ST802D

High Performance Dual-frequency GNSS Positioning Module

Manual

Aug. 2023

Revision History

Ver. NO.	Version	Date
V.1	New	Aug. 2023

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Catalogue

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1. Product Description

1.1 Overview

ST802D module, is a high-performance dual-frequency GNSS positioning module, based on the design of high-precision navigation positioning SOC chip. Support parallel reception of L1 (GPS L1, Beidou B1, Galileo E1, QZSS L1, GLONASS G1), L5 (GPS L5, Beidou B2A, Galileo E5, QZSS L5, IRNSS) frequency band of satellites' navigation signals, and can be multi-systems dual-frequency joint positioning. The internal unit of the module integrates power divider, filter, TCXO, RTC, frequency conversion channel, and digital baseband part, can provide low power consumption, small size and high performance positioning solutions for motorcycle and UAV cruise.

　・High integration, single chip receiver solution

・Standard NMEA0183 protocol

　・Integrated low noise amplifier, sound meter filter circuit

　・Built-in Power On Reset, no need for peripheral Reset circuit

ST802D of the compact size, with the adopt of SMT PAD, can support full automation integration of standard taking and placing and reflow welding, ROHS process, with low cost, high performance, low power consumption and other characteristics, can be widely used in portable equipment, such as PND, PAD, interphone and wearable device, outdoor GPS tracker, bicycle navigator, drones; Vehicle-mounted navigation equipment such as vehicle-mounted terminal, dashcam, OBD and traffic warning system and so on.

1.2 Key Indexes

Frequency	L1 frequency points of GPS L1, Beidou B1, Galileo E1, QZSS L1, GLONASS G1
	L5 frequency points of GPS L5, Beidou B2A, Galileo E5, QZSS L5, IRNSS

Refresh rate[1]	Default 1Hz, maximum 20Hz	
Sensitivity	Tracking	-163dBm
	Recapture	-159dBm
	Cold start	-148dBm
	Hot start	-159dBm
Positioning time[2]	Hot Start	1s typ @-130dBm
	A-GNSS auxiliary[3]	3s
	Cold start	28s typ @-130dBm
Horizontal positioning accuracy[4]	Autonomous positioning	3m
	Wide area difference	2.5 m
Speed measurement accuracy	0.1m /s	
Azimuth accuracy	0.5 degrees	
Height limit	>18,000 m	
Speed limit	> 515 m/s	
Acceleration limit	>4G	
Output Protocol	NMEA 0183	9600 bps, 8 data bits, no parity, 1 stop bits (default) 1Hz: GGA, GLL, GSA, GSV, RMC, VTG

1. Support SBAS and QZSS

2. Strength of all satellites -130dBm

3. Depending on data network speed and latency

4. CEP, 50%, 24 hours static, -130 dBm, > 6 SVs

2. Technical Specifications

2.1 Electrical Maximum

Parameters	Symbols	Minimum value	Maximum	Units
Module Supply Voltage (VCC)	Vcc	-0.3	3.6	V
Backup Battery voltage (VBAT)	Vbat	-0.3	3.6	V
Maximum acceptable ESD level	VESD(HBM)		2000	V
Storage temperature		- 40	+ 85	℃

2.2 Operating Conditions

Parameters	Symbols	Minimum value	Typical value	Maximum value	Units
Supply voltage	Vcc	2.8	3.3	3.6	V
Vcc peak current (except antenna)	Ipeak			60	mA
Capture phase average current			35		mA
Tracking phase average current			30		mA
Active antenna output voltage	VCC_RF		3.3		V
Antenna gain	Gant	15		30	dB
Operating temperature		- 40	25	+ 85	℃

2.3 Dimensions

Symbol	Min. (mm)	Typ. (mm)	Max. (mm)
A	15.9	16.0	16.6
B	12.1	12.2	12.3
C	2.2	2.4	2.6
D	0.9	1.0	1.3
E	1.0	1.1	1.2
F	2.9	3.0	3.1
G	0.9	1.0	1.3
H		0.82	
K	0.7	0.8	0.9
M	0.8	0.9	1.0
N	0.4	0.5	0.6
Weight		1.6g	
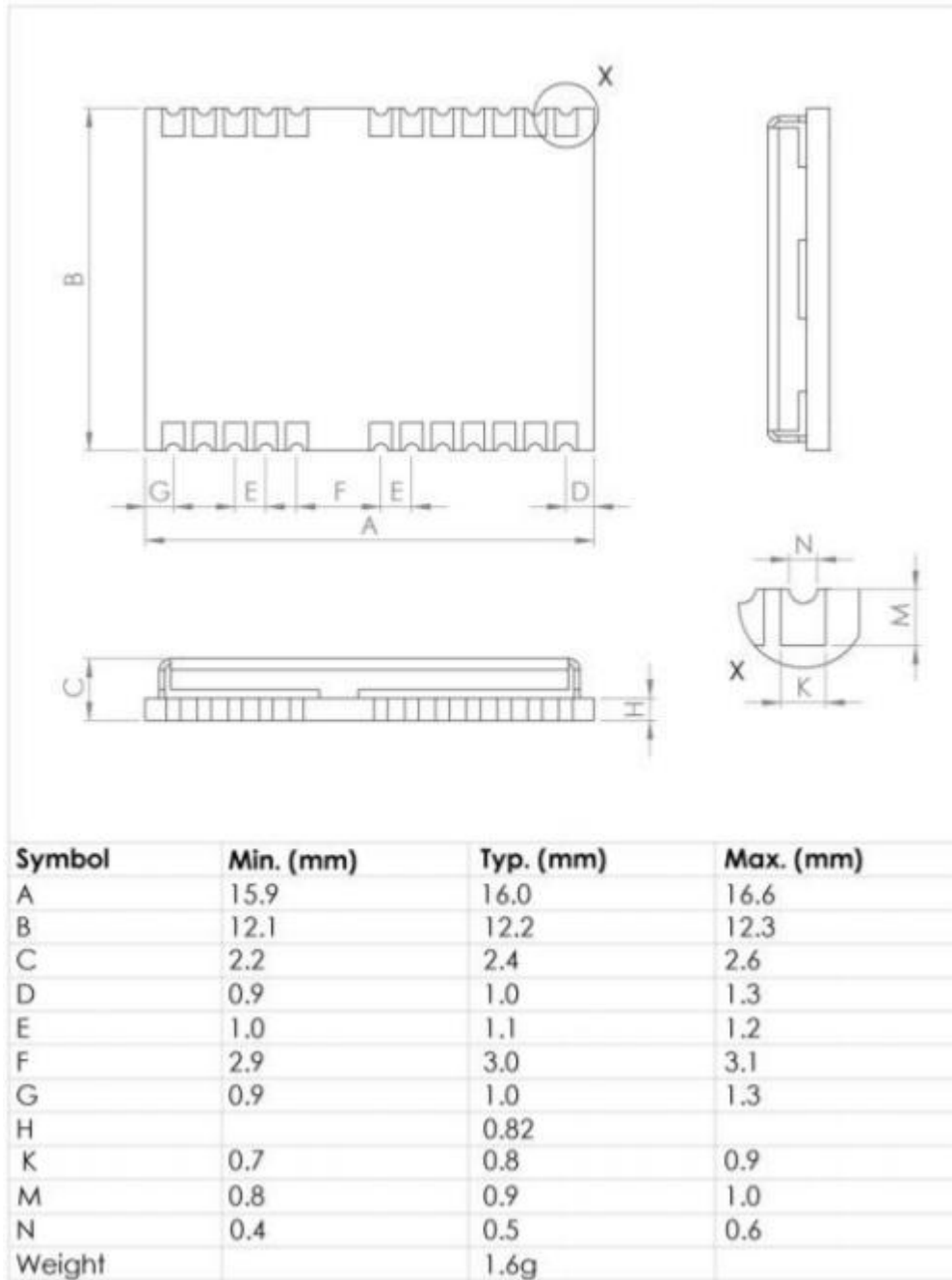
Table 2-1 Dimensions

2.4 Pins Descriptions
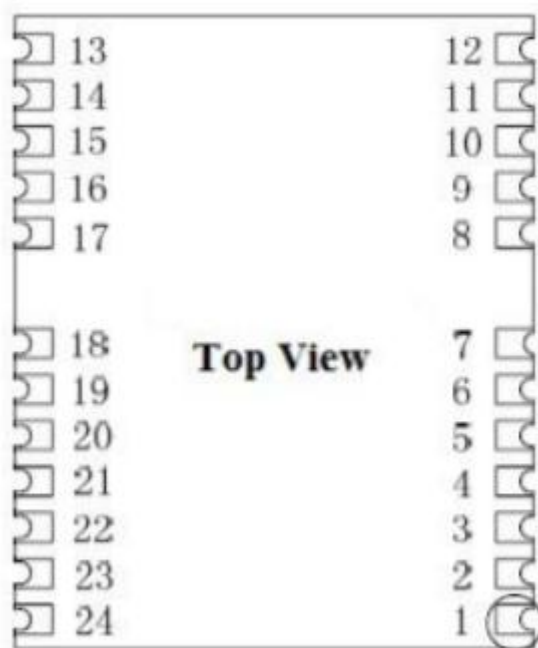
Figure 2-2 Pins Diagram

NO.	Name	I/O	Description	Electrical Characteristics
1	RST	I	Module reset input, active in low	Power-on self-reset, it is recommended to be unconnected
2	D_SEL		Reserved pins	Be unconnected
3	PPS	O	Second pulse	Time pulse(1PPS),TTL level
4	NC			Be unconnected
5	RXD1	I		UART1_RX
6	TXD1	O		UART1_TX
7	NC			Be unconnected
8	RSTN	I	Module reset input, active in low	Automatically resets after power-on, advised to be unconnected

| 9	VRF	I	RF power output	Active antenna power supply: 3.3V
10	GND	G	Ground	
11	RF_IN	I	Antenna signal input	Pay attention to ESD protection
12	GND	G	Ground	
13	GND	G	Ground	
14	NC		Reserved pins	Be unconnected
15	NC		NC	Be unconnected
16	NC		Reserved pins	Be unconnected
17	NC		Reserved pins	Be unconnected
18	I2C_SDA		I2C Data interaction	I2C_SDA
19	I2C_SCL		I2C clock	I2C_SCL
20	TXD0	O	Navigation data output	NMEA0183 protocol, TTL level
21	RXD0	I	Interactive command input	Configure command input, TTL level
22	VRTC	P	Backup power input	DC 2.0-3.3V
23	VCC	P	Module power input	DC 3.3V
24	GND	G	Ground	

2.5 PCB Dimensions
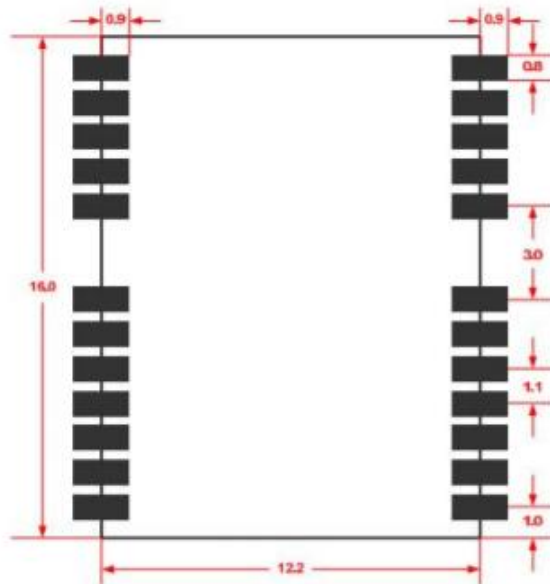
Figure 2-3 Recommended PCB Dimensions (unit: mm)

3. Hardware Design

3.1 Design Considerations

To make ST802D module work normally, the following signals need to be correctly connected:

- ✓ Provide a reliable power supply to the VCC pins.
- ✓ Ground all GND pins of the module.
- ✓ VBAT can be connected to farad capacitor or micro battery to ensure that it can provide a current greater than 100 mA, a voltage greater than 2 volts, and can last for at least 2 hours.
- ✓ Connect the RF_IN signal to the antenna and maintain 50ohm impedance match.
- ✓ Ensure serial port 1 is connected to a PC or an external processor. User can receive the location data, or upgrade software through this serial port.

To obtain good performance, should also pay special attention to the following:
- ✓ Power supply: Good performance needs stable and low ripple power supply to ensure. The difference voltage ripple peaks between the Max. and the Min. should not exceed 50mV.
  - – Use LDO to ensure pure power supply
  - – Place the LDO as close to the module as possible
  - – Widen the power cables or use a split copper surface to transmit current
  - – Do not route power cables through high-power and high-inductive devices such as magnetic coils
- ✓ UART interface: Ensure the main device and the pin signals and baud rates of the ST802D module are consistent
- ✓ Antenna interface: the antenna line should pay attention to impedance matching, as short and smooth as possible, and avoid going at acute angles
- ✓ Antenna position: To ensure a good signal-to-noise ratio, ensure that the antenna has a good isolation from the electromagnetic radiation source, especially the electromagnetic radiation in the 1559 ~ 1620MHz band
- ✓ Try to avoid running the wire directly below the ST802D
- ✓ This module is a temperature sensitive equipment, the drastic change of temperature

will lead to its performance degradation, try to stay away from high temperature airflow and high power heater

3.2 Module Reset Signal

After power-on, ST802D module needs to be reset correctly to work normally, and the chip provides self-reset function. In order to ensure effective reset, the following timing sequence requirements must be met between the reset pin nRESET of the module and the power supply VCC during power-on. During the normal operation of the module, lowering the nRESET pin for more than 5ms can also reset the ST802D.
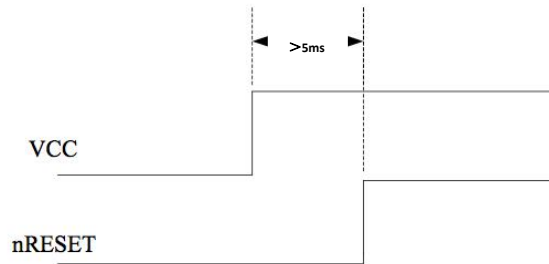
Figure 3-1 Module Reset Signal

3.3 Active Antenna Scheme

Adopt + 3/3.3V power supply an active antenna, use VCC_RF to power the antenna.
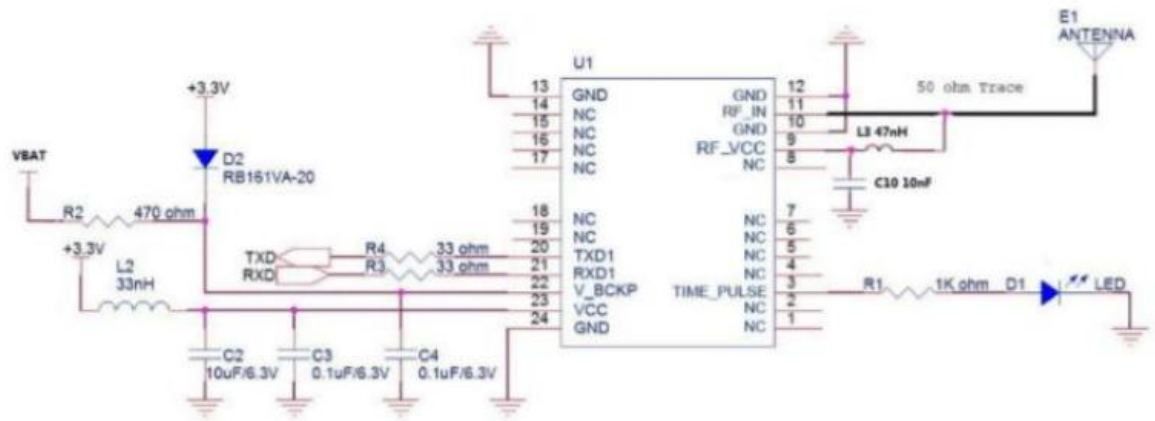
A minimal design

Figure 3-2   +3/3.3V Active Antenna Scheme

Note: 1. The above supply power for active antennas and are compatible with the antenna detection function
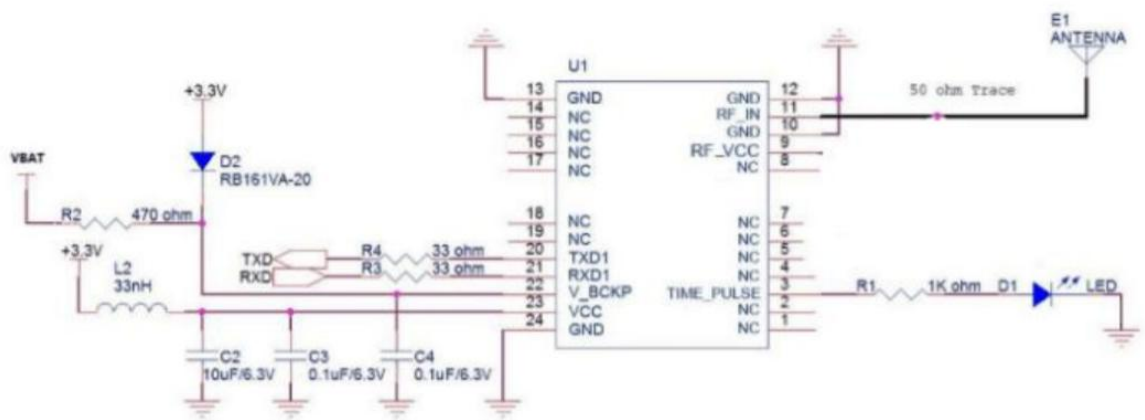
3.4 Passive Antenna Scheme

Figure 3-4 Passive Antenna Scheme

4. Processing Requirements

4.1 Humidity Control

The module belongs to MSL level 4. After unpacking the plastic sealing, it must be baked and dried before welding. The baking temperature should not exceed 80 degrees Celsius and the time should not be less than 4Hr.

4.2 Requirements for Reflow Soldering

| Preheating phase	Up rate of temperature	Less than 3 ° C /s
	End temperature of preheat	150-160 ° C
Constant temperature phase	Up rate of temperature	(150℃-183℃ range) less than 0.3℃/s;
	Up rate of temperature	(183℃-217℃ range) less than 3.5℃/s
	Constant temperature time	60 – 120 seconds
	End temperature of constant temperature	217℃
Molten tin phase	Tin melting time	40-60 seconds
	Peak temperature	245℃
Cooling phase	Drop rate of temperature	Not higher than 4℃/s
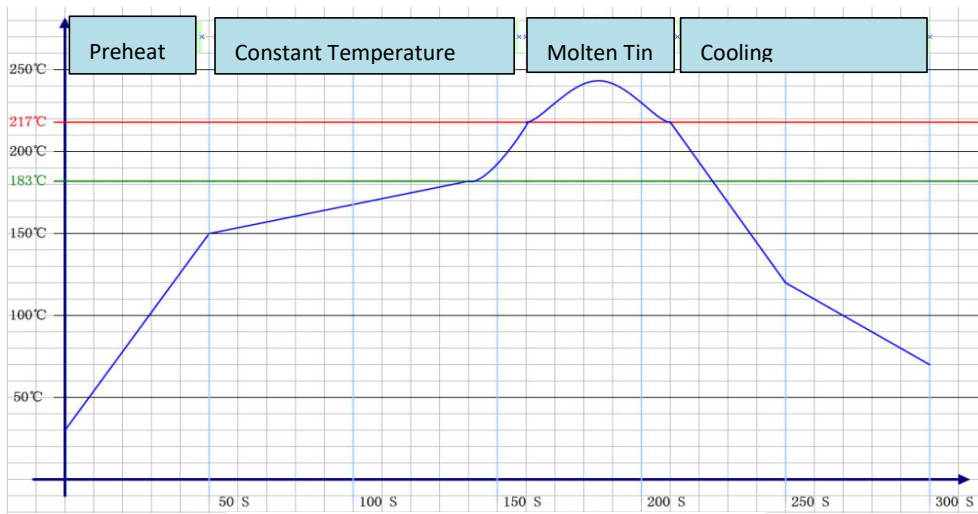
Figure 4-1 Reflow temperature curve

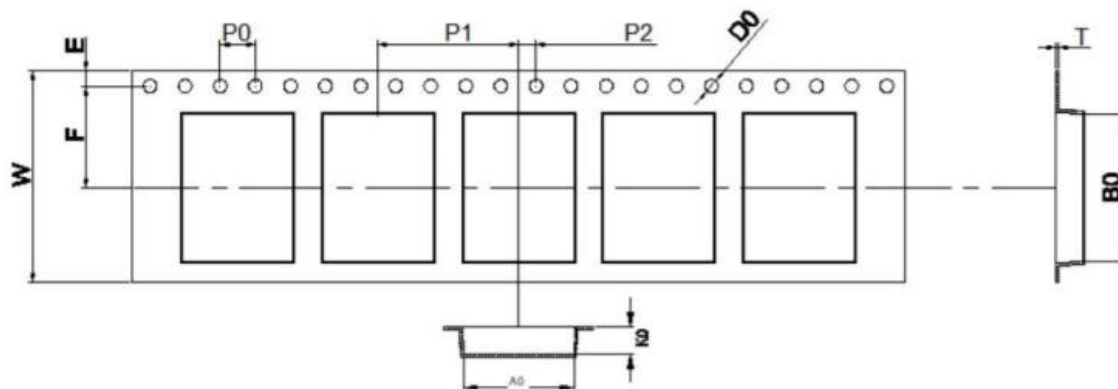Focus on Precise Space-time, Assist in Smart Service Worldwide

5. Package and Transportation

5.1 Packaging Dimensions

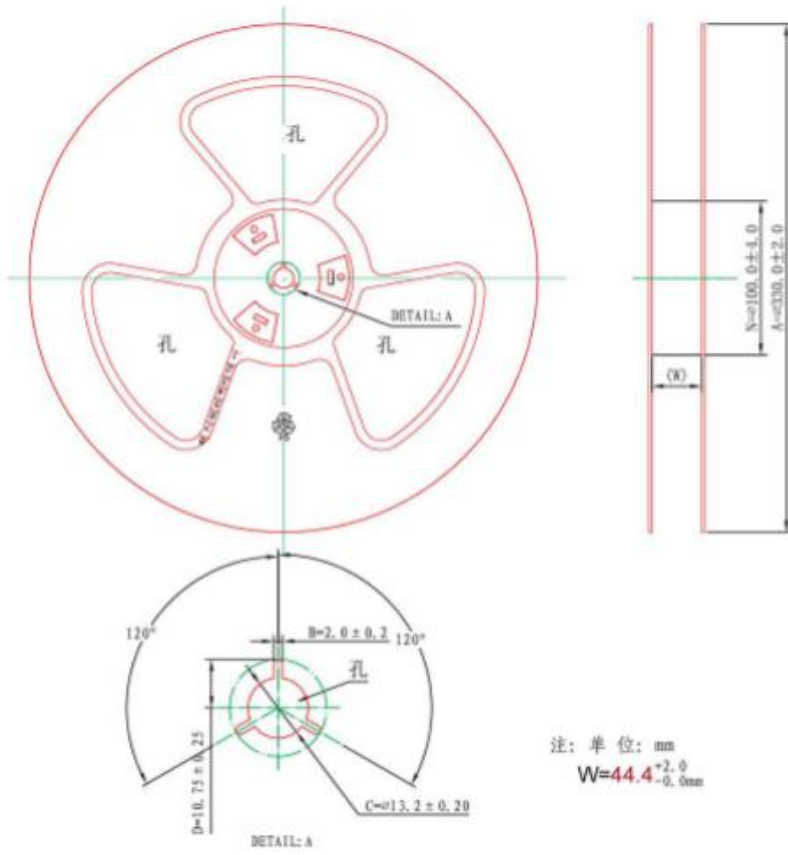The module is mounted on a reel, and the MPQ of 1 inner packing box is 1K;

1 outer packing box contains 3 inner packing boxes, and the MOQ quantity is 3K.

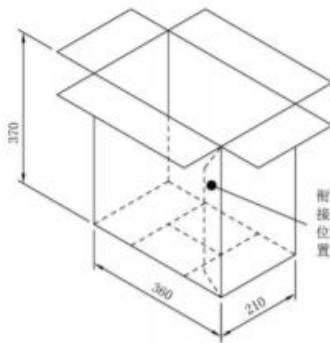The carrier tape/ reel, sizes are as below:

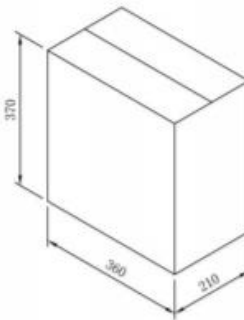| D	1.50±0.10	W	24.00±0.30
A	12.60±0.10	E	1.75±0.10
B	16.80±0.10	F	11.50±0.10
K	3.10±0.10	P	4.00±0.10
T	0.30±0.05	P	16.0±0.10
		P	2.00±0.10

The carrier dimensions are as follows:

The outer box dimensions are as follows:

Before Packing   After Packing

5.2 ESD requirements

The module is electrostatic sensitive. The RF circuit on the module contains electrostatic sensitive components. Pay attention to ESD protection during welding, installation, and transportation. Do not touch the RF_IN or other pins with bare hands in case the module damaged.

6. Ordering Information

Model NO.	Description	Default frequency	Low Noise Amplifier	filter	Dimensions
ST802D	GNSS	GPS+BEIDOU	low	low	16 * 12

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