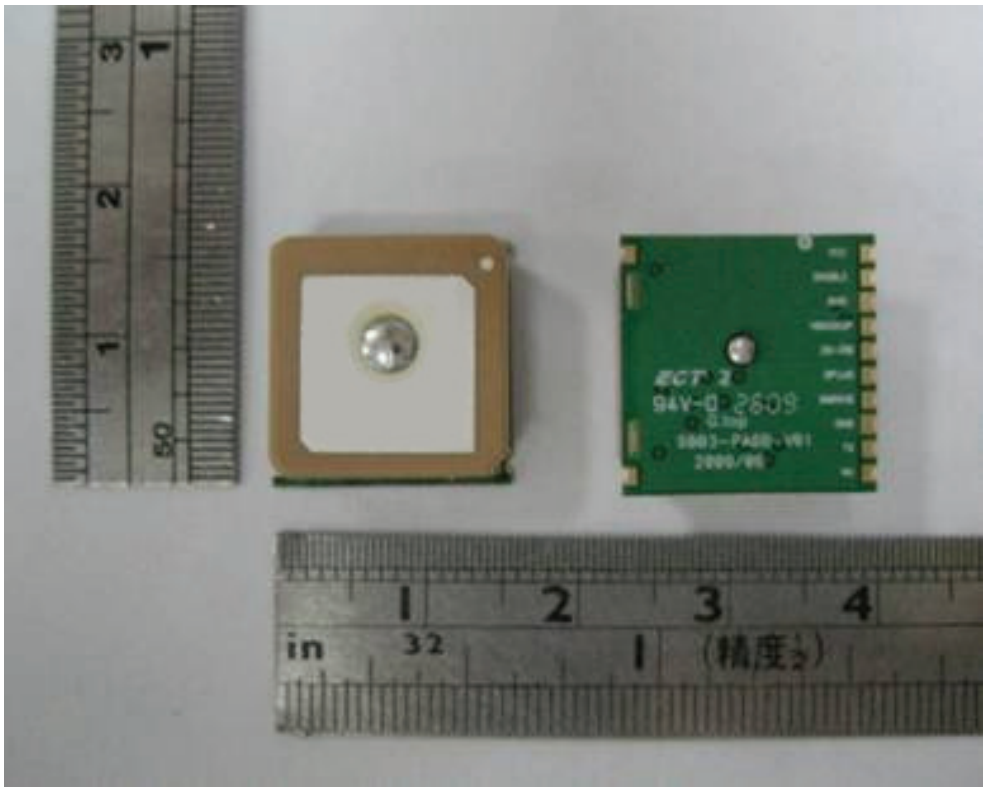
FGPMMOPA6B
Datasheet

Rev.A01



66-channel GPS Engine Board
Antenna Module

with MTK Chipset

FGPMMOPA6B

[Fully pin compatible with FGPMMOPA6]

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History		
Date	**Rev.**	**Description**
2009/07/10	A00	First Release
2009/07/23	A01	Add RoHS Compliant

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Description

The FGPMMOPA6B is a POT (Patch On Top) GPS Module. This POT 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 powered 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, is the small-form-factor ever device. The module is suitable for every GPS-related applications, such as :

- ✓ Fleet Management/Asset Tracking
- ✓ LBS (location-base service) and AVL system
- ✓ Security system
- ✓ Hand-held device for personal positioning and travel navigation

Features

- MediaTek MT3329 Single Chip
- L1 Frequency, C/A code, 66 channels
- Support up 210 PRN channels
- Jammer detection and reduction
- Multi-path detection and compensation
- Dimension：16mm x 16mm x 6mm
- Patch Antenna Size：15mm x 15mm x 4mm
- High Sensitivity：Up to -165 dBm tracking, superior urban performances[1]
- Low Power Consumption：48mA @ acquisition, 37mA @ tracking
- Low shut-down current consumption：15uA, typical
- DGPS(WAAS/EGNOS/MSAS/GAGAN) support (Default: Enable)
- Max. Update Rate：up to 10Hz (Configurable by firmware)
- USB Interface support without extra bridge IC
- FCC E911 compliance and AGPS support (Offline mode : EPO valid up to 14 days)
- RoHS Compliant

[1] Reference to GPS chipset specification

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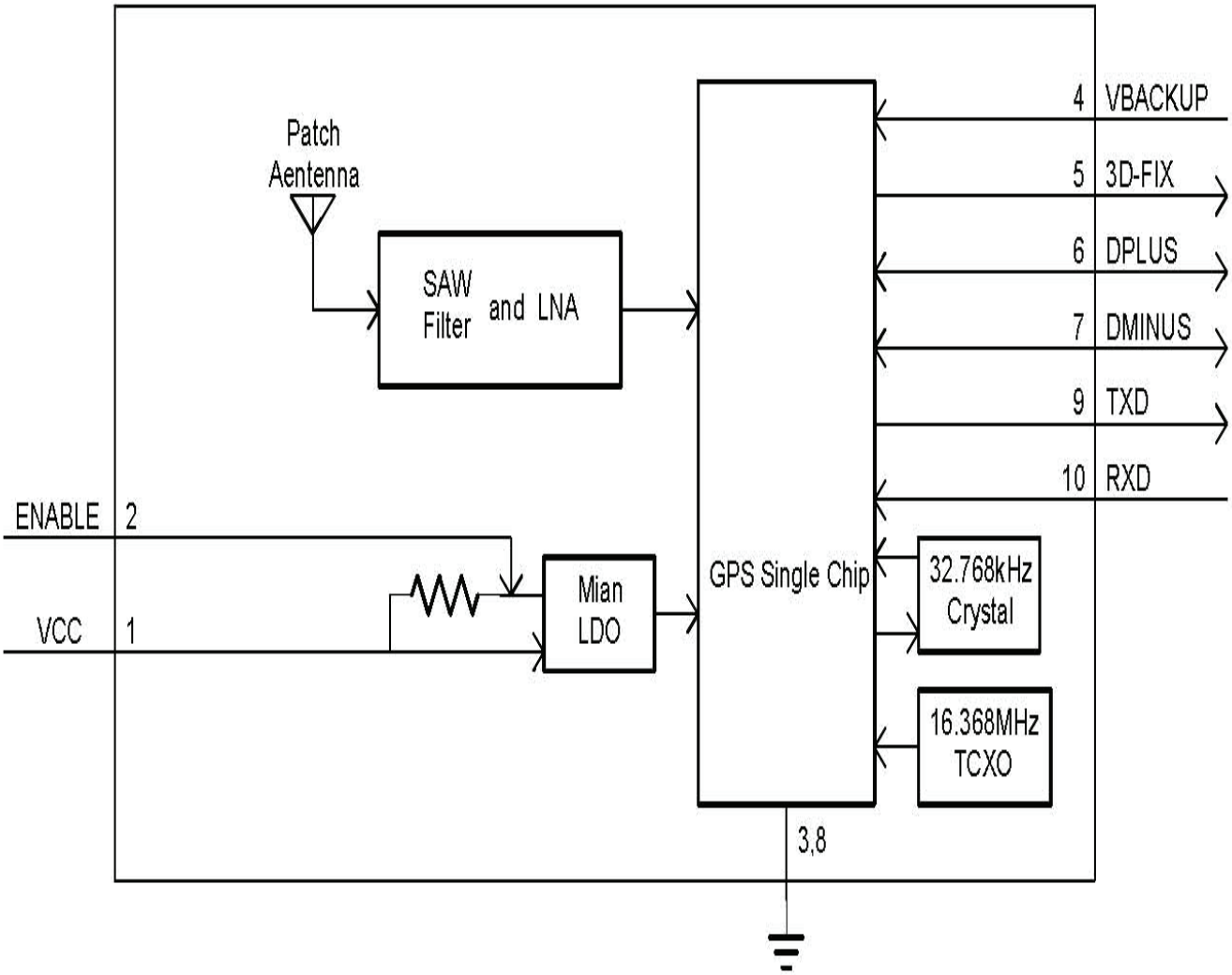
System Block



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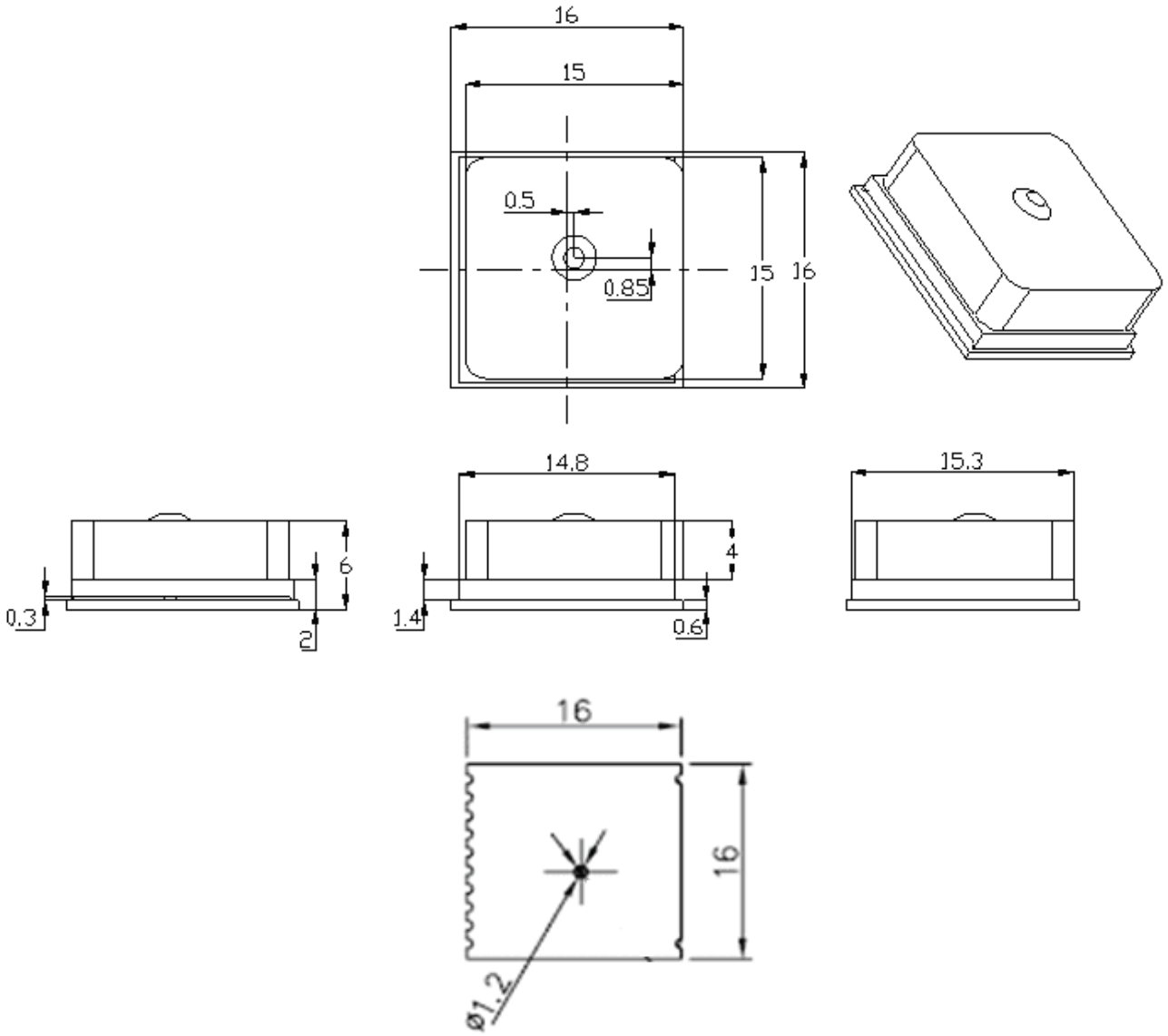
Mechanical



Unit: mm

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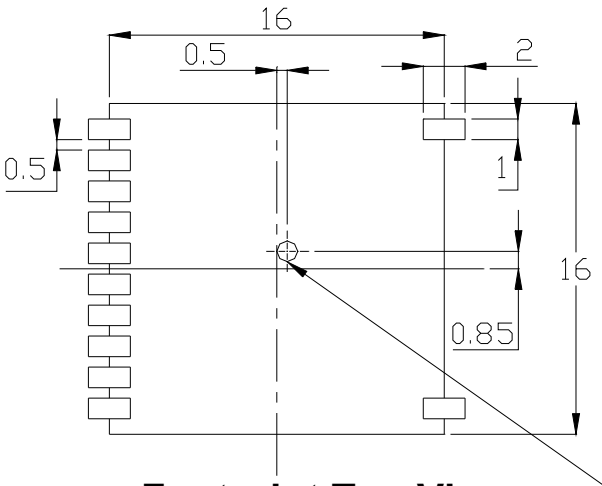
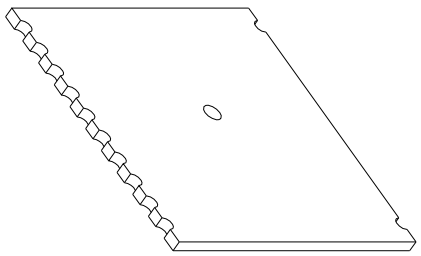
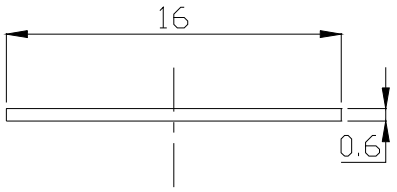
Recommend PCB Layout Pad

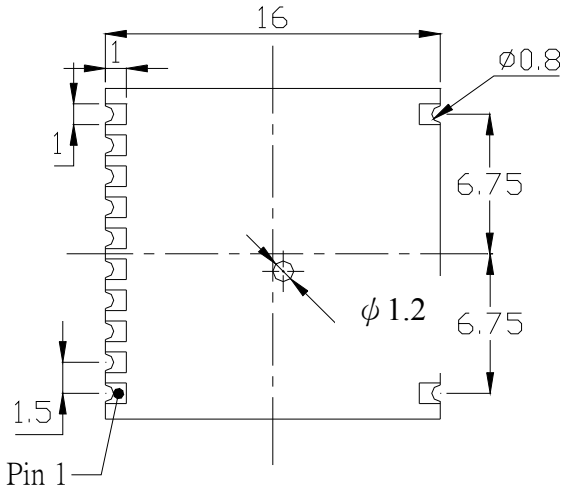


Footprint Top View



No traces and vias are allowed to pass the area.





PCB Bottom View

Unit: mm

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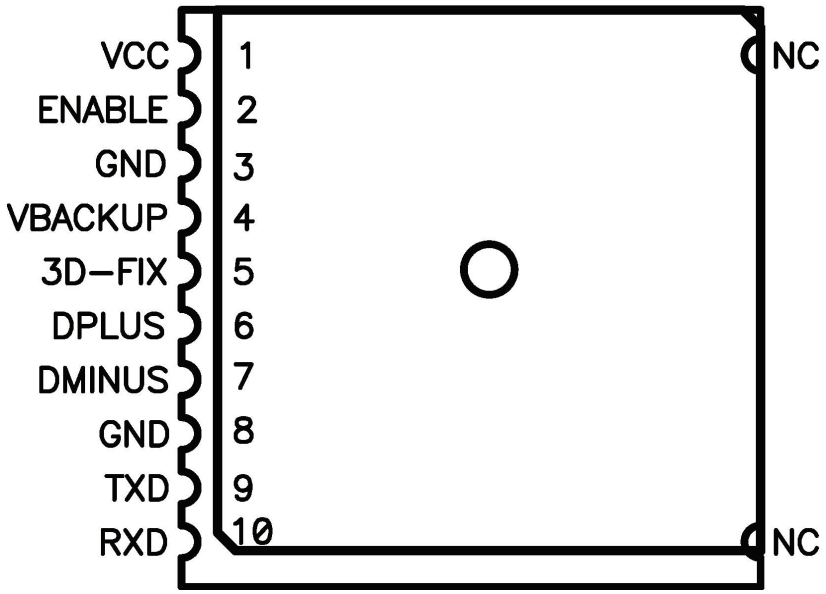
Pin Configuration



Top View

Pin Definition

Pin	Name	I/O	Description
1	VCC	PI	Main DC power input
2	ENABLE	I	High active, or keep floating for normal working
3	GND	P	Ground
4	VBACKUP	PI	Backup power input
5	3D-FIX	O	3D-fix indicator
6	DPLUS	I/O	USB port D+
7	DMINUS	I/O	USB port D-
8	GND	P	Ground
9	TXD	O	Serial data output of NMEA
10	RXD	I	Serial data input for firmware update

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Description of I/O Pin

VCC (Pin1)

The main DC power supply of the module. The voltage should be kept between from 3.2V to 5.0V. **The Vcc ripple must be controlled under 50mV$_{pp}$ (Typical：3.3V)**

ENABLE (Pin2)

Keep open or pull high to Power ON. Pull low to shutdown the module.

Enable (High): 1.8V<= V$_{enable}$<=VCC

Disable (Low): 0V<= V$_{enable}$<=0.25V

GND (Pin3)

Ground.

VBACKUP (Pin4)

This is the power for GPS chipset to keep RTC running when main power is removed. The voltage should be kept between 2.0V~4.3V . **(Typical：3.0V)**

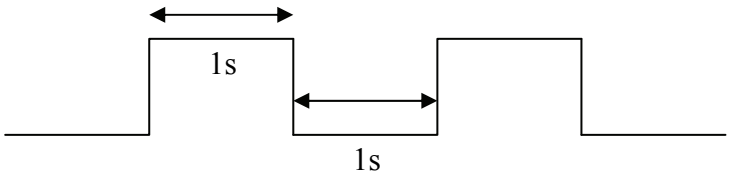
The pin must be connected for normal operation.

3D-FIX (Pin5)

The 3D-FIX was assigned as fix flag output. If not used, keep floating.

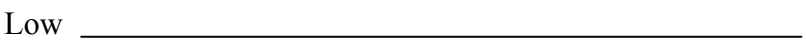
- Before 2D Fix

  The pin should continuously output one-second high-level with one-second low-level signal.



- After 2D or 3D Fix

  The pin should continuously output low-level signal.



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DPLUS (Pin6)
USB Port DPLUS Signal

DMINUS (Pin7)
USB Port DMINUS Signal

GND (Pin8)
Ground.

TXD (Pin9)
This is the UART transmitter of the module. It outputs the GPS information for application.

RXD (Pin10)
This is the UART receiver of the module. It is used to receive software commands and firmware update.

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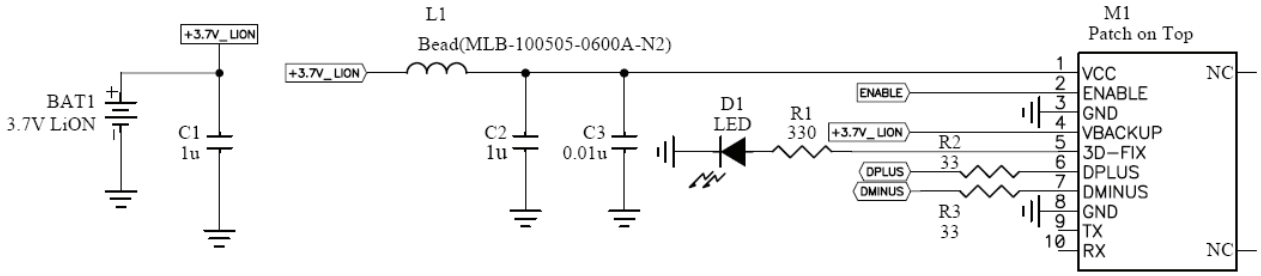
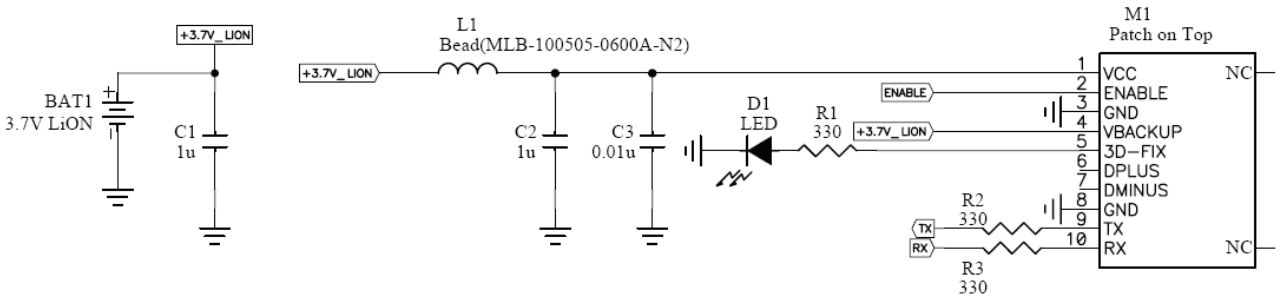
Reference Design

USB Interface



UART Interface



Note: For better filtering L1/C2/C3 components need to be placed Closely Pin 1(VCC)

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Specifications

General	
Chipset	MTK MT3329
Frequency	L1, 1575.42MHz
C/A Code	1.023 MHz
Channels	66 channels
SBAS	WAAS, EGNOS,MSAS ,GAGAN Supported(Default: Enable)
Datum	WGS84(Default), Tokyo-M, Tokyo-A, User Define
CPU	ARM7EJ-S
Dimensions	
Length/Width/Height	16*16*6 mm
Weight	6g
Performance Characteristics	
Position Accuracy	Without aid：3.0m 2D-RMS
	< 3m CEP (50%) without SA (horizontal)
	DGPS (RTCM, SBAS)：2.5m
Velocity Accuracy	Without aid：0.1 m/s
	DGPS (RTCM, SBAS)：0.05m/s
Acceleration Accuracy	Without aid：0.1 m/s²
	DGPS (RTCM, SBAS)：0.05m/s²
Timing Accuracy	100 ns RMS
Sensitivity[1]	Acquisition：-148dBm (Cold Start)
	Reacquisition：-160dBm
	Tracking：-165dBm
Update Rate	1Hz (Default)
Acquisition (Open sky, stationary)	
Reacquisition Time[1]	Less than 1 second
Hot start[1]	1.0s (Typical)
Warm start[1]	34s (Typical)
Cold start[1]	35s (Typical)

[1] Reference to GPS chipset specification

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Dynamic	
Altitude	Maximum 18,000m
Velocity	Maximum 515m/s
Acceleration	Maximum 4G
I/O	
Signal Output	8 data bits, no parity, 1 stop bit
Available Baud Rates	Default：9600bps (4800/9600/38400/57600/115200 bps by customization)
Protocols	NMEA 0183 v3.01 (Default：GGA,GSA,GSV,RMC,VTG) MTK NMEA Command
Data output Interface	
USB Interface	Logo certified USB 2.0 full-speed compatible
UART Interface	TTL level serial port
Environment	
Operating Temperature	-40 ℃ to 85 ℃
Storage Temperature	-50 ℃ to 90 ℃
Operating Humidity	5% to 95% (no condensing)
Mounting	SMD Type ,10 Pin

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DC Characteristics

Parameter	Condition	Min.	Typ.	Max.	Unit
Operation supply Voltage	—	3.2	3.3	5.0	V
Operation supply Ripple Voltage	—	—	—	50	mVpp
Backup Battery Voltage	—	2.0	3.0	4.3	V
RXA TTL H Level	VCC=3.3V	2.1	—	2.8	V
RXA TTL L Level	VCC=3.3V	0	—	0.9	V
TXA TTL H Level	VCC=3.3V	2.1	—	2.8	V
TXA TTL L Level	VCC=3.3V	0	—	0.8	V
USB D+	VCC=5.0V				V
USB D-	VCC=5.0V				V
Power Consumption @ 3.3V	Acquisition	43	48	53	mA
	Tracking	32	37	42	mA
Backup Power Consumption@ 3.0V	25℃	—	10	—	uA

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. Recommended Minimum Navigation Information.
VTG	Course and speed information relative to the ground.

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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 **Table-3**
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

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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 **Table-5**
Mode 2	3		See **Table-6**
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 (≧4 SVs used)

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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 *(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, (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, (null when not tracking)
Checksum	*7D		
<CR> <LF>			End of message termination

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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 *(MTK does support magnetic declination)*
Mode	A		A= Autonomous mode D= Differential mode E= Estimated mode
Checksum	*65		
<CR> <LF>			End of message termination

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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 *(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 D= Differential mode E= Estimated mode
Checksum	*06		
<CR> <LF>			End of message termination

MTK NMEA Command Protocol

Packet Type：

103 PMTK_CMD_COLD_START

Packet Meaning：

Cold Start：Don’t use Time, Position, Almanacs and Ephemeris data at re-start.

Example：

$PMTK103*30<CR><LF>

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***All the information in this sheet can be used only for Pb- free certification.**

SMT Reflow Soldering Temperature Profile: (Reference Only)

Reflow Condition (Follow JEDEC-020C)

Average ramp-up rate (217℃ to peak)：3℃/sec. max.

Preheat：150 ~ 200℃ 、60~180 seconds

Temperature maintained above 217℃ ：60 ~ 150 seconds

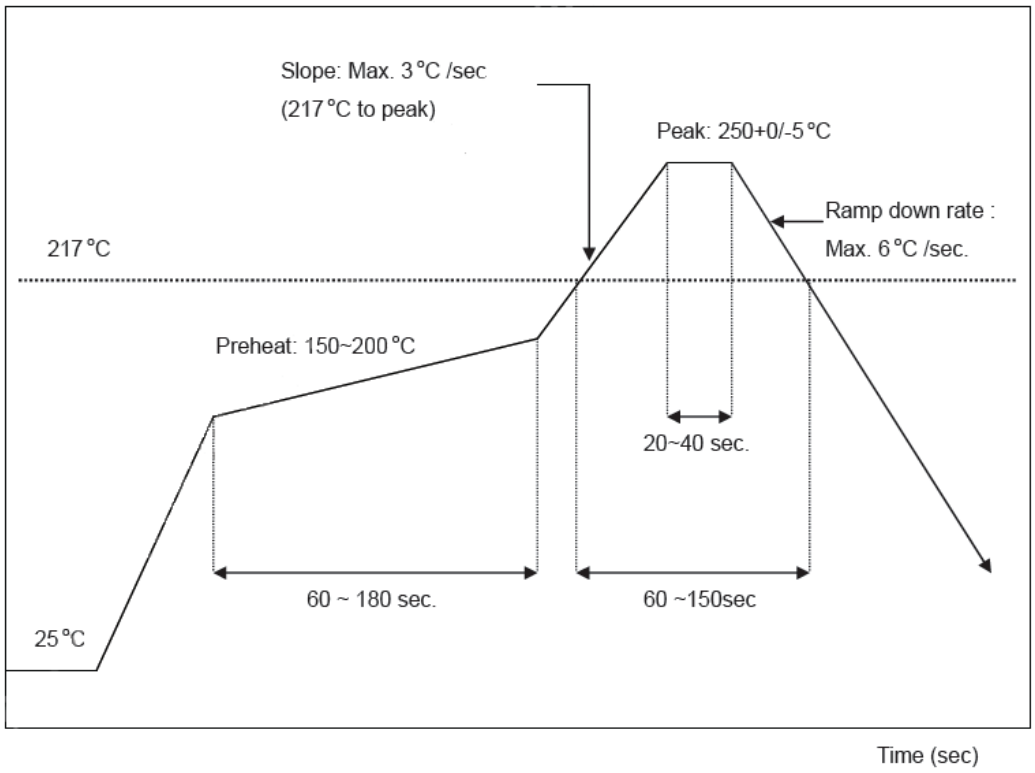
Time within 5℃ of actual peak temperature：20 ~ 40 seconds

Peak temperature：250+0/-5℃

Ramp-down rate：6℃/sec. max.

Time 25℃ to peak temperature：8 minutes max.

Cycle interval：5 minus



Manual Soldering:

Soldering iron:

Bit Temperature : Under 380℃ Time : Under 3 sec.

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