



GPS Module Series

Model: GT-714RS

SMD type ROM version



Technical Manual

UniTraQ International Corp. All right reserved, © 2008
9F-2, NO. 158, Sec. 2, Gongdao 5th Rd., Hsinchu City 30070, Taiwan, R.O.C

MADE IN TAIWAN

Contents

1. Features.....	1
2. Performance.....	2
2.1 Receiver specification.....	2
2.2 Electric specification.....	3
2.3 Pin assignment.....	3
2.4 Absolute maximum ratings.....	4
2.5 DC electrical characteristics.....	4
2.6 Antenna power supply output.....	4
2.7 One plus per second(1PPS).....	5
2.8 Adaptor antenna.....	5
2.9 Input and output timing.....	5
2.10 Environment specification.....	5
3. Reference design.....	6
4. Communication specification.....	7
5. Foot print.....	8
6. Outline.....	8
7. Approved NMEA message.....	9
7.1 GGA – global positioning system fix data.....	9
7.2 GLL – latitude and longitude, with time of position fix and status.....	10
7.3 GSA – GPS DOP and active satellites.....	11
7.4 GSV – GPS satellites in view.....	12
7.5 RMC – recommended minimum specific GPS/transit data.....	13
7.6 VTG – course over ground and ground speed.....	14
7.7 ZDA – time and data.....	14



GT-714RS

Fast-Acquisition High-Sensitivity 44-Channel SMD GPS Receiver Module

GT-714RS is a miniature 44-channel OEM GPS receiver module. It is optimized for high-performance, ease-of-use, flexibility, and low-cost. The GPS receiver is suitable for a wide range of navigation and tracking applications.

1. FEATURES

- 44 channel to acquire and track satellites simultaneously
- SMD type packaging
- Industry-leading TTFB speed
- Signal detection better than -158 dBm
- 0.5 PPM TCXO for quick cold start
- SBAS (WAAS/EGNOS) capable
- Cold start < 45sec
- Hot start < 1sec
- Accuracy 5m CEP
- 25 mm L x 25 mm W x 2.8 mm
- RoHS compliance

44 parallel channels and 20000+ correlators provide fast satellite signal acquisition and short start-up time. Acquisition sensitivity of -155dBm and tracking sensitivity of -158 dBm offer good performance even under difficult environments.

The **GT-714RS** provides Self-contained LNA supports direct connection to passive or active antenna. On-board Flash-based program memory allows firmware upgrade.

Satellite-based augmentation systems, such as WAAS and EGNOS, are supported to yield improved accuracy.

Small size and SMD mounting allow standard SMT assembly process, making it ideal for high volume production.

EVA-714RS

GT-714RS Evaluation Board

- GT-714RS
- USB output adapter board for PC/Notebook
- USB power/signal cable
- GPS active antenna (SMA, 3.3V)
- CD user manual and UniTraQ testing programming

2. PERFORMANCE

2.1 RECEIVER SPECIFICATIONS

Parameter	Specification
Receiver Type	44 channel
Re-acquisition sensitivity	-155dBm
Tracking sensitivity	-158dBm
Cold start sensitivity	-137dBm
Receiver frequency	1575.42MHz
Code	C/A code
Accuracy	
(1) Position	5m CEP
(2) Velocity	0.1m/sec
Startup Time	
hot start	< 1 sec
warm start	< 35 sec
cold start	< 45 sec
Signal Reacquisition	<1s
Update Rate	1Hz
Operational Limits	
(1) Altitude	< 18,000m
(2) velocity	< 500m/s
Dynamics	4G (39.2m/sec ²)
Datum	WGS-84
Protocol	NMEA-0183 V3.01

2.2 ELECTRIC SPECIFICATIONS

2.3 PIN ASSIGNMENT

10	RF_GND	GND	9
11	RF_IN	RF GND	8
12	RF_GND	LED	7
20	GND	GND	19

13	RTC_VCC	P1PPS	6
14	NRST	NC	5
15	NC	DIGITAL FTXD0	4
16	NC	FRXD0	3
17	NC	GND	2
18	NC	VCC	1

NO.	Signal name	I/O	V	Description	Notes
1	VCC	P	3.3	Main power supply	3.3V
2	GND	P	0	System ground	
3	FTXD0	O	0/3.3	Serial data port transmit line	
4	FRXD0	I	0/3.3	Serial data port transmit line	
5	NC	-	-	Not used	
6	P1PPS	O	0/3.3	1 pulse per second	
7	LED	O	0/3.3	GPS status indicator	
8	GND	P	0	System ground	
9	GND	P	0	System ground	
10	RF-GND	P	0	Radio frequency ground	
11	RF_IN	P	3.3	power supply from RF circuit for connecting an LNA	3.3V
12	RF-GND	P	0	Radio frequency ground	
13	RTC_VCC	P	3.3	Back up power input	
14	NRST	I	0/3.3	Manual Reset IN (active Low) Not use keep it floating	
15	NC	-	-	Not used	
16	NC	-	-	Not used	
17	NC	-	-	Not used	

NO.	Signal name	I/O	V	Description	Notes
18	NC	-	-	Not used	
19	GND	P	0	System ground	
20	GND	P	0	System ground	

2.4 ABSOLUTE MAXIMUM RATINGS

Item	Absolute maximum ratings	Unit
FRXD0 input voltage	0~3.3 (Max 4.0V)	V
RTC_VCC input voltage	0~3.3 (Max 6.0V)	V
VIN input voltage	0~3.3 (Max 6.0V)	V

2.5 DC ELECTRICAL CHARACTERISTICS

Item			Min.	TYP	Max	Unit	Notes
FTXD0 (Output)	H	Voltage	2.6	-	3.3	V	
	L	Voltage	0	-	0.4	V	
FRXD0 (Input)	H	Voltage	2.6	-	3.3	V	
	L	Voltage	0	--	0.4	V	
RTC_VCC	Voltage		3.0	3.3	3.6	V	
VIN	Voltage		3.0	3.3	3.6	V	
	Current		-	40mA	52mA	mA	@3.3V
RF-IN	Voltage		3.0	3.3	3.6	V	
	Impedance		-	50	-	Ohm	
	Center frequency		-	1.57542	-	GHz	

2.6 ANTENNA POWER SUPPLY

The **GT-714RS** No.11 pin, RF_IN, receives RF signal input and antenna power supply which must be connected to an external active antenna.

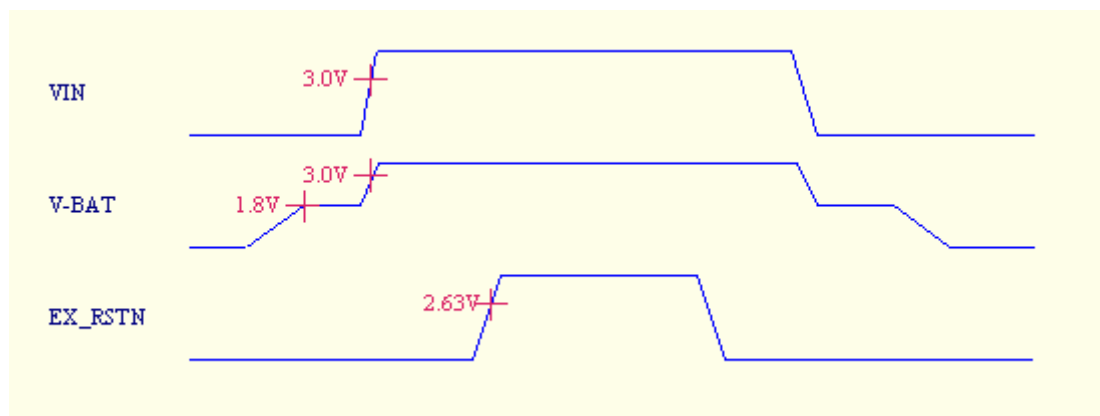
2.7 ONE PLUS PER SECOND (1PPS)

The **GT-714RS** provides a 500 microsecond wide, CMOS compatible TTL level Pulse-Per-Second (PPS). The PPS is a positive pulse available on pin 6. The rising edge of the PPS pulse is synchronized with respect to UTC. The timing accuracy is ± 50 nanoseconds when valid position fixes are being reported.

2.8 ADAPTOR ANTENNA

Parameter	Condition
Impedance	50 Ohm
NF	1.5dB or less
VSWR	2.0 or less
Element profit	0dBi or more (at zenith)
	-6dBi or more (elevation ≥ 10 degree)
Axial ratio	3dB or less
Gain	16dBi~30dBi
Out of band rejection	25dB or more

2.9 INPUT AND OUTPUT TIMING

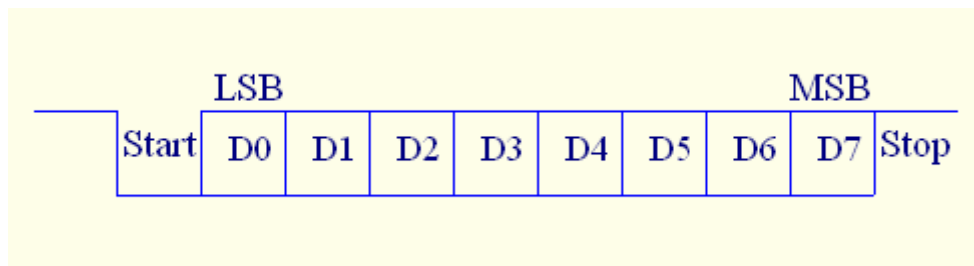


2.10 ENVIRONMENT SPECIFICATION

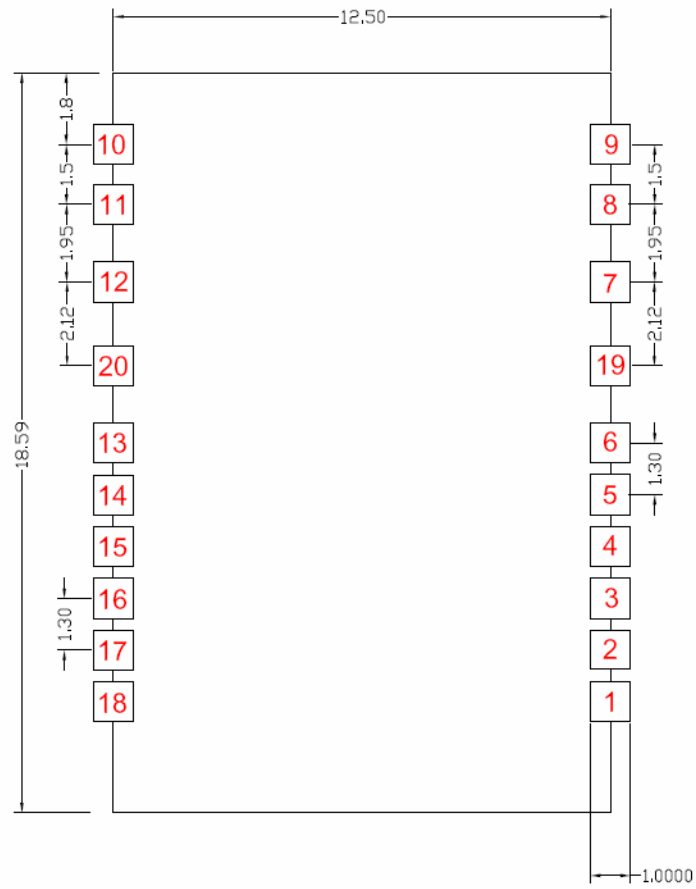
Parameter		Specification
Temperature	Operating	-20°C~+70°C
	Storage	-40°C~+80°C
Humidity		5%~95%

4. COMMUNICATION SEPECIFICATIONS

Item	Description
Interface	Full duplex serial interface
Bit rate	4800/9600bps
Start bit	1bit
Stop bit	1bit
Data bit	8bit
Parity	none
Transmission data	SACII NMEA0183 Ver:3.01
Update rate	1Hz
Output sentence	GGG/GSA/GSV/RMC



5. FOOT PRINT



Unit:mm

TopView

6. OUTLINE



7. APPROVED NMEA MESSAGE

The serial interface protocol is based on the National Marine Electronics Association's NMEA 0183 ASCII interface specification. This standard is fully define in "NMEA 0183, Version 3.01" The standard may be obtained from NMEA, www.nmea.org

7.1 GGA - GLOBAL POSITIONING SYSTEM FIX DATA

Time, position and fix related data for a GPS receiver.

Structure:

\$GPGGA,hhmmss.sss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>
 1 2 3 4 56 7 8 9 10 11 12 13

Example:

\$GPGGA,060932.448,2447.0959,N,12100.5204,E,1,08,1.1,108.7,M,,,,,0000*0E<CR><LF>

Field	Name	Example	Description
1	UTC Time	060932.448	UTC of position in hhmmss.sss format, (000000.00 ~ 235959.99)
2	Latitude	2447.0959	Latitude in dddm.mmmm format Leading zeros transmitted
3	N/S Indicator	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
4	Longitude	12100.5204	Longitude in dddmm.mmmm format Leading zeros transmitted
5	E/W Indicator	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
6	GPS quality indicator	1	GPS quality indicator 0: position fix unavailable 1: valid position fix, SPS mode 2: valid position fix, differential GPS mode 3: GPS PPS Mode, fix valid 4: Real Time Kinematic. System used in RTK mode with fixed integers 5: Float RTK. Satellite system used in RTK mode. Floating integers 6: Estimated (dead reckoning) Mode 7: Manual Input Mode 8: Simulator Mode
7	Satellites Used	08	Number of satellites in use, (00 ~ 12)
8	HDOP	1.1	Horizontal dilution of precision, (00.0 ~ 99.9)
9	Altitude	108.7	mean sea level (geoid), (-9999.9 ~ 17999.9)
10	Geoid Separation		Geoid separation in meters according to WGS-84 ellipsoid (-999.9 ~ 9999.9)
11	DGPS Age		Age of DGPS data since last valid RTCM transmission in xxx format (seconds) NULL when DGPS not used
12	DGPS Station ID	0000	Differential reference station ID, 0000 ~ 1023 NULL when DGPS not used
13	Checksum	0E	

Note: The checksum field starts with a '*' and consists of 2 characters representing a hex number. The checksum is the exclusive OR of all characters between '\$' and '*'.

7.2 GLL - LATITUDE AND LONGITUDE, WITH TIME OF POSITION FIX AND STATUS

Latitude and longitude of current position, time, and status.

Structure:

```
$GPGLL,ddmm.mmmm,a,dddmm.mmmm,a,hhmmss.sss,A,a*hh<CR><LF>
```

1 2 3 4 5 6 7 8

Example:

```
$GPGLL,4250.5589,S,14718.5084,E,092204.999,A,A*2D<CR><LF>
```

Field	Name	Example	Description
1	Latitude	4250.5589	Latitude in ddmm.mmmm format Leading zeros transmitted
2	N/S Indicator	S	Latitude hemisphere indicator 'N' = North 'S' = South
3	Longitude	14718.5084	Longitude in dddmm.mmmm format Leading zeros transmitted
4	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
5	UTC Time	092204.999	UTC time in hhmmss.sss format (000000.00 ~ 235959.99)
6	Status	A	Status, 'A' = Data valid, 'V' = Data not valid
7	Mode Indicator	A	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
8	Checksum	2D	

7.3 GSA - GPS DOP AND ACTIVE SATELLITES

GPS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentence and DOP values.

Structure:

```
$GPGSA,A,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh<CR><LF>
  1 2 3 3 3 3 3 3 3 3 3 3 3 3 4 5 6 7
```

Example:

```
$GPGSA,A,3,01,20,19,13,,,,,,,,,40.4,24.4,32.2*0A<CR><LF>
```

Field	Name	Example	Description
1	Mode	A	Mode 'M' = Manual, forced to operate in 2D or 3D mode 'A' = Automatic, allowed to automatically switch 2D/3D
2	Mode	3	Fix type 1 = Fix not available 2 = 2D 3 = 3D
3	Satellite used 1~12	01,20,19,13,,,,, ,,,,	Satellite ID number, 01 to 32, of satellite used in solution, up to 12 transmitted
4	PDOP	40.4	Position dilution of precision (00.0 to 99.9)
5	HDOP	24.4	Horizontal dilution of precision (00.0 to 99.9)
6	VDOP	32.2	Vertical dilution of precision (00.0 to 99.9)
7	Checksum	0A	

7.4 GSV - GPS SATELLITE IN VIEW

Number of satellites in view, PRN number, elevation angle, azimuth angle, and C/No. Four satellites details are transmitted per message. Additional satellite in view information is send in subsequent GSV messages.

Structure:

```
$GPGSV,x,x,xx,xx,xx,xxx,xx,...,xx,xx,xxx,xx *hh<CR><LF>
  1 2 3 4 5 6 7 4 5 6 7 8
```

Example:

```
$GPGSV,3,1,09,28,81,225,41,24,66,323,44,20,48,066,43,17,45,336,41*78<CR><LF>
$GPGSV,3,2,09,07,36,321,45,04,36,257,39,11,20,050,41,08,18,208,43*77<CR><LF>
```

Field	Name	Example	Description
1	Number of message	3	Total number of GSV messages to be transmitted (1-3)
2	Sequence number	1	Sequence number of current GSV message
3	Satellites in view	09	Total number of satellites in view (00 ~ 12)
4	Satellite ID	28	Satellite ID number, GPS: 01 ~ 32, SBAS: 33 ~ 64 (33 = PRN120)
5	Elevation	81	Satellite elevation in degrees, (00 ~ 90)
6	Azimuth	225	Satellite azimuth angle in degrees, (000 ~ 359)
7	SNR	41	C/No in dB (00 ~ 99) Null when not tracking
8	Checksum	78	

7.5 RMC - RECOMMENDED MINIMUM SPECIFIC GPS/TRANSIT DATA

Time, date, position, course and speed data provided by a GNSS navigation receiver.

Structure:

\$GPRMC,hhmmss.sss,A,dddmm.mmmm,a,dddmm.mmmm,a,x.x,x.x,ddmmyy,x.x,a,*hh<CR><LF>
 1 2 3 4 5 6 7 8 9 10 11 12 13

Example:

\$GPRMC,092204.999,A,4250.5589,S,14718.5084,E,0.00,89.68,211200,,A*25<CR><LF>

Field	Name	Example	Description
1	UTC time	092204.999	UTC time in hhmmss.sss format (000000.00 ~ 235959.999)
2	Status	A	Status 'V' = Navigation receiver warning 'A' = Data Valid
3	Latitude	4250.5589	Latitude in dddmm.mmmm format Leading zeros transmitted
4	N/S indicator	S	Latitude hemisphere indicator 'N' = North 'S' = South
5	Longitude	14718.5084	Longitude in dddmm.mmmm format Leading zeros transmitted
6	E/W Indicator	E	Longitude hemisphere indicator 'E' = East 'W' = West
7	Speed over ground	000.0	Speed over ground in knots (000.0 ~ 999.9)
8	Course over ground	000.0	Course over ground in degrees (000.0 ~ 359.9)
9	UTC Date	211200	UTC date of position fix, ddmmyy format
10	Magnetic variation		Magnetic variation in degrees (000.0 ~ 180.0)
11	Magnetic Variation		Magnetic variation direction 'E' = East 'W' = West
12	Mode indicator	A	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
13	checksum	25	

7.6 VTG - COURSE OVER GROUND AND GROUND SPEED

The Actual course and speed relative to the ground.

Structure:

GPVTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>
 1 2 3 4 5 6

Example:

\$GPVTG,89.68,T,,M,0.00,N,0.0,K,A*5F<CR><LF>

Field	Name	Example	Description
1	Course	89.68	True course over ground in degrees (000.0 ~ 359.9)
2	Course		Magnetic course over ground in degrees (000.0 ~ 359.9)
3	Speed	0.00	Speed over ground in knots (000.0 ~ 999.9)
4	Speed	0.00	Speed over ground in kilometers per hour (0000.0 ~ 1800.0)
5	Mode	A	Mode indicator 'N' = not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode 'M' = Manual input mode 'S' = Simulator mode
6	Checksum	5F	

7.7 ZDA -TIME AND DATE

Structure:

\$GPRMC,hhmmss.sss,dd,mm.yyyy, , ,xxx<CR><LF>
 1 2 3 4 5 6 7

Example:

\$GPZDA,104548.04,25,03,2004,,*6C<CR><LF>

Field	Name	Example	Description
1	UTC time	104548.04	UTC time in hhmmss.ss format, 000000.00 ~ 235959.99
2	UTC time: day	25	UTC time: day (01 ... 31)
3	UTC time: month	03	UTC time: month (01 ... 12)
4	UTC time: year	2004	UTC time: year (4 digit year)
5			Local zone hour Not being output by the receiver (NULL)
6			Local zone minutes Not being output by the receiver (NULL)
7	6C	6C	Checksum

UniTraQ International Corp

9F-2, No.158, Gongdao 5th Rd., Sec. 2 Hsinchu City 300, Taiwan, R.O.C.

TEL : 886-3-5710727 FAX : 886-3-5751365

Email support@unitraq.com

Website www.unitraq.com

© 2008 UniTraQ International Corp. All rights reserved.

Not to be reproduced in whole or part for any purpose without written permission of UniTraQ International Corp ("UniTraQ") Information provided by UniTraQ is believed to be accurate and reliable. These materials are provided by UniTraQ as a service to its customers and may be used for informational purposes only. UniTraQ assumes no responsibility for errors or omissions in these materials, nor for its use. UniTraQ reserves the right to change specification at any time without notice.

These materials are provided "as is" without warranty of any kind, either expressed or implied, relating to sale and/or use of UniTraQ products including liability or warranties relating to fitness for a particular purpose, consequential or incidental damages, merchantability, or infringement of any patent, copyright or other intellectual property right. UniTraQ further does not warrant the accuracy or completeness of the information, text, graphics or other items contained within these materials. UniTraQ shall not be liable for any special, indirect, incidental, or consequential damages, including without limitation, lost revenues or lost profits, which may result from the use of these materials.

UniTraQ products are not intended for use in medical, life-support devices, or applications involving potential risk of death, personal injury, or severe property damage in case of failure of the product.

All of products designed and produced in Taiwan, and RoHS compliance