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Xizhi City, Taipei County 221, Taiwan
☎ 886-2-8698-3698
886-2-8698-3699
www.locosystech.com/

Product name	Description	Version
BH-0606	Datasheet of BH-0606 host-based GPS and GLONASS module	0.92

1 Introduction

LOCOSYS BH-0606 is a host-based GPS and GLONASS module that features high sensitivity, low power and faster location fix. Combined GPS and GLONASS can provide more satellites to gain the advantages of higher position accuracy and saving acquisition time, especially in urban canyon. Besides, it can self generate up to 5 days ephemeris prediction to perform a cold start time of less than 15 seconds.

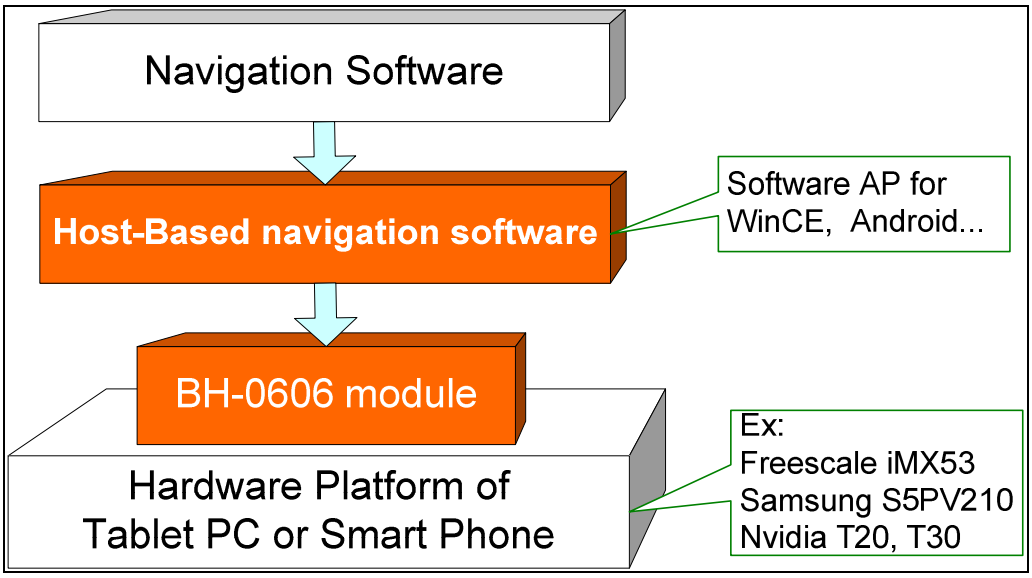

Fig 1-1 Operational diagram of BH-0606 module on a tablet PC or smart phone.

2 Features

- BROADCOMM high sensitivity host-based GPS and GLONASS solution
- No real time operation system requirement on host CPU
- Easy software integration for WinCE and Android
- Fast TTFF at low signal level
- Capable of SBAS (WAAS, EGNOS, MSAS, GAGAN)
- Support QZSS
- SMD type; RoHS compliant

3 Application

- Personal positioning and navigation
- Automotive navigation
- Marine navigation

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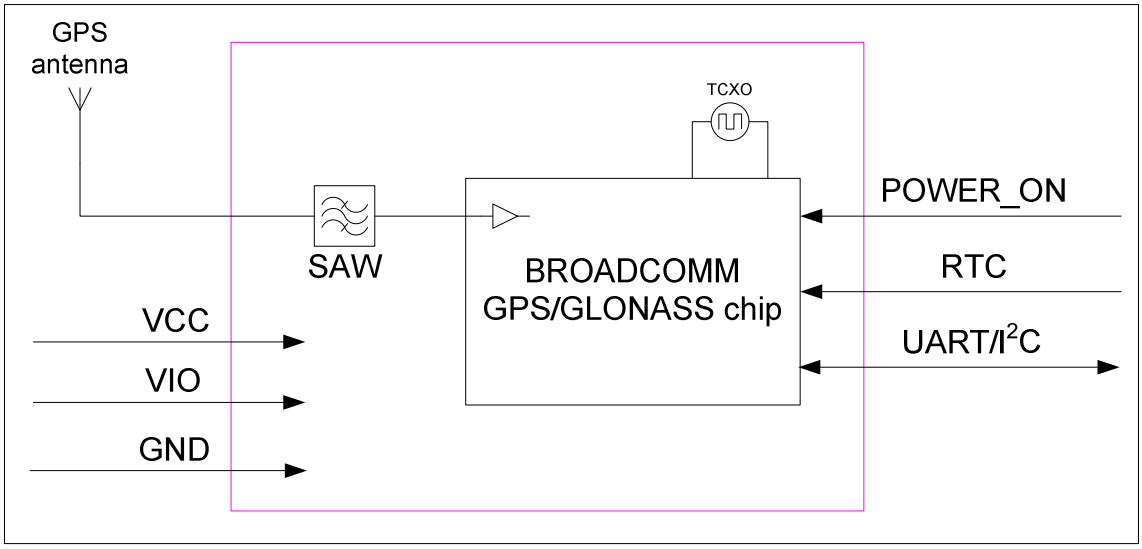

Fig 3-1 System block diagram.

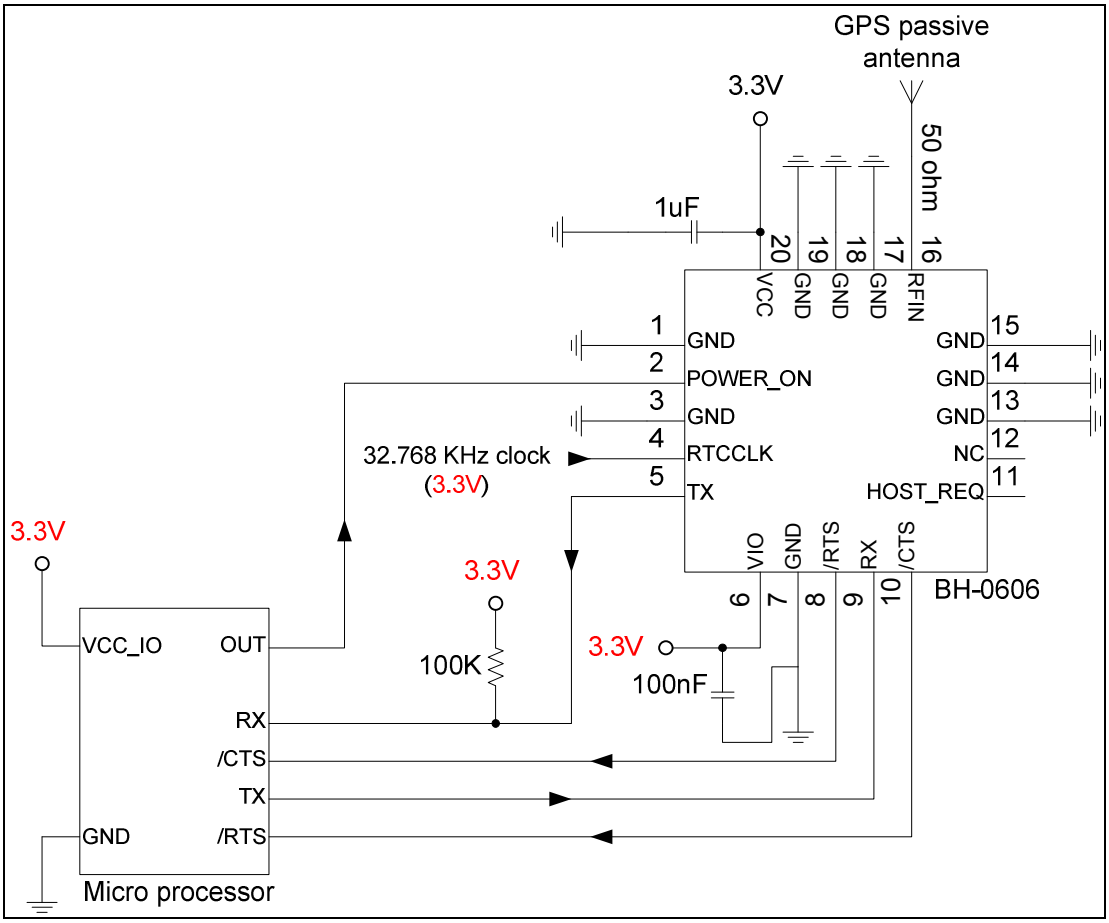

Fig 3-2 Typical application circuit that uses a passive antenna.

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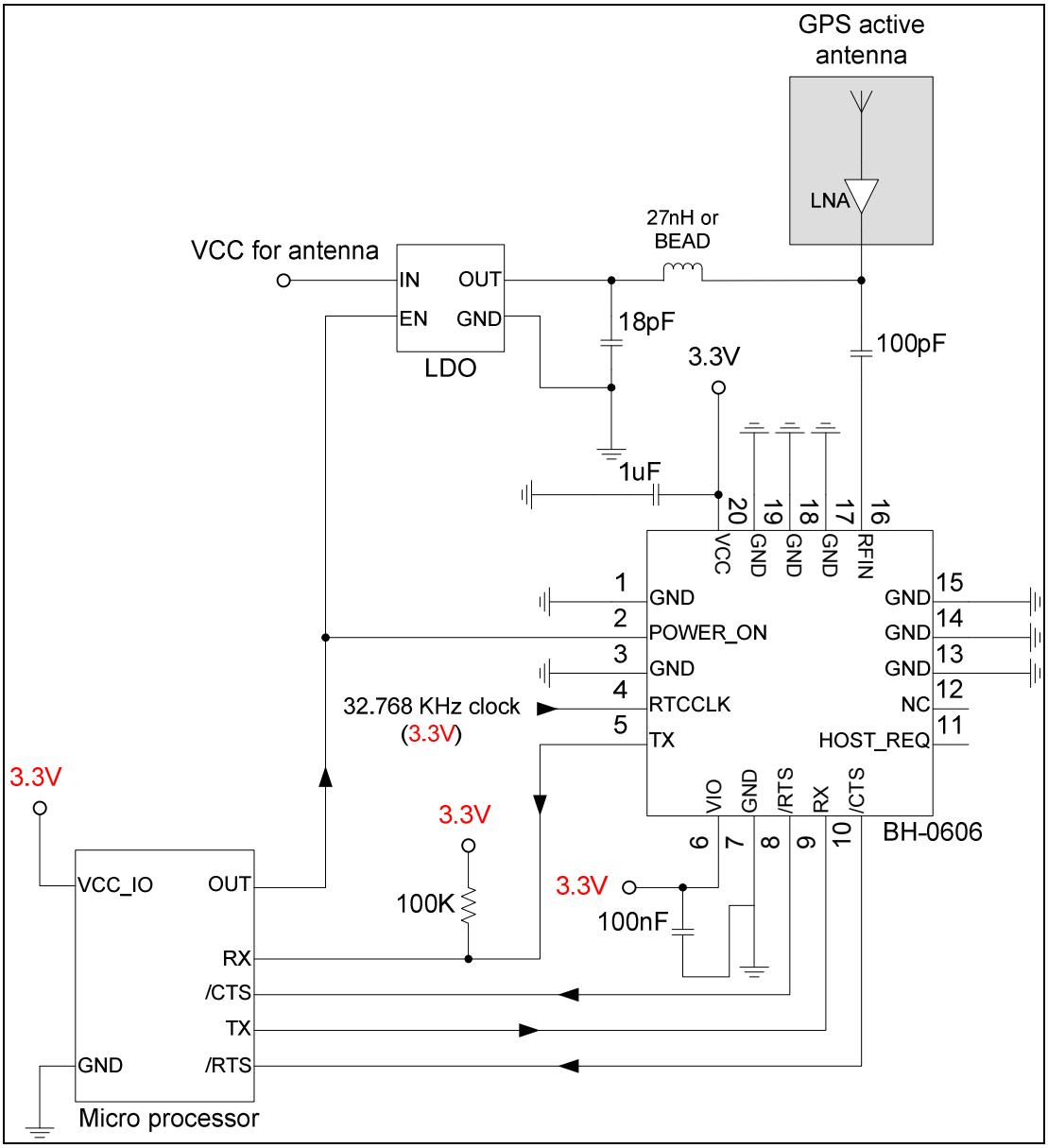

Fig 3-3 Typical application circuit that uses an active antenna.

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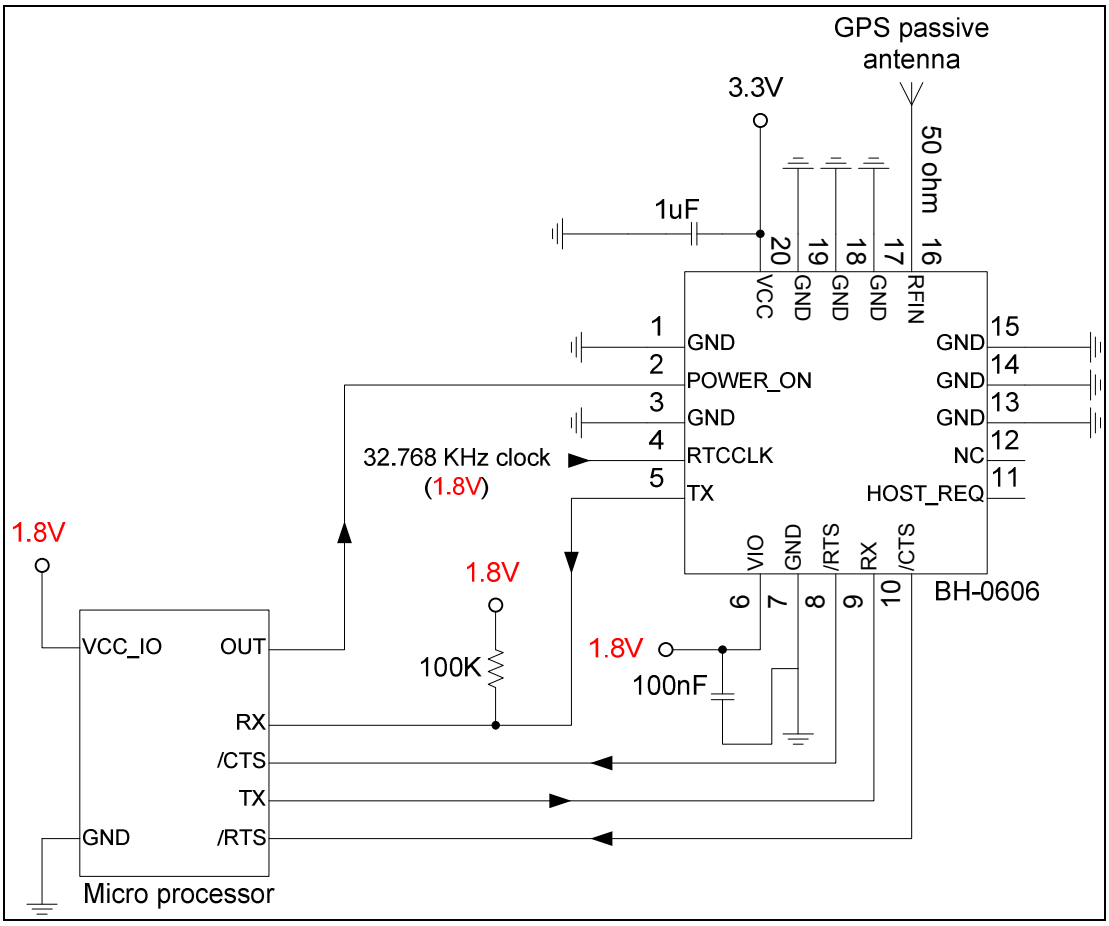

Fig 3-4 Typical application circuit that uses 1.8V as IO voltage.

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4 GPS receiver

Chip	BROADCOM BCM47511	
Frequency	GPS: L1 1575.42MHz, C/A code GLONASS: L1 1598.0625MHz ~ 1605.375MHz, C/A code	
Channels	Support 18 channels	
Update rate	1Hz	
Sensitivity	Tracking	up to -163dBm (with external LNA)
	Cold start	up to -147dBm (with external LNA)
Acquisition Time	Hot start (Open Sky)	< 1s (typical)
	Hot start (Indoor)	< 30s
	Cold Start (Open Sky)	35s (typical)
		< 15s (typical), with predicted ephemeris
Position Accuracy	Autonomous	3m (2D RMS)
	SBAS	2.5m (depends on accuracy of correction data).
Max. Altitude	< 18,000 m	
Max. Velocity	< 515 m/s	
Protocol Support	NMEA 0183 ver 3.0	Virtual COM Port (1) 1Hz: GGA, GSA, GSV, RMC

Note 1: Application software can access BH-0606 with any baud rate.

5 Software interface

5.1 NMEA output message

Table 5.1-1 NMEA output message

NMEA record	Description
GGA	Global positioning system fixed data
GLL	Geographic position - latitude/longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

- **GGA--- Global Positioning System Fixed Data**

Table 5.1-2 contains the values for the following example:

$GPGGA,053740.000,2503.6319,N,12136.0099,E,1,08,1.1,63.8,M,15.2,M,,0000*64

Table5.1- 2 GGA Data Format

Name	Example	Units	Description

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Message ID	$GPGGA		GGA protocol header
UTC Time	053740.000		hhmmss.sss
Latitude	2503.6319		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12136.0099		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 5.1-3
Satellites Used	08		Range 0 to 12
HDOP	1.1		Horizontal Dilution of Precision
MSL Altitude	63.8	mters	
Units	M	mters	
Geoid Separation	15.2	mters	
Units	M	mters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*64		
<CR> <LF>			End of message termination

Table 5.1-3 Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3-5	Not supported
6	Dead Reckoning Mode, fix valid

● GLL--- Geographic Position – Latitude/Longitude

Table 5.1-4 contains the values for the following example:

$GPGLL,2503.6319,N,12136.0099,E,053740.000,A,A*52

Table 5.1-4 GLL Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPGLL		GLL protocol header
Latitude	2503.6319		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12136.0099		dddmm.mmmm
E/W indicator	E		E=east or W=west
UTC Time	053740.000		hhmmss.sss

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Status	A		A=data valid or V=data not valid
Mode	A		A=autonomous, D=DGPS, E=DR
Checksum	*52		
<CR> <LF>			End of message termination

● GSA---GNSS DOP and Active Satellites

Table 5.1-5 contains the values for the following example:

$GPGSA,A,3,24,07,17,11,28,08,20,04,,,,,2.0,1.1,1.7*35

Table 5.1-5 GSA Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 5.1-6
Mode 2	3		See Table 5.1-7
ID of satellite used	24		Sv on Channel 1
ID of satellite used	07		Sv on Channel 2
….			….
ID of satellite used			Sv on Channel 12
PDOP	2.0		Position Dilution of Precision
HDOP	1.1		Horizontal Dilution of Precision
VDOP	1.7		Vertical Dilution of Precision
Checksum	*35		
<CR> <LF>			End of message termination

Table 5.1-6 Mode 1

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

Table 5.1-7 Mode 2

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

● GSV---GNSS Satellites in View

Table 5.1-8 contains the values for the following example:

$GPGSV,3,1,12,28,81,285,42,24,67,302,46,31,54,354,,20,51,077,46*73

$GPGSV,3,2,12,17,41,328,45,07,32,315,45,04,31,250,40,11,25,046,41*75

$GPGSV,3,3,12,08,22,214,38,27,08,190,16,19,05,092,33,23,04,127,*7B

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Table 5.1-8 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Total number of messages[1]	3		Range 1 to 3
Message number[1]	1		Range 1 to 3
Satellites in view	12		
Satellite ID	28		Channel 1 (Range 01 to 32)
Elevation	81	degrees	Channel 1 (Range 00 to 90)
Azimuth	285	degrees	Channel 1 (Range 000 to 359)
SNR (C/No)	42	dB-Hz	Channel 1 (Range 00 to 99, null when not tracking)
Satellite ID	20		Channel 4 (Range 01 to 32)
Elevation	51	degrees	Channel 4 (Range 00 to 90)
Azimuth	077	degrees	Channel 4 (Range 000 to 359)
SNR (C/No)	46	dB-Hz	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.

● RMC---Recommended Minimum Specific GNSS Data

Table 5.1-9 contains the values for the following example:

$GPRMC,053740.000,A,2503.6319,N,12136.0099,E,2.69,79.65,100106,,,A*53

Table 5.1-9 RMC Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Time	053740.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2503.6319		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12136.0099		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed over ground	2.69	knots	True
Course over ground	79.65	degrees	
Date	100106		ddmmyy
Magnetic variation		degrees	
Variation sense			E=east or W=west (Not shown)
Mode	A		A=autonomous, D=DGPS, E=DR
Checksum	*53		

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<CR> <LF>			End of message termination

- **VTG---Course Over Ground and Ground Speed**

Table 5.1-10 contains the values for the following example:

$GPVTG,79.65,T,,M,2.69,N,5.0,K,A*38

Table 5.1-10 VTG Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPVTG		VTG protocol header
Course over ground	79.65	degrees	Measured heading
Reference	T		True
Course over ground		degrees	Measured heading
Reference	M		Magnetic
Speed over ground	2.69	knots	Measured speed
Units	N		Knots
Speed over ground	5.0	km/hr	Measured speed
Units	K		Kilometer per hour
Mode	A		A=autonomous, D=DGPS, E=DR
Checksum	*38		
<CR> <LF>			End of message termination

5.2 Proprietary NMEA input message

Please refer to BROADCOMM proprietary message.

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6 Pin assignment and descriptions

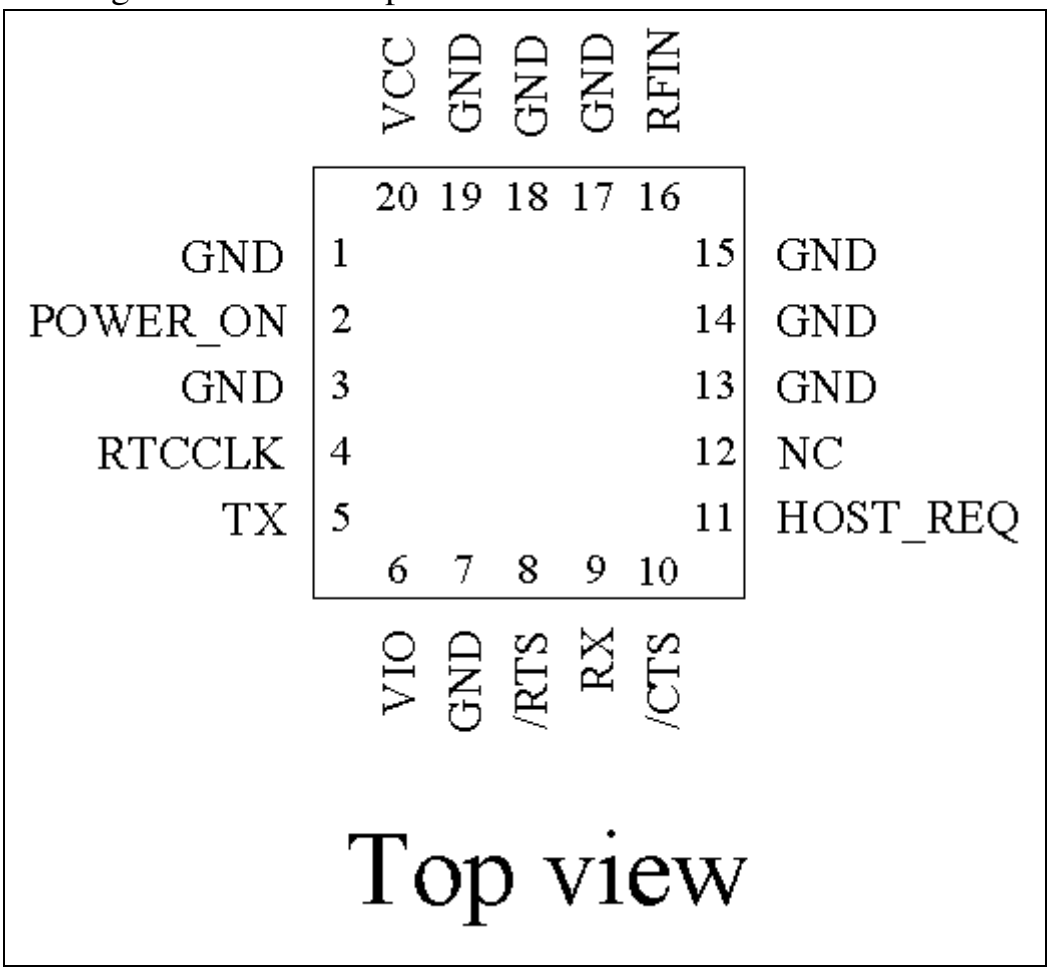

Table 6-1 Pin descriptions

Pin #	Name	Type	Description	Note
1	GND	P	Ground	
2	POWER_ON	I	Power-on control input. Active at “High” input. “Low” for deep sleep mode.	1
3	GND	P	Ground	
4	RTCCLK	I	RTC clock input	
5	TX_SCL	O	TX: UART transmit. A 100K pull-up resistor to VIO is required for transport detection.	
		I/O	SCL: I2C clock	
6	VIO	I	I/O supply voltage	
7	GND	P	Ground	
8	/RTS	O	UART request to send	
9	RX_SDA	I	RX: UART receive	
		I/O	SDA: I2C data	

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10	/CTS	I	UART clear to send	
11	HOST_REQ	O	Host request. Service request to master, used when I2C is active.	
12	NC		Not connect	
13	GND	P	Ground	
14	GND	P	Ground	
15	GND	P	Ground	
16	RFIN	I	GPS and GLONASS RF signal input	
17	GND	P	Ground	
18	GND	P	Ground	
19	GND	P	Ground	
20	VCC	P	DC supply voltage	

<Note>

1. In order to get Hot Start, use the pin POWER_ON to make BH-0606 go into sleep instead of directly turn off VCC. Besides, VIO must be still powered and maintain RTC clock to BH-0606.

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7 DC & Temperature characteristics

7.1 Absolute maximum ratings

Parameter	Symbol	Ratings	Units
DC Supply Voltage	VCC	5.5	V
I/O Supply Voltage	VIO	3.6	V
Operating Temperature Range	TAopr	-40 ~ 85	℃
Storage Temperature Range	TAstg	-40 ~ 85	℃

7.2 DC Electrical characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
DC Supply Voltage	VCC		2.8	3.3	5.5	V
I/O Supply Voltage	VIO		1.65	1.8 or 3.3	3.6	V
Supply Current to VCC	Icc	VCC = 3.3V, Peak Acquisition Tracking Sleep		 103 59(1) 15(2)	295	 mA mA mA uA
Supply Current to VIO	I_{VIO}			7		uA
High Level Input Voltage	V_{IH}		0.65*VIO		VIO	V
Low Level Input Voltage	V_{IL}		-0.3		0.3*VIO	V
High Level Output Voltage	V_{OH}		VIO-0.45		VIO	V
Low Level Output Voltage	V_{OL}				0.45	V
High Level Output Current	I_{OH}			2		mA
Low Level Output Current	I_{OL}			2		mA
Power on control input	POWER_ON	High (enabled)	0.9		3.6	V
		Low (shutdown)	0		0.45	V

Note 1: Measured when position fix is available and input voltage is 3.3V.

Note 2: POWER_ON = Low.

7.3 Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-30	-	85	℃
Storage Temperature	Tstg	-40	25	85	℃

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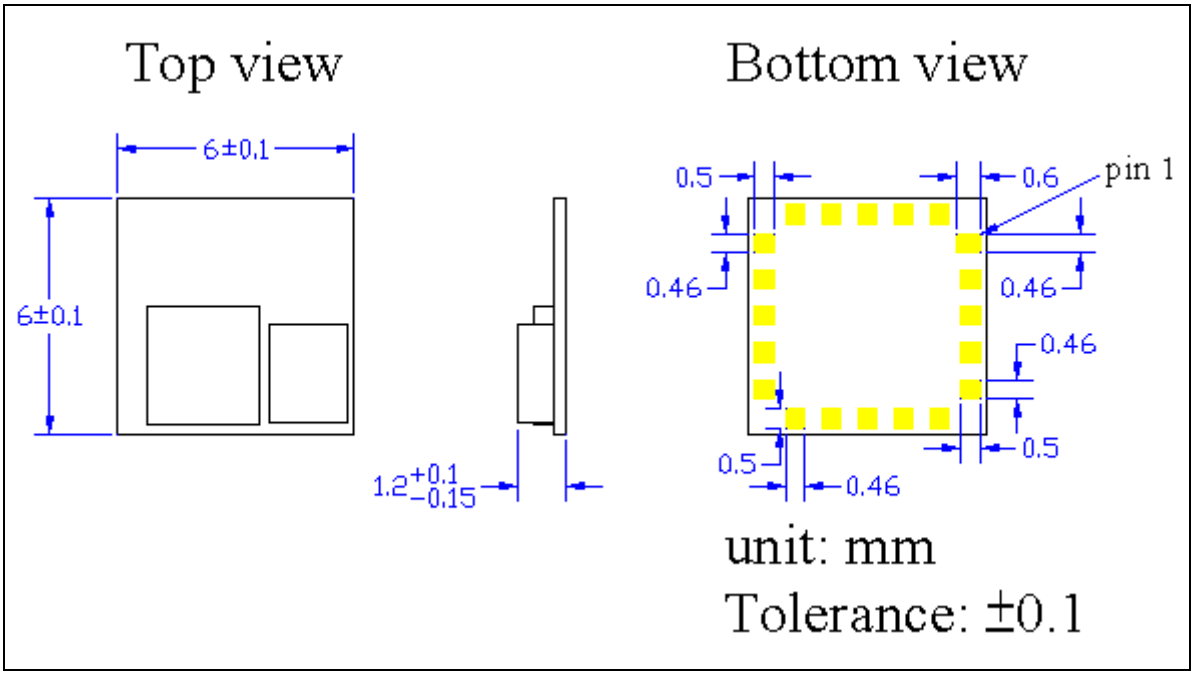
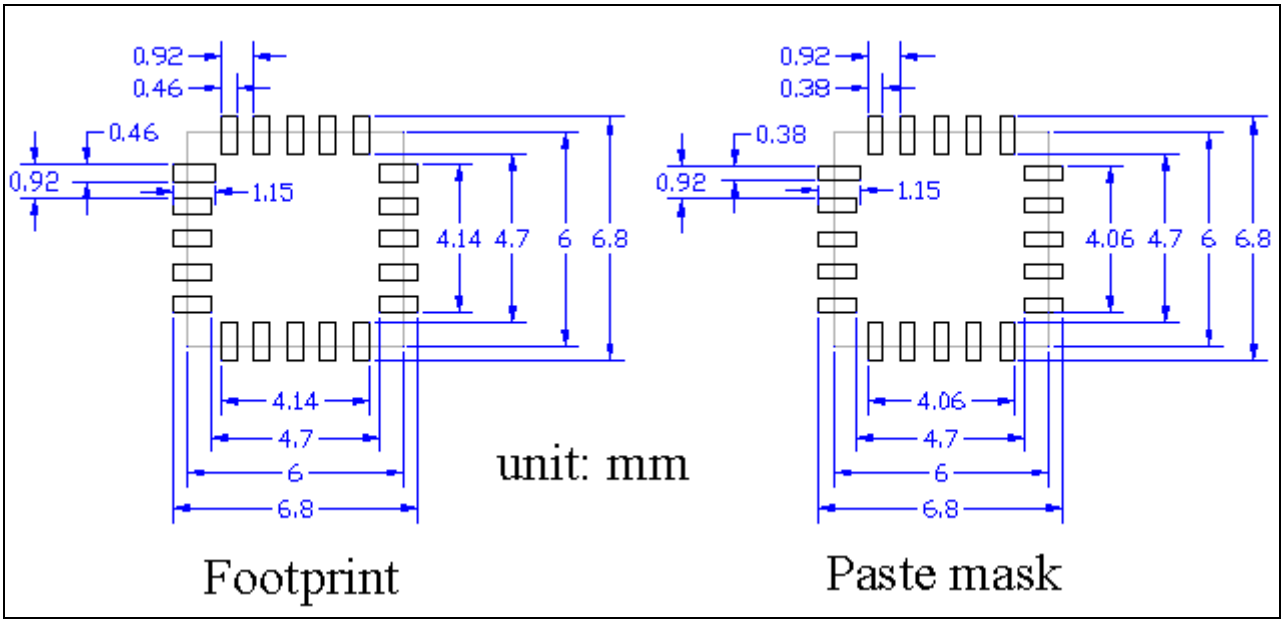
8 Mechanical specification

8.1 Outline dimensions



Note: This module should be covered by a metal shielding in order to avoid EMI from outside.

8.2 Recommended land pattern dimensions



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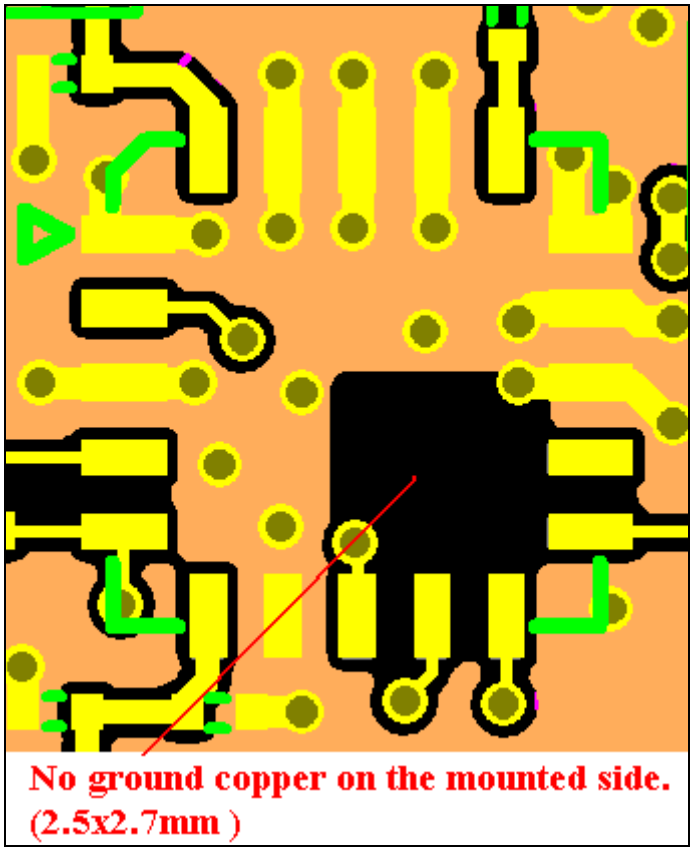
8.3 PCB layout note

- There must be at least 2 vias for each ground pin of BH-0606.
- If there is ground copper on the mounted side of BH-0606, do not pour ground copper at the lower right corner as below image.



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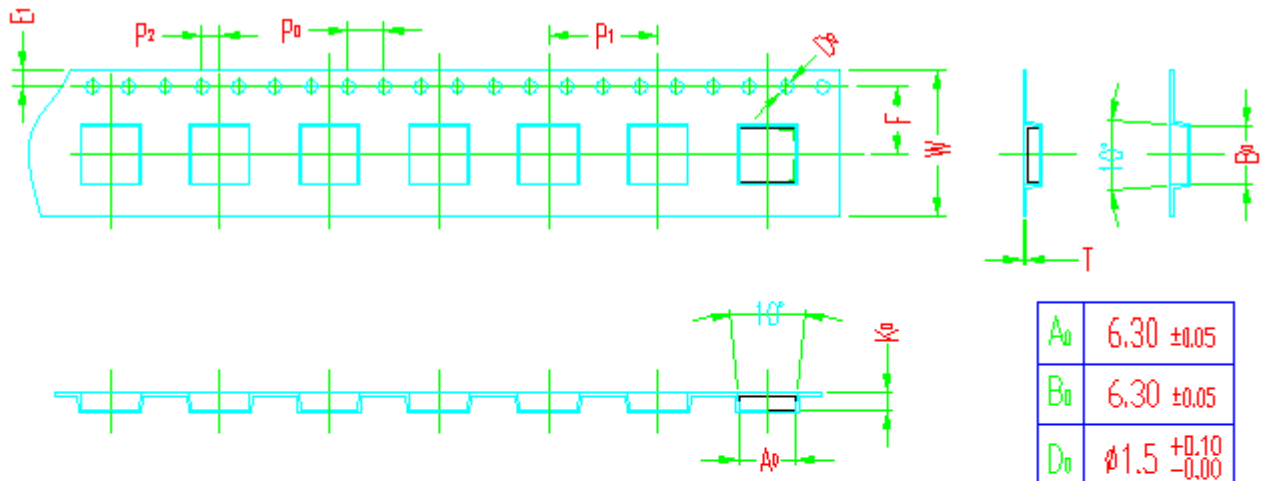
9 Reel Packing information



1. 10 sprocket hole pitch cumulative tolerance ±0.2
2. Camber not to exceed 1mm in 250 mm
3. A0 and B0 measured on a plane 0.30 mm above the bottom of the pocket
4. K0 measured from a plane on the inside bottom of the pocket to the top surface of the carrier .
5. pocket position relative to sprocket hole measured as true position of pocket,not pocket hole.
6. Component load per 13"reel: 3000 pcs
7. Packing length per 22"reel: 111 M
8. All dimensions meet EIA-481-D requirements.

A_0	6.30 ±0.05
B_0	6.30 ±0.05
D_0	ϕ1.5 $^{+0.10}_{-0.00}$
E_1	1.75 ±0.10
F	7.50 ±0.10
K_0	1.80 ±0.05
P_0	4.00 ±0.10
P_1	12.00 ±0.10
P_2	2.00 ±0.10
T	0.30 ±0.05
W	16.00 ±0.30

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Document change list

Revision 0.92

- Preliminary

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