# M3126

## 66 Channels Ultra High Sensitivity GPS Module

### GENERAL DESCRIPTION

The M3126 features high sensitivity, ultra low power consumption; compact size GPS module designed for a wide variety of OEM applications.

It is based on the latest MTK's MT3329 high sensitivity single chip all in one solution which equipped with the most up to date signal processing technique, such as anti-jamming and multi-path error correction.

With 66 search channels and 22 simultaneous tracking channels, it acquires and tracks satellites in the shortest time even at low signal levels and offers up to 5Hz navigation updates. The M3126 meets the sensitivity and accuracy requirements of car navigation as well as other location based applications, such as AVL system, handheld navigator, or any battery operated navigation systems.

This superior hardware capability combined with software intelligence makes the board easy to be integrated and used in all kinds of navigation applications or portable products.

### MAIN FEATURES

- Built-in the latest MTK MT3329 GPS single chip
- ARM7 based application processor
- High sensitivity: -165dBm tracking
- Channels: 66 acquisition/22 simultaneous tracking
- Cold/Warm/Hot Start time: <35/<34/<1.5 seconds (Autonomous)
- Low power consumption (~40mA typ. @3.3V in tracking mode)
- Multi-path detection and correction for accurate navigation in harsh urban canyon
- Support SBAS - WAAS, EGNOS, and MSAS (optional)
- Up to 5Hz update rate (optional)
- 1PPS GPS time reference (optional)
- Compact board size: 31.0x26.0x4.0mm (wafer connector not included)
- Support standard NMEA-0183 V3.01 and backward compliance
- Ceramic patch antenna (2mm) on top
- Support patch antenna only
- RoHS compliant

# *WONDE PROUD*

## TECHNICAL SPECIFICATIONS

### Chipset Characteristics

### General

| | |
|---|---|
| Frequency | L1, 1575.42 MHz |
| C/A code | 1.023 MHz chip rate |
| Channels | 66 acquisition/22 simultaneous tracking |

### Sensitivity

| | |
|---|---|
| Tracking | -165dBm |
| Autonomous Acquisition | -148dBm |
| Reacquisition | -157dBm |

### Accuracy

| | |
|---|---|
| Position | Without aid: 3m 2D-RMS; DGPS (WAAS, EGNOS, MSAS, RTCM): 2.5m |
| Velocity | Without aid: 0.1m/s; DGPS (WAAS, EGNOS, MSAS, RTCM): 0.05m/s |
| Acceleration | Without aid: $0.1m/s^2$; DGPS (WAAS, EGNOS, MSAS, RTCM): $0.05m/s^2$ |
| Time | <100ns |

### Datum

| | |
|---|---|
| Default | WGS-84 (default) |
| Other | TOY-A, TOY-M, User Define, ...total 223 datum |

### Acquisition Rate (Open sky, stationary requirements)

| | |
|---|---|
| Hot start | <1.5sec, average |
| Warm start | <34sec, average |
| Cold start | <35sec, average |
| Re-acquisition | <1sec |
| Update rate | 5Hz (optional); default setting 1Hz |

### Dynamic Conditions

| | |
|---|---|
| Altitude | 18,000m max. |
| Velocity | 515m/s max. |
| Acceleration | 4g, max. |
| Jerk | $4m/s^3$, max. |

### Power

| | |
|---|---|
| Main power input voltage | 3.3±10% VDC input |
| Backup voltage | 1.5 ~ 4.2 VDC |
| Current consumption in acquisition | ~50mA (@3.3V) |
| Current consumption in tracking | ~40mA (@3.3V) |
| Backup current consumption@1.5V | 2μA at 25°C |

## TECHNICAL SPECIFICATIONS (CONT.)

### I/O

| | |
|---|---|
| Signal output | One full duplex serial communication, TTL interface |
| Available baud rates | 4800/9600/19200/38400/57600/115200bps |
| Protocols | NMEA-0183 V3.01; RTCM; MTK NMEA command; Network Assistance Messages |
| Default NMEA | GGA, GLL, GSA, GSV, RMC, VTC and ZDA |
| 1PPS | 2.8V CMOS level |

### Recommended External Antenna Specification

| | |
|---|---|
| Gain | 20dB (including cable loss) |
| Noise figure | 1.5dB |
| Current | 3 ~ 30mA |
| Operate Voltage | 2.5 ~ 2.8V |

### Environmental Characteristics

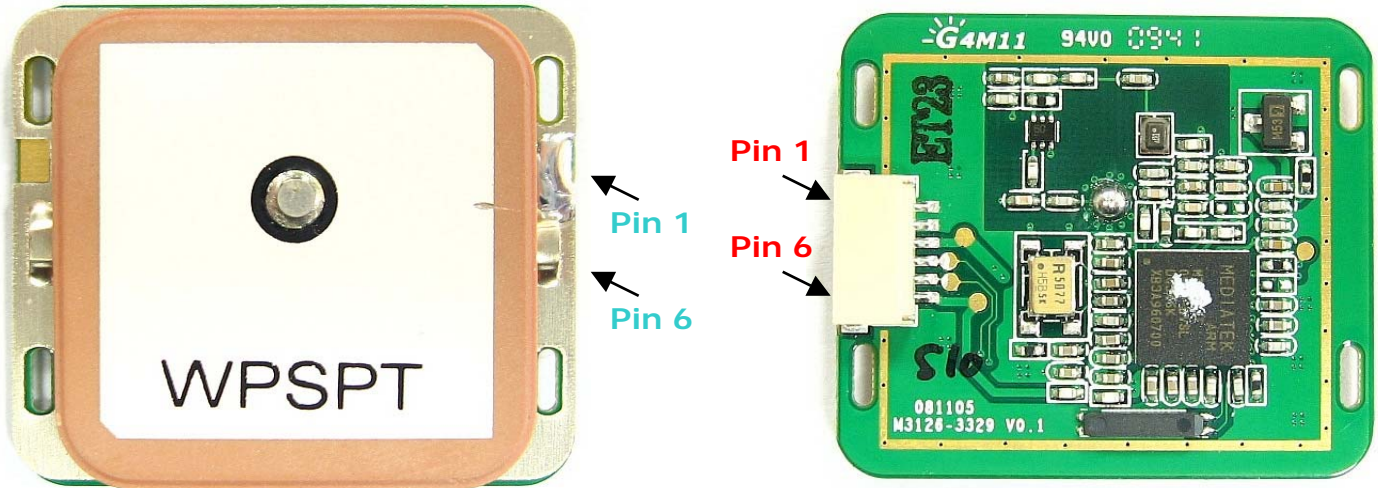| | |
|---|---|
| Operating temperature range | -30°C to +65°C |
| Storage temperature range | -40°C to +85°C |
| Operating humidity | 5% ~ 95% (non-condensing) |

### Physical Characteristics

| | |
|---|---|
| Dimension | 31.0x26.0x4.0mm |
| Weight | 8.2g (module only); cable: 0.4g |

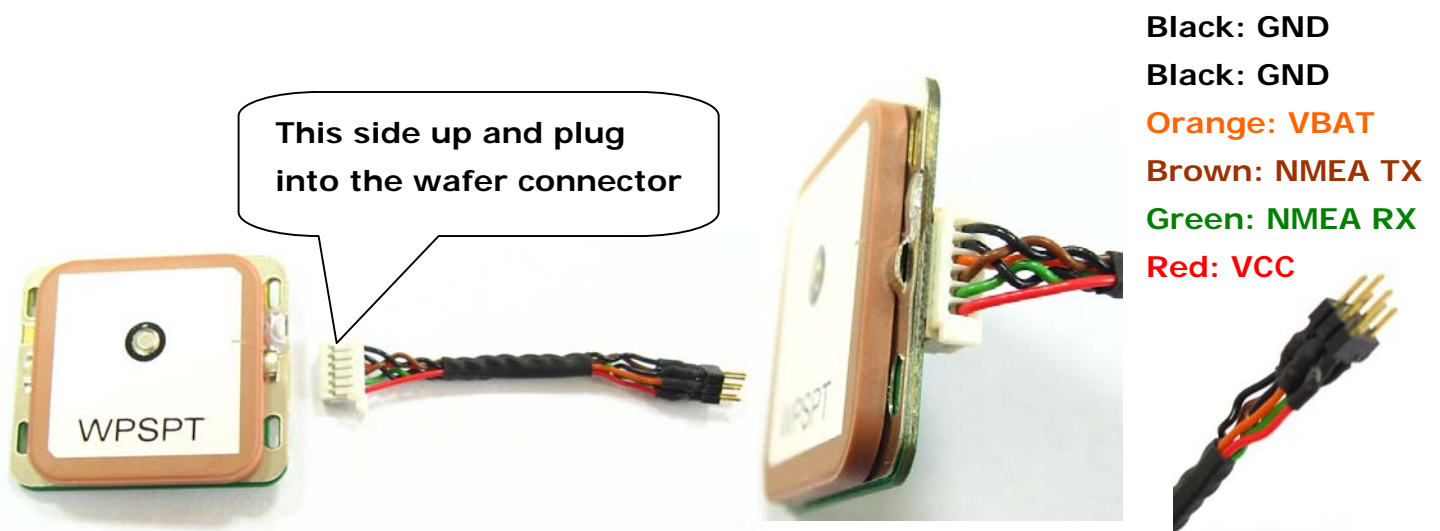*All specifications are subject to change without notice*

# *WONDE PROUD*

**M3126 PINOUT**



Pin 1

Pin 6

**M3126 Pin out**

| Pin # | Description |
|-------|-------------|
| 1 | GND |
| 2 | GND |
| 3 | RTC VCC (VBAT; backup) |
| 4 | NMEA TX |
| 5 | NMEA RX |
| 6 | VCC_IN |

**NOTE 1: The VBAT (Pin 3, Backup Battery Input) is needed otherwise the module can not start up properly.**

**NOTE 2: The module has equipped with a 2.5V reset IC, power up reset will be performed automatically every time when starting up.**

**This side up and plug into the wafer connector**

**Black: GND**
**Black: GND**
**Orange: VBAT**
**Brown: NMEA TX**
**Green: NMEA RX**
**Red: VCC**

# WONDE PROUD

## APPLICATIONS

The M3126 is a high performance, ultra low power consumption GPS module. The applications are as below:

- Car navigation
- GPS wrist watch
- Solar operated device
- Marine navigation
- Fleet management
- AVL and Location-Based Services
- Radar detector with GPS function
- Hand-held device for personal positioning and navigation
- Ideal for PDA, Pocket PC and other computing devices for GPS application

# *WONDE PROUD*

## SOFTWARE SPECIFICATIONS

### *M3126 NMEA Protocol*

The M3126 software is capable of supporting the following NMEA message formats:

| NMEA Message Prefix | Format | Direction |
|---|---|---|
| GGA | GPS fix data | Out |
| GLL | Geographic position Latitude / Longitude | Out |
| GSA | GNSS DOP and actives satellites | Out |
| GSV | Satellites in view | Out |
| RMC | Recommended minimum specific GNSS data | Out |
| VTG | Velocity and track over ground | Out |
| ZDA | Date and time | Out |

# WONDE PROUD

## GENERAL NMEA FORMAT

The general NMEA format consists of an ASCII string commencing with a '$' character and terminating with a <CR><LF> sequence. NMEA standard messages commence with 'GP' then a 3-letter message identifier. The message header is followed by a comma delimited list of fields optionally terminated with a checksum consisting of an asterisk '*' and a 2 digit hex value representing the checksum. There is no comma preceding the checksum field. When present, the checksum is calculated as a bitwise exclusive of the characters between the '$' and '*'. As an ASCII representation, the number of digits in each number will vary depending on the number and precision, hence the record length will vary. Certain fields may be omitted if they are not used, in which case the field position is reserved using commas to ensure correct interpretation of subsequent fields.

The tables below indicate the maximum and minimum widths of the fields to allow for buffer size allocation.

### *$GPGGA*

This message transfers global positioning system fix data. The $GPGGA message structure is shown below:

| Field | Format | Min chars | Max chars | Notes |
|-------|--------|-----------|-----------|-------|
| Message ID | $GPGGA | 6 | 6 | GGA protocol header. |
| UTC Time | hhmmss.sss | 2,2,2.3 | 2,2,2.3 | Fix time to 1ms accuracy. |
| Latitude | float | 3,2.4 | 3,2.4 | Degrees * 100 + minutes. |
| N/S Indicator | char | 1 | 1 | N=north or S=south |
| Longitude | float | 3,2.4 | 3,2.4 | Degree * 100 + minutes. |
| E/W indicator | Char | 1 | 1 | E=east or W=west |
| Position Fix Indictor | Int | 1 | 1 | 0: Fix not available or invalid. 1: GPS SPS mode. Fix available. |
| Satellites Used | Int | 2 | 2 | Number of satellites used to calculate fix. |
| HDOP | Float | 1.1 | 3.1 | Horizontal Dilution of Precision. |

# WONDE PROUD

| MSL Altitude | Float | 1.1 | 5.1 | Altitude above mean seal level |
|---|---|---|---|---|
| Units | Char | 1 | 1 | M Stands for "meters". |
| Geoid Separation | Int | (0) 1 | 4 | Separation from Geoids can be blank. |
| Units | Char | 1 | 1 | M Stands for "meters". |
| Age of Differential Corrections | int | (0) 1 | 5 | Age in seconds Blank (Null) fields when DGPS is not used. |
| Diff Reference Corrections | int | 4 | 4 | 0000. |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10. |

### *$GPGLL*

This message transfers Geographic position, Latitude, Longitude, and time. The $GPGLL message structure is shown below:

| Field | Format | Min chars | Max chars | Notes |
|---|---|---|---|---|
| Message ID | $GPGLL | 6 | 6 | GLL protocol header. |
| Latitude | Float | 1,2.1 | 3,2.4 | Degree * 100 + minutes. |
| N/S Indicator | Char | 1 | 1 | N=north or S=south. |
| Longitude | Float | 1,2.1 | 3,2.4 | Degree * 100 + minutes. |
| E/W indicator | Character | 1 | 1 | E=east or W=west. |
| UTC Time | hhmmss.sss | 1,2,2.1 | 2,2,2.3 | Fix time to 1ms accuracy. |
| Status | Char | 1 | 1 | A   Data Valid. V   Data invalid. |
| Mode Indicator | Char | 1 | 1 | A   Autonomous |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR><LF> | 2 | 2 | ASCII 13, ASCII 10. |

# WONDE PROUD

*$GPGSA*

This message transfers DOP and active satellites information. The $GPGSA message structure is shown below:

| Field | Format | Min chars | Max chars | Notes |
|---|---|---|---|---|
| Message ID | $GPGSA | 6 | 6 | GSA protocol header. |
| Mode | Char | 1 | 1 | M  Manual, forced to operate in selected mode.<br>An Automatic switching between modes. |
| Mode | Int | 1 | 1 | 1　　　　　　　Fix not available.<br>2　　　　　　　2D position fix.<br>3　　　　　　　3D position fix. |
| Satellites Used | Int | 2 | 2 | SV on channel 1. |
| Satellites Used | Int | 2 | 2 | SV on channel 2. |
| ... | . | .. | .. | .. |
| Satellites Used | Int | 2 | 2 | SV on channel 12. |
| PDOP | Float | 1.1 | 3.1 | |
| HDOP | Float | 1.1 | 3.1 | |
| VDOP | Float | 1.1 | 3.1 | |
| Checksum | *xx | 0 | 3 | 2 digits |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10 |

# WONDE PROUD

## *$GPGSV*

This message transfers information about satellites in view. The $GPGSV message structure is shown below. Each record contains the information for up to 4 channels, allowing up to 12 satellites in view. In the final record of the sequence the unused channel fields are left blank with commas to indicate that a field has been omitted.

| Field | Format | Min chars | Max chars | Notes |
|---|---|---|---|---|
| Message ID | $GPGSV | 6 | 6 | GSA protocol header. |
| Number of messages | Int | 1 | 1 | Number of messages in the message sequence from 1 to 3. |
| Message number | Int | 1 | 1 | Sequence number of this message in current sequence, form 1 to 3. |
| Satellites in view | Int | 1 | 2 | Number of satellites currently in view. |
| Satellite Id | Int | 2 | 2 | Satellite vehicle 1. |
| Elevation | Int | 1 | 3 | Elevation of satellite in degrees. |
| Azimuth | Int | 1 | 3 | Azimuth of satellite in degrees. |
| SNR | Int | (0) 1 | 2 | Signal to noise ration in dBHz, null if the sv is not in tracking. |
| Satellite Id | Int | 2 | 2 | Satellite vehicle 2. |
| Elevation | Int | 1 | 3 | Elevation of satellite in degrees. |
| Azimuth | Int | 1 | 3 | Azimuth of satellite in degrees. |
| SNR | Int | (0) 1 | 2 | Signal to noise ration in dBHz, null if the sv is not in tracking. |
| Satellite Id | Int | 2 | 2 | Satellite vehicle 3. |
| Elevation | Int | 1 | 3 | Elevation of satellite in degrees. |
| Azimuth | Int | 1 | 3 | Azimuth of satellite in degrees. |
| SNR | Int | (0) 1 | 2 | Signal to noise ration in dBHz, null if the sv is not in tracking. |
| Satellite Id | Int | 2 | 2 | Satellite vehicle 4. |
| Elevation | Int | 1 | 3 | Elevation of satellite in degrees. |
| Azimuth | Int | 1 | 3 | Azimuth of satellite in degrees. |
| SNR | Int | (0) 1 | 2 | Signal to noise ration in dBHz, null if the sv is not in tracking. |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10. |

# *WONDE PROUD*

*$GPRMC*

This message transfers recommended minimum specific GNSS data. The $GPRMC message format is shown below.

| Field | Format | Min chars | Max chars | Notes |
|---|---|---|---|---|
| Message ID | $GPRMC | 6 | 6 | RMC protocol header. |
| UTC Time | hhmmss.sss | 1,2,2.1 | 2,2,2.3 | Fix time to 1ms accuracy. |
| Status | char | 1 | 1 | A  Data Valid. V  Data invalid. |
| Latitude | Float | 1,2.1 | 3,2.4 | Degrees * 100 + minutes. |
| N/S Indicator | Char | 1 | 1 | N=north or S=south. |
| Longitude | Float | 1,2.1 | 3,2.4 | Degrees * 100 + minutes. |
| E/W indicator | Char | 1 | 1 | E=east or W=west. |
| Speed over ground | Float | 1,1 | 5.3 | Speed over ground in knots. |
| Course over ground | Float | 1.1 | 3.2 | Course over ground in degrees. |
| Date | ddmmyy | 2,2,2 | 2,2,2 | Current date. |
| Magnetic variation | Blank | (0) | (0) | Not used. |
| E/W indicator | Blank | (0) | (0) | Not used. |
| Mode | Char | 1 | 1 | A  Autonomous |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10. |

*$GPVTG*

This message transfers Velocity, course over ground, and ground speed. The $GPVTG message format is shown below.

| Field | Format | Min chars | Max chars | Notes |
|-------|--------|-----------|-----------|-------|
| Message ID | $GPVTG | 6 | 6 | VTG protocol header. |
| Course (true) | Float | 1.1 | 3.2 | Measured heading in degrees. |
| Reference | Char | 1 | 1 | T = true heading. |
| Course (magnetic) | Float | 1.1 | 3.2 | Measured heading (blank). |
| Reference | Char | 1 | 1 | M = magnetic heading. |
| Speed | Float | 1.1 | 4.2 | Speed in knots. |
| Units | Char | 1 | 1 | N = knots. |
| Speed | Float | 1.1 | 4.2 | Speed |
| units | Char | 1 | 1 | K = Km/h. |
| Mode | Char | 1 | 1 | A  Autonomous |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10. |

### $GPZDA

This message transfers UTC Time and Date. Since the latency of preparing and transferring the message is variable, and the time does not refer to a particular position fix, the second precision is reduced to 2 decimal places. The $GPZGA message format is shown below.

| Field | Format | Min chars | Max chars | Notes |
|---|---|---|---|---|
| Message ID | $GPZDA | 6 | 6 | ZDA protocol header. |
| UTC time | hhmmss.ss | 2,2,2.2 | 2,2,2.2 | 00000000.00 to 235959.99 |
| UTC day | dd | 2 | 2 | 01 to 31, day of month. |
| UTC month | mm | 2 | 2 | 01 to 12. |
| UTC Year | yyyy | 4 | 4 | 1989-9999. |
| Local zone hours | Int | (-)2 | (-)2 | Offset of local time zone (-13) to 13. |
| Local zone minutes | Unsigned | 2 | 2 | |
| Checksum | *xx | (0) 3 | 3 | 2 digits. |
| Message terminator | <CR> <LF> | 2 | 2 | ASCII 13, ASCII 10. |