



HARDWARE

**USER MANUAL**

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# UM982eb

## Evaluation Board

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## Revision History

Version	Revision History	Date
R1.0	First release	Aug. 2023

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## **UM982eb User Manual**

Should you purchase our product and encounter any inconsistency, please contact us or our local authorized distributor for the most up-to-date version of this manual along with any addenda or corrigenda.



## Foreword

This manual provides information on the hardware composition and design of UM982eb (evaluation board).

### **Target Readers**


This document is written for technicians who are familiar with GNSS modules.

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# 1 Product Overview

UM982eb is the evaluation board for UM982 and it consists of the UM982 module, a 3.3 V low dropout regulator (LDO), a 5V DC/DC boost circuit, two antenna short protection circuits and peripheral interfaces.

 The schematic of the UM982eb can be used as the reference design for the UM982 module.

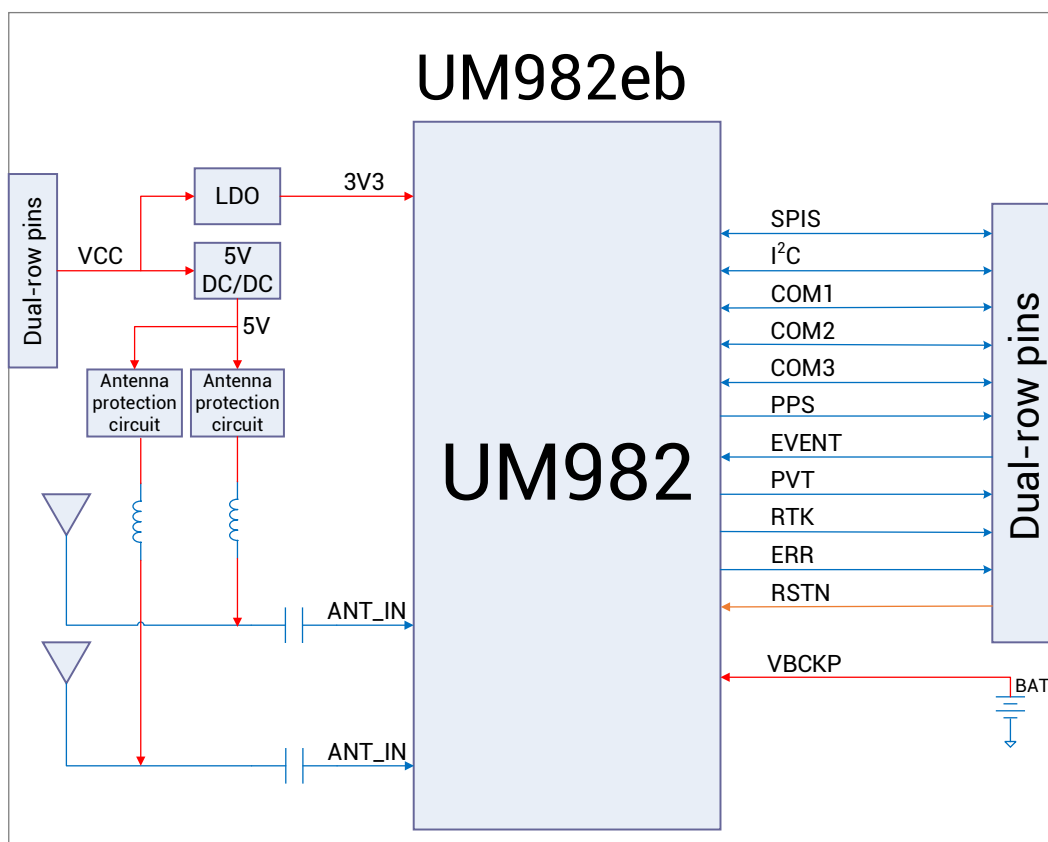


Figure 1-1 UM982eb Block Diagram

## UM982eb User Manual

The appearance of UM982eb is shown as follows:

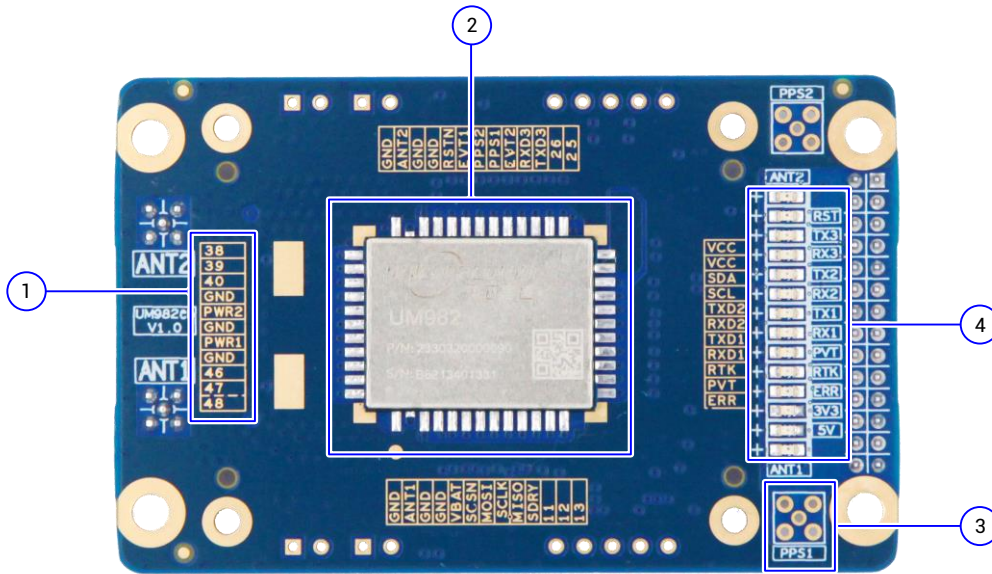


Figure 1-2 Top View of UM982eb

- (1) Silkscreen: It marks the signals of the pins. The smaller holes around are used to mount the UM982 socket. The printing adopts exposed copper to ensure the flatness of the surface.
- (2) UM982 module: The pin pads are designed long, which is convenient for soldering, testing and debugging. For detailed packaging information, please refer to the PCB document.
- (3) PPS connector: To measure the PPS signal, solder an MMCX connector here.
- (4) LED indicators: Indicating the status of the power supply, reset, antenna short circuit, the positioning status and UART.

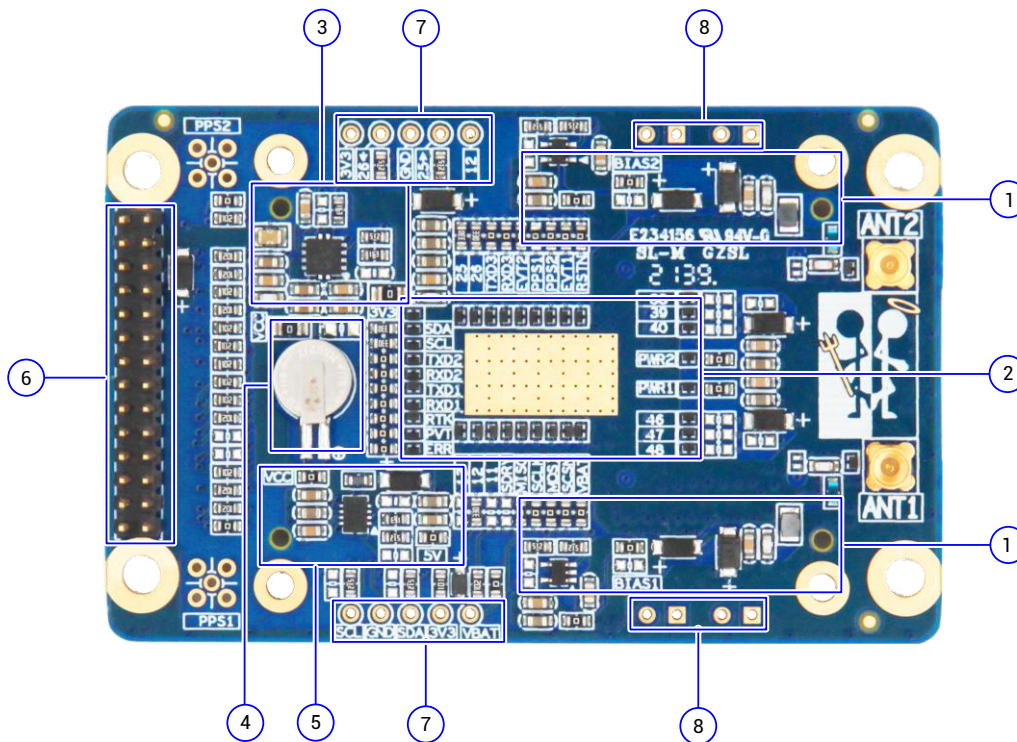


Figure 1-3 Bottom View of UM982eb

- (1) Antenna short protection circuit
- (2) Anti-static design and heat dissipation with exposed copper
- (3) VCC power supply and LDO circuit
- (4) Backup battery
- (5) 5 V DC/DC boost circuit for antenna feeding
- (6) Dual-row pins as external interfaces
- (7) Debug ports
- (8) Ports used to connect jumpers



## 2 Interfaces

The dual-row 28 pins serve as the external interfaces of UM982eb, and the pin pitch is 2 mm. The interfaces can be directly connected to the J18 on Unicore HPL EVK-V5.0 board.

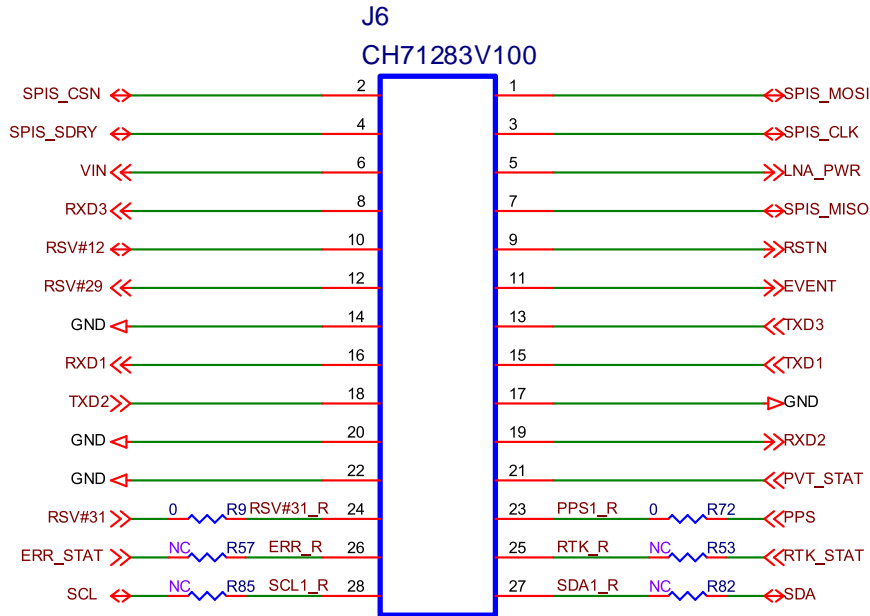


Figure 2-1 UM982eb Interfaces

Table 2-1 UM982eb Pin Description

No.	Pin Name	I/O	Description
1	SPIS_MOSI	I	Master Out / Slave In. This pin is used to receive data in slave mode.
2	SPIS_CSN	I	Chip select pin for SPI slave
3	SPIS_CLK	I	Clock input pin for SPI slave
4	SPIS_SDRY	O	Interrupt output of SPI slave
5	LNA_PWR	I	Antenna feed voltage for LNA
6	VIN	I	Main power supply
7	SPIS_MISO	O	Master In / Slave Out. This pin is used to transmit data in slave mode.
8	RXD3	I	COM3 input, can be used as CAN RXD, LVTTTL
9	RESET_N	I	System reset, active low, and the active time should be no less than 5 ms.

No.	Pin Name	I/O	Description
10	RSV#12	–	Reserved
11	EVENT	I	Event input, with adjustable frequency and polarity
12	RSV#29	–	Reserved
13	TXD3	O	COM3 output, can be used as CAN TXD, LVTTTL
14	GND	–	Ground
15	TXD1	O	COM1 output, LVTTTL
16	RXD1	I	COM1 input, LVTTTL
17	GND	–	Ground
18	TXD2	O	COM2 output, LVTTTL
19	RXD2	I	COM2 input, LVTTTL
20	GND	–	Ground
21	PVT_STAT	O	PVT status, active high. High level when positioning and low level when not positioning.
22	GND	–	Ground
23	PPS	O	Pulse per second, with adjustable pulse width and polarity
24	RSV#31	–	Reserved
25	RTK_STAT	O	RTK status, active high. High level for RTK fixed solution and low level for other status.
26	ERR_STAT	O	Error status, active high. High level when failing self-test and low level when passing self-test.
27	SDA	I/O	I <sup>2</sup> C data
28	SCL	I/O	I <sup>2</sup> C clock

 The availability of the ports depends on the firmware version of the UM982 module.

### 3 Power Supply

The power supply of the UM982eb is input from the VIN pin, passing through a circuit with surge protection and filter capacitors, to provide power for the 3.3 V LDO circuit and 5 V DC/DC boost circuit.

The input range of VIN is 3.2 V to 5 V.

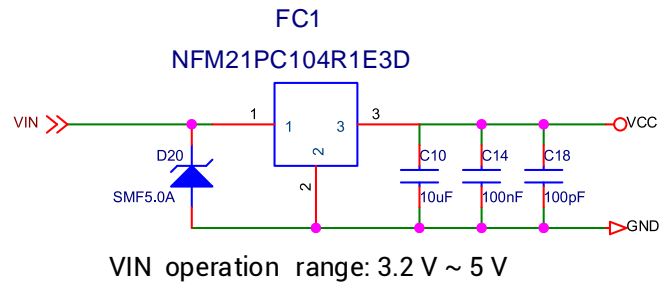


Figure 3-1 Power Filter Circuit

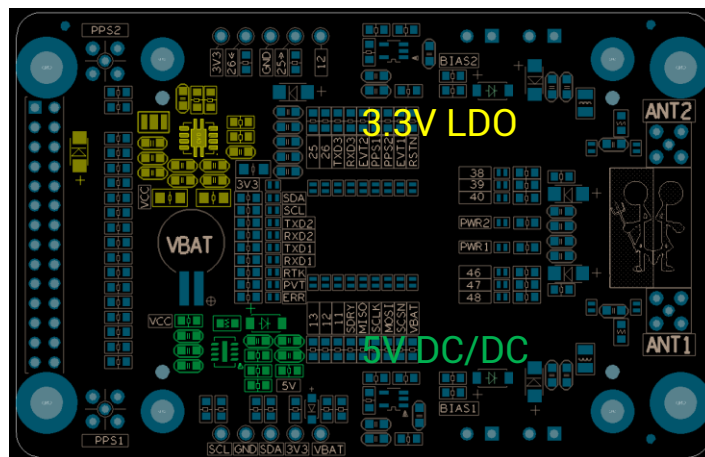


Figure 3-2 3.3 V LDO and 5 V DC/DC on the Bottom of UM982eb

## 3.1 3.3V LDO Power Supply

VCC outputs 3.3 V voltage after passing through the LDO circuit to provide power to UM982eb.

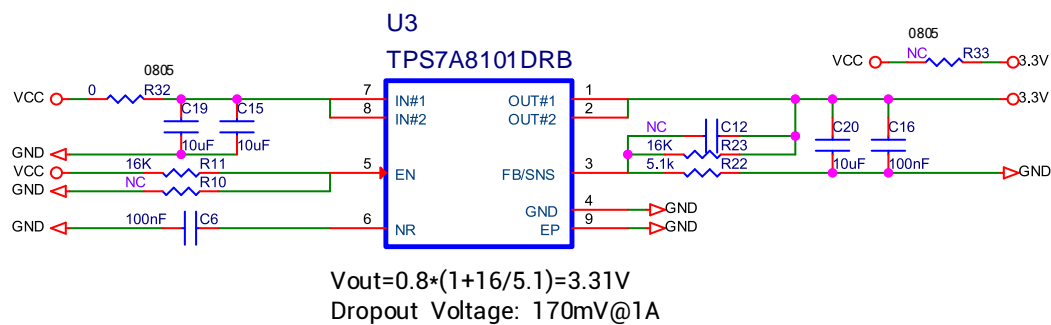


Figure 3-3 3.3V LDO Circuit

### Notes:

The rated output current of LDO should be more than twice the maximum operating current of UM982.

R32 is a series resistor placed at the input of the LDO, which is used for debugging. When selecting the resistor, choose one with high rated power to ensure the current capability. Here, a 0805 0-ohm resistor is selected.

R33 is a resistor connected in parallel with LDO. After removing R32 and soldering R33, you can use VCC to power the module.

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👉 When using the LDO to power the module, you should consider the power dissipation of the LDO.

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### 3.2 5V DC/DC Power Supply

VCC outputs 5 V voltage after passing through the DC/DC boost circuit to feed the antenna.

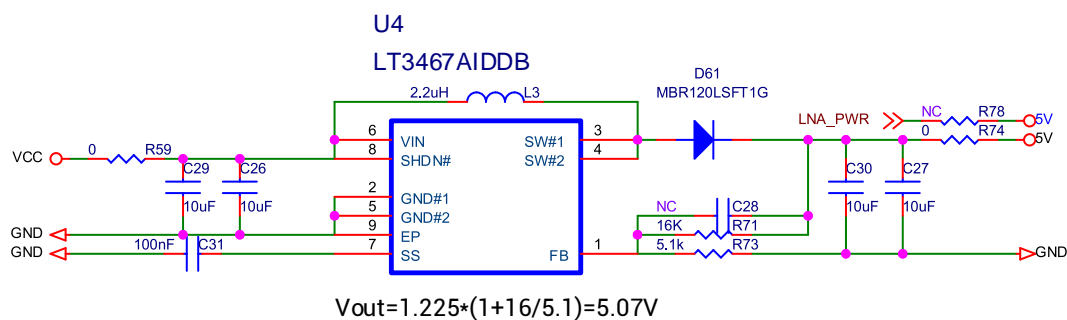


Figure 3-4 5V DC/DC Boost Circuit

**Note:**

You can choose whether to use the 5 V power on the board to feed the antenna according to the antenna type.

R59 and R74 are series resistors connected to the DC/DC circuit at the input and output, which are used for debugging. When selecting the resistors, choose those with suitable rated power according to the power consumption of the antenna load. Here a 0603 0-ohm resistor is selected.

R78: After removing R59/R74 and soldering R78, you can use the external LNA\_PWR to feed the antenna.

### 3.3 Backup Power Supply

When using the hot start function of UM982, you need to provide backup power for the module.

The input range of V\_BCKP is 2.0 V to 3.6 V.

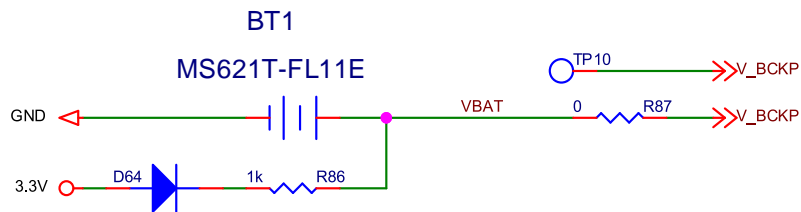


Figure 3-5 Backup Power Circuit

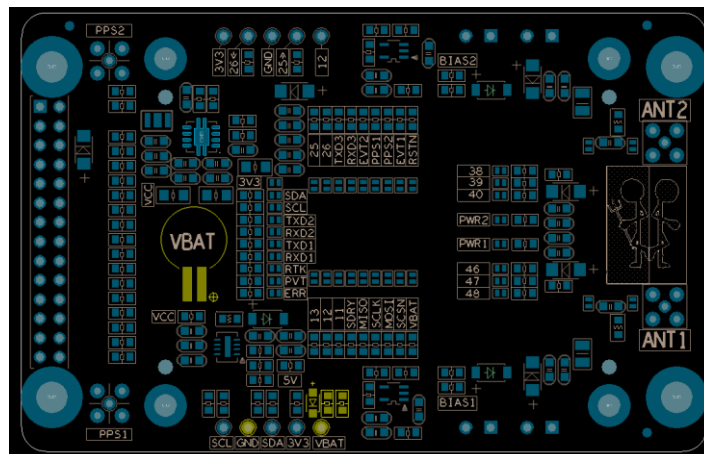


Figure 3-6 Backup Power Circuit on the Bottom of UM982eb

**Note:**

The power supply for V\_BCKP can be provided by the backup battery. The circuit that charges the backup battery should be designed to prevent reverse current to ensure that the battery only supplies power to V\_BCKP and the current does not flow back into the 3.3 V power domain, as the D64 shows in Figure 3-5.

According to the maximum charging current of the battery, a current-limiting resistor should be added, as the R86 shows in Figure 3-5.

V\_BCKP can also be powered through the test point TP10. Removing R86, connecting a power supply wire at TP10 and a ground wire at TP7, you can use an external power to supply V\_BCKP. This method can be used to measure the supply voltage and current of

V\_BCKP.

The backup battery may run out of power if it is not used for a long time, so it is recommended to charge the evaluation board for more than two hours when you first use it.

## 4 Antenna circuit

### 4.1 Antenna Short Protection Circuit

The antenna short protection circuit consists of a load management chip and peripheral circuits.

The 5 V power source supplies the antenna after passing through the load management chip.

When the current of the antenna circuit is greater than 100 mA, it will trigger short circuit protection, and FLAGB will output low level signals.

Removing R88/R77 (or R7/R6) and soldering R79 (or R8), you can feed ANT1 (or ANT2) bypassing the short protection circuit.

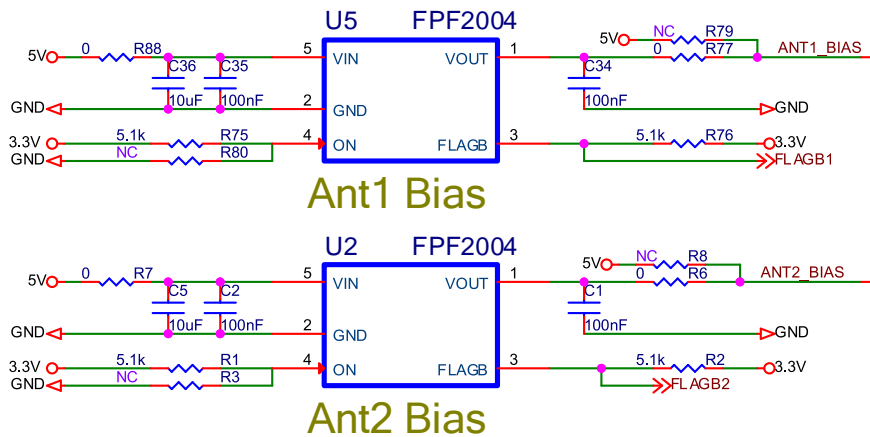


Figure 4-1 Antenna Short Protection Circuit

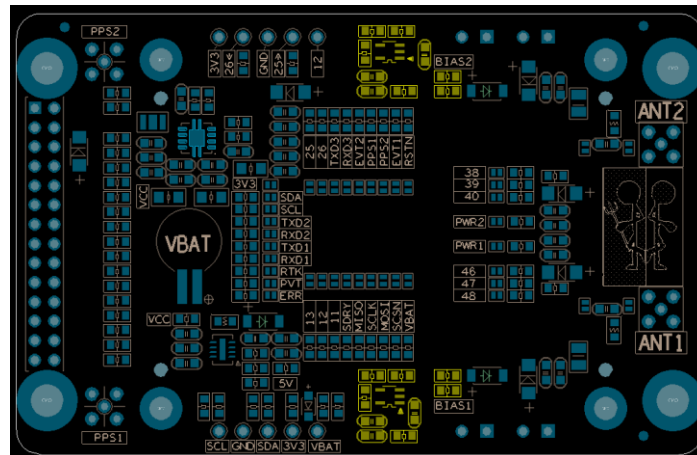


Figure 4-2 Antenna Short Protection Circuit on the Bottom of UM982eb

## 4.2 Antenna Feed Circuit

The antenna feed circuit consists of the anti-reverse current design, anti-surge design, filter inductors, and ESD protection.

Removing R77 and R6 and soldering R79 and R8, you can directly use the 5 V power to supply the antenna. In this condition, the antenna short protection circuit on UM982eb will be bypassed.

The ESD protection diode should support high-frequency signal (above 2000 MHz). Nexperia PESD5V0F1BL is recommended here.

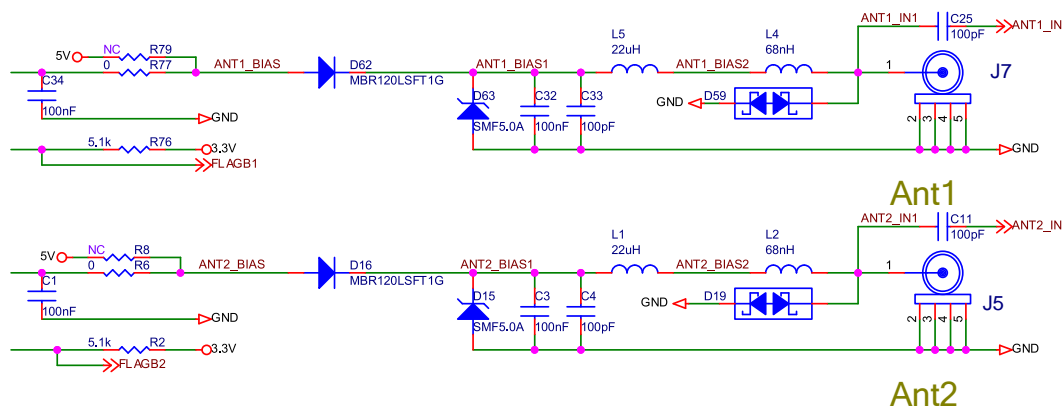


Figure 4-3 Antenna Feed Circuit



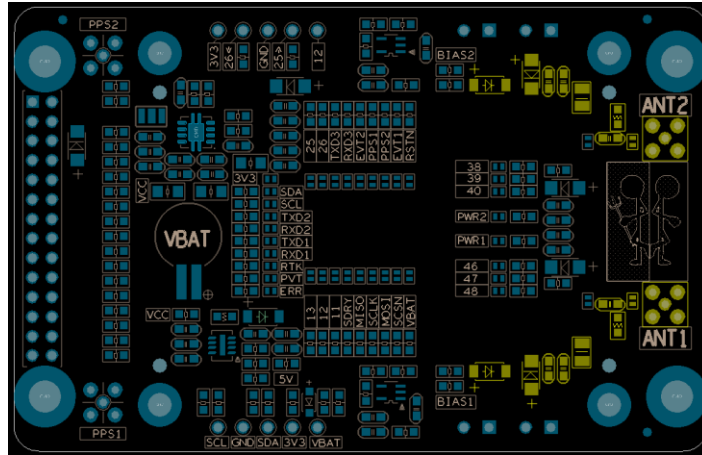


Figure 4-4 Antenna Feed Circuit on the Bottom of UM982eb

## 5 LED Indicators

There are LED indicators on UM982eb to indicate the working status of each functional unit.

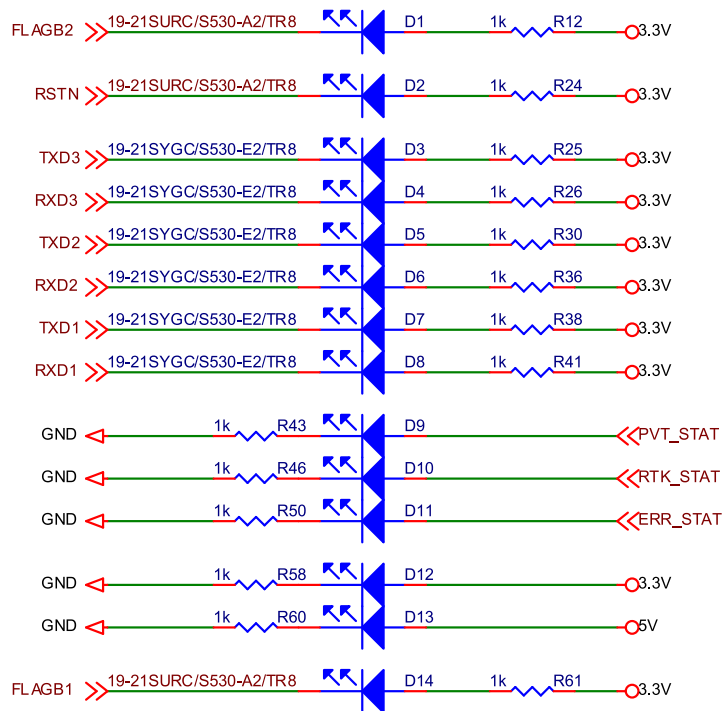


Figure 5-1 LED Indicators

Table 5-1 Description of the LED Status

LED Indicator	Color	Description
Power (5V or 3.3V)	Green	Light on when the power is normal
Reset	Red	Light on when pressing the reset button
Antenna	Red	Light on when antenna is shorted
PVT	Green	Light on when position is fixed
RTK	Green	Light on when RTK is fixed
ERR	Red	Light on when failing self-test
UART	Green	Blinking when UART is working

The silkscreen markings on the right of the LED indicators identify the corresponding function, as shown in the figure below:

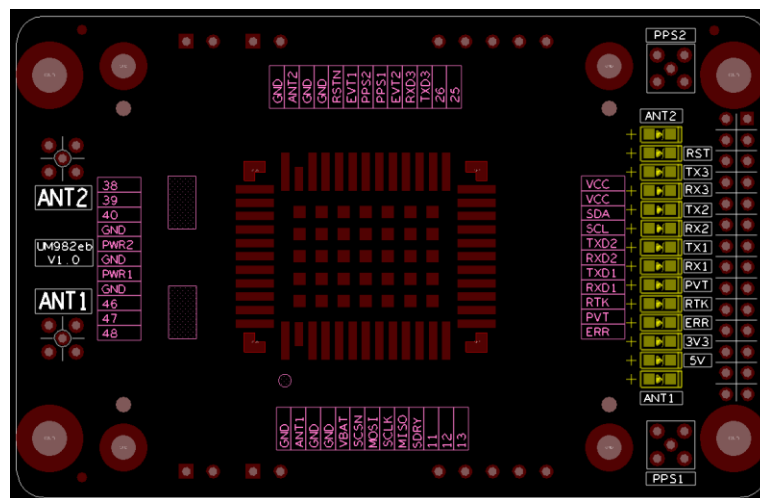


Figure 5-2 Markings on the Right of the LED Indicators

## 6 UM982 Peripheral Design

TVS anti-surge protection is added at the input of the UM982 module. ESD protection is added at all pins.

Use large and small VCC filter capacitors together, with a total capacitance greater than 30 uF.

Add series resistors at the IO pins for the convenience of debugging.

VCCIN powers the UM982 module only. R27 is a large-size resistor (with high rated power) to ensure the current capability. In the figure below, a 0805 resistor is used.

Removing R27, connecting a power supply wire at TP1 and a ground wire at TP3 (as shown in Figure 7-1), you can use an external power to supply the module. This method can be used to measure the input voltage and current of UM982.

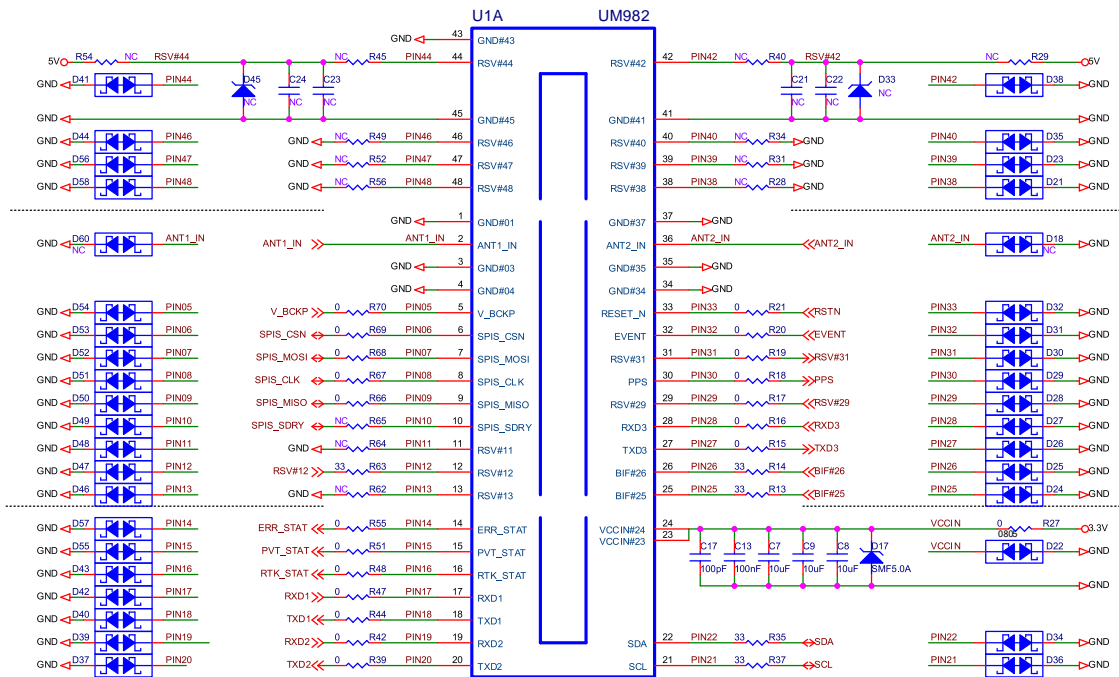


Figure 6-1 UM982 Peripheral Design

Silkscreen markings are printed around the UM982 module to identify the resistors, which is convenient for measurement.

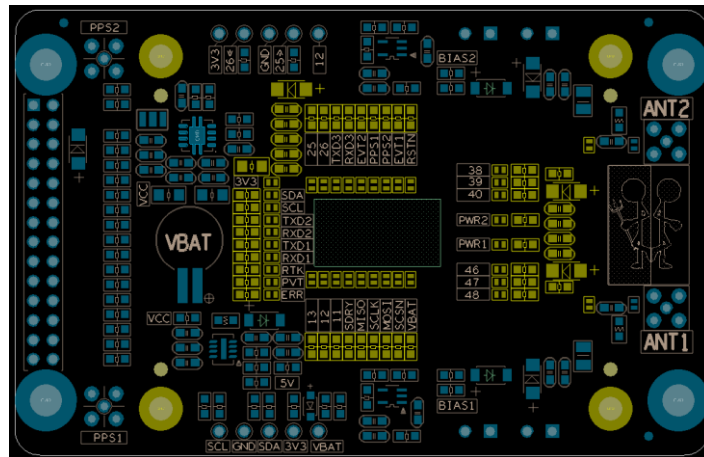


Figure 6-2 UM982 Peripheral Circuit

The GND pads at the bottom of the module should be grounded to ensure heat dissipation. The UM982eb has copper exposed on the bottom of the UM982 module, which not only enhances heat dissipation, but also provides a large area for grounding and is convenient to test.

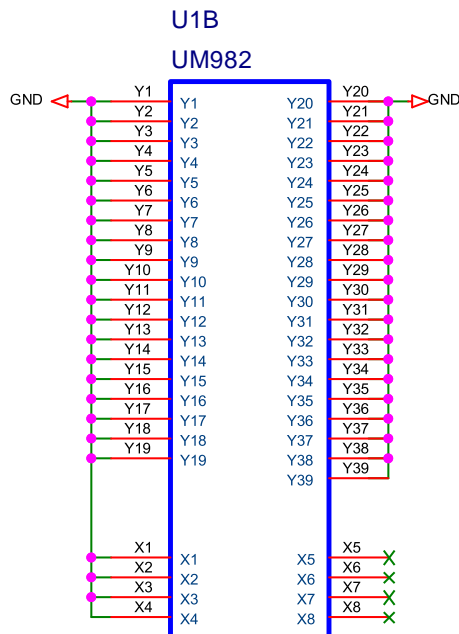


Figure 6-3 UM982 Pads (Y1-Y39) and Socket Mounting Holes (X1-X8)

## 7 Debug Support

As mentioned above, TP1 and TP10 can be used to connect an external power to supply VCCIN and V\_BCKP and to measure the supply voltage and current.

TP2, TP4, TP6 and TP8 are used for internal debugging, of which TP6 and TP8 can be used to debug I<sup>2</sup>C.

J1 and J2 are used for MMCX connection. After soldering the MMCX connector, it can be used to measure the PPS signals.

J3, J4, J8 and J9 are debug ports. Connect the signal that needs to be tested to the square hole and test the round hole, or connect the round hole to a measuring instrument. Using these debug ports can avoid damage to the PCB pads and traces, which is convenient for debugging.

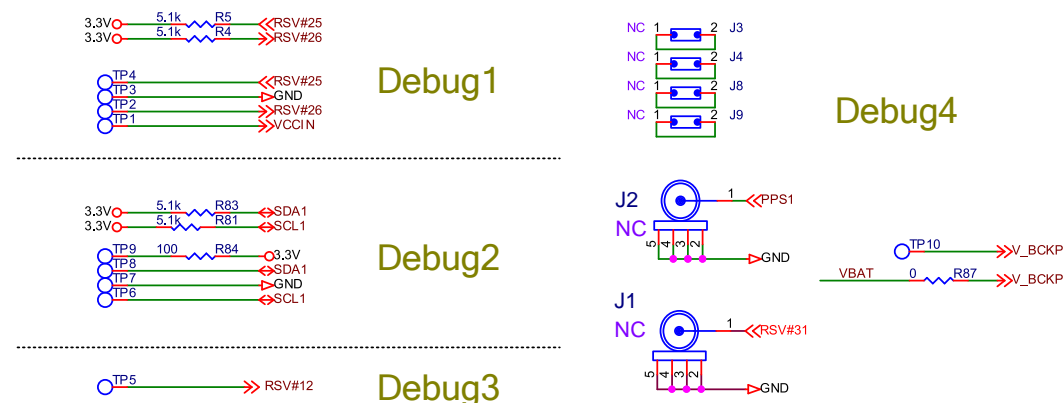


Figure 7-1 Debug Ports for the UM982 Module

The silkscreen markings on the right of the test points are arranged in order to identify the function of each port.

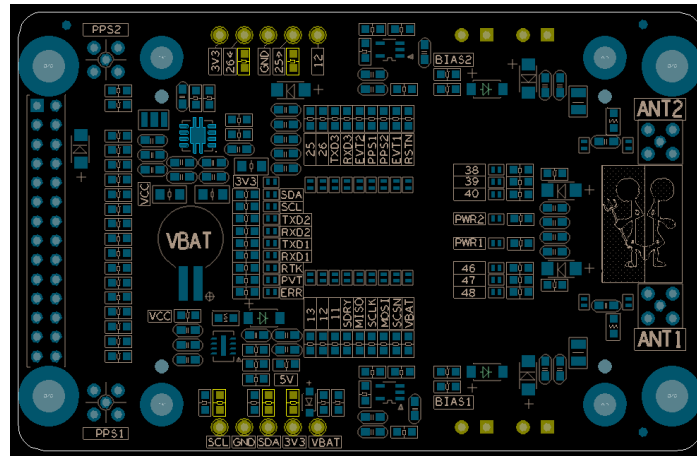
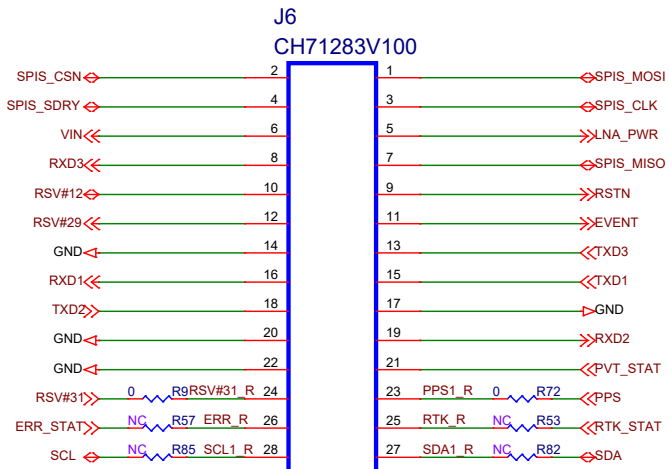


Figure 7-2 Through-Hole Test Points on UM982eb

## Appendix

Schematic of UM982eb

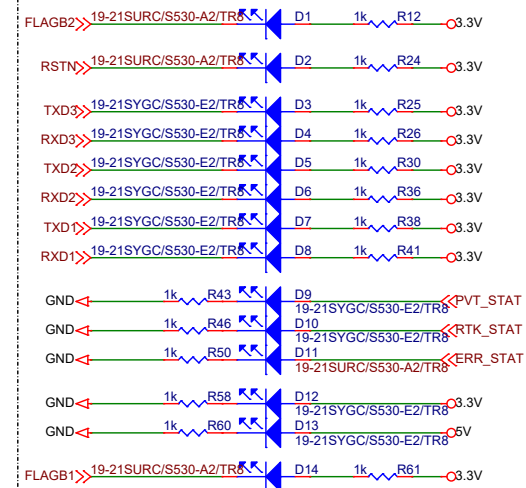


### Interface

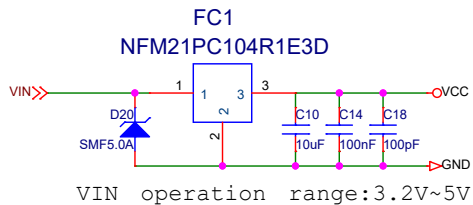
2	SPI_CS	1	SPI_MOSI
4	TPO_MID	3	SPI_CLK
6	VCC	5	RSV (LNA_PWR)
8	RXD3	7	SPI_MISO
10	FRESET_N	9	RESETIN_N
12	RSV (SPEED)	11	EVENT
14	GND	13	TXD3
16	RXD1	15	TXD1
18	TXD2	17	GND
20	GND	19	RXD2
22	GND	21	PV
24	RSV (FWR)	23	PPS
26	TPI+	25	TPO+
28	TPI-	27	TPO-

### UB482

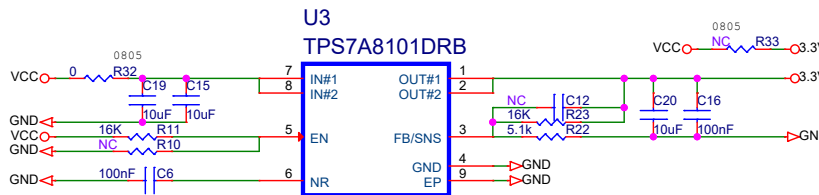
X5  
UM982eb-PCB-V1R0



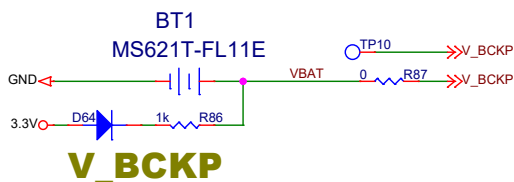
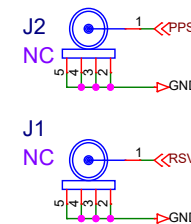
### LEDs



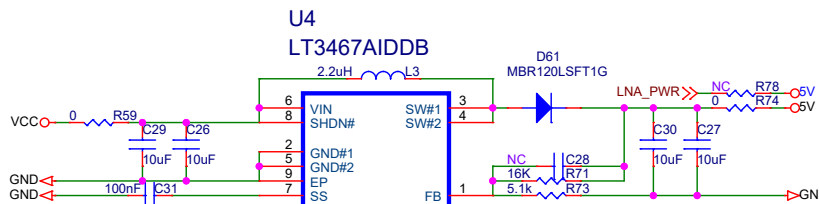
### Power Filter



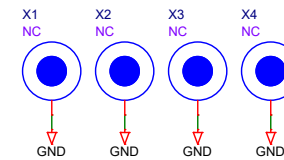
### LDO 3.3V



### V\_BCKP



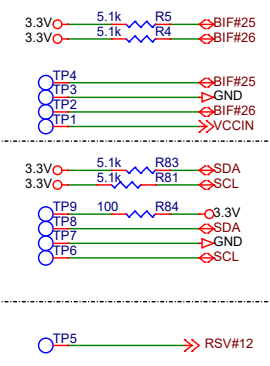
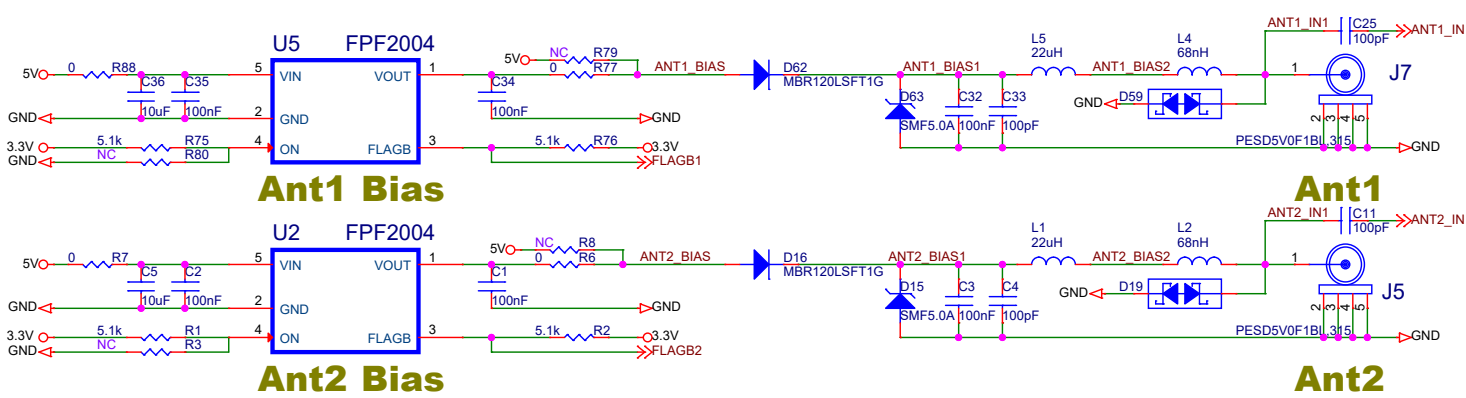
### DC/DC 5V



### Hole

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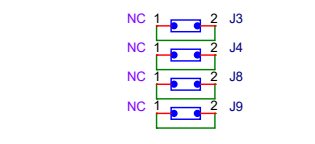
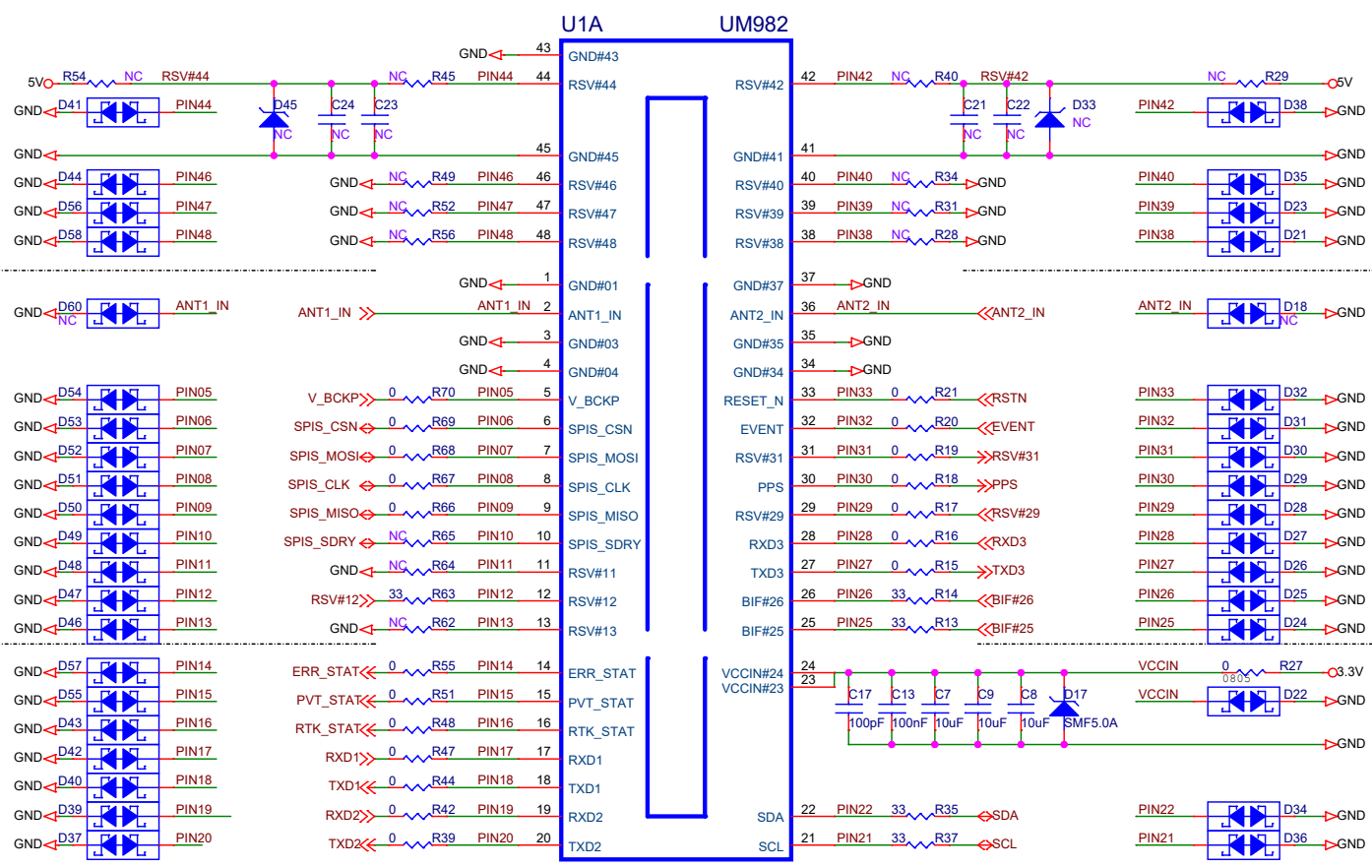
Title		
UM982eb		
Size	Document Number	Rev
B	Interface Power LEDs	V1.0
Date:	Friday, May 20, 2022	Sheet 3 of 5



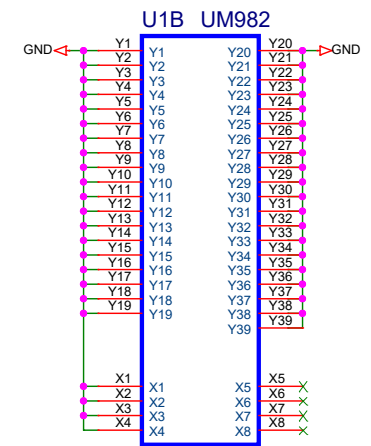
**Debug1**

**Debug2**

**Debug3**



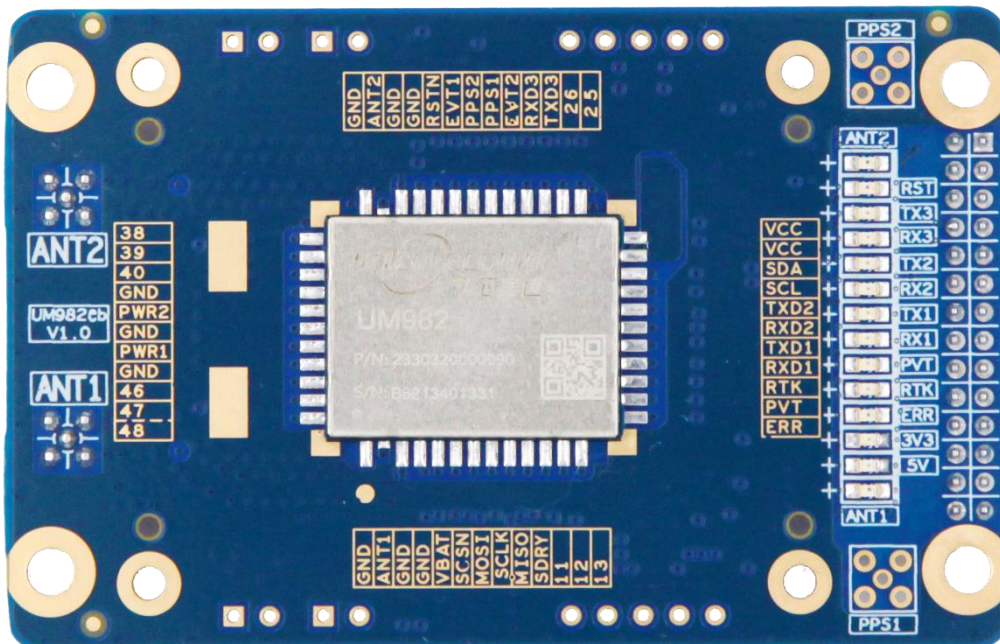
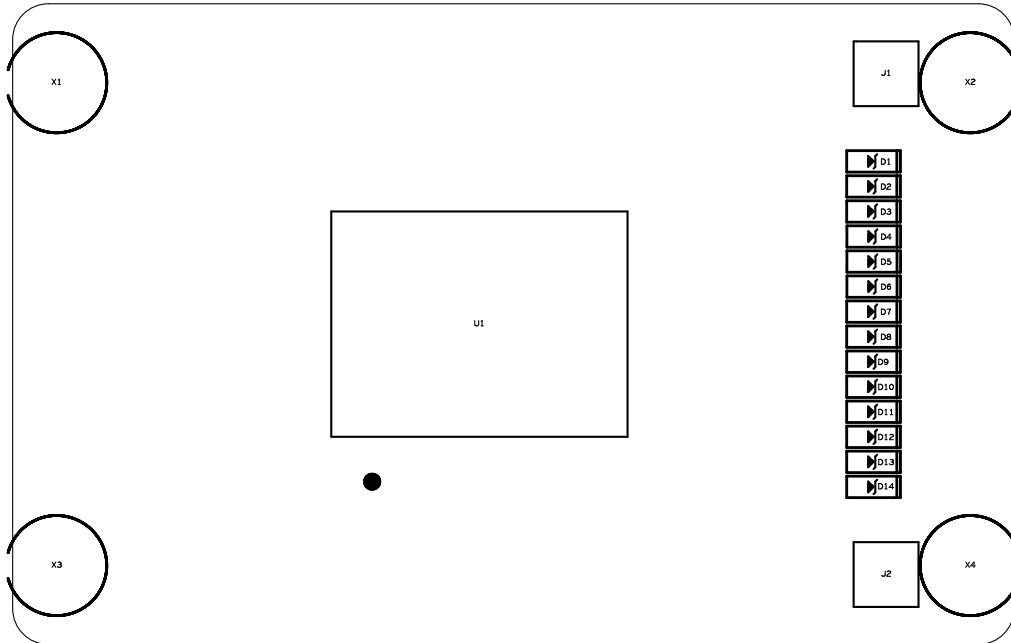
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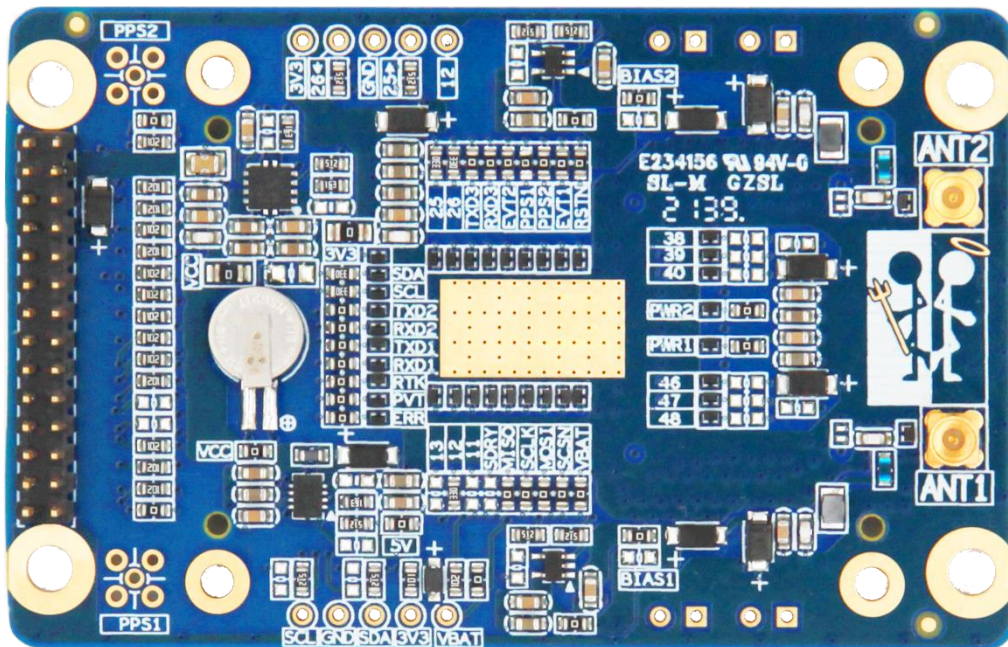
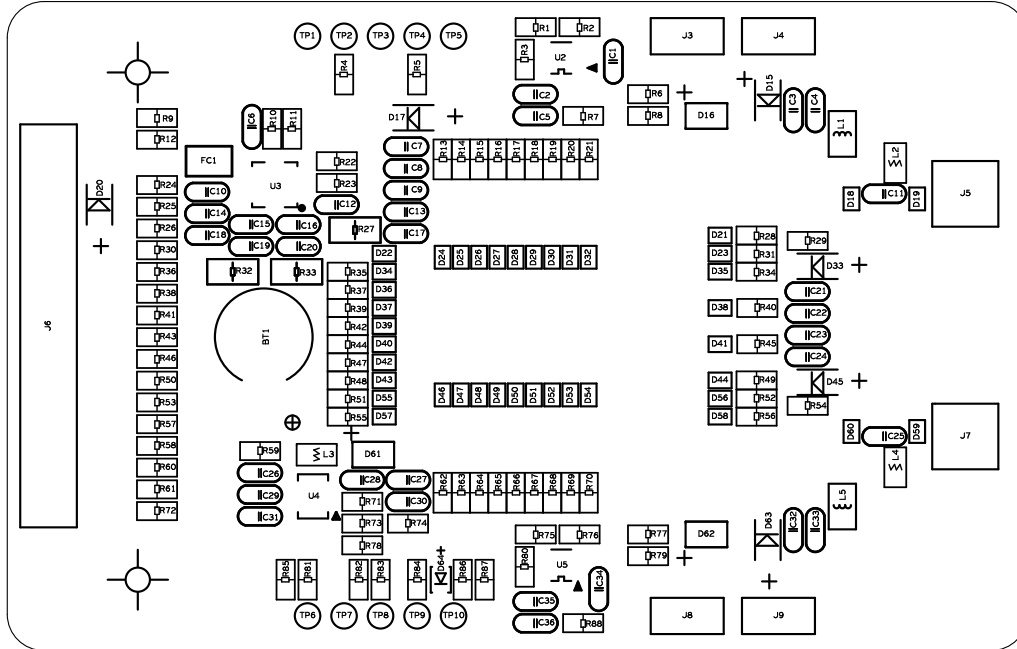
**UM982 Module**



## Assembly Top of UM982eb



### Assembly Bottom of UM982eb



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