BE-220

GNSS Module

Datasheet

Revision: 5.63

Date:2023.5

Features:

Item	Description	
Electrical Characteristic	Chip	M10050
	Receiver type	GPS L1 C/A, QZSS L1 C/A/S,BDS B1I/B1C, Galileo E1B/C,SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN
	Default position system	GPS, BDS, GALILEO
	Augmentation system	SBAS, QZSS
	Channel	N/A
Sensitivity	Tracking & Navigation	-166dBm
	Reacquisition	-160dBm
	Cold start	-148dBm
	Hot Start	-160dBm
Accuracy	Horizontal position	2.0m CEP
	Velocity	0.05m/s
	Dynamic heading	0.3 deg
	Time pulse	RMS 30ns
		99% 60ns
Acquisition	Cold start	27s
	Hot start	1s
	Aided start	1s
Data Output	Baud rate	4800bps - 921600bps,default 38400bps
	Level	TTL level
	Protocol	NMEA,UBX
	NMEA messages	RMC,VTG,GGA,GSA,GSV,GLL
	Update rate	0.25Hz-18Hz,default 1Hz
	FLASH	With FLASH, the configuration can be changed, and the power will not be lost
	Frequency of time pulse signal	Configurable from 0.25 Hz to 10 MHz, the default period is 1s, and the high level lasts for 100ms
Operational Limits	Altitude	80,000m
	Velocity	500m/s
	Dynamics	<4g
Power Consumption	Voltage	DC 3.6V-5.5V, typical: 5.0V
	Current	15mA/5.0V
Physical Specications	Dimension	22*20*6mm
	Weight	5.3g
	Connector	1.00mm 4pins connector
Temperature	Operating	-40 °C ~ +85°C

	Storage	-40°C ~ +105°C
LED	Built-in LED	TX LED: blue. The data output, TX LED flashing
		PPS LED: red. PPS LED not bright when GPS not fixed, flashing when fixed

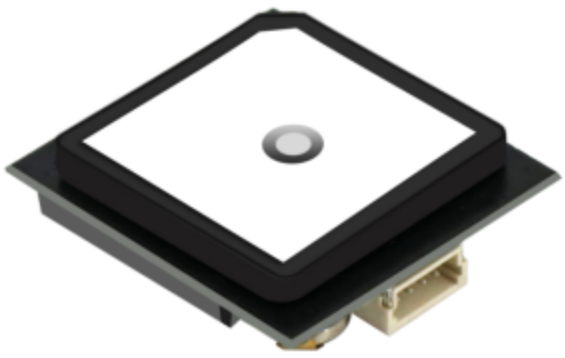
Pin Description:

PIN	Name	I/O	Description
1	GND	G	Ground
2	TX	O	Serial Data Output.
3	RX	I	Serial Data Input.
4	VCC	I	DC 3.6V - 5.5V supply input,Typical: 5.0V

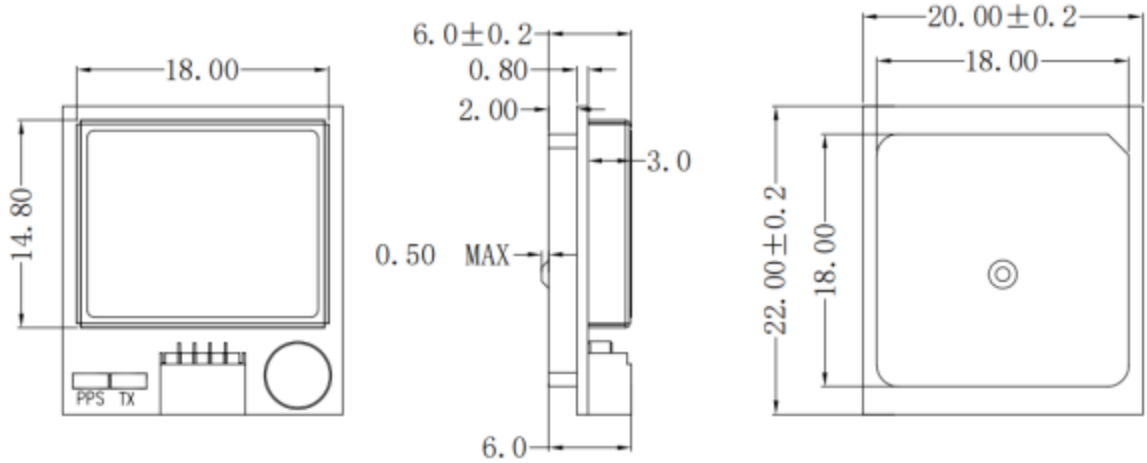
Indicator light:

1. The blue light, the TX light, and the blue light flashes when power on, indicating that there is data output.
2. The red light, the PPS light, does not light up if it is not positioned; after 3D positioning, it starts to flash.

Rear view of the module:



Dimensions:



Data output protocol

Joint Mode Protocol Header - GN
GPS Mode Protocol Header-GP
GLONASS Mode Protocol Header-GL
Beidou mode protocol header - GB or BD

Unlocated:

$GNRMC,,V,,,,,,,,,N,V*37
$GNVTG,,,,,,,,,N*2E
$GNGGA,,,,,,0,00,99.99,,,,,,*56
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,1*33
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,3*31
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,4*36
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,5*37
$GPGSV,1,1,00,0*65
$GAGSV,1,1,00,0*74
$GBGSV,1,1,00,0*77
$GQGSV,1,1,00,0*64
$GNGLL,,,,,,V,N*7A

Positioned:

$GNRMC,054411.00,A,2243.08151,N,11401.10827,E,0.008,,230423,,,A,V*1E
$GNVTG,,T,,M,0.008,N,0.016,K,A*32
$GNGGA,054411.00,2243.08151,N,11401.10827,E,1,12,0.56,93.2,M,-2.7,M,,*64
$GNGSA,A,3,30,03,14,06,07,17,01,19,,,,,1.15,0.56,1.00,1*0D
$GNGSA,A,3,30,13,15,34,27,02,,,,,,,1.15,0.56,1.00,3*01
$GNGSA,A,3,27,28,30,01,02,03,37,38,40,,,,1.15,0.56,1.00,4*04
$GNGSA,A,3,02,07,03,04,,,,,,,,,1.15,0.56,1.00,5*00

$GPGSV,3,1,12,01,27,034,37,03,44,087,39,06,38,241,42,07,15,180,35,1*64
$GPGSV,3,2,12,14,78,359,45,17,43,333,38,19,28,303,39,30,34,212,39,1*6C
$GPGSV,3,3,12,39,29,252,33,40,20,257,40,41,46,237,44,50,60,149,39,1*65
$GPGSV,1,1,01,11,00,228,,0*5C
$GAGSV,2,1,06,02,30,136,38,13,23,238,40,15,68,289,42,27,37,324,30,7*7E
$GAGSV,2,2,06,30,83,091,42,34,41,026,41,7*70
$GBGSV,3,1,11,01,47,123,36,02,46,234,37,03,63,189,38,04,,,31,1*49
$GBGSV,3,2,11,05,,,34,27,52,351,44,28,24,046,37,30,31,283,40,1*46
$GBGSV,3,3,11,37,43,178,40,38,70,172,40,40,57,034,39,1*48
$GQGSV,1,1,04,02,63,125,42,03,59,044,39,04,38,131,38,07,60,149,36,1*6C
$GNGLL,2243.08151,N,11401.10827,E,054411.00,A,A*71

$xxGGA,time,lat,NS,lon,EW,quality,numSV,HDOP,alt,altUnit,sep,sepUnit,diffAge,diffStation*cs<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.mmmmm	4717.11399	Latitude (degrees & minutes), see format description
3	NS	-	character	N	North/South indicator
4	lon	-	dddmm.mmmmm	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.mmmmm	4717.11364	Latitude (degrees & minutes), see format description
2	NS	-	character	N	North/South indicator
3	lon	-	dddmm.mmmmm	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 + 4*N	svid	-	numeric	23	Satellite ID
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	Name	Unit	Format	Example	Description

No.					
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.mmmmm	4717.11437	Latitude (degrees & minutes), see format description
4	NS	-	character	N	North/South indicator
5	lon	-	dddmm.mmmmm	00833.91522	Longitude (degrees & minutes), see format description
6	EW	-	character	E	East/West indicator
7	spd	knots	numeric	0.004	Speed over ground
8	cog	degrees	numeric	77.52	Course over ground
Field No.	Name	Unit	Format	Example	Description
9	date	-	ddmmyy	091202	Date in day, month, year format, see note on UTC representation
10	mv	degrees	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,sogn,sognUnit,sogk,sogkUnit,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	degrees	numeric	77.52	Course over ground (true)
2	cogtUnit	-	character	T	Course over ground units: T (degrees true, fixed field)
3	cogm	degrees	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	sogn	knots	numeric	0.004	Speed over ground
6	sognUnit	-	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