

# SPECIFICATION OF APPROVAL

## 规格承认书

CUSTOMER /客户	
PRODUCT NAME/产品类别	GPS&BD Module
CUSTOMER PRODUCT NO./客户产品编号	
MODEL No./产品型号	RT-TD1612BD
DATE/日期	2017-02-08
EDITION/版本	V:0A

SUPPLIER/供应者签署	ACCEPTANCE/承认者签署
深圳市荣泰电子有限公司	



深圳市荣泰电子有限公司

**SHENZHEN RONGTAI ELECTRONICS CO., LTD.**

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Date/日期	2017-2-8
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## **Functional Overview**

The RT-TD1612BD designed by Dragon basing on the TD1030 is a new generation of GPS receiving module. Based on new highly integrated TD chips and meticulously integration key parts of Dragon.. In the same chip specifications, this product has faster GPS signals ability to capture, lower power consumption, more strong anti-jamming performance and more wide working voltage range.

RT-TD1612BD module designed with industrial requirements, using stamps package, can adapt to wet high temperature, electromagnetic interference etc. odiously working environment. It is widely used in monitoring, positioning, mapping, navigation, security applications.

## **Applications**

- Automotive navigation
- Personal positioning
- Fleet management
- Marine navigation

## **Product Features**

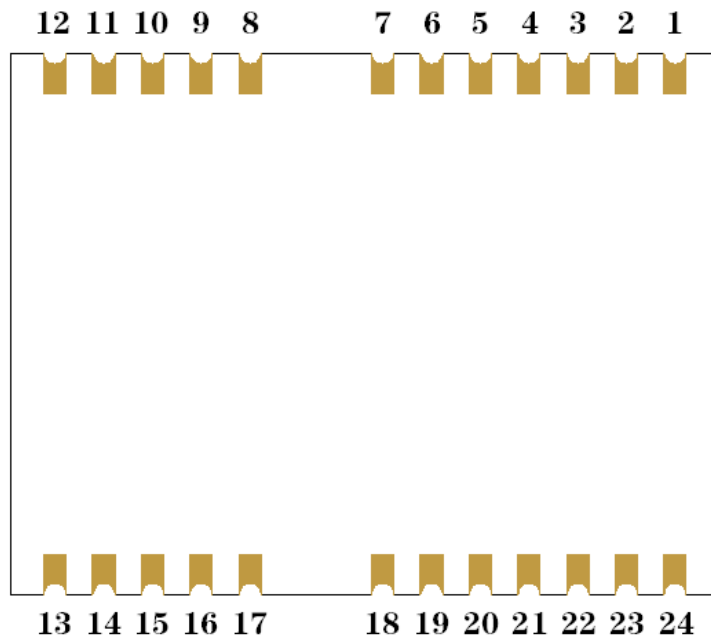
- TD1030 high performance GPS Chipset
- cold start capture sensitivity of 147 dbm, tracking sensitivity of 163 dbm
- Support UART interface
- Compact size (16mmx12.2mmx2.6mm) suitable for space-sensitive application
- One size component, easy to mount on another PCB board
- Support BDS, GPS, GLONASS satellite system
- Support SBAS and QZSS
- support anti-interference techniques
- support DR integrated navigation application
- to support A - GNSS auxiliary positioning
- support D - GNSS difference positioning
- support ephemeris calculation

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## Pin Assignment



## Pin Description

PIN	Name	Type	Description	Remark
1.2.4.5.6.7.8.9 14.15.16.17	NC		Reverse PIN, just NC	No Connection
3	1PPS	O	TIMESYNC signal output	Leave open if not used
10.12.13.24	RF GND	P	Ground.	
11	RF_IN	RF	GPS antenna input	50Ω@1.57542GHz
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	TX	O	UART Serial Data Output	NMEA Protocol
21	RX	I	UART Serial Data Input	NMEA Protocol
22	VBAT	P	RTC and backup SRAM power	May be connect to Battery
23	VCC	P	Module Power Supply	

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## Electrical Characteristics

### Absolute Maximum Rating

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	VCC	2.8	4.3	V
Backup Battery Volt	VBAT	2	4.3	V
Input Pins				
Input Pin Voltage I/O	RX	-0.3	3.6	V
Environment				
Storage Temperature	T <sub>stg</sub>	-40	125	°C
Peak Reflow Soldering Temperature	T <sub>peak</sub>		260	°C
Humidity			95	%

Note: Absolute maximum ratings are stress ratings only, and functional operation at the maxims is not guaranteed. Stress beyond the limits specified in this table may affect device reliability or cause permanent damage to the device. For functional operating conditions, refer to the operating conditions tables as follow.

### Operating Condition

Parameter	Symbol	Condition	Min	Type	Max	Units
Power supply voltage	VCC	Relative to GND	2.8	3.3	4.3	V
Power supply voltage ripple	VCC_PP	V <sub>cc</sub> =3.0V			30	mV
Consumption current	I <sub>cc</sub>	V <sub>cc</sub> =3.0V		28	42	mA
Backup Battery voltage	VBAT	Relative to GND	2	3.3	4.3	V
Input high voltage	V <sub>IH</sub>		2.0		3.6	V
Input low voltage	V <sub>IL</sub>		-0.3		0.8	V
Output high voltage	V <sub>OH</sub>		2.4		3.15	V
Output low voltage	V <sub>OL</sub>		-0.3		0.4	V
Operating temperature	T <sub>opr</sub>		-40		85	°C

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## Product Specifications

Parameter	Specification
Chip	TD1030
Receiver Type	GPS L1 ,frequency band 1575.42 MHz, BD B1, frequency band 1561.098 MHz
Sensitivity	tracking & navigation: - 163 dBm heavy capture: -159 dBm Cold start: -147dBm Warm start: -155 dBm
Accuracy	level positioning accuracy 3.0 m CEP Velocity 0.1m/s
Acquisition Time	Cold Start 28s (Typical Open Sky) Warm Start 22s Hot Start 1s
Power Consumption	Tracking 45mA @3.3V Typical Acquisition 40mA @3.3V
Navigation Data Update Rate	1Hz
Operational Limits	Altitude Max18000m Velocity Max 515m/s Acceleration Less than 4g
Protocol Support	NMEA 0183 Ver.4.1 9600bps 1Hz: GPGGA, GNLL, GNGSA, GPGSV, BDGSV, GNRMC, GPVTG, GPZDA,

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## Mechanical Specification

### Recommended Layout PAD

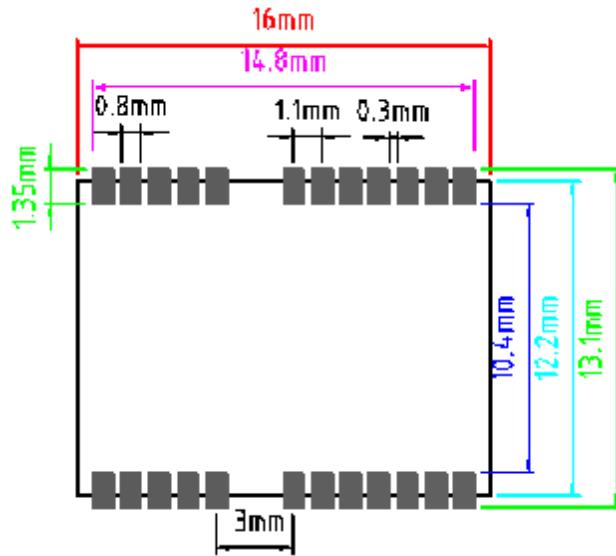


Figure 4: RT-TD1612BD PAD Style & Dimensions

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## **OPERATING Description**

### **RF\_IN**

This pin receives signal of GPS analog via external active antenna. It has to be a controlled impedance trace at 50ohm. Do not have RF traces closed the other signal path and routing it on the top layer. Keep the RF traces as short as possible.

### **TX**

This is the main transmits channel for outputting navigation and measurement data to user's navigation software or user written software.

### **RX**

This is the main channel for receiving software commands from TD demo software or from your proprietary software.

### **VBAT**

This is the battery backup power input for the SRAM and RTC when main power is off.

Without the external backup battery, **RT-TD1612BD** will always execute a cold start after turning on. To achieve the faster start-up offered by a hot or warm start, a battery backup must be connected. The battery voltage should be between 2V and 4.3V.

### **VCC**

This is the main power supply to the engine board. (2.8V to 4.3V)

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# SOFTWARE COMMAND

## NMEA Output Command

### NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a \$ and with carriage return/line feed. GPS specific messages all start with \$GPxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.

The **RT-TD1612BD** supports the following NMEA-0183 messages: GGA, GSA, RMC. The module default NMEA-0183 output is set up GGA, GSA, GSV, RMC and default baud rate is set up 9600bps.

Table 1: NMEA-0183 Output Messages

NMEA Record	DESCRIPTION
GGA	Global positioning system fixed data
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data

### GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:

\$GPGGA, 025438.000, 2232.8557,N, 11355.7438,E, 1,04,1.0, 65.5,M, ,M, ,0000\*75

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Time	025438.000		hhmmss.sss
Latitude	2232.8557		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	11355.7438		ddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	04		Range 00 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	65.5	meters	Altitude above mean seal level
Units	M	meters	
Geoids Separation		meters	Separation from Geoids can be bank
Units	M	meters	
Age of Diff.Corr.		second	Null fields when DGPS is not Used
Diff.Ref.Station ID	0000		Null fields when DGPS is not Used
Checksum	*75		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

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Table 2-1: Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

**GSA-GNSS DOP and Active Satellites**

Table 4 contains the values of the following example:  
 \$GNGSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , 1.8,1.0,1.5\*33.

Table 4: GSA Data Format

Name	Example	Units	Description
Message	\$GNGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
...	...		...
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

Table 4-1: Mode 1

Value	Description
1	Fix not available
2	2D
3	3D

Table 4-2: Mode 2

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

**GSV-GNSS Satellites in View**

Table 5 contains the values of the following example:

\$GPGSV , 2, 1, 07, 07, 79, 048, 42, 02, 51,062, 43, 26, 36,256, 42, 27, 27, 138,42\*71

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\$GPGSV , 2, 2, 07, 09, 23,313, 42, 04, 19, 159, 41, 15,12,041, 42\*41.

Table 5: GSV Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Message	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Maximum 90)
Azinmuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
...			...
Satellite ID	27		Channel 4(Range 1 to 32)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

Depending on the number of satellites tracked multiple messages of GSV data may be required.

Table 6 contains the values of the following example:

\$BDGSV,3,1,10,07,63,172,38,03,61,188,34,06,59,034,38,09,51,345,26\*69  
 \$BDGSV,3,2,10,01,50,128,40,02,44,240,31,10,42,195,37,04,32,111,41\*6A  
 \$BDGSV,3,3,10,05,23,254,,08,11,188,43\*60

Table 6:BDGSV Data Format

Name	Example	Units	Description
Message ID	\$BDGSV		GSV protocol header
Number of Message	3		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	10		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	63	degrees	Channel 1(Maximum 90)
Azinmuth	172	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	38	dBHz	Range 0 to 99,null when not tracking
...			...
Satellite ID	08		Channel 4(Range 1 to 32)
Elevation	11	degrees	Channel 4(Maximum 90)
Azimuth	188	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	43	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

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## RMC-Recommended Minimum Specific GNSS Data

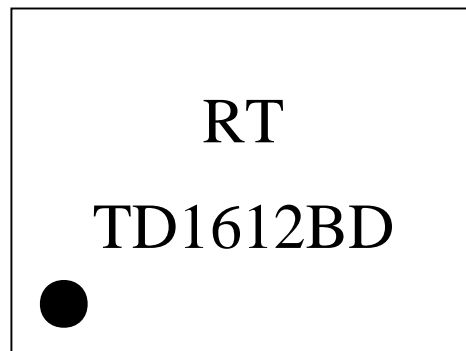
Table 7 contains the values of the following example:

\$GNRMC, 025439.000, A, 2232.8557, N, 11355.7438, E, 0.13, 309.62, 031209, , \*10

Table 7: RMC Data Format

Name	Example	Units	Description
Message ID	\$GNRMC		RMC protocol header
UTC Time	025439.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2232.8557		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	11355.7438		Ddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over Ground	309.62	Degrees	True
Date	031209		Dummy
Magnetic variation		Degrees	Not used
E/W indicator			Not used
Mode			Only NMEA0183 version 3.00 output
Checksum	*10	hexadecimal	
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

## PRODUCT IDENTIFICATION (MARKING): LASER

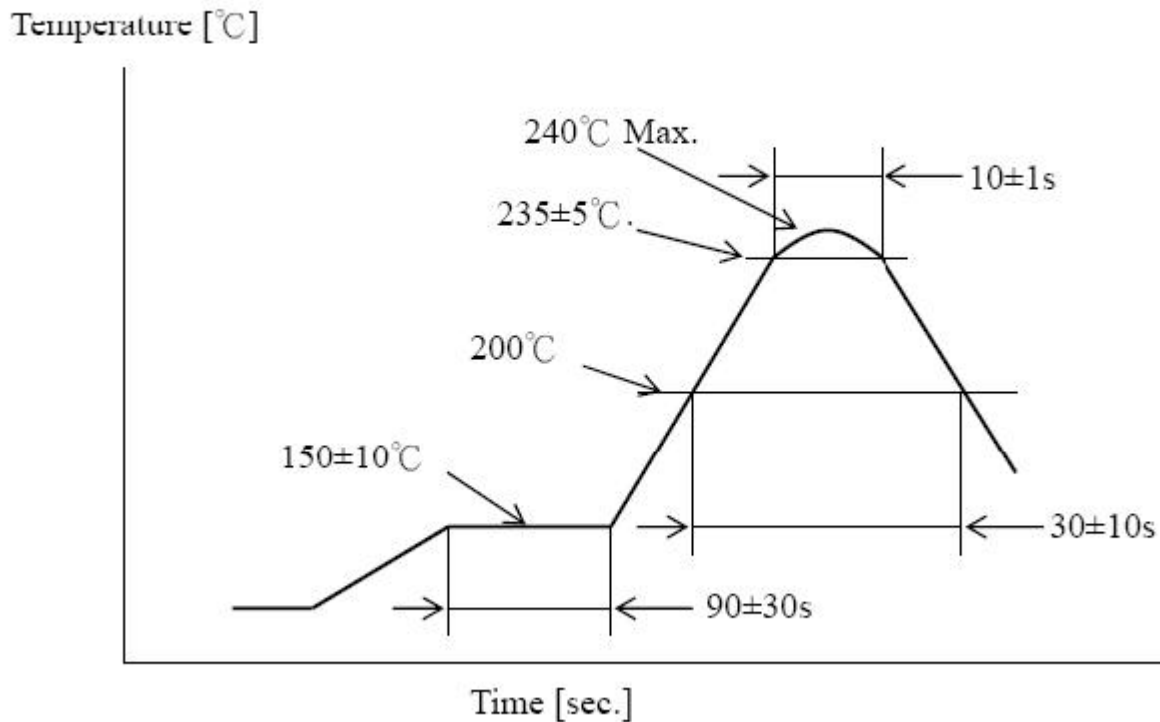


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## Recommended Reflow Profile:



Pre heating temperature: 150±10[°C]

Pre heating time: 90±30[sec.]

Heating temperature: 235±5[°C]

Heating time: 10±1[sec.]

Peak temperature must not exceed 240 and the °C he duration of over 200°C should be 30±10 Seconds.

## The module package specification

The module package includes inner packing and outer packing, the accurate e-tray is used for inner packing, and the carton is used for outer packing.

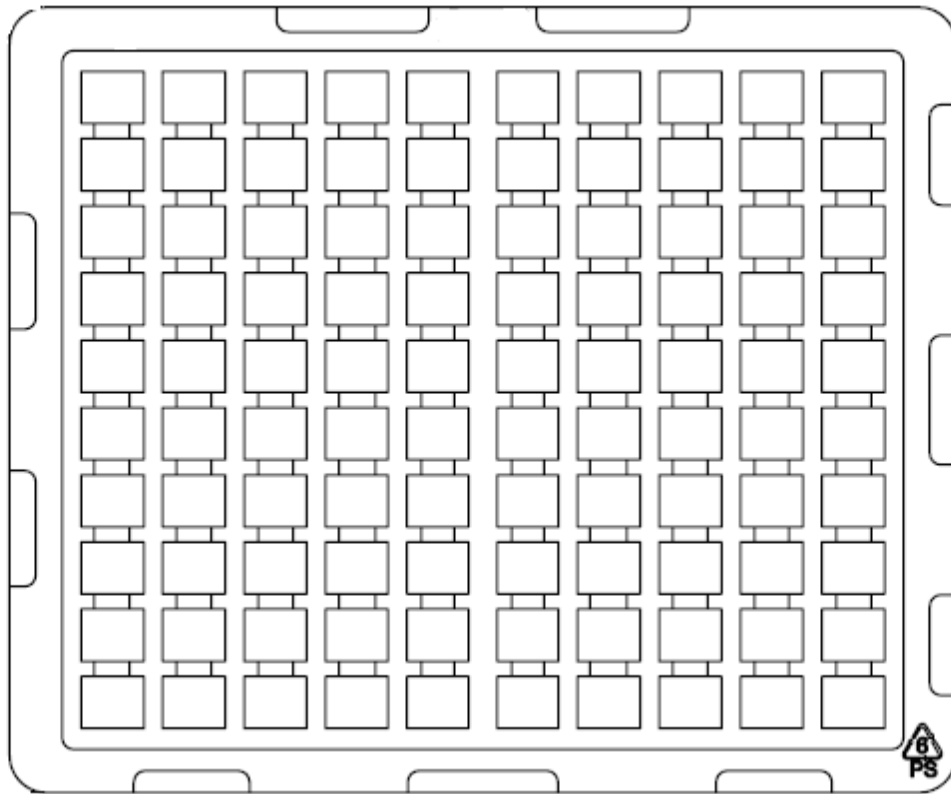
### Inner packing

- I Size : 253(L)x 213(W)x 7(H) (mm)
- I Packing unit : 100pcs of per tray
- I Inner packing diagram

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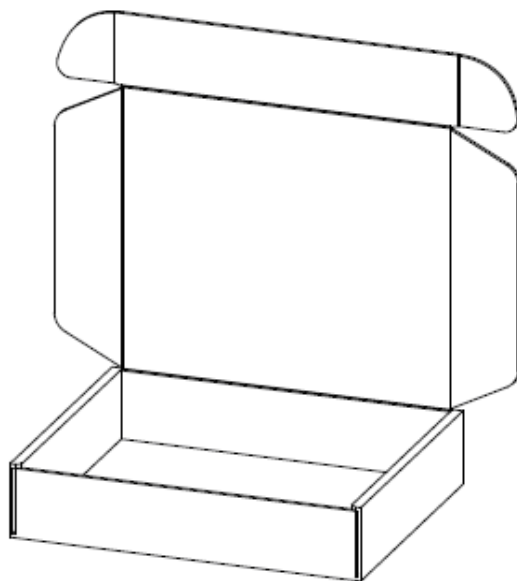
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### Outer packing

- I Size : 262(L)x 223(W)x 86(H) (mm)
- I Packing unit : 10 trays of per carton
- I Quantity : 1000pcs of per carton
- I Outer packing diagram



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