

BE-450

GNSS+罗盘一体模块

Datasheet

Revision: 5.59

Date:2023.3



参数表:

参数	说明	
芯片特性	芯片	M10050
	频率	GPS L1 C/A, QZSS L1 C/A/S, BDS B1/B1C, Galileo E1B/C, SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN
	工作模式	GPS, BDS, GALILEO
	辅助系统	SBAS, QZSS
	通道	N/A
灵敏度	跟踪	-166dBm
	重捕	-160dBm
	冷启动	-148dBm
	热启动	-160dBm
精度	水平精度	2.0 米 CEP
	速度精度	0.05m/s
	动态航向角精度	0.3 deg
	1PPS时间精度	RMS 30ns
99% 60ns		
启动时间	冷启动	27s
	热启动	1s
	辅助启动	1s
输出数据	波特率	4800bps - 921600bps, 默认 38400bps
	输出电平	TTL 电平
	输出协议	NMEA, UBX
	NMEA 语句	RMC, VTG, GGA, GSA, GSV, GLL
	更新频率	0.25Hz-18Hz, 默认 1Hz
	FLASH	带 FLASH, 可以更改配置, 断电不丢失
	秒脉冲	0.25 Hz to 10 MHz 可配置, 默认周期 1s, 高电平持续 100ms
工作限制	高度	80,000m
	速度	500m/s
	重力加速度	<4g
电源消耗	电压	直流 3.6V-5.5V, 典型:5.0V
	电流	15mA/5.0V
物理参数	尺寸	Φ56*9.8mm
	重量	31g
	连接器	1.25 间距 6pin 带锁座子
环境	操作温度	-40°C ~ +85°C
	存储温度	-40°C ~ +105°C
指示灯	TX 灯	上电蓝灯闪烁, 表示有数据输出
	PPS 灯	未定位该灯不亮; 3D 定位后, 开始闪烁

罗盘	罗盘	内部带电子罗盘 QMC5883L
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管脚定义:



序号	名称	I/O	描述	特性
1	SDA	O	串行数据-I2C 总线主/从数据	罗盘数据引脚
2	VCC	I	主电源, 直流输入	DC 3.6V-5.5V; 推荐 5.0V
3	GND	G	接地	接地
4	TX	O	UART 通讯接口,TTL 电平	GPS 数据输出引脚
5	RX	I	UART 通讯接口,TTL 电平	GPS 数据输入引脚
6	SCL	I	串行时钟-I2C 总线主/从时钟	罗盘时钟引脚

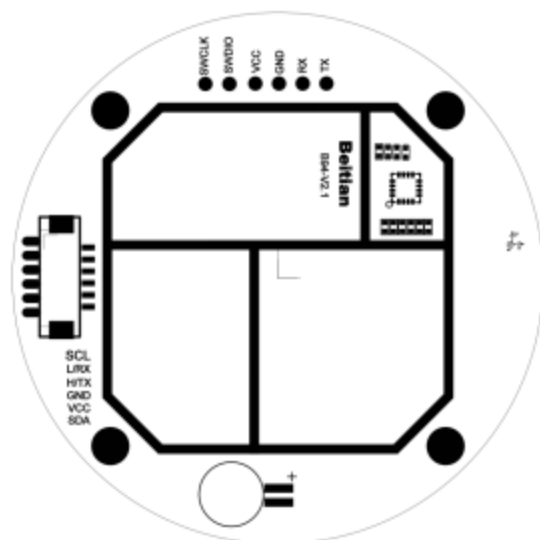
指示灯:

1. 蓝灯, TX 灯, 上电蓝灯闪烁, 表示有数据输出。
2. 红灯, PPS 灯, 未定位该灯不亮; 3D 定位后, 开始闪烁。

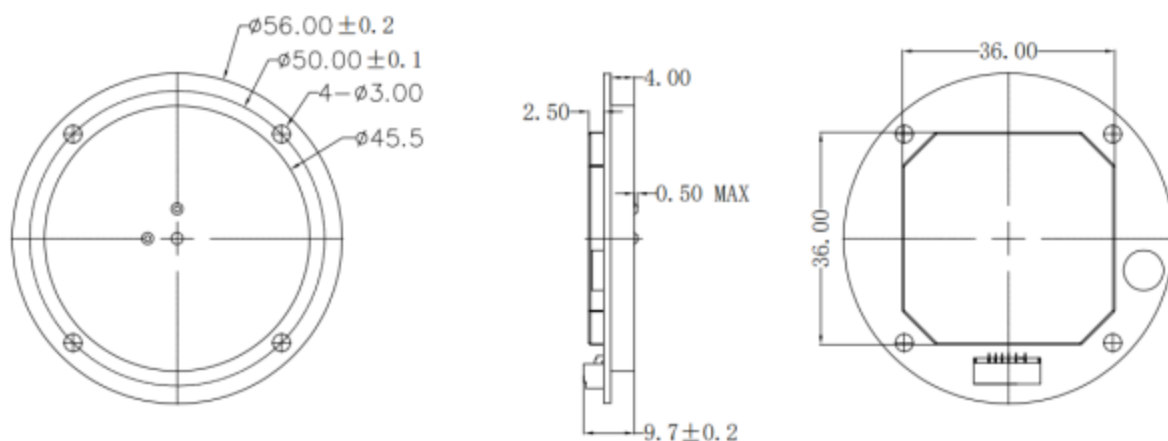
模块背面图:



电子罗盘 IC QMC5883L 的位置，指示方向：



尺寸图：



数据输出协议

联合模式协议头-GN
GPS 模式协议头-GP
GLONASS 模式协议头-GL
北斗模式协议头-GB 或 BD

输出实例：

```
$GNRMC,090020.00,A,2240.8406477,N,11402.7075007,E,0.005,,140520,,A,V*16
$GNVTG,,T,,M,0.005,N,0.009,K,A*31
$GNGGA,090020.00,2240.8406477,N,11402.7075007,E,1,12,0.48,75.358,M,-2.521,M,,*6D
$GNGSA,A,3,02,06,09,17,19,28,04,03,,,,,0.99,0.48,0.87,1*0C
$GNGSA,A,3,73,74,70,75,69,85,,,,,0.99,0.48,0.87,2*01
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$GNGSA,A,3,27,13,26,01,08,21,,,,,0.99,0.48,0.87,3*09
$GNGSA,A,3,28,07,08,10,13,27,30,,,,,0.99,0.48,0.87,4*07
$GPGSV,3,1,10,02,29,277,42,03,14,039,35,04,12,085,36,06,50,309,46,1*64
$GPGSV,3,2,10,09,19,119,37,17,55,035,46,19,50,357,46,23,,,41,1*50
$GPGSV,3,3,10,24,00,288,,28,57,171,46,1*6C
$GPGSV,3,1,09,02,29,277,,03,14,039,31,04,12,085,38,06,50,309,46,6*67
$GPGSV,3,2,09,09,19,119,40,17,55,035,45,19,50,357,,24,00,288,,6*6E
$GPGSV,3,3,09,28,57,171,,6*55
$GLGSV,2,1,08,68,02,027,33,69,37,063,50,70,41,146,43,73,15,191,34,1*79
$GLGSV,2,2,08,74,36,228,44,75,29,298,47,84,29,034,20,85,28,327,47,1*77
$GLGSV,3,1,09,68,02,027,33,69,37,063,47,70,41,146,,73,15,191,40,3*79
$GLGSV,3,2,09,74,36,228,,75,29,298,46,84,29,034,37,85,28,327,44,3*71
$GLGSV,3,3,09,3*73
$GAGSV,2,1,07,01,26,310,40,08,30,091,42,13,45,016,46,14,18,100,37,7*7E
$GAGSV,2,2,07,21,55,249,46,26,36,302,43,27,30,180,40,7*46
$GAGSV,2,1,07,01,26,310,41,08,30,091,45,13,45,016,50,14,18,100,44,2*7E
$GAGSV,2,2,07,21,55,249,49,26,36,302,46,27,30,180,44,2*4D
$GBGSV,2,1,07,07,56,176,44,08,55,345,43,10,71,235,44,13,52,299,45,1*7E
$GBGSV,2,2,07,27,50,001,48,28,30,070,44,30,19,306,42,1*4A
$GBGSV,2,1,07,07,56,176,,08,55,345,,10,71,235,,13,52,299,,*49
$GBGSV,2,2,07,27,50,001,,28,30,070,,30,19,306,,*71
$GNGLL,2240.8406477,N,11402.7075007,E,090020.00,A,A*72
    
```

\$xxGGA,time,lat,NS,lon,EW,quality,numSV,HDOP,alt,altUnit,sep,sepUnit,diffAge,diffStation*c
s<CR><LF>

Example:

```
$GPGGA,092725.00,4717.11399,N,00833.91590,E,1,08,1.01,499.6,M,48.0,M,,*5B
```

Field No.	Name	Unit	Format	Example	Description
0	xxGGA	-	string	\$GPGGA	GGA Message ID (xx = current Talker ID, see NMEA Talker IDs table)
1	time	-	hhmmss.ss	092725.00	UTC time, see note on UTC representation
2	lat	-	ddmm. mmmm	4717.11399	Latitude (degrees & minutes), see format description
3	NS	-	character	N	North/South indicator
4	lon	-	dddmm. mmmm	00833.91590	Longitude (degrees & minutes), see format description
5	EW	-	character	E	East/West indicator
6	quality	-	digit	1	Quality indicator for position fix, see position fix flags description Flags in NMEA 4.10 and above
7	numSV	-	numeric	08	Number of satellites used (range: 0-12)
8	HDOP	-	numeric	1.01	Horizontal Dilution of Precision
9	alt	m	numeric	499.6	Altitude above mean sea level

Field No.	Name	Unit	Format	Example	Description
10	altUnit	-	character	M	Altitude units: M (meters, fixed field)
11	sep	m	numeric	48.0	Geoid separation: difference between ellipsoid and mean sea level
12	sepUnit	-	character	M	Geoid separation units: M (meters, fixed field)
13	diffAge	s	numeric	-	Age of differential corrections (null when DGPS is not used)
14	diffStation	-	numeric	-	ID of station providing differential corrections (null when DGPS is not used)
15	cs	-	hexadecimal	*5B	Checksum
16	<CR><LF>	-	character	-	Carriage return and line feed

\$xxGLL,lat,NS,lon,EW,time,status,posMode*cs<CR><LF>

Example:

\$GPGLL,4717.11364,N,00833.91565,E,092321.00,A,A*60

Field No.	Name	Unit	Format	Example	Description
0	xxGLL	-	string	\$GPGLL	GLL Message ID (xx = current Talker ID, see NMEA Talker IDs table)
1	lat	-	ddmm. mmmm	4717.11364	Latitude (degrees & minutes), see format description
2	NS	-	character	N	North/South indicator
3	lon	-	dddmm. mmmm	00833.91565	Longitude (degrees & minutes), see format description
4	EW	-	character	E	East/West indicator
5	time	-	hhmmss.ss	092321.00	UTC time, see note on UTC representation
6	status	-	character	A	Data validity status, see position fix flags description
7	posMode	-	character	A	Positioning mode, see position fix flags description (only available in NMEA 2.3 and later)
Field No.	Name	Unit	Format	Example	Description
8	cs	-	hexadecimal	*60	Checksum
9	<CR><LF>	-	character	-	Carriage return and line feed

\$xxGSA,opMode,navMode{,svid},PDOP,HDOP,VDOP,systemId*cs<CR><LF>

Example:

\$GPGSA,A,3,23,29,07,08,09,18,26,28,.,.,.,1.94,1.18,1.54,1*0D

Field No.	Name	Unit	Format	Example	Description
0	xxGSA	-	string	\$GPGSA	GSA Message ID (xx = current Talker ID, see NMEA Talker IDs table)
1	opMode	-	character	A	Operation mode: M = Manually set to operate in 2D or 3D mode A = Automatically switching between 2D or 3D mode
2	navMode	-	digit	3	Navigation mode, see position fix flags description
Start of repeated block (12 times)					
3 + 1*N	svid	-	numeric	29	Satellite number
End of repeated block					
15	PDOP	-	numeric	1.94	Position dilution of precision
16	HDOP	-	numeric	1.18	Horizontal dilution of precision
17	VDOP	-	numeric	1.54	Vertical dilution of precision
18	systemId	-	numeric	1	NMEA defined GNSS System ID, see Signal Identifiers table (only available in NMEA 4.10 and later)
19	cs	-	hexadecimal	*0D	Checksum
20	<CR><LF>	-	character	-	Carriage return and line feed

\$xxGSV,numMsg,msgNum,numSV{svid,elv,az,cno},signalId*cs<CR><LF>

Example:

\$GPGSV,3,1,09,09,.,.,17,10,.,.,40,12,.,.,49,13,.,.,35,1*6F

\$GPGSV,3,2,09,15,.,.,44,17,.,.,45,19,.,.,44,24,.,.,50,1*64

\$GPGSV,3,3,09,25,.,.,40,1*6E

\$GPGSV,1,1,03,12,.,.,42,24,.,.,47,32,.,.,37,5*66

\$GAGSV,1,1,00,2*76

Field No.	Name	Unit	Format	Example	Description
0	xxGSV	-	string	\$GPGSV	GSV Message ID (xx = GSV Talker ID, see NMEA Talker IDs table). Talker ID GN shall not be used
1	numMsg	-	digit	3	Number of messages, total number of GSV messages being output (range: 1-9)
2	msgNum	-	digit	1	Number of this message (range: 1-numMsg)
3	numSV	-	numeric	10	Number of known satellites in view regarding both the talker ID and the signalId
Start of repeated block (1..4 times)					
4 +	svid	-	numeric	23	Satellite ID

4*N					
5 + 4*N	elv	deg	numeric	38	Elevation (range: 0-90)
6 + 4*N	az	deg	numeric	230	Azimuth (range: 0-359)
7 + 4*N	cno	dB Hz	numeric	44	Signal strength (C/N0, range: 0-99), null when not tracking
End of repeated block					
Field No.	Name	Unit	Format	Example	Description
5.. 16	signalId	-	numeric	0	NMEA defined GNSS Signal ID, see Signal Identifiers table (only available in NMEA 4.10 and later)
6.. 16	cs	-	hexadecimal	*7F	Checksum
7.. 16	<CR><LF>	-	character	-	Carriage return and line feed

\$xxRMC,time,status,lat,NS,lon,EW,spd,cog,date,mv,mvEW,posMode,navStatus*cs<CR><LF>

>

Example:

\$GPRMC,083559.00,A,4717.11437,N,00833.91522,E,0.004,77.52,091202,,A,V*57

Field No.	Name	Unit	Format	Example	Description
0	xxRMC	-	string	\$GPRMC	RMC Message ID (xx = current Talker ID, see NMEA Talker IDs table)
1	time	-	hhmmss.ss	083559.00	UTC time, see note on UTC representation
2	status	-	character	A	Data validity status, see position fix flags description
3	lat	-	ddmm. mmmm	4717.11437	Latitude (degrees & minutes), see format description
4	NS	-	character	N	North/South indicator
5	lon	-	dddmm. mmmm	00833.91522	Longitude (degrees & minutes), see format description
6	EW	-	character	E	East/West indicator
7	spd	kno ts	numeric	0.004	Speed over ground
8	cog	deg rees	numeric	77.52	Course over ground
Field	Name	Unit	Format	Example	Description

No.					
9	date	-	ddmmyy	091202	Date in day, month, year format, see note on UTC representation
10	mv	deg rees	numeric	-	Magnetic variation value. Only supported in ADR 4.10 and later
11	mvEW	-	character	-	Magnetic variation E/W indicator. Only supported in ADR 4.10 and later
12	posMode	-	character	A	Mode Indicator, see position fix flags description (only available in NMEA 2.3 and later)
13	navStatus	-	character	V	Navigational status indicator: V (Equipment is not providing navigational status information, fixed field, only available in NMEA 4.10 and later)
14	cs	-	hexadecimal	*57	Checksum
15	<CR><LF>	-	character	-	Carriage return and line feed

\$xxVTG,cogt,cogtUnit,cogm,cogmUnit,so gn,so gnUnit,so gk,so gkUnit,posMode*cs<CR><LF>

Example:

\$GPVTG,77.52,T,,M,0.004,N,0.008,K,A*06

Field No.	Name	Unit	Format	Example	Description
0	xxVTG	-	string	\$GPVTG	VTG Message ID (xx = current Talker ID, see NMEA Talker IDs table)
1	cogt	deg rees s	numeric	77.52	Course over ground (true)
2	cogtUnit	-	character	T	Course over ground units: T (degrees true, fixed field)
3	cogm	deg rees s	numeric	-	Course over ground (magnetic). Only supported in ADR 4.10 and above
4	cogmUnit	-	character	M	Course over ground units: M (degrees magnetic, fixed field)
5	so gn	kno ts	numeric	0.004	Speed over ground
6	so gnUnit	-	character	N	Speed over ground units: N (knots, fixed field)
Field No.	Name	Unit	Format	Example	Description

7	sogk	km/h	numeric	0.008	Speed over ground
8	sogkUnit	-	character	K	Speed over ground units: K (kilometers per hour, fixed field)
9	posMode	-	character	A	Mode Indicator, see position fix flags description (only available in NMEA 2.3 and later)
10	cs	-	hexadecimal	*06	Checksum
11	<CR><LF>	-	character	-	Carriage return and line feed

Flags in NMEA 4.10 and above

NMEA Message	GLL, RMC	GGA	GLL, VTG	RMC, GNS
Field	status	quality	posMode	posMode
No position fix (at power-up, after losing satellite lock)	V	0	N	N
GNSS fix, but user limits exceeded	V	0	N	N
Dead reckoning fix, but user limits exceeded	V	6	E	E
Dead reckoning fix	A	6	E	E
RTK float	A	5	D	F
RTK fixed	A	4	D	R
2D GNSS fix	A	1 / 2	A / D	A / D
3D GNSS fix	A	1 / 2	A / D	A / D
Combined GNSS/dead reckoning fix	A	1 / 2	A / D	A / D
	See below (1)	See below(2)	See below(3)	See below(3)

(1) Possible values for status: V = Data invalid, A = Data valid

(2) Possible values for quality: 0 = No fix, 1 = Autonomous GNSS fix, 2 = Differential GNSS fix, 4 = RTK fixed, 5 = RTK float, 6 = Estimated/Dead reckoning fix

(3) Possible values for posMode: N = No fix, E = Estimated/Dead reckoning fix, A = Autonomous GNSS fix, D = Differential GNSS fix, F = RTK float, R = RTK fixed