

SKM2102SR-40FXT规格书 /Datasheet

L1+L5 GNSS G-Mouse

系列型号/Serial model No.:

SKM2102SR-40F3T

SKM2102SR-40F5T

SKM2102SR-40F8T

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1 产品简介/Product introduction

SKYLAB SKM2102SR 具有嵌入式 GNSS 天线，可以在最严格的应用程序中实现高性能导航，甚至在严酷的 GNSS 可见环境中也能实现可靠的定位。它是基于单片架构的高性能 GNSS 单芯片，-162dBm 跟踪灵敏度将定位覆盖扩展到城市峡谷和茂密的树叶环境中。标准连接插头的设计是与其他电子设备进行通信的最简单、最方便的解决方案。

The SKYLAB SKM2102SR has an embedded GNSS antenna, which enables high performance navigation in the most stringent applications and reliable positioning even in harsh GNSS visibility environments. It is a high-performance GNSS single chip based on a monolithic architecture with a -165dbm tracking sensitivity that extends positioning coverage into urban canyons and dense leafy environments. The standard connector plug is designed to be the simplest and most convenient solution for communicating with other electronic devices.



Figure 1: SKM2102SR-40FXT Top View

2 典型应用/Applications

- ◆ LBS（基于位置的服务）/LBS (Location-based Services)
- ◆ PND（便携式导航设备）/PND (Portable Navigation Equipment)
- ◆ 车载导航系统 /Car Navigation System

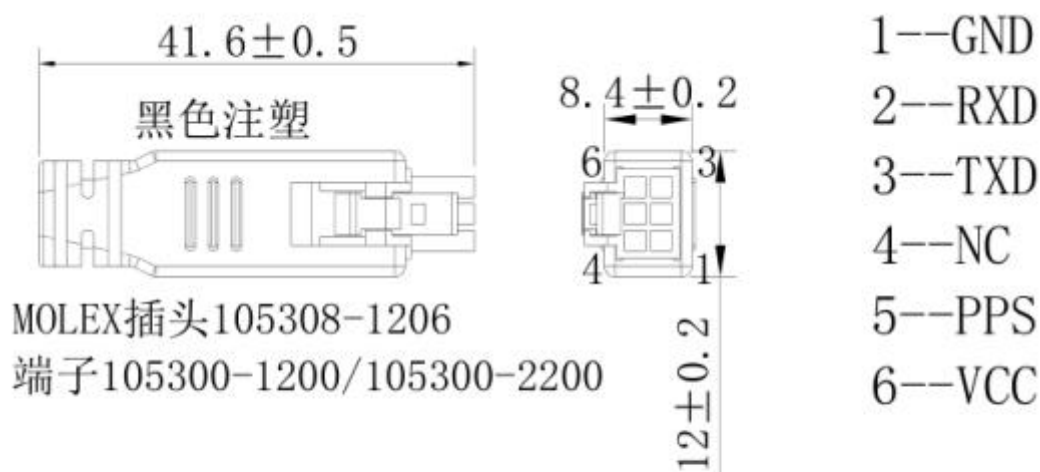
3 产品特点/Features

- ◆ BDS、GPS、GLONASS、Galileo、QZSS、SBAS 和 Navic 多系统接收 /BDS, GPS, GLONASS, Galileo, QZSS, SBAS and Navic multi-system reception
- ◆ 支持 BDS B1C 频段/ Support BDS B1C band
- ◆ 超高灵敏度/Ultra high sensitivity: -162dBm
- ◆ NMEA 协议（默认波特率：115200 bps）/NMEA protocol (default baud rate: 115200 BPS)
- ◆ 内部备用电池/Internal spare battery
- ◆ 嵌入式陶瓷天线 25 x 25 x 4.0mm 及 35 x35 x4.0mm/ Embedded ceramic antenna 25 x 25 x4.0mm and 35 x35 x4.0mm
- ◆ 高级特性/Advanced Features: Always Locate; AIC; EPO; EASY
- ◆ 工作温度范围/Operating temperature range: -40~85℃
- ◆ 符合 ROHS, CE, FCC 标准/Compliance with ROHS, CE, FCC standards
- ◆ 尺寸/ Size: 50.7* 48.5* 18.5mm

4 型号说明/Model Code



5 接口定义/Interface definition



RXD:Serial Data Input To Gmouse
TXD:Serial Data Output From Gmouse

图 2: SKM2102SR-40FXT 接口定义

6 接口描述/Interface description

电源: SKM2102SR 系列输入电压 VCC 范围为 3.5V~5.5V, 电流要求大于 100mA。靠近接口电源的地方请放置去耦电容 (10uF 和 1uF)。

Power supply: SKM2102SR series input voltage VCC range is 3.5V~5.5V, current requirement is greater than 100mA. Place decoupling capacitors (10uF and 1uF) close to the interface power supply.

UART 端口: SKM2102SR 系列支持一个完整的双工系列通道 UART。

UART port: The SKM2102SR series supports a complete duplex series channel UART.

RS232 电平: SKM2102SR 系列使用单芯片 RS232 到 UART bridge, 它是 5V 驱动的 EIA / TIA-232 和 V.28/V.24。

RS232 level: The SKM2102SR series uses a single-chip RS232 to UART bridge, which is 5V driven EIA/TIA-232 and V.28/V.24.

序号/NO.	名称 /Name	输入/输出 Input/Output	描述/Describe	备注/Remark
MOLEX 连接头 105308-1206/ MOLEX connector 105308-1206				
1	GND	G	Power Ground	Reference Ground

2	RXD	I	UART Serial Data Input To SKM2102SR	RS232
3	TXD	O	UART Serial Data Output From SKM2102SR	RS232
4	NC		Not Connect	
5	PPS	O	Time Pulse Signal (Default 100ms)	
6	VCC	P	Power Supply	VCC:3.5V~5.5V

7 性能介绍/Performance introduction

项目/Items	参数/Parameter	
接收类型/Type of receipt	GNSS	
灵敏度/Sensitivity	跟踪/Tracking	-162dBm
	捕获/Acquisition	-148dBm
精度/Accuracy	定位精度/Position	Open-Sky CEP<1m
	漂移速度/Velocity	0.1m/s
定位时间/Acquisition Time	冷启动/Cold Start	≤28s
	热启动/Hot Start	<1s
	重捕获/Re-Acquisition	≤1s
电源功耗/ Power Consumption	跟踪/Tracking	56~59mA @5V Typical
	捕获/Acquisition	57~62mA @5V
NMEA 输出频率/ NMEA output frequency		1Hz
使用范围/ Operational Limits	速度 Velocity	Max 515m/s
	加速度/Acceleration	<4g
天线指标/Antenna design		
外型尺寸/External dimension	25 x 25 x 4.0mm 或 35 x35 x4.0mm	
频点/Frequency point	GPS/QZSS :L1CA, L1C,L5 GLONASS: L1(Off by default) BeiDou: B1I,B2a,B1C GALILEO: E1,E5 SBAS: WAAS, EGNOS, MSAS, GAGAN, SDCM (L1) (Off by default) L1 频点: 1575.42, 支持 L1 /E1/B1C/L1, 及附近频点: B1/B1I L5 频点: 1176.42, 支持: L5/B2a/L5, 及附近频点: E5	
阻抗/Impedance	50Ω±10%	
轴比/Axial ratio	3 dB max	

极化/Polarization	右极化(RHCP) /Right polarization (RHCP)
机械特性/Mechanical characteristics	
尺寸/Size	50.7* 48.5 * 18.5mm
电源功耗/Power Consumption	
电压/Voltage	3.5V~5.5V
电流/Electric current	53mA(typical)
工作环境/Operating environment	
工作温度范围/ Operating temperature	-40 ~ +85 °C （不包括备份电池）
存储温度/ storage temperature	-40 ~ +105 °C
湿度/ Humidity	≤95%

8 模块尺寸/Module size

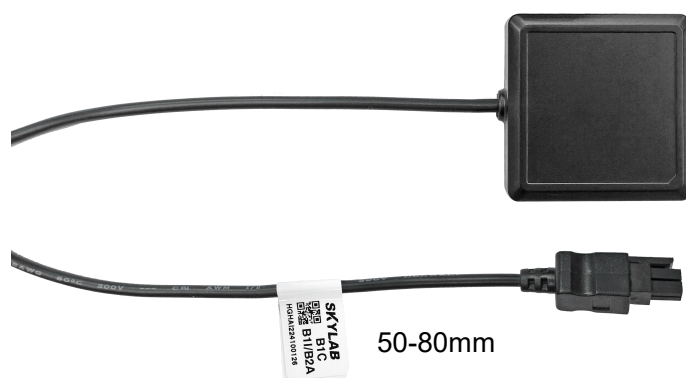


图 3 SKM2102SR-40FXT Log 标签

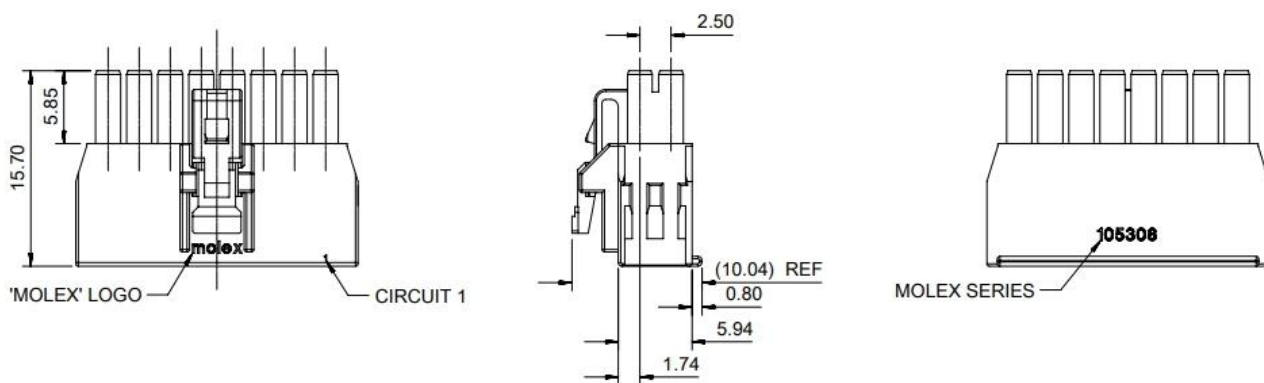
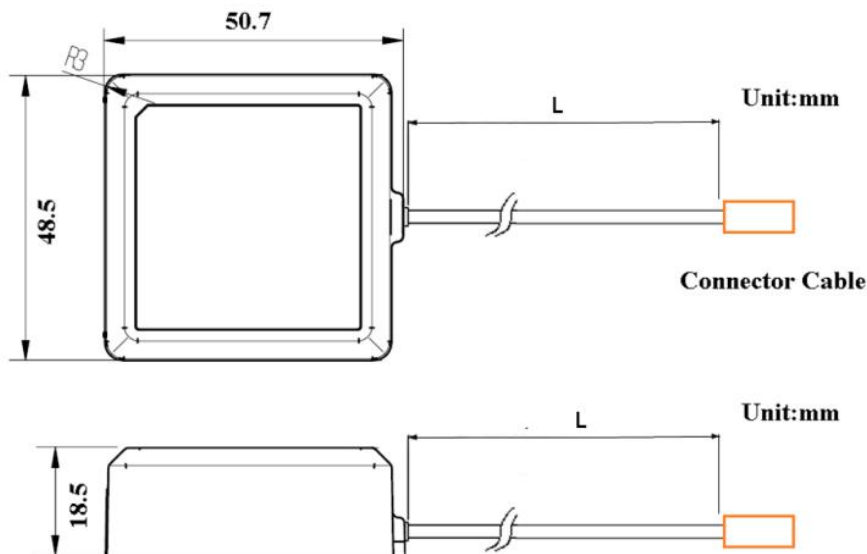


图 4: MOLEX 连接头 105308-1206 尺寸



线长	长度/Length (mm)
L	3000±50
L	5000±50
L	8000±50

图 5: SKM2102SR-40FXT 尺寸

9 应用配置/Application configuration

9.1 NMEA-0183 协议/NMEA 0183 Protocol

NMEA 协议是一种基于代码的协议，记录以\$开始，并带有回车/换行。GNSS 特定的消息都以\$GNxxx 开始，其中 xxx 是一个三字母的消息数据标识符。NMEA 消息有一个校验和，它允许检测损坏的数据传输。

The NMEA protocol is an ASCII-based protocol, Records start with a \$ and with carriage return/line feed. GNSS 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.

Skylab SKM2102SR 支持以下 NMEA-0183 消息：GGA、GLL、GSA、GSV、RMC VTG、ZDA。默认的 NMEA-0183 输出设置为 GGA、GLL、GSA、GSV、RMC VTG、ZDA 和默认的波特率，设置为 115200bps。

The Skylab SKM2102SR 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 115200bps.

表 1: NMEA-0183 输出消息/NMEA-0183 Output Messages

NMEA 记录/NMEA Record	描述/Description	默认/Default
GNGGA	Global positioning system fixed data	Y
GNGLL	Geographic position—latitude/longitude	Y
GNGSA	GNSS DOP and active satellites	Y
GPGSV	GNSS satellites in view for GPS	Y
GLGSV	GNSS satellites in view for GLONASS	Y
GAGSV	GNSS satellites in view for Galileo	Y
GBGSV	Beidou satellites in view for BDS	Y
GNRMC	Recommended minimum specific GNSS data	Y
GNVTG	Course over ground and ground speed	Y
GNZDA	Date and Time	Y

表 2: 标识符助记码/Identifier mnemonic code

标识符/Identifier	数据类型/Data type
GB	北斗模式/Beidou mode
GP	GPS 模式/GPS mode
GN	GNSS 模式/GNSS mode
GA	Galileo 模式/Galileo mode
GL	GLONASS 模式/GLONASS mode

9.2 GGA-位置信息/GGA- Location information

包含导航定位的位置、时间和精度因子。

Contains the location, time, and precision factor of navigation positioning.

\$GNGGA,040529.000,2238.3501,N,11403.1008,E,1,15,1.33,50.8,M,-2.2,M,,*5F

表 2: GGA 数据格式/GGA Data Format

名称/Name	举例/Example	单位/Units	描述/Description
Message ID	\$GNGGA		GGA protocol header
UTC Position	040529.000		hhmmss.sss

Latitude	2238.3501		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	11403.1008		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	15		Range 0 to 12
HDOP	1.33		Horizontal Dilution of Precision
MSL Altitude	50.8	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	*5F		
EOL	<CR> <LF>		End of message termination

表 2-1：位置固定指标/ Position Fix Indicators

Value	描述/Description
0	Fix not available or invalid
1	fix valid
2	Differential GPS, fix valid

9.3 GLL-地理定位信息/Geographic Position – Latitude/Longitude

包含纬度和经度信息。

This sentence contains the fix latitude and longitude.

\$GNGLL,2238.3501,N,11403.1008,E,040529.000,A,A*4F

表 3: GLL 数据格式/GLL Data Format

名称/Name	举例/Example	单位/Units	描述/Description
Message ID	\$GNGLL		GLL protocol header
Latitude	2238.3501		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	11403.1008		dddmm.mmmm
E/W Indicator	E		E=east or W=west
UTC Position	040529.000		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	*4F		
EOL	<CR> <LF>		End of message termination

9.4 GSA-GNSS 正在使用的卫星信息/GSA- GNSS satellites in using

包含卫星的 PRN，以及 PDOP、HDOP 和 VDOP。

PRN of the satellites used in the solution as well as PDOP, HDOP and VDOP.

\$GNGSA,A,3,194,01,21,07,195,09,,,,,,1.62,1.33,0.93,1*02

\$GNGSA,A,3,79,,,,,,1.62,1.33,0.93,2*02

\$GNGSA,A,3,,,,,,1.62,1.33,0.93,3*0D

\$GNGSA,A,3,07,10,24,,,,,,1.62,1.33,0.93,4*0A

表 4: GSA 数据格式/GSA Data Format

名称/Name	举例/Example	单位/Units	描述/Description
Message	\$GNGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
ID of satellite used	194		Sv on Channel 1
ID of satellite used	01		Sv on Channel 2
...	...		...
ID of satellite used	<Null>		Sv on Channel 12 (Null fields when it is not Used)

PDOP	1.62		Position Dilution of Precision
HDOP	1.33		Horizontal Dilution of Precision
VDOP	0.93		Vertical Dilution of Precision
Checksum	*02		
EOL	<CR> <LF>		End of message termination

表 4 - 1: 模式 2/ Mode 2

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

表 4 - 2: 模式 1/Mode 1

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

9.5 GSV-GNSS 可见卫星信息/GSV-GNSS Satellites in View

包含了所有可见卫星的 PRN、方位、仰角和信号强度。

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

\$GPGSV,2,1,07,07,74,271,19,01,67,151,25,21,66,073,42,194,65,088,39,1*5E

\$GPGSV,2,2,07,195,63,052,44,09,15,212,27,16,07,098,29,1*6F

\$GPGSV,2,1,05,01,67,151,32,194,65,088,33,195,63,052,38,09,15,212,20,8*6A

\$GPGSV,2,2,05,30,,,27,8*6E

\$GLGSV,1,1,01,79,61,018,29,1*42

\$GAGSV,1,1,01,21,,,42,7*77

\$GAGSV,1,1,01,21,,,32,1*76

\$GBGSV,2,1,05,07,59,023,39,24,56,329,42,10,52,334,36,08,49,160,24,1*78

\$GBGSV,2,2,05,09,37,216,22,1*4B

\$GBGSV,1,1,01,24,56,329,28,4*45

表 5: GSV 数据格式/ GSV Data Format

名称/Name	举例/Example	单位/Units	描述/Description
Message ID	\$GPGSV		GSV protocol header
Number of Message	2		Total number of GSV sentences (Range 1 to 3)
Message Number	1		Sentence number of the total (Range 1 to 3)
Satellites in View	07		Number of satellites in view
Satellite ID	07		Channel 1
Elevation	74	degrees	Channel 1(Range 00 to 90)
Azinmuth	271	degrees	Channel 1(Range 000 to 359)
SNR(C/NO)	19	dB-Hz	Channel 1(Range 00 to 99, null when not tracking)
...			...
Satellite ID	194		Channel 4
Elevation	65	degrees	Channel 4(Range 00 to 90)
Azimuth	088	degrees	Channel 4(Range 000 to 359)
SNR(C/NO)	39	dB-Hz	Channel 4(Range 00 to 99, null when not tracking)
Checksum	*5E		
EOL	<CR> <LF>		End of message termination

根据跟踪的卫星数量，可能需要使用 GSV 数据的多个消息。

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

9.6 RMC-推荐的最小定位信息/RMC-Recommended Minimum locating information

包含推荐的最小定位信息。

This sentence contains the recommended minimum locating information.

\$GNRMC,040529.000,A,2238.3501,N,11403.1008,E,0.14,59.79,070521,,A,V*34

表 6: RMC 数据格式/ RMC Data Format

名称/Name	举例 /Example	单位 /Units	描述/Description
Message ID	\$GNRMC		RMC protocol header

UTS Position	040529.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	2238.3501		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	11403.1008		dddmm.mmmm
E/W Indicator	E		E=east or W=west
Speed Over Ground	0.14	Knots	
Course Over Ground	59.79	Degrees	True Course
Date(UTC)	070521		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	*34		
EOL	<CR> <LF>		End of message termination

9.7 VTG-地面速度信息/VTG-Course Over Ground and Ground Speed

\$GNVTG,59.79,T,,M,0.14,N,0.26,K,A*10

表 7：VTG 数据格式

名称/Name	举例/Example	单位/Units	描述/Description
Message ID	\$GPVTG		VTG protocol header
Tcourse	59.79	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	0.14	Knots	Nautical Miles per Hour
Units	N		Knots
Speed over ground	0.26	Km/hr	in Kilometers per Hour
Units	K		Kilometer per hour
Mode	A		A=Autonomous, N=No fix, D=DGPS, E=DR

Checksum	*10		
EOL	<CR> <LF>		End of message termination

9.8 ZDA-时间和日期信息/ZDA-Date and Time

包含 UTC 日期和时间信息。

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

\$GNZDA,040529.000,07,05,2021,*,*41

表 8: ZDA 数据格式/ZDA Data Format

名称/Name	举例/Example	单位/Units	描述/Description
Message ID	\$GNZDA		ZDA protocol header
UTC Time	040529.000		hhmmss.sss
Day	07		UTC time: day (01 ... 31) dd
Month	05		UTC time: month (01 ... 12) mm
Year	2021		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	*41		
EOL	<CR> <LF>		End of message termination

9.9 CMD 列表 (TBD) /CMD List (TBD)

以下 CMD 需以 16 进制发送。/ The following CMDs need to be sent in hexadecimal.

表 9: CMD 列表/CMD List

CMD 命令/CMD command	CMD Example:
热启动/Hot start	F1 D9 06 40 01 00 03 4A 24
温启动/Warm start	F1 D9 06 40 01 00 02 49 23
冷启动/Cold start	F1 D9 06 40 01 00 01 48 22
恢复出厂设置/ Restore factory settings	F1 D9 06 09 08 00 02 00 00 00 FF FF FF FF 15 01

只搜索 GPS 卫星/ Search GPS satellites only	F1 D9 06 0C 04 00 01 03 00 00 1A A9
只搜索北斗卫星 /Search BDS satellites only	F1 D9 06 0C 04 00 04 C0 00 00 DA EC
搜索 GPS 和北斗卫星/Search GPS and BDS satellites	F1 D9 06 0C 04 00 05 C3 00 00 DE F9
搜索 GPS 和 Galileo 卫星/Search GPS and Galileo satellites	F1 D9 06 0C 04 00 11 03 10 00 3A 09
搜索 GPS 和 BDS 及 Galileo 卫星/Search GPS and BDS and Galileo satellites	F1 D9 06 0C 04 00 15 C3 10 00 FE 59
版本查询/ Version Query	F1 D9 0A 04 00 00 0E 34
保存配置/ Save Configuration	F1 D9 06 09 08 00 00 00 00 2F 00 00 00 46 B7

10 联系方式/Contact Information

Skylab M&C Technology Co., Ltd.

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