

Product name	Description	Version
LS23030	GPS mouse/ MTK3329,2m,USB,VCP	1.1
LS23032	GPS mouse/ MTK3329,2m,PS2,9600BPS	
LS23033	GPS mouse/ MTK3329,3m,RJ11,9600BPS	
LS23035	GPS mouse/ MTK3329,5m,PS2 with lock,9600BPS	
LS23036	GPS mouse/ MTK3329,3m,RJ11,9600BPS	

Note: LS23036 is most popular. We recommend customers to use for their new design.

Datasheet of GPS mouse, LS2303x series



1 Introduction

LS2303x series products are complete GPS receivers (also known as GPS mouse) based on the proven technology found in LOCOSYS 66 channel GPS SMD type receivers MC-1513 that use MediaTek chip solution. The GPS mouse will acquire up to 66 satellites at a time while providing fast Time-To-First-Fix, one-second navigation update and low power consumption. It can provide you with superior sensitivity and performance even in urban canyon and dense foliage environment. Its far-reaching capability meets the sensitivity requirements of car navigation as well as other location-based applications.

2 Features

- MediaTek MT3329 solution
- Support 66-channel GPS
- Fast TTFF at low signal level
- Support AGPS
- Up to 10 Hz update rate
- Capable of SBAS (WAAS, EGNOS, MSAS)
- Build-in micro battery to reserve system data for rapid satellite acquisition
- LED indicator for GPS fix or not fix
- Magnet for mounting on the car
- Skid resistant pad on the bottom
- Waterproof

3 Application

- Personal positioning and navigation
- Automotive navigation
- Marine navigation

4 GPS specification

GPS Chip	MediaTek MT3329	
Frequency	L1 1575.42MHz, C/A code	
Channels	Support 66 channels (22 Tracking, 66 Acquisition)	
Update rate	1Hz default, up to 10Hz	
Acquisition Time	Hot start (Open Sky)	< 2s (typical)
	Cold Start (Open Sky)	35s (typical)
Position Accuracy	Autonomous	30m (2D RMS)
	SBAS	2.5m (depends on accuracy of correction data)
Datum	WGS-84 (default)	
Max. Altitude	< 18,000 m	
Max. Velocity	< 515 m/s	
Protocol Support	NMEA 0183 ver 3.01	9600 bps ⁽¹⁾ , 8 data bits, no parity, 1 stop bits (default)
		1Hz: GGA, GLL, GSA, GSV, RMC, VTG

Note 1: LS23030 is a USB device with virtual COM port (VCP). That is the application software can access LS23030 with any baud rate.

5 Software interface

5.1 NMEA output message

Table 5-1 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 5-2 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- 2 GGA Data Format

Name	Example	Units	Description
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 5-3
Satellites Used	08		Range 0 to 12
HDOP	1.1		Horizontal Dilution of Precision
MSL Altitude	63.8	meters	
Units	M	meters	
Geoid Separation	15.2	meters	
Units	M	meters	
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 5-3 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 5-4 contains the values for the following example:

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

Table 5-4 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
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 5-5 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 5-5 GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		See Table 5-6
Mode 2	3		See Table 5-7
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 5-6 Mode 1

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

Table 5-7 Mode 2

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

● GSV---GNSS Satellites in View

Table 5-8 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

Table 5-8 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 5-9 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 5-9 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	Not shown
Variation sense			E=east or W=west (Not shown)

Mode	A		A=autonomous, D=DGPS, E=DR
Checksum	*53		
<CR> <LF>			End of message termination

● VTG---Course Over Ground and Ground Speed

Table 5-10 contains the values for the following example:

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

Table 5-10 VTG Data Format

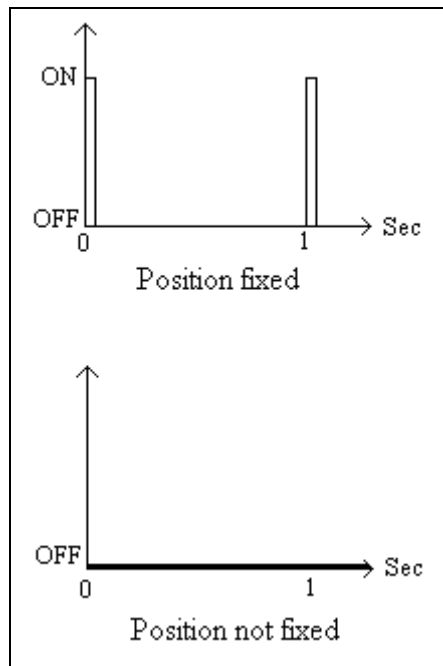
Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course over ground	79.65	degrees	Measured heading
Reference	T		True
Course over ground		degrees	Measured heading
Reference	M		Magnetic
Speed over ground	2.69	knots	Measured speed
Units	N		Knots
Speed over ground	5.0	km/hr	Measured 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 MTK proprietary message.

6 LED indicator

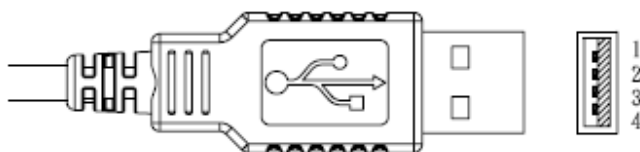
The red LED is an indicator of GPS positioning status. In continuous power mode, it flashes once per second when position is fixed. Otherwise it is off. The timing in detail is as below.



7 Pin assignment and descriptions

● LS23030

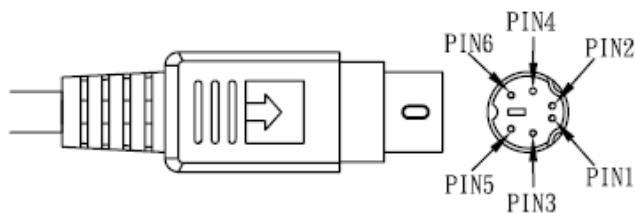
Pin #	Name	Type	Description
1	VBUS	P	USB power input
2	D-		D- line
3	D+		D+ line
4	GND	P	Ground



USB A-TYPE Plug

● LS23032

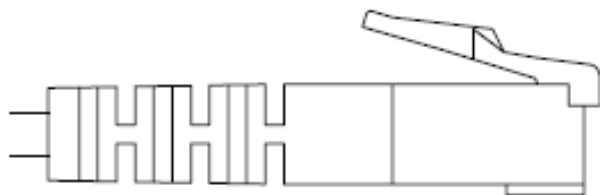
Pin #	Name	Type	Description
1	GND	P	Ground
2	VDD	P	Power input
3	NC		Not connect
4	RX	I	Data input (RS232 level)
5	TX	O	Data output (RS232 level)
6	NC		Not connect



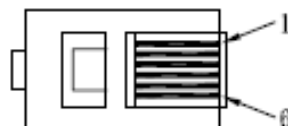
PS2 MALE

● LS23033

Pin #	Name	Type	Description
1	VDD	P	Power input
2	RX	I	Data input (RS232 level)
3	TX	O	Data output (RS232 level)
4	GND	P	Ground
5	NC		Not connect
6	NC		Not connect

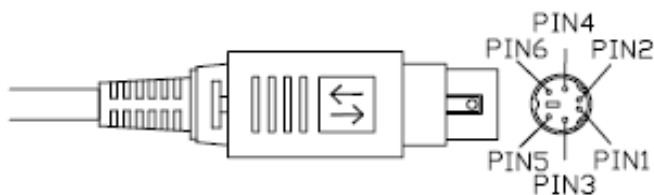


RJ11 MALE



● LS23035

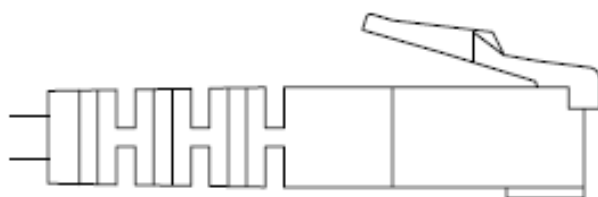
Pin #	Name	Type	Description
1	VDD	P	Power input
2	GND	P	Ground
3	NC		Not connect
4	TX	O	Data output (RS232 level)
5	RX	I	Data input (RS232 level)
6	NC		Not connect



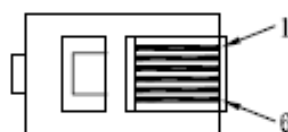
PS2 MALE
with lock

● LS23036

Pin #	Name	Type	Description
1	NC		Not connect
2	GND	P	Ground
3	RX	I	Data input (RS232 level)
4	TX	O	Data output (RS232 level)
5	VDD	P	Power input
6	NC		Not connect



RJ11 MALE



8 DC & Temperature characteristics

8.1 Power consumption (continuous mode)

Parameter	Symbol	Product	Min.	Typ.	Max.	Units
Input voltage	VCC	LS23030	4.75	5	5.25	V
		LS23032	4	5	6	
		LS23033	4	5	6	
		LS23035	4	5	6	
		LS23036	4	5	6	
Input current	Icc	LS23030		29 ⁽¹⁾		mA
		LS23032		34 ⁽¹⁾		

		LS23033		34 ⁽¹⁾		
		LS23035		34 ⁽¹⁾		
		LS23036		34 ⁽¹⁾		

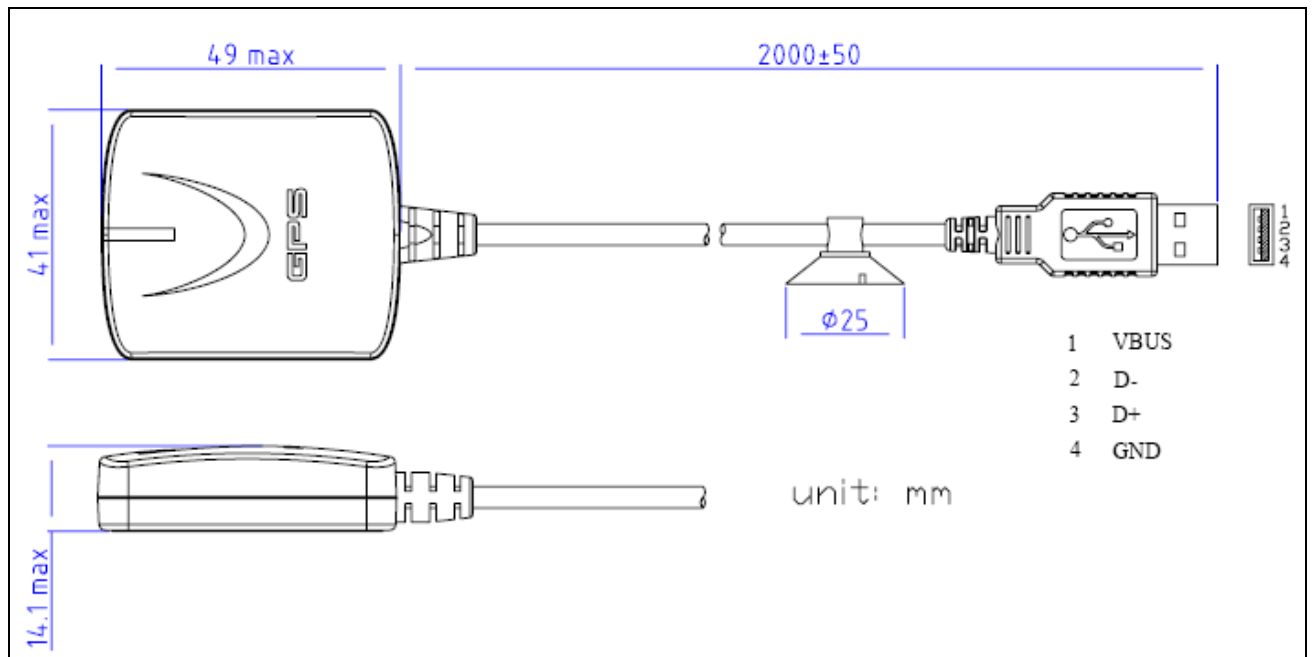
1. Measured when position fix is available and input voltage is 3.3V. This value may vary with short period test.

8.2 Temperature characteristics

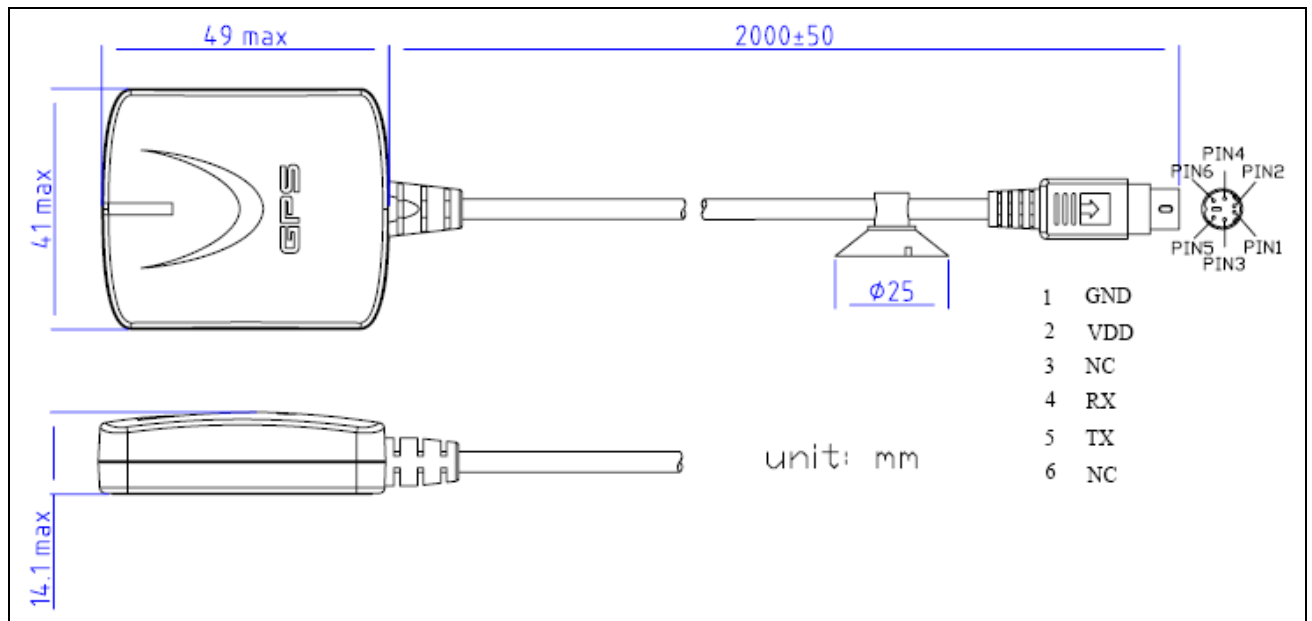
Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-30	-	85	°C
Storage Temperature	Tstg	-40	25	85	°C

9 Mechanical specification

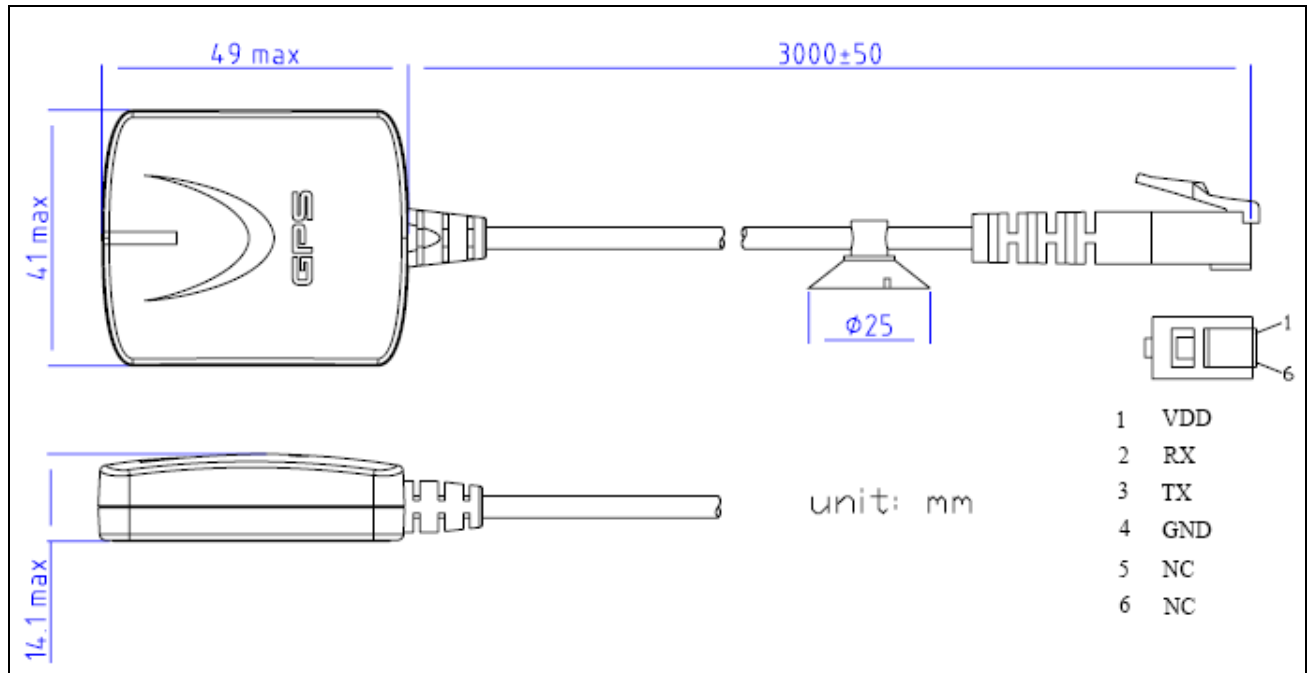
● LS23030 (USB interface)



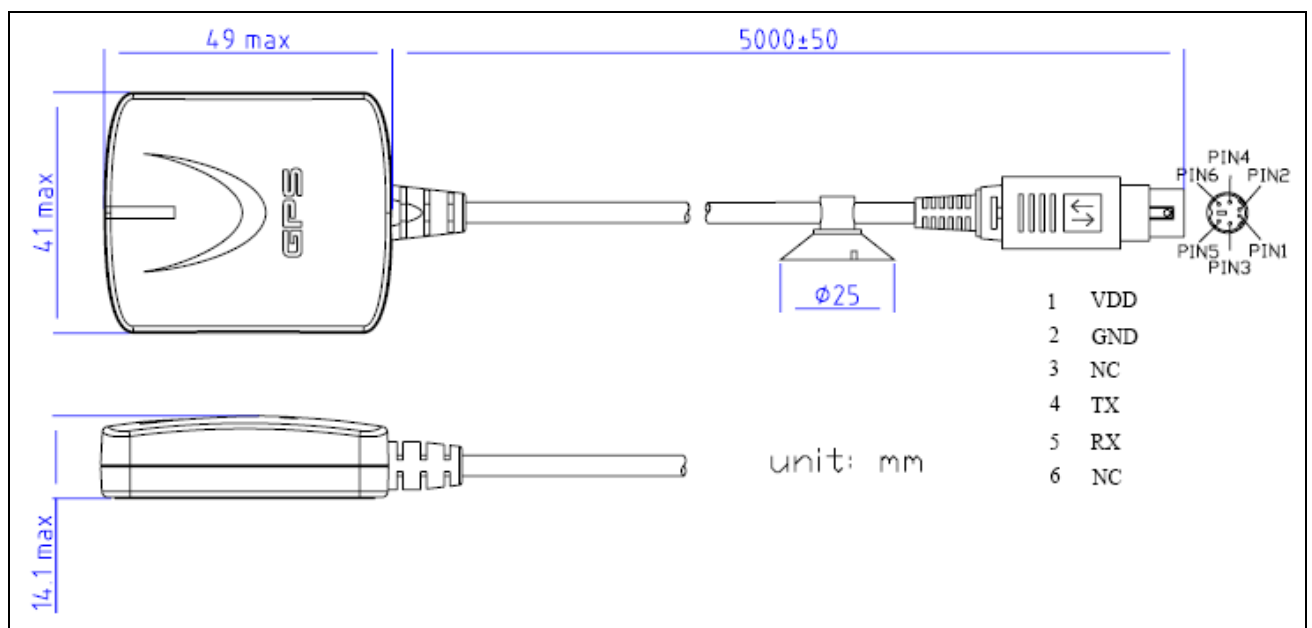
● LS23032 (RS232 interface)



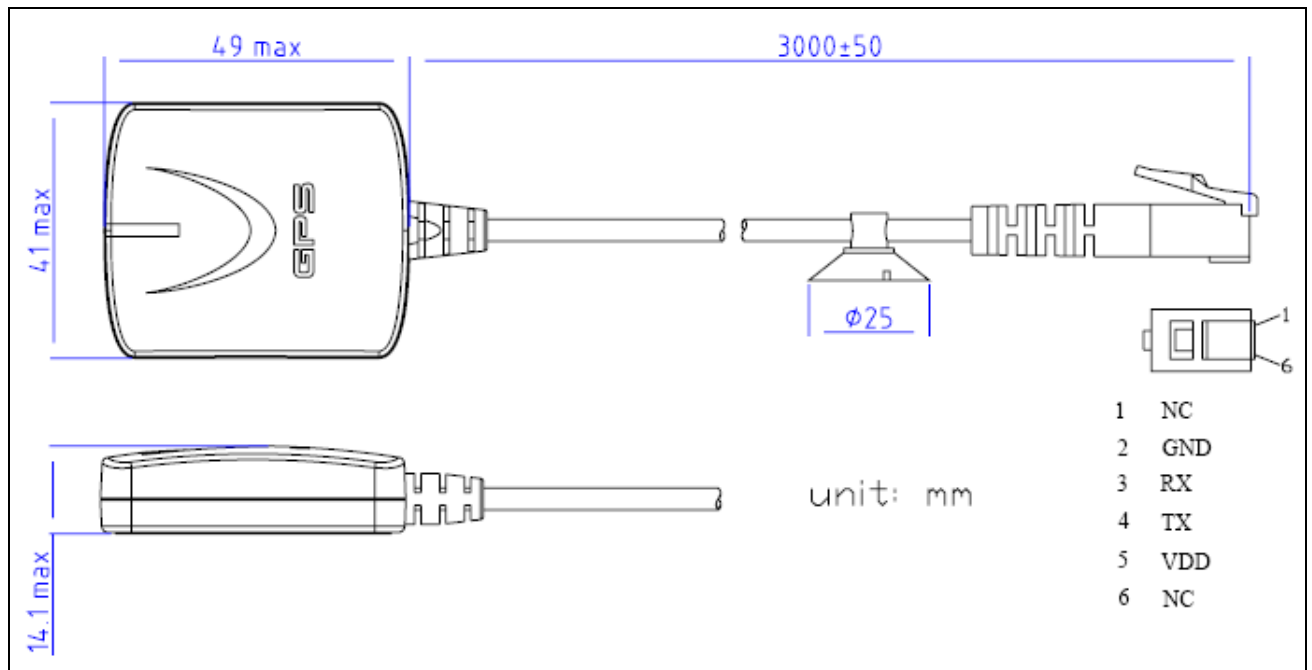
● LS23033 (RS232 interface)



● LS23035 (RS232 interface)



● **LS23036 (RS232 interface)**



Document change list

Revision 1.0

- First release on Oct. 25, 2007.

Revision 1.0 to Revision 1.1 (July 20, 2009)

- Changed GPS chip from MT3318 to MT3329 on page 2.
- Added “Support AGPS” on page 1.
- Changed channels from 32 to 66 on page 2.
- Changed update rate from “up to 5Hz” to “up to 10Hz” on page 2.
- Changed hot start time from “2s (typical)” to “<2s (typical)” on page 2.
- Changed cold start time from 36s to 35s on page 2.
- Added “Note 1” on page 2.
- Changed typical current of LS23030 from 47mA to 29mA on page 9.
- Changed typical current of LS23032 from 46mA to 34mA on page 9.
- Changed typical current of LS23033 from 46mA to 34mA on page 10.
- Changed typical current of LS23035 from 46mA to 34mA on page 10.
- Changed typical current of LS23036 from 46mA to 34mA on page 10.