

UHF-M500-TTL
1 CH UHF RFID Module
Hardware Description

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1 Function Description

1.1 Intended Use

The UHF-M500 hereinafter named RFID device, is a high-performance RFID communication device to read data from and write data to RFID tags of the standard ISO18000-63. For this purpose, it can produce an RX power of up to +27 dBm (500 mW).

The coin-sized form factor is designed to meet the requirements of high-performance RFID handhelds and mobile portables. This RFID module has the characteristics of low power consumption, small size, good RF performance, and advanced anti-interference design. It is the first choice for low-cost mobile devices.

1.2 Hardware Settings

There are no hardware settings to be done. All configuration is done using the configuration software.

1.3 Status Indication

Pin 12 delivers 3.3 Vdc from an internal voltage regulator. This is intended to drive a LED for power on control. An external resistor is needed to limit the current through the LED.

1.4 Safety Notes

The device may only be used for the intended purpose designed by the manufacturer. The operation manual should be conveniently always kept available for each user.

Unauthorized changes and the use of spare parts and additional devices that have not been sold or recommended by the manufacturer may cause fire, electric shocks, or injuries. Such unauthorized measures shall exclude any liability by the manufacturer.

The liability-prescriptions of the manufacturer in the issue valid at the time of purchase are valid for the device. The manufacturer shall not be held legally responsible for inaccuracies, errors, or omissions in the manual or automatically set parameters for a device or for an incorrect application of a device.

Repairs may be executed by the manufacturer only.

Only qualified staff should carry out installation, operation, and maintenance procedures.

Use of the device and its installation must be in accordance with national legal requirements and local electrical codes.

When working on devices the valid safety regulations must be observed.

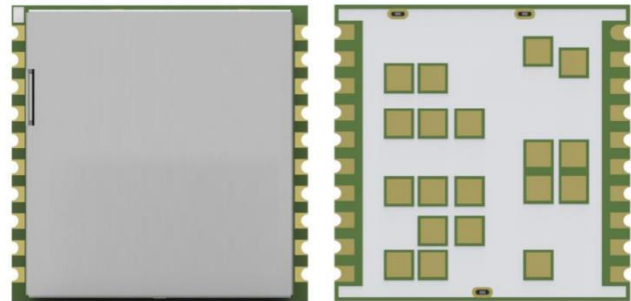
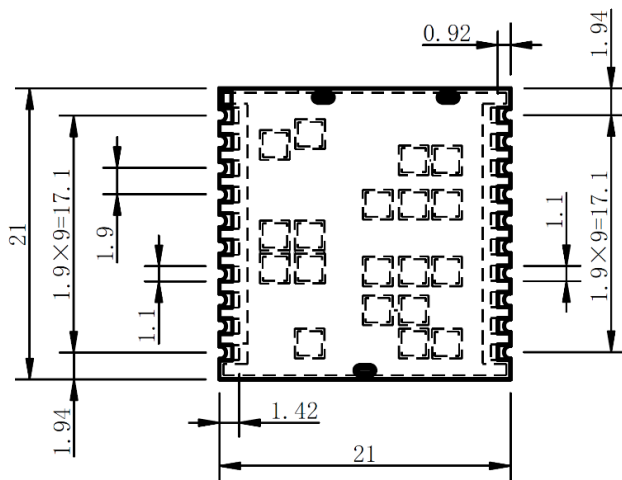
Do not operate the RFID device without antenna or another 50 Ohms load capable of consuming +27 dBm (0.5 W) RF power.

1.5 Reference Document

Communication Protocol: UHF Communication Protocol 1.0_EN.pdf

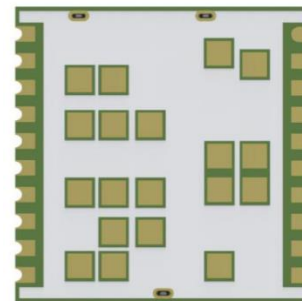
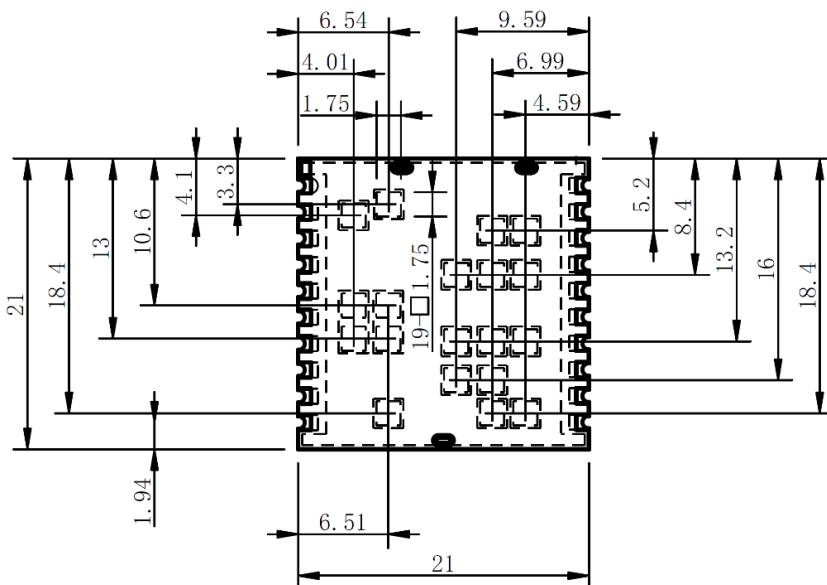
2 Mechanical Drawings

2.1 Overall Dimensions and Position of Solder Joints



The solder joints have a rectangular outline.

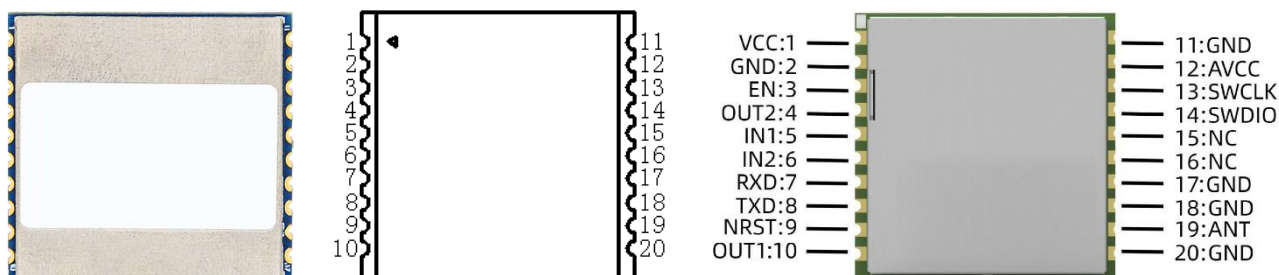
2.2 Heat Dissipation Areas on the Underside



For maximum heat dissipation, have copper contact zones on the carrier PCB to transport heat off the RFID module. Furthermore, you can add thermal compound to bridge the small air gap between the PCBs.



3 Electrical Installation

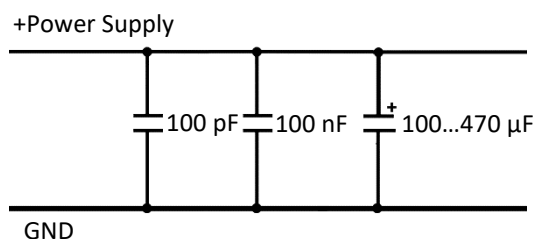


3.1 Solder Joint Pinout

Pin	Signal Name	Description
1	VCC	Positive Power Supply 3.6...5 Vdc
2	GND	Negative Power Supply
3	Enable	High or open: RFID device is active; pulled to GND: power down mode, built-in pull-up resistor
4	GPIO Out 2	Digital Output 2, TTL Level
5	GPIO In 1	Digital Input 1, TTL Level
6	GPIO In 2	Digital Input 2, TTL Level
7	RxD	Data Input, TTL Level
8	TxD	Data Output, TTTL Level
9	/RST	Reset, low-active, built-in pull-up resistor
10	GPIO Out 1	Digital Output 1, TTL Level
11	GND	Negative Power Supply
12	3.3V	For power on signal LED. External resistor to limit current is needed.
13	SWCLK	SWD programming interface clock cable
14	SWDIO	SWD programming interface data cable
15	NC	RFU
16	NC	RFU
17	GND	Negative Power Supply
18	GND	Negative Power Supply
19	Ant	Antenna, RF Output
20	GND	Negative Power Supply

3.2 Power Supply Filtering

Filter and stabilize the power supply lines with a combination of 3 capacitors:

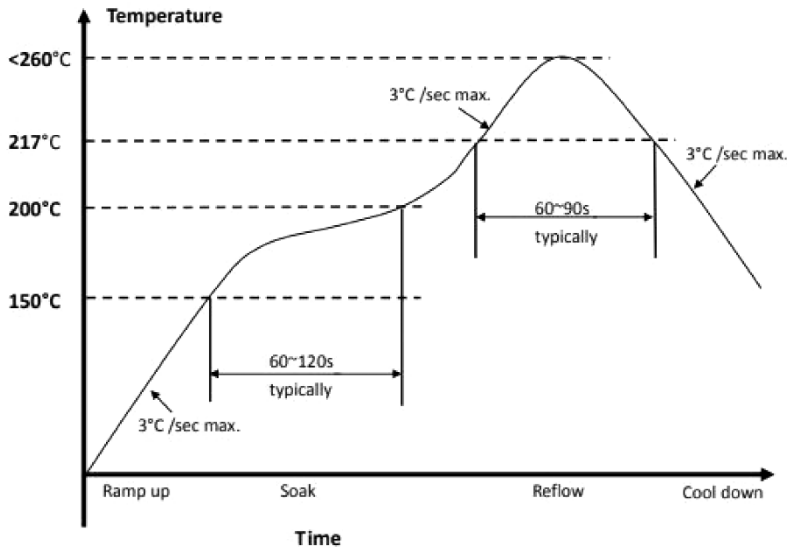


4 Installation

4.1 SMT Reflow Soldering Information

Baking temperature requirement is $125\text{ }^{\circ}\text{C} \pm 6\text{ }^{\circ}\text{C}$. Baking time requirement is:

- For more than three months and less than six months shelf time: 4 h.
- For more than six months, the baking time is 24 h



Refer to IPC/JEDEC standards. Peak temperature: less than 260 °C. Number of reflow soldering cycles: maximum 2 times. Add nitrogen (N₂) during the reflow soldering process to achieve the oxygen concentration requirement of 2000 ppm or less.

4.2 General Instructions

- Before soldering the device add a thin layer of thermal compound the heat dissipation zones on the underside.
- Install the device using the solder strips.
- Keep the device away from direct sunlight, high humidity, extreme temperatures, and sources of electromagnetic interference. Any combination of these conditions might degrade performance or shorten the life of the device.
- Connect the device as defined in the electrical connections section.
- Power the device as defined in electrical connections section. The boot sequence begins in either case when power is supplied to the device. After the boot sequence finishes, the device accepts commands, not before.
- Use an external LED to monitor the presence of supply voltage.

4.3 Avoiding Interference

The device usually operates without any interference caused by radio communication if it is

- used as intended and,
- correctly installed.

This is an RFID device. It is part of its normal functions to emit radio waves. The operation free of radio disturbance cannot be guaranteed for each application.

If the device causes radio disturbance in an application, the following instructions will help:

- Realign the antenna.
- Change the position of the antenna.
- Increase the distance between the device and the antenna.
- Change the power supply of the device.
- Contact the support of the manufacturer.

4.4 Emitted Frequencies During Normal Operation

Region	Frequencies
Europe (ETSI)	865.7, 866.3, 866.9, 867.5 MHz
USA (FCC)	The FCC specifies frequency hopping between 902.75–927.25 MHz in 500 kHz steps. This specification states that no listen-before-talk is performed. The maximum continuous transmit time on a channel is 0.4 seconds.

According to ETSI EN 302208-1 only channels 4, 7, 10 and 13 (internal numerated as 1, 4, 7 and 10) could be used at high power! Other RF channels are present only for test purposes and should not be used in normal operation!

5 Maintenance, Repair and Disposal

5.1 Maintenance

The electronics are maintenance-free. Protect it against dirt and liquids.

5.2 Repair

There are no user-serviceable parts. Do not attempt repairs. Do not allow any unauthorized service centre or personnel to repair or modify the product.

In the event your electronics fails, contact iDTRONIC GmbH via the service e-mail address: helpdesk@idtronic.de

5.3 Disposal

After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.

Do not dispose of this device in normal household waste. Contact your local council for information on disposal options for electronic devices in your area.

6 Technical Data

Radio Specifications	
Operating Frequency	840...960 MHz, Configurations for USA: 902...928 MHz (FCC), EU: 865...868 MHz (ETSI), CN: 920...925 MHz
RF TX Power	+5...27 dBm, adjustable in steps of 1 dB
Reading Range	≥ 3 m with +3 dBi antenna *
RF impedance	50 Ω
Antenna Connection	Solder Joints

* Reading range depends on tag, antenna and environmental conditions.

Radio Specifications depending on the Reader IC			
RFID IC	Impinj E310	Impinj E510	Impinj E710
RF Sensitivity	-73 dBm	-80 dBm	-87 dBm
Reading Rate	≥ 300 tags/s	≥ 600 tags/s	≥ 1000 tags/s
Order Code	OEM-UHF-M503-TTL	OEM-UHF-M505-TTL	OEM-UHF-M507-TTL

Supported Standards / Tags	
ISO Standard	ISO 168000-63 (EPC Class 1 Generation 2)
Tag Cache	≥ 1000 Tags @ 12 Bytes EPC size

Electrical Specifications	
Power Supply	3.6...5 Vdc
Power Consumption	560 mA @ +27 dBm TX Power 130 mA Standby 10 mA Boot Load Mode
Connectors	Solder Joints
Communication Interface	UART TTL port
Communication Parameters	Baud rate: 9600...921600 bit/s, 115200 bits/s factory default 1 start bit, 8 data bits, 1 stop bit, no parity bit
GPIO	2 Inputs TTL Levels: Logic low: < 0.8 V, minimum 0V Logic high: > 2 V, maximum 3.3 V 4 Outputs TTL Levels: Logic low: maximum 0.4 V Logic high: minimum 2.9V, maximum 3.3V IO The maximum output current of the port is 5mA

Mechanical Specifications	
Dimensions	21 × 21 × 3.7 mm
Weight	2.5 g
Material	PCB: FR4 Shielding frame: nickel-nickel copper Shield cover: stainless steel

Environmental Conditions	
Operating Temperature	-20 °C ... +55 °C
Storage Temperature	-40 °C ... +85 °C
Humidity	up to 95 %, non-condensing

SDK Information	
Supported OS	Windows, Linux, Android
Supported Languages	C, C#/.NET, Java
Demo Software	Windows

Other functions and details to be continued and upgraded.

7 Revision History

Version	Date	Notes
0.1	2025-03-17	Initial User’s Guide Version.