SKM55U-XX Datasheet

USB GNSS GMouse

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1 General Description

The SkyLab SKM55U Series with embedded GNSS antenna enables high performance navigation in the most stringent applications and solid fix even in harsh GNSS visibility environments.

It is based on the high performance single-chip architecture, Its –165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the Gmouse was not possible before. The UART connector design is the easiest and convenient solution to communication with other electronic equipment.

Figure 1: SKM55U-XX Top View

说明：与旧版 SKM55 产品相比，本次产品外壳丝印改为 GNSS,去掉 LED 灯，线径改为 3.0mm。

Description: Compared with the old SKM55 product, the shell screen of this product is changed to GNSS, the LED lamp is removed, and the wire diameter is changed to 3.0mm.

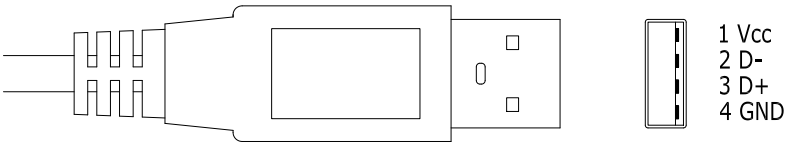
2 Applications

- 车辆导航/ Vehicle navigation
- 公交车智能交通/ Intelligent transportation of buses
- 车辆远程监控/ Remote vehicle monitoring

3 Features

- Ultra high sensitivity: -165dBm
- GPS or GPS/GLONASS or GPS/BDS/GLONASS receiver
- WAAS/EGNOS/MSAS/GAGAN support
- NMEA protocols (default speed: 9600bps)
- Internal back-up battery
- One serial port UART to USB
- Embedded patch antenna 25 x 25 x 4.0 mm
- Operating temperature range: -40 to 85℃
- RoHS compliance (Lead-free)
- FCC,CE compliance
- Tiny form factor ： 46 * 45 * 15mm

4 Pin Assignment



USB Connector

Figure 2: SKM55U-XX Series Pin Package

5 Performance Specification

Parameter	Specification
GNSS receiver	
Receiver Type	GPS/QZSS L1C/A GLONASS L1 BDS L1 SBAS: WAAS, EGNOS, MSAS

Sensitivity	Tracking Acquisition	-161dBm -148dBm
Accuracy	Position Velocity Timing (PPS)	2.5m CEP50 without SA(Typical Open Sky) 0.1m/s without SA 30ns RMS
Acquisition Time	Cold Start Warm Start Hot Start Re-Acquisition	29s 28s 1s 5s
Power Consumption	Tracking Acquisition Sleep/Standby	<70mA @3.3V Typical <68mA @3.3V TBD
Navigation Data Update Rate	Max 10Hz	Default 1Hz
Operational Limits	Altitude Velocity Acceleration	Max 50,000m Max 500m/s Less than 4g
Antenna Specifications		
Outline Dimension	25 x 25 x 4.0 mm	
Impedance	50 Ω	
Axial Ratio	3 dB max	
Polarization	RHCP	
Mechanical requirements		
Dimension	46*45*15mm	
Weight	90g	
Power Supply		
VCC	3.5~5.5V	

Current	100mA(typical)
Environment	
Operating temperature	-40 ~ +85 ℃ (w/o backup battery)
Storage temperature	-40 ~ +125 ℃
Humidity	≦95%

Parameter	**Specification**	
GPS receiver		
Receiver Type	GPS L1 frequency band, C/A code	
Sensitivity	Tracking Acquisition	-165dBm -148dBm
Accuracy	Position Velocity	3.0m CEP50 without SA(Typical Open Sky) 0.1m/s without SA
Acquisition Time	Cold Start Warm Start Hot Start Re-Acquisition	32s 23s 1s <1s
Power Consumption	Tracking Acquisition	<40mA @3.3V Typical <35mA @3.3V
Navigation Data Update Rate	1Hz	
Operational Limits	Altitude Velocity Acceleration	Max 18,000m Max 515m/s Less than 4g
Antenna Specifications		
Outline Dimension	25 x 25 x 4.0 mm	
Center Frequency	1575 ± 3 MHz	
Bandwidth	10 MHz min	

Impedance	50Ω
Axial Ratio	3dB max
Polarization	RHCP
Mechanical requirements	
Dimension	46*45*15mm
Weight	90g
Power Supply	
VCC	3.5~5.5V
Current	80mA(typical)
Environment	
Operating temperature	-40 ~ +85 ℃ (w/o backup battery)
Storage temperature	-40 ~ +125 ℃
Humidity	≦95%

6 Hardware Interfaces Configuration

Power Supply: Regulated power for the SKM55U-GPS series is required. The input voltage VCC should be 3.3V~5.5V, current is no less than 150mA. Suitable decoupling must be provided by external decoupling circuitry(10uF and 1uF). It can reduce the Noise from power supply and increase power stability.

UART Ports: The SKM55U-GPS series supports one full duplex serial channels UART. The serial connections are at 2.85V LVTTL logic levels, if need different voltage levels, use appropriate level shifters. the data format is however fixed: X, N, 8, 1, i.e. X baud rate, no parity, eight data bits and one stop bit, no other data formats are supported, LSB is sent first. The modules default baud rate is set up 9600bps.

USB Ports: The SKM55U-GPS series uses single-chip USB to UART bridge, It is a USB 2.0 compliant full-speed device with integrated transceiver. Before using it, please install the appropriate driver.

7 Pin Description

Pin No.	Pin name	I/O	Description	Remark
USB Port (USB Connector)				
1	VCC	P	USB Power Supply	5.0V

2	D-	I\O	Data-	
3	D+	I\O	Data+	
4	GND	G	USB Power Supply	Reference Ground

8 Mechanical Specification

USB Connector

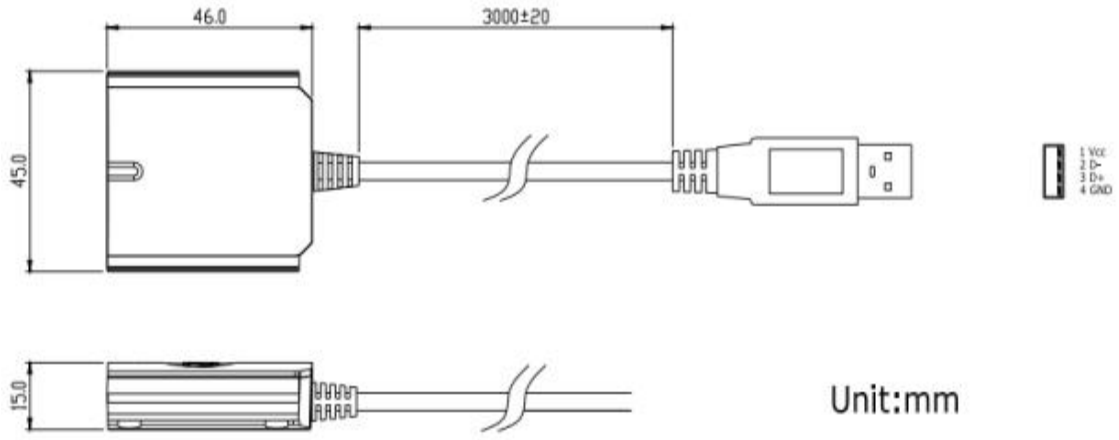


Figure 3: SKM55U-XX Series Connector

9 Ordering Information

Module No.	Electrical level	GNSS Receiver Type
SKM55U-Q	USB	GPS/BDS/GLONASS
SKM55U-U8	USB	GPS/GLONASS
SKM55U-U7	USB	GPS

10 User's Guide

Installing the USB Driver to you Laptop

Driver updates can be found at Silab's web-site:

https://www.wch.cn/downloads/category/67.html?feature=USB%E8%BD%AC%E4%B8%B2%E5%8F%A3&product_name=CH9102

Com Port Verification

1. Once your USB Driver has been installed, you will need to confirm which COM Port your PC has assigned to it in order to properly configure any software that will be utilizing the GPS data being received.
2. Your USB GPS must be plugged into your USB port at this time.
3. Using Window's Control Panel, select System > Hardware > Device Manager
4. Then look under the heading of: PORTS (Com & LPT)
5. There should be a listing for: CP210x USB to UART Bridge Controller (COM x) ("x" will actually be the number your PC has assigned the USB GPS receiver).
6. Once you have identified the COM port number, any software that you utilize must be configured to read GPS data from this COM port.

We strongly suggest that you first test your USB GPS with the included GPS Info utility program to confirm that the GPS receiver if functioning properly on your PC and that you have successfully configured the right COM Port setting. Once this has been done, close the GPS Info program and start your application for COM port configuration.

Note: By default, your PC will not allow you to run multiple applications from a single COM port. It is important that you close any previously opened GPS application before switching to another GPS application as the GPS receiver and data will not be found by the new program.

There are special utilities available to split data into multiple COM ports for use by more than one application simultaneously. (see:http://franson.com/gpsgate/)

Initialing your GPS receiver

Before using your USB GPS receiver for navigation (especially for the first time), the receiver must obtain a local GPS fix (coordinates) of the current position. To do this, take your laptop (with your USB driver and the mapping software loaded and configured) to an open area that has a clear view to the sky (such as a park or empty field). Start your software (or the included GPS Info utility program) and wait for initialization of the GPS to complete. This may take a few minutes depending on various factors such as the distance of the current coordinates from the last time the GPS receiver was activated, GPS signal strength and surrounding

terrain (tall trees and buildings can block the satellite signals). In some cases initialization can take up to several minutes depending on the conditions .

Coordinates scrolling with zero's means that the port connection is complete, but the satellite data is not being received yet (possibly still initializing or in a bad area for satellite reception).

Using/Testing your GPS Receiver

Once the USB GPS receiver's driver and your personal mapping software have been installed and configured properly, you can begin to use your navigation system by plugging the USB GPS into your laptop's USB port and launching your mapping software.

11 Software Protocol

NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a $ and with carriage return/line feed. BD/GPS specific messages all start with $GNxxx 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.

The Skylab SKM55U-3GB supports the following NMEA-0183 messages: GGA, GLL, GSA, GSV, RMC VTG, ZDA. The module default NMEA-0183 output is set up GGA、GSA、RMC、GSV , and default baud rate is set up 9600bps.

Table 1: NMEA-0183 Output Messages

NMEA Record	Description	Default
GNGGA	Global positioning system fixed data	Y
GNGLL	Geographic position—latitude/longitude	N
GPGSA	GPS DOP and active satellites for GPS	Y
BDGSA	Beidou DOP and active satellites for BD	Y
GPGSV	GPS satellites in view for GPS	Y
BDGSV	Beidou satellites in view for BD	Y
GNRMC	Recommended minimum specific GNSS data	Y

GNVTG	Course over ground and ground speed	N
GNZDA	Date and Time	N

GGA-Global Positioning System Fixed Data

This sentence contains the position, time and quality of the navigation fix.

See RMC for Fix Status, Fix Mode, Fix Date, Speed, and True Course.

See GSA for Fix Type, PDOP, and VDOP.

$GNGGA,013134.000,2232.1711,N,11401.1946,E,1,9,1.17,45.2,M,-2.2,M,,*70

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	$GNGGA		GGA protocol header
UTC Position	013134.000		hhmmss.sss
Latitude	2232.1711		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	11401.1946		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	9		Range 0 to 12
HDOP	1.17		Horizontal Dilution of Precision
MSL Altitude	45.2	meters	Altitude (referenced to the Ellipsoid)
AltUnit	M	meters	Altitude Unit
GeoSep	-2.2	meters	Geoidal Separation
GeoSepUnit	M	meters	Geoidal Separation Unit
Age of Diff.Corr.	<Null>	second	Null fields when it is not Used
Diff.Ref.Station ID	<Null>		Null fields when it is not Used
Checksum	*74		
EOL	<CR> <LF>		End of message termination

Table 2-1: Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	PPS Mode, fix valid

GLL-Geographic Position – Latitude/Longitude

This sentence contains the fix latitude and longitude.

$GNGLL,2232.1799,N,11401.1824,E,021513.000,A,A*50

Table 3: GLL Data Format

Name	Example	Units	Description
Message ID	$GNGLL		GLL protocol header
Latitude	2232.1799		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	11401.1824		dddmm.mmmm
E/W Indicator	E		E=east or W=west
UTC Position	021513.000		hhmmss.sss
Fix Status	A		A=data valid or V=data not valid
Fix Mode	A		A=autonomous, N = No fix, D=DGPS, E=DR
Checksum	*50		
EOL	<CR> <LF>		End of message temination

GSA-GNSS DOP and Active Satellites

This sentence contains the mode of operation, type of fix, PRNs of the satellites used in the solution as well as PDOP, HDOP and VDOP.

$GPGSA,A,3,25,20,32,29,31,16,,,,,,,1.54,1.26,0.88*13

GPS GSA message: ID1 to ID32 for GPS satellites

$BDGSA,A,3,10,,,,,,,,,,,,1.54,1.26,0.88*17

BD message: ID1 to ID30 for BD satellites

Table 4: GSA Data Format

Name	Example	Units	Description
Message	$GPGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
ID of satellite used	28		Sv on Channel 1
ID of satellite used	20		Sv on Channel 2
…	…		…
ID of satellite used	<Null>		Sv on Channel 12 (Null fields when it is not Used)
PDOP	1.14		Position Dilution of Precision
HDOP	0.75		Horizontal Dilution of Precision
VDOP	0.85		Vertical Dilution of Precision
Checksum	*2F		
EOL	<CR> <LF>		End of message termination

Table 4-1: Mode 2

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

Table 4-2: Mode 1

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

GSV-GNSS Satellites in View

This sentence contains the PRNs, azimuth, elevation, and signal strength of all satellites in view.

$GPGSV,4,1,13,14,53,105,,16,46,228,27,31,46,011,28,32,39,289,23*72

$GPGSV,4,2,13,29,23,067,20,06,17,183,13,22,16,172,17,20,15,307,29*70

$GPGSV,4,3,13,27,08,188,17,25,07,039,33,03,04,197,17,33,,,*42

$GPGSV,4,4,13,193,,,*40

GPS GSV message: ID1 to ID32 for GPS satellites

$BDGSV,1,1,03,10,46,329,31,08,43,161,,09,40,217,*52

BD GSV message: ID1 to ID30 for BD satellites

Table 5: GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Message	4		Total number of GSV sentences
Message Number	1		Sentence number of the total
Satellites in View	13		Number of satellites in view
Satellite ID	207		Channel 1
Elevation	79	degrees	Channel 1(Range 00 to 90)
Azinmuth	304	degrees	Channel 1(Range 000 to 359)
SNR(C/NO)	34	dB-Hz	Channel 1(Range 00 to 99, null when not tracking)
…			…
Satellite ID	210		Channel 4(Range 01 to 32)
Elevation	60	degrees	Channel 4(Range 00 to 90)
Azimuth	245	degrees	Channel 4(Range 000 to 359)
SNR(C/NO)	28	dB-Hz	Channel 4(Range 00 to 99, null when not tracking)

Checksum	*41		
EOL	<CR> <LF>		End of message termination

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

RMC-Recommended Minimum Specific GNSS Data

This sentence contains the recommended minimum fix information.

See GGA for Fix Quality, Sats Used, HDOP, Altitude, Geoidal Separation, and DGPS data.

See GSA for Fix Type, PDOP and VDOP.

$GNRMC,013133.000,A,2232.1711,N,11401.1946,E,0.017,0.00,040513,,,A*4E

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	$GNRMC		RMC protocol header
UTS Position	013133.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2232.1711		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	11401.1946		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed Over Ground	0.017	Knots	
Course Over Ground	0.00	Degrees	True Course
Date(UTC)	040513		ddmmyy
Magnetic variation	<Null>	Degrees	Null fields when it is not Used
Magnetic Variation Direction	<Null>		E=east or W=west (Null fields when it is not Used)
Fix Mode	A		A=autonomous, N = No fix, D=DGPS, E=DR
Checksum	*6B		
EOL	<CR> <LF>		End of message termination

VTG-Course Over Ground and Ground Speed

This sentence contains the course and speed of the navigation solution.

$GNVTG,148.81,T,,M,0.13,N,0.24,K,A*3D

Table 7: VTG Data Format

Name	Example	Units	Description
Message ID	$GNVTG		VTG protocol header
Tcourse	148.81	Degrees	True Course
Reference	T		T = True
Mcourse	<Null>	Degrees	Magnetic Course (Null fields when it is not Used)
Reference	M		M = Magnetic (Null fields when it is not Used)
Speed over ground	0.13	Knots	Nautical Miles per Hour
Units	N		Knots
Speed over ground	0.24	Km/hr	in Kilometers per Hour
Units	K		Kilometer per hour
Mode	A		A=Autonomous, N=No fix, D=DGPS, E=DR
Checksum	*3D		
EOL	<CR> <LF>		End of message termination

ZDA-Date and Time

This sentence contains UTC date & time, and local time zone offset information.

$GNZDA,023345.000,10,04,2010,,*50

Table 8: ZDA Data Format

Name	Example	Units	Description
Message ID	$GNZDA		ZDA protocol header
UTC Time	023345.000		hhmmss.sss
Day	10		UTC time: day (01 ... 31) dd
Month	04		UTC time: month (01 ... 12) mm

Year	2010		UTC time: year (4 digit year) yyyy
local zone hours	<null>		Local Time Zone Offset Hours (Null fields when it is not Used)
local zone minutes	<null>		Local Time Zone Offset Minutes (Null fields when it is not Used)
Checksum	*50		
EOL	<CR> <LF>		End of message termination

12 Contact Information

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