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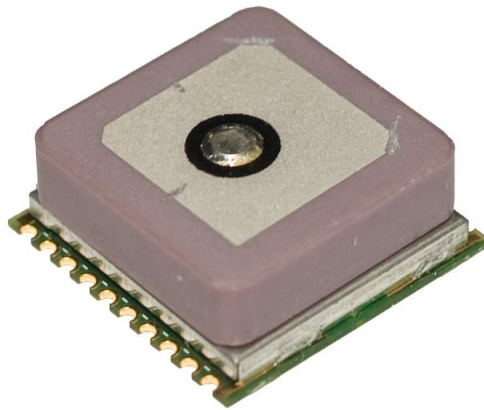
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## 66-Channel GPS Module

*with MTK Chipset*



## GP3906-TLP

*Low power consumption version*



## Description

The GP3906-TLP is a POT (Patch on Top) GPS module which is special designed for **ultra low power consumption** purpose environment. It is a GPS receiver providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions. The GPS chipsets inside the module are designed by **MediaTek Inc.**, which is the world's leading digital media solution provider and largest fab-less IC company in Taiwan. The module can support up to **66 channels**. The GPS solution enables small form factor devices. They deliver major advancements in GPS performances, accuracy, integration, computing power and flexibility. They are designed to simplify the embedded system integration process.

## Features

- ✦ Based on **MediaTek** Single Chip Architecture (MT3339).
- ✦ ARM7 based application processor
- ✦ High sensitivity: -165dBm tracking
- ✦ L1 frequency, C/A code
- ✦ Channels: 66 acquisition, 22 simultaneous tracking
- ✦ Low power consumption: 26mA @ acquisition, 20mA @ tracking
- ✦ Cold/Warm/Hot start time: <35/<33/<1 seconds
- ✦ Maximum update rate up to **10Hz**
- ✦ GPS data interface: TTL level serial port
- ✦ Support NMEA 0183 standard V3.01 and backward compliance
- ✦ Support SBAS – WAAS, EGNOS, GAGAN and MSAS
- ✦ Dimension : **16mm x 16mm x 6.7mm**
- ✦ RoHS compliant
- ✦ Advanced software features
  - AlwaysLocate™ advanced location awareness technology
  - EPO™ orbit prediction
  - Supports logger function (LOCUS)

## Chipset Characteristics

| <b>General</b>                            |  |
|---|--|
| Chipset                                   | MTK MT3339   |
| Frequency                                 | L1, 1575.42MHz   |
| C/A Code                                  | 1.023 MHz  |
| Channels                                  | 66 channels  |
| SBAS                                      | WAAS, EGNOS, GAGAN,MSAS Supported                      |
| Datum                                     | WGS84(Default), Tokyo-M, Tokyo-A, User Define          |
| CPU                                       | ARM7EJ-S   |
| <b>Dimensions</b>                         |  |
| Length/Width/Height                       | 16*16*6.7 mm   |
| Weight                                    | 6g   |
| <b>Performance Characteristics</b>        |  |
| Position Accuracy                         | Without aid : 3.0m 2D-RMS                              |
|   | < 3m CEP (50%) without SA (horizontal)                 |
|   | DGPS (SBAS (WAAS, EGNOS, MSAS)) : 2.5m                 |
| Velocity Accuracy                         | Without aid : 0.1 m/s                                  |
|   | DGPS (SBAS (WAAS, EGNOS, MSAS)) : 0.05m/s              |
| Acceleration Accuracy                     | Without aid : 0.1 m/s <sup>2</sup>                     |
|   | DGPS (SBAS (WAAS, EGNOS, MSAS)) : 0.05m/s <sup>2</sup> |
| Timing Accuracy                           | 10 ns RMS  |
| <b>Sensitivity</b>                        | Acquisition : -148dBm (Cold Start)                     |
|   | Reacquisition : -163dBm                                |
|   | Tracking : -165dBm                                     |
| Maximum Update Rate                       | Up to 10Hz(Default: 1Hz)                               |
| <b>Acquisition (Open sky, stationary)</b> |  |
| Reacquisition Time                        | Less than 1 second                                     |
| Hot start                                 | 1.0s (Typical)   |
| Warm start                                | 33s (Typical)  |
| Cold start                                | 35s (Typical)  |
| <b>Dynamic</b>                            |  |

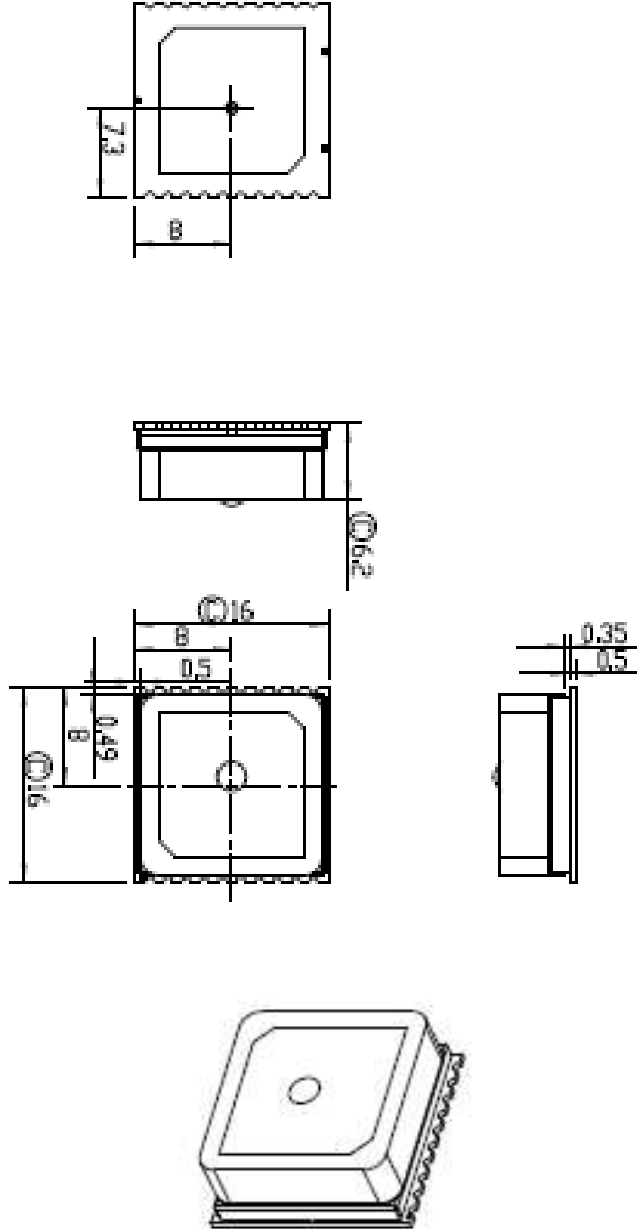


## GP3906-TLP Data Sheet

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|                              |   |
|------------------------------|---|
| Altitude                     | Maximum 18,000m   |
| Velocity                     | Maximum 515m/s  |
| Acceleration                 | Maximum 4G  |
| <b>Power</b>                 |   |
| Input Voltage                | DC 3.3V $\pm$ 5%  |
| Power Consumption @ 3.3V     | Acquisition : 30mA Typical                                      |
|                              | Tracking : 24mA Typical   |
| VBACKUP                      | DC 3 to 4.3V  |
| <b>I/O</b>                   |   |
| Signal Output                | UART, 8 data bits, no parity, 1 stop bit                        |
| Available Baud Rates         | 4800/9600/38400/57600/115200 bps(Default : 9600)                |
| Protocols                    | NMEA 0183 v3.01 (Default : GGA,GSA,GSV,RMC,VTG)                 |
|                              | MTK NMEA Command  |
|                              | Network Assistance Messages                                     |
| <b>Data output Interface</b> |   |
| Protocol messages            | 9600 bps/8/N/1 (Default)  |
| Output format                | GGA(1sec),GSA(1sec),RMC(1sec),VTG(1sec),<br>GSV(5sec) (Default) |
| <b>Environment</b>           |   |
| Operating Temperature        | -30 °C to 85 °C   |
| Storage Temperature          | -40 °C to 125 °C  |
| Operating Humidity           | 5% to 95% (no condensing)                                       |

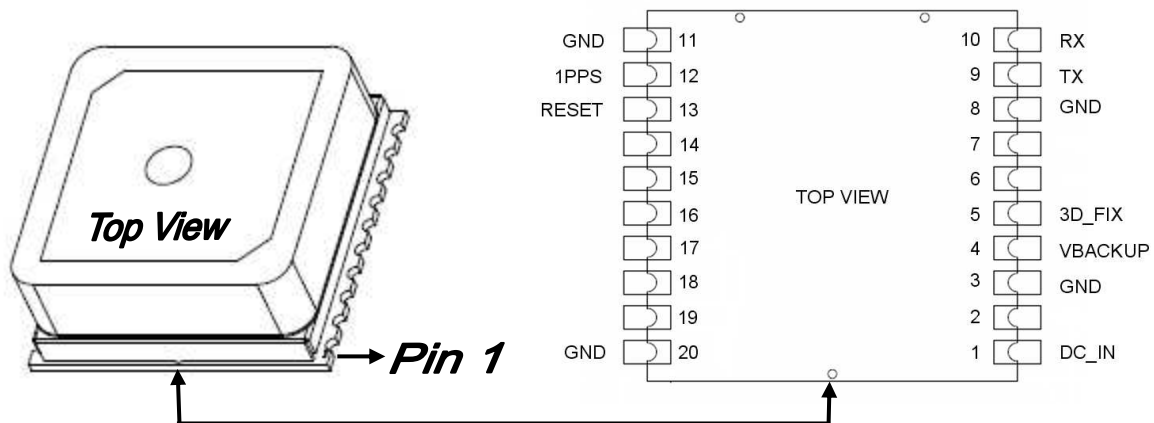
## Outline Dimension







## Pin Configuration



## Pin Definition

| Pin | Name    | I/O | Description                           |
|-----|---------|-----|---------------------------------------|
| 1   | DC_IN   | P   | 3.3V $\pm$ 5% DC Power Supply Input   |
| 2   | NC      |     |                                       |
| 3   | GND     | I   | Ground                                |
| 4   | VBACKUP | P   | RTC Backup Power Input                |
| 5   | 3D_FIX  | O   | 3D_Fix Indicator                      |
| 6   | NC      |     |                                       |
| 7   | NC      |     |                                       |
| 8   | GND     | P   | Ground                                |
| 9   | Tx      | O   | Serial data Output                    |
| 10  | Rx      | I   | Serial Data Input                     |
| 11  | GND     | P   | Ground                                |
| 12  | 1PPS    | O   | 1 pulse-per-second GPS time reference |
| 13  | RESET   | I   | System Reset. Low Active              |
| 14  | NC      |     |                                       |
| 15  | NC      |     |                                       |
| 16  | NC      |     |                                       |
| 17  | NC      |     |                                       |
| 18  | NC      |     |                                       |
| 19  | NC      |     |                                       |
| 20  | GND     | P   | Ground                                |

## Description of I/O Pin

### DC\_IN (Pin1)

3.3V  $\pm$  5% DC power supply input.

### GND (Pin3, Pin8, Pin11,20)

The ground of the module.

### VBACKUP (Pin4)

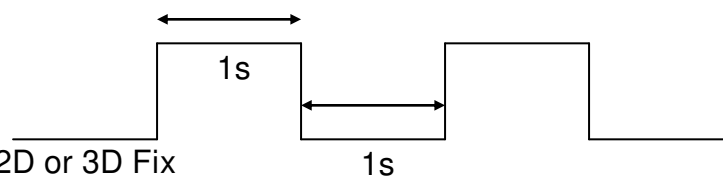
This is the backup power for GPS chipset to keep RTC running when main power is removed. For normal operation, the input voltage must be kept from 2.0V to 4.3V.

### 3D\_FIX (Pin5)

The fix flag output. If not used, keep this pin floating and do not put this pin in high level when the module starting up.

#### ■ Before 2D Fix

The 3D\_FIX should continuously output one-second high-level with one-second low-level signal.



#### ■ After 2D or 3D Fix

The 3D\_FIX should continuously output high-level signal.

high \_\_\_\_\_

### Tx (Pin9)

This is the UART transmitter of the module. It outputs the GPS information for application.

### Rx (Pin10)

This is the UART receiver of the module. It is used to receive software commands and firmware update.

# GP3906-TLP Data Sheet

## **1PPS (Pin12)**

1 pulse-per-second GPS time reference output

## **RESET (Pin13)**

With a low level, it causes the module to reset. If not used, keep floating.

## NMEA Output Sentence

**Table-1** lists each of the NMEA output sentences specifically developed and defined by MTK for use within MTK products

| <b>NMEA Output Sentence</b> |  | <b>Table-1</b> |
|-----------------------------|--|----------------|
| <b>Option</b>               | <b>Description</b>   |                |
| GGA                         | Time, position and fix type data.  |                |
| GSA                         | GPS receiver operating mode, active satellites used in the position solution, and DOP values.  |                |
| GSV                         | The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values. |                |
| RMC                         | Time, date, position, course and speed data.<br>Recommended Minimum Navigation Information.    |                |
| VTG                         | Course and speed information relative to the ground.   |                |

## GP3906-TLP Data Sheet

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**GGA—Global Positioning System Fixed Data. Time, Position and fix related data for a GPS receiver**

**Table-2** contains the values for the following example :

\$GPGGA,064951.000,2307.1256,N,12016.4438,E,1,8,0.95,39.9,M,17.8,M,,\*65

| GGA Data Format        |            |        | Table-2                                     |
|------------------------|------------|--------|---|
| Name                   | Example    | Units  | Description                                 |
| Message ID             | \$GPGGA    |        | GGA protocol header                         |
| UTC Time               | 064951.000 |        | hhmmss.sss                                  |
| Latitude               | 2307.1256  |        | ddmm.mmmm                                   |
| N/S Indicator          | N          |        | N=north or S=south                          |
| Longitude              | 12016.4438 |        | dddmm.mmmm                                  |
| E/W Indicator          | E          |        | E=east or W=west                            |
| Position Fix Indicator | 1          |        | See <b>Table-3</b>                          |
| Satellites Used        | 8          |        | Range 0 to 14                               |
| HDOP                   | 0.95       |        | Horizontal Dilution of Precision            |
| MSL Altitude           | 39.9       | meters | Antenna Altitude above/below mean-sae-level |
| Units                  | M          | meters | Units of antenna altitude                   |
| Geoidal Separation     | 17.8       | meters |   |
| Units                  | M          | meters | Units of geoidal separation                 |
| Age of Diff. Corr.     |            | second | Null fields when DGPS is not used           |
| Checksum               | *65        |        |   |
| <CR> <LF>              |            |        | End of message termination                  |

| Position Fix Indicator |                      | Table-3 |
|------------------------|----------------------|---------|
| Value                  | Description          |         |
| 0                      | Fix not available    |         |
| 1                      | GPS fix              |         |
| 2                      | Differential GPS fix |         |

**GSA—GNSS DOP and Active Satellites**

**Table-4** contains the values for the following example :

\$GPGSA,A,3,29,21,26,15,18,09,06,10,,,,,2.32,0.95,2.11\*00

## GP3906-TLP Data Sheet

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| <b>GSA Data Format</b> |                |              | <b>Table-4</b>                   |
|------------------------|----------------|--------------|----------------------------------|
| <b>Name</b>            | <b>Example</b> | <b>Units</b> | <b>Description</b>               |
| Message ID             | \$GPGSA        |              | GSA protocol header              |
| Mode 1                 | A              |              | See <b>Table-5</b>               |
| Mode 2                 | 3              |              | See <b>Table-6</b>               |
| Satellite Used         | 29             |              | SV on Channel 1                  |
| Satellite Used         | 21             |              | SV on Channel 2                  |
| ....                   | ....           | ....         | ....                             |
| Satellite Used         |                |              | SV on Channel 12                 |
| PDOP                   | 2.32           |              | Position Dilution of Precision   |
| HDOP                   | 0.95           |              | Horizontal Dilution of Precision |
| VDOP                   | 2.11           |              | Vertical Dilution of Precision   |
| Checksum               | *00            |              |                                  |
| <CR> <LF>              |                |              | End of message termination       |

| <b>Mode 1</b> |  | <b>Table-5</b> |
|---------------|--|----------------|
| <b>Value</b>  | <b>Description</b>                                 |                |
| M             | Manual—forced to operate in 2D or 3D mode          |                |
| A             | 2D Automatic—allowed to automatically switch 2D/3D |                |

| <b>Mode 2</b> |                         | <b>Table-6</b> |
|---------------|-------------------------|----------------|
| <b>Value</b>  | <b>Description</b>      |                |
| 1             | Fix not available       |                |
| 2             | 2D (< 4 SVs used)       |                |
| 3             | 3D ( $\geq$ 4 SVs used) |                |

## GP3906-TLP Data Sheet

**GSV—GNSS Satellites in View**

**Table-7** contains the values for the following example :

```
$GPGSV,3,1,09,29,36,029,42,21,46,314,43,26,44,020,43,15,21,321,39*7D
```

```
$GPGSV,3,2,09,18,26,314,40,09,57,170,44,06,20,229,37,10,26,084,37*77
```

```
$GPGSV,3,3,09,07,,,26*73
```

| GSV Data Format    |         |         | Table-7  |
|--------------------|---------|---------|--|
| Name               | Example | Units   | Description  |
| Message ID         | \$GPGSV |         | GSV protocol header  |
| Number of Messages | 3       |         | Range 1 to 3<br><i>(Depending on the number of satellites tracked, multiple messages of GSV data may be required.)</i> |
| Message Number1    | 1       |         | Range 1 to 3   |
| Satellites in View | 09      |         |  |
| Satellite ID       | 29      |         | Channel 1 (Range 1 to 32)  |
| Elevation          | 36      | degrees | Channel 1 (Maximum 90)   |
| Azimuth            | 029     | degrees | Channel 1 (True, Range 0 to 359)   |
| SNR (C/No)         | 42      | dBHz    | Range 0 to 99,<br>(null when not tracking)   |
| ....               | ....    | ....    | ....   |
| Satellite ID       | 15      |         | Channel 4 (Range 1 to 32)  |
| Elevation          | 21      | degrees | Channel 4 (Maximum 90)   |
| Azimuth            | 321     | degrees | Channel 4 (True, Range 0 to 359)   |
| SNR (C/No)         | 39      | dBHz    | Range 0 to 99,<br>(null when not tracking)   |
| Checksum           | *7D     |         |  |
| <CR> <LF>          |         |         | End of message termination   |



## GP3906-TLP Data Sheet

**RMC—Recommended Minimum Navigation Information**

**Table-8** contains the values for the following example :

\$GPRMC,064951.000,A,2307.1256,N,12016.4438,E,0.03,165.48,260406,,,A\*55

| RMC Data Format    |            |         | Table-8  |
|--------------------|------------|---------|--|
| Name               | Example    | Units   | Description  |
| Message ID         | \$GPRMC    |         | RMC protocol header  |
| UTC Time           | 064951.000 |         | hhmmss.sss   |
| Status             | A          |         | A=data valid or V=data not valid                                       |
| Latitude           | 2307.1256  |         | ddmm.mmmm  |
| N/S Indicator      | N          |         | N=north or S=south   |
| Longitude          | 12016.4438 |         | dddmm.mmmm   |
| E/W Indicator      | E          |         | E=east or W=west   |
| Speed Over Ground  | 0.03       | knots   |  |
| Course Over Ground | 165.48     | degrees | True   |
| Date               | 260406     |         | ddmmyy   |
| Magnetic Variation |            | degrees | E=east or W=west<br><i>(MTK does not support magnetic declination)</i> |
| Mode               | A          |         | A= Autonomous mode<br>D= Differential mode<br>E= Estimated mode        |
| Checksum           | *65        |         |  |
| <CR> <LF>          |            |         | End of message termination   |

## GP3906-TLP Data Sheet

**VTG—Course and speed information relative to the ground.**

**Table-9** contains the values for the following example :

\$GPVTG,165.48,T,,M,0.03,N,0.06,K,A\*37

| VTG Data Format |         |         | Table-9   |
|-----------------|---------|---------|---|
| Name            | Example | Units   | Description   |
| Message ID      | \$GPVTG |         | VTG protocol header   |
| Course          | 165.48  | degrees | Measured heading  |
| Reference       | T       |         | True  |
| Course          |         | degrees | Measured heading  |
| Reference       | M       |         | Magnetic<br>( <i>MTK does not support magnetic declination.</i> ) |
| Speed           | 0.03    | knots   | Measured horizontal speed   |
| Units           | N       |         | Knots   |
| Speed           | 0.06    | km/hr   | Measured horizontal speed   |
| Units           | K       |         | Kilometers per hour   |
| Mode            | A       |         | A= Autonomous mode<br>D= Differential mode<br>E= Estimated mode   |
| Checksum        | *06     |         |   |
| <CR> <LF>       |         |         | End of message termination  |