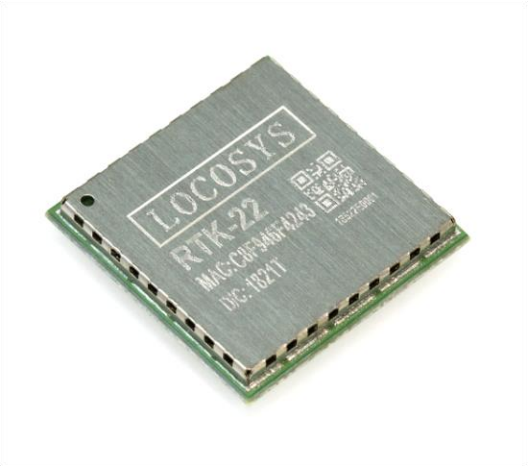
RTK-22

A Powerful Module Designed for RTK Application

Datasheet



Document history

Version	Date	Updates
0.1	April 17, 2018	• Creation.
0.2	August 17, 2018	• Added pin description.
0.3	January 28, 2019	• Added the accuracy with dual-frequency GNSS receiver. • Added application diagram • Added the typical supply current.

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1. Introduction

RTK-22 is a 22mm by 22mm compact module designed for RTK application. The algorithm of RTK-22 supports raw data from both single and multi-frequency GNSS receivers. It can provide centimeter-level positioning accuracy in the open sky environment.

RTK-22 offers three modes of operation: rover, base station and moving baseline. In the rover mode, it can use the built-in USB OTG combined an external 4G LTE module to connect the cloud virtual reference station, such as SmartNet and Qianxun SI. Besides a 4G LTE module, the built-in Ethernet network can also be used.

In the base station mode, RTK-22 uses RTCM protocol to output corrections via either network or UART serial port. An external Sub-GHz module can be integrated to form a proprietary RTK application.

In the moving baseline mode, RTK-22 can connect two GNSS receivers at the same time and output both the distance and azimuth between these two GNSS receivers.

RTK-22 takes care the data transmission between the rover and base. Then output RTK results to the external host/microprocessor via a dedicated UART serial port. No additional resources of the external host/microprocessor are required. This eases the hardware and software development of RTK applications.

1.1 Product features

- Integrated Real Time Kinematics to offer cm-level accuracy (1)
- Rover or Base mode by combining with an external GNSS receiver
- Moving baseline function by combining with two external GNSS receivers
- Built in 64M bytes memory for RTK data log
- One 10/100 Mbit/s Ethernet controller
- One USB OTG for connecting to 4G LTE module.
- One UART for connecting to Sub-GHz module

(1) With single-frequency multi-constellation GNSS, the accuracy is 0.015 m + 1 ppm CEP (baseline ≤ 10 km).
With dual-frequency multi-constellation GNSS, the accuracy is 0.01 m + 1ppm CEP (baseline ≤ 10 km).

1.2 Block diagram

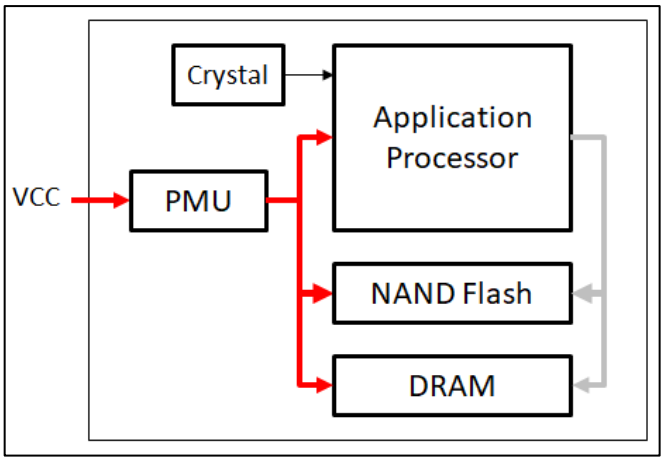


Figure 1: RTK-22 module block diagram

1.3 Application diagram

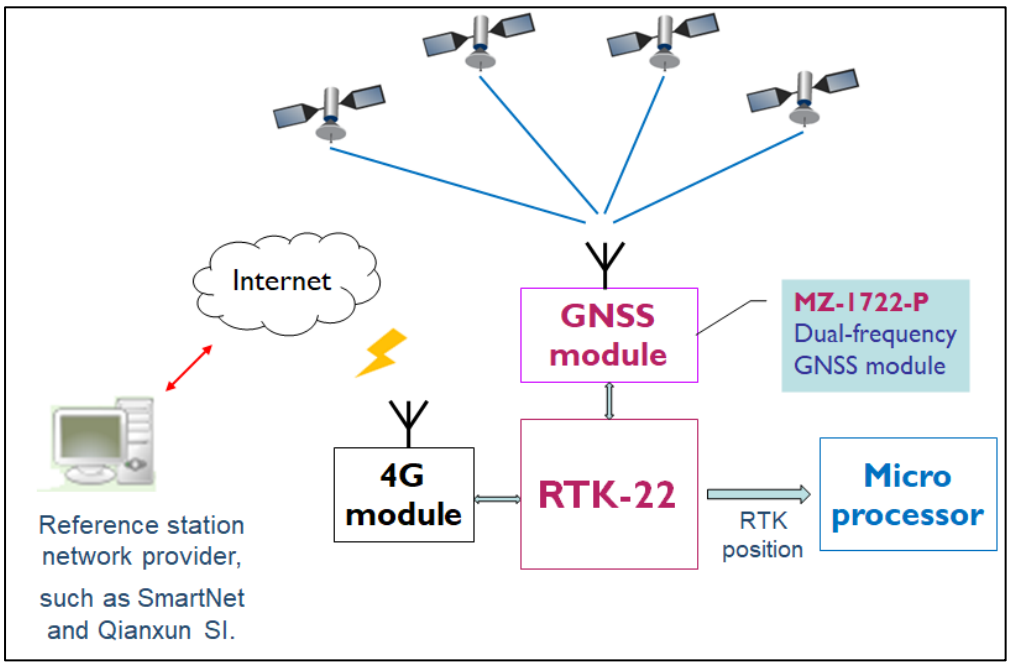


Figure 2: RTK-22 acts as a rover

2. Pin definition

2.1 Pin assignment

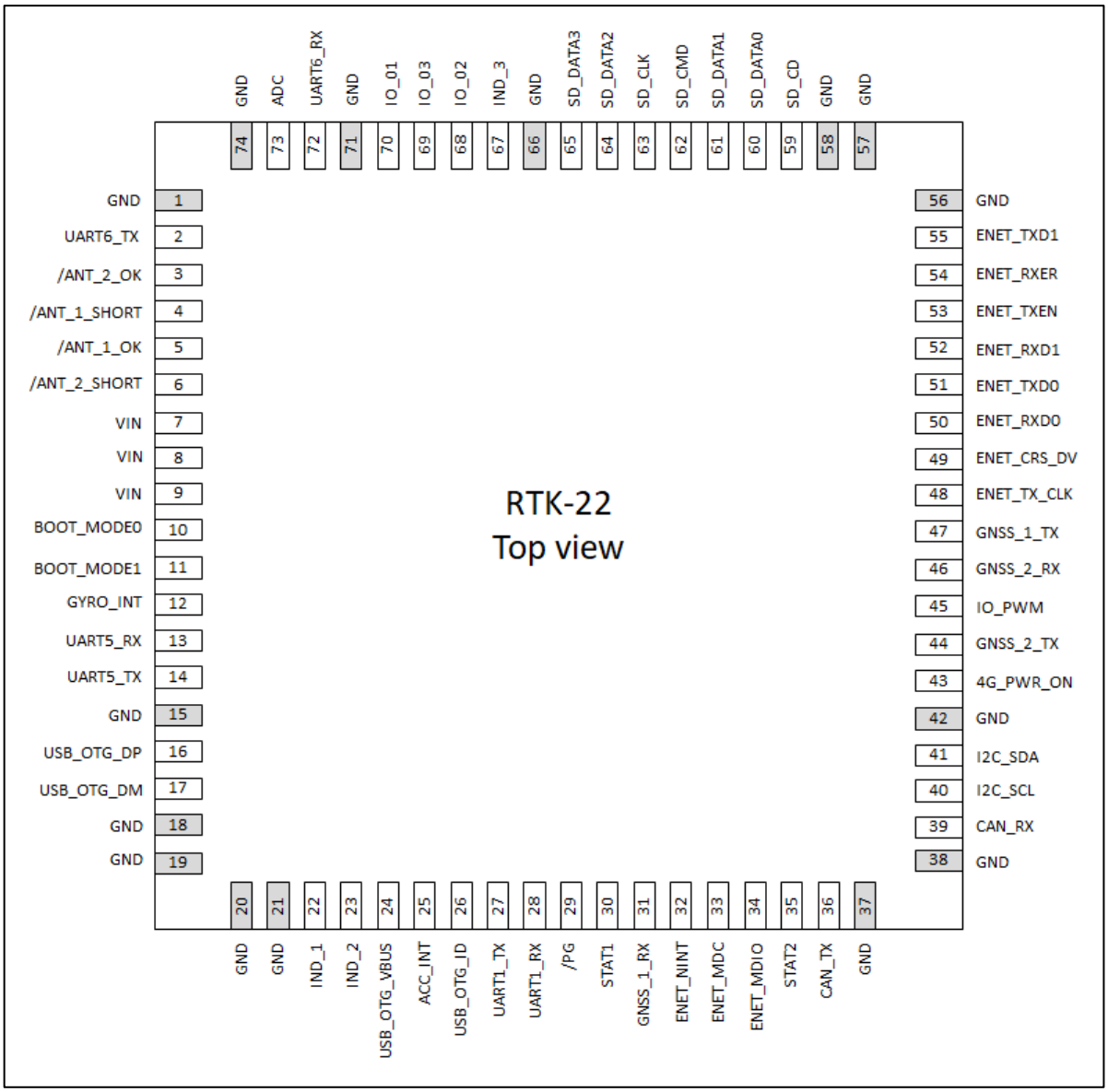


Figure 3: Pin assignment

2.2 Pin description

Table 1: Pin description

Pin #	Name	I/O	Description	Remarks
1	GND		Ground	
2	UART6_TX	O	UART6 transmitted data. Used for transmitting raw data to Sub-GHz module. If not used, leave unconnected.	
3	/ANT_2_OK	I	GNSS antenna [2] connected detection. If not used,	

			leave unconnected.	
4	/ANT_1_SHORT	I	GNSS antenna [1] short detection. If not used, leave unconnected.	
5	/ANT_1_OK	I	GNSS antenna [1] connected detection. If not used, leave unconnected.	
6	/ANT_2_SHORT	I	GNSS antenna [2] short detection. If not used, leave unconnected.	
7	VIN	I	Power supply input (3.3V)	
8	VIN	I	Power supply input (3.3V)	
9	VIN	I	Power supply input (3.3V)	
10	BOOT_MODE0	I	Reserved pin. Leave unconnected.	
11	BOOT_MODE1	I	Reserved pin. Leave unconnected.	
12	GYRO_INT	I	Reserved pin. Leave unconnected.	
13	UART5_RX	I	UART5 received data. Used for communication with the external host/microprocessor.	
14	UART5_TX	O	UART5 transmitted data. Used for communication with the external host/microprocessor.	
15	GND		Ground	
16	USB_OTG_DP		When a 4G LET module is used, connect this pin to USB_DP pin of 4G LTE module. If not used, leave unconnected.	
17	USB_OTG_DM		When a 4G LET module is used, connect this pin to USB_DM pin of 4G LTE module. If not used, leave unconnected.	
18	GND		Ground	
19	GND		Ground	
20	GND		Ground	
21	GND		Ground	
22	IND_1	O	Indicator output [1]. Used to indicate the status of GNSS antenna.	
23	IND_2	O	Indicator output [2]. Used to indicate the status of 4G/LTE module.	
24	USB_OTG_VBUS	I	When a 4G LTE module is used, supply this pin with 5V voltage. If not used, leave unconnected.	
25	ACC_INT	IO	Reserved pin. Leave unconnected.	
26	USB_OTG_ID	I	USB OTG ID pin. When a 4G LTE module is used, connect this pin to a 10K resistor pulled up by VIN (3.3V) pin. If not used, leave unconnected.	

27	UART1_TX	O	UART1 transmitted data. Reserved for debug purpose, leave unconnected.	
28	UART1_RX	I	UART1 received data. Reserved for debug purpose, leave unconnected.	
29	/PG	IO	Reserved pin. Leave unconnected.	
30	STAT1	IO	Reserved pin. Leave unconnected.	
31	GNSS_1_RX	O	Connect to RX of GNSS module [1] to be the rover or base mode.	
32	ENET_NINT	I	Ethernet interrupt input	
33	ENET_MDC	O	Ethernet management interface clock output	
34	ENET_MDIO	IO	Ethernet management interface data I/O	
35	STAT2	IO	Reserved pin. Leave unconnected.	
36	CAN_TX	O	Reserved pin. Leave unconnected.	
37	GND		Ground	
38	GND		Ground	
39	CAN_RX	I	Reserved pin. Leave unconnected.	
40	I2C_SCL	I	I^2C clock. Reserved pin. Leave unconnected.	
41	I2C_SDA	IO	I^2C data. Reserved pin. Leave unconnected.	
42	GND		Ground	
43	4G_PWR_ON	O	Output pin for controlling the power of 4G module.	
44	GNSS_2_TX	I	Connect to TX of GNSS module [2] to be the base in moving baseline mode. If not used, leave unconnected.	
45	IO_PWM	IO	Reserved pin. Leave unconnected.	
46	GNSS_2_RX	O	Connect to RX of GNSS module [2] to be the base in moving baseline mode. If not used, leave unconnected.	
47	GNSS_1_TX	I	Connect to TX of GNSS module [1] to be the rover or base mode.	
48	ENET_TX_CLK	O	Ethernet transmit clock	
49	ENET_CRS_DV	IO	Ethernet carrier sense	
50	ENET_RXD0	I	Ethernet receive data [0]	
51	ENET_TXD0	O	Ethernet transmit data [0]	
52	ENET_RXD1	I	Ethernet receive data [1]	
53	ENET_TXEN	O	Ethernet transmit enable	

54	ENET_RXER	IO	Ethernet receive error	
55	ENET_TXD1	O	Ethernet transmit data [1]	
56	GND		Ground	
57	GND		Ground	
58	GND		Ground	
59	SD_CD	I	SD card detect. Reserved pin. Leave unconnected.	
60	SD_DATA0	IO	SD card data line [0] Reserved pin. Leave unconnected.	
61	SD_DATA1	IO	SD card data line [1] Reserved pin. Leave unconnected.	
62	SD_CMD	IO	SD card command Reserved pin. Leave unconnected.	
63	SD_CLK	O	SD card clock output Reserved pin. Leave unconnected.	
64	SD_DATA2	IO	SD card data line [2] Reserved pin. Leave unconnected.	
65	SD_DATA3	IO	SD card data line [3] Reserved pin. Leave unconnected.	
66	GND		Ground	
67	IND_3	O	Indicator output [3]. Used to indicate the working status of RTK-22.	
68	IO_02	IO	General purpose IO [2]	
69	IO_03	IO	General purpose IO [3]	
70	IO_01	IO	General purpose IO [1]	
71	GND		Ground	
72	UART6_RX	I	UART6 received data. Used for receiving raw data from Sub-GHz module. If not used, leave unconnected.	
73	ADC	I	Analog to digital converter input. Reserved pin. Leave unconnected.	
74	GND		Ground	

3. Electrical specifications

3.1 Absolute maximum rating

Table 2: Absolute maximum rating

Parameter	Symbol	Minimum	Maximum	Unit
Power supply input	VBAT	-0.3	3.6	V
Storage temperature	TA_{stg}	-40	85	℃

3.2 Electrical characteristics

Table 3: Electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply input	VIN	3	3.3	3.6	V
Supply current	I_{SS}		100		mA
High level input voltage	V_{IH}	0.7 x VIN		VIN	V
Low level input voltage	V_{IL}	0		0.3 x VIN	V
High level output voltage	V_{OH}	VIN – 0.15		VIN	V
Low level output voltage	V_{OL}	–		0.15	V

3.3 Temperature characteristics

Table 4: Temperature characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Normal operating temperature	T_{opr}	-25	25	70	℃
Storage temperature	T_{stg}	-40	25	85	℃

4. Mechanical specification

4.1 Outline dimensions

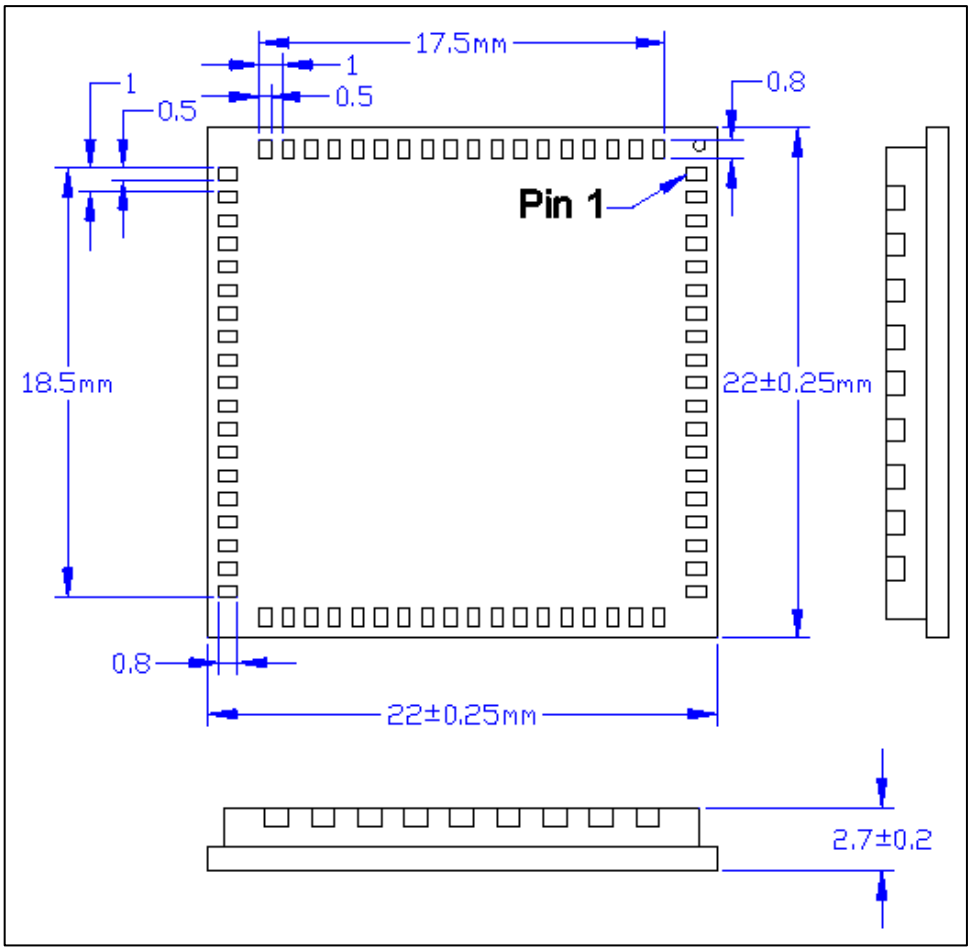


Figure 4: Outline dimensions

4.2 Recommended layout pattern

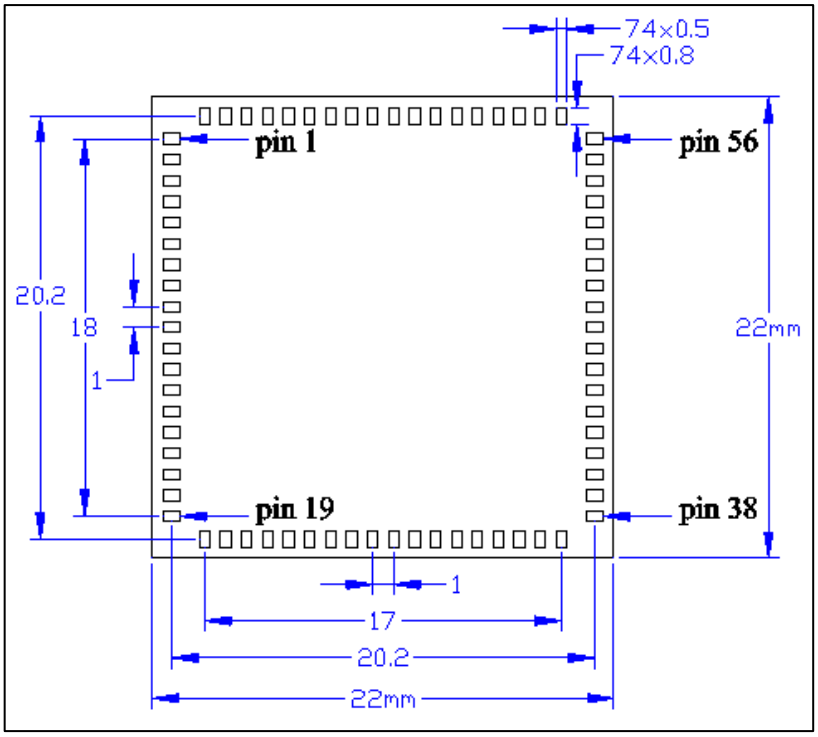
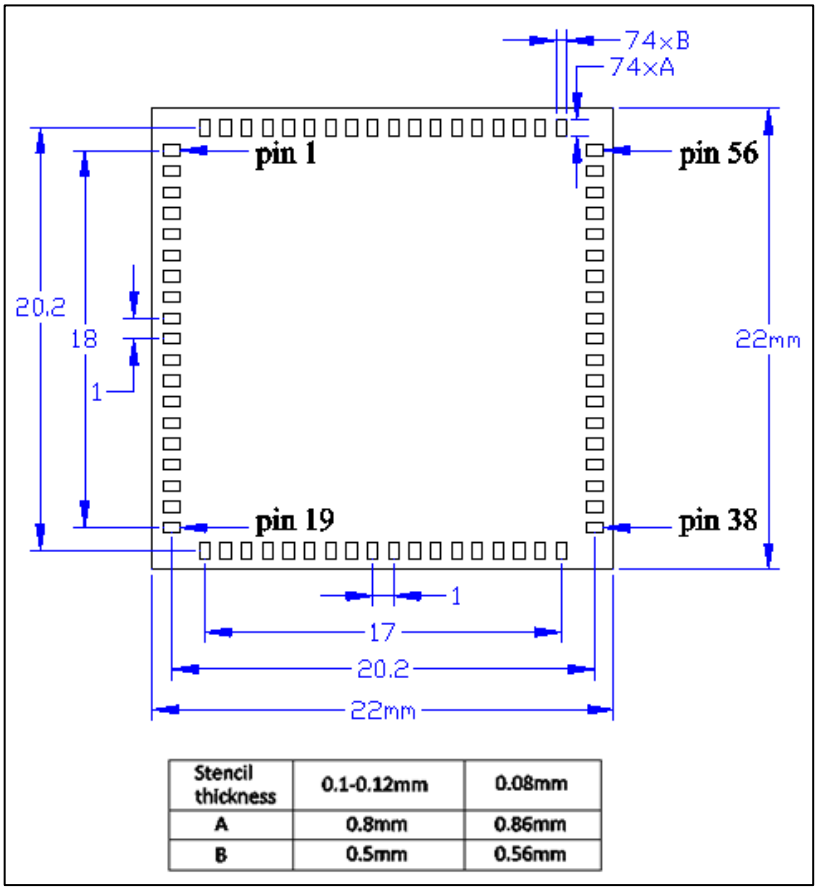


Figure 5: Recommended land pattern dimensions



Stencil thickness	0.1-0.12mm	0.08mm
A	0.8mm	0.86mm
B	0.5mm	0.56mm

Figure 6: Recommended stencil design

5. Product handling

5.1 ESD precaution

RTK-22 modules are electrostatic sensitive devices. Handling the modules without proper ESD protection may result in severe damage to them. ESD protection must be implemented throughout the processing, handling and even when the modules are being returned for repair.

5.2 Packaging

The modules are sealed in a moisture barrier ESD bag with the appropriate units of desiccant and a humidity indicator card. It should not be opened until the modules are ready to be soldered onto the application.

5.2.1 Tape and reel packaging

5.2.2 Box packaging

5.3 Moisture sensitivity level

The moisture sensitivity level of the module is 3. After the sealed bag is opened, modules should be mounted within 168 hours at factory conditions of ≦ 30℃ and 60% RH or stored at ≦ 20% RH.

The modules require baking before mounting if above conditions are not met. If baking is required, the modules may be baked for:

a. 192 hours at 40℃ + 5℃ / -0℃ and < 5% RH
b. 24 hours at 125℃ + 5℃ / -0℃

5.4 Reflow soldering

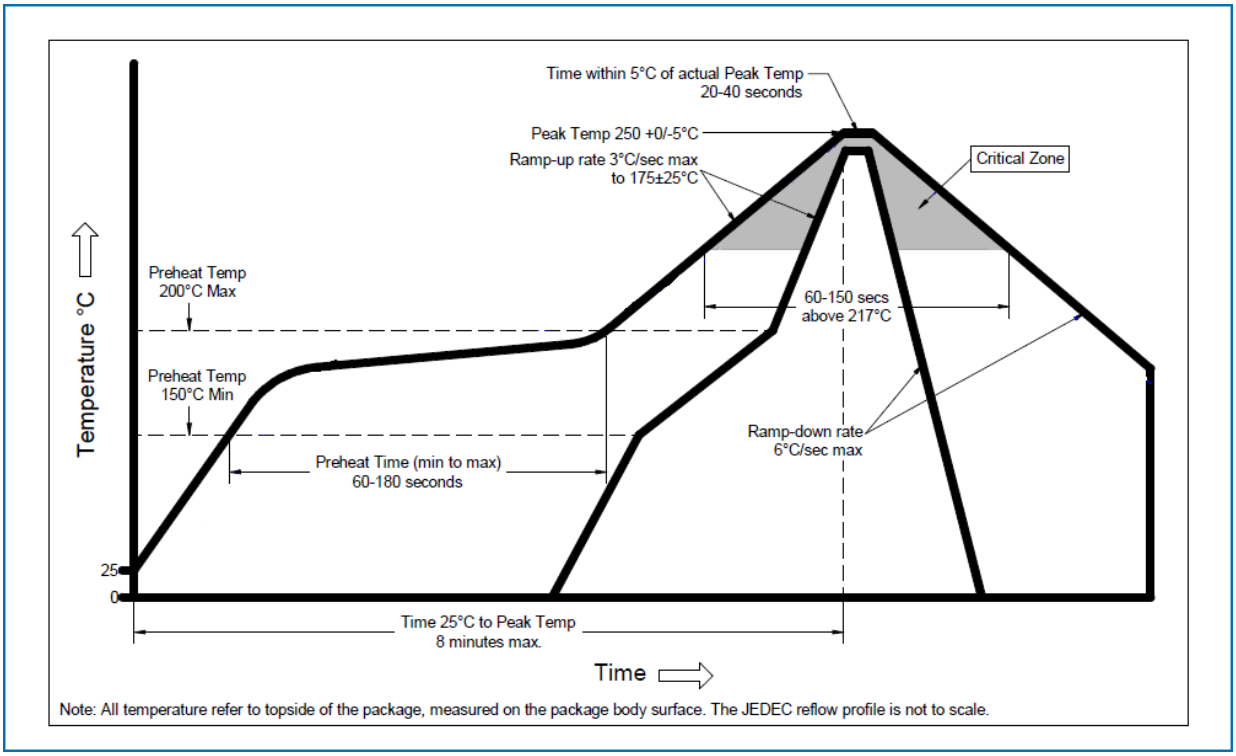


Figure 7: Recommended reflow profile

6. Product marking and ordering information

6.1. Product marking

The marking of RTK-22 is engraved on the metal shielding that has product information, such as LOCOSYS logo, product name, MAC address and manufacturing date.

6.2. Ordering information

Product name	Description	Remark
RTK-22	RTK algorithm module	

Note: RTK-22 supports both single and multi-frequency GNSS raw data modules. For example, single-frequency GNSS module ST-1612i-P and dual-frequency GNSS module MZ-1722-P from LOCOSYS.