

1. Product Information

1.1 Product Name

KH-1110-UB7X

1.2 Product Description

KH-1110-UB7X is a compact, high performance, and low power consumption GNSS engine board. It uses the chipset which can track up to 56 channels at a time and perform fast TTFF in weak signal environments.

1.3 Product Features

- High performance and low power consumption GNSS Chipset
- Very high sensitivity
- Extremely fast TTFF (Time To First Fix) at low signal level
- Built-in LNA
- 3Mbit of internal ROM and 2Mbit of RAM
- Compact size suitable for space-sensitive application
- One size component, easy to mount on another PCB board
- Support NMEA 0183 and binary protocol

1.4 Product Application

- Automotive navigation
- Personal positioning
- Fleet management
- Mobile phone navigation
- Marine navigation

2. Technical Specifications

GPS Performance	
Chipset	GNSS Chipset
Frequency	L1 frequency band
Code	C/A Code
Protocol	NMEA 0183 v4.1 GALILEO L1 open service (with upgrade) Default:GGA,GSA,GSV,RMC Support:VTG,GLL,TXT binary and NMEA Command
Available Baud Rate	9,600 bps
Channels	56
Internal ROM	3Mbit of ROM and 2Mbit of RAM
Sensitivity	Tracking:-162dBm Reacquisition:-162dBm ColdStart:-148dBm
Cold Start	29 seconds, average
Warm Start	28 seconds, average
Hot Start	1 second, average
Accuracy	HorizontalPosition:Autonomous<2.5m average, SBAS < 2.0m average Velocity: 0.1 m/s Timepulse signal: RMS 30 ns
Maximum Altitude	50,000 meter
Maximum Velocity	500 m/s(1000 knots)
Dynamics	≤ 4G
Update Rate	10 Hz
A-GPS	AssistNow on-line and off-line
Physical Characteristic	
Type	18 pin stamp holes
Dimensions	10.1mm * 9.7 mm * 2.5mm ±0.2mm
DC Characteristics	
Power Supply	2.8 ~ 3.6V
Backup Voltage	1.4 ~ 3.6V
Power Consumption	Max Performance: Acquisition:67mA Tracking: 67mA Eco Mode: Acquisition:39.5mA Tracking:29.5mA Power Save Mode: 5mA

Environmental Range	
Humidity Range	5% to 95% non-condensing
Operation Temperature	-40°C to 85°C
Storage Temperature	-40°C to 85°C

GLONASS Performance

GLONASS Performance	
Chipset	GNSS Chipset
Frequency	L1 frequency band
Protocol	GALILEO L1 open service (with upgrade) Default:GGA,GSA,GSV,RMC Support:TTG,GLL,TXT binary and NMEA Command
Available Baud Rate	9,600 bps
Channels	56
Internal ROM	3Mbit of ROM and 2Mbit of RAM
Sensitivity	Tracking:-158dBm Reacquisition:-158dBm ColdStart:-140 dBm
Cold Start	30 seconds, average
Warm Start	25 seconds, average
Hot Start	1 second, average
Accuracy	Horizontal Position: Autonomous<4.0m average, Velocity: 0.1 m/s Timepulse signal: RMS 50 ns
Maximum Altitude	50,000 meter
Maximum Velocity	500 m/s(1000 knots)
Dynamics	≤ 4G
Update Rate	1 Hz
Physical Characteristic	
Type	18 pin stamp holes
Dimensions	10.1mm * 9.7 mm * 2.5mm ±0.2mm
DC Characteristics	
Power Supply	2.8 ~ 3.6V
Backup Voltage	1.4 ~ 3.6V

Power Consumption	Max Performance: Acquisition:67mA Tracking: 67mA	KH-1110-UB7X
	Eco Mode: Acquisition:39.5mA Tracking:29.5mA	
	Power Save Mode: 5mA	
Environmental Range		
Humidity Range	5% to 95% non-condensing	
Operation Temperature	-40°C to 85°C	
Storage Temperature	-40°C to 85°C	

3. Technical Information

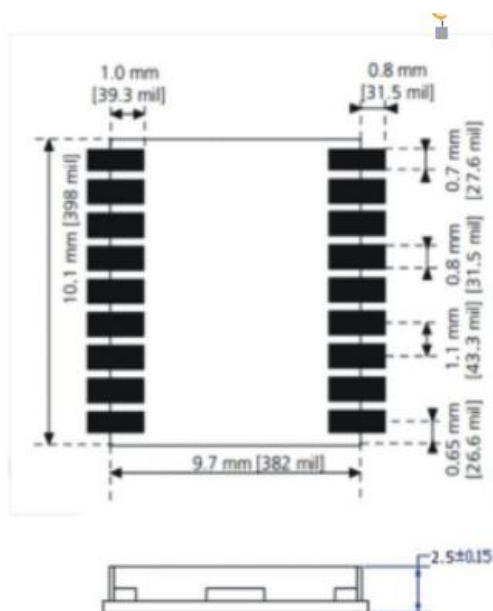
Module Pin Assignment

10	GND	VRESET	9
11	RF_IN	VCC	8
12	GND	NC	7
13	NC	V_BCKP	6
14	VCC_RF	NC	5
15	NC	TIMEPULSE	4
16	NC	RXD1	3
17	NC	TXD1	2
18	NC	GND	1

Pin NO.	Pin Name	I/O	Remark
1.	GND	G	Ground.
2.	TXD1	O	
3.	RXD1	I	
4.	TIMEPULSE	O	1 Pulse per second
5.	NC	N	Not connected
6.	V_BCKP	PWR	Backup battery supply voltage
7.	NC	N	Not connected
8.	VCC	PWR	Main power supply to the engine board.
9.	VRESET	I	Reset
10.	GND	G	Ground.
11.	RF_IN	RF	GPS antenna input

12.	GND	G	Ground.
13.	NC	N	Not connected
14.	VCC_RF		
15.	NC	N	Not connected
16.	NC	N	Not connected
17.	NC	N	Not connected
18.	NC	N	Not connected

Dimensions



unit: mm
Tolerance: ±0.1

4. NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a \$ and with carriage return/line feed. GPS specific messages all start with \$GPxxx where xxx is a three-letter identifier of the message data that follows. NMEA messages have a checksum, which allows detection of corrupted data transfers.

KH-1110-UB7X modules support the following NMEA -0183 messages: GGA, GLL,GSA, GSV, RMC and VTG.

Table 1: NMEA-0183 Output Messages

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

4.1 GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:

\$GPGGA, 161229.00,3723.24751,N, 12158.34160,W, 1,07,1.0,9.0,M.0000*18

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Position	161229.00		hhmmss.ss
Latitude	3723.24751		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	12158.34160		ddmm.mmmmm
E/W Indicator	W		E=east orW=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSLAltitude	9.0	meters	
Units	M	meters	
Geoids Separation		meters	
Units	M	meters	
Age of Diff.Corr.		second	Null fields when DGPS is not Used
Diff.Ref.Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

Table 2-1: 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	GPS PPS Mode, fix valid

4.2 GLL-Geographic Position – Latitude/Longitude

Table 3 contains the values of the following example:

\$GPGLL , 3723.24755, N,12158.34161,W,161229.00, A*2C.

Table 3: GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	3723.24755		Ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		ddmm.mmmmm
E/W Indicator	W		E=east orW=west
UTC Position	161229.00		Hhmmss.ss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR> <LF>			End of message termination

4.3 GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

\$GPGSA , A, 3, 07, 02, 26,27, 09, 04,15, , , , , , 1.8,1.0,1.5*33.

Table 4: GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1

Satellite Used	02		Sv on Channel 2
...
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

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

Table 4-1: Mode 1

Table 4-2: Mode 2

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

4.4 GSV-GNSS Satellites in View

Table 5 contains the values of the following example:

\$GPGSV , 2, 1, 07, 07, 79,048, 42, 02, 51,062, 43, 26, 36,256, 42, 27, 27,
138,42*71 \$GPGSV, 2, 2, 07, 09, 23,313, 42, 04, 19, 159, 41, 15,12,041, 42*41.

Table 5: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Message	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		

Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Maximum 90)
Azinmuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
...			...
Satellite ID	27		Channel 4(Range 1 to 32)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination

Depending on the number of satellites tracked multiple messages of GSV data may be required

4.5 RMC-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:

\$GPRMC, 161229.00, A, 3723.24751, N, 12158.34161,W, 0.13,309.62, 120598,,

*10 Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTS Position	161229.00		hhmmss.ss
Status	A		A=data valid or V=data not valid
Latitude	3723.24751		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		Ddmm.mmmmm
E/W Indicator	W		E=east orW=west
Speed Over Ground	0.13	Knots	
Course Over	309.62	Degrees	True

Ground			
Date	120598		Dummy
Magnetic variation		Degrees	E=east or W=west
Checksum	*10		
<CR> <LF>			End of message termination

4.6 VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

\$GPVTG, 309.62, T, M, 0.13, N, 0.2, K*6E

Table 7: VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course	309.62	Degrees	Measured heading
Reference	T		True
Course		Degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	Knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	K		Kilometer per hour
Date	*6E		
<CR> <LF>			End of message termination

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