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	**CDG-G7BD**
DATE/日期	2017-7-10
EDITION/版本	V:0A

SUPPLER/供应者签署	ACCEPTANCE/承认者签署
深圳市中龙通电子科技有限公司	

Cdtech 深圳市中龙通电子科技有限公司

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Prepared/制作	甘 炜

Functional Overview

The **CDG-G7BD** designed by Dragon basing on the GK9501S is a new generation of GPS receiving module. It's up to 66 acquisition and 22 simultaneously tracking channel,ultra-high sensitive GPS receiving module. Based on new highly integrated GK 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.

CDG-G7BD 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.

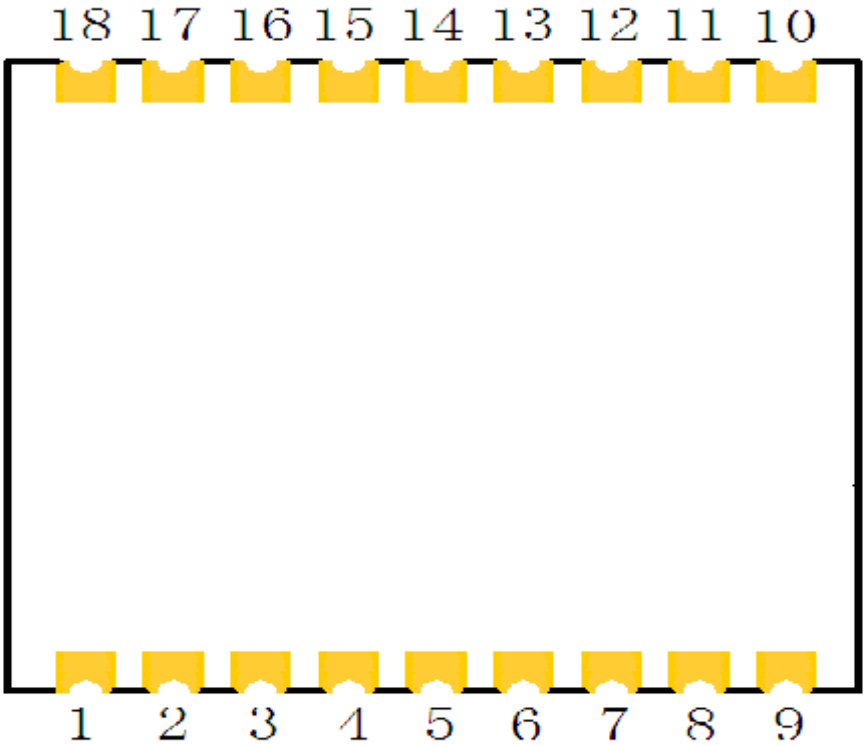
Applications

■ Automotive navigation
■ Personal positioning
■ Fleet management
■ Marine navigation

Product Features

■GK9501S high performance GPS Chipset
■Very high sensitivity (Tracking Sensitivity: -166dBm)
■ Extremely fast TTFF (Time To First Fix) at low signal level
■ Support UART interface
■ Built-in LNA
■ Compact size (10.1mm x 9.7 mm x 2.2mm) suitable for space-sensitive application
■ One size component, easy to mount on another PCB board
■ Support NMEA 0183 V3.0 (GGA, GSA, GSV, RMC,VTG)
■ Supports multi-GNSS incl.BDS QZSS,SBAS ranging
■Supports FCC E911 compliance and A-GPS
■Max.fixed update rate up to 10 Hz

Pin Assignment



Pin Description

Pin NO.	Pin Name	I/O	Remark
5.7.13.14.15.16.17.18	NC		NC
4	1PPS	I/O	One pulse per second.
2	TX	O	This is the main transmits channel for outputting navigation and measurement data to user's navigation software or user written software. Output TTL level, 0V ~ 2.85V.
3	RX	I	This is the main receive channel for receiving software commands to the engine board from SiRFdemo software or from user written software.
9	RESET		Keep floating(System Reset,active low).
6	VBAT	I	This is the battery backup input that powers the SRAM and RTC, The battery voltage should be between 2.0v and 4.3V
8	VCC	PWR	Main power supply to the engine board.
11	RF IN	RF	GPS antenna input.
1.10.12	GND	G	Ground.

Electrical Characteristics

Absolute Maximum Rating

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	Vcc	2.8	4.3	V
Input Pins				
Input Pin Voltage I/O	TXA, RXA	-0.3	3.6	V
Backup Battery Volt	VBAT	2.0	4.3	V
Environment				
Storage Temperature	Tstg	-40	125	℃
Peak Reflow Soldering Temperature	Tpeak		260	℃
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.

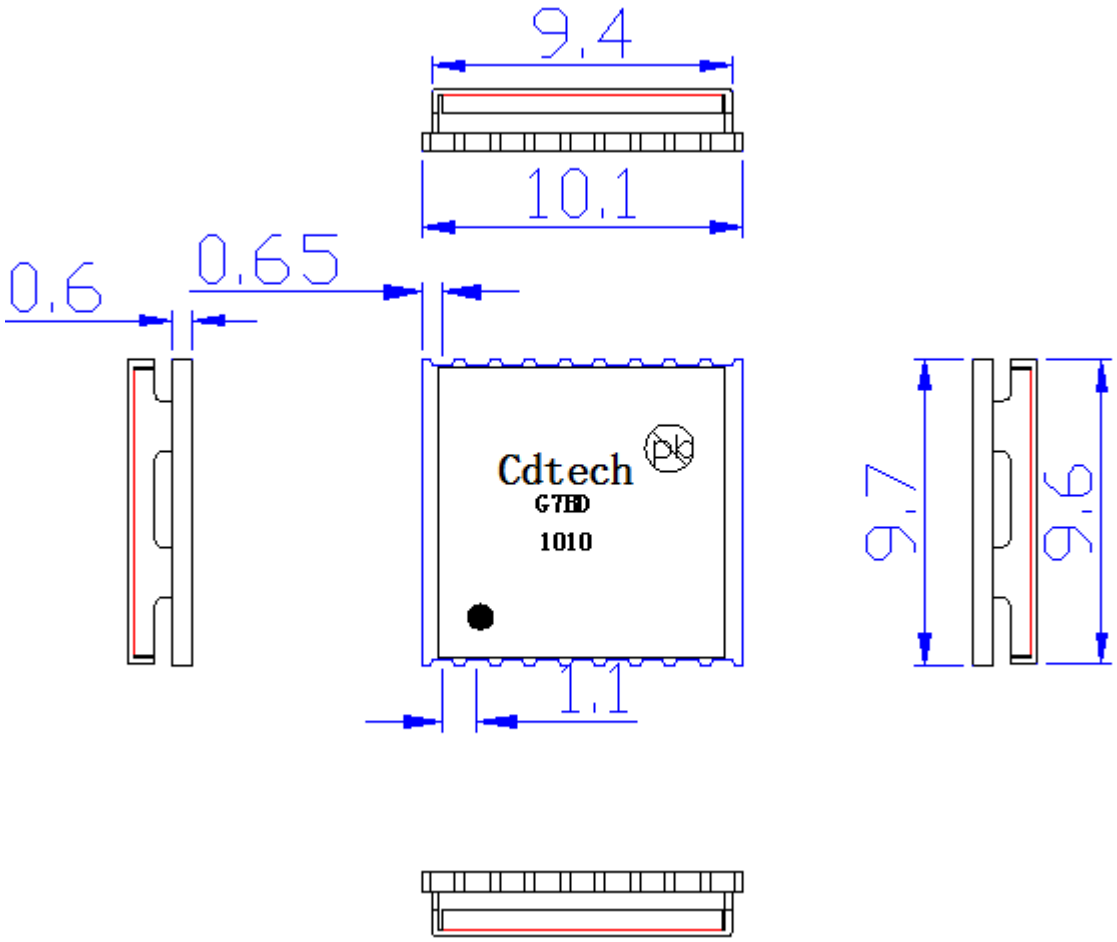
Operating Condition

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	Vcc=3.0V			30	mV
Consumption current	Icc	Vcc=3.0V		28	30	mA
Backup Battery voltage	VBAT	Relative to GND	2	3.3	4.3	V
Input high voltage	V_{IH}		2.0		3.6	V
Input low voltage	V_{IL}		-0.3		0.8	V
Output high voltage	V_{OH}		2.4		3.15	V
Output low voltage	V_{OL}		-0.3		0.4	V
Operating temperature	Topr		-40		85	˚C

Product Specifications

Parameter	Specification
Chip	GK9501S
Receiver Type	L1 frequency band 1575.42 MHz, C/A code, 12 Channels BD B1, frequency band 1561.098 MHz
Sensitivity	Tracking -166dBm Acquisition -148dBm(cold)/-162dBm(hot)
Accuracy	Position < 5 M (Typical Open Sky) Velocity 0.1m/s
Acquisition Time	Cold Start 27s (Typical Open Sky) Warm Start 22s Hot Start 1s
Power Consumption	Tracking 30mA @3.3V Typical Acquisition 35mA @3.3V
Navigation Data Update Rate	1Hz
Operational Limits	Altitude Max 18,000m Velocity Max 515m/s Acceleration Less than 4g
Protocol Support	NMEA 0183 Ver.3.0 Default: 9600bps 1Hz: GGA, GSA, GSV, RMC,VTG

Mechanical Specification



Recommended Layout PAD

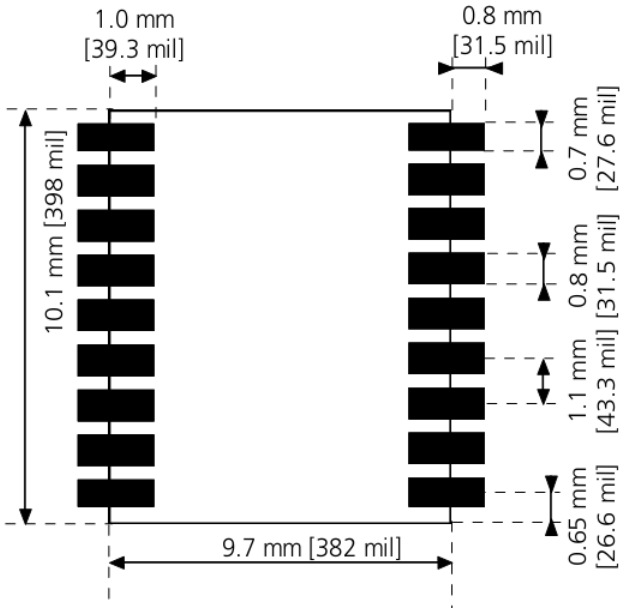
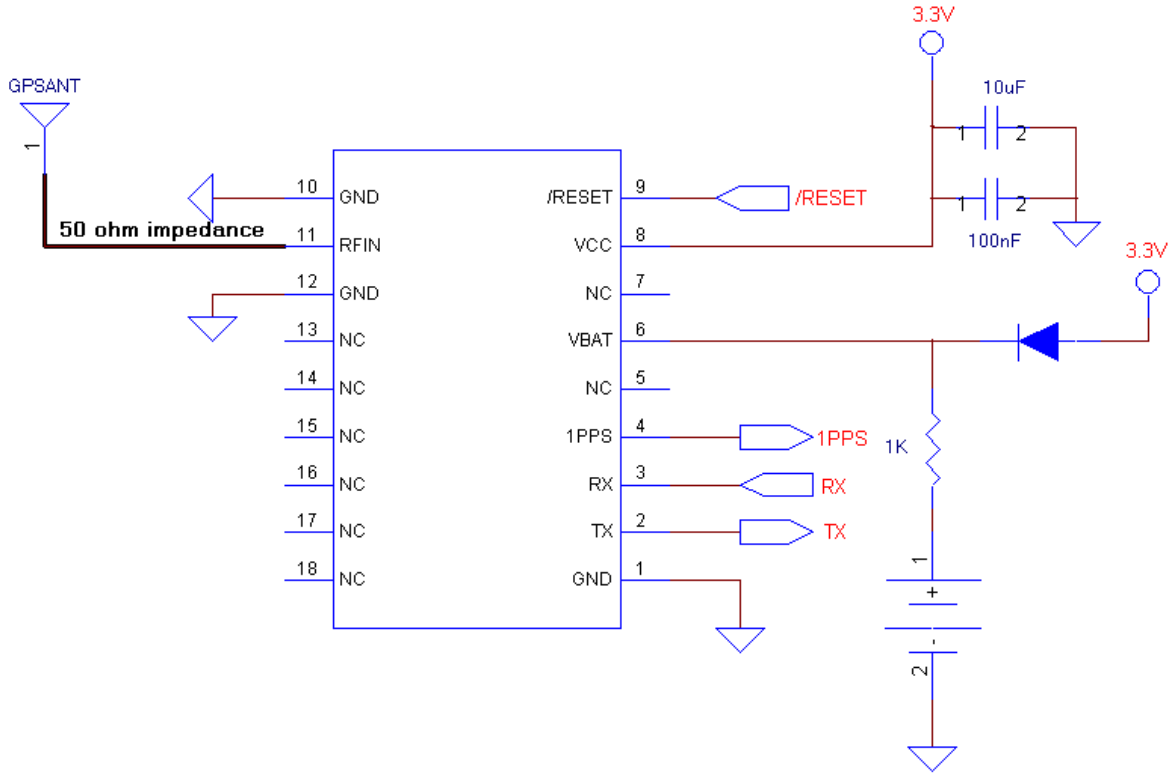


Figure 4: CDG-G7BD PAD Style& Dimensions

Application

Application Circuit



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 GK 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, **CDG-G7BD** will always execute a cold star 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)

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 **CDG-G7BD** supports the following NMEA-0183 messages: GGA,GSA, GSV, RMC ,VTG

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
VTG	Course over ground and ground speed

GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:

$GNGGA, 025438.000, 2232.8557,N, 1 1 3 5 5 . 7 4 3 8 ,E, 1,04,1.0, 65.5,M,-2.4 ,M,,0000*75

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	$GNGGA		GGA protocol header
UTC Time	025438.000		hhmmss.sss
Latitude	2232.8557		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	1 1 3 5 5 . 7 4 3 8		ddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		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
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	-2.4	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)

GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

$GPGSA , 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	$GPGSA		GSA protocol header
Mode 1	A		M：Manual-forced to operate in 2D or 3D mode A: Automatic-allowed to automatically switch 2D/3D
Mode 2	3		1：Fix not available 2：2D 3：3D
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)

$BDGSA , A, 3, 24, 22, 26,27, 09, 04,15, , , , , ,2.2,1.03,1.95*01

Name	Example	Units	Description
Message	$BDGSA		GSA protocol header
Mode 1	A		M：Manual-forced to operate in 2D or 3D mode A: Automatic-allowed to automatically switch 2D/3D
Mode 2	3		1：Fix not available 2：2D 3：3D
Satellite Used	24		Sv on Channel 1
Satellite Used	22		Sv on Channel 2
…	…		…
Satellite Used			Sv on Channel 12
PDOP	2.2		Position Dilution of Precision
HDOP	1.03		Horizontal Dilution of Precision
VDOP	1.95		Vertical Dilution of Precision
Checksum	*01		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

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

$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	*60		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

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, , ,A*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	A		A= independent positioning, D= difference, E= estimation, N= data invalid
Checksum	*10	hexadecimal	
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

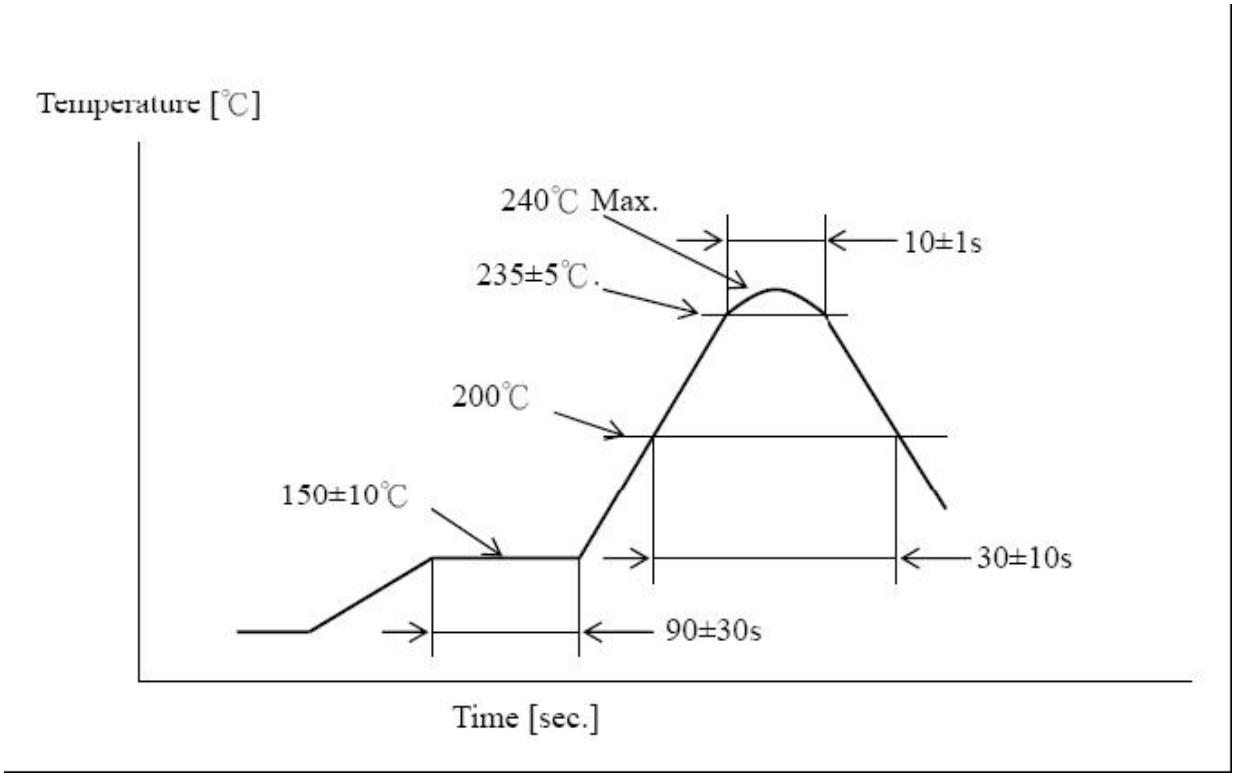
VTG- Course over ground and ground speed

Table8 contains the values of the following example:

$GNVTG,309.62,T, ,M,0.13,N,0.2,K,A*6E

Name	Example	Units	Description
Message ID	$GNVTG		VTG protocol header
Course Over Ground	309.62	Degrees	
Consult	T		True north
Course Over Ground	309.62	Degrees	
Consult	M		magnetism
Speed	0.13	Knot	
Units	N		Knot
Speed	0.2	Km/h	
Units	K		Km/h
Mode	A		A= independent positioning, D= difference, E= estimation, N= data invalid
Checksum	*6E		
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

Recommended Reflow Profile:

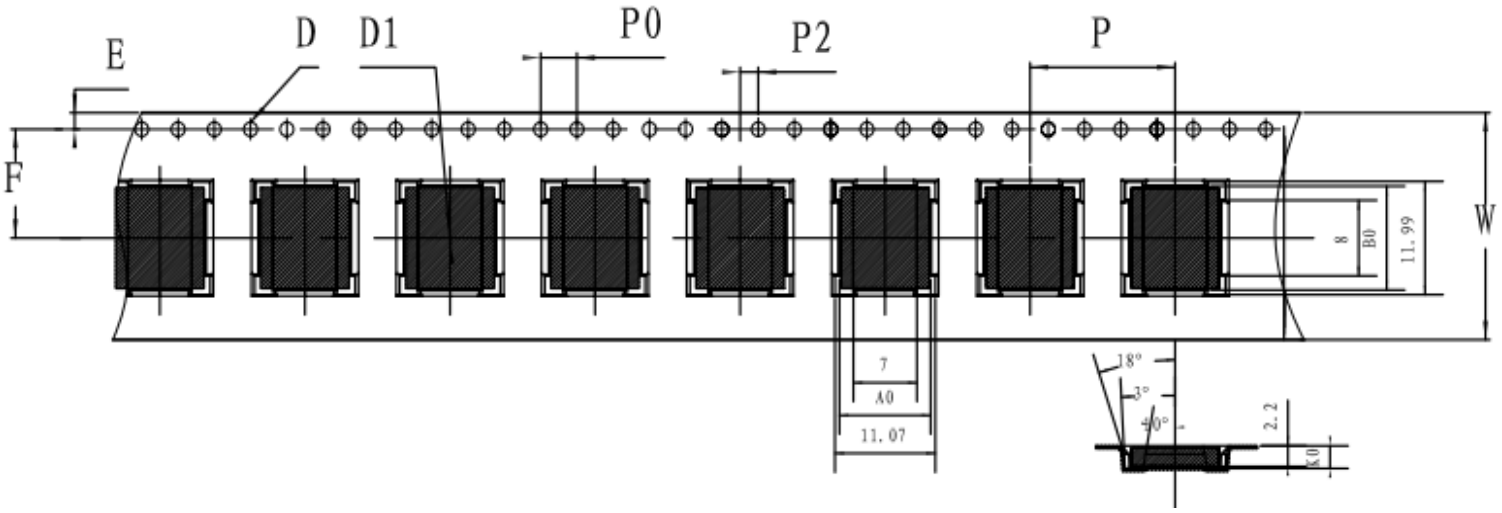


Pre heating temperature: 150±10[℃] Pre heating time: 90±30[sec.]
Heating temperature: 235±5[℃] Heating time: 10±1[sec.]

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

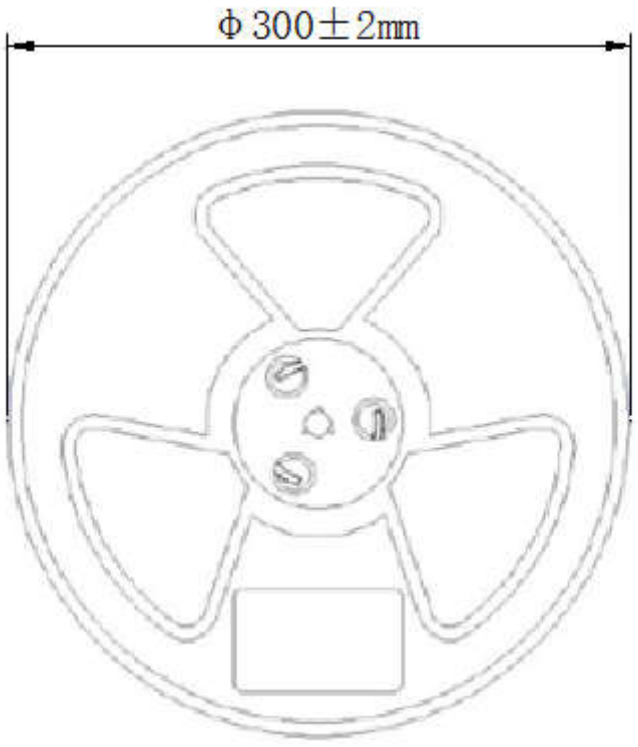
The module package specification

The module package includes inner packing and outer packing,the braid packaging is used for inner packing,and the carton is used for outer packing.

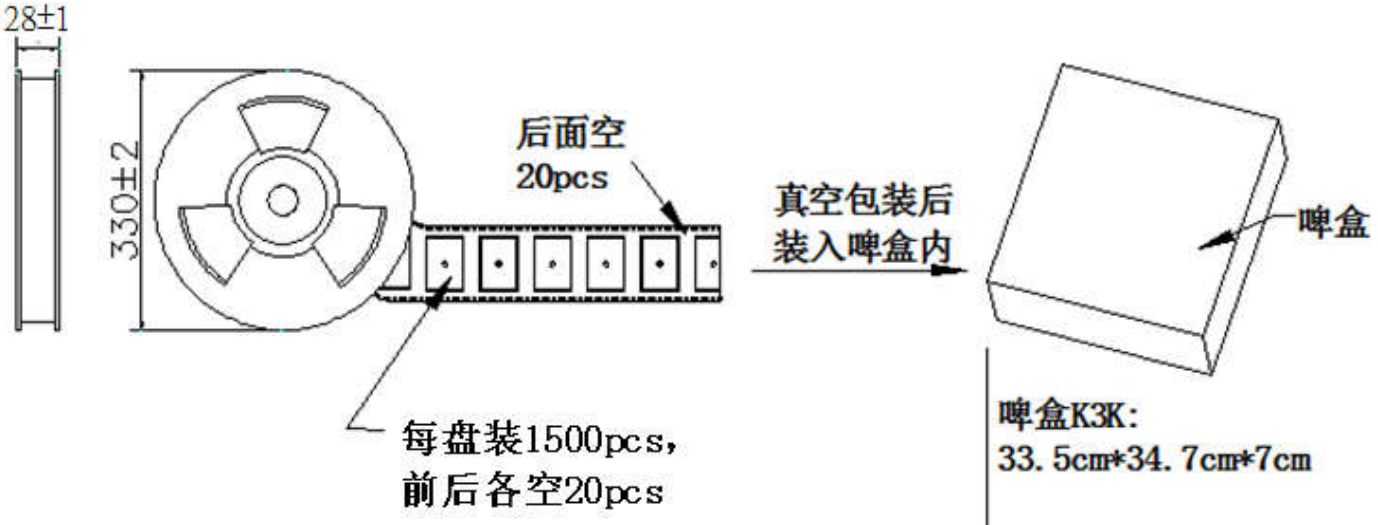


ITEM	W	A0	B0	K0	P	F	E	D	D1	P0	P2	T	13″	
DIM	24.0	10.07	10.99	2.4	16	11.5	1.75	1.50	1.50	4.00	2.00	0.3	长度/盘	元件/盘
TOLE	+0.30 -0.30	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.00	+0.10 -0.00	+0.10 -0.10	+0.10 -0.10	+0.05 -0.05	27.6	1540

UNIT:mm



Outer packing



1. 每盘编带装机1500pcs（前后空20格不装产品）
2. 编带完成后进行真空包装。
3. 真空包装后，将编带装入啤盒内(共1500pcs)
4. 每个外箱装5个啤盒，共装机:
   1500pcs*5=7500pcs