interface line 2 as SPI Target Select (SS) connection
13	EF1	I/O	High switching speed general purpose I/O used for antenna external switches
14	SE_INT	I	Host Secure Element interrupt (IRQ flag to indicate that data are ready to be shared via I2C)
15	EF2	I/O	High switching speed general purpose I/O used for antenna external switches
16	GPIO00	I/O	General-Purpose I/O
17	GPIO01	I/O	General-Purpose I/O
18	SE_I2C_SDA	I/O	SDA (I2C Data) with 2.2K pull-up to VDDIO
19	SE_I2C_SCL	I/O	SCL (I2C clock) with 2.2K pull-up to VDDIO
20	CX_UART_RX	I	RX connection of the UART for external radio interface
21	UWB_WAKEUP	I	HOST interface wakeup input
22	UWB_HOST_IRQ	O	Host IRQ pin
23	CX_UART_TX	O	TX connection of the UART for external radio interface
24	NC		
25	GND	G	Ground

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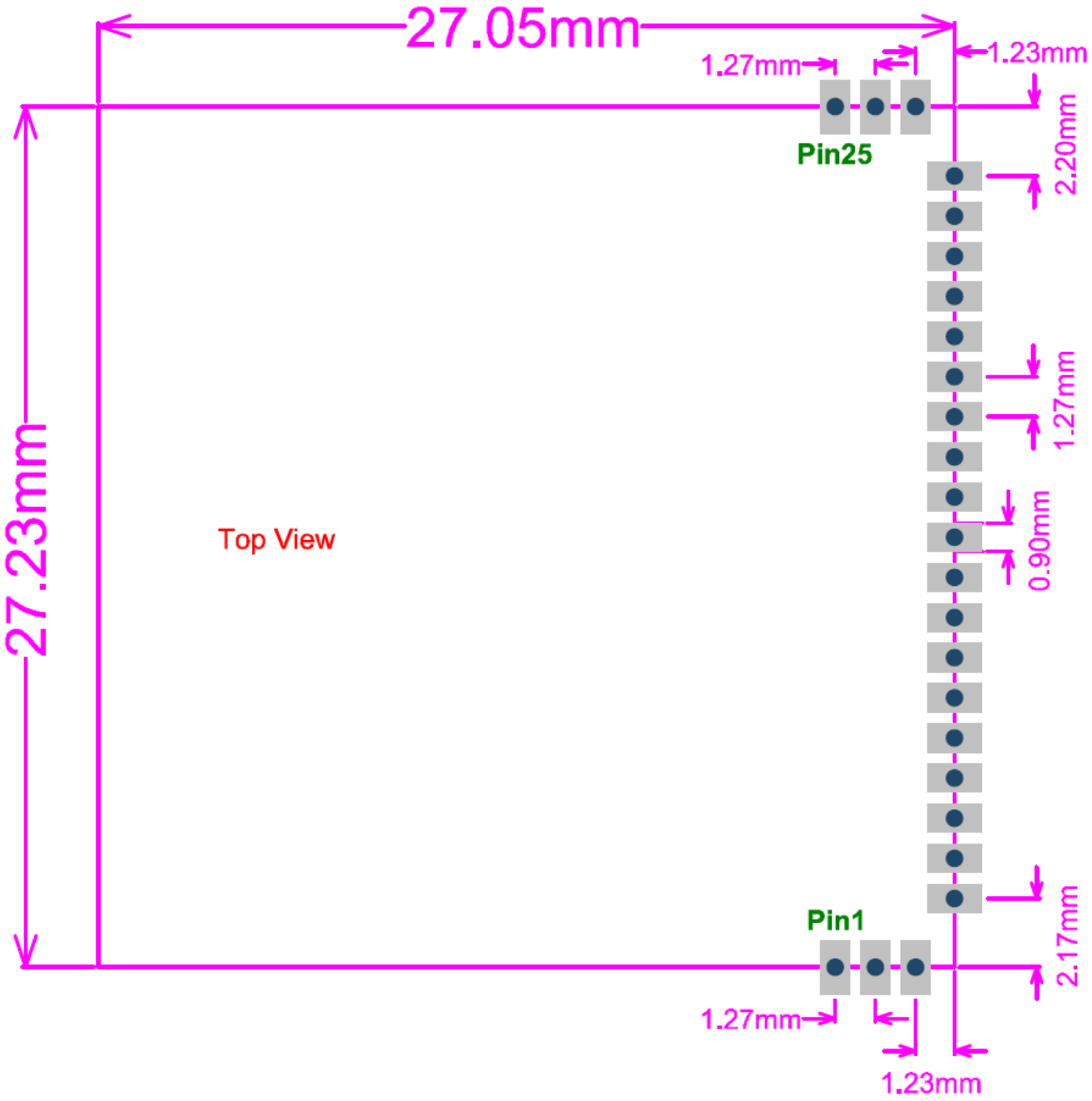
3.5 Package outline



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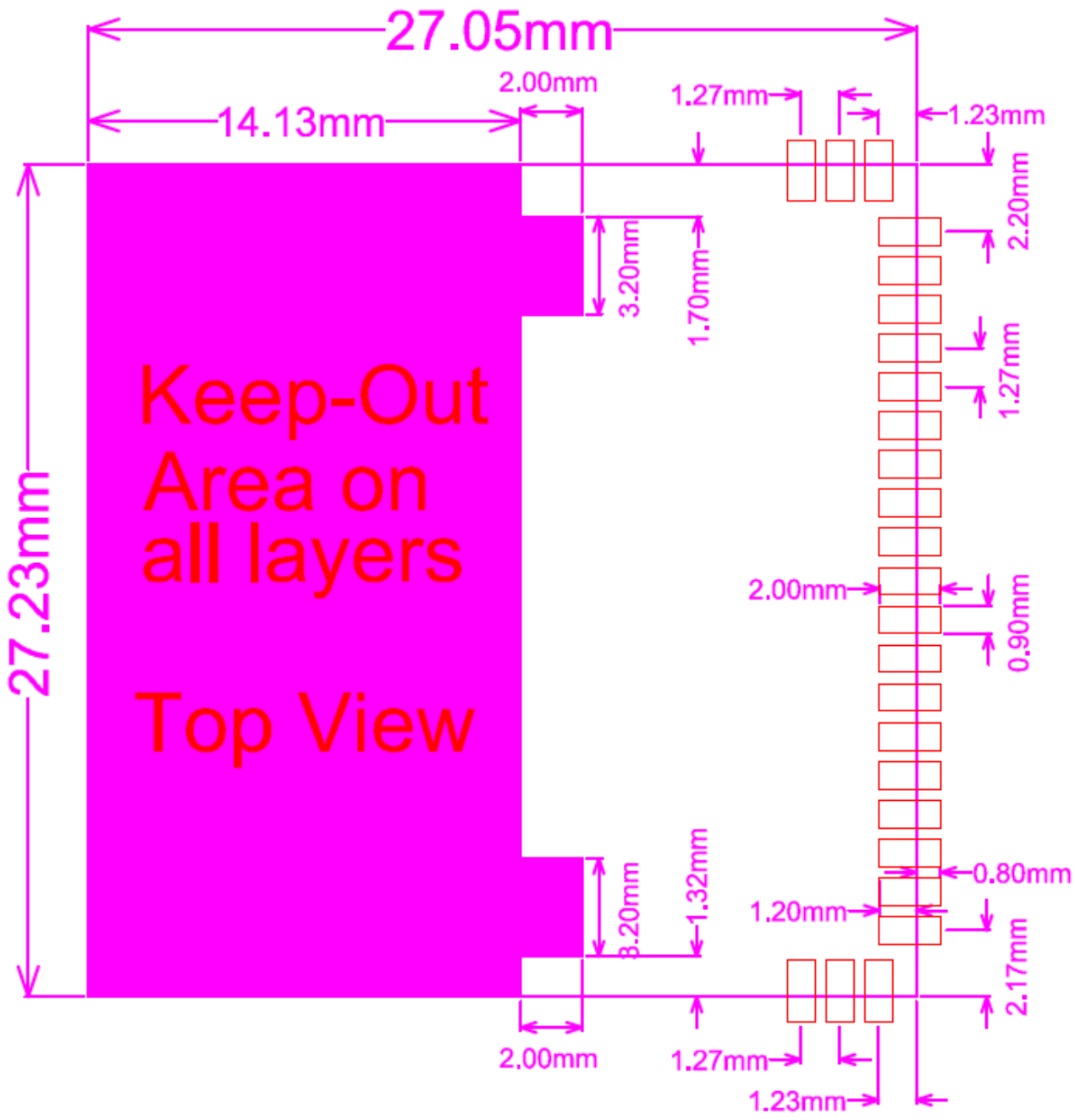
3.6 Recommended PCB Footprint



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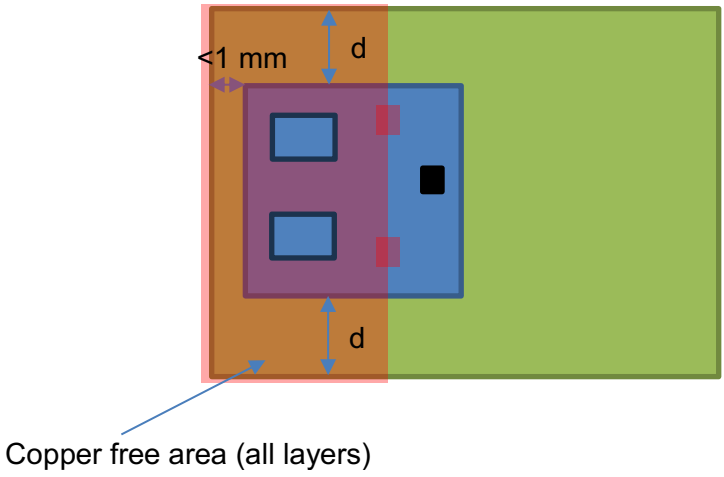
3.7 Host Board mounting

TS MINI 250 is designed to be mounted onto a host board and it is preferably mounted close to the host board edge, as shown next. Maximum distance from top to the edge should be up to 1mm.
It's also recommended to reserve a 10mm(d) spacing without metal(copper on PCB or components) at the left & right side of the module antenna area.

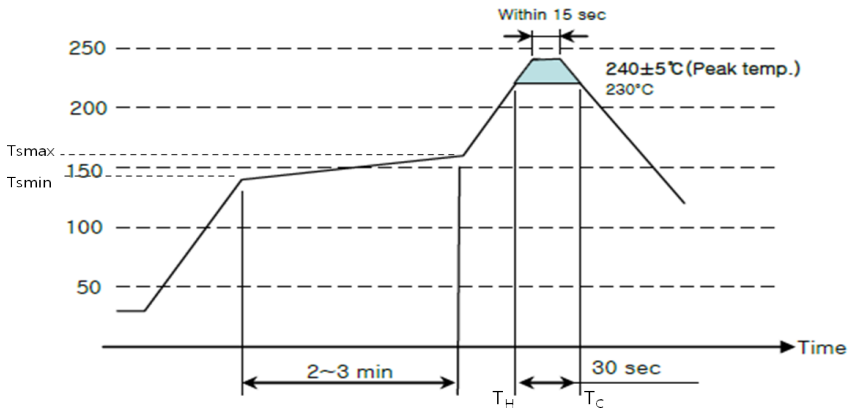


4 Soldering Condition

4.3 Manual Soldering – Pb Free

Soldering Temperature: 360°C ± 5°C, 5sec max.

4.4 Recommended Reflow Condition – Pb Free



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Profile Feature	Pb-Free Assembly
Preheat -Temperature Min (Tsmin) -Temperature Typical (Tstypical) -Temperature Max (Tsmax) -Time Tsmin to Tsmax	 140˚C 150˚C 160˚C 2 ~ 3 min
Peak Temperature	240±5˚C
Time of actual peak temperature	Max. 15 seconds
Heating to Cool -Temperature Heating (TH) -Temperature Cool (TC) -Time TH to TC	 230˚C 230˚C 30 seconds

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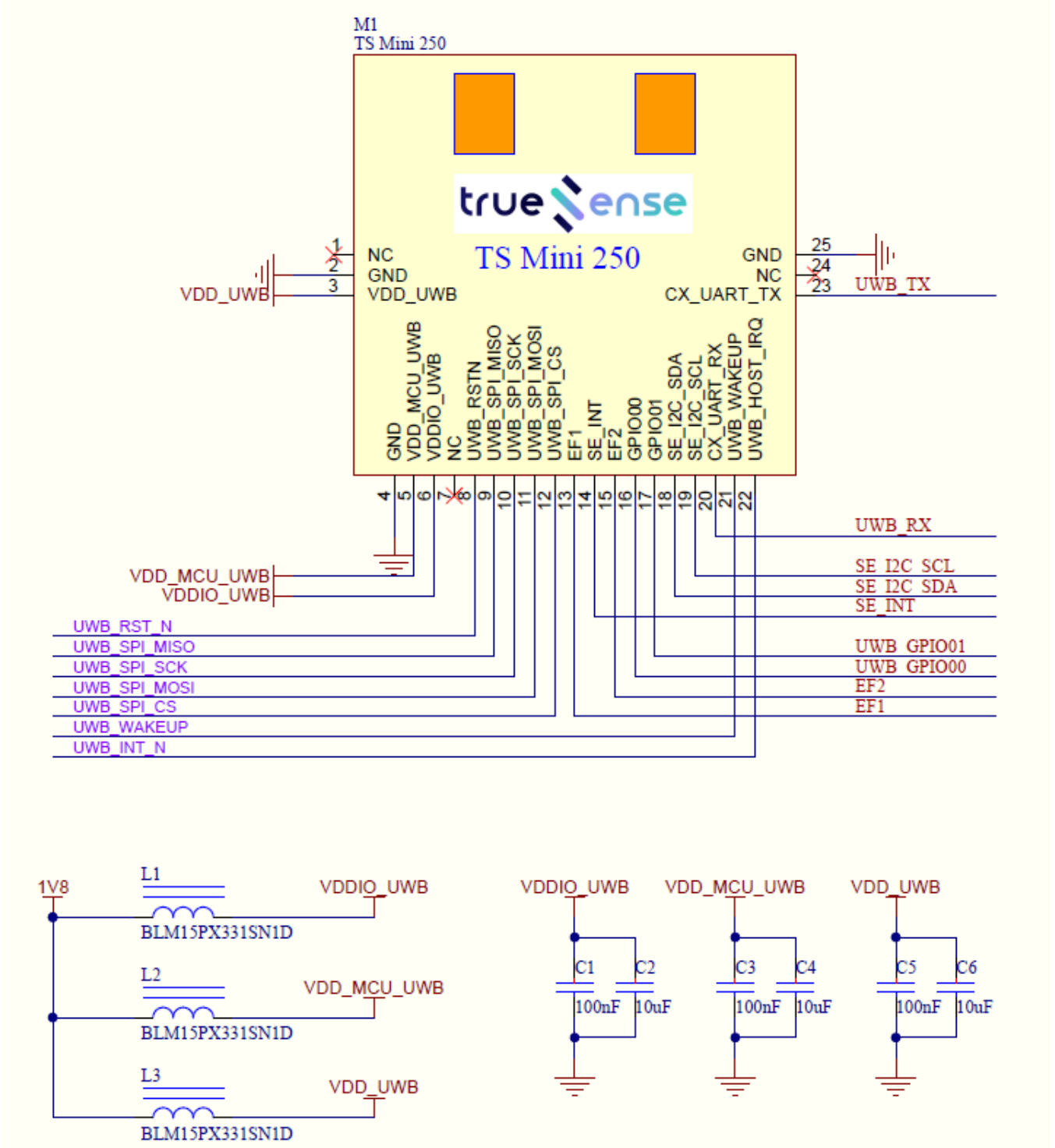
5 Application design-in information

5.3 Reference schematics for TS MINI 250



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6. Regulatory information

Regulatory approvals on going.

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