TX-26-GNF GNSS Module User Manual

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contents

1. Product Description

Product Name:TX-26-GNF multi-modepositioning module

The TX-26-GNF GNSS module is an ultra-low power, ultra-high sensitivity, ultra-small receiving module that supports the four global navigation systems of GPS, GLONASS, BeiDou, and Galileo, and also supports auxiliary DGPS satellites such as SBAS and QZSS. The product adopts the eighth-generation UBX-M8030 chip design, with built-in LNA+ SAW+FLASH, which can perfectly meet the needs of positioning, tracking, navigation and other applications. It is especially suitable for high-frequency flight control aircraft models, drones, four-six-axis, and multi-rotor aircraft. It can also be widely used in car DVDs, PNDs , DVRs, portable devices, measuring equipment, personnel positioning management, tracking and speed measurement equipment, timing equipment, pet tracking, school care management cards, vehicle delivery tracking and positioning, taxi tracking and positioning, company vehicle tracking and positioning, logistics vehicle tracking and positioning, automobile fault detection, automobile oil detection, automobile Internet of Things, excavator positioning and other products.

Module Appearance

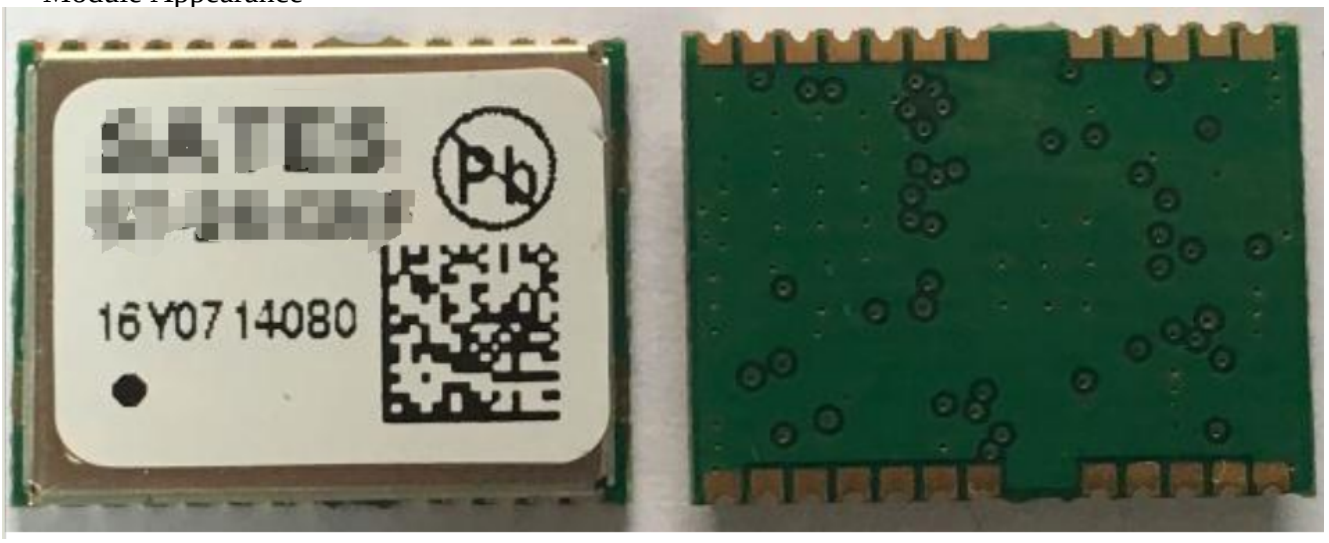


Figure 1: TX-26-GNF Top View

Figure 2: TX-26-GNF Bottom view

2. Product application range

Typical application

- Personal positioning and car navigation, positioning and other track tracking products PDA, Pocket PC and other portable devices
- Surveying and mapping products such as area measurement and distance measurement
- Synchrotron UTC time and timing
- Track recording and GPS data point calibration
- Electronic dog, student care card and other products

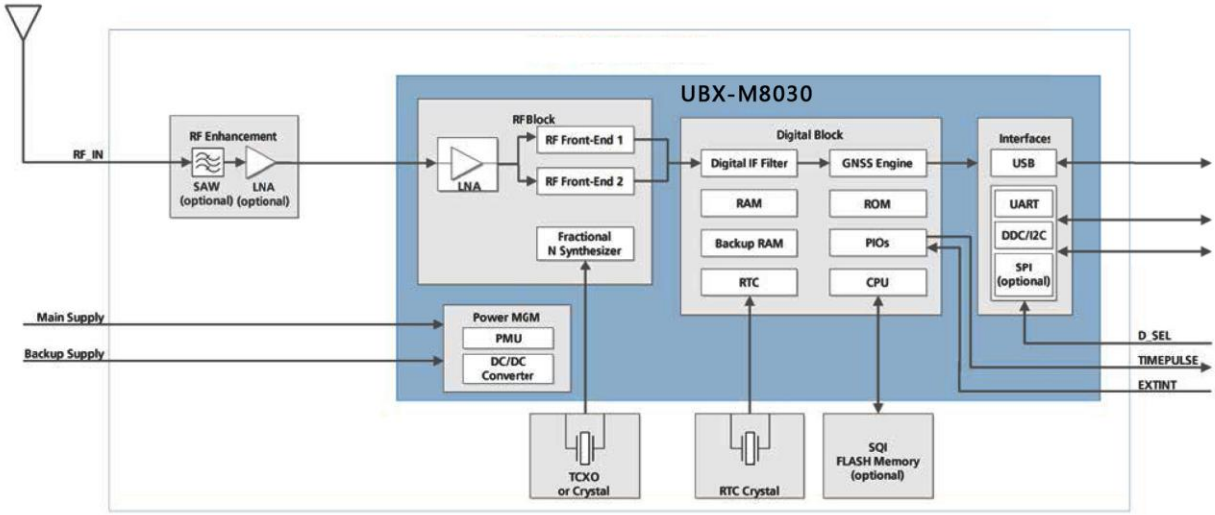
Product Benefits

- Single-sided surface mount, secondary SMT solution, faster application
- Made with lead-free process, compliant with RoHS standards
- UART/TTL, USB2.0 optional output
- Using KDS 0.5PPM high-precision TCXO
- Rich data output rate: 9600bps (default) [optional: 1200, 2400, 4800, 19200, 38400, 57600, 115 200, 230400, 460800, 921600]
- Can set output statements arbitrarily: NMEA 0183 V3.0 (GGA, GSA, GSV, RMC, VTG, GLL)
- Built-in RTC crystal
- Built-in LNA+SAW+FLASH, can save configuration instructions in memory, power off withou t loss
- Support adjustable data refresh rate: 1Hz-10Hz
- Satellite quality control: rich settings for satellite quality control and anti-floating software setti ngs
- Application scenarios: users can freely set from walking mode-vehicle mode-static mode-portab le mode-airborne mode and 2D&3D positioning
- Support positioning PPS indicator: always on or off before positioning; flashing after positionin g
- Support A-GPS services such as AssistNow Online and AssistNow Offline
- GPS, GLONASS, BeiDou, GALILEO, SBAS (WAAS, EGNOS, MSAS, GAGAN) hybrid engi ne

3. Technical characteristics

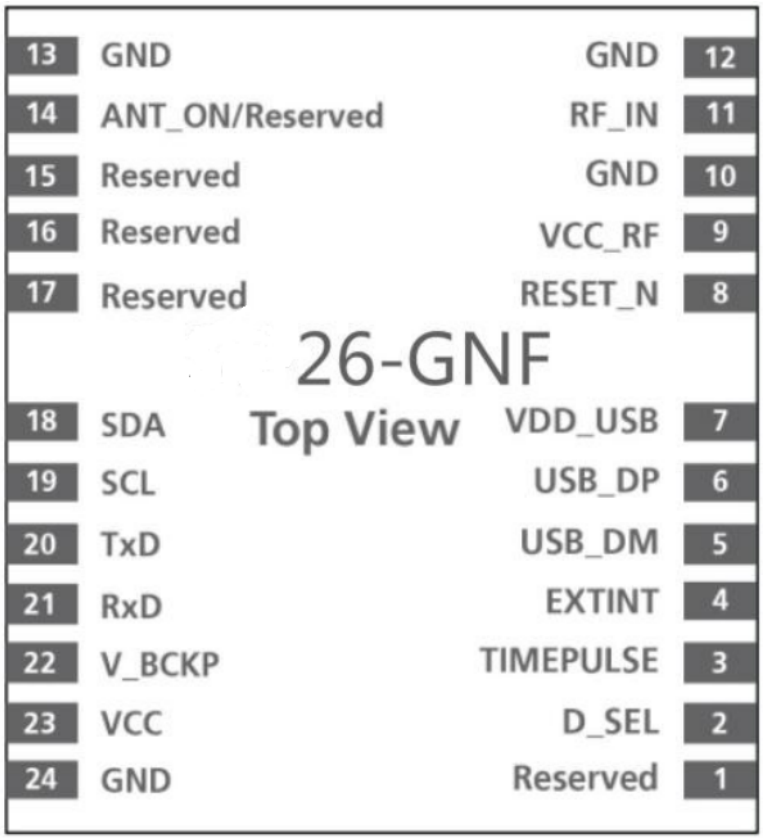
Module performance	
Chip	ublox UBX-M8030
frequancy	GPS/L1, 1575.42MHz;BeiDou/B1: 1561.098±2.046MHz,Gl onass/L1=1602+0.5625 MHZ Galileo/G1=1561.098±2.046MHz
protocol	NMEA 0183 v2.3 UBXPrivate Protocol
Available serial transfer rates	1200,4800,9600,19200,38400,57600,112500 bp
aisle	72
Internal ROM	3Mbit of ROM and 2Mbit of RAM,8M SPI Flash
Sensitivity	Tracking: -167dBm Capture: -160dBm Cold start -148dBm
Cold boot	Average 26 seconds
Warm start	Average 10 seconds
Hot boot	Average 1 seconds
Accuracy	HorizontalPosition:Autonomous<2.5maverage, SBAS < 2.0m average Velocity: 0.1 m/s Timepulse signal: RMS 30 ns
Maximum altitude	50000 meter
Maximum speed	515 m/s
Maximum acceleration	≦ 4G
Update frequency	1-10 Hz
A-GPS	AssistNow on-line and off-line
inteface	
I/O Pins	1 serial ports
Physical properties	
Type	24 pin stamp holes
Dimensions	16.0mm * 12.2 mm * 2.4mm
power supply	
power supply	3.3VDC ±5%
Backup voltage	1.8~3.6VDC
power consumption	Maximum performance: Capture: 34mA, Tracking (in power saving mode/1HZ): 10.5mA
Work Environment	
Humidity range	5% to 95% non-condensing
Operating temperature	-40℃ to 80℃
Storage temperature	-40℃ to 80℃

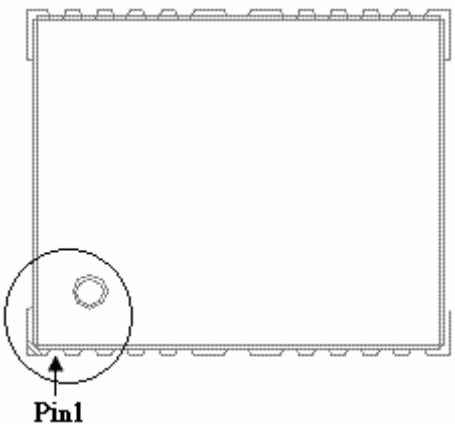
4. Module architecture diagram



6.Module pin assignment

6.1 Pin Diagram

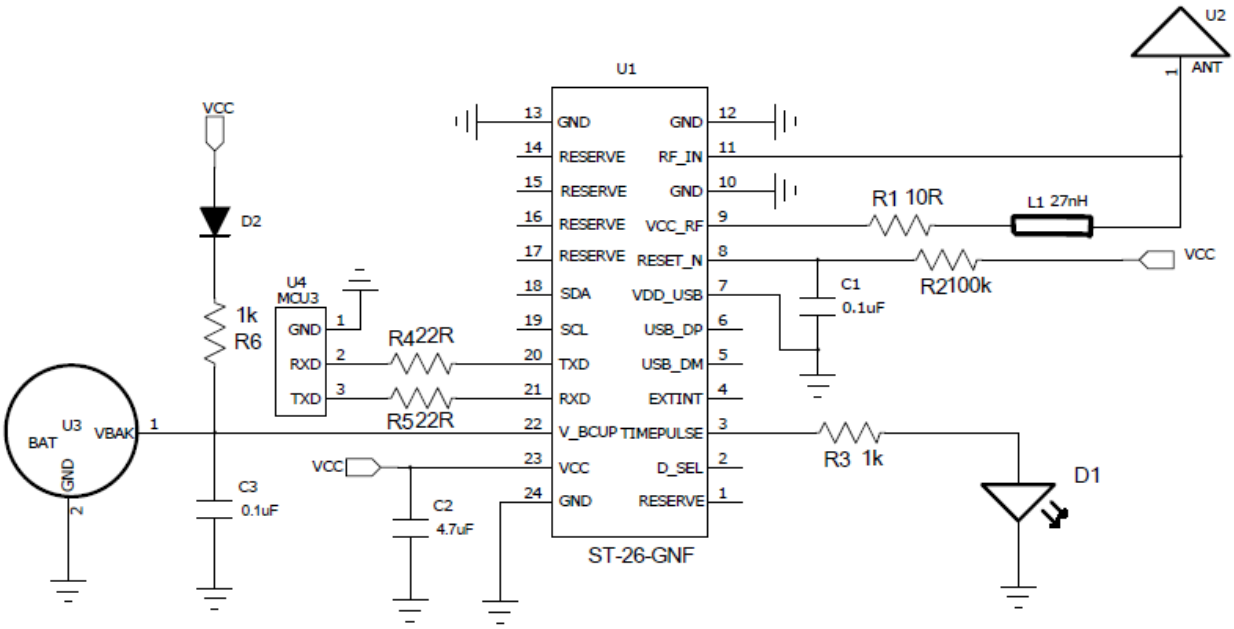




6.2 Pin Function Description

Pin NO.	Pin Name	I/O	Description	Remark
1	Reserved	I	Reserved	SAFEBOOT_N (for future service, updates and reconfiguration, leave OPEN)
2	D_SEL	I	SPI Select	Interface select ,Leave open if not used.
3	TIMEPULSE	O	Timepulse Signal	Configurable Timepulse signal (one pulse per second by default). Leave open if not used
4	EXTINT	I	External Interrupt	External Interrupt Pin. Internal pull-up resistor to VCC. Leave open if not used.
5	USB_DM	I/O	USB I/O line	USB2.0 bidirectional communication pin. Leave open if unused.
6	USB_DP	I/O	USB I/O line	Leave open if not used
7	VDD-USB	I	USB Power Supply	To use the USB interface connect this pin to 3.0 – 3.6 V. If no USB serial port used connect to GND.
8	RESET-N	I	Reserved	Leave open. Can be used as a RESET_N input.
9	VCC_RF	O	Output Voltage RF section	VCC_RF can also be used to power an external active antenna.
10	GND	I	Ground	Assure a good GND connection to all GND pins of the module, preferably with a large ground plane
11	RF_IN	I	GPS signal input from antenna	The connection to the antenna has to be routed on the PCB. Use a controlled impedance of 50 Ω to connect RF-IN to the antenna or the antenna connector..
12	GND	I	Ground	Assure a good GND connection to all GND pins of the module, preferably with a large ground plane
13	GND	I	Ground	Assure a good GND connection to all GND pins of the module, preferably with a large ground plane
14	Reserved	O	Reserved	Leave open
15	Reserved	-	Reserved	Leave open
16	Reserved	-	Config. Pin /SPI SCK	Leave open
17	Reserved	-	Reserved	Leave open
18	SDA	I/O	DDC Pins	DDC Data. Leave open, if not used.
19	SCL	I/O	DDC Pins	DDC Clock. Leave open, if not used.
20	TxD	O	Serial Port	Serial Port
21	RxD	I	Serial Port	Serial Port
22	V_BCKP	I	Backup voltage upply	It's recommended to connect a backup battery to V-BCKP in order to enable Warm and Hot Start features on the receivers. Otherwise connect to GND.
23	VCC	I	Supply Voltage	Max allowed ripple on VCC=50 mVpp
24	GND	I	Ground	Assure a good GND connection to all GND pins of the module, preferably with a large ground plane

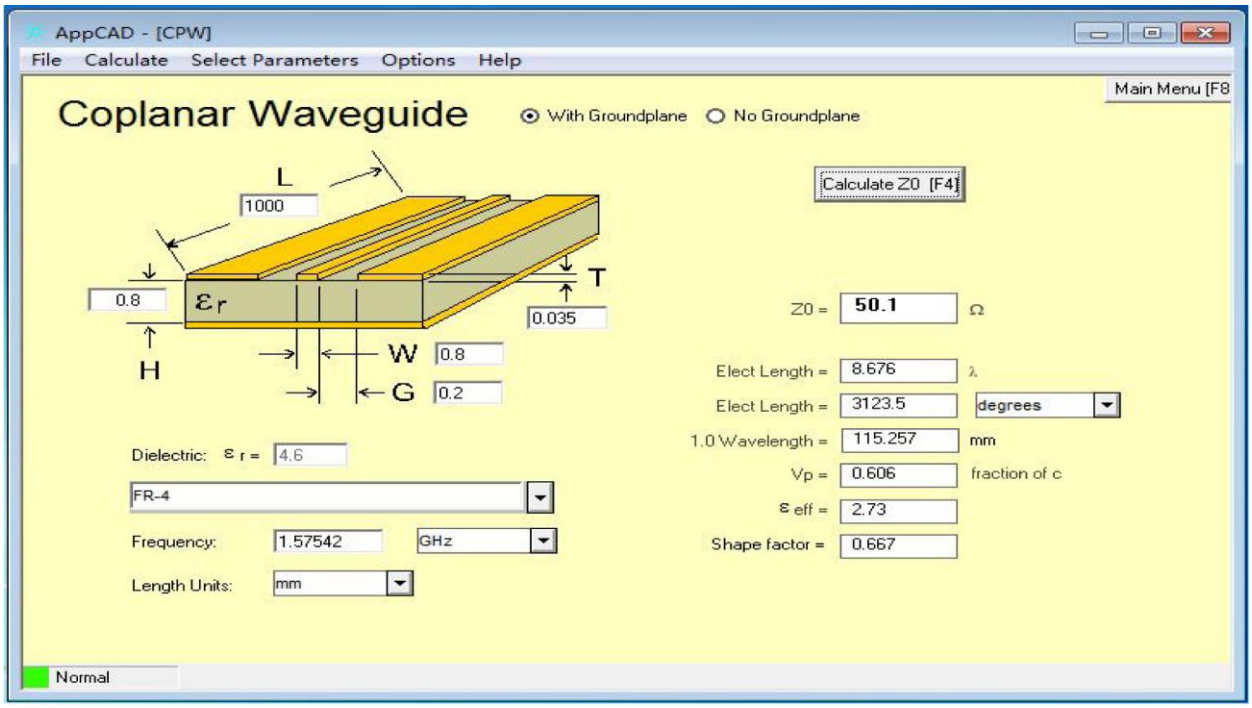
7. Recommended application circuit



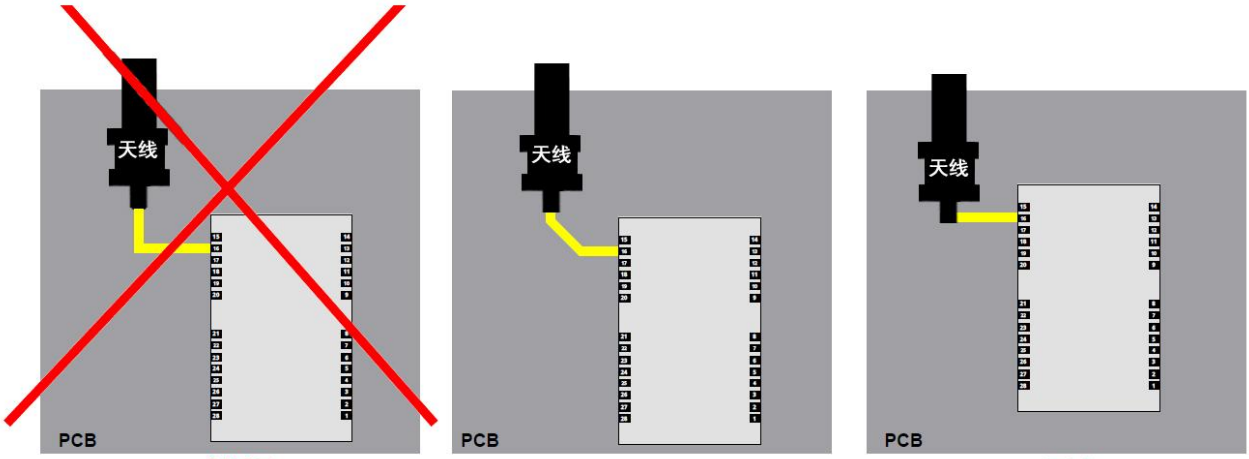
8. Module design considerations

In order to achieve the highest performance of the GPS module, the layout of the PCB is crucial. Please pay attention to the following design points.

The module RF foot attachment keeps the signal clean and free of interference. The connection point from the microstrip line to the antenna or the antenna seat must be as short as possible. Try to be within 2.5CM. A T-type circuit needs to be reserved in the microstrip line for impedance and auxiliary wave matching debugging. The microstrip line is closely wrapped with complete GND copper foil and ground vias. In order to reduce signal reflection, 90-degree wiring with sharp angles should be avoided. Straight and circular wiring are the most ideal methods. 45-degree wiring is preferred over 90-degree wiring. The bottom layer of the PCB of the microstrip line needs to be completely paved with copper, and no other lines can be run. The microstrip line needs to have a 50Ω impedance, and it is necessary to avoid running other lines too close to prevent interference from entering the very sensitive RF part.



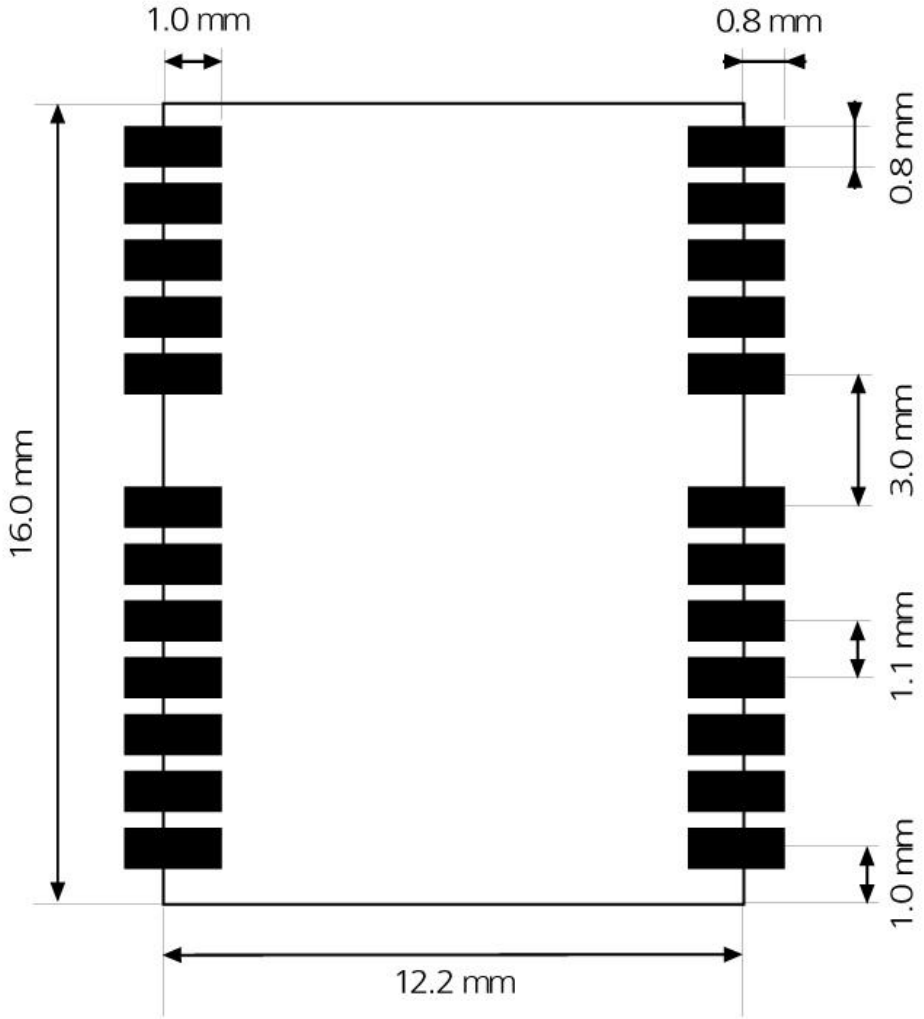
PCB Design RF Matching Reference



错误 error　　一般 common　　最好 best

Recommendations for routing the GPS antenna to the module RF_IN pin

9. Module pad size



ST-26-GNF module package size

10.NMEA0183 protocol

NMEA0183 output
GGA: time, position, positioning type
GLL: longitude, latitude, UTC time
GSA: GPS receiver operation mode, satellites used for positioning, DOP value
GSV: visible GPS satellite information, elevation, azimuth, signal-to-noise ratio (SNR) RMC: time, date, position, speed
VTG: ground speed information
MSS: signal strength, etc.
Note: The output information and frequency are related to the settings
Sentence identification word:

Identifier	meaning
GB	BeiDou-2 satellite system
GP	GPS-global positioning system
GA	Galileo satellite navigation system
GN	GNSS-global navigation satellite system

Sample data:

$GNGGA,133257.00,2236.91225,N,11403.25521,E,1,09,2.09,95.5,M,-2.4,M,,

*6D $GNGSA,A,3,18,14,12,15,,,,,,,,,2.89,2.09,1.99*1E

$GNGSA,A,3,74,71,72,73,70,,,,,,,,2.89,2.09,1.99*16

$GPGSV,3,1,09,12,36,083,39,14,37,312,25,15,14,075,33,18,80,078,45*7F

$GPGSV,3,2,09,22,,,37,24,30,036,34,25,,,42,42,51,128,38*71

$GPGSV,3,3,09,50,46,123,37*43

$GLGSV,2,1,08,65,01,321,,70,12,120,35,71,50,077,47,72,42,354,45*6D

$GLGSV,2,2,08,73,27,027,38,74,81,014,40,75,41,210,,87,02,261,*65

$GNGLL,2236.91225,N,11403.25521,E,133257.00,A,A*78

$GNRMC,133258.00,A,2236.91260,N,11403.25548,E,0.487,,241014,,,A*69

$GNVTG,,T,,M,0.487,N,0.903,K,A*3C

10.1 GGA

Sample Data：$GNGGA,133257.00,2236.91225,N,11403.25521,E,1,09,2.09,95.5,M,-2.4,M,,*6D

NAME	SAMPLE	UNIT	DESCRIPTION
Message ID	$GngGA		GGA protocol header
UTC time	133257.00		hhmmss.ss
latitude	2236.91225		ddmm.mmmmm
N/S indication	N		N=North, S=South
longitude	11403.25521		dddmm.mmmmm
E/W instruct	E		W=WEST，E=EAST
Positioning indication	1		0: Not positioned 1: SPS mode, positioning valid 2: Differential, SPS mode, positioning valid 3: PPS mode, positioning valid
Number of satellites	09		Range 0 to 12
HDOP	2.09		Leveling accuracy
MSL amplitude	95.5	METER	-
unit	M	METER	
ground	-2.4	METER	-
unit	M		-
Differential time		SECOND	Invalid when there is no DGPS
Differential ID	0000		
checksum	*6D		
<CR><LF>			End of Message

10.2 GLL

Sample date：$GNGLL,2236.91225,N,11403.25521,E,133257.00,A,A*
78

Name	Sample	Unit	Description
message ID	$GNGLL		GLLProtocol Header
Latitude	2236.91225		ddmm.mmmmm
N/Sindication	N		N=north，S=south
longitude	11403.25521		dddmm.mmmmm
E/Windication	E		W=west，E=east
UTCtime	133257.00		hhmmss.ss
state	A		A=Data is valid; V=data is not available
Checksum	*78		
<CR><LF>			End of Message

10.3 GSA

Sample date：$GNGSA,A,3,18,14,12,15,,,,,,,,,2.89,2.09,1.99*1E

name	sample	unit	Description
messageID	$GNGSA		GSAProtocol Header
Model 1	A		M = Manual (forces operation in 2D or 3D mode), A = Automatic
Model 2	3		1: Positioning is invalid 2:2D positioning 3:3D Positioning
Satellite use	18		Channel 1
Satellite use	14		Channel 2
…	…	…	…
Satellite use			Channel 12
PDOP	2.89		Position accuracy
HDOP	2.09		Leveling accuracy
VDOP	1.99		Vertical accuracy
Checksum	*1E		
<CR><LF>			End of Message

10.4 GSV

Sample data:

$GPGSV,3,1,09,12,36,083,39,14,37,312,25,15,14,075,33,18,80,078,45*7F $GPGSV,3,2,09,22,,

,37,24,30,036,34,25,,,42,42,51,128,38*71

$GPGSV,3,3,09,50,46,123,37*43

Name	Sample	Unit	Description
Message ID	$GPGSV		GSVProtocol Header
Number of messages	3		Range 1 to 3
Message number	1		Range 1 to 3
Number of satellites	09		
Satellite ID	12		Range 1 to 32
Elevation	36	Degree	Max. 90°
Azimuth	083	Degree	Range 0 to 359°
Carrier-to-Noise Ratio（C/No）	39	dBHz	Range 0 to 99, empty when no tracking is done
Satellite ID	14		Range 1 to 32
Elevation	37	Degree	Max. 90°
Azimuth	312	Degree	Range 0 to 359°
Carrier-to-Noise Ratio（C/No）	25	dBHz	Range 0 to 99, empty when no tracking is done
Satellite ID	15		Range 1 to 32
Elevation	14	Degree	Max.90°
Azimuth	075	Degree	Range 0 to 359°
Carrier to Noise Ratio (C/No)	33	dBHz	Range 0 to 99, empty when no tracking is done
Satellite ID	18		Range 1 to 32
Elevation	80	Degree	Max.90°
Azimuth	078	Degree	Range 0 to 359°
Carrier-to-Noise Ratio（C/No）	45	dBHz	Range 0 to 99, empty when no tracking is done
Checksum	*7F		
<CR><LF>			End of message

10.5 RMC

Sample date：$GNRMC,133258.00,A,2236.91260,N,11403.25548,E,0.487,,241014,,,A*69

Name	Sample	Unit	Description
MESSAGEID	$GNRMC		RMCPROTOCOL HEADER
UTCTIME	133258.00		hhmmss.ss
state	A		A=valid；V=invalid
latitude	2236.91260		ddmm.mmmmm
N/Sindication	N		N=north，S=south
longtitude	11403.25548		dddmm.mmmmm
E/Windication	E		W=west，E=east
Ground speed	0.487	Knot	
Position		degree	
date	241014		ddmmyy
Magnetic variable			-
Checksum	*69		
<CR><LF>			End of message

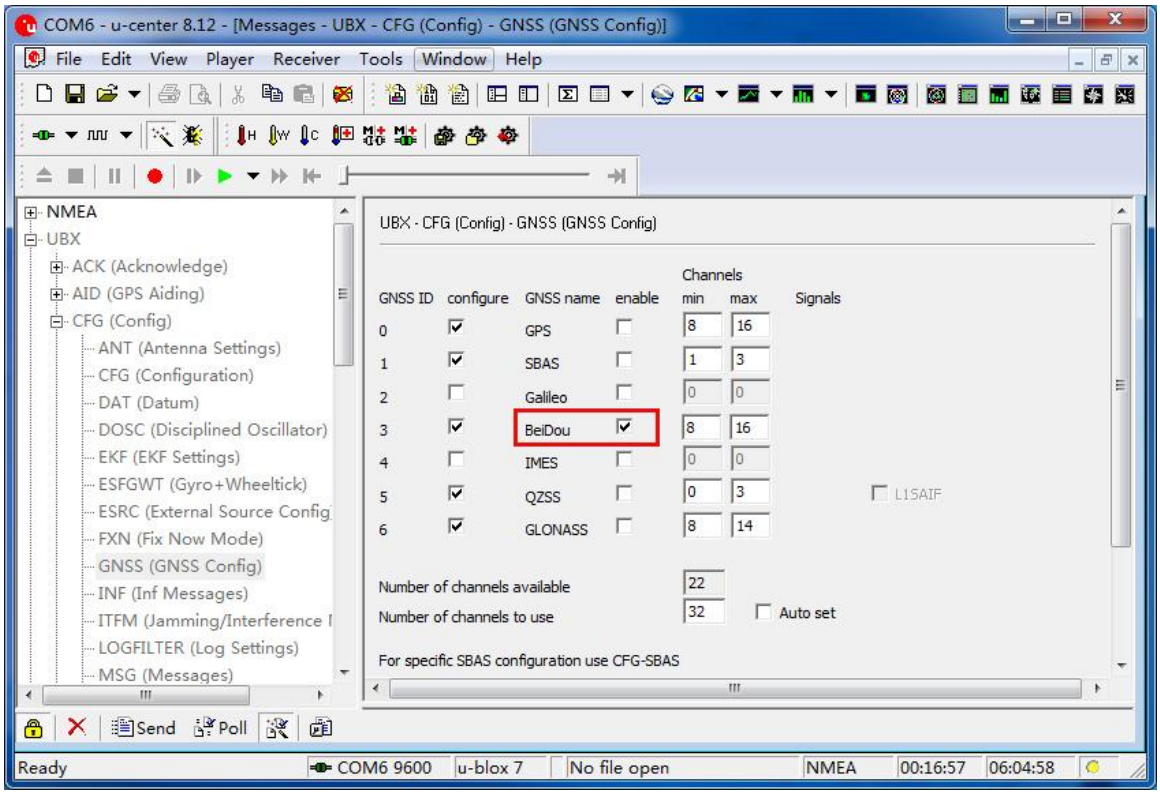
10.6 VTG

Sample date：$GNVTG,,T,,M,0.487,N,0.903,K,A*3C

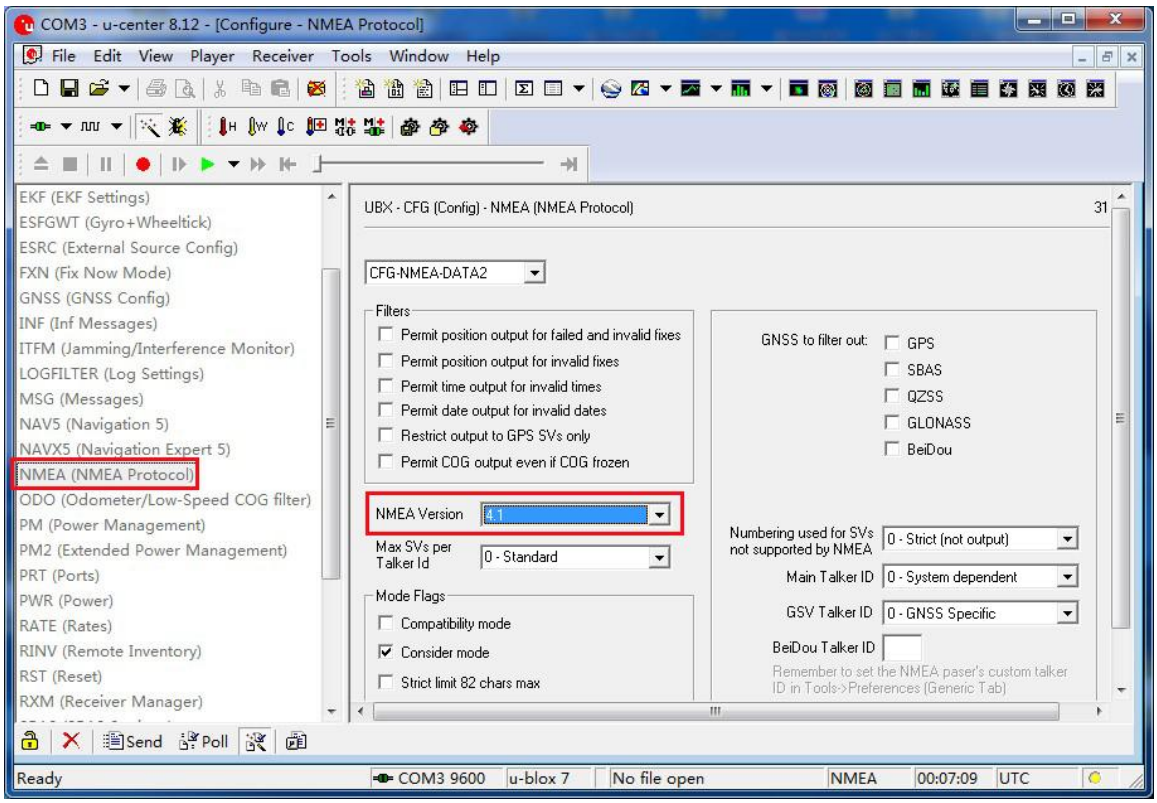
Name	Sample	Unit	Description
message ID	$GNVTG		VTG protocol header
position		degree	
reference	T		True North
position		degree	
reference	M		Magnetic North
speed	0.487	Knot	
unit	N		Section
speed	0.903	km/h	
unit	K		km/h
Checksum	*3C		
<CR><LF>			End of message

11.GPS/GLONASS/BeiDou/Galileo protocol switching

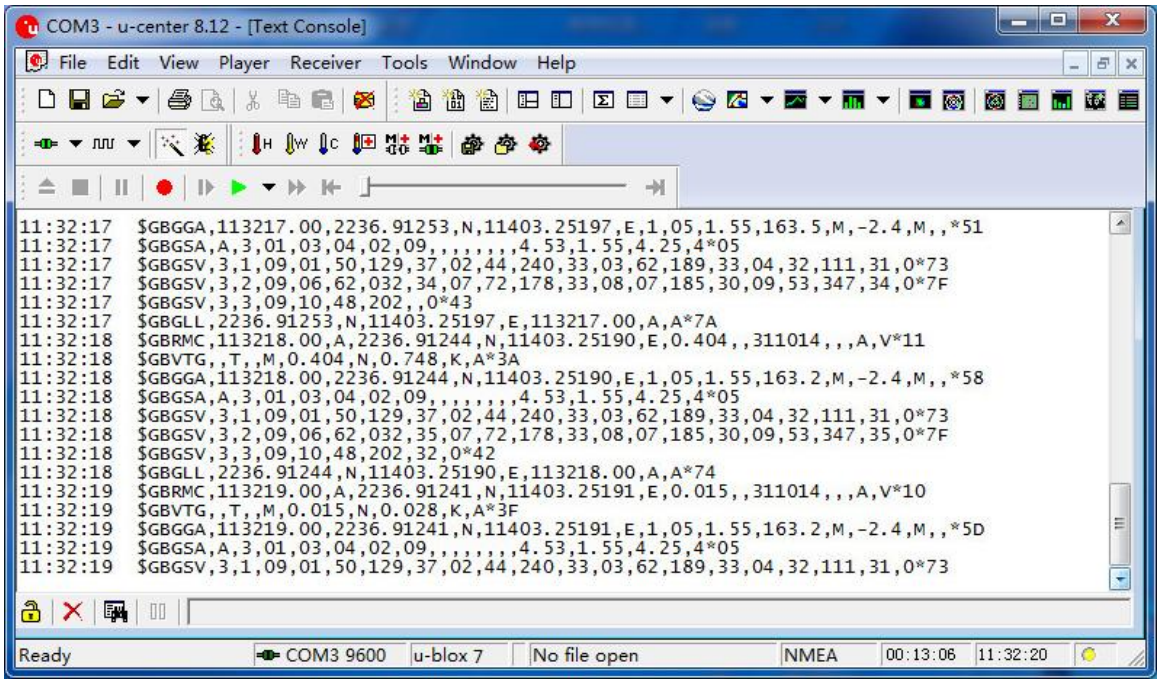
The module outputs GPS/GLONASS protocol data by default. You can modify and switch to BeiDou or Galileo protocol data through the test software. Set it to BeiDou protocol data only through the test software, as shown in the figure:



After setting, click Send to save, then select NMEA (NMEA Protocol), select 4.1 in NEMA Version and click Send to save as shown below:



After setting, it will be as shown in the figure: The output is BeiDou protocol data starting with $GB.



You can also send the hexadecimal configuration code generated after configuration to the module through the serial port to take effect. Because the module is based on the FLASH version, there is no need to add a backup battery to save the configuration data and prevent it from being lost after power failure.

The steps to configure GPS+Galileo are the same: enable the required navigation system, select NEMA Version 4.1, and save to take effect.

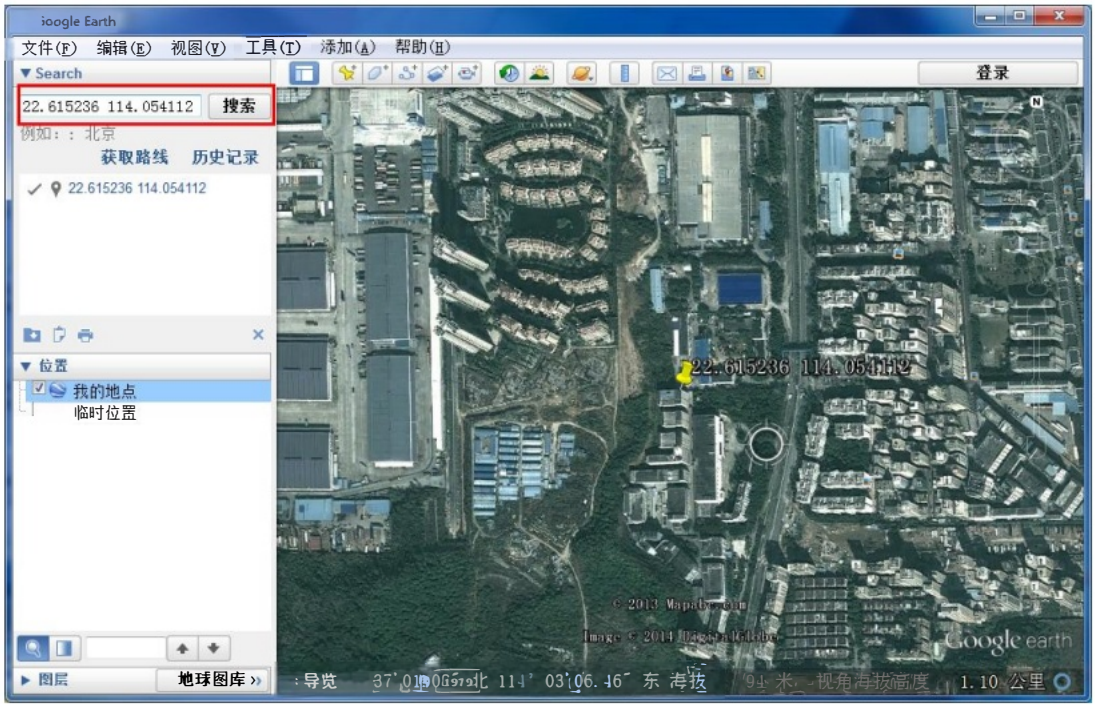
12. Latitude and longitude conversion

$GPRMC,060556.00,A,2236.91418,N,11403.24669,E,0.034,,130214,,,D*7F

	please enter		result
Longitude (GPS data)	11403.2467	Transformed into:	114.054112
Latitude (GPS data)	2236.9142	Transformed into:	22.615236

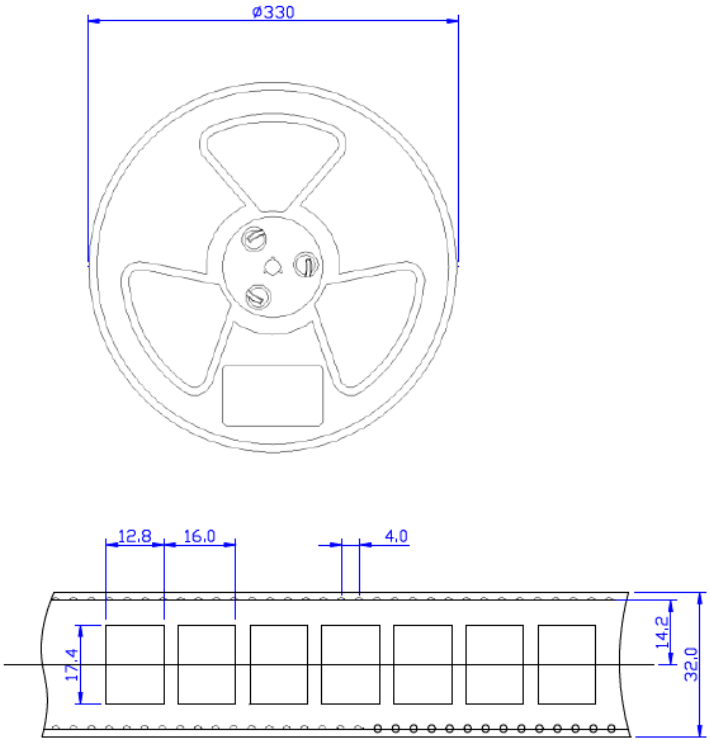
Calculation basis: abcde.fghi
abc+(de/60)+(fghi/600000)

The result of the conversion: 22.615236,114.054112 through Google Earth
Search and display the current actual location (note: there will be deviations through Google Maps or Baidu Maps on the browser):



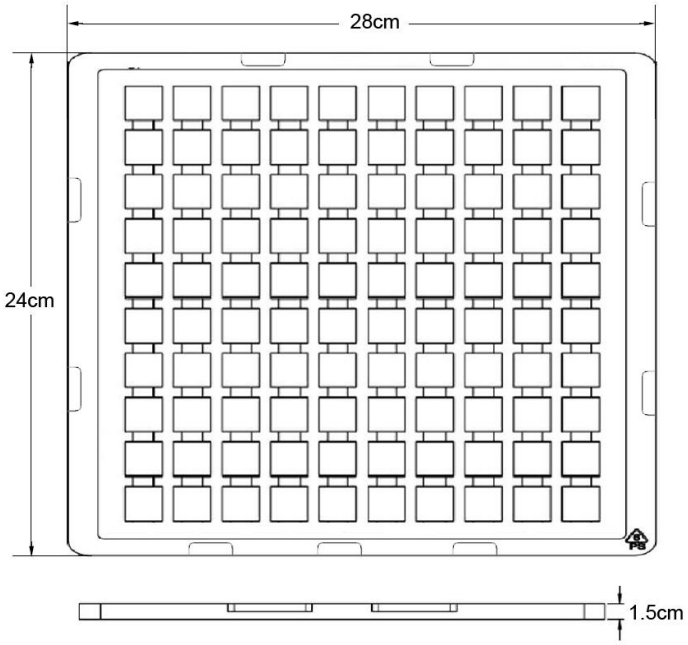
13. Packaging instructions

1. Taping packaging (1000pcs per roll)

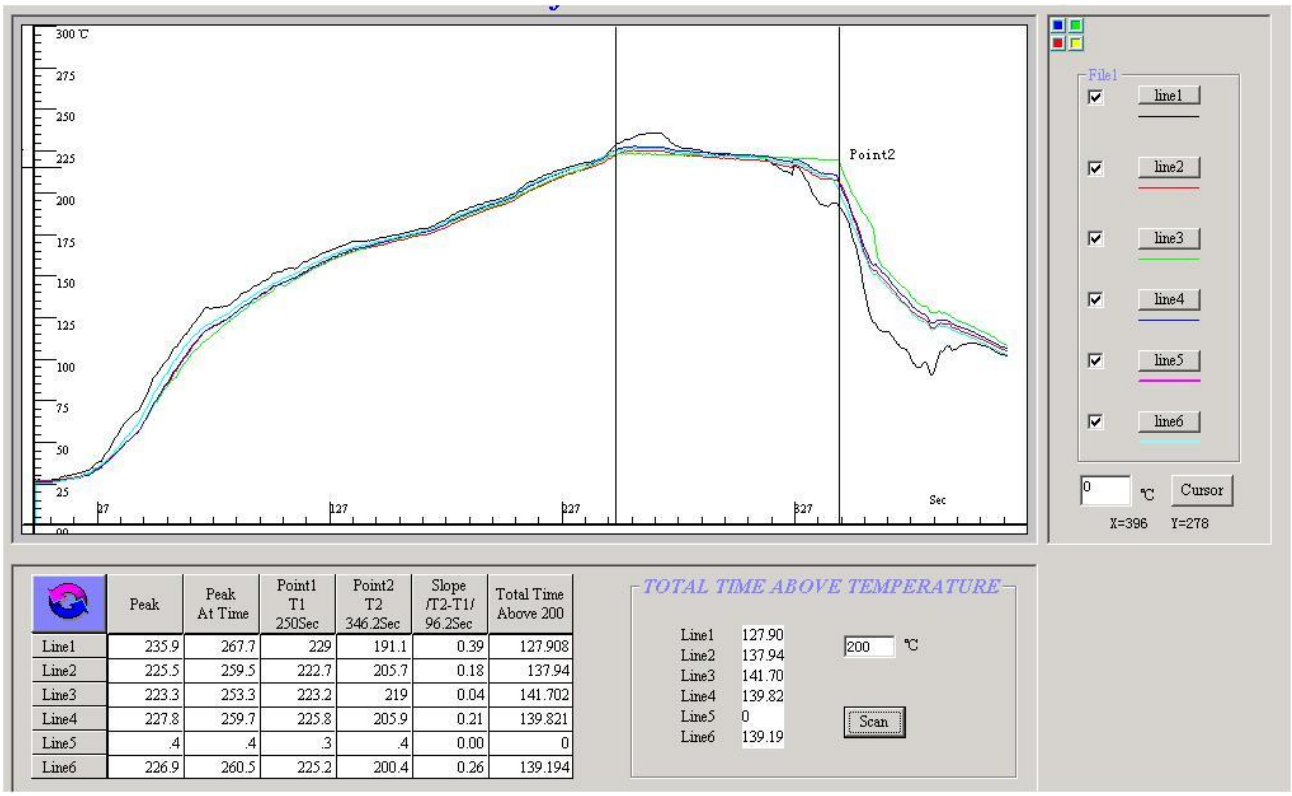


UNIT:mm

2. Pallet packaging (100pcs per pallet)



14.SMT temperature curve



	Peak	Peak At Time	Point1 T1 250Sec	Point2 T2 346.2Sec	Slope /T2-T1/ 96.2Sec	Total Time Above 200
Line1	235.9	267.7	229	191.1	0.39	127.908
Line2	225.5	259.5	222.7	205.7	0.18	137.94
Line3	223.3	253.3	223.2	219	0.04	141.702
Line4	227.8	259.7	225.8	205.9	0.21	139.821
Line5	.4	.4	.3	.4	0.00	0
Line6	226.9	260.5	225.2	200.4	0.26	139.194

TOTAL TIME ABOVE TEMPERATURE

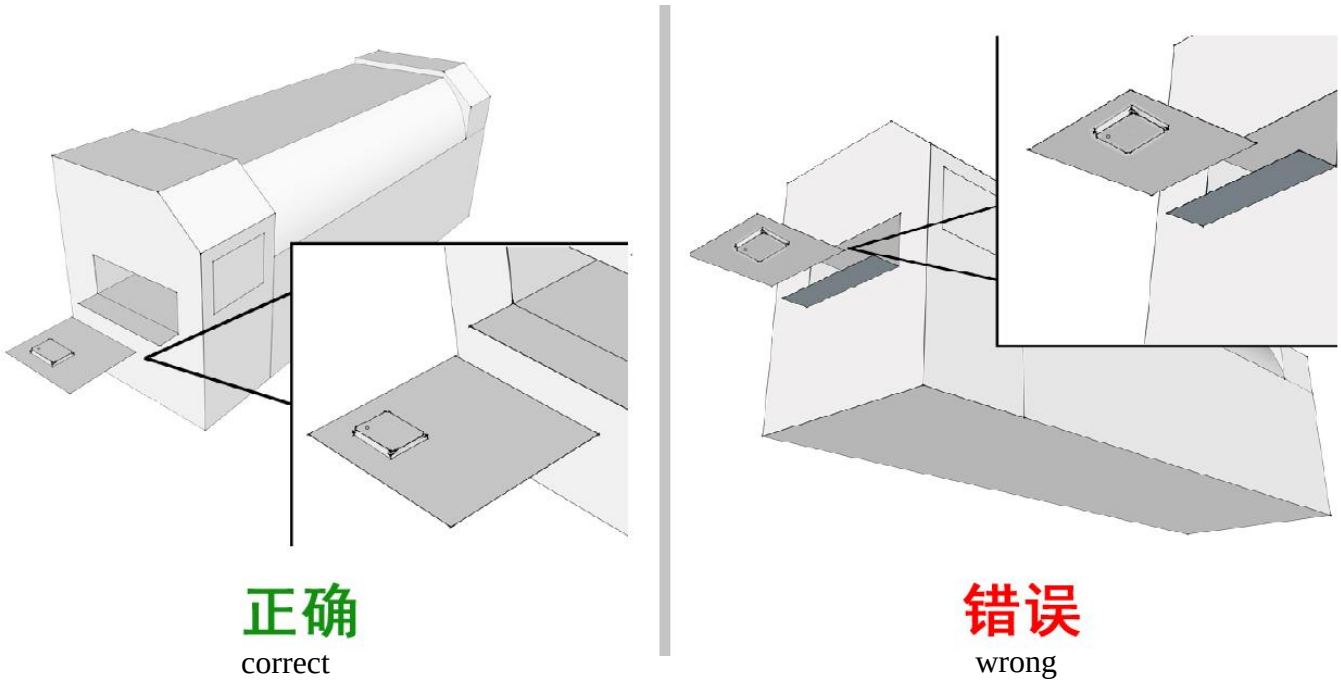
Line1	127.90
Line2	137.94
Line3	141.70
Line4	139.82
Line5	0
Line6	139.19

200 ℃

Scan

15. Notes on patch

Other precautions for TX-26-GNF module during reflow soldering:
1. The module must be pre-baked before undergoing the SMT reflow soldering process.
2. The use of solder paste should follow the principle of "first in, first out". Opening of solder paste needs to be monitored and recorded in a timely manner.
3. Temperature and humidity must be controlled in the SMT production line and storage area. 23°C temperature, 60±5%RH humidity is recommended. 4. When performing solder paste printing, please pay attention if the amount of solder paste is excessive or insufficient, because these two conditions may cause defects such as insufficient electricity, empty solder, etc.
5. Make sure that the vacuum mouthpiece is able to bear the weight of the GPS module to prevent position shifting during loading.
6. Before the PCBA is undergoing the reflow soldering process, the operator should visually check to see if there is position shift to the module.
7. The reflow temperature and its distribution data must be measured before the SMT process and match the level and guidelines set by IPQC.
8. If the SMT protection line runs a double-sided process PCBA, please process the GPS module in the second pass to avoid the risk of repeated reflow of the GPS module.



16. Conclusion

With the booming development of GPS applications, the demand for various navigation, positioning and tracking products is becoming increasingly urgent. The TX-26-GNF GPS module has unparallele d advantages such as simple application, convenient design, excellent performance, low cost and fast time to market, which provides great convenience for many customer groups such as equipment integ rators, design solution providers, and electronic enthusiasts. The above is a brief introduction of this module by our company, hoping to help you understand and design this module.