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Application Note 001

**Ethertronics LoRa Evaluation board, Passive V1.1, using
module ETH-LORA-M-AX-01 and Ethertronics Prestta™
Multi-Band ISM antenna (P/N:1002232)**

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

OVERVIEW

This Application Note provides hardware description for the evaluation of Ethertronics LoRa module on its evaluation board with a passive antenna.

The version of the parts are:

- Evaluation Board: EVB passive antenna, V1.1.
- Module: Lora Module ETH-LORA-M-AX-01, V1.2
- Antenna: Ethertronics Prestta™ Multi-Band ISM antenna (P/N: 1002232).

Instructions to setup the evaluation board are given with the full schematic and BOM.

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

GENERAL DESCRIPTION

The Evaluation Board (EVb) is provided with test-connector to control the Ethertronics Lora module with AT-commands and battery holder (3xAA batteries) for power supply. The EVb can also be powered through the test-connector.

PCB LAYOUT

ETHERTRONICS LORA PASSIVE EVALUATION BOARD (TOP LAYER 1, TOP VIEW)

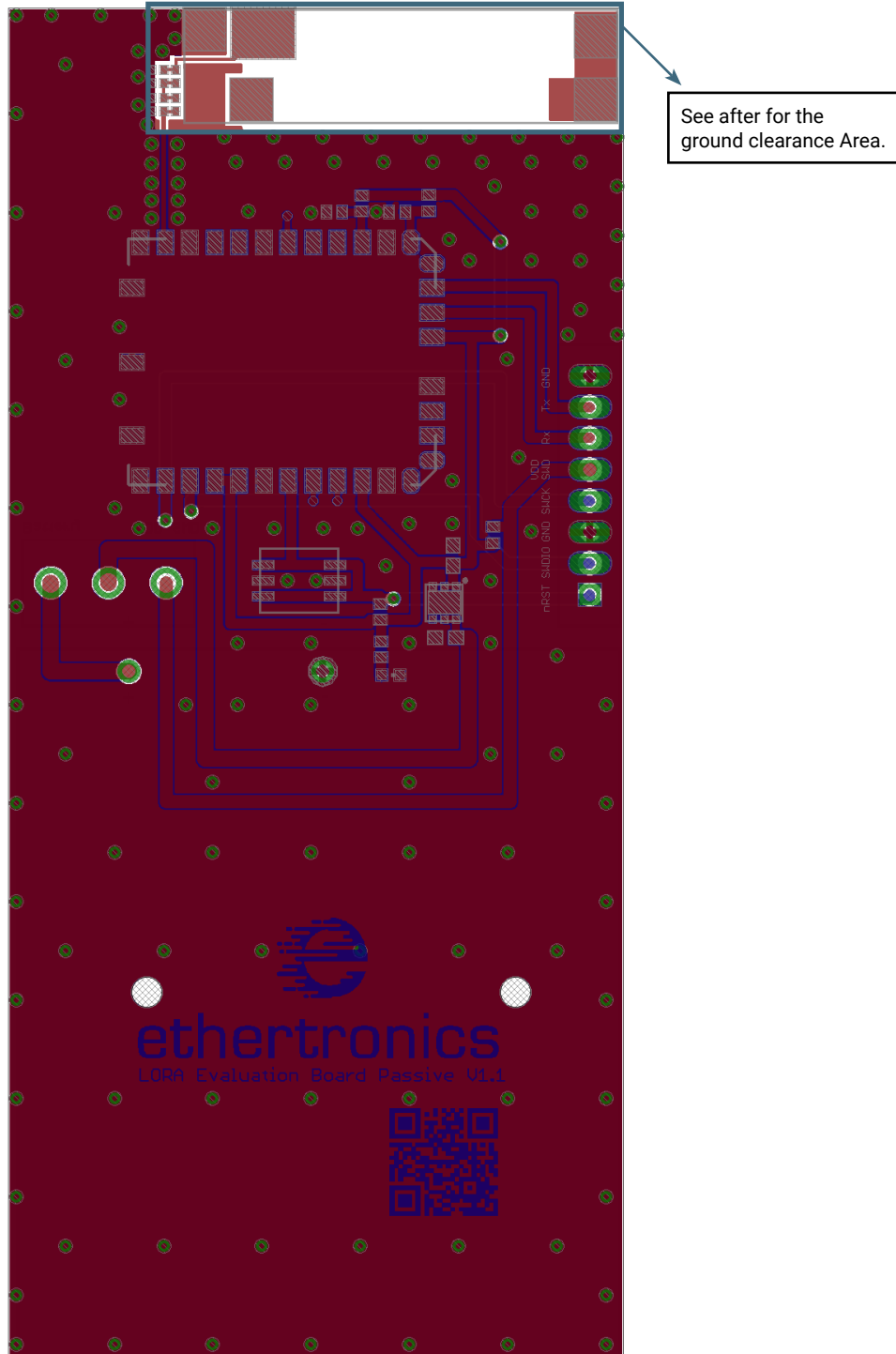


Figure 1

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

PCB LAYOUT

ETHERTRONICS LORA PASSIVE EVALUATION BOARD (BOTTOM LAYER 16, TOP VIEW)

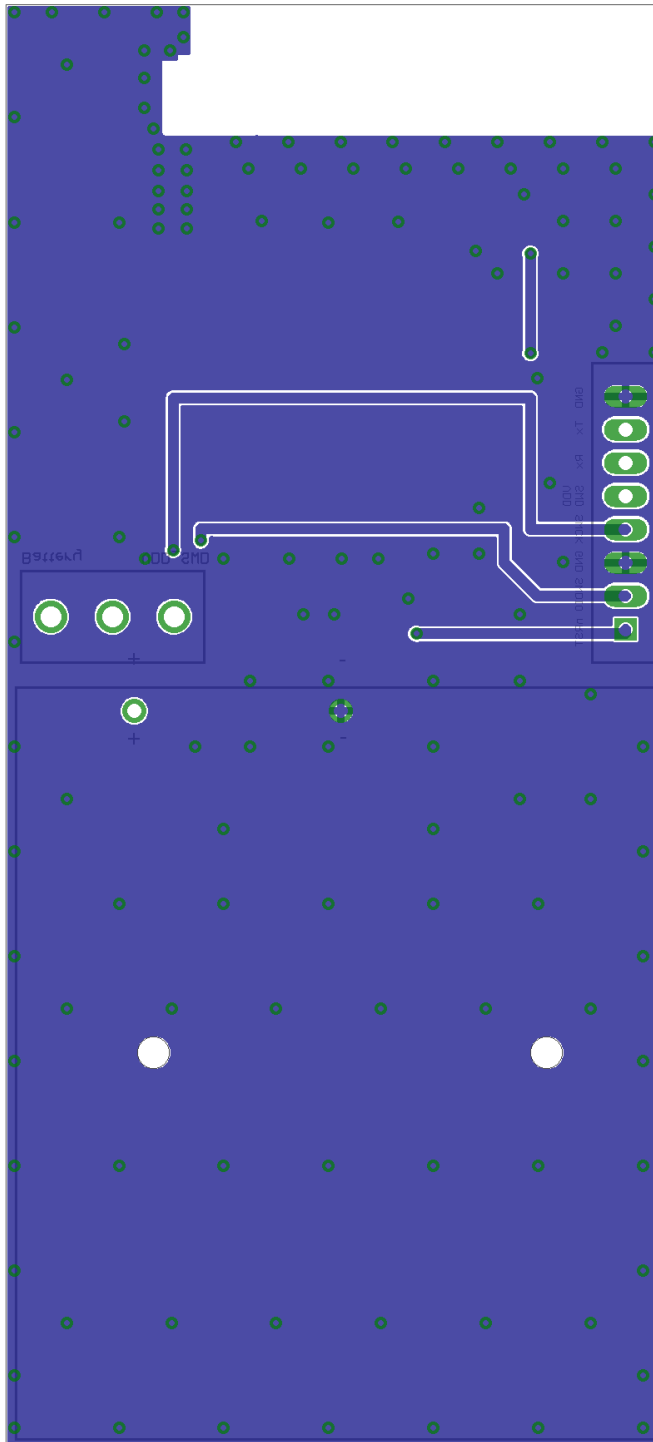


Figure 2

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

PCB LAYOUT

ETHERTRONICS LORA PASSIVE EVALUATION BOARD (LAYER 2, TOP VIEW)

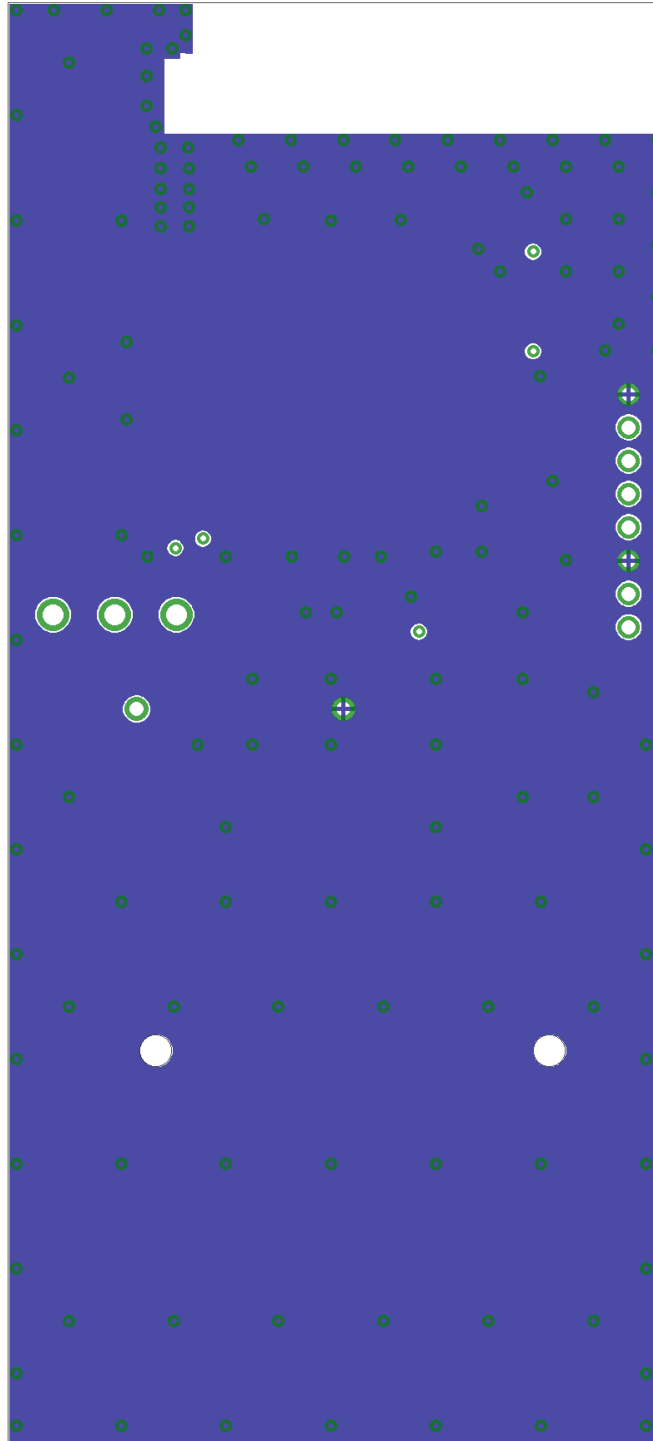


Figure 3

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

PCB LAYOUT

ETHERTRONICS LORA PASSIVE EVALUATION BOARD (LAYER 3, TOP VIEW)

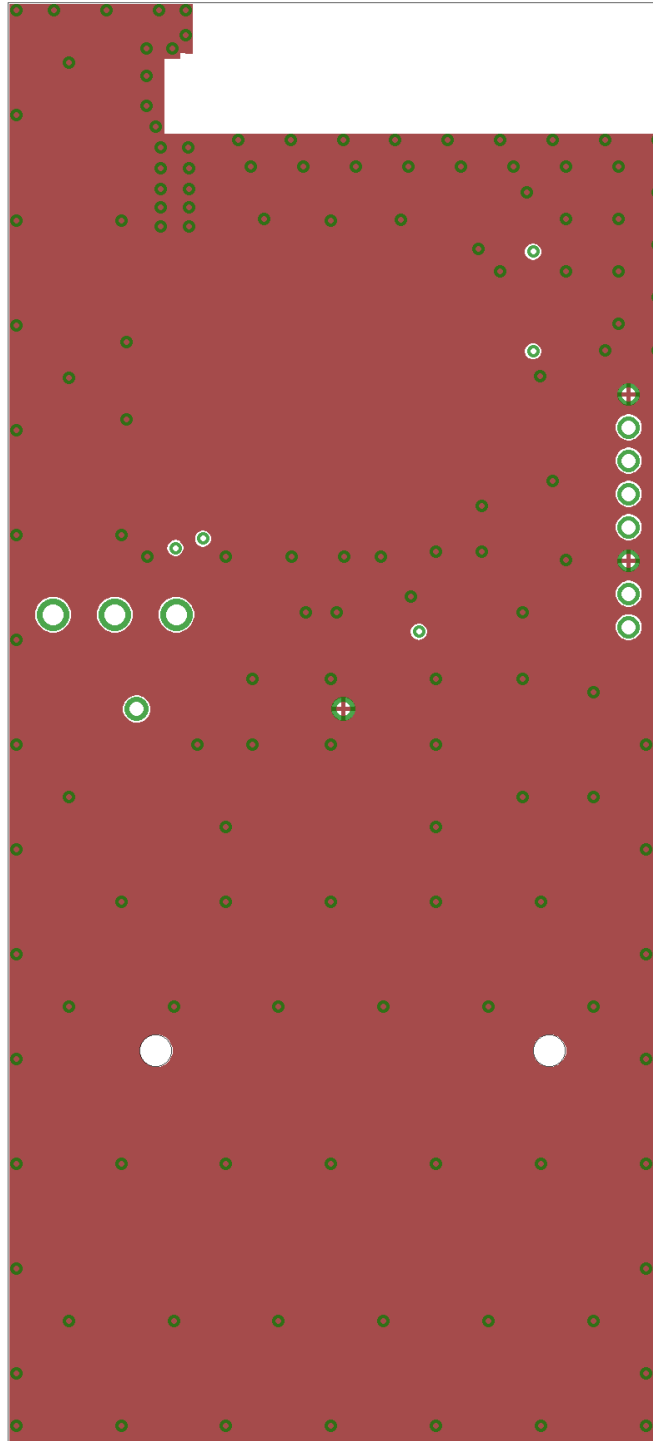


Figure 4

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

ANTENNA GROUND CLEARANCE

PCB GROUND CLEARANCE ON TOP LAYER

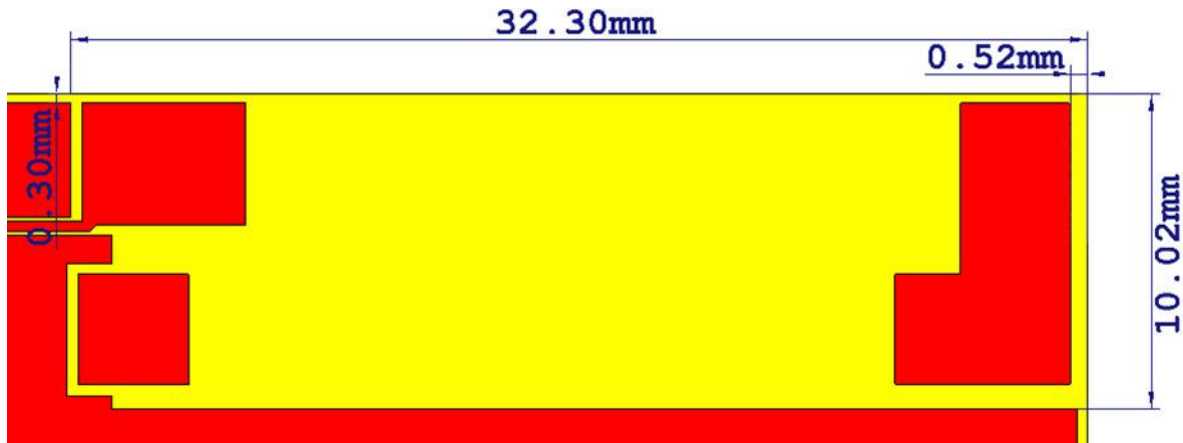


Figure 5

PCB GROUND CLEARANCE ON BOTTOM LAYER



Figure 6

PCB STACK UP AND SIZE

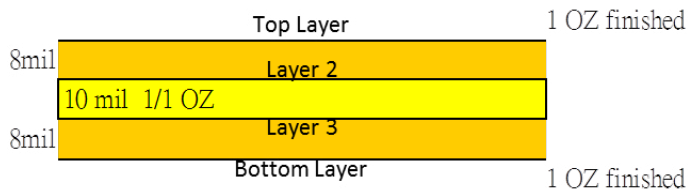


Figure 7: Ethertronics LoRa Passive Evaluation Board PCB Stack Up

The Passive Evaluation Board size is 110x50 mm, 4 layers, 0.8 mm thick FR4 PCB.

- The Layers 2 and 3 are ground layers, no signal lines routed in evaluation board. Do not use these layers for routing under the RF line.
- No routing under antenna pattern.

For detailed antenna pattern dimensions, please contact Ethertronics via our website

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

EVALUATION BOARD SCHEMATIC AND BOM

ETHERTRONICS PASSIVE LORA EVALUATION BOARD SCHEMATIC

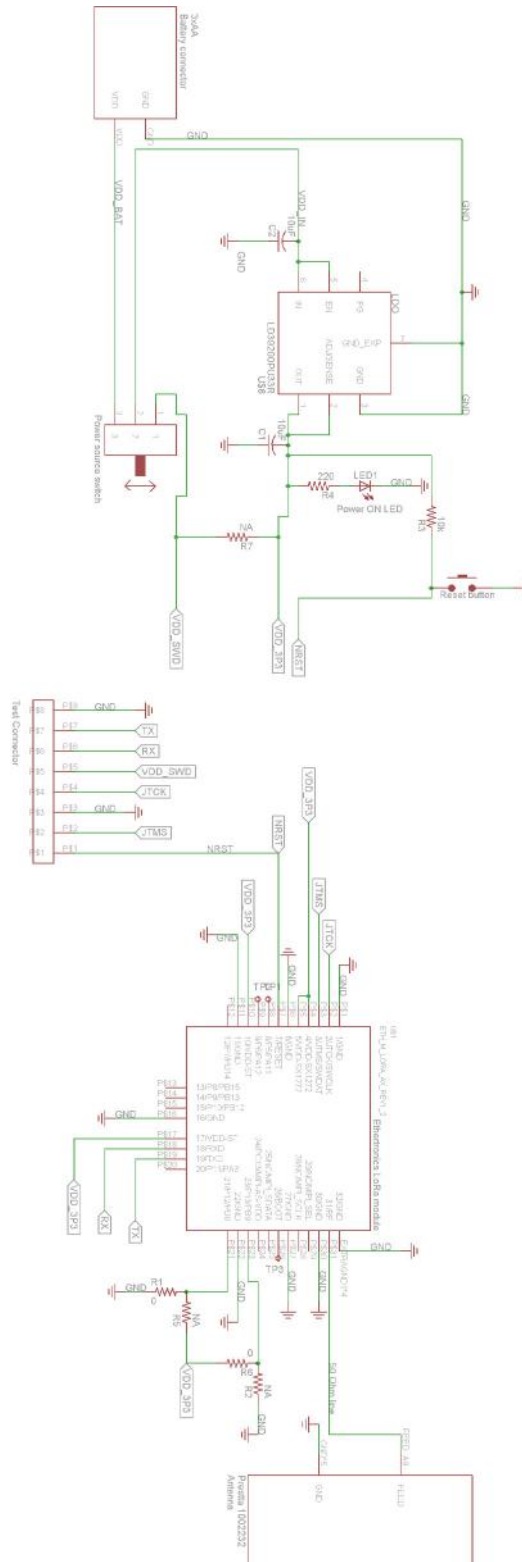


Figure 8

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

EVALUATION BOARD SCHEMATIC AND BOM

DETAILED SCHEMATIC OF LORA MODULE WITH ANTENNA AND TEST CONNECTOR

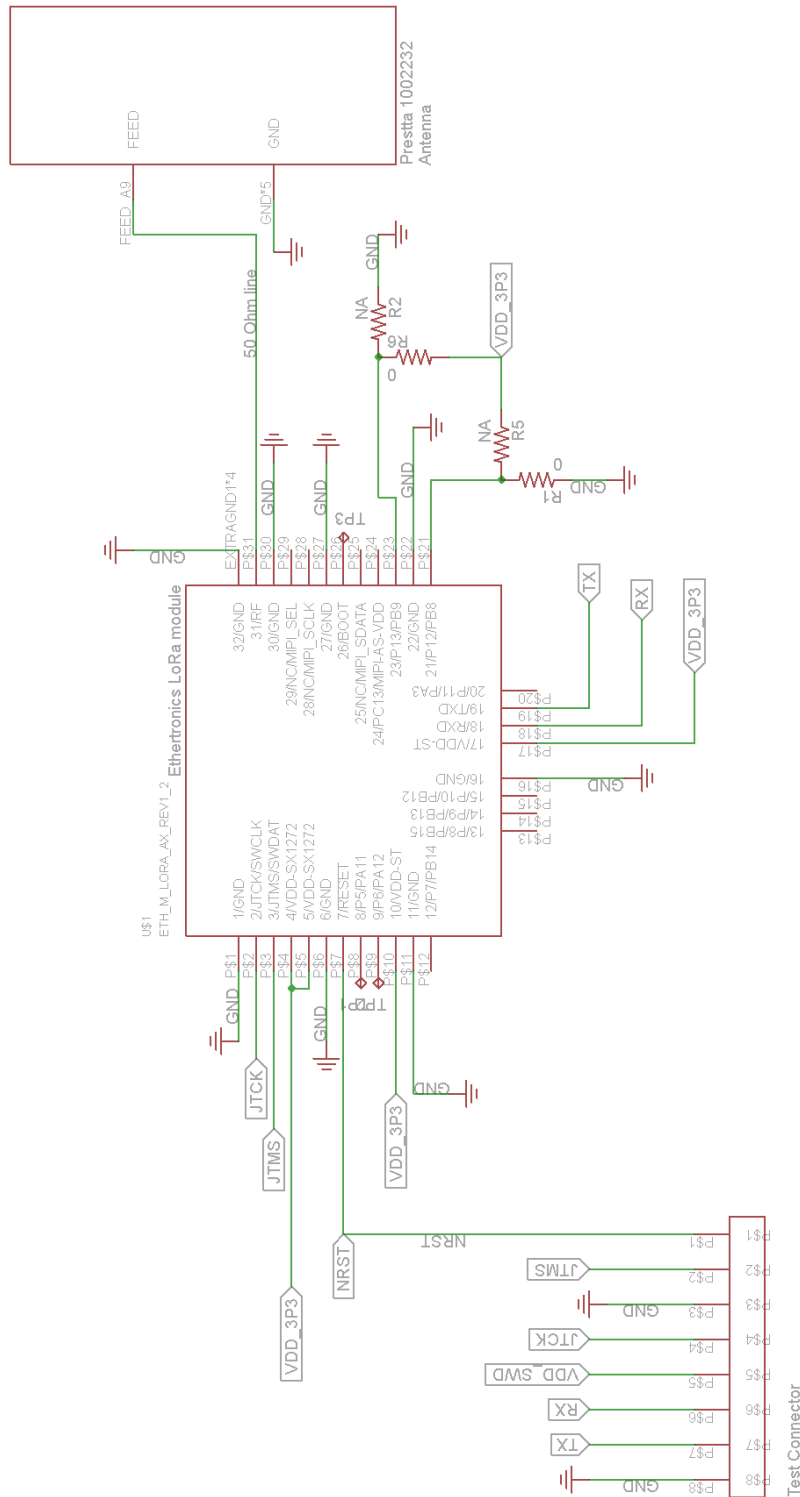


Figure 9

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

EVALUATION BOARD SCHEMATIC AND BOM

DETAILED SCHEMATIC OF POWER OF THE EVALUATION BOARD

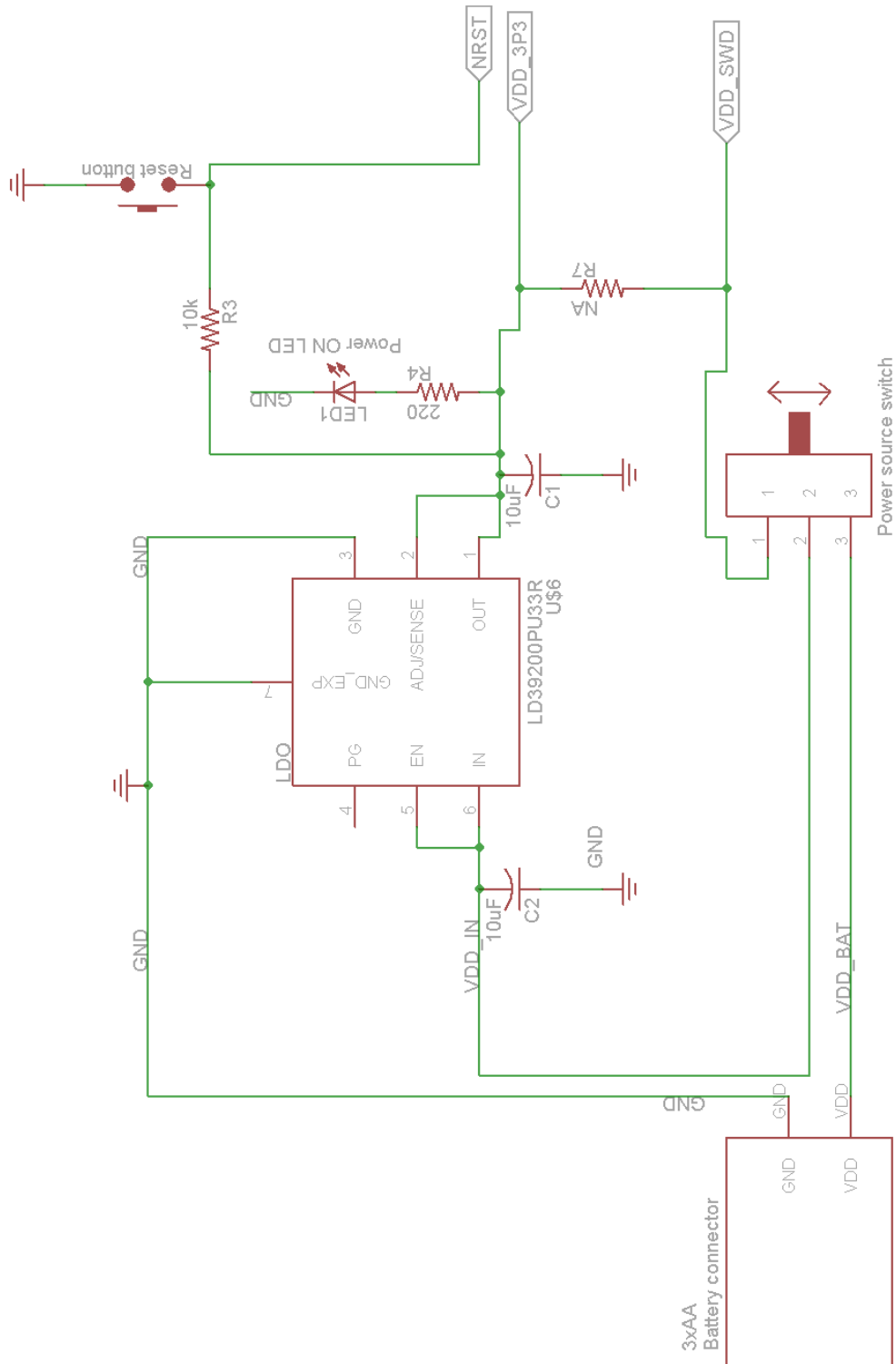


Figure 10

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

BOM OF EVALUATION BOARD

Schematic Name	Manufacturer	Manufacture P/N	Description
C1	Murata	GRM188R6YA106MA73D	Capacitor 10 μ F, 0603 35V
C2	Murata	GRM188R6YA106MA73D	Capacitor 10 μ F, 0603 35V
LED1	Osram	LS Q976-NR-1	LED RED, 0603
R1	Panasonic	ERJ-S020R00X	Resistor 0 Ω , 0402
R2			NA, Not Assembled
R3	Panasonic	ERJ-2RKF1002X	Resistor 10k Ω , 0402
R4	Panasonic	ERJ-2RKF2200X	Resistor 220 Ω , 0402
R5			NA, Not Assembled
R6	Panasonic	ERJ-S020R00X	Resistor 0 Ω , 0402
R7			NA, Not Assembled
U\$1	Ethertronics, Inc.	ETH_M_LORA_AX_REV1_2	Ethertronics LoRa module V1.2
Prestta 1002232	Ethertronics, Inc.	Prestta™ 1002232	Ethertronics Prestta™ 1002232 Antenna
Test connector	Molex LCC	22-28-4080	8 Positions Header, Breakaway Connector 2.54 mm Through Hole
Power source switch	NKK Switches	CS12ANW03	Slide switch SPDT 3A 125V
3xAA Battery connector	Memory protection devices	BC3AAPC	Battery holder for AA-batteries
U\$6	ST Microelectronics	LD39200PU33R	LDO 2A, DFN6 3x3mm
Reset button	RAFI	1.14002.1010000	Push Switch SPST-NO 0.1A 35V
S1 (antenna matching circuit)	Murata	GJM1555C1H2R0WB01D	Capacitor 2 pF, 0402 50V
P2 (antenna matching circuit)	Murata	GJM1555C1HR50WB01D	Capacitor 0.5 pF, 0402 50V
S2 (antenna matching circuit)	Murata	LQW15AN5N1B00	Inductor 5.1 nH, 0402

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Ethertronics LoRa Evaluation board, Passive V1.1, using module ETH-LORA-M-AX-01 (V1.2) and Ethertronics Prestta™ Multi-Band ISM antenna (P/N:1002232)

COMPONENT LOCATION ON EVALUATION PCB

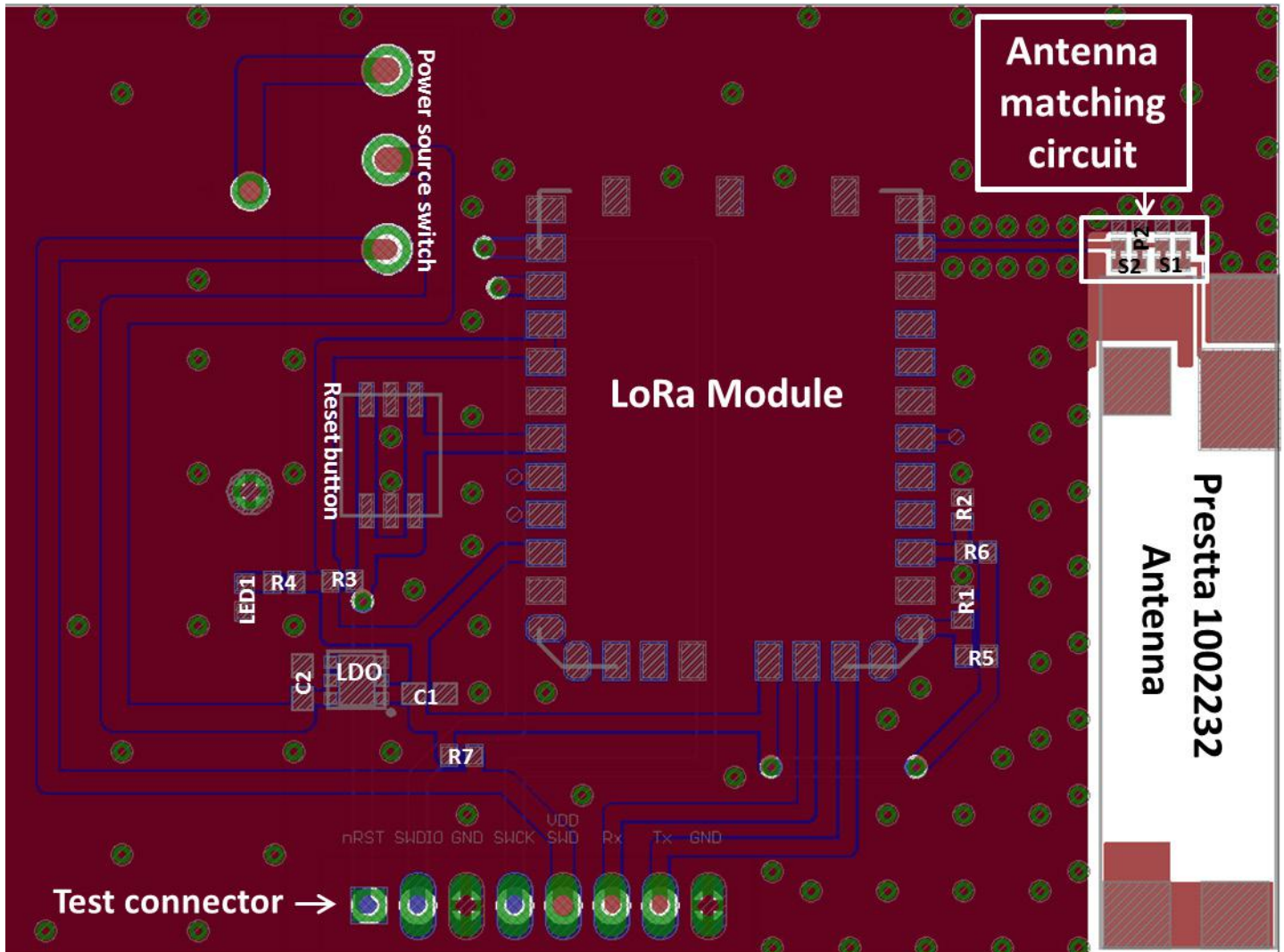


Figure 11

The Battery holder, Power source switch, and Test connector are on the backside of the PCB.

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POWER SUPPLY

POWER BY BATTERY

The Passive LoRa Evaluation Board is provided with a battery holder for 3 AA-batteries. When powering the evaluation board with the batteries, the power selection switch is slide to position “Battery” and the evaluation board is powered through the Low Drop Out (LDO) regulator. The LDO is protecting the LoRa module from over voltage. The LDO has an output of 3.3V

POWER BY TEST CONNECTOR

When powering through test connector, it is possible to route the power through the LDO or to bypass the LDO.

THROUGH LDO

The safest way to power the evaluation board by the test connector is through the LDO. To power up through LDO the power selection switch is slide to position “VDD_SW”. The LDO will drop the input voltage by 0.3 V when providing 2 A. A minimum power of 3.6 V is therefore recommended before the LDO

STRAIGHT FROM THE TEST CONNECTOR

The evaluation board can be powered up also straight from the test connector without the protection of the LDO. To power up the board, slide the power selection switch to position “Battery” and solder a 0 Ω resistor to the R7 pads. Be careful not to exceed 3.6 V on VDD_SW pin. Exceeding this voltage may damage the LoRa module permanently.

ANTENNA

The Passive Evaluation Board is provided with Ethertronics, Inc. Prestta™ 1002232 Multi-Band ISMs antenna which covers all the ISM frequencies (868/915/2400 MHz). In the below charts the antenna typical performance and dimensions are specified with the matching circuit topology and component values. The antenna impedance (return loss) on evaluation board is optimized for the Ethertronics impedance matching chipset on the Ethertronics LoRa module.

ANTENNA RETURN LOSS AND TOTAL EFFICIENCY

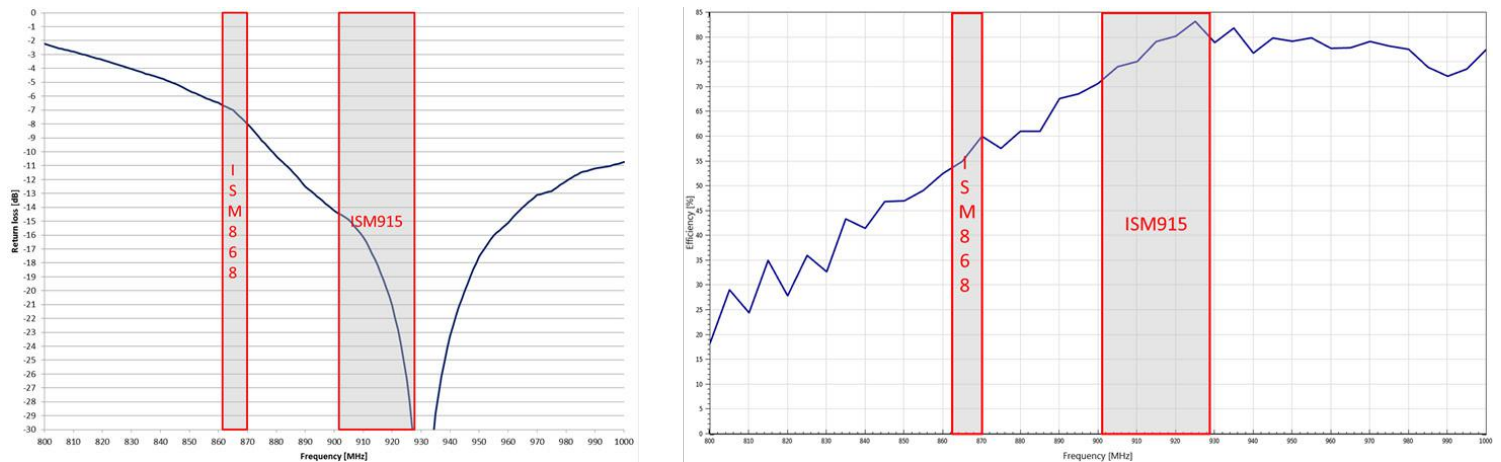


Figure 12: Typical Return loss and Total efficiency. Measured on 110x50 mm PCB, without the module.

ANTENNA RADIATION PATTERNS

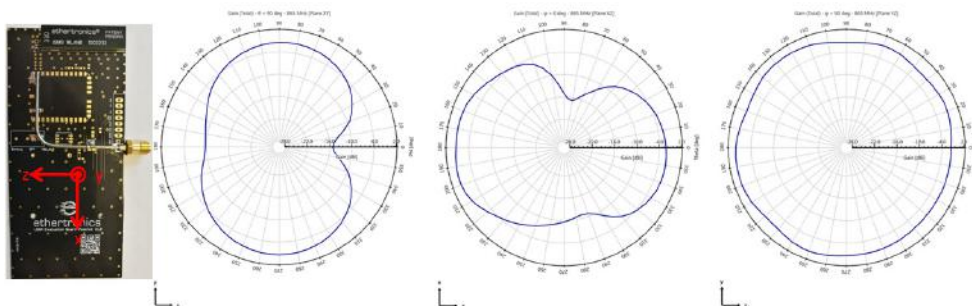


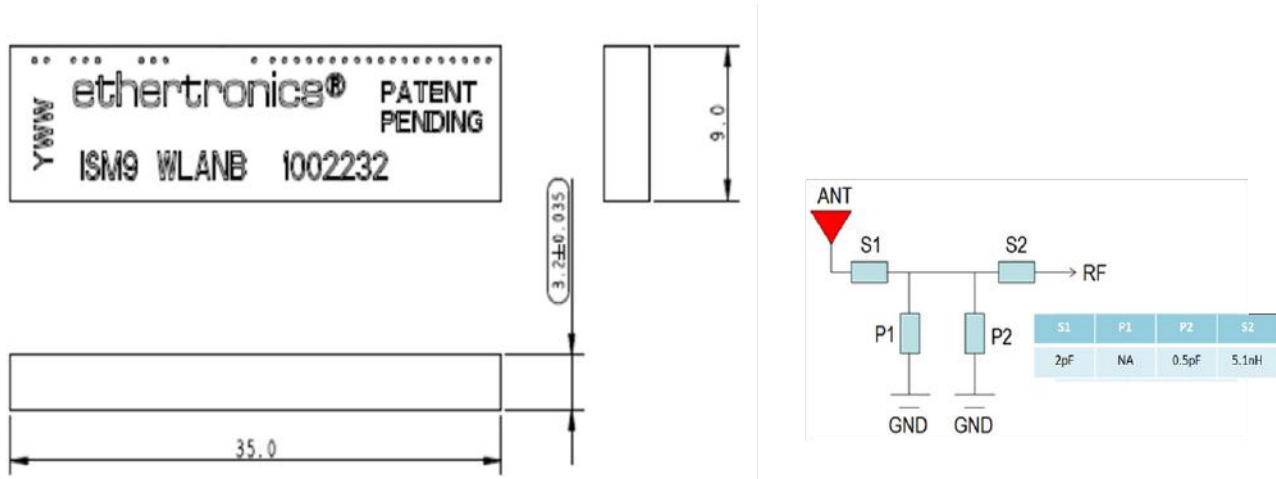
Figure 13: Typical Radiation pattern at 868 MHz. Measured on 110x50 PCB, without the module.

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ANTENNA

MATCHING CIRCUIT AND ANTENNA DIMENSIONS



AT-COMMANDS

To control the Ethertronics LoRa module with AT-commands, please refer the documents LoRa_Module_AT Command Reference Guide from www.avx.com/products/modules/lora-module.

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