

# GPS Engine Board

## EB-230

EB-230 is an ultra miniature 12 x 12 mm<sup>2</sup> GPS engine board. It provides superior navigation performance under dynamic conditions in areas with limited sky view like urban canyons. High sensitivity up to **-158dBm** for weak signal operation without compromising accuracy. EB-230 is your best choice for embedded applications.

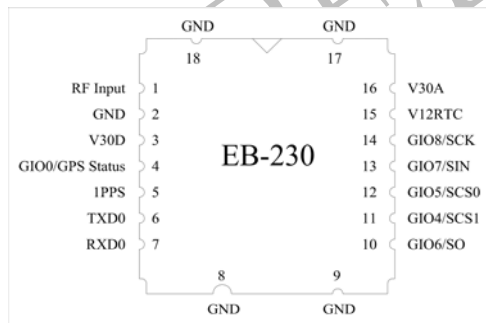
### Key Features :

- Small form factor: 12 x 12 x 3 mm
- Lead-Free – RoHS/WEEE compliant
- High sensitivity -158dBm
- Tracks 32-Channel of satellites
- Fast Position Fix
- Low power consumption

### Applications :

- Handheld devices
- Automotive and Marine Navigation
- Automotive Navigator Tracking
- Emergency Locator
- Geographic Surveying
- Personal Positioning
- Sporting and Recreation
- Embedded applications : PDA, DSC, Smart phone, UMPC, PND, MP4

### PIN Definition :



### PIN Coordinates

Unit:mm

| Pin # | X    | Y     | Pin # | X     | Y     |
|-------|------|-------|-------|-------|-------|
| 1     | 0.00 | 0.00  | 10    | 12.50 | 7.62  |
| 2     | 0.00 | 1.27  | 11    | 12.50 | 6.35  |
| 3     | 0.00 | 2.54  | 12    | 12.50 | 5.08  |
| 4     | 0.00 | 3.81  | 13    | 12.50 | 3.81  |
| 5     | 0.00 | 5.08  | 14    | 12.50 | 2.54  |
| 6     | 0.00 | 6.35  | 15    | 12.50 | 1.27  |
| 7     | 0.00 | 7.62  | 16    | 12.50 | 0.00  |
| 8     | 4.06 | 10.06 | 17    | 9.71  | -2.44 |
| 9     | 9.71 | 10.06 | 18    | 2.79  | -2.44 |



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## EB-230 Specifications

| Specification          | Description   |
|------------------------|---|
| General                | L1 frequency, C/A code (SPS)<br>32 independent tracking channels  |
| Sensitivity            | -158dBm /Tracking; -146dBm /Acquisition   |
| Update Rate            | Up to 5Hz   |
| Accuracy               | Without aid: 3.0m 2D-RMS<br><3m CEP (50%) without SA (horizontal)<br>DGPS (WAAS, EGNOS, MSAS, RTCM): 2.5m                                 |
| Acquisition (open sky) | Cold Start: 36sec<br>Warm Start: 33sec<br>Hot Start: 1sec   |
| Reacquisition          | < 1sec  |
| Dynamics               | Altitude: 18000m (max.)<br>Velocity: 515m/sec (max.)<br>Vibration: 4G (max.)  |
| Supply Voltage         | DC 3.0V   |
| Power Consumption      | < 30mA @ 3.0V (w/o Active ANT) / Tracking   |
| Backup Battery         | DC 1.2V ( RTC Vcc )   |
| NMEA Message           | NMEA0183 v3.1 baud rate 4800/9600/.../57600, default 9600<br>Protocol: 3V CMOS/TTL<br>Selectable Output: GGA, GLL, GSA, GSV, RMC, and VTG |
| Datum                  | Default WGS-84  |
| Antenna                | External Active Antenna<br>Output Voltage: 3.0 VDC  |
| Serial Interface       | RS-232, SPI   |
| Operating Temperature  | -30°C to 85°C   |
| Storage Temperature    | -40°C to 125°C  |
| Operating Humidity     | ≤ 95%, non condensing   |
| Mounting               | SMT Type, 18 Pin  |
| Dimension              | 12 x 12 x 3(H) mm   |

\*Specifications subject to change without prior notice.

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## 1 Introduction

EB-230 is an ultra miniature 12 x12mm<sup>2</sup> GPS engine board. It provides superior navigation performance under dynamic conditions in areas with limited sky view like urban canyons. High sensitivity up to -158dBm for weak signal operation without compromising accuracy. EB-230 is your best choice for embedded applications.

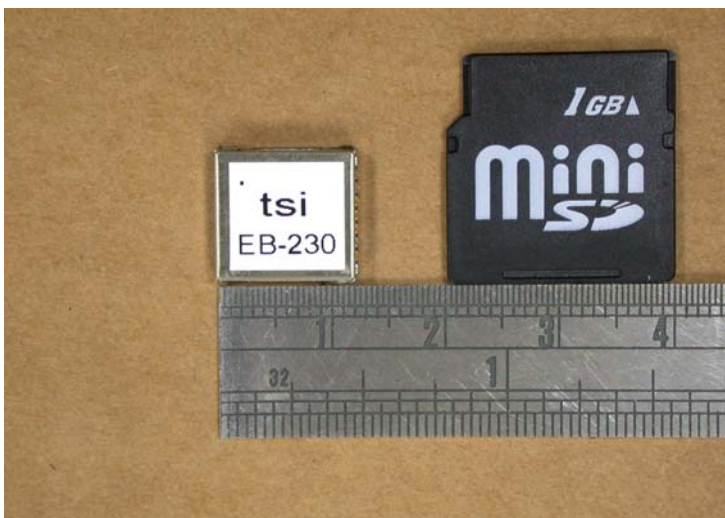
### 1.1 Key Features

- Small form factor: 12 x 12 x 3 mm
- Lead-Free – RoHS/WEEE compliant
- High sensitivity -158dBm
- Tracks 32-Channel of satellites
- Fast Position Fix, 36/ 33/ 1s for Cold/ Warm/ Hot start
- Low power consumption

### 1.2 Applications

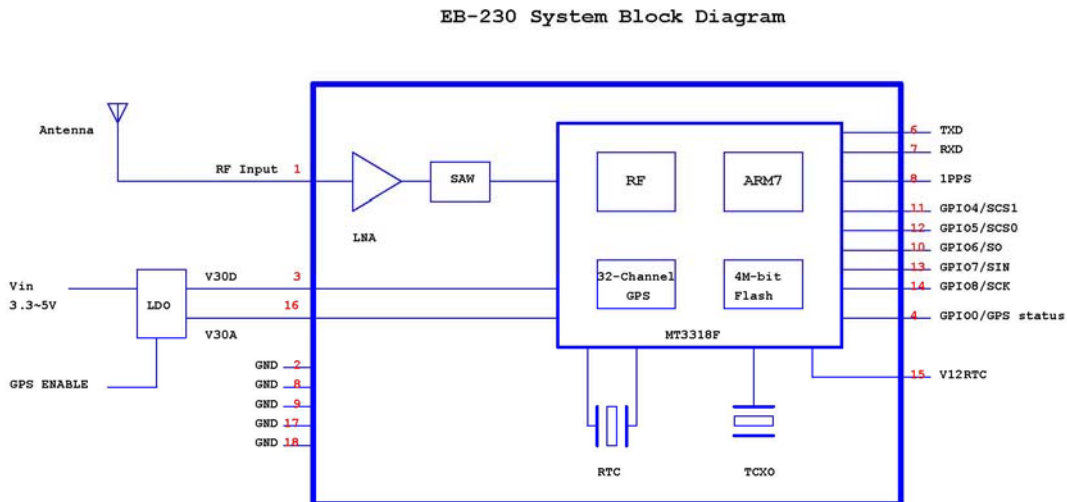
- Handheld devices
- Automotive and Marine Navigation
- Automotive Navigator Tracking
- Emergency Locator
- Geographic Surveying
- Personal Positioning
- Sporting and Recreation
- Embedded applications such as: PDA, DSC, Smart phone, UMPC, PND, MP4

### 1.3 Look & Feel



## 2 Technical Description

### 2.1 Block Diagram



### 2.2 Pin Definition

| Pin# | Signal Name          | Type | Description  |
|------|----------------------|------|--|
| 1    | RF Input             | I    | Antenna port, L1, 1575.42MHz, 50 ohm                                 |
| 2    | GND                  | P    | Ground   |
| 3    | V30D                 | P    | Digital power supply, 3.0V±10%                                       |
| 4    | GPS status/<br>GPIO0 | O    | GPS status, blink when GPS has position fix<br>General input/ output |
| 5    | 1PPS                 | O    | 1Hz pulse 10% duty cycle when GPS has position fix                   |
| 6    | TXD                  | O    | 3V CMOS level, data output from EB-230                               |
| 7    | RXD                  | I    | 3V CMOS level, data into EB-230                                      |
| 8    | GND                  | P    | Ground   |
| 9    | GND                  | P    | Ground   |
| 10   | GPIO6/SO             | I/O* | General input/ output, SPI data output                               |
| 11   | GPIO4/SCS1           | I/O* | General input/ output, SPI chip select 1                             |
| 12   | GPIO5/SCS0           | I/O* | General input/ output, SPI chip select 0                             |
| 13   | GPIO7/SIN            | I/O* | General input/ output, SPI data input                                |
| 14   | GPIO8/SCK            | I/O* | General input/ output, SPI clock                                     |
| 15   | V12RTC               | P    | RTC power 1.0~1.5Vdc, 500uA max                                      |
| 16   | V30A                 | P    | Analog power supply, 3.0V±10%  |
| 17   | GND                  | P    | Ground   |
| 18   | GND                  | P    | Ground   |

P: Power I: Input O: Output I/O\*: Input or Output, Open if not used

## 2.3 Specification

|                          |  |
|--------------------------|--|
| <b>General</b>           |  |
| GPS technology           | MTK GPS chipset  |
| Frequency                | L1, 1575.42 MHz  |
| C/A Code                 | 1.023 MHz chip rate  |
| Channels                 | 32 channels all in view tracking   |
| Sensitivity              | Better than -158dBm  |
| <b>Receiver Accuracy</b> |  |
| Position                 | Without aid: 3.0 m 2D-RMS<br>DGPS (WAAS, EGNOS, MSAS, RTCM): 2.5 m   |
| Velocity                 | Without aid: 0.1 m/s   |
| Time                     | 100 ns RMS   |
| <b>Datum</b>             |  |
| Datum                    | WGS84(Default) total 219 datums  |
| <b>Time to First Fix</b> |  |
| Hot start                | 1 sec, average   |
| Warm start               | 33 sec, average  |
| Cold start               | 36 sec, average  |
| Reacquisition            | <1sec  |
| <b>Protocol</b>          |  |
| GPS Output Data          | NMEA 0183 (V3.01) - GGA, GLL ,GSA, GSV, RMC, VTG<br>Baud rate 9600 bps, Data bit: 8, Stop bit: 1 (default) |
| Update Rate              | 1HZ(default)   |
| <b>1PPS</b>              | Enable (1Hz pulse 10% duty cycle)  |
| <b>Limitations</b>       |  |
| Acceleration Limit       | <4G  |
| Altitude Limit           | <18,000 meters   |
| Velocity Limit           | <515 meters/sec.   |
| Jerk Limit               | 20 m/sec.  |
| <b>Power</b>             |  |
| Operation Current        | Acquisition: 55 mA<br>Tracking: <30 mA (w/o Active ANT)  |
| DC Input Range           | VCC 3.0Vdc $\pm$ 10%<br>VBAT 1.0~1.5Vdc  |
| <b>Physical</b>          |  |
| Dimension                | 12 x 12 x 3mm  |
| <b>Temperature</b>       |  |
| Operating                | -30°C ~ +85°C  |
| Storage                  | -40°C ~ +125°C   |
| Humidity                 | 5% to 95% non-condensing   |
| <b>Antenna</b>           |  |
| Impedance                | 50 $\Omega$  |
| Protection               | Build-in Short circuit and Over current protection   |
| Output Voltage           | 3.0VDC   |
| <b>Mounting</b>          |  |
| SMT Type                 | 18Pin  |

## 3 User Interface

EB-230 provides 2-wire digital UART port for communication of GPS position data using NMEA protocol or MTK extension protocol. UART port is capable of 4800 to 115200 baud rate. Additional 5-pin SPI port is provided for connection with external sensors such as compass, gyro...etc. SPI port share same pin location with general purpose input / output pins (pin #10 ~14).

### 3.1 Protocol

EB-230 is default to support standard NMEA-0183 protocol. In addition, a series of MTK extensions (PMTK messages) have been developed that can be used to provide extended capabilities common to many applications.

To achieve optimal compatibility it is intended to implement 100% compatible operating modes to existing protocols since these protocols are largely symmetrical and designed to provide a bi-directional exchange of data between GPS equipments.

#### 3.1.1 NMEA Protocol

EB-230 is capable of supporting following NMEA formats:

| NMEA Prefix | Format                                   | Direction |
|-------------|--|-----------|
| \$GPGGA     | GPS fix data                             | Out       |
| \$GPGLL     | Geographic position Latitude / Longitude | Out       |
| \$GPGSA     | GNSS DOP and active satellites           | Out       |
| \$GPGSV     | Satellites in view                       | Out       |
| \$GPRMC     | Recommended minimum specific GNSS data   | Out       |
| \$GPVTG     | Velocity and track over ground           | Out       |
| \$GPZDA     | Date and time                            | Out       |

## 3.1.2 MTK NMEA Packet Format

|          |          |         |           |   |      |      |    |    |
|----------|----------|---------|-----------|---|------|------|----|----|
| Preamble | TalkerID | PktType | DataField | * | CHK1 | CHK2 | CR | LF |
|----------|----------|---------|-----------|---|------|------|----|----|

Maximum packet length is restricted to 255 bytes.

| Field      | Length   | Type             | Description  |
|------------|----------|------------------|--|
| Preamble   | 1 byte   | Character        | "\$"   |
| TalkerID   | 4 byte   | Character string | "PMTK"   |
| PktType    | 3 byte   | Character string | From "000" to "999", an identifier used to tell the decoder how to decode the packet |
| DataField  | Variable |                  | A "," must be inserted before each data field to help decoder process the DataField  |
| *          | 1 byte   | Character        | The star symbol is used to mark the end of DataField                                 |
| CHK1, CHK2 | 2 byte   | Character string | Checksum of the data between preamble "\$" and "*"                                   |
| CR, LF     | 2 byte   | Binary data      | Used to identify the end of a packet   |

Sample Packet: \$PMTK000\*32<CR><LF>

## 3.1.3 MTK NMEA Packet Protocol

In order to inform the sender whether the receiver has received the packet, an acknowledge packet PMTK\_ACK should return after the receiver receives a packet.

## 3.1.4 MTK NMEA Packet List

| Pkt Type | Abbreviation / Syntax               | Data Field   | Meaning / Example / Return   |
|----------|-------------------------------------|--|--|
| 000      | PMTK_TEST                           | None   | Test Packet<br><b>\$PMTK000*32&lt;CR&gt;&lt;LF&gt;</b>                       |
| 001      | PMTK_ACK<br><b>PMTK001,Cmd,Flag</b> | Cmd: Command / packet type the acknowledge responds<br>Flag:<br>0 = Invalid command / packet<br>1 = Unsupported command / packet type<br>2 = Valid command / packet, but action failed<br>3 = Valid command / packet, and action succeeded | Acknowledge of PMTK command<br><b>\$PMTK001,604,3*32&lt;CR&gt;&lt;LF&gt;</b> |
| 010      | PMTK_SYS_MSG<br><b>PMTK001,Msg</b>  | Msg: System message.<br>0 : Unknown<br>1: Startup  | Output system message<br><b>\$PMTK010,001*2E&lt;CR&gt;&lt;LF&gt;</b>         |



| Pkt Type | Abbreviation / Syntax  | Data Field   | Meaning / Example / Return  |
|----------|--|--|---|
| 101      | PMTK_CMD_HOT_START   | None   | Hot Restart: Use all available data in the NV storage<br><b>\$PMTK101*32&lt;CR&gt;&lt;LF&gt;</b>  |
| 102      | PMTK_CMD_WARM_START  | None   | Warm Restart: Don't use Ephemeris at re-start<br><b>\$PMTK102*31&lt;CR&gt;&lt;LF&gt;</b>  |
| 103      | PMTK_CMD_COLD_START  | None   | Cold Restart: Don't use Time, Position, Almanacs and Ephemeris data at re-start<br><b>\$PMTK103*30&lt;CR&gt;&lt;LF&gt;</b>  |
| 104      | PMTK_CMD_FULL_COLD_START   | None   | Essentially a Cold Restart, but additionally clear system/user configurations at re-start. Reset the receiver to factory default<br><b>\$PMTK104*37&lt;CR&gt;&lt;LF&gt;</b> |
| 251      | PMTK_SET_NMEA_BAUDRATE<br><b>PMTK251,Baudrate</b>                                | Baudrate: Baud rate setting<br>0 – default setting,<br>4800, 9600, 14400,<br>19200, 38400, 57600,<br>115200  | Set NMEA port baud rate<br><b>\$PMTK251,38400*27&lt;CR&gt;&lt;LF&gt;</b>  |
| 300      | PMTK_API_SET_FIX_CTL<br><b>PMTK300,FixInterval,0,0,0,0</b>                       | FixInterval: Position fix interval [msec]. Must be larger than 200   | This parameter controls the rate of position fixing activity<br><b>\$PMTK300,1000,0,0,0,0*1C&lt;CR&gt;&lt;LF&gt;</b>  |
| 301      | PMTK_API_SET_DGPS_MODE<br><b>PMTK301,Mode</b>                                    | Mode: DGPS data source mode.<br>0 : No DGPS source<br>1 : RTCM<br>2 : WAAS   | DGPS correction data source mode<br><b>\$PMTK301,1*2D&lt;CR&gt;&lt;LF&gt;</b>   |
| 313      | PMTK_API_SET_SBAS_ENABLED  | 0 = Disable<br>1 = Enable  | Enable to search a SBAS satellite or not<br><b>\$PMTK313,1*2E&lt;CR&gt;&lt;LF&gt;</b>   |
| 314      | PMTK_API_SET_NMEA_OUTPUT   | See below note 1   | Set NMEA sentence output frequency<br><b>\$PMTK314,1,1,1,1,1,5,1,1,1,1,1,0,1,1,1,1,1*2C&lt;CR&gt;&lt;LF&gt;</b>   |
| 320      | PMTK_API_SET_PWR_SAVING_MODE<br><b>PMTK320,Mode</b><br>( Internal testing ONLY ) | Mode:<br>0: power saving mode off<br>1: power saving mode on   | Set power saving operation mode<br><b>\$PMTK320,0*26&lt;CR&gt;&lt;LF&gt;</b>  |
| 330      | PMTK_API_SET_DATUM<br><b>PMTK330,Datum</b>                                       | Datum:<br>0 : WGS84<br>1 : TOKYO-M<br>2 : TOKYO-A  | Set default datum<br><b>\$PMTK330,0*2E&lt;CR&gt;&lt;LF&gt;</b>  |
| 331      | PMTK_API_SET_DATUM_ADVANCE<br><b>PMTK331,majA,ecc,dX,dY,dZ</b>                   | majA: User defined datum semi-major axis [m]<br>ecc: User defined datum eccentric [m]<br>dX: User defined datum to WGS84 X axis offset [m]<br>dY: User defined datum to WGS84 Y axis offset [m]<br>dZ: User defined datum to WGS84 Z axis offset [m] | Set user defined datum<br><b>\$PMTK331, 6377397.155, 299.1528128, -148.0, 507.0,685.0*16&lt;CR&gt;&lt;LF&gt;</b>  |

| Pkt Type | Abbreviation / Syntax   | Data Field   | Meaning / Example / Return  |
|----------|---|--|---|
| 390      | PMTK_API_SET_USER_OPTION<br><b>PMTK390, Lock, Update_Rate, Baud_Rate, GLL_Period, RMC_Period, VTG_Period, GSA_Period, GSV_Period, GGA_Period, ZDA_Period, MCHN_Period</b> | Lock: nonzero: freeze the setting; 0: allow further setting<br>Update_Rate: 1~5 (Hz)<br>Baud_Rate: 115200, 57600, 38400, 19200, 14400, 9600, 4800<br>XXX_Period: NMEA sentence output period | Write the user setting to the flash to override the default setting. Maximum 8 times without erase the chip. This feature may not be available<br><b>\$PMTK390,1,1,38400,1,1,1,1,1,1,0*2B&lt;CR&gt;&lt;LF&gt;</b> |
| 400      | PMTK_API_Q_FIX_CTL  | None   | API_Query_Fix_Ctl<br><b>\$PMTK400*36&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_FIX_CTL   |
| 401      | PMTK_API_Q_DGPS_MODE  | None   | API_Query_Dgps_Mode<br><b>\$PMTK401*37&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_DGPS_MODE   |
| 413      | PMTK_API_Q_SBAS_ENABLED   | None   | API_Query_Sbas_Enabled<br><b>\$PMTK413*34&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_SBAS_ENABLED   |
| 414      | PMTK_API_Q_NMEA_OUTPUT  | None   | Query current NMEA sentence output frequencies<br><b>\$PMTK414*33&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_NMEA_OUTPUT  |
| 420      | PMTK_API_Q_PWR_SAVING_MODE<br>( Internal testing ONLY )   | None   | Query power saving operation mode<br><b>\$PMTK420*3F&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_PWR_SAVING_MODE   |
| 430      | PMTK_API_Q_DATUM  | None   | Query default datum<br><b>\$PMTK430*35&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_DATUM   |
| 431      | PMTK_API_Q_DATUM_ADVANCE  | None   | Query user defined datum<br><b>\$PMTK431*34&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_DATUM  |
| 490      | PMTK_API_GET_USER_OPTION  | None   | Returns current user setting from flash memory. Refer to packet type 590 for detail<br><b>\$PMTK490*33&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_FLASH_USER_OPTION   |
| 500      | PMTK_DT_FIX_CTL   | FixInterval: Position fix interval in msec [ >= 200]   | These parameters control the rate of position fixing activity<br><b>\$PMTK500,1000,0,0,0,0*1A&lt;CR&gt;&lt;LF&gt;</b>   |
| 501      | PMTK_DT_DGPS_MODE   | Mode: DGPS data source mode<br>0 : No DGPS source<br>1 : RTCM<br>2 : WAAS  | DGPS Data Source Mode<br><b>\$PMTK501,1*2B&lt;CR&gt;&lt;LF&gt;</b>  |
| 513      | PMTK_DT_SBAS_ENABLE   | 0 = Disable<br>1 = Enable  | Enable to search a SBAS satellite or not<br><b>\$PMTK513,1*28&lt;CR&gt;&lt;LF&gt;</b>   |
| 514      | PMTK_DT_NMEA_OUTPUT   | Total 19 data fields that present output frequency for the 19 supported NMEA sentences.<br>Refer to packet type 314 for supported NMEA sentences and frequency                               | NMEA sentence output frequency setting<br><b>\$PMTK514,1,1,1,1,1,5,1,1,1,1,1,0,1,1,1,1,1*2A&lt;CR&gt;&lt;LF&gt;</b>   |

| Pkt Type | Abbreviation / Syntax  | Data Field  | Meaning / Example / Return  |
|----------|--|---|---|
| 520      | PMTK_DT_PWR_SAV_MODE<br><b>PMTK520,Mode</b><br>( Internal testing ONLY ) | 0: power saving mode off<br>1: power saving mode on   | Power saving operation mode<br><b>\$PMTK520,0*24&lt;CR&gt;&lt;LF&gt;</b>  |
| 530      | PMTK_DT_DATUM<br><b>PMTK530,Datum</b>                                    | 0 : WGS84<br>1 : TOKYO-M<br>2 : TOKYO-A   | Current datum used<br><b>\$PMTK530,0*28&lt;CR&gt;&lt;LF&gt;</b>   |
| 590      | PMTK_DT_FLASH_USER_OPTION  | There are totally 11 data fields that present the followings:<br>1: Available number of times for recording the user setting.<br>2: Update_Rate: 1~5<br>3: Baud_Rate: in bps<br>4~11: NMEA sentence output period (GLL, RMC, VTG, GSA, GSV, GGA, ZDA, MCHN)<br>12: Datum<br>13: DGPS mode: 0 (disable), 1 (RTCM), 2 (SBAS)<br>14: RTCM baud rate in bps | The user setting in the flash memory<br><b>\$PMTK590,0,1,9600,1,1,0,1,5,1,0,0,0,2,9600*2A&lt;CR&gt;&lt;LF&gt;</b> |
| 604      | PMTK_Q_VERSION   | None  | Query FW version<br><b>\$PMTK604*6D&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_VERSION                                    |
| 605      | PMTK_Q_RELEASE   | None  | Query FW release information<br><b>\$PMTK605*31&lt;CR&gt;&lt;LF&gt;</b><br>PMTK_DT_RELEASE                        |
| 704      | PMTK_DT_VERSION<br><b>PMTK704,FWVrsn1,FWVrsn2, FWVrsn3</b>               | Vrsn: MainVersion<br>_ReleaseNumber   | Version information of FW<br><b>\$PMTK704,1.881_06,0606_m0138,0000*52&lt;CR&gt;&lt;LF&gt;</b>                     |
| 705      | PMTK_DT_RELEASE<br><b>PMTK705,ReleaseStr,ModelID</b>                     | ReleaseStr: Firmware release name & version<br>ModelID: Model ID  | Firmware release information<br><b>\$PMTK705,Mcore_1.3,0000*15&lt;CR&gt;&lt;LF&gt;</b>                            |

### Note 1:

Total 19 data fields representing output frequency for each of the 19 supported NMEA sentences.

- 0 NMEA\_SEN\_GLL, // GPGLL interval - Geographic Position - Latitude longitude
- 1 NMEA\_SEN\_RMC, // GPRMC interval - Recommended Min. specific GNSS sentence
- 2 NMEA\_SEN\_VTG, // GPVTG interval - Course Over Ground and Ground Speed
- 3 NMEA\_SEN\_GGA, // GPGGA interval - GPS Fix Data
- 4 NMEA\_SEN\_GSA, // GPGSA interval - GNSS DOPS and Active Satellites
- 5 NMEA\_SEN\_GSV, // GPGSV interval - GNSS Satellites in View
- 6 NMEA\_SEN\_GRS, // GPGRS interval - GNSS Range Residuals
- 7 NMEA\_SEN\_GST, // GPGST interval - GNSS Pseudorange Error Statistics
- 13 NMEA\_SEN\_MALM, // PMTKALM interval - GPS almanac information
- 14 NMEA\_SEN\_MEPH, // PMTKEPH interval - GPS ephemeris information
- 15 NMEA\_SEN\_MDGP, // PMTKDGP interval - GPS differential correction information
- 16 NMEA\_SEN\_MDBG, // PMTKDBG interval - MTK debug information
- 17 NMEA\_SEN\_ZDA, // GPZDA interval - Time & Date
- 18 NMEA\_SEN\_MCHN, // PMTKCHN interval - GPS channel status

Support Frequency Setting :

- 0 - Disabled or not supported sentence
- 1 - Output once every one position fix

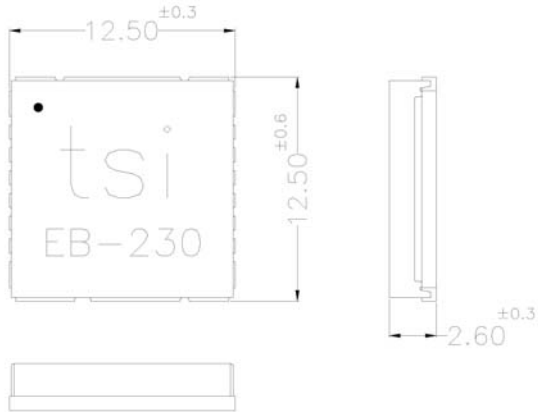
- 2 - Output once every two position fixes
- 3 - Output once every three position fixes
- 4 - Output once every four position fixes
- 5 - Output once every five position fixes

This command set GLL output frequency to be outputting once every 1 position fix, and RMC to be outputting once every 1 position fix, and so on.

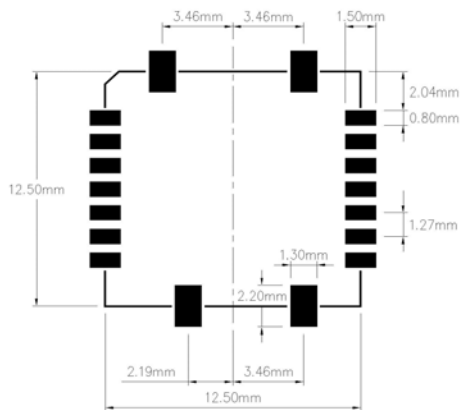
You can also restore the system default setting via issue: `$PMTK314,-1*04<CR><LF>`

## 4 Dimension and Package

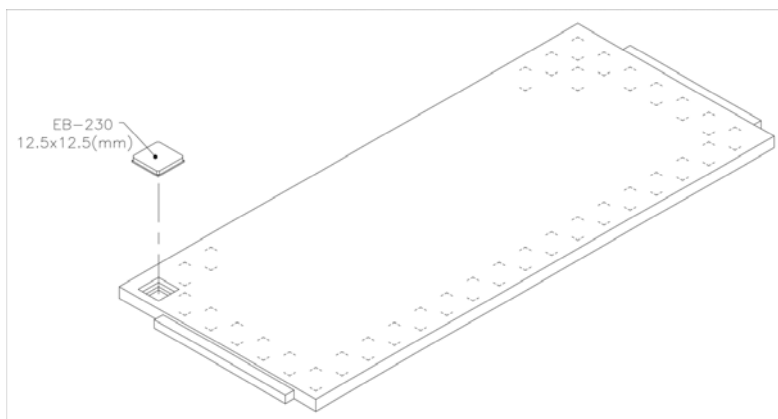
### 4.1 Mechanical Dimension



### 4.2 Recommend Layout Pattern



### 4.3 Package



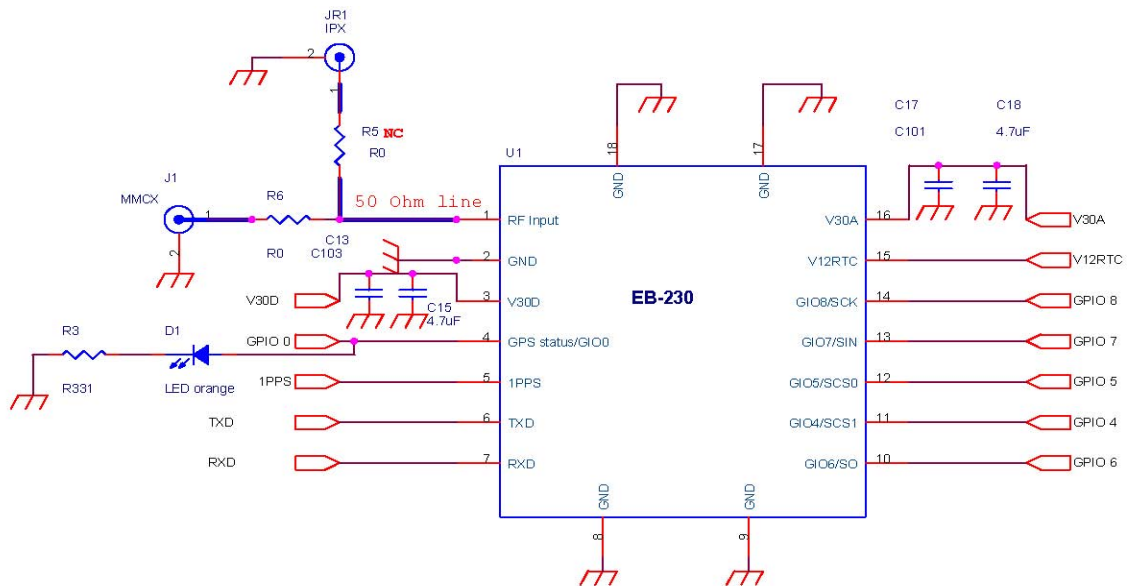
## 5 Application Information

### 5.1 GPS Antenna Recommendations

Follow below recommendations when choosing GPS antenna for EB-230 for best system performance. Transystem also offers active antenna products for optimal performance with EB-230. For details, please contact your Transystem sales contact directly.

- Use active antenna that works with 3V power supply
- Receiving frequency  $1575.42 \pm 1.032\text{MHz}$
- Polarization RHCP (right hand circular polarized)
- Output impedance = 50 Ohm
- $15\text{dB} \leq \text{LNA Gain} \leq 20\text{dB}$
- Noise figure  $\leq 2.0\text{dB}$
- Connector: surface mounted on main PCB, Ipex or MMCX

### 5.2 Application Circuit



**【Note1】** : GPS Status (pin#4) can be used as GPS position fix indicator.

**【Note2】** : V12RTC (pin#15) could connect to 1.0 ~1.5Vdc power supply directly.

**【Note3】** : Separate V30D (pin#3) from V30A (pin#16) for optimal performance.

## 5.3 General GPS Receiver User's Tips

- If the satellite signals can not be locked or experiencing receiving problem (while in urban area), following steps are suggested:
  - a) Please plug the external active antenna into GPS receiver and put the antenna outdoor or on the roof of the vehicle for better receiving performance.
  - b) Move to another open space or reposition GPS receiver toward the direction with least blockage.
  - c) Move the GPS receiver away from the interference sources.
  - d) Wait until the weather condition is improved.
- Some vehicles having heavy metallic sun protecting coating on windshields may affect signal receptions
- Driving in and around high buildings may affect signal reception.
- Driving under tunnels or in buildings may affect signal reception.
- In general, GPS receiver performs best in open space where it can see clean sky. Weather will affect GPS reception – rain & snow contribute to worsen sensitivity.
- When GPS receiver is moving, it will take longer time to get position fix. Wait for satellite signals to be locked at a fixed point when first power-on the GPS receiver to ensure quick GPS position fix.

## Contact Information

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