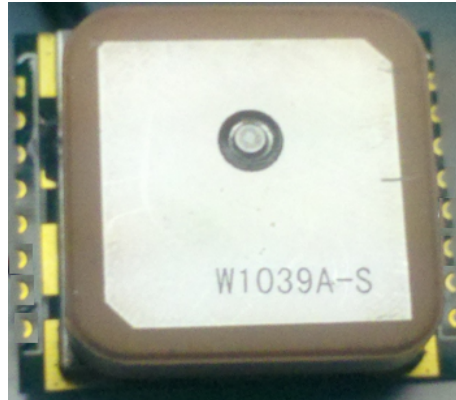


# 66-Channel GPS POT Module

## *with MTK Chipset*



## FMP04-TLP-SMD

*Low power consumption version*



# FMP04-TLP-SMD Data Sheet

Rev.A00

| History    |      |               |
|------------|------|---------------|
| Date       | Rev. | Description   |
| 2012/07/25 | A00  | First Release |
|            |      |               |
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## Description

The FMP04 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 (MT3329).
- ✚ ARM7 based application processor
- ✚ High sensitivity: -165dBm tracking
- ✚ L1 frequency, C/A code
- ✚ Channels: 66 acquisition, 22 simultaneous tracking
- ✚ Low power consumption: 30mA @ acquisition, 24mA @ tracking
- ✚ Cold/Warm/Hot start time: <35/<34/<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 : **30mm x 26mm x 6.6mm**
- ✚ RoHS compliant

## Chipset Characteristics

|                                           |                                                              |
|-------------------------------------------|--------------------------------------------------------------|
| <b>General</b>                            |                                                              |
| Chipset                                   | MTK MT3329                                                   |
| 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                       | 30*26*6.6 mm                                                 |
| Weight                                    | 12 g                                                         |
| <b>Performance Characteristics</b>        |                                                              |
| Position Accuracy                         | Without aid : 3.0m 2D-RMS                                    |
|                                           | < 3m CEP (50%) without SA (horizontal)                       |
|                                           | DGPS (RTCM, SBAS (WAAS, EGNOS, MSAS)) : 2.5m                 |
| Velocity Accuracy                         | Without aid : 0.1 m/s                                        |
|                                           | DGPS (RTCM, SBAS (WAAS, EGNOS, MSAS)) : 0.05m/s              |
| Acceleration Accuracy                     | Without aid : 0.1 m/s <sup>2</sup>                           |
|                                           | DGPS (RTCM, SBAS (WAAS, EGNOS, MSAS)) : 0.05m/s <sup>2</sup> |
| Timing Accuracy                           | 100 ns RMS                                                   |
| <b>Sensitivity</b>                        | Acquisition : -148dBm (Cold Start)                           |
|                                           | Reacquisition : -157dBm                                      |
|                                           | 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)                                               |

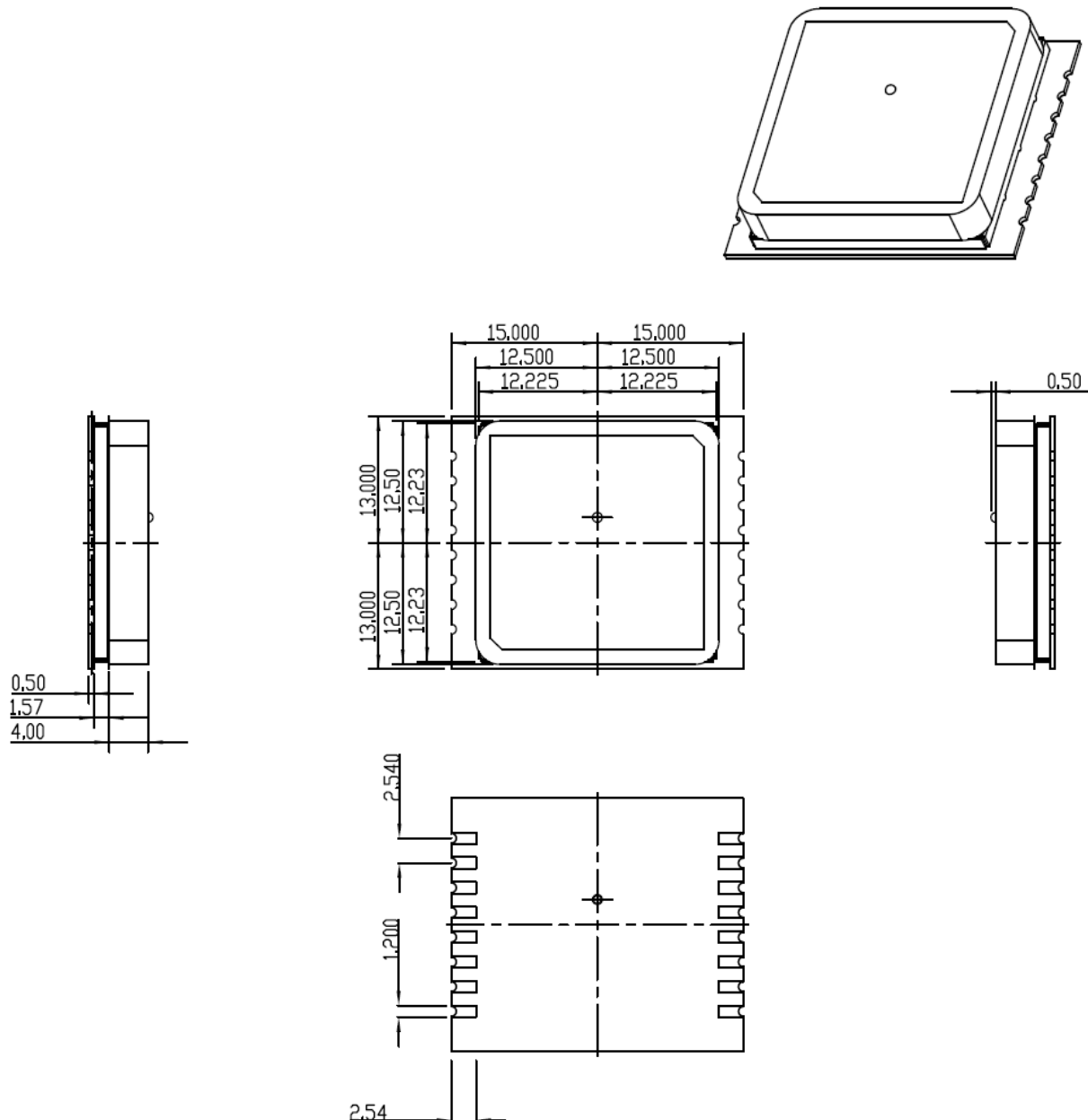


# FMP04-TLP-SMD Data Sheet

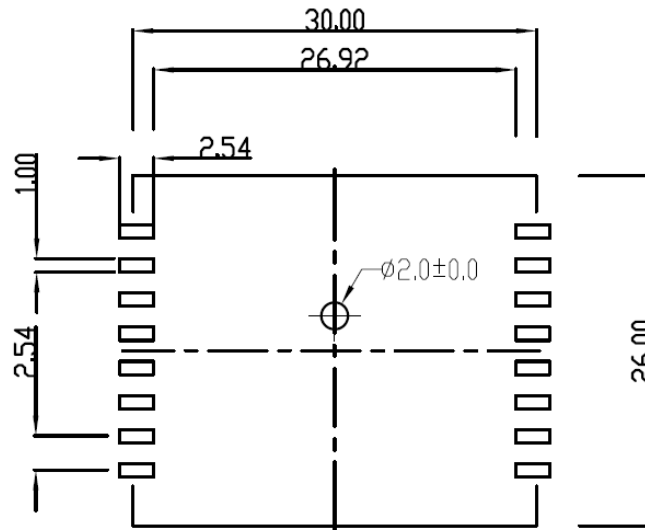
Rev.A00

|                              |                                                                                                            |
|------------------------------|------------------------------------------------------------------------------------------------------------|
| Warm start                   | 34s (Typical)                                                                                              |
| Cold start                   | 35s (Typical)                                                                                              |
| <b>Dynamic</b>               |                                                                                                            |
| Altitude                     | Maximum 18,000m                                                                                            |
| Velocity                     | Maximum 515m/s                                                                                             |
| Acceleration                 | Maximum 4G                                                                                                 |
| <b>Power</b>                 |                                                                                                            |
| Input Voltage                | DC 3.3V Typical                                                                                            |
| Power Consumption @ 3.3V     | Acquisition : 30mA Typical                                                                                 |
|                              | Tracking : 24mA Typical                                                                                    |
| <b>I/O</b>                   |                                                                                                            |
| Signal Output                | TTL level, 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)<br>RTCM<br>MTK NMEA Command<br>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)                                                                                  |

## Mechanic Dimension



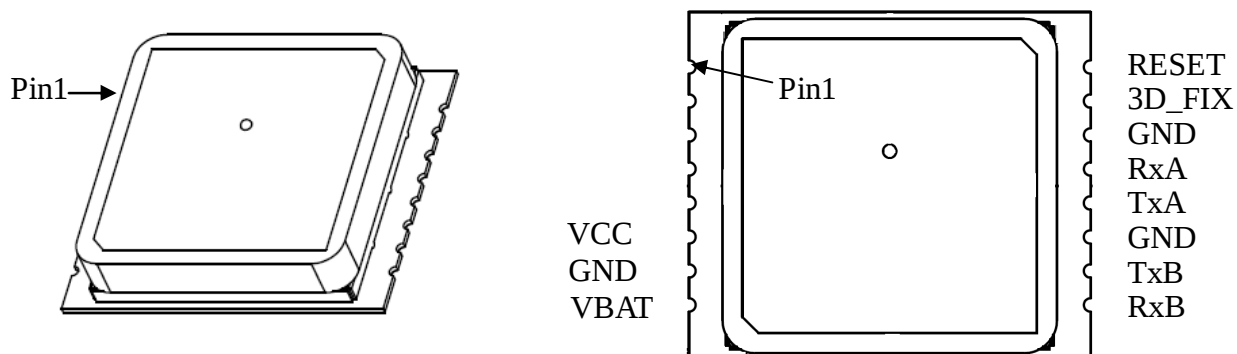
## Recommended Layout pattern



Note.

- Ø Do not place any pad, via or high current power line within the area under this module.
- Ø Place a 2mm N-PTH hole under this module for the antenna pad.

## Pin Configuration



## Pin Definition

| Pin | Name   | I/O | Description                         |
|-----|--------|-----|-------------------------------------|
| 1   | NC     |     |                                     |
| 2   | NC     |     |                                     |
| 3   | NC     |     |                                     |
| 4   | NC     |     |                                     |
| 5   | NC     |     |                                     |
| 6   | VCC    | P   | 3.3V $\pm$ 5% DC Power Supply Input |
| 7   | GND    | P   | Ground                              |
| 8   | VBAT   | I   | External Battery Input              |
| 9   | RxB    | I   | Secondary Serial Data Input         |
| 10  | TxB    | O   | Secondary Serial data Output        |
| 11  | GND    | P   | Ground                              |
| 12  | TxA    | O   | Primary Serial data Output          |
| 13  | RxA    | I   | Primary Serial Data Input           |
| 14  | GND    | P   | Ground                              |
| 15  | 3D_FIX | O   | 3D_FIX Indicator                    |
| 16  | RESET  | I   | System Reset. Active low            |



## Description of I/O Pin

### VCC (Pin6)

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

### GND (Pin7, 11 and 14)

The power and signal ground of the module.

### VBAT (Pin8)

The external backup battery input of the module. If there is no backup battery used, please connect this pin to 3.3V.

### RxB (Pin9)

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

### TxB (Pin10)

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

### TxA (Pin12)

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

### RxB (Pin13)

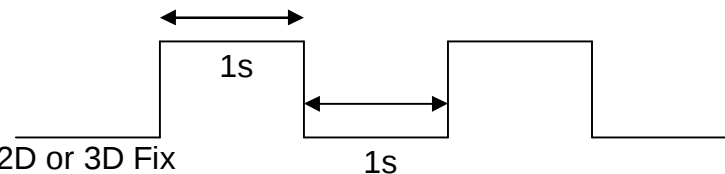
This is the Primary UART receiver of the module. It is used to receive software commands and firmware update.

## 3D\_FIX (Pin15)

The fix flag output. If not used, keep this pin floating.

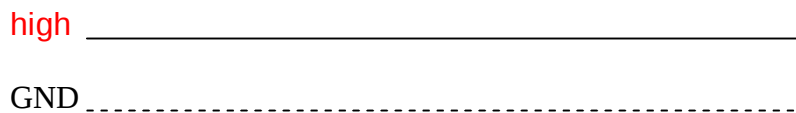
### n Before 2D Fix

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



### n After 2D or 3D Fix

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



## RESET (Pin16)

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

## GPS External Antenna Specification (Recommended)

It is important that the antenna gets a clear view of the sky and is positioned on a surface level to the horizon for best results. The following specification has to meet for the use reference design.

| Characteristic    | Specification                 |
|-------------------|-------------------------------|
| Polarization      | Right-hand circular polarized |
| Receive frequency | 1.57542GHz +/-1.023MHz        |
| Power supply      | 2.8V                          |
| DC current        | <30mA at 2.8V                 |
| Total gain        | +15dBi                        |
| Output VSWR       | <2.5                          |
| Impedance         | 50ohm                         |
| Noise Figure      | <1.5dB                        |

## NMEA Output Sentence

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

| NMEA Output Sentence |                                                                                                | Table-1 |
|----------------------|------------------------------------------------------------------------------------------------|---------|
| Option               | Description                                                                                    |         |
| 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.                                           |         |

**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

| GSA Data Format |         |       | Table-4                          |
|-----------------|---------|-------|----------------------------------|
| Name            | Example | Units | Description                      |
| 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       |

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

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

## 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>(Depending on the number of satellites tracked, multiple messages of GSV data may be required.) |
| 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                                                                                      |

## 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>(MTK does not support magnetic declination) |
| Mode               | A          |         | A= Autonomous mode<br>D= Differential mode<br>E= Estimated mode |
| Checksum           | *65        |         |                                                                 |
| <CR> <LF>          |            |         | End of message termination                                      |

**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>(MTK does not support magnetic declination.)        |
| 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                                      |