



# Product Approval Datasheet

P/N: GM22U7

## 1. Introduction

### 1.1 Over view

GM22U7 is a GPS receiver build-in high performances -165dBm GPS chipset. GM22U7 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 -165 dBm
- Low power consumption: Max 35mA@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 MTK binary 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        | +3.3V-5.0V DC                |
| 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 | 22 mm |
|--------|-------|

|        |       |
|--------|-------|
| Width  | 22 mm |
| Height | 8 mm  |

## 2.5 Absolute Maximum Ratings

| Parameter            | Min  | Typ | Max | Unit |
|----------------------|------|-----|-----|------|
| Power supply voltage | -0.1 | 3.3 | 5   | 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 positioning system fixed data       |
| GLL         | Geographic 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 Positioning 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    | \$GPGLL     |       | GLL protocol header              |
| Latitude      | 3723.24756  |       | ddmm.mmmmm                       |
| N/S Indicator | N           |       | N=north or S=south               |
| Longitude     | 12158.34162 |       | Dddmm.mmmmm                      |
| 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 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 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 <sup>1</sup> | 2       |         | Range 1 to 3                      |
| Messages Number <sup>1</sup>    | 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           |

<sup>1</sup> 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 Variation |             |         | 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 GM22U7 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       | VCC      | P   | Power Supply            | 3-5V   |
| 2       | RX       | I   | UART Serial Data Input  | RXD    |
| 3       | TX       | O   | UART Serial Data Output | TXD    |
| 4       | GND      | G   | Ground                  |        |