

Product Approval Datasheet

P/N: FU-GT3-1613 Module

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Functional Overview

The FU-GT3-1613 designed by Dragon basing on the MT3339 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 MTK 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.

FU-GT3-1613 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
- Mobile phone navigation
- Marine navigation

Product Features

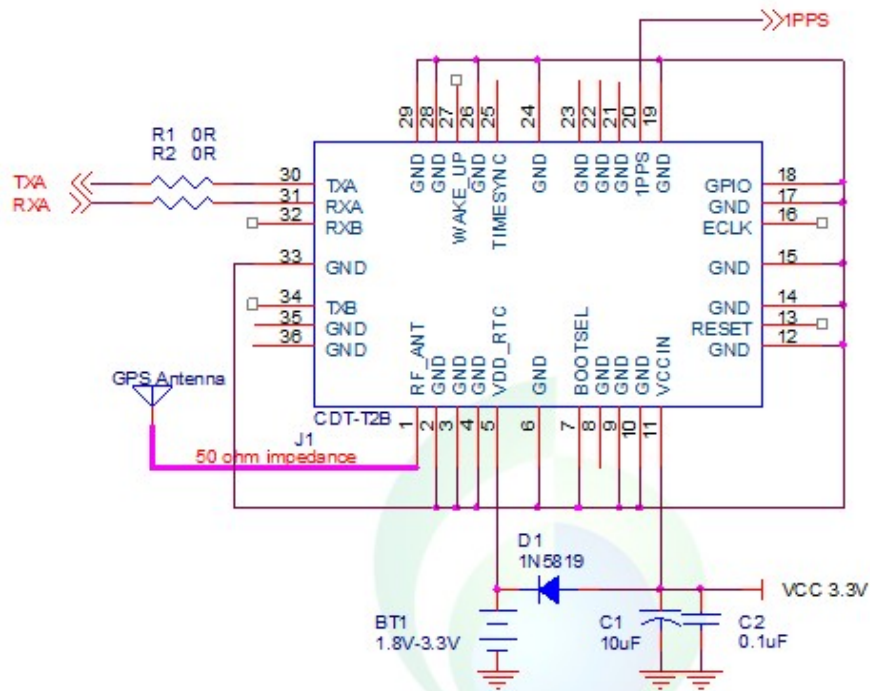
- MTK3339 high performance GPS Chipset
- Very high sensitivity (Tracking Sensitivity: -165 dBm)
- Extremely fast TTFF (Time To First Fix) at low signal level
- Support UART interface
- Built-in LNA(with in CHIP)
- Compact size (16mm x 13 mm x 2.6mm) suitable for space-sensitive application
- One size component, easy to mount on another PCB board
- Support NMEA 0183 V3.0 (GGA, GSA, GSV, RMC)
- Support OSP protocol
- MEMS Support: 3-axis Magnetometer for compass heading for "Point and Tell" feature
- MicroPower Mode (MPM) : Reduce MPM current consumption from <500 uA
- Support SBAS (WASS, EGNOS, MSAS, GAGAN)

Product Specifications

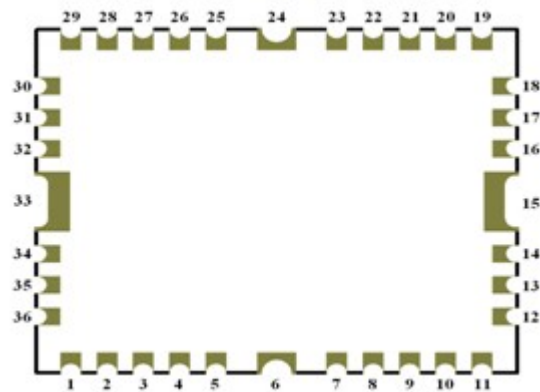
Parameter	Specification
Chip	MTK3339
Receiver Type	L1 frequency band 1575.42 MHz, C/A code, 12 Channels
Sensitivity	Tracking -165dBm Acquisition -148dBm(cold)/-163dBm(hot)
Accuracy	Position < 5 M (Typical Open Sky) Velocity 0.1m/s
Acquisition Time	Cold Start 25s (Typical Open Sky) Warm Start 22s Hot Start 1s
Power Consumption	Tracking 18mA @3.3V Typical Acquisition 25mA @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

Application

Application Circuit



Pin Assignment(Top View)

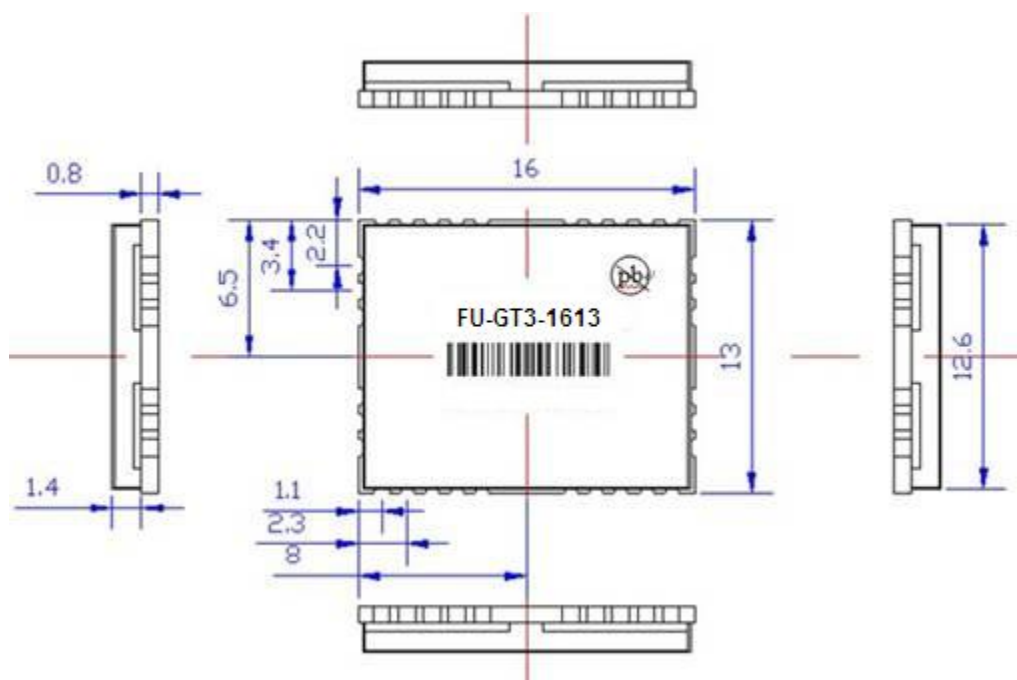


Pin Assignment(Top View)

Pin Description

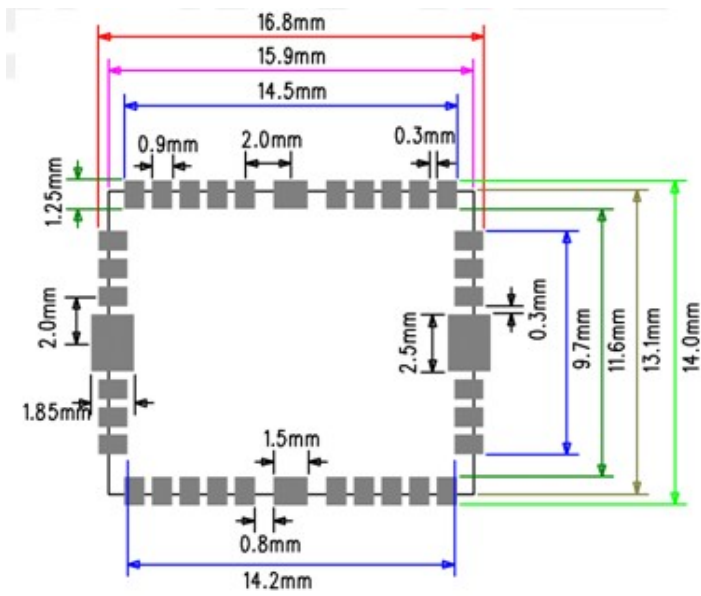
Pin No.	Pin name	I/O	Description	Remark
1	RF_IN	I	GPS Signal Input	50Ω@1.57542GHz
7	BOOTSEL	I	Boot mode set	Leave open if not used
13	RESET	I	Module Reset (Active Low)	Leave open if not used
16	NC			No Connection
18	NC			No Connection
20	1PPS	O	One pulse per second.	Leave Open in not used
25	NC			No Connection
27	NC			No Connection
30	TXA	O	UART Serial Data Output.	NMEA Protocol
31	RXA	I	UART Serial Data Input.	NMEA Protocol
5	VBAT	P	RTC and backup SRAM power	May be connect to Battery
11	VCC	P	Module Power Supply	Must be connect to +3.0-3.3V
2,3,4,35,36,	RF_GND	P	Ground	
6,8,9,10,12, 14,15,17,19, 21,22,23,24 26,28,29,33	VCC_GND	P	Ground	

Mechanical Specification



FU-GT3-1613 V1_Dimensions Unit: mm

Recommended Layout PAD



FU-GT3-1613_PAD Style& Dimensions Unit: mm

Electrical Characteristics

Absolute Maximum Rating

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	VCC	3.0	3.63	V
Backup Battery Volt	VBAT	3.0	3.63	V
Input Pins				
Input Pin Voltage I/O	RESET	-0.3	3.63	V
Input Pin Voltage I/O	RXA	-0.3	3.63	V
Antenna Bias DC Voltage	RF_IN	-0.3	5.0	V
Environment				
Storage Temperature	T _{stg}	-40	125	°C
Peak Reflow Soldering Temperature <10s	T _{peak}		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	3.0	3.3	3.6	V
Power supply voltage ripple	VCC_PP	V _{cc} =3.0V			30	mV
Consumption current	I _{cc}	V _{cc} =3.3V		15	18	mA
Backup Battery voltage	VBAT	Relative to GND	3.0	3.3	3.6	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	T _{opr}		-35		80	°C

Operating Description

TIMEMARK

This pin provides one pulse-per-second output from the board, which is synchronized to GPS time. This is not available in Trickle Power mode. If do not use it, Just NC.

Wake Up

System power controller, when **FU-GT3-1722** Power ON, this pin will output 3.3V_{dc}.

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. Output is TTL level, 0V ~ 3.3V.

RX

This is the main channel for receiving software commands from MTK 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, FU-GT3-1613 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 2.5V and 3.6V.

VCC

This is the main power supply to the engine board. (3.1V_{dc} to 3.6V_{dc})

Software Command

NMEA Output Command

NMEA0183 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 FU-GT3-1613 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)

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:

\$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		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

\$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.

RMC-Recommended Minimum Specific GNSS Data

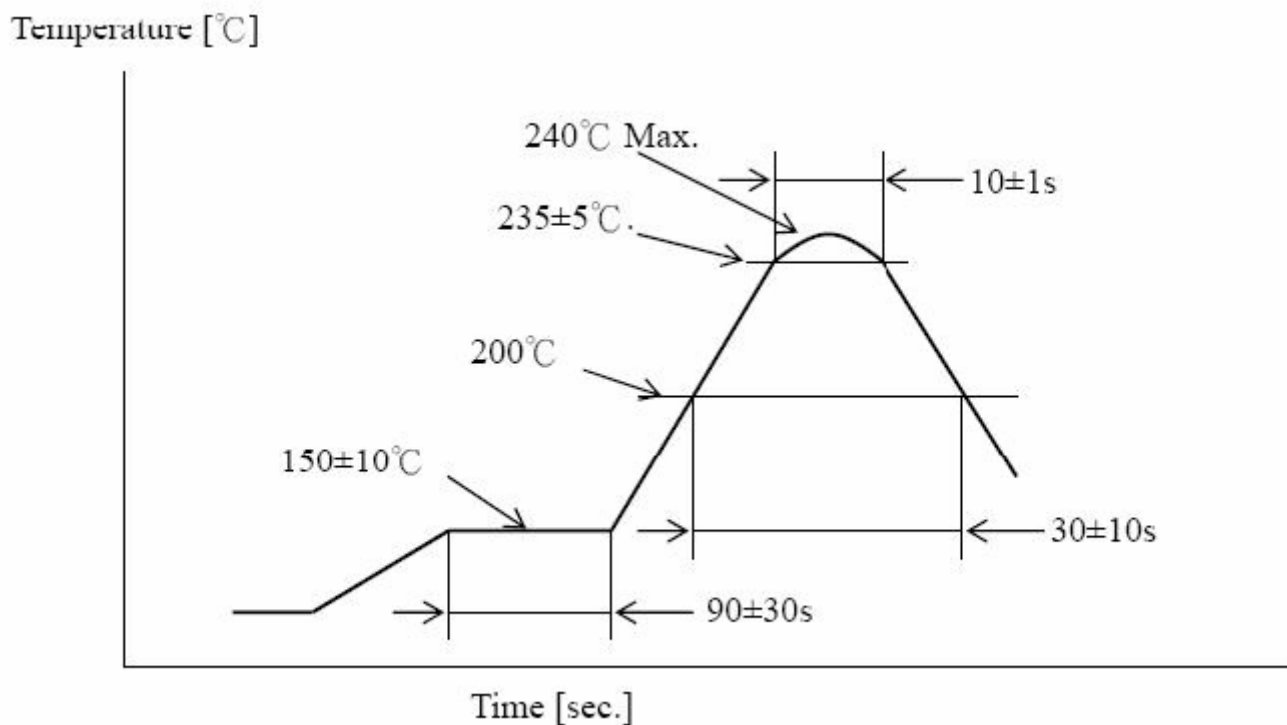
Table 6 contains the values of the following example:

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

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	025439.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2232.8557		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	11355.7438		Ddmm.mmmmm
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)

Recommended Reflow Profile:



Pre heating temperature: $150 \pm 10^{\circ}\text{C}$

Pre heating time: 90 ± 30 [sec.]

Heating temperature: $235 \pm 5^{\circ}\text{C}$

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.**

GPS Active Antenna Specifications (Recommendation)

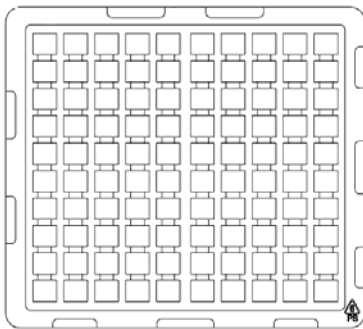
Frequency:	$1575.42 \pm 2\text{MHz}$	Amplifier Gain:	18~22dB Typical
Axial Ratio:	3 dB Typical	Output VSWR:	2.0 Max.
Output Impedance:	50Ω	Noise Figure:	2.0 dB Max
Polarization:	RHCP	Antenna Input Voltage:	3.3V (Typ.)

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

- Size : 320(L) x 250(W) x 7(H) (mm)
- Packing unit : 100pcs of per tray
- Inner packing diagram



Outer packing

- Size : 330(L) x 260(W) x 86(H) (mm)
- Packing unit : 10 trays of per carton
- Quantity : 1000pcs of per carton
- Outer packing diagram

