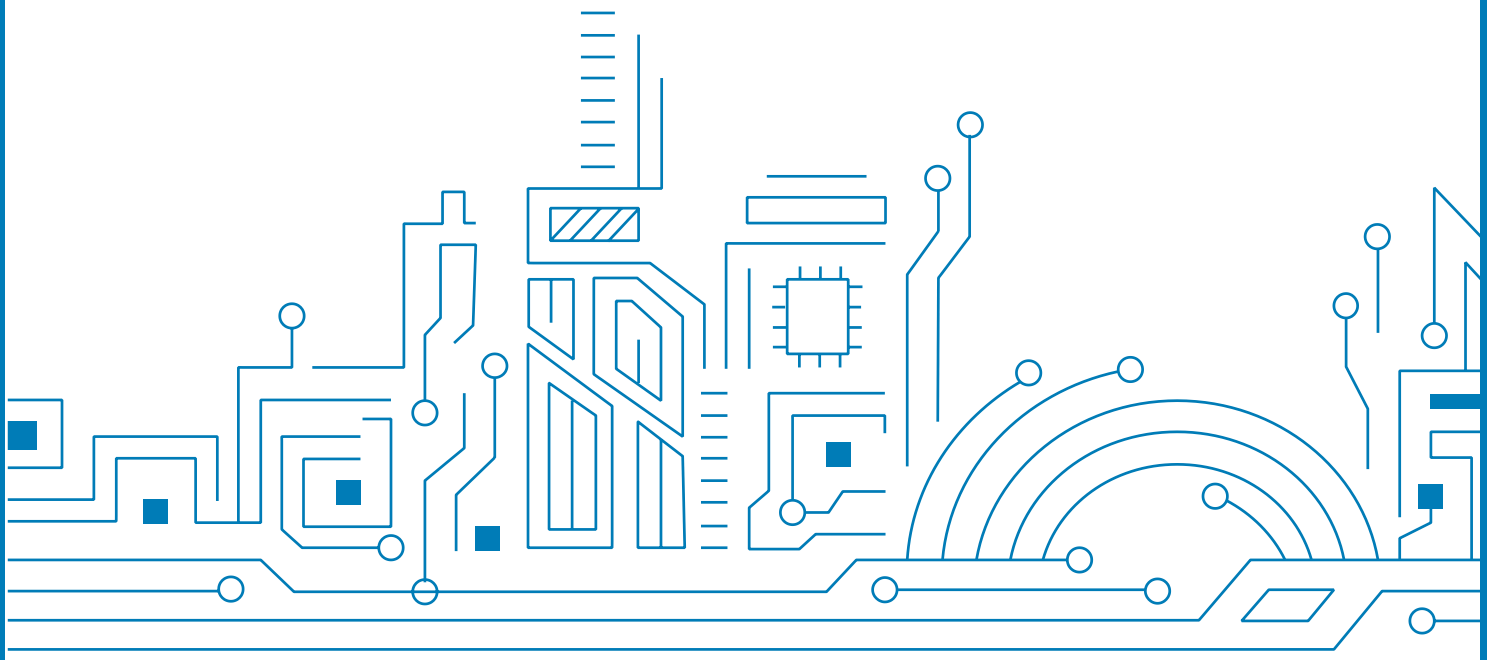
GNSS Positioning Module

TAU1102

Datasheet V1.4



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1 SYSTEM OVERVIEW

1.1 General description

Allystar TAU1102 is a cost-effective dual-system positioning module, which is based on Allystar HD8020 series GNSS chip. It is capable of tracking supports GPS, BeiDou, and QZSS signals. With highly integrated design, TAU1102 is easy to apply to navigation applications, especially ideal for large-scale GNSS applications with high cost requirements.

1.2 Features

- Supports GPS, BDS, and QZSS
- Low power consumption with cost-effective
- Compatible with mainstream GPS modules
- Support active antenna short circuit protection and open circuit detection
- Supports A-GNSS feature

1.3 Module photo

Figure 1 TAU1102 module photo

Table 1 Difference between TAU102-1216A00 and TAU1102-1216B00

Product Model	Description
TAU1102-1216A00	RF_IN pin does not provide the power for active antenna, so a bias choke from ANT_BIAS to RF_IN pin should be used.
TAU1102-1216B00	A bias choke is built-in between ANT_BIAS and RF_IN pin to power the active antenna. If the active antenna is powered by a supply source other than the module, a capacitor should be used to block the DC from RF_IN.

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1.4 Block diagram

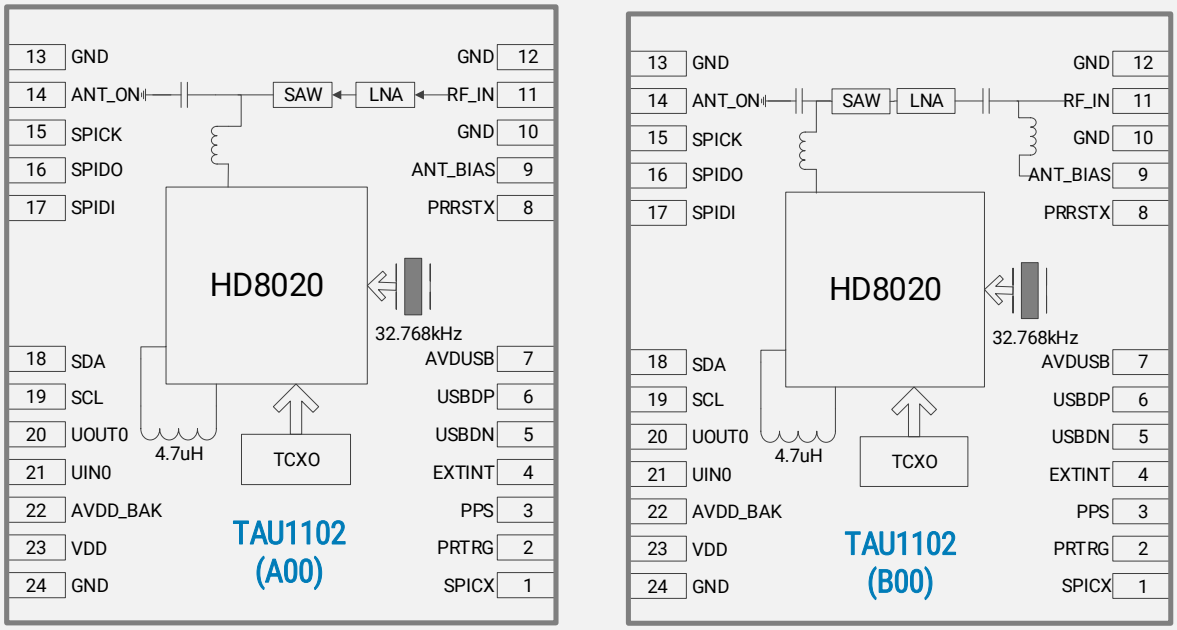

Figure 2 Block diagram

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1.5 Specifications

Table 2 Specifications

Parameter	Specification	
GNSS tracking channels	72	
GNSS reception	GPS/QZSS: L1C/A	
	BDS: B1I	
Update rate	5Hz max.	
Position accuracy[1]	GNSS	2.5m CEP
Velocity & Time accuracy	GNSS	0.1m/s CEP
	1PPS	25ns
Time to First Fix(TTFF)	Hot start	1 sec
	Cold start	28 secs
Sensitivity[2]	Cold start	-148dBm
	Hot start	-158dBm
	Reacquisition	-159dBm
	Navigation	-162dBm
Operating condition	Main voltage	3.0 ~ 3.6V
	Digital I/O voltage	3.0 ~ 3.6V
	Backup voltage	1.6 ~3.6V
Power consumption	Operating	31mA@3.3V
	Standby power	14uA
Serial interface	USB (FS, 12Mbps)	1
	UART	1
	SPI[3]	1
	I^2C	1
Protocol	NMEA 0183 Protocol Ver. 3.01/4.00(default)/4.10 Cynosure GNSS Receiver Protocol	
Operating limit	Velocity	515 m/s
	Altitude	18,000 m
Safety Supervision	Active antenna short circuit protection and open circuit detection	
Operating temperature	-40 °C ~ +85 °C	
Storage temperature	-40 °C ~ +85 °C	
PCB Type	24-pin stamp hole	
Dimensions	12.2mm x 16.0mm x 2.4mm	
Certification	RoHS, REACH	

* *[1] Condition: Open sky*
* *[2] Demonstrated with a good external LNA*
* *[3] Supported by customized firmware*

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2 PIN DESCRIPTION

2.1 Pin assignment

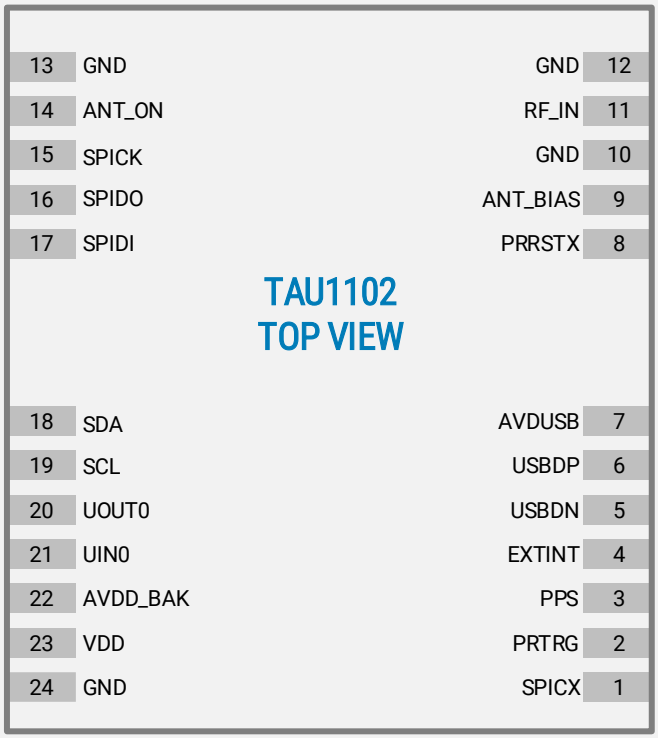

Figure 3 Pin assignment (top view)

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2.2 Detailed pin descriptions

Table 3 Detailed pin descriptions

Function	Symbol	No.	I/O	Description
Power	VDD	23	Power	Main voltage supply.
	GND	10,12, 13,24	VSS	Assure a good GND connection to all GND pins of the module, preferably with a large ground plane.
	AVDD_BAK	22	Power	Backup voltage supply. If no available backup supply, please leave it floating.
	AVDUSB	7	Power	USB voltage supply. Leave it floating if not used.
Antenna	RF_IN	11	I	RF signal input. Use a controlled impedance of 50Ω for the routing from RF_IN pin to the antenna or the antenna connector.
	ANT_BIAS	9	O	Antenna bias voltage output. The ANT_BIAS pin is used to power an external active antenna, and the current should be no more than 25mA.
UART	UOUT0	20	O	UART0 serial data output.
	UIN0	21	I	UART0 serial data input.
USB	USBDN	5	I/O	USB I/O line. USB bidirectional communication pin. Leave it floating if not used.
	USBDP	6	I/O	
SPI[1]	SPICX	1	O	SPI chip select. Leave it floating if not used.
	SPICK	15	O	SPI clock output. Leave it floating if not used.
	SPIDO	16	O	SPI data output. Leave it floating if not used.
	SPIDI	17	I	SPI data input. Leave it floating if not used.
I2C	SDA	18	I/O	I2C data. Leave it floating if not used.
	SCL	19	I/O	I2C clock. Leave it floating if not used.
Other	PRTRG	2	I	Mode selection, or the trigger input in deep sleep mode to wake up the system
	PRRSTX	8	I	External reset, low active
	PPS	3	O	Time pulse signal (one pulse per second by default). Leave it floating if not used.
	EXTINT	4	I	External interrupt input. Leave it floating if not used.
	ANT_ON	14	O	ANT_ON pin is used to turn on or off an external antenna. Leave it floating if not used.

* *[1] Supported by customized firmware.*

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3 ELECTRICAL CHARACTERISTICS

3.1 Absolute maximum rating

This product contains devices to protect the inputs against damage due to high static voltages, however it is advisable to take normal precautions to avoid application of any voltage higher than the specified maximum rated voltages. Stresses above those listed under “Absolute maximum rating” may cause permanent damage to the device.

Table 4 Absolute rating

Symbol	Parameter	Min.	Max.	Unit
VDD	Power supply voltage	-0.5	3.6	V
AVDD_BAK	Backup battery voltage	-0.5	3.6	V
AVDUSB	USB supply voltage	-0.5	3.6	V
VI_{max}	Digital I/O pin input voltage	-0.5	3.6	V
$T_{storage}$	Storage temperature	-40	85	°C
T_{solder}	Solder reflow temperature	--	260	°C

3.2 IO Characteristics

3.2.1 PRRSTX and PRTRG

Table 5 PRRSTX and PRTRG

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
I_{IZ}	Input leakage current	--	--	--	+/-1	uA
V_{IH}	Input high voltage	--	AVDD_BAK*0. 67	--	AVDD_BAK	V
V_{IL}	Input low voltage	--	0	--	AVDD_BAK*0.27	V
V_{OH}	Output high voltage	I_{OH}=5.3 mA, AVDD_BAK=3.3V	2.64	--	--	V
		I_{OH}=1.2 mA, AVDD_BAK=1.8V	1.53	--	--	V
V_{OL}	Output low voltage	I_{OL}=3.9 mA, AVDD_BAK=3.3V	--	--	0.4	V
		I_{OL}=1.9 mA, AVDD_BAK=1.8V	--	--	0.45	V
C_i	Input capacitance	--	--	--	11	pF
R_{PU}	Pull-up resistance	--	35	--	84	kΩ

3.2.2 USB I/O

Table 6 USB signal

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
I_{IZ}	Input leakage current	--	--	--	+/-10	uA
V_{IH}	Input high voltage	--	AVDUSB*0.67	--	AVDUSB	V
V_{IL}	Input low voltage	--	0	--	AVDUSB*0.27	V
V_{OH}	Output high voltage	I_{OH} =10 mA, AVDUSB=3.3V	2.35	--	--	V

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V_{OL}	Output low voltage	I_{OL} =10 mA, AVDUSB=3.3V	--	--	0.5	V
R_{PUIDEL}	Pull-up resistance, idle state	--	0.9	--	1.575	kΩ
$R_{PUACTIVE}$	Pull-up resistance, active state	--	1.425	--	3.09	kΩ

3.2.3 Others

Table 7 Others

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
I_{IZ}	Input leakage current	--	--	--	+/-1	uA
V_{IH}	Input high voltage	--	VDD *0.67	--	VDD	V
V_{IL}	Input low voltage	--	0	--	VDD *0.27	V
V_{OH}	Output high voltage	I_{OH} =5.3 mA, VDD =3.3V	2.64	--	--	V
V_{OL}	Output low voltage	I_{OL} =3.9 mA, VDD =3.3V	--	--	0.4	V
C_i	Input capacitance	--	--	--	11	pF
R_{PU}	Pull-up resistance	--	35	--	84	kΩ

3.3 DC Characteristics

3.3.1 Operating Conditions

Table 8 Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
VDD	Power input for the main power domain	3.0	3.3	3.6	V
AVDUSB	USB supply voltage	3.0	3.3	3.6	V
AVDD_BAK	Power input for the backup power domain	1.6	3.3	3.6	V
ICC_{max}	Maximum operating current @ VDD	--	--	200	mA
T_{env}	Operating temperature	-40	--	85	°C

3.3.2 Power consumption

Table 9 Power consumption

Parameter	Mode	Condition	Typ.[2]	Unit
Average acquisition current [1]	Operating mode	-130dBm 3.3V	33	mA
Average tracking current	Operating mode	-130dBm 3.3V	31	mA
Average backup current	Standby mode	AVDD_BAK	14	uA

* *[1] Average acquisition current means average current from start-up to first fix.*
* *[2] The value varies with positioning mode and functions.*

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4 HARDWARE DESCRIPTION

4.1 Connecting power

In order to ensure the positioning performance, please control the ripple of the module power supply. It is recommended to use the LDO with max output current above 100mA.
If the power for VDD pin is off, the real-time clock (RTC) and battery backed RAM (BBR) are supplied through the AVDD_BAK pin. Thus, orbit information and time can be maintained and will allow a Hot or Warm start. If no backup battery is connected and no aiding data are sent to the module, the module will perform a cold start at every power-up.

Note: If no backup supply is available, leave AVDD_BAK pin floating.

4.2 Antenna Design

There is built-in LNA and SAW in the GNSS module. It is recommended to use an active antenna with gain less than 30dB.

The module has built-in short circuit protection and open circuit detection functions, which can detect the antenna status of normal connection, open circuit, and short circuit, and send out the status prompt message in NMEA data.

4.3 Reset and Mode Control

The operation mode of GNSS module is controlled by PRRSTX (nRESET) and PRTRG (BOOT) pin. While the module works in normal operation, leave PRRSTX and PRTRG pins floating if there is no upgrading or reset demands, or others.

- Keep PRTRG pin floating during system power-up or the external reset (PRRSTX from low to high), and the module will enter **User Normal Mode**.
- When the module powers up or PRRSTX from low to high, the module will execute an **external reset**. (If the power for AVDD_BAK is always on, the external reset will not affect the ephemeris data in the backup domain)
- Drive PRTRG pin to low or connect PRTRG to GND directly (not by pull-down resistance) during system power-up or the external reset (PRRSTX from low to high) , and the system enters **BootROM Command Mode** at PRTRG pin being released from low to floating state, and ready for firmware upgrading command.
- When connecting PRRSTX and PRTRG to any host IO, DO NOT use the pull-up or pull-down resistance.

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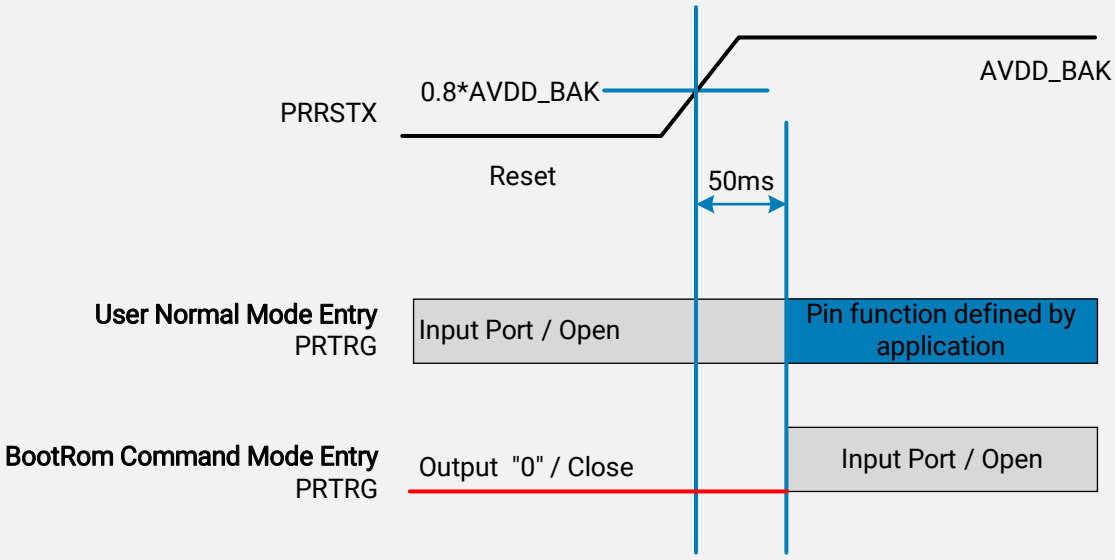

Figure 4 Timing of mode entry with host controller

Table 10 Reset minimum timing

Parameter	Symbol	Pin	Condition	Min.	Typ.	Max.	Unit
Reset input time	t_{RSTL}	PRRSTX	There is power supply and the oscillator is stable.	100	--	--	mS

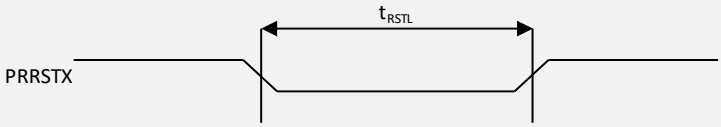

Figure 5 Reset minimum timing

4.4 Serial interfaces

The module provides a TTL Universal Asynchronous Receiver / Transmitter (UART) interface. The data format is: 1 start bit, 8 data bits, 1 stop bit, no checksum, and the default baud rate is 9600 bps. NMEA data outputs while the module is powered on.

When the module is applied to the specific application, users may shut off the main power in order to further reduce the power consumption. To avoid the high level in serial interface influencing the normal operation, it is highly recommended to cut off the serial port connection when shut off the main power. Or, please set the serial port to input mode or high impedance state with pull-down resistor.

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5 MECHANICAL SPECIFICATION

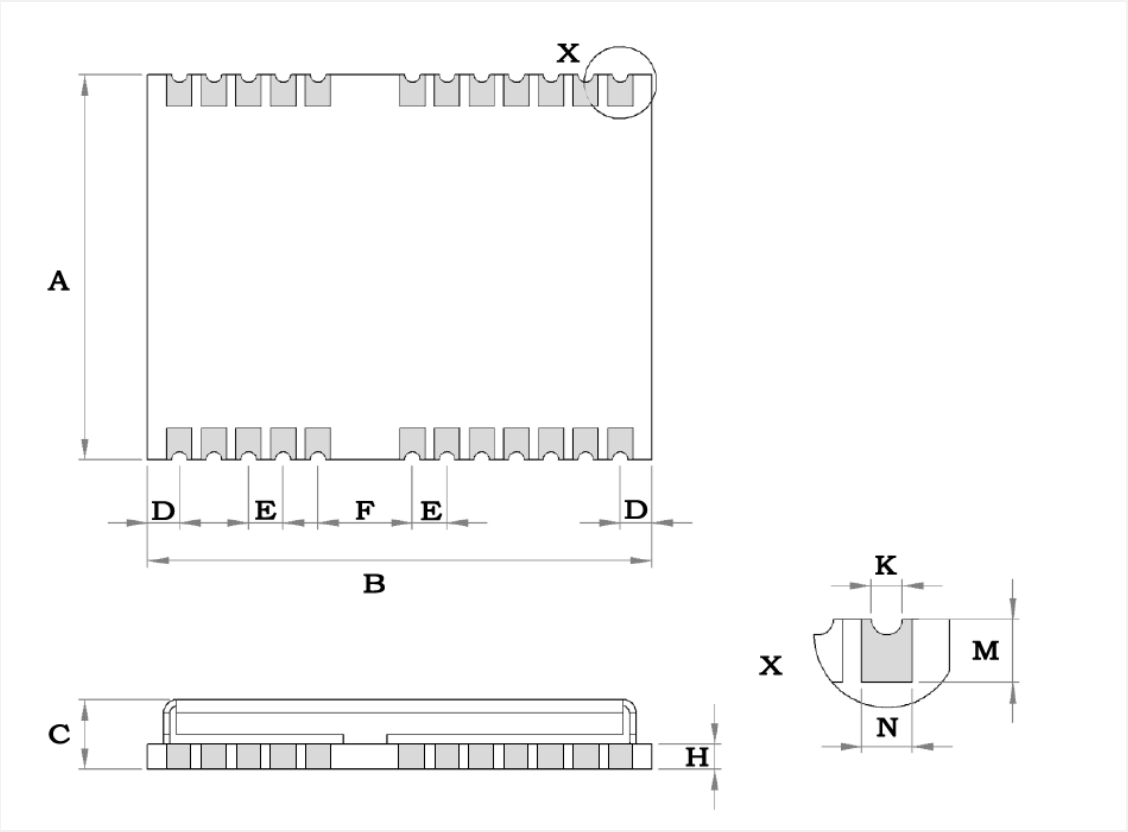

Figure 6 Dimensions

Table 11 Dimensions

Symbol	Min. (mm)	Typ.(mm)	Max. (mm)
A	12.0	12.2	12.4
B	15.8	16.0	16.2
C	2.2	2.4	2.6
D	0.9	1.0	1.3
E	1.0	1.1	1.2
F	2.9	3.0	3.1
H	--	0.8	--
K	0.4	0.5	0.6
M	0.8	0.9	1.0
N	0.7	0.8	0.9

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6 REFERENCE DESIGN

6.1 Minimal design

6.1.1 TAU1102-1216A00

This is a minimal design for TAU1102-1216A00. When connected to an active antenna, make sure there is an 82nH inductor soldered as shown in the following figure. When connected to a passive antenna, there is no need for the 82nH inductor. The characteristic impedance from RF_IN pin to the antenna connector should be 50Ω.

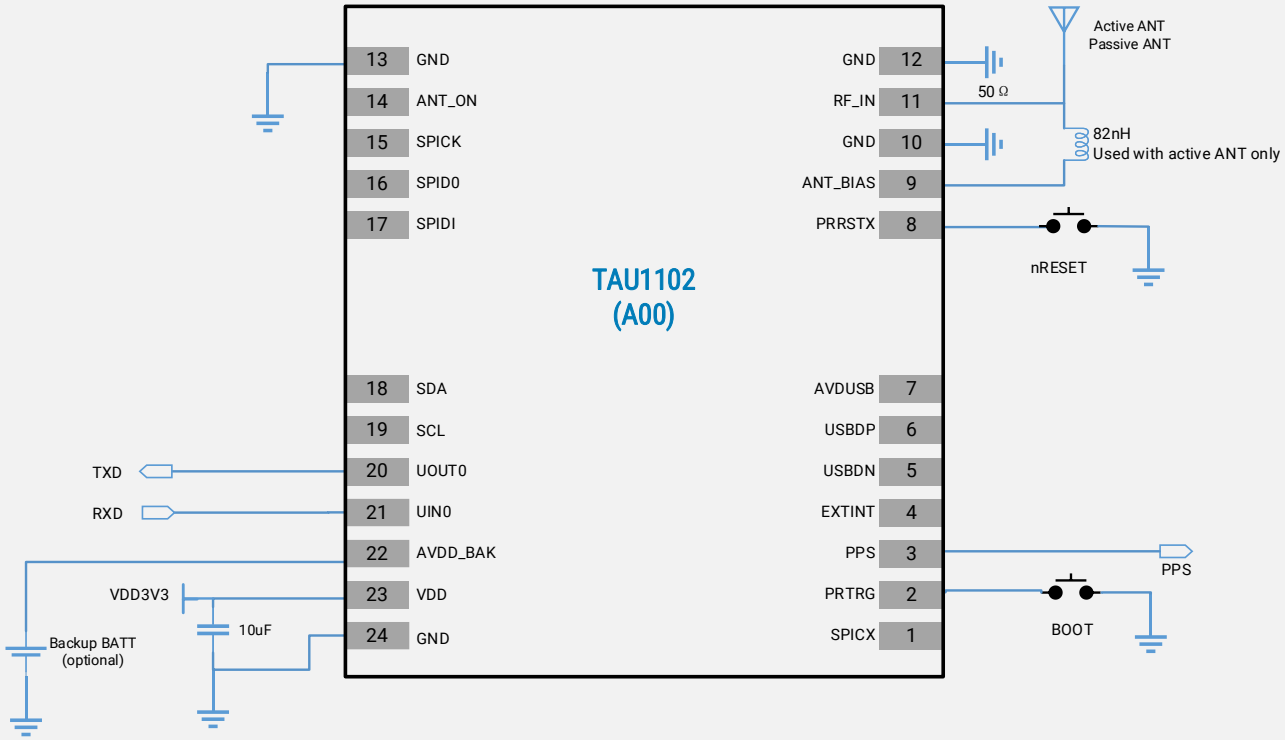

Figure 7 Minimal application diagram of TAU1102-1216A00

6.1.2 TAU1102-1216B00

TAU1102-1216B00 minimal design is shown as below. In this design, a bias choke is built-in between ANT_BIAS and RF_IN pin to power the active antenna. No more external inductor is needed. The characteristic impedance from RF_IN pin to the antenna connector should be 50Ω.

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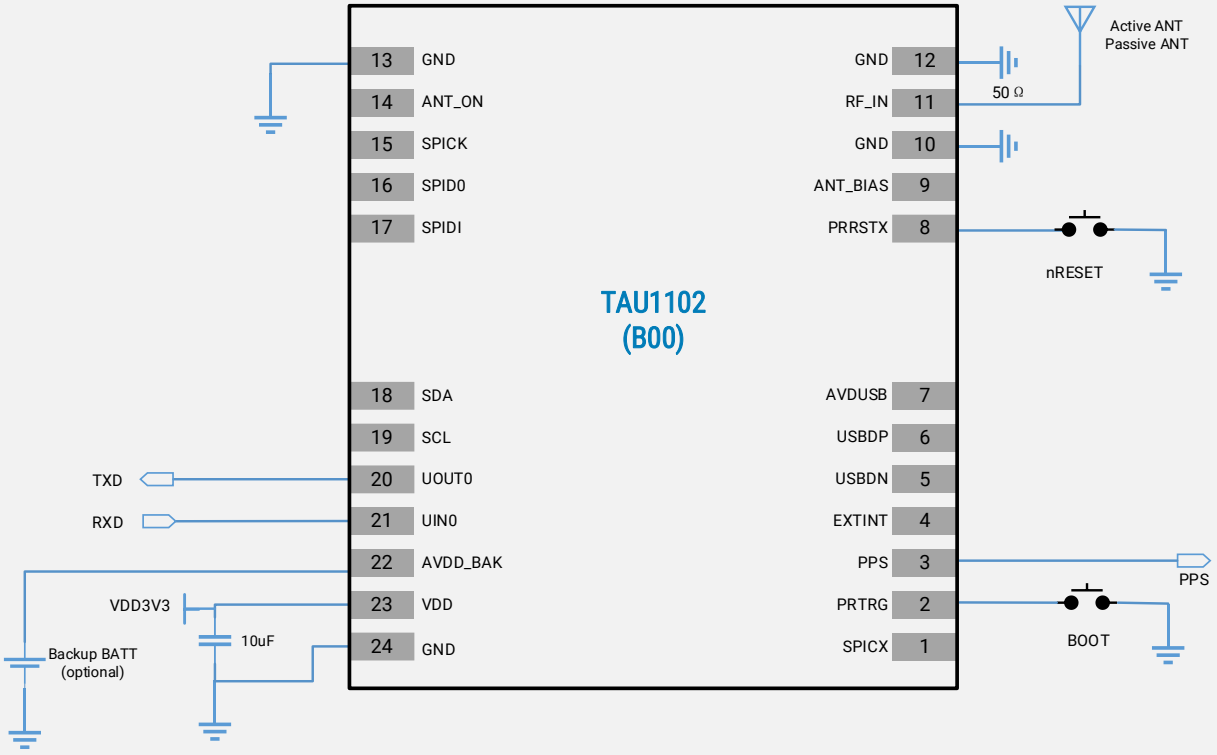

Figure 8 Minimal application diagram of TAU1102-1216B00

6.2 PCB Footprint Reference

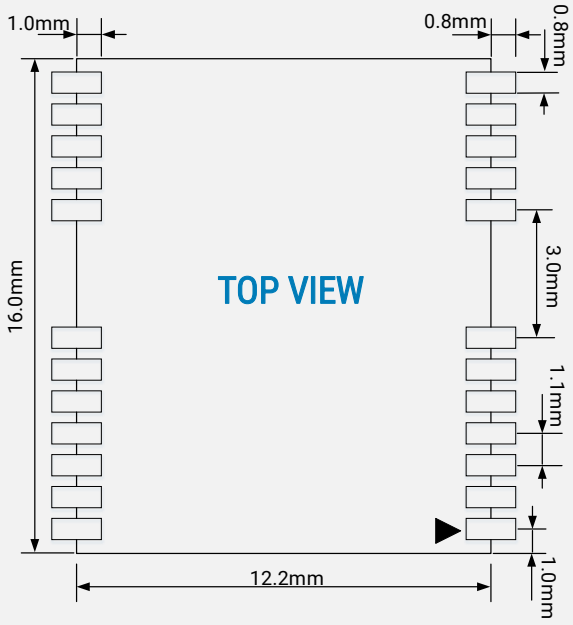

Figure 9 PCB Footprint Reference

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6.3 Layout Notes

(1) A decoupling capacitor should be placed close to VDD pin of the module, and the width of power routing should be more than 0.5mm;

(2) The width of RF routing between RF port to antenna interface should be wider than 0.2mm. The characteristic impedance of RF routing between RF port to antenna interface should be controlled to 50Ω.

(3) It is recommended that the routing from RF port to antenna interface refers to the second layer, and no routing are recommended on the layer.

(4) Do not place the module close to any EMI source, like antenna, RF routing, DC/DC or power conductor, clock signal or other high-frequency switching signal, etc.

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7 SOFTWARE INTERFACE

7.1 NMEA Message Format

Table 12 NMEA output message

NMEA	Sub ID	Description
GGA	0x00	Global positioning system fixed data
GLL	0x01	Geographic position - latitude/longitude
GRS	0x02	GNSS Overall satellite data
GSA	0x03	GNSS Overall satellite data
GSV	0x04	GNSS Detailed satellite data
RMC	0x05	Recommended minimal data for GNSS
VTG	0x06	Course over ground and ground speed
ZDA	0x07	Date and time
GST	0x08	GNSS Pseudorange Error Statistics
TXT	0x20	Antenna status

* *The default output of module is GGA GSA GSV RMC ZDA TXT.*

7.1.1 GGA - Global Positioning System Fix Data

Output example of Table 13 as bellows:
$GNGGA,074144.000,3957.79941,N,11619.02981,E,1,19,0.83,105.5,M,-8.4,M,,*65

Table 13 GGA Data Format

Name	Example	Unit	Description
Message ID	$GNGGA		GGA protocol header
UTC Time	074144.000		hhmmss.sss
Latitude	3957.79941		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	11619.02981		dddmm.mmmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 14
Satellites Used	19		Number of satellites in use, 00-24
HDOP	0.83		Horizontal Dilution of Precision (meters)
MSL Altitude	105.5	meter	Antenna Altitude above/below mean-sea-level (geoid) (in meters)
Units	M	meter	Units of antenna altitude, meters
Geoidal Separation	-8.4	meter	
Units	M	meter	Units of geoidal separation, meters
Age of diff. GNSS data		second	Null fields when DGPS is not used
Diff. Ref. Station ID			Differential reference station ID, 0000-1023

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Checksum	*65		Checksum
<CR> <LF>			End of message termination

Table 14 Position Fix Indicators

Value	Description
0	Fix not available
1	GNSS fix
2	Differential GNSS fix

7.1.2 GLL-Geographic Position – Latitude/Longitude

Output example of Table 15 as bellows:
$GNGLL,2503.71465,N,12138.73922,E,062052.000,A,A*45

Table 15 GLL Data Format

Name	Example	Unit	Description
Message ID	$GNGLL		GLL protocol header
Latitude	2503.71465		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	12138.73922		dddmm.mmmmm
E/W indicator	E		E=east or W=west
UTC Time	062052.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Mode	A		A=Autonomous, D=DGPS, N=Data not valid,
Checksum	*45		
<CR> <LF>			End of message termination

7.1.3 GSA-GNSS DOP and Active Satellites

Output example of Table 16 as bellows:
$GPGSA,A,3,01,11,18,30,28,07,17,22,03,,,,1.10,0.79,0.77,1*12
$BDGSA,A,3,10,07,08,12,03,13,01,11,02,04,05,,1.10,0.79,0.77,4*0B

Table 16 GSA Data Format

Name	Example	Unit	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 17
Mode 2	3		See Table 18
ID of satellite used	01		Sv on Channel 1
ID of satellite used	11		Sv on Channel 2
….			….
ID of satellite used			Sv on Channel 12
PDOP	1.10		Position Dilution of Precision
HDOP	0.79		Horizontal Dilution of Precision
VDOP	0.77		Vertical Dilution of Precision

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System ID	1		Satellites used in GPS 1= GPS 4=BD
Checksum	*12		
<CR> <LF>			End of message termination

Table 17 Mode 1

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

Table 18 Mode 2

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

7.1.4 GSV-GNSS Satellites in View

Output example of Table 19 as bellows:

$GPGSV,4,1,15,193,69,35,39,6,50,28,41,137,50,134,34,129,50,134,34*73

$GPGSV,4,2,15,17,45,137,41,2,42,326,40,5,42,250,40,128,38,243,36*4B

$GPGSV,4,3,15,9,36,65,42,12,26,285,35,127,12,260,32,19,9,137,35*7D

$GPGSV,4,4,15,23,8,41,35,25,4,316,36,28,,,*4F

$BDGSV,3,1,09,8,75,64,39,6,73,237,38,3,58,205,38,1,53,143,38*56

$BDGSV,3,2,09,9,47,224,38,4,38,118,37,2,35,246,33,5,16,259,31*6C

$BDGSV,3,3,09,10,2,210,21*62

Table 19 GSV Data Format

Name	Example	Unit	Description
Message ID	$GPGSV		GSV protocol header
Total number of messages[1]	4		Range 1 to 6, Total number of GSV messages to be transmitted in this group
Message number[1]	1		Range 1 to 6 Origin number of this GSV message within current group
Satellites in view	15		Total number of satellites in view
Satellite ID[2]	193		Satellite PRN number
Elevation	69	degrees	Elevation in degrees (Range 00 to 90)
Azimuth	35	degrees	Azimuth in degrees to true north (Range 000 to 359)
SNR (C/No)	39	dB-Hz	SNR in dB (Range 00 to 99, null when not tracking)
....			....
Satellite ID	129		Satellite PRN number (Range 01 to 196)

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Elevation	50	degrees	Elevation in degrees (Range 00 to 90)
Azimuth	134	degrees	Azimuth in degrees to true north (Range 000 to 359)
SNR (C/No)	34	dB-Hz	SNR in dB Channel 4 (Range 00 to 99, null when not tracking)
Checksum	*73		
<CR> <LF>			End of message termination

* *[1] Depending on the number of satellites tracked multiple messages of GSV data may be required.*
* *[2] GPS ID: 01~32, SBAS ID: 127~141, QZSS ID: 193~199, BEIDOU ID: 01~32*

7.1.5 RMC-Recommended Minimum Specific GNSS Data

Output example of Table 20 as bellows:
$GNRMC,075939.000,A,2225.56166,N,11412.68199,E,0.000,64.79,020589,0.0,E,A*1D
$GNRMC,074458.000,A,3957.79932,N,11619.03010,E,0.005,0.00,280419,,,A*4B

Table 20 RMC Data Format

Name	Example	Unit	Description
Message ID	$GNRMC		RMC protocol header
UTC Time	075939.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2225.56166		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	11412.68199		dddmm.mmmmm
E/W Indicator	E		E=east or W=west
Speed over ground	0.000	knots	Speed over ground
Course over ground	64.79	degrees	Degrees to true north
Date	020589		ddmmyy
Magnetic variation	0.0	degrees	(Not shown)
Variation sense	E		E=east or W=west (Not shown)
Mode	A		A=Autonomous, D=DGPS, N=Data not valid,
Checksum	*4B		
<CR> <LF>			End of message termination

7.1.6 VTG-Course over Ground and Ground Speed

Output example of Table 21 as bellows:
$GNVTG,0.00,T,0.00,M,0.000,N,0.000,K,A*3D
$GNVTG,0.00,T,,M,0.011,N,0.021,K,A*20

Table 21 VTG Data Format

Name	Example	Unit	Description
Message ID	$GNVTG		VTG protocol header
Course over ground	0.00	degrees	Degrees to true north
Reference	T		True north

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Course over ground		degrees	Degrees to Magnetic
Reference	M		Magnetic
Speed over ground	0.000	knots	Measured speed
Units	N		Knots
Speed over ground	0.000	km/hr	Measured speed
Units	K		Kilometer per hour
Mode	A		A=Autonomous, D=DGPS, N=Data not valid,
Checksum	*3D		
<CR> <LF>			End of message termination

7.1.7 ZDA-Time & Date

Output example of Table 22 as bellows:
$GNZDA,033900.000,28,10,2015,,*4C

Table 22 ZDA Data Format

Name	Example	Unit	Description
Message ID	$GNZDA		ZDA protocol header
UTC Time	033900.000		hhmmss.sss
Day	28		dd (01 to 31)
Month	10		mm (01 to 12)
Year	2015		yyyy (1980 to 2025)
Local zone hours		hour	
Local zone minutes		minute	
Checksum	*4C		
<CR> <LF>			End of message termination

7.1.8 GST- GNSS Pseudorange Error Statistics

Output example of Table 23 as bellows:
$GNGST,081119.000,1.2,,,,0.6,0.5,0.5*52

Table 23 GST Data Format

Name	Example	Unit	Description
Message ID	$GNGST		GST protocol header
UTC Time	081119.000		hhmmss.sss
RMS value	1.2		RMS value of the standard deviation of the range inputs to the navigation process. Range inputs include pseudoranges & DGNSS corrections
Standard semi-major axis of error		Meter	Standard deviation of semi-major axis of error ellipse
Standard semi-minor axis of error		Meter	Standard deviation of semi-minor axis of error ellipse
Orientation of semi-major axis of error		Degree	Orientation of semi-major axis of error ellipse (degrees from true north)

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latitude error	0.6	Meter	Standard deviation of latitude error
longitude error	0.5	Meter	Standard deviation of longitude error
altitude error	0.5	Meter	Standard deviation of altitude error
Checksum	*52		

7.1.9 TXT-ANT & USR message

Output example of Table 24 as bellows:
$GNTXT,01,01,01,ANT_OK*50

Table 24 TXT Data Format

Name	Example	Unit	Description
Message ID	$GNTXT		USR message protocol header
Total number	01		Total number of sentences
Sentence Number	01		Sentence number
Identifier	01		Text identifier
Content	ANT_OK		Text message
Checksum	*50	4C	
<CR> <LF>			End of message termination

Table 25 Antenna status NMEA output

Active antenna status	GNSS module output
Short circuit	$GNTXT,01,01,01,ANT_SHORT*06
Normal operating	$GNTXT,01,01,01,ANT_OK*50
Open circuit	$GNTXT,01,01,01,ANT_OPEN*40

7.2 Exclusive Binary Message

The common exclusive commands show as bellows:

Table 26 Commands exclusive to TAU1102

Command description	Software command[2]
Perform a Cold start	F1 D9 06 40 01 00 01 48 22
Perform a Warm start	F1 D9 06 40 01 00 02 49 23
Perform a Hot start	F1 D9 06 40 01 00 03 4A 24
Perform a Factory reset	F1 D9 06 09 08 00 02 00 00 00 FF FF FF FF 15 01
UART configures as 115200bps	F1 D9 06 00 08 00 00 00 00 00 00 C2 01 00 D1 E0
UART configures as 9600bps	F1 D9 06 00 08 00 00 00 00 00 80 25 00 00 B3 07
Enable ZDA message	F1 D9 06 01 03 00 F0 07 01 02 1E
Disable ZDA message	F1 D9 06 01 03 00 F0 07 00 01 1D
Navigate with GPS only	F1 D9 06 0C 04 00 01 00 00 00 17 A0
Navigate with BEIDOU system only	F1 D9 06 0C 04 00 04 00 00 00 1A AC

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Navigate with GPS+BEIDOU system	F1 D9 06 0C 04 00 05 00 00 00 1B B0
Query firmware version[1]	F1 D9 0A 04 00 00 0E 34

* *[1] Firmware version will show as Hex mode too.*
* *[2] Add 0D 0A at the end of command.*

7.3 Mode Configuration

7.3.1 CFG-SIMPLERST

Configure soft reset (as system command, there is NO ACK);
F1 D9 06 40 01 00 00 47 21
Configure a cold start (as system command, there is NO ACK);
F1 D9 06 40 01 00 01 48 22
Configure a warm start (as system command, there is NO ACK);
F1 D9 06 40 01 00 02 49 23
Configure a hot start (as system command, there is NO ACK);
F1 D9 06 40 01 00 03 4A 24
Configure GNSS stop (if successful, it would return ACK, else return NAK);
F1 D9 06 40 01 00 10 57 31
Configure GNSS start (if successful, it would return ACK, else return NAK);
F1 D9 06 40 01 00 11 58 32
Configure Clear All TRK Channels (if successful, it would return ACK, else return NAK);
F1 D9 06 40 01 00 80 C7 A1
CFG-SLEEP
Set GNSS task to deep sleep for 5000ms;
F1 D9 06 41 05 00 88 13 00 00 01 E8 56
CFG-PWRCTL
Poll message of power control;
F1 D9 06 42 00 00 13 3F
Set receiver into cyclic sleep mode;
F1 D9 06 42 14 00 00 05 00 00 B8 0B 00 00 60 EA 00 00 D0 07 00 00 00 00 00 00 45 F9

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8 PRODUCT PACKAGING AND HANDLING

8.1 Packaging

TAU1102 is a Moisture Sensitive Device (MSD) and Electrostatic Sensitive Device (ESD). During the packing and shipping, it is strictly required to take appropriate MSD handling instructions and precautions. The table below shows the general packing hierarchy for the standard shipment.

Table 27 Packing hierarchy

Module	Reel	Sealed bag	Shipping carton
			

Note: *Packaging of non-standard quantities is not explained here. Please see the package you have received.*

8.1.1 Tape and Reel

TAU1102 is delivered as hermetically sealed, reeled tapes in order to enable efficient production, production lot set-up and tear-down. The figure below shows the tape dimensions.

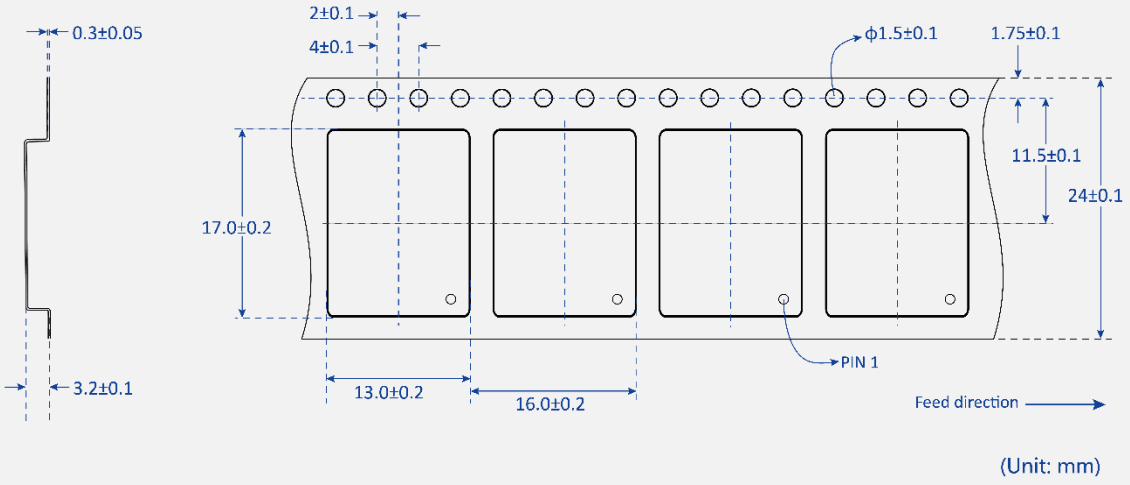

Figure 10 Tape dimensions

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TAU1102 is deliverable in quantities of 1000pcs on a reel. The figure below shows the dimensions of the reel.

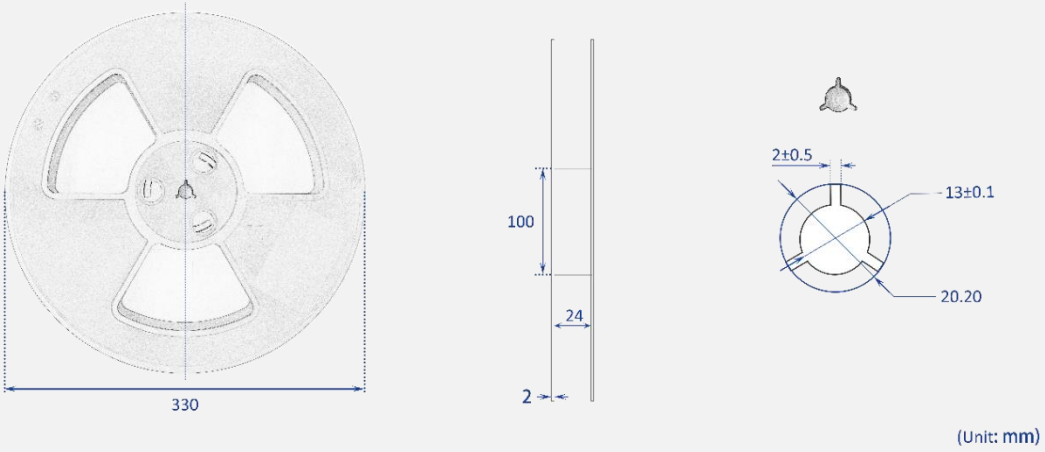

Figure 11 Reel dimensions

8.1.2 Shipment Packaging

The reels are packed in the sealed bags and shipped by shipping cartons. Up to five sealed bags (5000pcs in total) can be packed in one shipping carton.

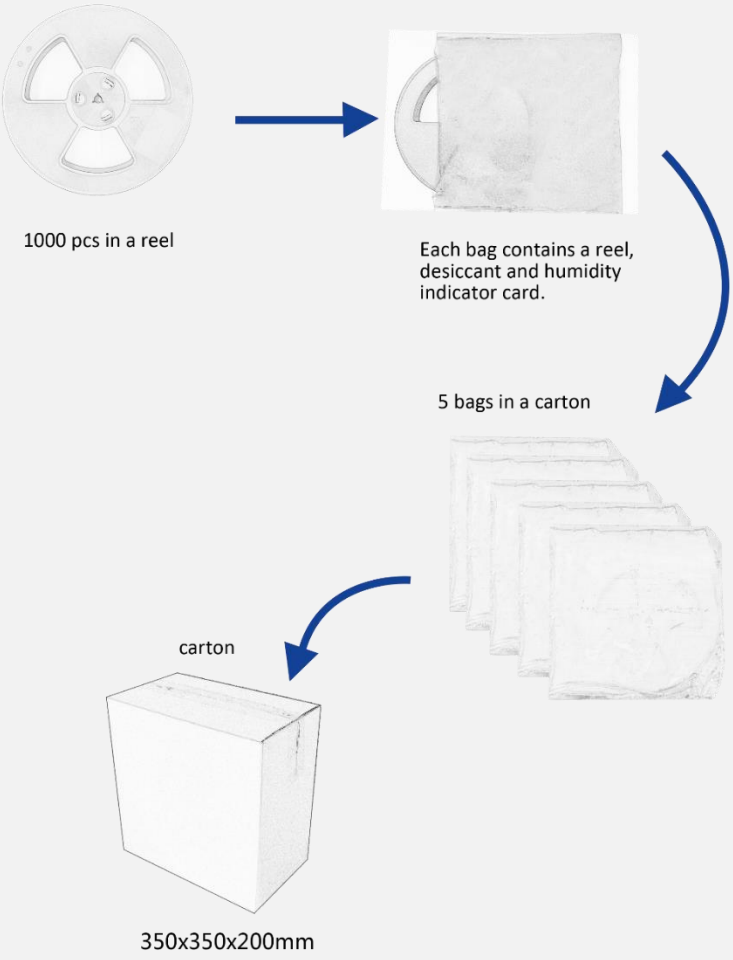

Figure 12 Packaging

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8.2 Storage

In order to prevent moisture intake and protect against electrostatic discharge, TAU1102 is packaged together with a humidity indicator card and desiccant to absorb humidity.

8.3 ESD Handling

8.3.1 ESD Handling Precautions

TAU1102 which contains highly sensitive electronic circuitry is an Electrostatic Sensitive Device (ESD). Observe precautions for handling! Failure to observe these precautions may result in severe damage to the GNSS module!

- Unless there is a galvanic coupling between the local GND (i.e. the workbench) and the PCB GND, then the first point of contact when handling the PCB must always be between the local GND and PCB GND.
- Before mounting an antenna patch, connect ground of the device.
- When handling the RF pin, do not come into contact with any charged capacitors and be careful when contacting materials that can develop charges (e.g. patch antenna ~10 pF, coax cable ~50 – 80 pF/m, soldering iron …)
- To prevent electrostatic discharge through the RF input, do not touch any exposed antenna area. If there is any risk that such exposed antenna area is touched in non ESD protected work area, implement proper ESD protection measures in the design.
- When soldering RF connectors and patch antennas to the module's RF pin, make sure to use an ESD safe soldering iron (tip).

8.3.2 ESD Protection Measures

The GNSS positioning modules is sensitive to static electricity. Whenever handling the module, particular care must be exercised to reduce the risk of electrostatic charges. In addition to standard ESD safety practices, the following measures should be taken into account.

- Adds ESD Diodes to the RF input part to prevent electrostatics discharge.
- Do not touch any exposed antenna area.
- Adds ESD Diodes to the UART interface.

8.3.3 Moisture Sensitivity Level

The Moisture Sensitivity Level (MSL) of the GNSS module is MSL4.

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9 RELATED DOCUMENTS

[1] HD8020 Series Datasheet
[2] Satrack User Manual
[3] Cynosure Receiver Protocol

10 REVISION HISTORY

Revision	Date	Reviser	Status / Comments
V1.0	2018-09-25	Daisy	Start version, first released
V1.1	2019-02-19	Daisy	ANT_BIAS pin: 2mA ~ 25mA; module photo updates
V1.2	2019-02-20	Daisy	Updates baud rate and a minimal design
V1.3	2019-02-27	Daisy	Add information of the 39NH inductance to chapter 5
V1.4	2021-02	Vita Wu	Updates some specifications. Adds packaging info. Adds software interface. Adds PCB reference. Adds minimal design of B00. Improves wording. Updates mechanical specification. Updates product photo.

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