



VK2828U7G5LF

V1.0

G-Mouse



V.KEL ELECTRONICS (HONG KONG) Co.,Ltd.

Hong Kong Office : No 1-21 of Henry Centre, Anle Village, Fenling, Hongkong Tel: 00852-69410941

V.KEL Communications Equipment (SHENZHEN) Co., Ltd.

Shenzhen Office: 101 Room of B Block, Hekan Industrial Park, Bantian District, Longgang Town, Shenzhen City

Tel: 0755-83502502 Fax: 0755-85225122

E-mail: vkel@vkelcom.com Website : <http://www.vkelcom.com>



Contents

- 1. Introduction of VK2828U7G5LF1
 - 1.1 Features.....1
 - 1.2 Appearance and Size1
 - 1.3 Pins2
- 2. Working Conditions3
 - 2.1 Normal Working Requirements3
 - 2.2 RTC Power Requirements3
 - 2.3 Digital Interface Level Requirements3
 - 2.4 Transient Current Chart3
- 3. Technical Parameters.....4
- 4. Signal Testing and RF Property5
 - 4.1 GPS Signal Testing5
 - 4.2 RF Property.....5
- 5. NMEA0183 Protocols.....6
 - 5.1 GGA7
 - 5.2 GLL.....8
 - 5.3 GSA8
 - 5.4 GSV9
 - 5.5 RMC.....10
 - 5.6 VTG.....10
- 6. GPS/GLONASS and BeiDou Switching11
- 7. Longitude and Latitude Switching.....13
- 8. Protocols for Setting U-blox Parameters14
 - 8.1 Disable Outputting Commands14
 - 8.2 Enable Outputting Commands14
 - 8.3 Set Baud Rate14
 - 8.4 Set Outputting Rate15
 - 8.5 Other Settings15
- 9. Packages16

G-MOUSE

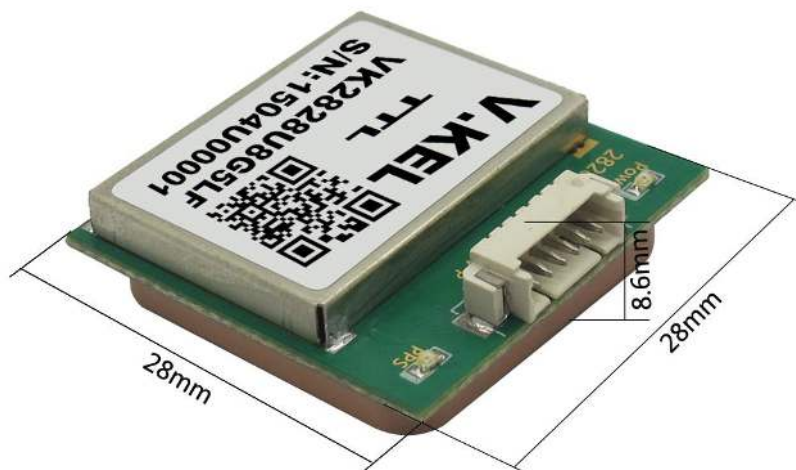


1. Introduction of VK2828U7G5LF

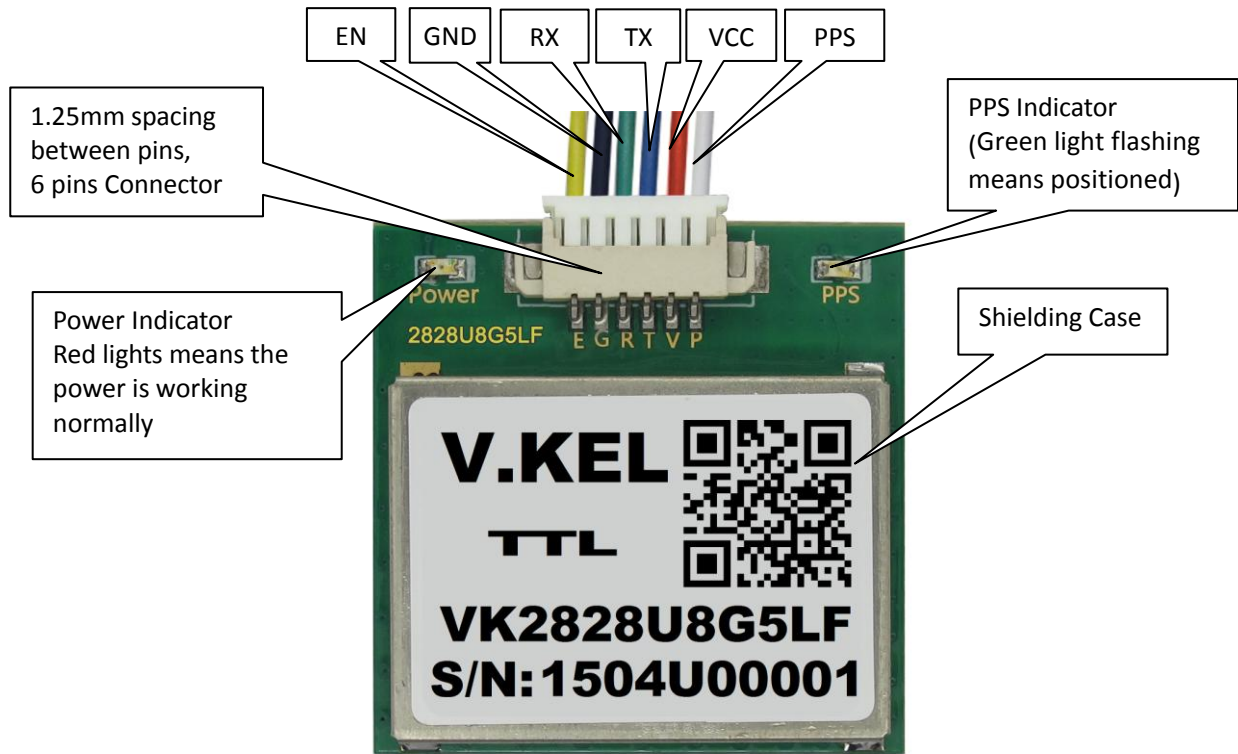
1.1 Features

- Industry standard GPS antenna of 25 * 25 * 4mm, with high sensitivity
- Optional interface: UART/TTL, RS232
- High-precision TCXO of KDS 0.5PPM
- Built-in SQI flash to set the parameters as required
- Built-in RTC crystal and capacitors to start quickly
- Built-in LNA
- Optional frequency of data refreshing: 1Hz-10Hz
- Supports A-GPS service: Assist Now Online and Assist Now Offline
- Hybrid engine: GPS, GALILEO, SBAS (WAAS, EGNOS, MSAS, GAGAN)

1.2 Appearance and Size



1.3 Pins



G-MOUSE

Pins' Definition

| Name | Function Description |
|------|---|
| PPS | Output time pulses (pulses per second) |
| VCC | The main power supply is +3.3V~+5V, and the power consumption is 50mA in one hour |
| TX | UART/TTL interface, and RS232_TXD is optional |
| RX | UART/TTL interface, and RS232_RXD is optional |
| GND | Connect to the ground |
| EN | Power Enable: high level means the module works, low level means the modules is closed. |



2. Working Conditions

2.1 Normal Working Requirements

| Parameters | Min | Norm | Max | Unit |
|---------------------|-----|------|-----|------|
| Voltage | 3.3 | 5 | 5.5 | V |
| Working Temperature | -40 | -- | +85 | °C |
| Current | 25 | 30 | 35 | mA |
| Storage Temperature | -40 | -- | +85 | °C |

2.2 RTC Power Requirements

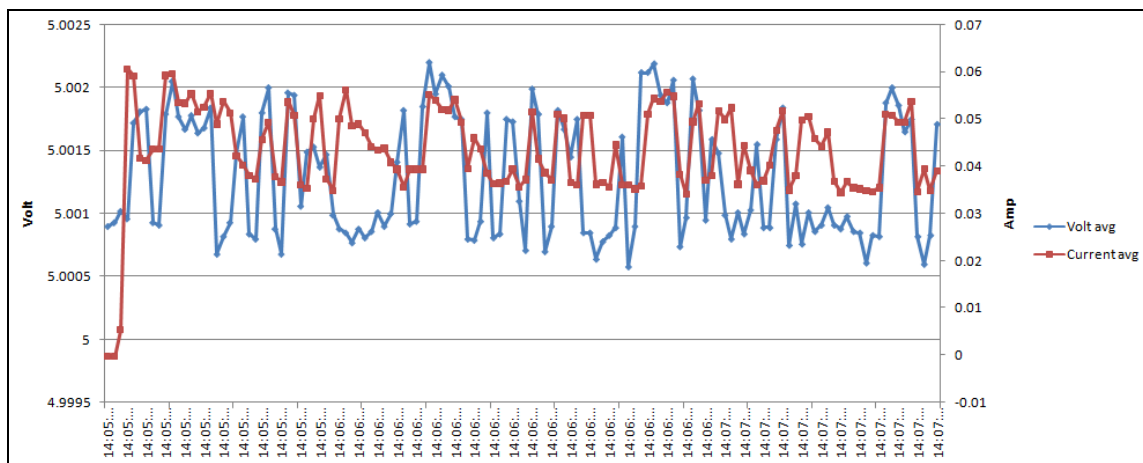
The RTC power is built in the module, and its endurance is 2 hours.

| Parameters | Min | Norm | Max | Unit |
|---------------------|-----|------|-----|------|
| RTC Voltage | 1.8 | 3.0 | 3.6 | V |
| Current Consumption | -- | 15 | -- | uA |

2.3 Digital Interface Level Requirements

| Parameters | Min | Norm | Max | Unit |
|---------------------|-----|------|-----|------|
| High Level (Input) | 2.0 | 2.8 | 3.3 | V |
| Low Level (Input) | -- | -- | 0.8 | V |
| High Level (Output) | 2.4 | 2.8 | 3.3 | V |
| Low Level (Output) | -- | -- | 0.4 | V |

2.4 Transient Current Chart



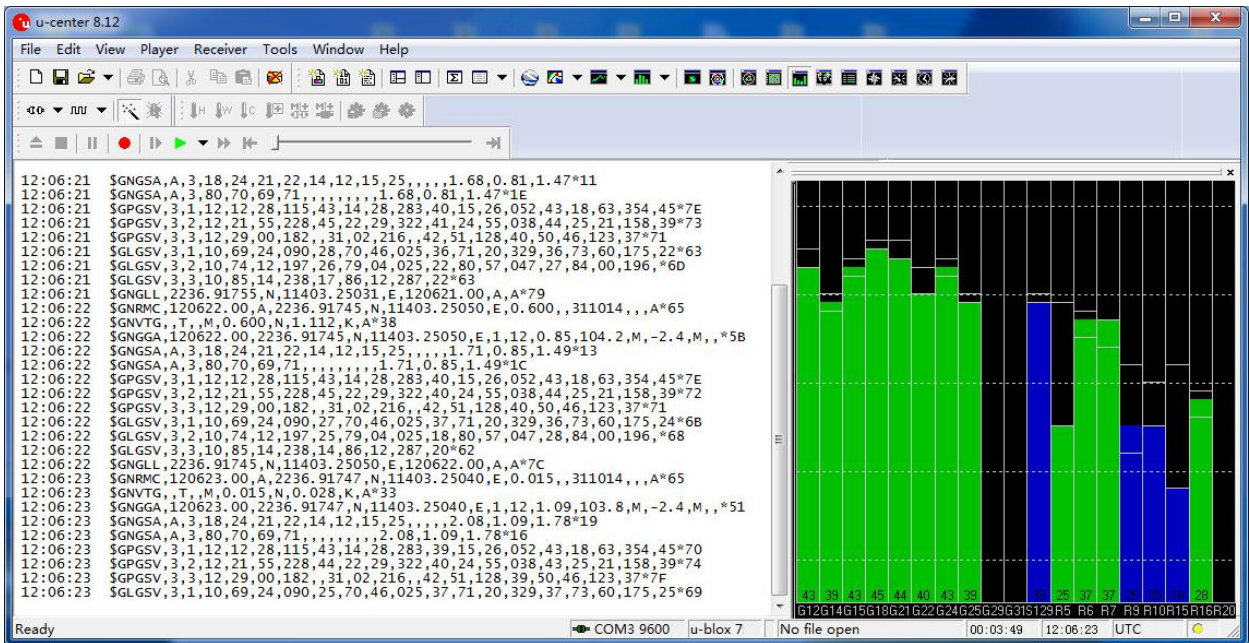


3. Technical Parameters

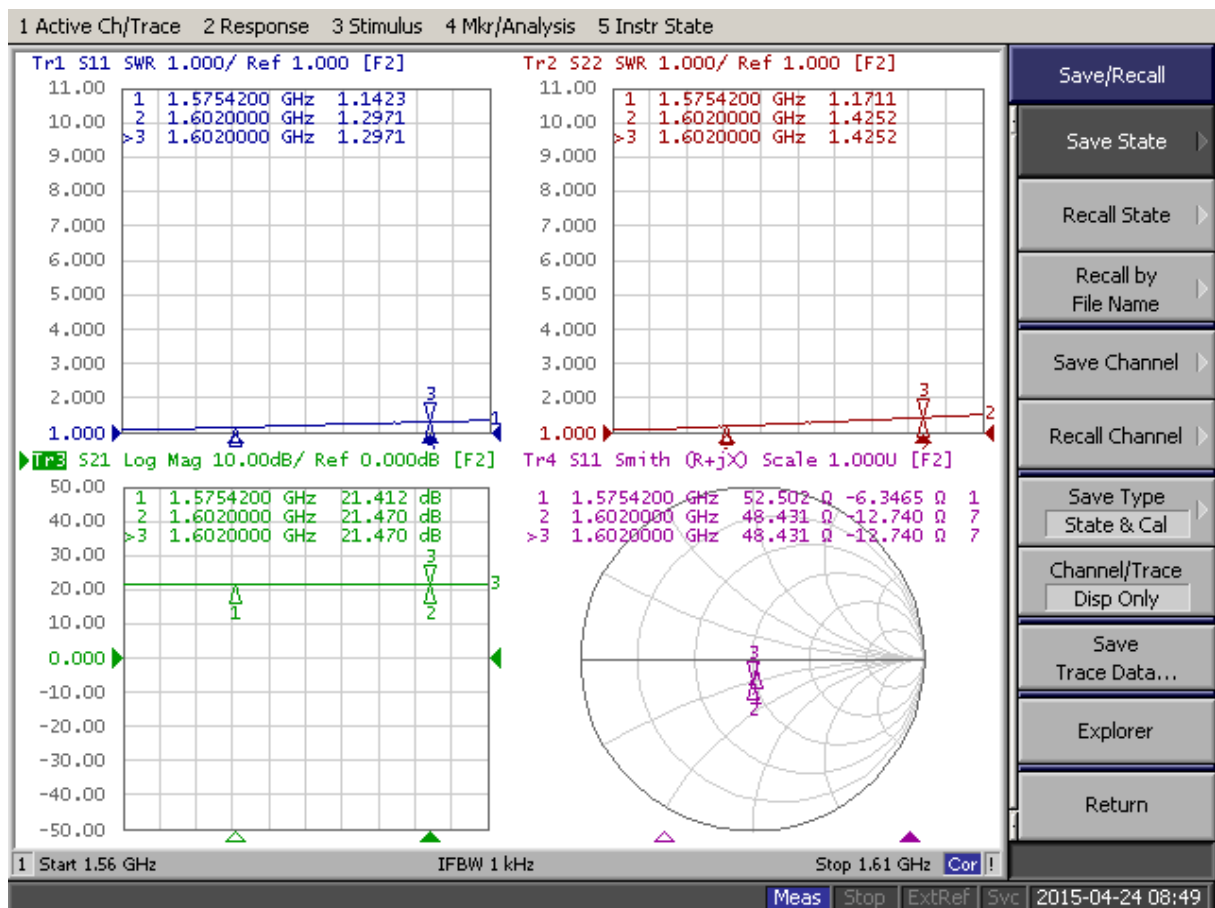
| Module Property | |
|----------------------|---|
| Chip | UBX-M8030-KT |
| C/A (Data Rate) | 1.023MHz |
| Receiving Frequency | L 1 [1575.42MHz] |
| Receiving Channel | 56 |
| S11 SWR | ≤ 1.3 |
| S11 SWR | ≤ 1.3 |
| S21 Log Mag | ≥ 20 db |
| S11 Smith | 50 Ω \pm 5% |
| Positioning Property | |
| Horizontal Position | Autonomous<2.5m on average, SBAS < 2.0m on average |
| Speed | <0.1m/s |
| Direction | <0.5 degrees |
| Timing Accuracy | 30ns |
| Coordinate System | WGS-84 |
| Max Height | 50km |
| Max Speed | 500m/s |
| Accelerate | ≤ 4 G |
| Electrical Property | |
| Sensitivity | Tracking:-162dBm Capturing:-160dBm Cold Start:-148dBm |
| Cold Start | 26 seconds on average |
| Warm Start | 24 seconds on average |
| Hot Start | 1 second on average |
| A-GPS | 3 seconds |
| Optional data baud | 9600bps(by default) [optional: 1200,2400,4800, 19200, 38400, 57600, 115200, 230400,460800,921600] |
| Optional output code | NMEA 0183 V3.0(GGA, GSA, GSV, RMC, VTG, GLL) |
| Working Environment | -40°C to 85°C |
| Other Parameters | |
| Clock Pulse | 0.25-1KHz |
| Updating Frequency | 1-10 Hz |
| UART/TTL | YES |
| RS232 | Optional |

4. Signal Testing and RF Property

4.1 GPS Signal Testing



4.2 RF Property





5. NMEA0183 Protocols

- NMEA 0183 output

GGA: time, position, position type

GLL: latitude, longitude, UTC

GSA: GPS receiver operating mod, satellites for positioning, DOP value

GSV: Available GPS satellites information, azimuth, elevation, SNR

RMC: time, date, position, speed

VTG: the speed information on ground

MSS: signal strength

Note: the output information and frequency are determined by your setting.

- Examples

\$GPGGA,060556.00,2236.91418,N,11403.24669,E,2,08,1.02,115.1,M,-2.4,M,,0000*43

\$GPGLL, 2236.91418, N, 11403.24669, E, 060556.00, A, D*64

\$GPGSA,A,3,24,22,14,12,15,25,18,42,,,,,2.20,1.02,1.95*00

\$GPGSV,3,1,11,12,31,118,39,14,30,289,44,15,20,059,41,18,68,007,43*75

\$GPGSV,3,2,11,21,48,208,,22,39,325,46,24,46,036,44,25,23,160,31*73

\$GPGSV,3,3,11,31,03,218,,42,51,128,35,50,46,122,36*4F

\$GPRMC,060556.00,A,2236.91418,N,11403.24669,E,0.13, 309.62,130214,,,D*7F

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



5.1 GGA

Example: \$GPGGA,060556.00,2236.91418,N,11403.24669,E,2,08,1.02,115.1,M,-2.4,M,,0000*43

| Name | Example | Unit | Description |
|----------------------|-------------|--------|--|
| Message ID | \$GPGGA | | GGA protocol head |
| UTC | 060556.00 | | hhmmss.ss |
| latitude | 2236.91418 | | ddmm.mmmmm |
| N/S direction | N | | N=North, S=South |
| longitude | 11403.24669 | | dddmm.mmmmm |
| E/W direction | E | | W=West, E=East |
| Position direction | 2 | | 0: not position 1:SPS mode, valid position 2: Differentia, SPS mode, valid position 3: PPS mode, valid position |
| Number of satellites | 08 | | Range: 0-12 |
| HDOP | 1.02 | | Horizontal accuracy |
| MSL amplitude | 115.2 | meter | - |
| Unit | M | meter | |
| Ground | -2.4 | meter | - |
| Unit | M | | - |
| Differentiated time | | second | Invalid as there is no DGPS |
| Differentiated ID | 0000 | | |
| Checksum | *43 | | |
| <CR><LF> | | | Message ends |



5.2 GLL

Example: \$GPGLL,2236.91418,N,11403.24669,E,060556.00,A,D*64

| Name | Example | Unit | Description |
|---------------|-------------|------|------------------------------|
| Message ID | \$GPGLL | | GLL protocol head |
| latitude | 2236.91418 | | ddmm.mmmmm |
| N/S direction | N | | N=North, S=South |
| longitude | 11403.24669 | | dddmm.mmmmm |
| E/W direction | E | | W=West, E=East |
| UTC | 060556.00 | | hhmmss.ss |
| Status | A | | A=Valid data, V=Invalid data |
| Checksum | D*64 | | |
| <CR><LF> | | | Message ends |

5.3 GSA

Example: \$GPGSA,A,3,24,22,14,12,15,25,18,42,,,,,2.20,1.02,1.95*00

| Name | Example | Unit | Description |
|-----------------|---------|------|---|
| Message ID | \$GPGSA | | GSA protocol head |
| Mode 1 | A | | M=Manually (in 2D/3D positioning mode) A=Automatically |
| Mode 2 | 3 | | 1: invalid position 2: 2D positioning 3: 3D positioning |
| Satellite using | 24 | | Channel 1 |
| Satellite using | 22 | | Channel 2 |
| ... | ... | ... | ... |
| Satellite using | | | Channel 12 |
| PDOP | 2.20 | | Positioning accuracy |
| HDOP | 1.2 | | Horizontal accuracy |
| VDOP | 1.95 | | Vertical accuracy |
| Checksum | *00 | | |
| <CR><LF> | | | Message ends |



5.4 GSV

Examples: \$GPGSV,3,1,11,12,31,118,39,14,30,289,44,15,20,059,41,18,68,007,43*75

\$GPGSV,3,2,11,21,48,208,,22,39,325,46,24,46,036,44,25,23,160,31*73

\$GPGSV,3,3,11,31,03,218,,42,51,128,35,50,46,122,36*4F

| Name | Example | Unit | Description |
|----------------|---------|--------|---|
| Message ID | \$GPGSV | | GSV protocol head |
| Message amount | 3 | | Range: 1-3 |
| Message NO. | 1 | | Range: 1-3 |
| Satellites NO. | 11 | | |
| Satellites ID | 12 | | Range: 1-32 |
| Elevation | 31 | degree | The maximum is 90 |
| Azimuth | 118 | degree | Range:0-359 |
| CNR (C/No) | 39 | dBHz | Range: 0-99; Null means there is no positioning |
| Satellites ID | 14 | | Range: 1-32 |
| Elevation | 30 | degree | The maximum is 90 |
| Azimuth | 289 | degree | Range: 0-359 |
| CNR (C/No) | 44 | dBHz | Range: 0-99; Null means there is no positioning |
| Satellites ID | 15 | | Range: 1-32 |
| Elevation | 20 | degree | The maximum is 90 |
| Azimuth | 059 | degree | Range:0-359 |
| CNR (C/No) | 41 | dBHz | Range: 0-99; Null means there is no positioning |
| Satellites ID | 18 | | Range: 1-32 |
| Elevation | 68 | degree | The maximum is 90 |
| Azimuth | 007 | degree | Range:0-359 |
| CNR (C/No) | 43 | dBHz | Range: 0-99; Null means there is no positioning |
| Checksum | *75 | | |
| <CR><LF> | | | Message ends |



5.5 RMC

Example: \$GPRMC,060556.00,A,2236.91418,N,11403.24669,E,0.13, 309.62,130214,,,D*7F

| Name | Example | Unit | Description |
|---------------------|-------------|--------|------------------------------|
| Message ID | \$GPRMC | | RMC protocol head |
| UTC | 060556.00 | | hhmmss.ss |
| Status | A | | A=Valid data, V=Invalid data |
| latitude | 2236.91418 | | ddmm.mmmmm |
| N/S direction | N | | N=North, S=South |
| longitude | 11403.24669 | | dddmm.mmmmm |
| E/W direction | E | | W=West, E=East |
| Speed on the ground | 0.13 | Knot | |
| Direction | 309.62 | Degree | |
| Date | 130214 | | ddmmyy |
| Magnetic variable | | | - |
| Checksum | *7F | | |
| <CR><LF> | | | Message ends |

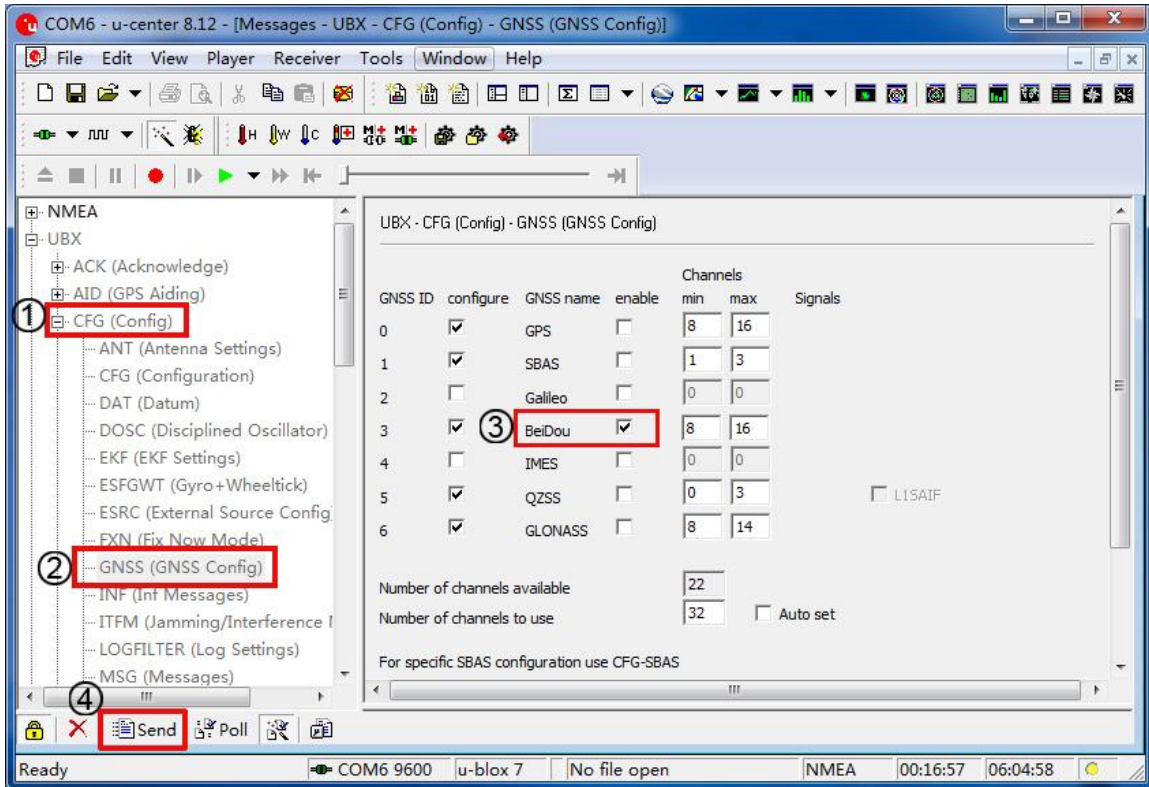
5.6 VTG

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

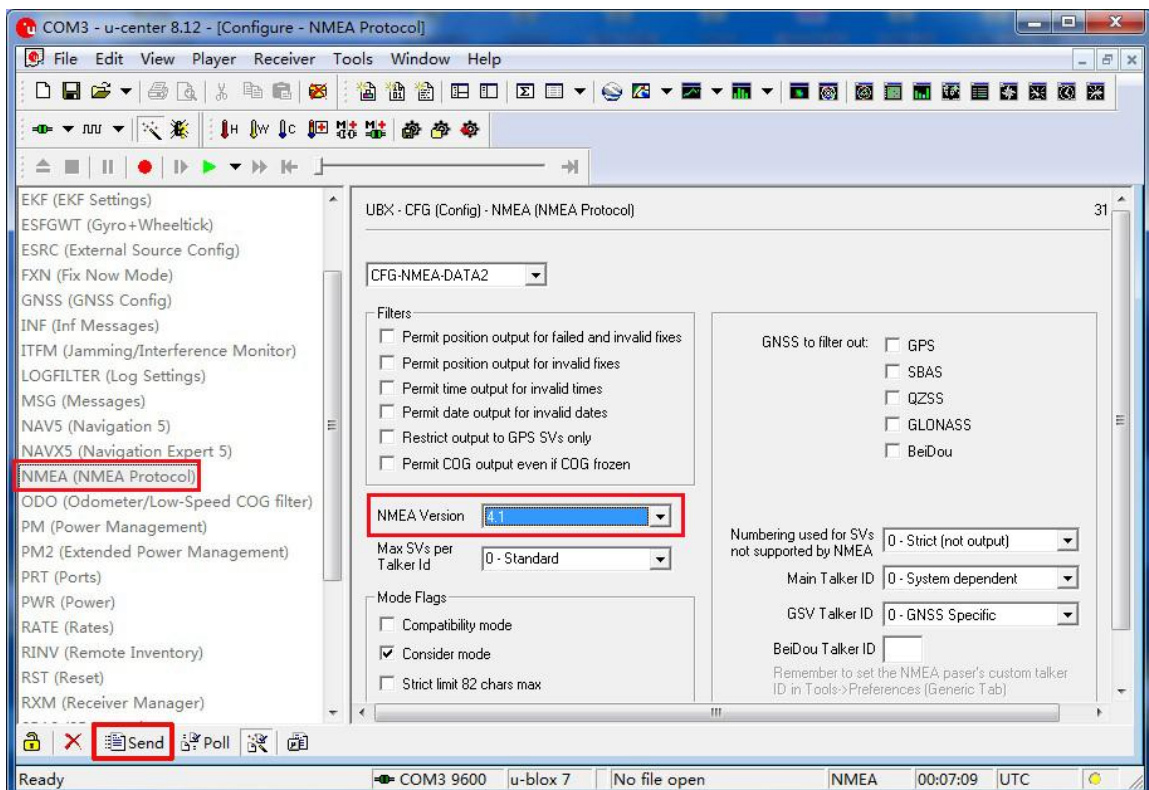
| Name | Example | Unit | Description |
|------------|---------|--------|-------------------|
| Message ID | \$GPVTG | | VTG protocol head |
| Direction | 309.62 | Degree | |
| Reference | T | | True North |
| Direction | 309.62 | Degree | |
| Reference | M | | Magnetic |
| Speed | 0.13 | Knot | |
| Unit | N | | Knot |
| Speed | 0.2 | Km/h | |
| Unit | K | | Km/h |
| Checksum | *10 | | |
| <CR><LF> | | | Message ends |

6. GPS/GLONASS and BeiDou Switching

It is the data of GPS/GLONASS protocol outputting from the module by default. You can modify to the BeiDou protocol through the testing software. The steps are shown in the following figures.

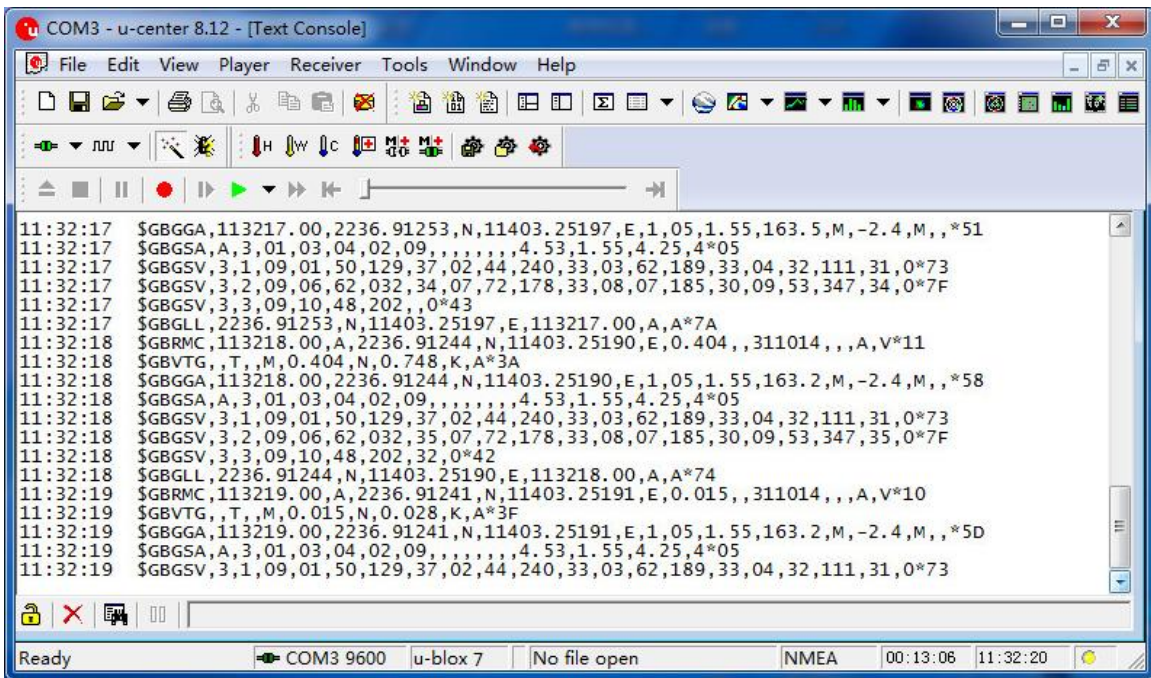


Select “NMEA(NMEA Protocol) “ and set the NEMA Version to “4.1”, and then click [Send] to save this modification.





The \$GB indicates that the data meets BeiDou protocol.




G-MOUSE

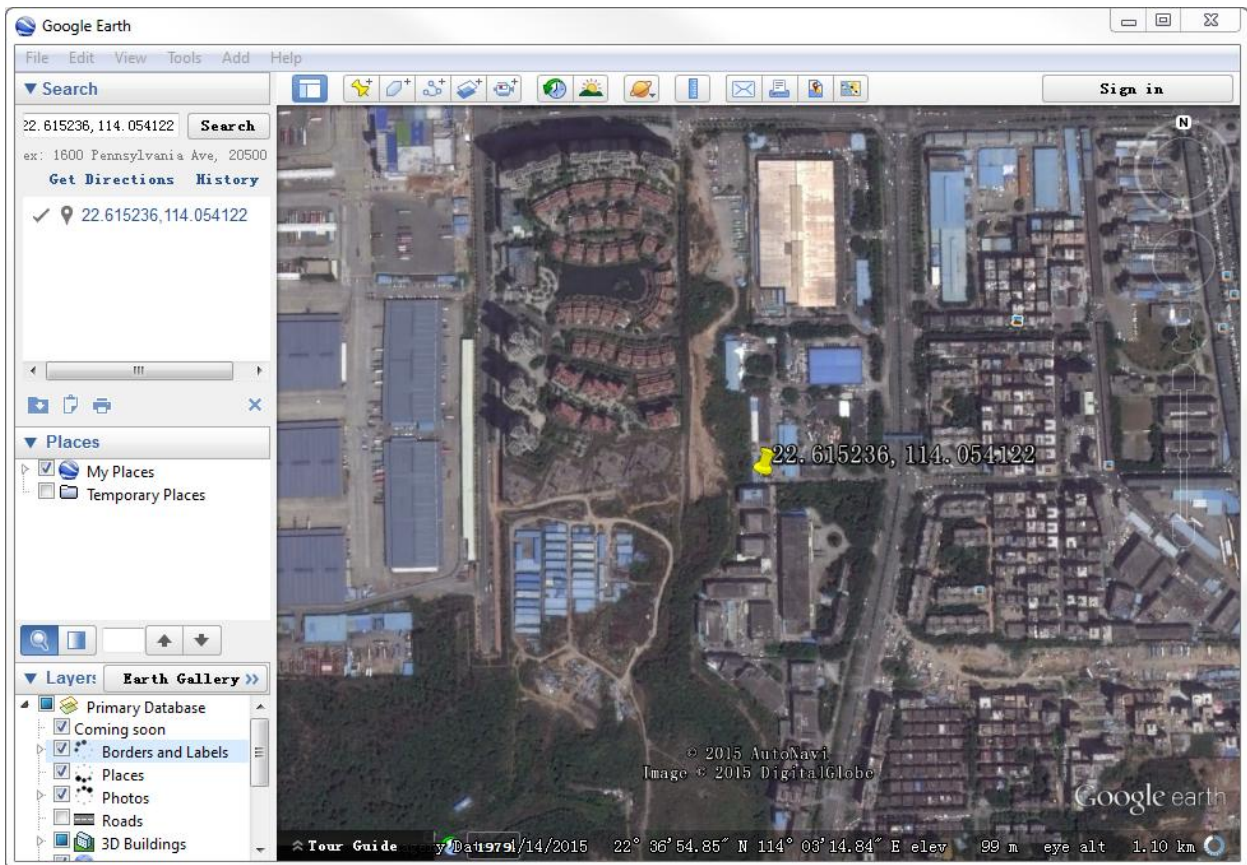
7. Longitude and Latitude Switching

\$GPRMC,060556.00,A,2236.91418,N,11403.24669,E,0.034,,130214,,,D*7F

| | please input | | Results |
|-----------------|--------------|------------|------------|
| Longitude (GPS) | 11403.2467 | The reults | 114.054112 |
| Latitude (GPS) | 2236.9142 | The reults | 22.615236 |

Basis for calculation: abcde.fghi
 $abd+(de/60)+(fghi/600000)$

Input the results in "Google Earth"  and search, you can get the detailed position information.





8. Protocols for Setting U-blox Parameters

You can send commands through serial port to modify the settings. The HEX must be selected when you send commands through the serial port of PC software.

It will cost 300ms to start the U-blox for the first time. Please send the following commands to set the parameters after it starts.

8.1 Disable Outputting Commands

24 45 49 47 50 51 2c 44 54 4d 2a 33 42 0d 0a b5 62 06 01 03 00 f0 0a 00 04 23 -> Disable GPDTM

24 45 49 47 50 51 2c 47 42 53 2a 33 30 0d 0a b5 62 06 01 03 00 f0 09 00 03 21 -> Disable GPGBS

24 45 49 47 50 51 2c 47 47 41 2a 32 37 0d 0a b5 62 06 01 03 00 f0 00 00 fa 0f -> Disable GPGGA

24 45 49 47 50 51 2c 47 4c 4c 2a 32 31 0d 0a b5 62 06 01 03 00 f0 01 00 fb 11 -> Disable GPGLL

24 45 49 47 50 51 2c 47 52 53 2a 32 30 0d 0a b5 62 06 01 03 00 f0 06 00 00 1b -> Disable GPGRS

24 45 49 47 50 51 2c 47 53 41 2a 33 33 0d 0a b5 62 06 01 03 00 f0 02 00 fc 13 -> Disable GPGSA

24 45 49 47 50 51 2c 47 53 54 2a 32 36 0d 0a b5 62 06 01 03 00 f0 07 00 01 1d -> Disable GPGST

24 45 49 47 50 51 2c 47 53 56 2a 32 34 0d 0a b5 62 06 01 03 00 f0 03 00 fd 15 -> Disable GPGSV

24 45 49 47 50 51 2c 52 4d 43 2a 33 41 0d 0a b5 62 06 01 03 00 f0 04 00 fe 17 -> Disable GPRMC

24 45 49 47 50 51 2c 56 54 47 2a 32 33 0d 0a b5 62 06 01 03 00 f0 05 00 ff 19 -> Disable GPVTG

24 45 49 47 50 51 2c 5a 44 41 2a 33 39 0d 0a b5 62 06 01 03 00 f0 08 00 02 1f -> Disable GPZDA

8.2 Enable Outputting Commands

24 45 49 47 50 51 2c 44 54 4d 2a 33 42 0d 0a b5 62 06 01 03 00 f0 0a 01 05 24 -> Enable GPDTM

24 45 49 47 50 51 2c 47 42 53 2a 33 30 0d 0a b5 62 06 01 03 00 f0 09 01 04 22 -> Enable GPGBS

24 45 49 47 50 51 2c 47 47 41 2a 32 37 0d 0a b5 62 06 01 03 00 f0 00 01 fb 10 -> Enable GPGGA

24 45 49 47 50 51 2c 47 4c 4c 2a 32 31 0d 0a b5 62 06 01 03 00 f0 01 01 fc 12 -> Enable GPGLL

24 45 49 47 50 51 2c 47 52 53 2a 32 30 0d 0a b5 62 06 01 03 00 f0 06 01 01 1c -> Enable GPGRS

24 45 49 47 50 51 2c 47 53 41 2a 33 33 0d 0a b5 62 06 01 03 00 f0 02 01 fd 14 -> Enable GPGSA

24 45 49 47 50 51 2c 47 53 54 2a 32 36 0d 0a b5 62 06 01 03 00 f0 07 01 02 1e -> Enable GPGST

24 45 49 47 50 51 2c 47 53 56 2a 32 34 0d 0a b5 62 06 01 03 00 f0 03 01 fe 16 -> Enable GPGSV

24 45 49 47 50 51 2c 52 4d 43 2a 33 41 0d 0a b5 62 06 01 03 00 f0 04 01 ff 18 -> Enable GPRMC

24 45 49 47 50 51 2c 56 54 47 2a 32 33 0d 0a b5 62 06 01 03 00 f0 05 01 00 1a -> Enable GPVTG

24 45 49 47 50 51 2c 5a 44 41 2a 33 39 0d 0a b5 62 06 01 03 00 f0 08 01 03 20 -> Enable GPZDA

8.3 Set Baud Rate

- Set baud rate to 4800

b5 62 06 00 14 00 01 00 00 00 d0 08 00 00 c0 12 00 00 07 00 07 00 00 00 00 00 d3 fc b5 62 06 00 01 00 01 08 22

- Set baud rate to 9600

b5 62 06 00 14 00 01 00 00 00 d0 08 00 00 80 25 00 00 07 00 07 00 00 00 00 00 a6 cd b5 62 06 00 01 00 01 08 22



- Set baud rate to 38400

b5 62 06 00 14 00 01 00 00 00 d0 08 00 00 00 96 00 00 07 00 07 00 00 00 00 00 97 a8

- Set baud rate to 115200

b5 62 06 00 14 00 01 00 00 00 d0 08 00 00 00 c2 01 00 07 00 07 00 00 00 00 00 c4 96 b5 62 06 00 01 00 01 08 22

8.4 Set Outputting Rate

1HZ (1 output per second)

B5 62 06 08 06 00 E8 03 01 00 01 00 01 39

5Hz (5 outputs per second)

B5 62 06 08 06 00 C8 00 01 00 01 00 DE 6A B5 62 06 08 00 00 0E 30

10Hz (10 outputs per second)

B5 62 06 08 06 00 64 00 01 00 01 00 7A 12 B5 62 06 08 00 00 0E 30

0.33Hz (1 output per 3 seconds)

B5 62 06 08 06 00 B8 0B 01 00 01 00 D9 41 B5 62 06 08 00 00 0E 30

0.2Hz (1 output per 5 seconds)

B5 62 06 08 06 00 88 13 01 00 01 00 B1 49 B5 62 06 08 00 00 0E 30

0.1Hz (1 output per 10 seconds)

B5 62 06 08 06 00 10 27 01 00 01 00 4D DD B5 62 06 08 00 00 0E 30

0.05Hz (1 output per 20 seconds)

B5 62 06 08 06 00 20 4E 01 00 01 00 84 00 B5 62 06 08 00 00 0E 30

8.5 Other Settings

- Reset

B5 62 06 04 04 00 FF 87 01 00 95 F7

- Cold Start

B5 62 06 04 04 00 FF FF 02 00 0E 61

- Hot Start

B5 62 06 04 04 00 00 00 02 00 10 68

- Reset to Manufacturer Defaults

B5 62 06 09 0D 00 FF FF 00 00 00 00 FF FF 00 00 07 1F 9E

- Enable the Sleeping Mode(Low Consumption Mode)

B5 62 06 04 04 00 00 00 08 00 16 74

Note: There is no data outputting in sleeping mode, but the module still keeps positioning. You can send the "Hot Start" commands to enable the real-time tracking mode.

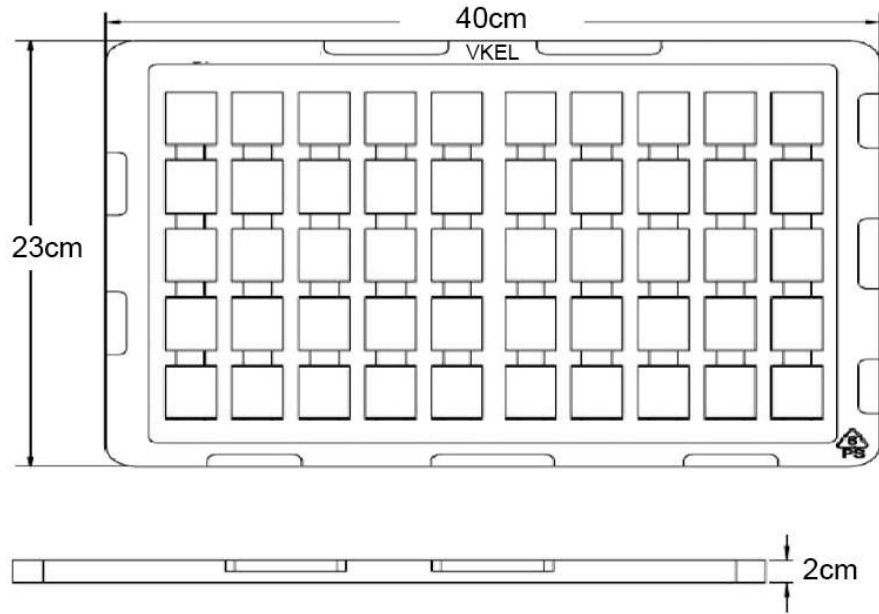
- Save the changes

B5 62 06 09 0D 00 00 00 00 FF FF 00 00 00 00 17 31 BF



9. Packages

There are 50pcs in every pallet. The dimension of the pallet is shown in the following figure.



G-MOUSE