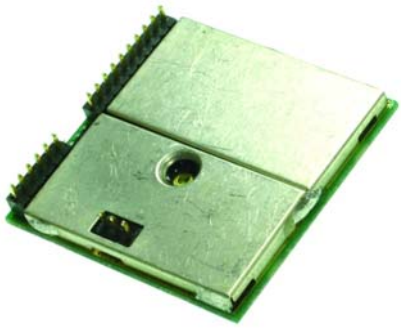
WONDE PROUD

Preliminary Datasheet

M4125/M4125P



M4125

M4125P

M4125/M4125P

66 Channels Ultra High Sensitivity GPS Module

GENERAL DESCRIPTION

The M4125 (without patch antenna)/M4125P (with patch antenna on top) 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 M4125/M4125P 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. It communicates with application system via RS232 (TTL level) with NMEA0183 protocol.

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
- TTL level serial port for GPS receiver command message interface
- Compact board size

M4125 1.043"x1.043"x0.11"(26.5x26.5x3.0mm)
M4125P 1.043"x1.043"x0.34"(26.5x26.5x8.7mm)

- Support standard NMEA-0183 V3.01 and backward compliance
- Up to 5Hz update rate (optional)
- 1PPS GPS time reference (optional)
- Support SBAS - WAAS, EGNOS, and MSAS (optional)
- Support dual antenna with built-in auto-detect RF switch (M4125P)
- RoHS compliant

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: 2.5m
Velocity	Without aid: 0.1m/s; DGPS: 0.05m/s
Acceleration	Without aid: 0.1m/s^2; DGPS: 0.05m/s^2
Timing	<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
Warm start	<34sec
Cold start	<35sec
Reacquisition	<1sec
Max 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	RS232, 8 data bits, no parity, 1 stop bit
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	-40°C to +85°C
Storage temperature range	-40°C to +100°C
Operating humidity	5% ~ 95% (non-condensing)

Physical Characteristics

Dimension	M4125 1.043”x1.043”x0.11” (26.5x26.5x3.0mm)
	M4125P 1.043”x1.043”x0.34” (26.5x26.5x8.7mm)
	(With TH: 4mm patch antenna)
Weight	M4125 3.8g
	M4125P 15g
	Antenna connector: 1.27 mm pitch 3 pin board to board
	Interface connector: 1.27 mm pitch 10 pin board to board

All specifications are subject to change without notice

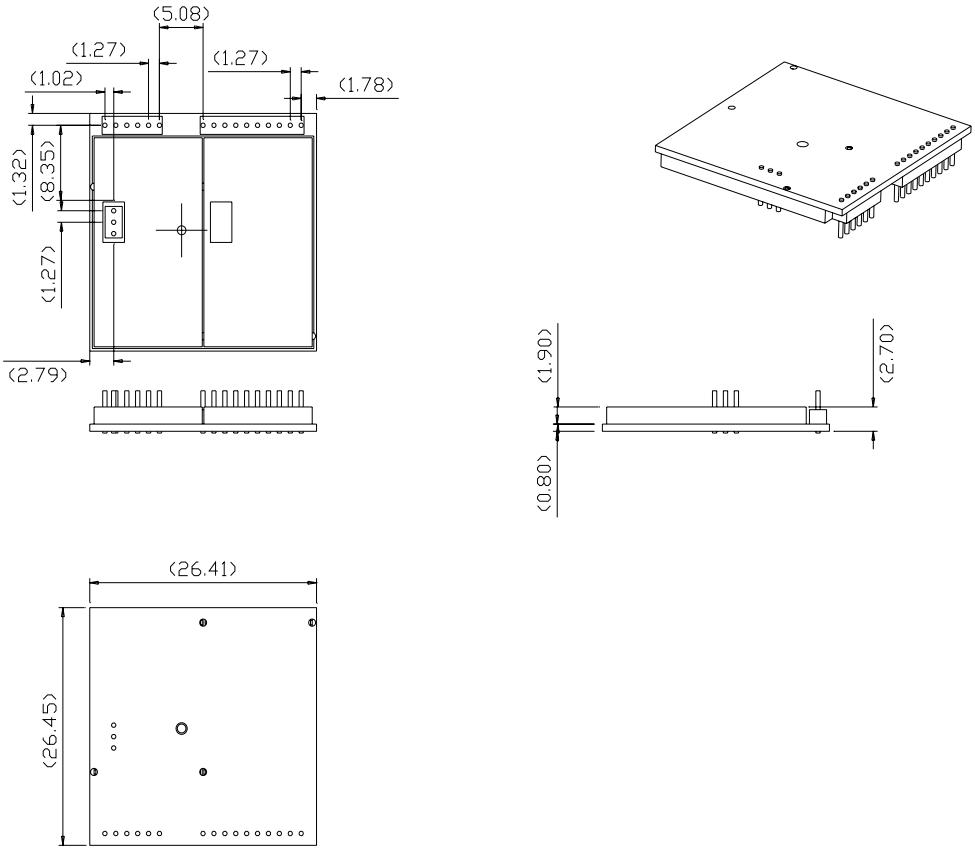
Remarks: Difference between M4125 & M4125P

M4125: one RF input (Use active antenna only)

M4125P: two RF input with auto switch (One patch antenna, one external antenna)

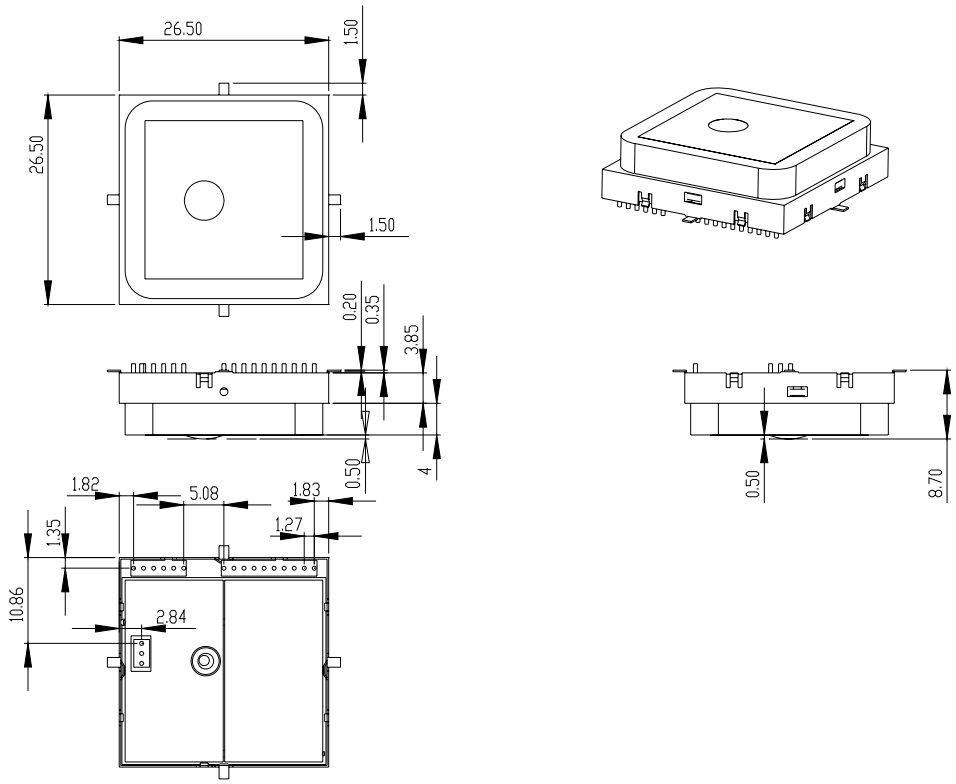
MECHNICAL DIMENSIONS

M4125



Pin	Name	Pin	Name
1	Status	11	NC
2	1PPS output	12	NC
3	NMEA TX	13	NC
4	NMEA RX	14	NC
5	NC	15	NC
6	Reset (NC)	16	NC
7	VBAT	17	RF GND
8	GND	18	RF IN
9	VDD	19	RF GND
10	NC		

M4125P



Pin	Name	Pin	Name
1	Status	11	NC
2	1PPS output	12	NC
3	NMEA TX	13	NC
4	NMEA RX	14	NC
5	NC	15	NC
6	Reset (NC)	16	NC
7	VBAT	17	RF GND
8	GND	18	RF IN
9	VDD	19	RF GND
10	NC		

PIN ASSIGNMENT OF CONNECTOR

Serial Interface

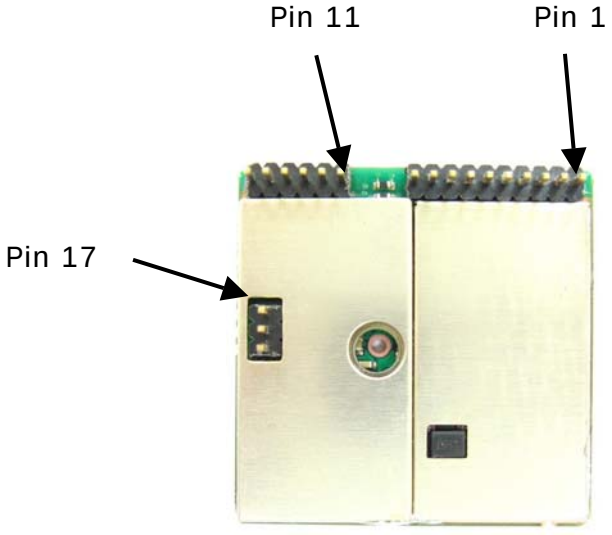
Communication to the M4125/M4125P is provided via a serial interface. A 10-pin 1.27mm whole connector is used. The pin out is shown in Table 1.

Table 1 Pin list of the Serial Interface

Pin	Name	Type	Description
1	Status	I/O	GPS Status
2	1PPS	I/O	1PPS output
3	NMEA TX	I/O	NMEA Serial Data Output
4	NMEA RX	I/O	NMEA Serial Data Input
5	NC	NU	Reserved, keep floating
6	Reset (NC)	NU	Keep floating; **power up reset**
7	VBAT	I	Backup Battery Input (1.5~4.2V)
8	GND	PWR	Ground
9	VDD	PWR	3.3±10% VDC Power Input
10	NC	NU	Keep floating

NOTE 1: The VBAT (Pin 7, 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.



APPLICATIONS

The M4125/M4125P 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

SOFTWARE SPECIFICATIONS

M4125/M4125P NMEA Protocol

The M4125/M4125P 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

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.

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.

$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. An Automatic switching between modes.
Mode	Int	1	1	1 Fix not available. 2 2D position fix. 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

$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.

$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.