1. Introduction

1.1 Over view

GP-20U7 is a GPS receiver build-in high performances -165dBm GPS chipset. GP-20U7 provides customer high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities. Customers benefit from the strength of both companies. Thanks to the low power consumption technology, the GPS receiver is ideal for many portable applications such as PDA, Tablet PC, smart phone etc.

1.2 Feature

- Build on high performance GPS single chip
- High Sensitivity -163 dBm

- Low power consumption: Max 40mA@3.3V
- Integrated LNA with low-gain mode for active antenna option
- 56 channels in Search mode and 22 channels "All-in-View" tracking
- Up to 60,000 simultaneous search windows for fast TTFF and high sensitivity acquisitions
- Average cold start time under 29seconds(open sky)
- Support standard NMEA-0183 and UBLOX protocol
- Patch Antenna Size:18.4(w)mmX18.4(d)mmX4(h)mm

- RoHS compliant (Lead-free)

1.3 Product Application

- Handheld GPS receiver application
- Ideal for PDA, Pocket PC and other consumer devices requiring Positioning capability
- Geographic Surveying
- Sports and Recreation
- Marine Navigation, Fleet Management
- Automotive application
- Car navigation and tracking
- AVL and Location-Based Services
- Timing application

1.4 Product Picture
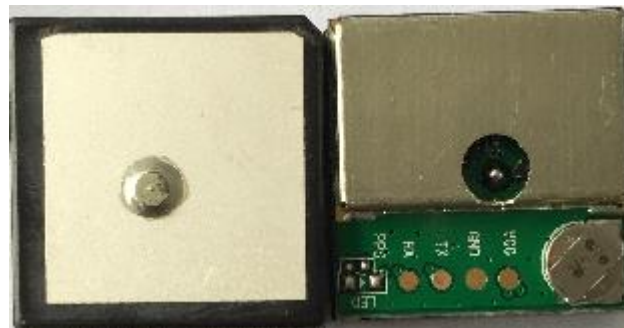
2 Technical Specifications

2.1 General Characteristics

2.1.1 General

Frequency	L1, 1575.42 MHz
C/A code	1.023 MHz chip rate
Acquisition Channel	56
Tracking Channel	22

2.1.2 Accuracy

Position	2.5m CEP
Velocity	0.1 m/s

2.1.3 Datum

WGS-84	Default WGS84

2.1.4 Time To First Fix （TTFF）

Hot start	<1sec., average
Warm start	<28sec., average
Cold start	<29sec., average

2.1.5 Sensitivity

Tracking Sensitivity	-165dBm, typical
Acquisition Sensitivity	-148dBm, typical for cold start

2.1.6 Dynamic condition

Altitude	18000m(Max)
Velocity	515m/s(Max)
Acceleration	4g
Jerk	1g/s

2.2 Electrical Characteristics

2.2.1 DC Power

Voltage	+3.3VDC
Supply current	Under 30mA @ 3.3V DC Typical

2.2.2 Serial Port

Electrical Interface	Two full duplex serial communication
Baud rate	9.6K（Default）
Navigation update rate	1Hz
Protocol Message	NMEA-0183 Ver 3.01

2.2.3 Antenna

Type	Active patch antenna
Center Frequency	1575.42 +/-1.032MHz
Polarization	RHCP
Impedance	50 Ohm

2.3 Environmental Characteristics

Operating range	-40°C ~ +85°C
Storage range	-40°C ~ +150°C
Relative Humidity	5% ~ 80%

2.4 Physical Characteristics

Length	18 mm
Width	18 mm
Height	7.1 mm

2.5 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit
Power supply voltage	-0.1	3.3	3.6	V

3 Software Interface

3.1 NMEA V3.01 Protocol

Its output signal level is TTL: 9600bps (default), 8 bit data, 1 stop bit and no parity.

It supports the following NMEA-0183

Messages: GGA, GLL, GSA, GSV, RMC and VTG.

NMEA Output Messages: the module board outputs the following messages as shown in Table.

Table 1 NMEA-0183 Output Messages

NMEA Record	Description
GGA	Global positoning system fixed data
GLL	Geogrphic position – latitude / longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

3.1.1 GGA-Global Postioning System Fixed Data

Table 2 contains the values of the following example:

$GPGGA, 161229.487, 3723.24756, N, 12158.34162, W, 1, 07, 1.0, 9.0, M, , , ,0000*18

Table 2 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.24756		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34162		Dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of

			Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoid Separation		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
＜CR＞＜LF＞			End of message termination

Table 2-1 Position Fix Indicator

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

3.1.2 GLL-Geographic Position-Latitude/Longitude

Table 3 contains the values of the following Example:

$GPGLL, 3723.24756, N, 12158.34162, W, 161229.487, A*2C

Table 3　GLL Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GLL protocol header
Latitude	3723.24756		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34162		Dddmm.mmmm
E/W Indicator	W		N=north or S=south
UTC Position	161229.487		Hhmmss.ss
Status	A		A=data valid or V=data not valid

Checksum	*2C		
<CR><LF>			End of message termination

3.1.3 GSA-GNSS DOP and Active Satallites

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 ID	$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

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

3.1.4 GSV-GNSS Satallites 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　GGA Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Messages[1]	2		Range 1 to 3
Messages Number[1]	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)
Azimuth	048	degrees	Channel 1 (Ture,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)
Azimuth	27	degrees	Channel 4 (Maximum 90)
Elevation	138	degrees	Channel 4 (Ture,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

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

3.1.5 RMC-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:

$GPRMC, 161229.487, A, 3723.24756, N, 12158.34162, W, 0.13,　309.62, 120598, ,*10

Table 6 GGA Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Position	161229.487		hhmmss.sss

Status	A		A=data valid or V=data not valid
Latitude	3723.24756		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34162		ddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	Ture
Date	120598	dBHz	ddmmyy
Magnetic Varation			E=east or W=west
Checksum	*10		
＜CR＞＜LF＞			End of message termination

3.1.6 VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

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

Table 7 VTG Data Format

Name	Example	Units	Description
Message ID	$GPVTG		VTG protocol header
Course	309.62	degrees	Measured heading
Reference	T		Ture
Course		degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	knots	Measured horizontal speed
Units	N		knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	*6E		
＜CR＞＜LF＞			End of message termination

4 Hardware Interface

The GP-20U7 includes an antenna in a unique style waterproof gadget. We can

manufacture variable connector cable to suit your demands. Like USB, PHR(JST), GHR(JST), Molex, PS2, RJ11, D-Sub 9..etc. You provide me specification, we manufacture the cable and connector.

Definition of Pin assignment

1　2　3　4

Pin No.	Pin name	I/O	Description	Remark
1	RX	P	UART Serial Data Input	RXD
2	TX	I	UART Serial Data Output	TXD
3	GND	O	Ground	GND
4	VCC	G	Power Supply	3-5V