

General Description

The Gotop GUM-5546-MTBDMU15 is a complete GPS/BeiDou engine module that features super sensitivity, ultra low power and small form factor. The GPS/BeiDou signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol.

Its -165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS/BeiDou was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like PNDs, mobile phones, cameras and vehicle navigation systems.

Applications

- LBS (Location Based Service)
- PND (Portable Navigation Device)
- Vehicle navigation system
- Mobile phone



Figure 1:GUM-5546-MTBDMU15 View

Features

- Build on high performance, low-power MT3333 chipset
- Ultra high sensitivity: -165dBm
- Extremely fast TTFF at low signal level
- Built in high gain LNA
- Low power consumption: $\text{Max } 20\text{mA} @ 5.0\text{V}$
- NMEA-0183 compliant protocol or custom protocol
- Operating voltage: $5.0\text{V} - 5.5\text{V}$
- Operating temperature range: $-40\text{ to } 85^\circ\text{C}$
- Baud Rate: 4800 bps; Datum: WGS-84
- Patch Antenna Size: $25(\text{w})\text{mm} \times 25(\text{d})\text{mm} \times 4(\text{h})\text{mm}$
- Small form factor: $55 \times 46 \times 10\text{mm}$
- Line long: 1.5M
- RoHS compliant (Lead-free)

Performance Specification

Parameter	Specification
Receiver Type	Gps/Glonass/Galileo/Beidou(afterICDreleased)receiver Supports multi-GNSS incl.QZSS,SBAS ranging Supports:WAAS/EGNOS/MSAS/GAGAN
Sensitivity	Tracking -165dBm Acquisition -163dBm(hot) -148dBm(cold)
Accuracy	Position 5m CEP without SA Velocity 0.1m/s without SA Timing (PPS) 10ns RMS
Acquisition Time	Cold Start 38s Warm Start 35s Hot Start 1s Re-Acquisition <1s
Power Consumption	Tracking 20mA @3.3V Vcc Acquisition 18mA Sleep/Standby TBD
NavigationDataUpdate Rate	1Hz
Operational Limits	Altitude Max 18,000m Velocity Max 515m/s Acceleration Less than 4g

Interfaces Configuration

Power Supply: Regulated power for the GUM-5546-MTBDMU15 is required. The input voltage Vcc should be 5.0V \pm 10%, maximum, current is no less than 100mA. Suitable decoupling must be provided by external decoupling circuitry.

UART Ports: The module supports two full duplex serial channels UART. All serial connections are at 3V CMOS logic levels, if need different voltage levels, use appropriate level shifters. The baud rate of both serial ports are fully programmable, the data format is however fixed: X, N, 8, 1, i.e. X baud rate, no parity, eight data bits and one stop bit, no other data

formats are supported, LSB is sent first. The modules default baud rate is set up 4800bps, however, the user can change the default baud rate to any value from 4800 bps to 38.4kbps. UART is used e.g. for booting and NMEA interface.

USB Ports:modules provide a USB version 2.0 FS (Full Speed, 12Mbit/s) interface as an alternative to the UART. The pull-up resistor on USB_DP is integrated to signal a full-speed device to the host. provides a Microsoft® certified USB driver for Windows XP and Windows Vista operating systems. Windows 7 will also be supported following certification

Operating System	Support level
Windows XP	Certified
Windows Vista	Certified
Windows 7	Certified

Absolute Maximum Rating

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	Vcc	5.0	5.5	V
Input Pins				
Input Pin Voltage I/O	USB	-0.3	5.0	V
Environment				
Storage Temperature	Tstg	-40	125	°C
Peak Reflow Soldering Temperature	Tpeak		260	°C
Humidity			95	%

Note: Absolute maximum ratings are stress ratings only, and functional operation at the

maxims is not guaranteed. Stress beyond the limits specified in this table may affect device reliability or cause permanent damage to the device. For functional operating conditions, refer to the operating conditions tables as follow.

Operating Conditions

Parameter	Symbol	Condition	Min	Typ	Max	Units
Power supply voltage	Vcc		4.5	5.0	5.5	V
Powersupplyvoltagegeripple	Vcc_PP	Vcc=5.0V			40	mV
Consumption current	Icc	Vcc=5.0V		20	20	mA
Input high voltage	V _{IH}		0.7xVcc		Vcc+1.0	V
Input low voltage	V _{IL}		-0.3		0.3xVcc	V
Output high voltage	V _{OH}		0.8xVcc		Vcc	V
Output low voltage	V _{OL}		0		0.2xVcc	V
Operating temperature	Topr		-40		85	°C

NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a \$ and with carriage return/line feed. GPS&BeiDou specific messages all start with \$GPxxx/GNxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.

The Gotop GUM-5546-MTBDMU15 supports the following NMEA-0183 messages:
GPGSA.

GPRMC.GNGSA.GNRMC.GLGSV

Table 1: NMEA-0183 Output Messages

NMEA Record	DESCRIPTION
GPGSA	GPS DOP and active satellites

GPRMC	Recommended minimum specific GPS data
GNGSA	BeiDou DOP and active satellites
GNRMC	Recommended minimum specific BeiDou data
GLGSV	GPS/BeiDou satellites in view

GPGSA-GPS DOP and Active Satellites

Table 4 contains the values of the following example:

\$GPGSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , , 1.8,1.0,1.5*33.

Table 4: GSA Data Format

Name	Example	Units	Description
Message	\$GPGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
...
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

Table 4-1: Mode 1

Value	Description
1	Fix not available

2	2D
3	3D

Table 4-2: Mode 2

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

GPRMC-Recommended Minimum Specific GPS Data

Table 6 contains the values of the following example:

\$GPRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13,309.62, 120598,, *10

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTS Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over	309.62	Degrees	True
Ground			
Date	120598		Dummy
Magnetic variation		Degrees	E=east or W=west
Checksum	*10		
<CR> <LF>			End of message termination

GNSSA-BeiDou DOP and Active Satellites

Table 4 contains the values of the following example:

\$GNSSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , , 1.8,1.0,1.5*33.

Table 4: GSA Data Format

Name	Example	Units	Description
Message	\$GNSSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
...
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

Table 4-1: Mode 1

Value	Description
1	Fix not available
2	2D
3	3D

Table 4-2: Mode 2

Value	Description
M	Manual-forced to operate in 2D or 3D mode

A	Automatic-allowed to automatically switch 2D/3D
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GNRMC-Recommended Minimum Specific BeiDou Data

Table 6 contains the values of the following example:

\$GNRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13,309.62, 120598,, *10

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	\$GNRMC		RMC protocol header
UTS Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over	309.62	Degrees	True
Ground			
Date	120598		Dummy
Magnetic variation		Degrees	E=east or W=west
Checksum	*10		
<CR> <LF>			End of message termination

GLGSV-GPS/GNSS Satellites in View

Table 5 contains the values of the following example:

\$GLGSV , 2, 1, 07, 07, 79,048, 42, 02, 51,062, 43, 26, 36,256, 42, 27, 27, 138,42*71

\$GLGSV, 2, 2, 07, 09, 23,313, 42, 04, 19, 159, 41, 15,12,041, 42*41.

Table 5: GLGGA Data Format

Name	Example	Units	Description
Message ID	\$GLGSV		GSV protocol header
Number of Message	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 214)
Elevation	79	degrees	Channel 1(Maximum 90)
Azimuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
...			...
Satellite ID	27		Channel 4(Range 1 to 214)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination

Depending on the number of satellites tracked multiple messages of GLGSV data may be required. The range of GPS SVID is 1~32, BeiDou SVID is 201~214.

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Gotop Technology Co. , LTD

Add:Room 603 Zhantao Technology Building,Minzhi Road,Xinniu Communnity,Minzhi Street,Baoan District,ShenZhen City China.

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