JS-ATP28-M

PRODUCT SPECIFICATION

Datasheet

Contents

Updating History of Revision 3
1 *Product Description* 4
1.1 *Overview* 4
1.2 *Product Features* 4
1.3 *performance* 5
1.4 *Block Diagram* 6
1.5 *protocol* 6
1.6 *Antenna* 6
1.7 *Product Application* 6
2 *Pin Definitions* 7
3 *Electrical Specifications* 7
4 *Mechanical Specifications* 8
5 *Application circuit* 8
6 ROHS *8*
7 NMEA *9*
7.1 NMEA protocol *9*
7.2 Standard information *11*
7.2.1 GGA *11*
7.2.2 GLL *11*
7.2.3 GSA *12*
7.2.4 GSV *12*
7.2.5 RMC *13*
7.2.6 VTG *13*
7.2.7 ZDA *14*

Updating History of Revision

Revision	Date	Contents of Revision Update	Remark
V1.0	2022-06-21	First release	汪伟

1 Product Description

1.1 Overview

JS-ATP28-M adopts a multi-mode solution, low power consumption, and low cost. It is a multi-mode dual-frequency (GPS, BDS, GLONASS, Galileo, QZSS, and SBAS, L1+L5) positioning module for various applications. and end product requirements. Based on a high-performance SOC position engine, this receiver provides excellent sensitivity and acquisition time with interference suppression measures to achieve reliable positioning even under difficult signal conditions.

1.2 Product Features

- Based on the high-performance GNSS SOC series
- 135 channels (L1:75, L5:60)*
- Cold start acquisition sensitivity is -148dBm, tracking sensitivity is -165dBm
- Navigation update rate up to 10Hz
- Supports GPS, BDS, GLONASS, Galileo, QZSS and SBAS
- Support AGPS
- Indoor and outdoor multipath detection and compensation
- Application-rich hardware interfaces support multiple configurations
- Integrated TCXO, LNA, SAW and RTC
- Compact size (28.0*28.0*12.6mm±0.3mm), suitable for space-sensitive applications
- Comply with ROHS standards
- Support standard NMEA 0183 V3.01/V4.10
- Support 1PPS output

* The number of channels in wear mode is L1:42, L5:30

1.3 Performance

Parameters	Specifications
Satellite frequency	■GPS L1CA L5 ■BDS B1I B2a ■Galileo E1B E1C E5a ■GLONASS L1OF ■QZSS L1CA L1SAIF L5 ■SBAS WAAS EGNOS MSAS GAGAN
Sensitivity	Tracking and Navigation -165dBm Cold Start -148dBm
Time-To-First-Fix[1]	Cold Start 24s Hot Start 1s
GNSS Position accuracy[2]	Horizontal 3G+B 1.0m (L1+L5); 2.5m (L1) Vertical 2.25m
Time pulse signal accuracy	1PPS 10ns
Speed accuracy[3]	0.05m/s
Operational restrictions[4]	Acceleration 4g Altitude 10000m speed limit 100m/s
Frequency of time pulse signal	1Hz
Baud Rate	4800-921600 bps（Default115200 bps）[5]
Max navigation update rate	10Hz （Default 1Hz）

1 All satellites at:-130dBm

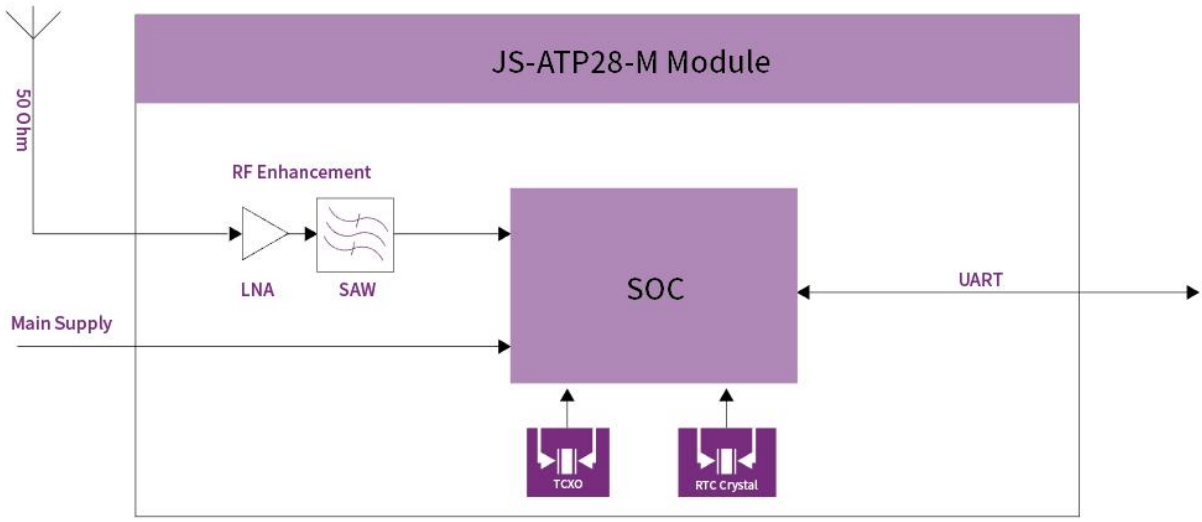
2 Open sky, 24 hours static，-130dBm，>6SVs，CEP 50%

3 50%@30m/s dynamic operation

4 Assuming Airborne≤4g platform

5 To open the debug log, need to be able to support a higher baud rate of 230400bps or above.

1.4 Block Diagram



1.5 protocols

Protocols	Type
NMEA 0183 V3.01/V4.10	Input/Output，ASCII

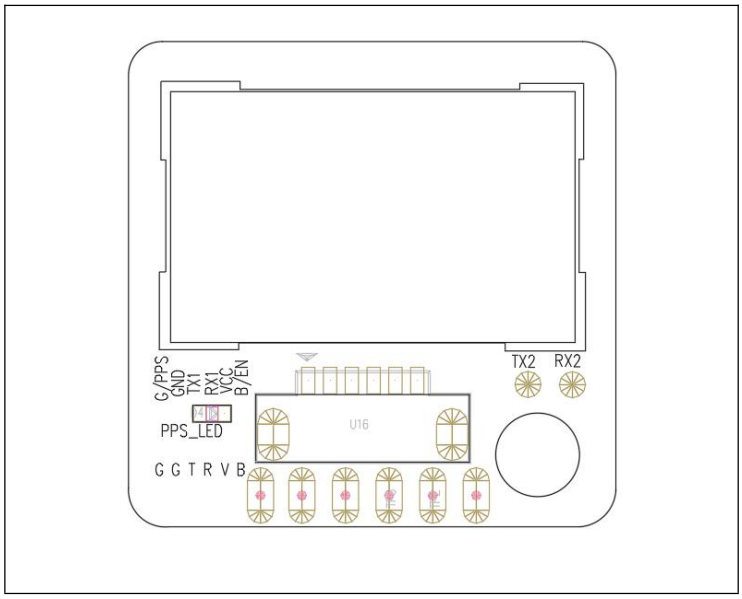
1.6 Antenna

parameter	Specification
Passive antenna type	25.0*25.0*4.0mm（L5）+18.0*18.0*4.0mm（L1）

1.7 Product Application

- •Automotive applications
- •Maritime navigation, fleet management
- •Intelligent logistics dispatching
- •Ground vehicle tracking and urban intelligent traffic management
- •Intelligent robots
- •Wearable devices
- •Personal travel and wilderness adventures
- •emergency rescue

2 Pin definitions



PIN	Name	I/O	Description
1	GND/PPS	G/O	Ground/time pulse signal output
2	GND	G	Ground
3	TX1	O	Serial data output (TTL level)
4	RX1	I	Serial data input (TTL level)
5	VCC	P	main power supply
6	VBAT/EN	I	Backup power/module power control switch

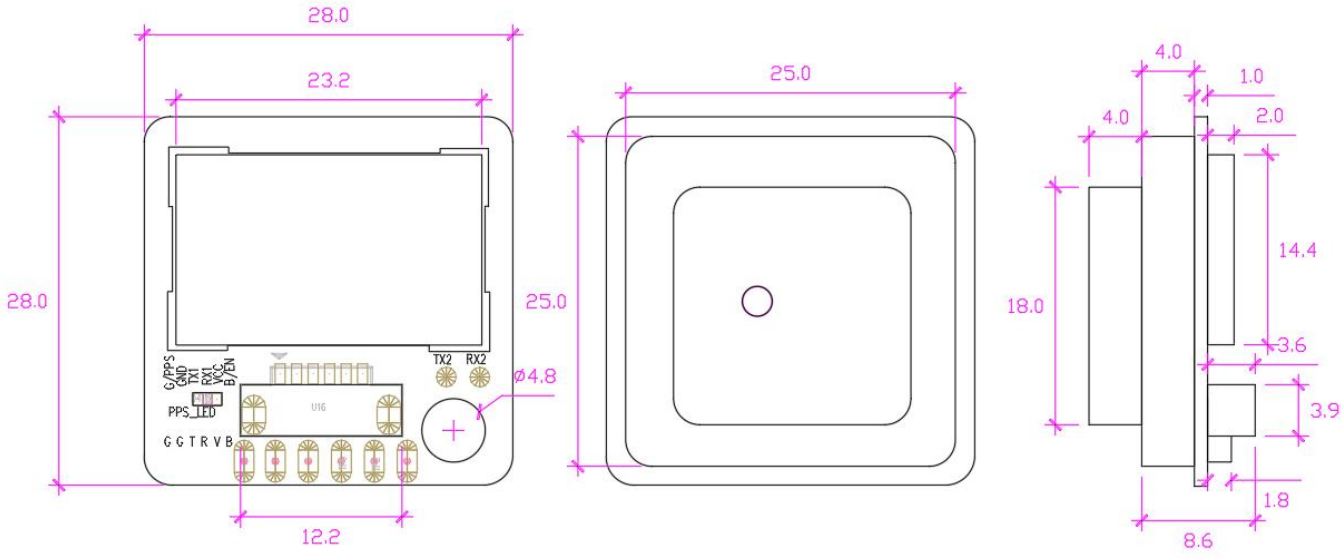
3 Electrical Specifications

Parameter	Symbol	Min	Type	Max	Units
Supply Power voltage	VCC	2.8	5.0	5.5	V
Average supply current	Acquisition	33@5.0V	35@5.0V	38@5.0V	mA
	Tracking	32@5.0V	33@5.0V	36@5.0V	mA
Backup battery		1.5	3.3	3.6	V
Backup battery current	I_BCKP		11@3.3V		uA
Digital IO voltage	Div	2.8	3.3	3.3	V
Storage temperature	Tstg	-40		85	℃
Operating temperature1	Topr	-40		85	℃
Farah capacitance2	Tstg	-25		60	℃
Humidity				95	%

1 The temperature range is the operating temperature range without the Farad capacitor

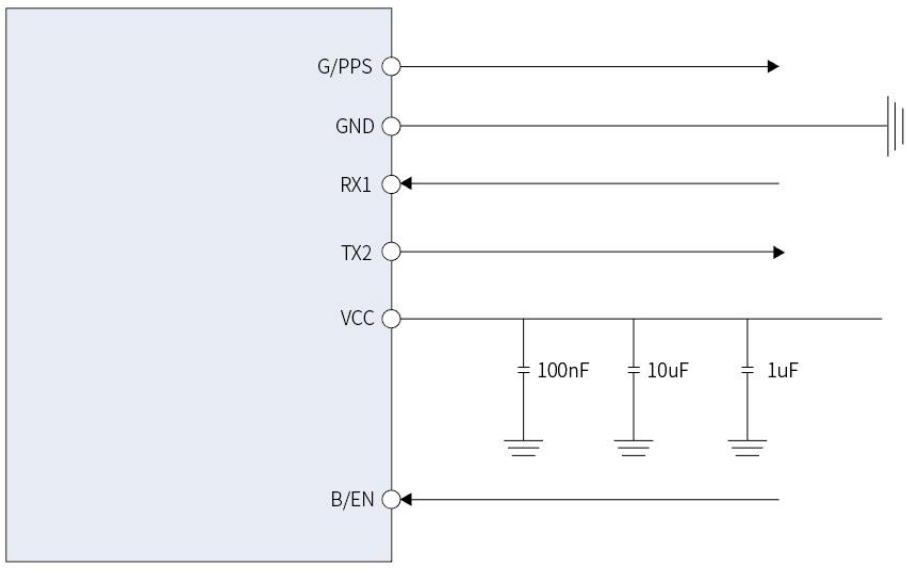
2 When the temperature is lower than -25℃ or higher than 60℃, this module cannot be hot-started

4 Mechanical Specifications



Units: mm. Dimension error: ±0.3mm.

5 Application Circuit



6 ROHS

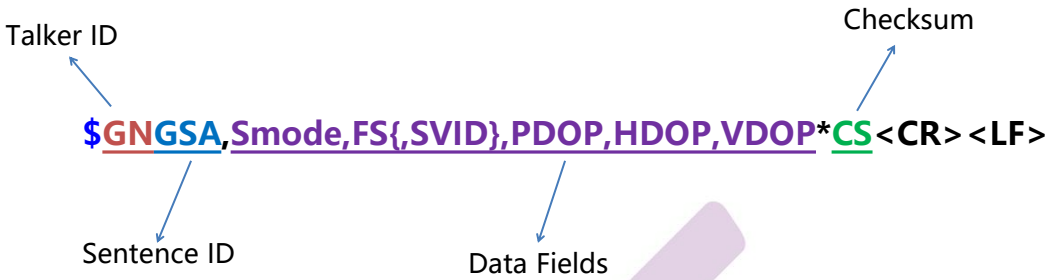
This product is RoHS compliance

7 NMEA

JS-ATP28-M supports National Marine Electronics Association (NMEA) messages based on NMEA 0183 v3.01/v4.10. The following section shows the structure of NMEA protocol messages and the corresponding common standard message format.

7.1 NMEA protocol

Generally, NMEA messages start with the $ character, followed by talker ID, sentence ID, data fields and checksum, and then end with '<CR>' '<LF>', as shown in the figure below.



NMEA protocol details

Parameter	string length	Description
preamble	1	$
Talker ID	2	Suitable for various GNSS configurations，such as GP/GL/GA/GB/GN
Sentence ID	3	Field description，GGA/GSA/GSV/RMC
Data Field	~	A comma symbol must be inserted before each data field to help the decoder process the Data Field
*	1	The asterisk * marks the end of the Data Field
Checksum	2	Checksum of data between preamble and *
CR, LF	2	These two bytes are used to identify the end of the packet

Talker ID Description

Talker ID	Description
GP	GPS
GL	GLONASS
GA	Galileo
GB*	BDS
GI*	NavIC
GN	Multi-GNSS

* NMEA v3.01/v4.10 does not define BDS/NavIC Talker ID. GB/GI is only defined in NMEA v4.11.

Sentence ID Description

Sentence ID	description
GGA	Receiver positioning data
GLL	Latitude and longitude, and time location and status
GSA	Factor of Precision (DOP) and Effective Satellite
GSV	Visible satellite information
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed
ZDA	GNSS date and time

Different GNSS system Talker ID display (for NMEA 0183 v3.01)

Talker ID	GPS only	GLONASS only	Galileo only	Beidou only	NavIC only	Multi-GNSS GPS+GLO+GAL+BDS+NavIC
GGA	GP	GL	GA	GB*	GI*	GN
GLL						
RMC						
VTG						
ZDA						
GSA**						GP+GL+GA+GB+GI
GSV						

Different GNSS system Talker ID display (for NMEA 0183 v4.10)

Talker ID	GPS only	GLONASS only	Galileo only	Beidou only	NavIC only	Multi-GNSS GPS+GLO+GAL+BDS+NavIC
GGA	GP	GL	GA	GB*	GI*	GN
GLL						
RMC						
VTG						
ZDA						
GSA**						
GSV						GP+GL+GA+GB+GI

*** NMEA v3.01/v4.10 does not define BDS/NavIC Talker ID. GB/GI is only defined in NMEA v4.11.**

****The difference between Talker ID's NMEA 0183 v3.01 and v4.10 is GSA.**

7.2 Standard information

Standard NMEA messages are GGA/GLL/GSA/GSV/RMC/VTG/ZDA. The definitions of satellite ID, system ID, and signal ID in the NMEA statement are as shown in the following table. Below are the details of these messages based on NMEA 0183 v4.10.

7.2.1 GGA

Fixation of time, location and related data. The output position will be affected by the selected datum. The default data is WGS84.

$--GGA,hhmmss.sss,ll.llll,a,yyy.yyyy,a,x,xx,x.xx,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>

No.	Format	Description
1	hhmmss.sss	The UTC time of the current location
2	ll.llll,a	Latitude (degrees and minutes format)- N / S
3	yyy.yyyy,a	Longitude (degrees and minutes format)- E / W
4	x	GNSS quality indicators
5	xx	Number of satellites in use, may differ from number seen
6	x.xx	horizontal precision factor
7	x.x,M	Altitude Mean sea level (geoid), unit: M
8	x.x,M	Geoid separation, unit: M
9	x.x	Differential GPS data age
10	xxxx	Differential reference station ID, 0000-1023

7.2.2 GLL

Positioning time and positioning status.

$--GLL,ll.llll,a,yyy.yyyy,a,hhmmss.sss,A,a*hh<CR><LF>

No.	Format	Description
1	ll.llll,a	Latitude (degrees and minutes format) - N/S
2	yyy.yyyy,a	Longitude (degrees and minutes format) - E/W
3	hhmmss.sss	The UTC time of the current location
4	A	Status A = data is valid, V = data is invalid
5	a	Positioning status indication. A=autonomous mode, V=estimate mode (dead reckoning), N=invalid, D=differential mode

7.2.3 GSA

Dispersion Factor of Precision (DOP) and effective satellites.

$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.xx,x.xx,x.xx,h*hh<CR><LF>

No.	Format	Description
1	a	Mode: M = Manual, forces 2D or 3D mode; A = Automatic, allows automatic 2D/3D switching
2	x	Mode: 1 = not available, 2 = 2D, 3 = 3D
3	xx	Satellite number used for positioning. This field displays a total of 12 available satellite numbers. If there are more than 12 satellites, only the first 12 will be output. If there are less than 12, the insufficient area will be filled in (please refer to the Satellite ID in the NMEA sentence)
4	x.xx	PDOP
5	x.xx	HDOP
6	x.xx	VDOP
7	h	GNSS System ID (1:GPS, 2:GLONASS, 3:Galileo, 4:BDS, 6:NavIC) (only supports NMEA v4.10 format, refer to the system and signal ID in the NMEA sentence)

7.2.4 GSV

Observed number of GNSS satellites, PRN, elevation angle, azimuth angle and signal-to-noise ratio.

$--GSV,x,x,xx,xx,xx,xxx,xx,……..,xx,xx,xxx,xx,h*hh<CR><LF>

No.	Format	Description
1	x	total number of statements
2	x	Current statement number
3	xx	Total number of visible satellites
4	xx	Satellite number
5	xx	Elevation angle, maximum 90°
6	xxx	Azimuth angle, 000 to 359°
7	xx	Signal-to-noise ratio (C/No) 00- 99 dB-Hz, empty when no tracking
8	h	Signal ID (only supports NMEA v4.10 format, refer to the system and signal ID in the NMEA sentence)

7.2.5 RMC

Recommended minimum specific GNSS data, i.e. position, SOG, COG and time.

$--RMC,hhmmss.sss,A,ll.llll,a,yyy.yyyy,a,x.xx,x.xx,xxxxxx,x.x,a,a,a*hh<CR><LF>

No.	Format	Description
1	hhmmss.sss	The UTC time of the current location
2	A	Status A = Autonomous mode, V = Inactive, D = Differential mode
3	ll.llll,a	Latitude (degrees and minutes format) - N/S
4	yyy.yyyy,a	Longitude (degrees and minutes format) - E/W
5	x.xx	Speed over ground, unit: knots
6	x.xx	True heading to ground, unit: degrees
7	xxxxxx	Date (ddmmyy)
8	x.x,a	Magnetic declination, unit: degrees. Magnetic declination direction: E-east, W-west. Fixed to empty
9	a	Status Bar. A=autonomous mode, V=estimate mode (dead reckoning), N=invalid, D=differential mode
10	a	Navigation status (only supports NMEA v4.10 format)

7.2.6 VTG

Course on Ground (COG) and Speed on Ground (SOG) information.

$--VTG,x.xx,T,x.xx,M,x.xx,N,x.xx,K,a*hh<CR><LF>

No.	Format	Description
1	x.xx	Heading to true north above ground, unit: degrees (000-359°)
2	T	True north indication, fixed to T
3	x.xx	Heading to magnetic north in degrees (000-359°)
4	M	Magnetic North indication, fixed at M
5	x.xx	Speed over ground, unit: knots (000-999 knots)
6	N	The unit of speed is knots, fixed at N = knots/hour
7	x.xx	Ground speed (000-999 kilometers/hour)
8	K	Speed unit, fixed at K=km/h
9	a	Positioning mode status. A=autonomous mode, V=estimate mode (dead reckoning), N=invalid, D=differential mode

7.2.7 ZDA

GNSS time and date.

$ --ZDA,hhmmss.sss,xx,xx,xxxx,xx,xx*hh<CR><LF>

No.	Format	Description
1	hhmmss.sss	UTC time, hhmmss (hours, minutes and seconds) format
2	xx	UTC date, 01 to 31
3	xx	UTC date, January to December
4	xxxx	UTC date, year
5	xx	Current time, hour
6	xx	Current time, minutes

Satellite ID in NMEA sentences

Satellite	PRN numbers	Satellite ID (AIROHA)	Satellite ID (NMEA 0183 v4.10)
GPS	1-32	1-32	1-32
SBAS	120-138	33-51	33-64
GLONASS	1-24	65-88	65-99
Galileo	1-36	1-36	1-36
BDS	1-63	1-63	N/A
QZSS	193-199	193-199	N/A
NavIC	1-14	1-14	N/A

System/Signal ID in NMEA sentence

Satellite	System ID (AIROHA)	Signal ID (AIROHA)	System ID (NMEA 0183 v4.10)	Signal ID (NMEA 0183 v4.10)
GPS L1C/A	1	1	1	1
GPS L5Q	1	8	1	8
GLONASS L1	2	1	2	1
GalileoE1-BC	3	7	3	7
Galileo E5a	3	1	3	1
BDS B1I	4*	1*		
BDS B2a	4*	4*		
NavIC L5	6*	1*		

* BDS is not defined in NMEA v4.10, the system/signal ID here is a custom ID