SkyNav SKM50 Series
Ultra High Sensitivity and Low Power
The G-Mouse GPS Receiver

SKYLAB
Simplify your systems

General Description

The SkyNav SKM50 Series with embedded GPS antenna enables high performance navigation in the most stringent applications and solid fix even in harsh GPS visibility environments.

It is based on the high performance features of the MediaTek 3327 single-chip architecture, Its –165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The UART and USB connector design is the easiest and convenient solution to communication with other electronic equipment.

Applications

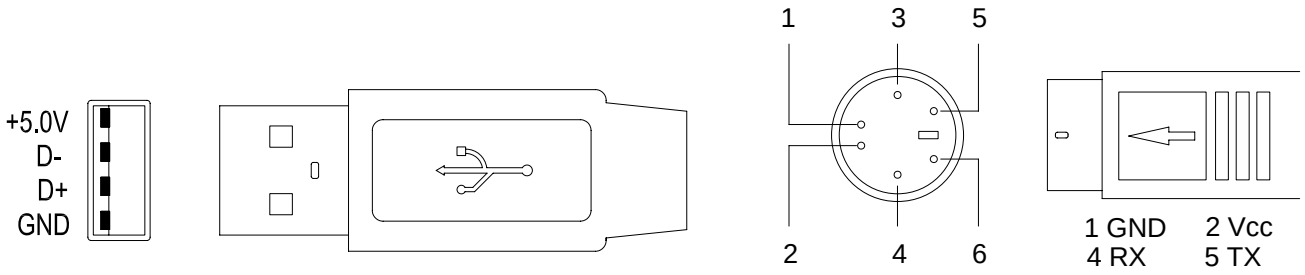
- LBS (Location Based Service)
- Vehicle navigation system
- PND (Portable Navigation Device)
- Timing application
- Personal Laptop

Figure 1: SKM50 Series Top View

Features

- Ultra high sensitivity: -165dBm
- 22 tracking/66 acquisition-channel receiver
- WAAS/EGNOS/MSAS/GAGAN support
- NMEA protocols (default speed: 9600bps)
- Internal back-up battery
- One serial port and USB port (option)
- Embedded patch antenna 25 x 25 x 4.0 mm
- Operating temperature range: -40 to 85℃
- RoHS compliant (Lead-free)
- Tiny form factor ： 54mm Diameter 15.6mm Height

Pin Assignment



USB **UART**

Figure 2: SKM50 Series Pin Package

Performance Specification

Parameter	Specification	
GPS receiver		
Receiver Type	L1 frequency band, C/A code, 22 Tracking / 66 Acquisition-Channel	
Sensitivity	Tracking Acquisition	-165dBm -148dBm
Accuracy	Position Velocity Timing (PPS)	3.0m 3D RMS without SA 0.1m/s without SA 60ns RMS
Acquisition Time	Cold Start Warm Start Hot Start Re-Acquisition	36s 33s 1s <1s
Power Consumption	Tracking Acquisition Sleep/Standby	<30mA @3.0V 40mA @3.0V TBD
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	50 Ω	
Axial Ratio	3 dB max	
Polarization	RHCP	
Mechanical requirements		
Dimension	54mm Diameter 15.6mm Height	
Weight	50g	
Power consumption		
VCC	5V ±5%	
Current	50mA(typical)	
Environment		
Operating temperature	40 ~ +85 ℃ (w/o backup battery)	
Storage temperature	40 ~ +125 ℃	
Humidity	≦95%	

Hardware Interfaces Configuration

Power Supply: Regulated power for the SKM50 series is required. The input voltage Vcc should be 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 SKM50 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. The RX & TX recommended to pull up (10KΩ). It can increase the stability of serial data.

USB Ports: The SKM50 series uses single-chip USB to UART bridge by Prolific PL2303HX, It is a USB 2.0 compliant full-speed device with integrated transceiver. Before using it, please install the appropriate driver.

Pin Description

Pin No.	Pin name	I/O	Description	Remark
UART Port				
1	GND	G	Power Ground	Reference Ground
2	5V	P	Power Supply	VCC:5V±5%
3	NC			
4	RX	O	TTL:VIH ≥0.7 *VDD VIL ≤0.3 *VDD	
5	TX	I	TTL:VOH≥0.75 *VDD VOL≤0.25VDD	
6	NC			
USB Port				
1	5V	P	USB Power Supply	
2	D-	I\O	Data-	
3	D+	I\O	Data+	
4	GND	G	USB Power Supply	

Ordering Information

SKM50S：UART Port Interface
SKM50U：USB Port Interface

User's Guide

Installing the USB Driver to you Laptop

Driver updates can be found at Prolific's web-site:http://www.prolific.com.tw/eng/downloads.asp?ID=31 (www.prolific.com.tw)

If your Windows is Vista version, please double click on "PL-2303 Vista Driver Installer.exe"to begin installation. Follow the instruction to complete the installation process.

If your Windows is XP or 2000 version, please double click on"PL-2303 Driver Installer.exe"to begin installation. Follow the instruction to complete the installation process.

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: Prolific Serial-to-USB Comm Port (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.

Software Protocol

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. The SkyNav SKM50 series supports the following NMEA-0183 messages: GGA, GSA, GSV, RMC .

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
ZDA	Time and Date

GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:
$GPGGA, 083559.00,3723.2475,N, 12158.3416,W, 1,07,1.0,9.0,M, ,M, ,0000*18

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Time	083559.00		hhmmss.sss
Latitude	3723.2457		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12158.3416		ddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 00 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	Altitude above mean seal level
Units	M	meters	
Geoids Separation		meters	Separation from Geoids can be bank
Units	M	meters	
Age of Diff.Corr.		second	Null fields when DGPS is not Used
Diff.Ref.Station ID	0000		Null fields when DGPS is not Used
Checksum	*18		

<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

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

GLL-Geographic Position – Latitude/Longitude

Table 3 contains the values of the following example:
$GPGLL , 3723.2475, N,12158.3416, W, 083559.00, A*2C.

Table 3: GLL Data Format

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.2475		Ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		Ddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Time	083559.00		Hhmmss.sss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR> <LF>			End of message temination(ASCII 13, ASCII 10)

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	$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(ASCII 13, ASCII 10)

Table 4-1: Mode 1

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

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

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(ASCII 13, ASCII 10)

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

RMC-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:
$GPRMC, 083559.00, A, 3723.2475, N, 12158.3416, W, 0.13, 309.62, 120598, , *10

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Time	083559.00		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		Ddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over Ground	309.62	Degrees	True
Date	120598		Dummy
Magnetic variation		Degrees	Not used
E/W indicator			Not used
Mode			Only NMEA0183 version 3.00 output
Checksum	*10	hexadecimal	
<CR> <LF>			End of message termination(ASCII 13, ASCII 10)

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	*6E		
<CR> <LF>			End of message termination

ZDA-Date and Time

Table 8 contains the values of the following example:

$GPZDA, 082710.00,04,07,2002,00,00*60

Name	Example	Units	Description

Message ID	$GPZDA		ZDA protocol header
UTC Time	082710.00		hhmmss.sss
Day	04		UTC time: day （01 ... 31）
Month	07		UTC time: month （01 ... 12）
Year	2002		UTC time: year （4 digit year）
local zone hours	00		Not supported (fixed to 00)
local zone minutes	00		Not supported (fixed to 00)
Checksum	*60		
<CR> <LF>			End of message termination

FAQ’s

Why does the GPS not work near buildings and other tall objects?

The GPS uses satellites in the space to find out where it is. Therefore it needs a clear view of the sky. Tall buildings and other objects that block the receiver’s view to the sky make it infeasible to determine your location. Sometimes the satellites are not overhead but near the horizon. In these cases the GPS must have a clear view of the horizon.

What is ideal GPS environment?

The GPS requires an open, clear view of the sky. Buildings, covered parking areas, tunnels and dense foliage can cause the GPS receiver to be unable to get a location fix.

If you are parked in a covered parking lot or near a tall building, it is recommended that you drive away until you have a clear view of the sky before using the SKM50. You may need to give the GPS a few minutes to find or get a fix its location.

Will the USB GPS work with other Street Mapping software?

GPS receivers provides standard NMEA data for mapping software to use and convert to coordinates and should work well with most any NMEA compliant software on the market today.

I an not getting GPS data into my application.

1. Check your DEVICE MANAGER to confirm the COM Port number assigned to the GPS Receiver (it will be listed under the PORTS (COM & LPT) heading as Prolific Serial-to-USB Comm. Then be sure this is the same COM port number configured in your application.
2. Be sure your Baud rate is configured correctly at: Baud Rate: 9600
   Data bit: 8
   Parity: None
   Stop Bit: 1
   Flow Control: None
3. Re-boot your computer and then insert the USB GPS into a USB port.
4. Configure the GPS Info utility with the correct COM Port and test your GPS receiver first before using it in your application.

How to Reach Us:

Skylab M&C Technology Co., Ltd.
Address: Room.801, Bldg.211, Terra Industrial Park, Futian District, Shenzhen
Phone: 86-755 8340 8210（Sales Support）
Phone: 86-755 8340 8130（Technical Support）
Fax: 86-755-8340 8560
E-Mail: sales@skylab.com.cn