RTK-GT-U16

Dual-frequency RTK-centimeter positioning

module supports GPS/BDS/GA/Module at the same time

AUG,
2022

GNSS Positioning Module Data Sheet

Revision History

Version number revision record		Date
Ver1.00 Initial establishment		August 2022 March
Ver1.01 Added schematic description and application guidance		2023

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GT-U16

Module

Data Sheet v1.01

1. Product Description

Product Name: GT-U16 GT-U16

is a self-developed new generation BDS/GPS/GLONASS/Galileo/QZSS full system dual-frequency high-precision RTK positioning module, which can simultaneously detect GalileoE1/E5a, QZSSL1/L5 and other signal frequencies. Tracking BDS B1I/B1C*/B2a/B2b* GLONASSL1 RF baseband and high-precision algorithm integrated GNSS SOC chip, GPS L1/L5 built-in high-performance CPU, integrated double-precision floating-point processor and RTK dedicated coprocessor, using 22nm low-power process, can achieve 10HZ RTK positioning result output, providing more powerful satellite navigation signal processing capabilities. The module supports UART communication interface, can meet the user's use needs in different scenarios, has a full range of functions, and can meet the strict requirements of professional positioning. It is small in size and can be installed anywhere inside the car. It has low power consumption and can meet the needs of individual users.

Module appearance:

2. Product Application

ÿThe module is compact in size of 16.0X12.2X2.4mm and uses SMT pads

ÿTrajectory tracking products such as personal positioning and vehicle positioning

ÿSurveying and mapping products such as area measurement and distance measurement

ÿApplicable to smart logistics

ÿSmart security

ÿAutomatic driving of agricultural machinery

ÿIntelligent robots

ÿFlight control flight formation

ÿLandslide /deformation monitoring

工业级	System Interface										Data update rate
	GPS	BDS	GLONASS	Galileo	QZSS	SBAS	UART0	UART1	I2C	SPI	
●	●	●	●	●	●	●	●	●	●	●	1Hz~10Hz

3. Product advantages

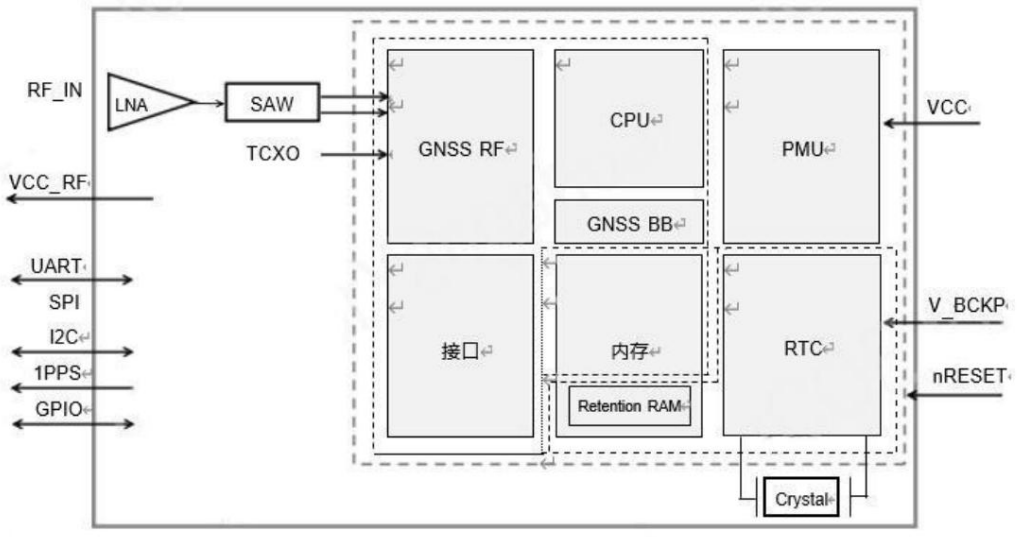
- 支持全系统双频点片上 RTK定位解算，定位精度可达lcm+1ppm (CEP)
- RTK更新速率最高可达 10HZ
- 支持 BDS B1I/B1C*/B2a/B2b*、 GPS LI/L5、 GLONASS L1、 Galileo EI/E5a、 QZSSL1/L5 等频点
- 超低功耗，双频 RTK跟踪功耗低至 100mw
- 卫星各频点独立跟踪及 60dB 窄带抗干扰技术
- 16.0x12.2x2.4mm 表面贴装

4. Technical characteristics

GNSS 性能					
卫星系统及频点	BDS :BII ,B1C*,B2a, B2b* GPS:L1C/A ,L5 GLONASS: L1 Galileo :EI,E5a QZSS: L1, L5				
灵敏度		GNSS			
	冷启动	-148dBm			
	热启动	-155dBm			
	重捕获	-155dBm			
	跟踪	-164dBm			
定位精度	水平定位精度	1.0mcEP (双频四系统，开阔天空)			
B1I/B1C*/L1C/A/E1/G1伪距	30cm	30cm	50cm	30cm	
B1I/B1C*/L1C/A/E1/G1载波相位	2mm	2mm	2mm	2mm	
B2a/L5/E5a伪距	10cm	10cm		10cm	
B2a/L5/E5a 载波相位	2mm	2mm		2mm	
测速精度	1m/s				
首次定位时间	冷启动: 24S 热启动: 1s 重捕获: 1s				
初始化时间	<5s (典型值)				
初始化可靠性	> 99.9%				
数据更新率	1HZ~10HZ				

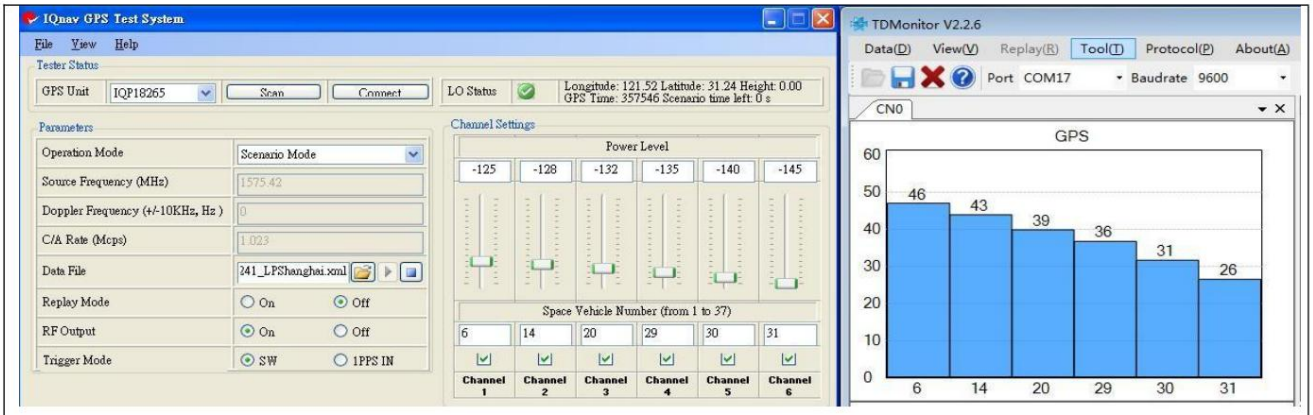
电源	
输入电压	+2.7V~3.6VDC
功耗	100mw (四系统双频-捕获) 100mw (四系统双频-跟踪)
射频输入	
输入增益	15dB~30dB
输入阻抗	50Ω
输入功率 (最大值)	10dBm
物理特性	
尺寸	16.0mm×12.2mm×2.4mm
环境指标	
工作温度	-40 ℃~+85℃
存储温度	-40℃~+85℃
湿度	5%~95% 非凝露
振动	GB2423.10
冲击	GB2423.5

5. Module working principle



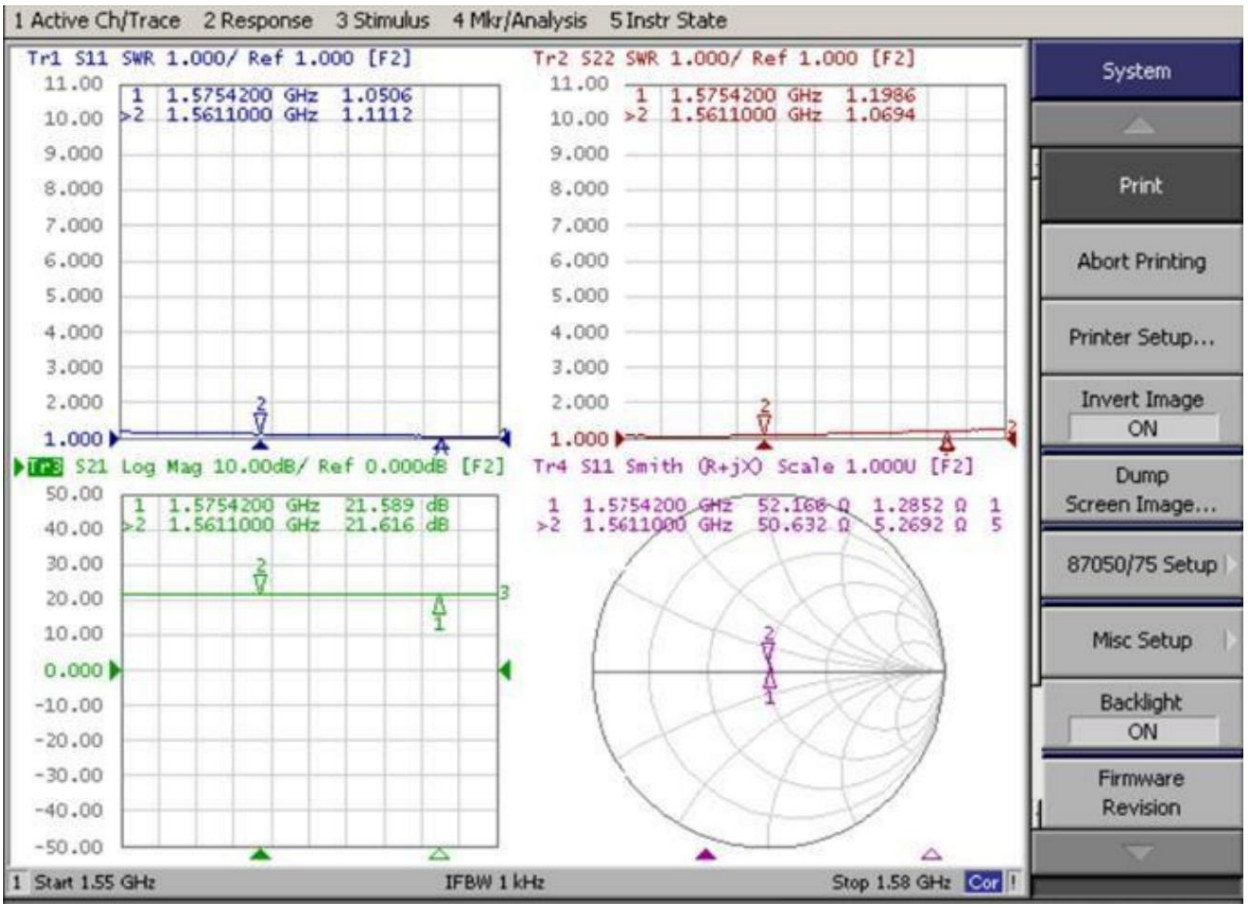
6.Module signal test diagram and module RF radio frequency diagram

6.1 Conduction test:

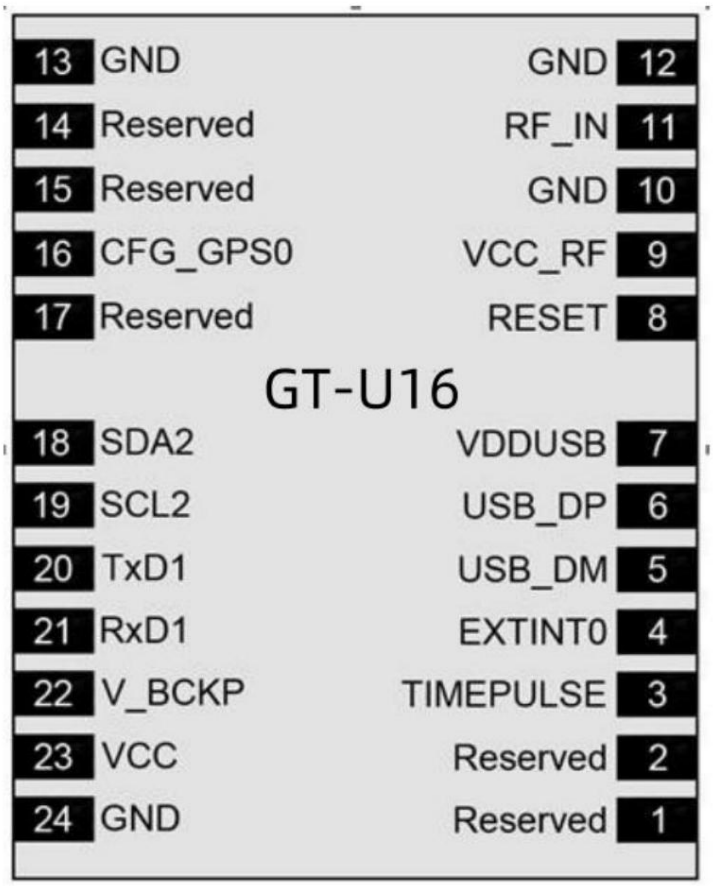


Signal Generator CNR	-125	-128	-132	-135	-140	-145
Tester GT-U16	46	43	39	36	31	26

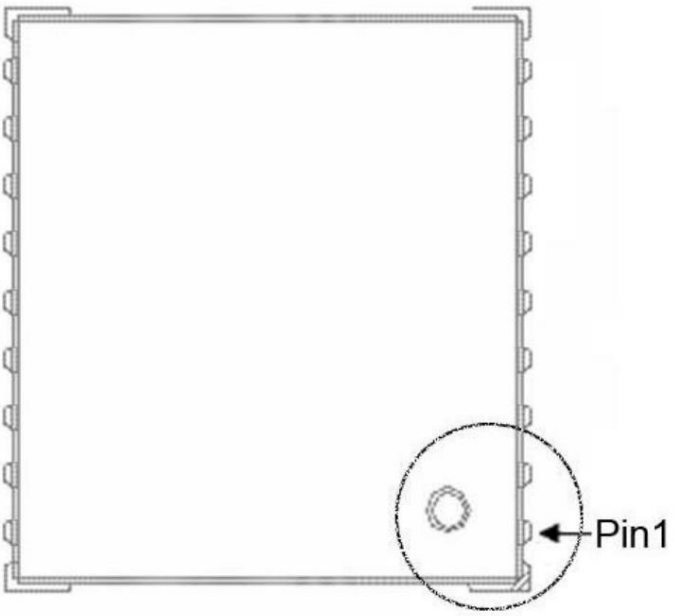
6.2Module RF properties:



7. Module pin assignment

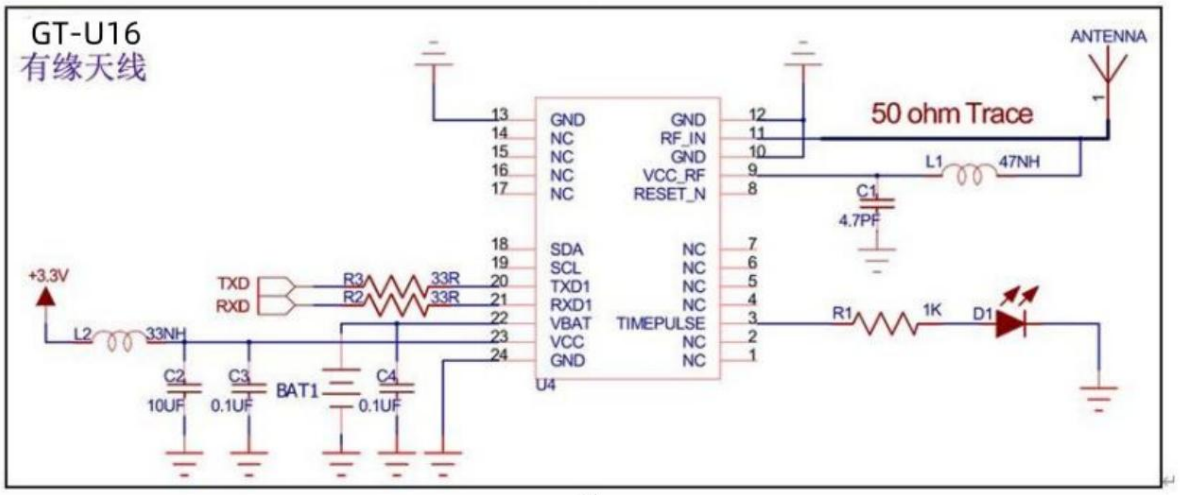


Top view



Pin No.	Pin name	I/O	Description	Remark
1	Reserved		Dangling	
2	Reserved		Dangling	
3	TIMEPULSE	THE		Second pulse output
4	Reserved		Dangling	
5	Reserved		Dangling	
6	Reserved		Dangling	
7	NC			
8	RESET_N	'	Leave it unused when not in use	Module reset input, low level is effective
9	VCC_RF	THE		Active antenna power output
10	GND	'		land
11	RFIN	'		Antenna signal input
12	GND	'		land
13	GND	'		land
14	NC			
15	NC			
16	NC			
17	NC			
18	SDA	I/O	Dangling	I2C Data Interface
19	SCL	THE	Dangling	I2C Clock Interface
20	TXD1	THE	NMEA0183 Protocol	Navigation data output
21	RXD1	'	Configuration command input	Interactive command input
22	VBAT	'	Provide +1.8~+3.3V power supply to ensure GPS hot start	RTC and SRAM backup power
23	VCC	'	DC 3.3V±10%, 200mA module power input	
24	GND	'		land

8. Recommended application circuit



9. Module design considerations

In order for the GT-U16 module to work properly, the following signals need to be connected correctly:

ÿ Provide reliable power supply to VCC pin.

ÿConnect all GND pins of the module to ground.

ÿConnect the RF_IN signal to the antenna, and keep the line impedance matching at 50 ohms. ÿEnsure that serial port 1 is connected to the PC or external processor. Users can use this serial port to receive positioning information data. (Software upgrades also need to be performed through this serial port)

In order to obtain good performance, special attention should be paid to the following items in the design:

ÿPower supply: Good performance requires a stable and low ripple power supply. The peak-to-peak voltage ripple should not exceed 50mV.

– Use LDO to ensure pure power supply

– Place the LDO as close to the module as possible in layout

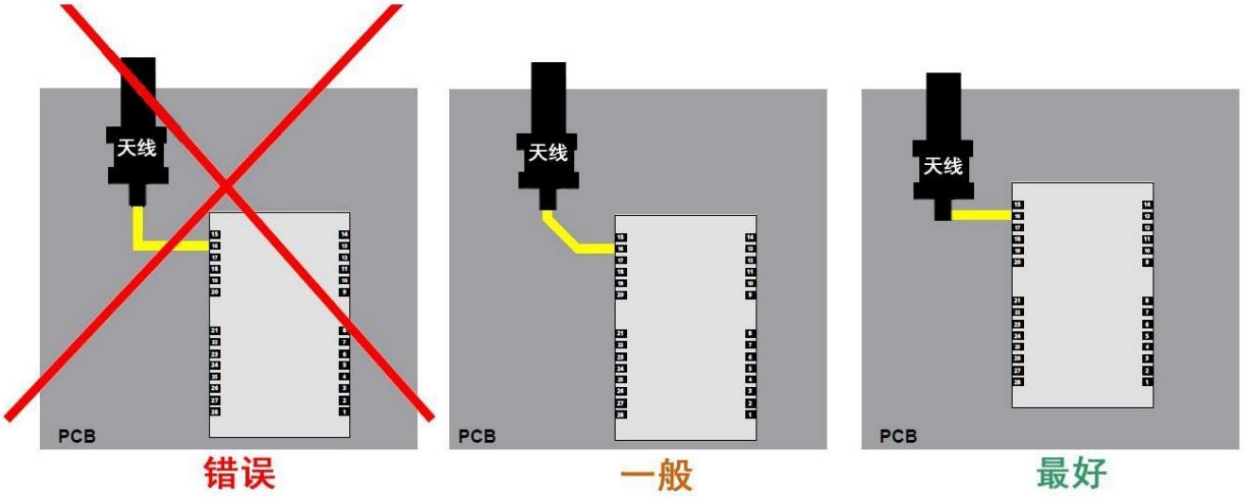
– Widen the power supply line or use split copper surface to transmit current

– Avoid routing power lines through high-power and high-inductance devices such as magnetic coils

ÿ UART interface: ensure that the pin signal and baud rate of the host device and GT-U16 module correspond to each other

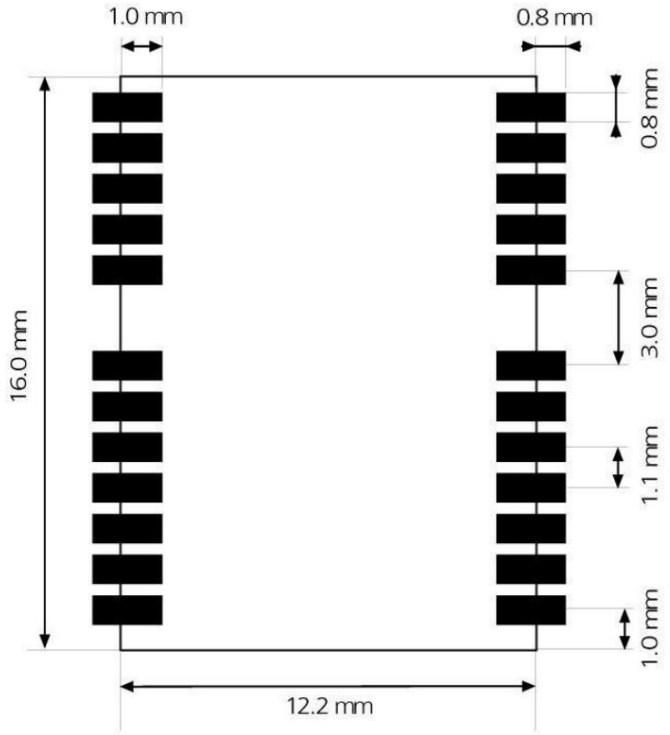
ÿAntenna interface: Pay attention to impedance matching of the antenna line, keep it as short and smooth as possible, and avoid sharp corners. ÿAntenna position: In order to ensure a good signal-to-noise ratio, ensure that the antenna is well isolated from the electromagnetic radiation source. Especially electromagnetic radiation in the frequency band of 1559ÿ1620MHz

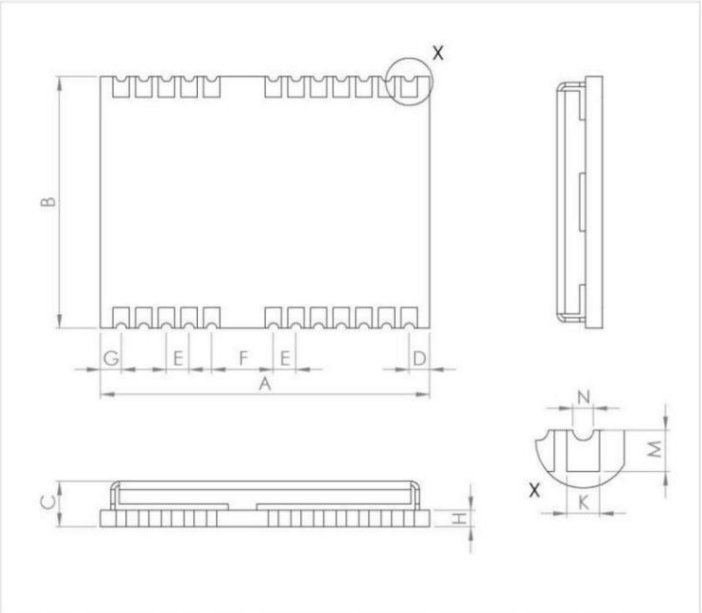
ÿTry to avoid routing the wires directly under the GT-U16 module ÿThis module is a temperature-sensitive device. Rapid temperature changes will cause its performance to degrade. Try to keep it away from high-temperature airflow and high-power heaters during use.



错误　一般　最好

10.Module pad size





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	

11. Common parameter setting instructions

11.1 Set the serial port communication

baud rate Type			
Input format $PCAS01,br*CS<CR><LF> Example			
$PCAS01,1*1D			
Parameter Description			
Field name format			Parameter
1 $PCAS01 string			Description Message
2 br		number	ID, sentence header Baud rate configuration: 0=4800bps 1=9600bps 2=19200bps 3=38400bps 4=57600bps 5=115200bps
3 CS		Hexadecimal checksum, XOR result of all characters between $ and * (excluding $ and *)	
4 <CR><LF>		character	Carriage return and line feed

11.2 Set the positioning

update rate type			
Input format $PCAS02,fixInt*CS<CR><LF> Example			
$PCAS02,1000*2E			
Parameter			
Field name format			Description
1 $PCAS02 string			Parameter Description Message ID, statement header
2	fixedInt	Numeric	Positioning update interval, in ms. 1000 = Update rate is 1Hz, outputting 1 positioning point per second 500 = Update rate is 2 Hz, 2 positioning points are output per second 250 = Update rate is 4 Hz, 4 positioning points are output per second 200 = Update rate is 5 Hz, 5 positioning points are output per second 100 = Update rate is 10 Hz, outputting 10 positioning points per second
3 CS		Hexadecimal checksum, XOR result of all characters between $ and * (excluding $ and *)	
4 <CR><LF> characters			Carriage return and line feed

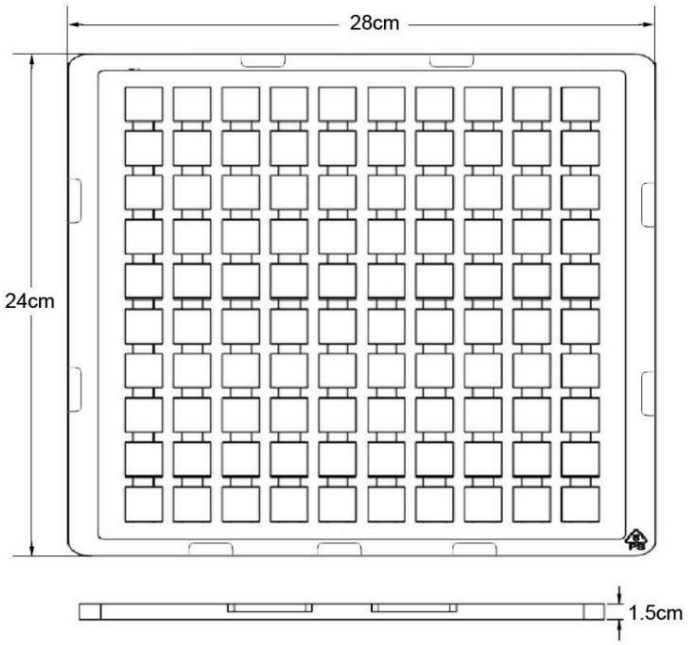
12.Module label description

Barcode: 19G0901545 (Note: The label is optional.) 19 is
2019, G09 is the month, and 01545 is the rolling barcode

The QR code is: GT-U16-19G0901545

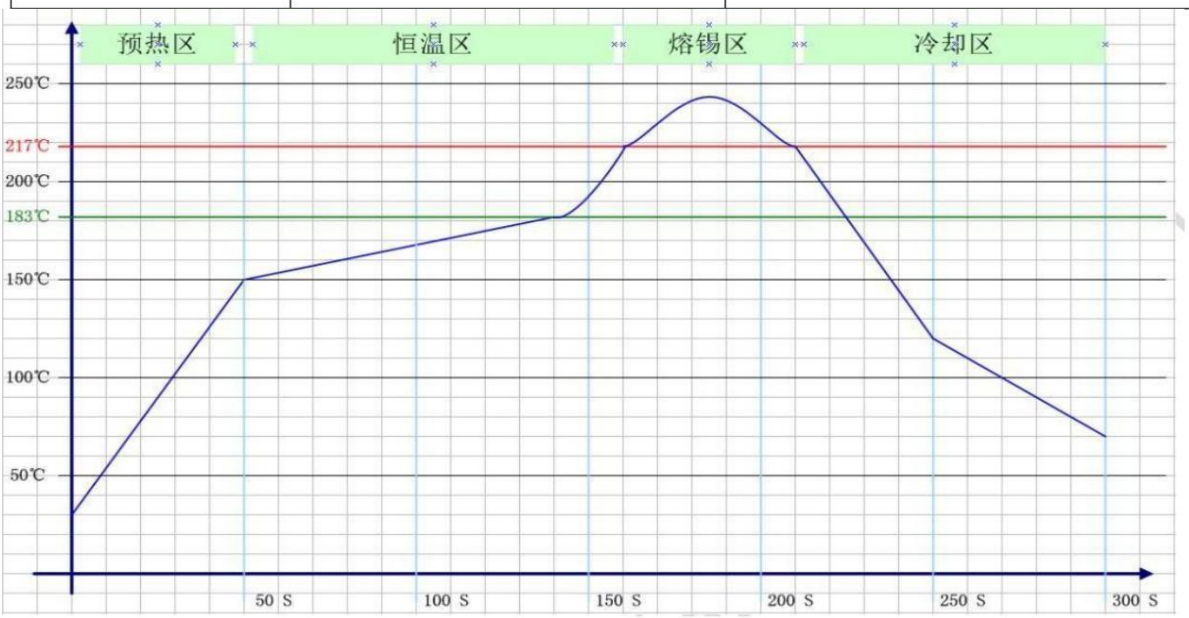
13. Packaging instructions

Pallet packaging: 100pcs per pallet,



14. SMT temperature curve

Warm-up phase	Temperature rise rate	Less than 3ÿ/s
	Preheating end temperature	150 - 160ÿ
Constant temperature stage	Temperature rise rate	(150ÿ-183ÿ range) less than 0.3ÿ/s;
	Temperature rise rate	(183ÿ-217ÿ range) less than 3.5ÿ/s
	Constant temperature time	60 – 120 seconds
	Constant temperature end temperature	217°C
Tin melting stage	Tin melting time	40-60 seconds
	Peak temperature	245°C
Cooling phase	Temperature drop rate	No higher than 4°C/s



15. Anti-static requirements

The module is an electrostatically sensitive product. The RF circuit on the module contains electrostatically sensitive components. Please pay attention to it during welding, installation and transportation.

For electrostatic protection, please do not touch the RF_IN pin directly with your bare hands, otherwise it may cause damage to the module

ESD CAUTION