LOCOSYS
N 25° 03.716' E 121°38.742'

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Product name	Description	Version
LS20126	Stand-alone GPS smart antenna module with magnetic sensor, 9600BPS	1.02

Datasheet of stand-alone GPS smart antenna module with magnetic sensor, LS20126

1 Introduction

LOCOSYS LS20126 GPS smart antenna module is a high sensitivity, low power, SMD type, 20 channels with built-in magnetic sensor, 3-axis acceleration sensor L1 GPS receiver and 10mm patch antenna designed for portable applications. LS20126 is designed for easy and quick integration into customer's applications, especially those for slow speed or pedestrian mode scenarios. This module is pin to pin compatible to LOCOSYS LS200x6 series GPS modules.

2 Features

- GPS + magnetic sensor + 3-axis acceleration sensor
- Easy to install (SMT process capable)
- SiRF Star III high sensitivity solution
- Support 20-channel GPS
- Fast TTFF at low signal level
- Capable of SBAS (WAAS, ENGOS, MSAS)
- Pin-to-pin compatible with LS20026 (SiRF solution), LS20036 (MediaTek solution), LS20056 (Atheros solution) and LS20076 (ublox solution)
- Provide compass heading over a wide of conditions
- 0.5ppm TCXO for optimal performance

3 Application

- Cellular/Smart phone
- Personal tracker, smart key, track back, car finder(suggest to change to location finder)
- Mobile device
- Digital camera, Camcorder, in-vehicle recorder
- Medical monitoring, falling detection, baby geo-fencing

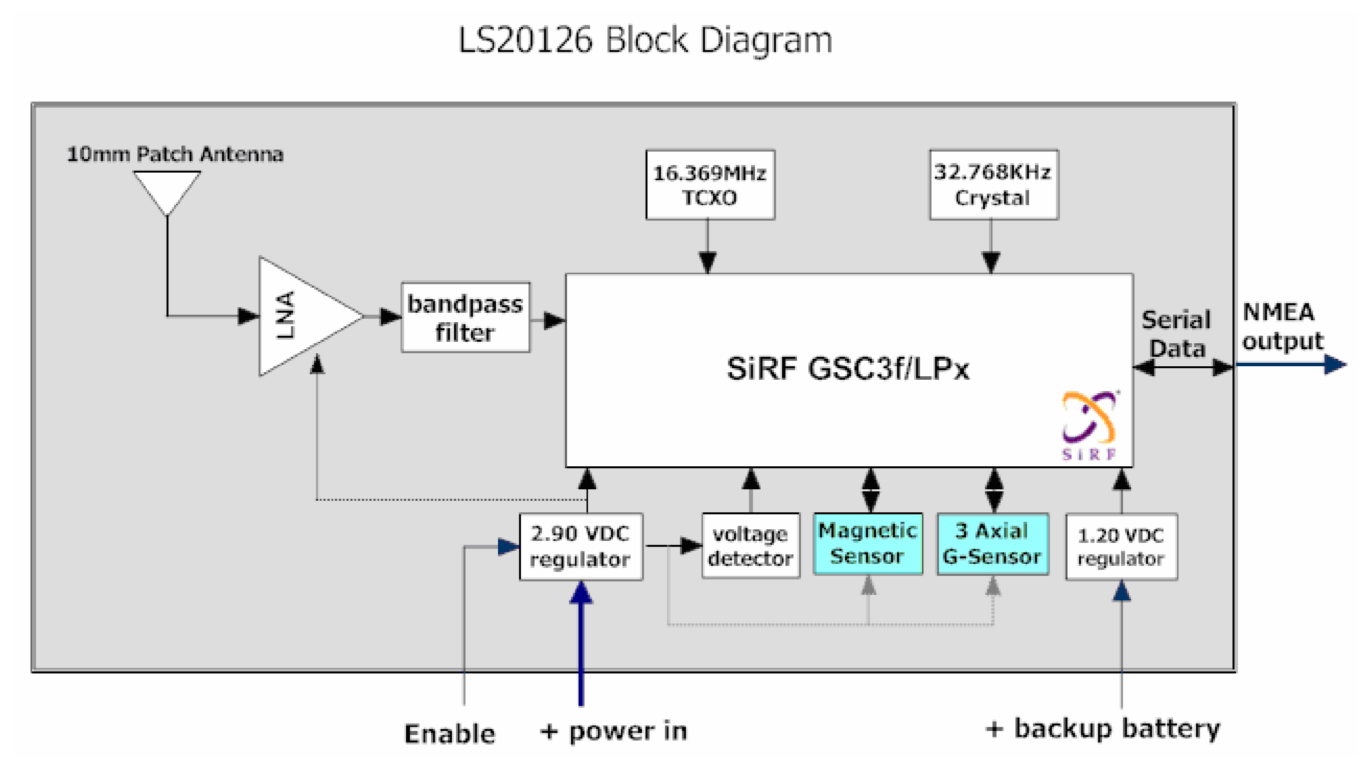

Fig 3-1 System block diagram of LS20126

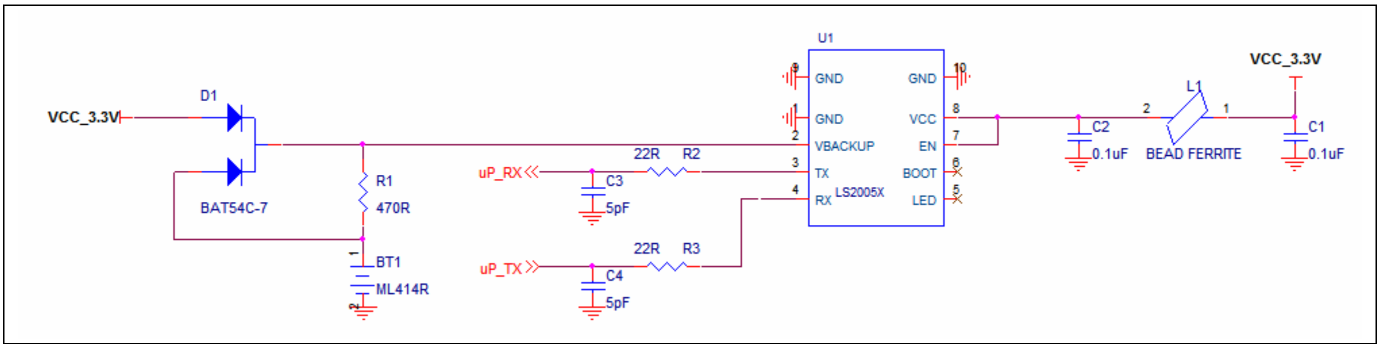

Fig 3-2 Reference Design

Note: All components are for reference only; this reference design may or may not be applicable in all cases.

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4 GPS receiver/antenna, magnetic sensor and 3-axis acceleration sensor

4.1 GPS receiver

GPS Section	
Parameter	**Description**
Frequency Band	L1 (1575.42 MHz) frequency, C/A code
Receiver Type	20-channel, continuous tracking receiver
Navigation Update Rate	1 Hz
Acquisition @-130 dBm	Cold start time: 36 s Hot start Time: 1 s
Positional Accuracy	Horizontal: < 5 meters (2D RMS)
Dynamics	4g max
Operational Limits	Maximum velocity: 515 m/sec (1000 knots) max Maximum altitude: 18000 m (60000 ft) max

4.2 Magnetic Sensor

Magnetic Sensor Section	
Parameter	**Description**
Measuring magnetic field range	300 μT (micro Tesla)
Magnetic heading accuracy	±5° at zero pitch (95% probability)

5 Software interface

5.1 NMEA output message

Table 5.1-1 NMEA output message

NMEA message	**Description**	**Update Rate**
GGA	Global Positioning System Fixed Data	1Hz
GLL	Geographic Position – Latitude / Longitude	1Hz
GSA	GNSS DOP and Active Satellites	1Hz
GSV	GNSS Satellites in View	1Hz
RMC	Recommended Minimum Specific GNSS Data	1Hz
VTG	Course Over Ground and Ground Speed	1Hz

Note: Baud Rate: 9600, 19200, 38400, 57600 bps (default 9600 bps).

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- **GGA--- Global Positioning System Fixed Data**

Table 5.1-2 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

***Table5.1-2* 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 5.1-3
Satellites Used	08		Range 0 to 12
HDOP	1.1		Horizontal Dilution of Precision
MSL Altitude	63.8	mters	
Units	M	mters	
Geoid Separation	15.2	mters	
Units	M	mters	
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 5.1-3* 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 5.1-4 contains the values for the following example:

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

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Table 5.1-4 **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 5.1-5 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 5.1-5 **GSA Data Format**

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 5.1-6
Mode 2	3		See Table 5.1-7
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 5.1-6 Mode 1

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

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Table 5.1-7 Mode 2

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

- **GSV---GNSS Satellites in View**

Table 5.1-8 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 5.1-8* 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 5.1-9 contains the values for the following example:

$GPRMC,053740.000,A,2503.6319,N,12136.0099,E,2.69,79.65,100106,,,A*53

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Table 5.1-9 **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	At low speed or in state of rest, the GPS heading is not valid. LS20126 will derive the heading information based on magnetic sensor in such circumstance.
Date	100106		ddmmyy
Magnetic variation		degrees	
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 5.1-10 contains the values for the following example:

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

Table 5.1-10 **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

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Mode	A		A=autonomous, D=DGPS, E=DR
Checksum	*38		
<CR> <LF>			End of message termination

5.2 Proprietary NMEA input message

***Table 5.2-1* Message Parameters**

Start Sequence	Payload	Checksum	End Sequence
$PSRF<MID>[1]	Data[2]	*CKSUM[3]	<CR><LF>[4]

1. Message Identifier consists of three numeric characters. Input messages begin at MID 100.
2. Message specifies data. Refer to a specific message section for <data>…<data> definition.
3. CKSUM is a two-hex character checksum as defined in the NMEA specification, *NMEA-0183Standard For Interfacing Marine Electronic Devices.* Use of checksums is required on all input messages.
4. Each message ends with Carriage Return (CR) Line Feed (LF) which is \r\n and it is hex 0D0A. Because \r\n is not printable ASCII characters, they are omitted from the example strings, but they must be sent to terminate the message and cause the receiver to process the input message.

Note: All fields in all proprietary NMEA messages are required, none are optional. All NMEA messages are comma delimited.

***Table 5.2-2* Proprietary NMEA input messages**

Message	MID[1]	Description
SetSerialPort	100	Set PORT A parameters and protocol
NavigationInitialization	101	Parameters required for start using X/Y/Z[2]
SetDGPSPort	102	Set PORT B parameters for DGPS input
Query/Rate Control	103	Query standard NMEA message and/or set output rate
LLANavigationInitialization	104	Parameters required for start using Lat/Lon/Alt[3]
Development Data On/Off	105	Development Data messages On/Off
Select Datum	106	Selection of datum to be used for coordinate transformations

1. Message Identification (MID).
2. Input coordinates must be WGS84.
3. Input coordinates must be WGS84

- **100---SetSerialPort**

This command message is used to set the protocol (SiRF binary or NMEA) and/or the communication

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parameters (Baud, data bits, stop bits, and parity). Generally, this command is used to switch the module back to SiRF binary protocol mode where a more extensive command message set is available. When a valid message is received, the parameters are stored in battery-backed SRAM and the evaluation receiver restarts using the saved parameters.

Table 5.2-3 contains the input values for the following example:

Switch to SiRF binary protocol at 9600,8,N,1

$PSRF100,0,9600,8,1,0*0C

Table 5.2-3 **Set Serial Port Data Format**

Name	Example	Units	Description
Message ID	$PSRF100		PSRF100 protocol header
Protocol	0		0=SiRF binary, 1=NMEA
Baud	9600		4800,9600,19200,38400,57600
DataBits	8		8,7[1]
StopBits	1		0,1
Parity	0		0=None, 1=Odd, 2=Even
Checksum	*0C		
<CR><LF>			End of message termination

1. SiRF protocol is only valid for 8 data bits, 1 stop bit, and no parity.

- **101---NavigationInitialization**

This command is used to initialize the evaluation receiver by providing current position (in X, Y, Z coordinates), clock offset, and time. This enables the evaluation receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters enable the evaluation receiver to acquire signals quickly.

Table 5.2-4 contains the input values for the following example:

Start using known position and time

$PSRF101,-2686700,-4304200,3851624,96000,497260,921,12,3*1C

Table 5.2-4 **Navigation Initialization Data Format**

Name	Example	Units	Description
Message ID	$PSRF101		PSRF101 protocol header
ECEF X	-2686700	meters	X coordinate position
ECEF Y	-4304200	meters	Y coordinate position
ECEF Z	3851624	meters	Z coordinate position
ClkOffset	96000	Hz	Clock Offset of the Evaluation Receiver[1]
TimeOfWeek	497260	seconds	GPS Time Of Week

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WeekNo	921		GPS Week Number
ChannelCount	12		Range 1 to 12
ResetCfg	3		See Table 5.2-5
Checksum	*1C		
<CR><LF>			End of message termination

1. Use 0 for last saved value if available. If this is unavailable, a default value of 96000 is used.

***Table 5.2-5* Reset Configuration**

Hex	Description
0x01	Hot Start – All data valid
0x02	Warm Start – Ephemeris cleared
0x03	Warm Start (with Init) – Ephemeris cleared, initialization data loaded
0x04	Cold Start – Clears all data in memory
0x08	Clear Memory – Clears all data in memory and resets the receiver back to factory defaults

- **102---SetDGPSPort**

This command is used to control the serial port to receive RTCM differential corrections. Differential receivers may output corrections by using different communication parameters. If a DGPS receiver is used that has different communication parameters, use this command to allow the receiver to correctly decode the data. When a valid message is received, the parameters are stored in battery-backed SRAM and the receiver restarts using the saved parameters.

Table 5.2-6 contains the input values for the following example:

Set DGPS Port to be 9600,8,N,1.

$PSRF102,9600,8,1,0*12

***Table 5.2-6* Set GPS Port Data Format**

Name	Example	Units	Description
Message ID	$PSRF102		PSRF102 protocol header
Baud	9600		4800,9600,19200,38400
DataBits	8		8,7
StopBits	1		0,1
Parity	0		0=None, 1=Odd, 2=Even
Checksum	*12		
<CR><LF>			End of message termination

Note: RTCM is not supported.

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- **103---Query/Rate Control**

This command is used to control the output of standard NMEA messages GGA, GLL, GSA, GSV, RMC, and VTG. Using this command message, standard NMEA messages may be polled once, or setup for periodic output. Checksums may also be enabled or disabled depending on the needs of the receiving program. NMEA message settings are saved in battery-backed memory for each entry when the message is accepted.

Table 5.2-7 contains the input values for the following example:

1. Query the GGA message with checksum enabled
   $PSRF103,00,01,00,01*25
2. Enable VTG message for a 1 Hz constant output with checksum enabled
   $PSRF103,05,00,01,01*20
3. Disable VTG message
   $PSRF103,05,00,00,01*21

Table 5.2-7 **Query/Rate Control Data Format (See example 1)**

Name	Example	Units	Description
Message ID	$PSRF103		PSRF103 protocol header
Msg	00		See Table 5.2-8
Mode	01		0=SetRate, 1=Query
Rate	00	seconds	Output – off=0, max=255
CksumEnable	01		0=Disable Checksum, 1=Enable Checksum
Checksum	*25		
<CR><LF>			End of message termination

Table 5.2-8 **Messages**

Value	Description
0	GGA
1	GLL
2	GSA
3	GSV
4	RMC
5	VTG
6	MSS (If internal beacon is supported)
7	Not defined
8	ZDA (if 1PPS output is supported)

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9	Not defined

- **104---LLANavigationInitialization**

This command is used to initialize the evaluation receiver by providing current position (in latitude, longitude, and altitude coordinates), clock offset, and time. This enables the receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters enable the receiver to acquire signals quickly.

Table 5.2-9 contains the input values for the following example:

Start using known position and time.

$PSRF104,37.3875111,-121.97232,0,96000,237759,1946,12,1*07

Table 5.2-9 **LLA Navigation Initialization Data Format**

Name	Example	Units	Description
Message ID	$PSRF104		PSRF104 protocol header
Lat	37.3875111	degrees	Latitude position (Range 90 to –90)
Lon	-121.97232	degrees	Longitude position (Range 180 to –180)
Alt	0	meters	Altitude position
ClkOffset	96000	Hz	Clock Offset of the Evaluation Receiver[1]
TimeOfWeek	237759	seconds	GPS Time Of Week
WeekNo	1946		Extended GPS Week Number (1024 added)
ChannelCount	12		Range 1 to 12
ResetCfg	1		See Table 5.2-10
Checksum	*07		
<CR><LF>			End of message termination

1. Use 0 for last saved value if available. If this is unavailable, a default value of 9600 is used.

Table 5.2-10 **Messages**

Hex	Description
0x01	Hot Start – All data valid
0x02	Warm Start – Ephemeris cleared
0x03	Warm Start (with Init) – Ephemeris cleared, initialization data loaded
0x04	Cold Start – Clears all data in memory
0x08	Clear Memory – Clears all data in memory and resets receiver back to factory defaults

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- **105---Development Data On/Off**

Use this command to enable development data information if you are having trouble getting commands accepted. Invalid commands generate debug information that enables you to determine the source of the command rejection. Common reasons for input command rejection are invalid checksum or parameter out of specified range.

Table 5.2-11 contains the input values for the following example:

1. Debug On
   $PSRF105,1*3E
2. Debug Off
   $PSRF105,0*3F

Table 5.2-11 **Development Data On/Off Data Format**

Name	Example	Units	Description
Message ID	$PSRF105		PSRF105 protocol header
Debug	1		0=Off, 1=On
Checksum	*3E		
<CR><LF>			End of message termination

- **106---Select Datum**

$PSGPS receivers perform initial position and velocity calculations using an earth-centered earth-fixed (ECEF) coordinate system. Results may be converted to an earth model (geoid) defined by the selected datum. The default datum is WGS 84 (World Geodetic System 1984) which provides a worldwide common grid system that may be translated into local coordinate systems or map datums. (Local map datums are a best fit to the local shape of the earth and not valid worldwide.)

Table 5.2-12 contains the input values for the following example:

Datum select TOKYO_MEAN
$PSRF106,178*32

Table 5.2-12 **Development Data On/Off Data Format**

Name	Example	Units	Description
Message ID	$PSRF106		PSRF106 protocol header
Datum	178		21=WGS84 178=TOKYO_MEAN 179=TOKYO_JAPAN 180=TOKYO_KOREA 181=TOKYO_OKINAWA
Checksum	*32		
<CR><LF>			End of message termination

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5.3 Proprietary messages for magnetic sensor

- **GPS speed**: 3D GPS speed output (ECEF coordinate)
  The GPS speed contains the values for the following example:
  $PLSR,245,7,0,0,0*05<CR><LF>

Table 5.3-1 **3D GPS speed output**

Name	Example	Unit	Description
Sentence ID	$PLSR,245,7		
GPS speed (east)	0	cm/sec	
GPS speed (north)	0	cm/sec	
GPS speed (up)	0	cm/sec	
Checksum	05		
<CR><LF>			End of message termination

- **HCHDG Heading**: Deviation and Variation (default 1Hz, maximum 1Hz)
  The HCHDG heading contains the values for the following example:
  $HCHDG,101.1,,,7.1,W*3C<CR><LF>

Table 5.3-2 **HCHDG Heading**

Name	Example	Unit	Description
Sentence ID	$HCHDG		
Heading	101.1	degree	Magnetic Sensor heading
Deviation		degree	Magnetic Deviation
Deviation Direction			Magnetic Deviation direction, E = Easterly, W = Westerly
Variation	7.1	degree	Magnetic Variation
Variation Direction	W		Magnetic Variation direction, E = Easterly, W = Westerly
Checksum	3C		
<CR><LF>			End of message termination

- **PLSR Compass Measurement Report 1**: calibration and acceleration (default 1Hz, maximum 5Hz)
  The PLSR compass measurement report 1 contains the values for the following example:
  $PLSR,245,1,95,7,165,148,-37,210,31,0,2*1D<CR><LF>

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Table 5.3-3 **PLSR Compass Measurement Report 1**

Name	Example	Unit	Description
Sentence ID	$PLSR,245,1		
Direction	95	degree	Magnetic direction: 0-360 degree, north: 0
Calibration Status	7		Auto-calibration status: 7:complete
Field Intensity	165		Magnetic field intensity: 0..1300 (0μT to 520μT)
Acceleration X	148	degree	Acceleration X:-512 to 511 (-2.0 G to + 2.0 G)
Acceleration Y	-37		Acceleration Y:-512 to 511 (-2.0 G to + 2.0 G)
Acceleration Z	210		Acceleration Z:-512 to 511 (-2.0 G to + 2.0 G)
Temperature	31	Celsius	Module temperature in Celsius (°C)
Mounting Mode	0		Module Mounting Mode:0..7, default 0
Current Calibration Data Status	2		Current calibration data status: none zero: valid, 0:not valid
Checksum	1D		
<CR><LF>			End of message termination

- **PLSR Compass Measurement Report 2**: attitude (default 1Hz, maximum 5Hz)
  The PLSR compass measurement report 2 contains a set of the attitude vectors, each row of the matrix means attitude vector and it is normalized with 0x1000; the values for the following example:
  $PLSR,245,2,2375,3323,-317,-34,414,4075,3338,-2360,269*2B<CR><LF>

Table 5.3-4 **PLSR Compass Measurement Report 2**

Name	Example	Unit	Description
Sentence ID	$PLSR,245,2		
Xx	2375		X acceleration data on X axis
Yx	3323		Y acceleration data on X axis
Zx	-317		Z acceleration data on X axis
Xy	-34		X acceleration data on Y axis
Yy	414		Y acceleration data on Y axis
Zy	4075		Z acceleration data on Y axis
Xz	3338		X acceleration data on Z axis
Yz	-2360		Y acceleration data on Z axis
Zz	269		Z acceleration data on Z axis
Checksum	2B		
<CR><LF>			End of message termination

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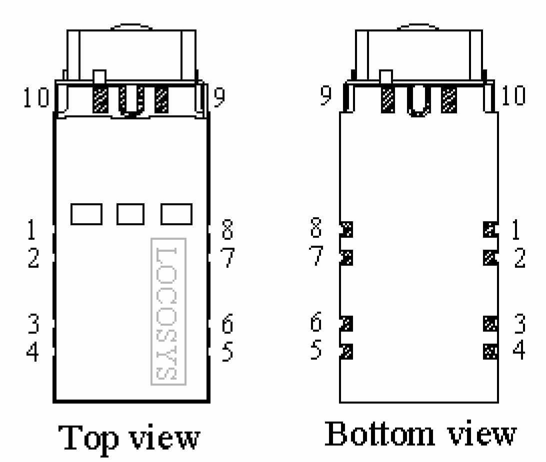
6 Pin assignment and descriptions



Pin	Name	Type	Description
1	GND	P	Ground
2	VBACKUP	P	Backup Battery Input (1.5 ~ 6.0 V)
3	TX	O	CMOS level asynchronous output for UART
4	RX	I	CMOS level asynchronous input for UART
5	GPIO	I/O	General purpose input / output (Can be defined by customer)
6	BOOTSEL	I	Keep floating (For internal manufacturing use)
7	EN	I	High active with internal pull-down resistor (This pin only controls the main power through VCC pin, not apply to VBACKUP pin.)
8	VCC	P	Main power input (3.0 ~ 6.0 V)
9	GND	P	Ground
10	GND	P	Ground

6.1 Caution of mounting

Keep magnetic parts such as speakers and vibrators away from LS20126 module as far as possible.

6.2 Battery Backup

The SRAM and RTC(Real Time Clock) can keep operating by supplying power from the VBACKUP pin (Pin 2) when main power is off.

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7 DC & Temperature characteristics

7.1 Absolute maximum ratings

Parameter	Symbol	Ratings	Units
Input Voltage	V_{CC}	-0.3 ~ 6.0	V
Enable Voltage	V_{EN}	-0.3 ~ 6.0	V

7.2 Electrical Characteristics

- Input power range: 3.0 to 6.0 V
- Power consumption: 31 mA (typical) at Vcc=3.3 V.
- Backup power consumption: 11 μA at V_{BAT}=3.3 V, Vcc=0 V.
- Magnetic sensor coil initialization will reach highest current of 178 mA at Vcc=6.0 V during 5 μs.

Parameter	Symbol	Conditions	Min.	Typ.	Max	Units
Supply Voltage	V_{CC}		3.0	3.3	6.0	V
Supply Current	I_{SS}			31	178	mA
Enable Voltage	V_{EN}		1.3		VCC	V
Enable Current	I_{EN}		2		17	μA
Battery Backup Voltage	V_{BAT}		1.5	3.3	6.0	V
Battery Backup Current	I_{BAT}	V_{BAT} = 3.3 V		11		μA

7.3 Digital Section Electrical Characteristics

Parameter		Symbol	Conditions	Min.	Typ.	Max	Units
Output Logic	High	V_{OH}		2.0		2.85	V
	Low	V_{OL}				0.9	V
Input Logic	High	V_{IH}		2.3		3.6	V
	Low	V_{IL}		GND		0.6	V

7.4 Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-30		+85	℃
Storage Temperature	Tstg	-40		+85	℃

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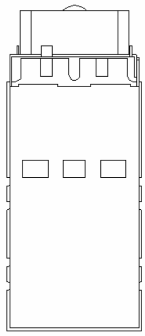
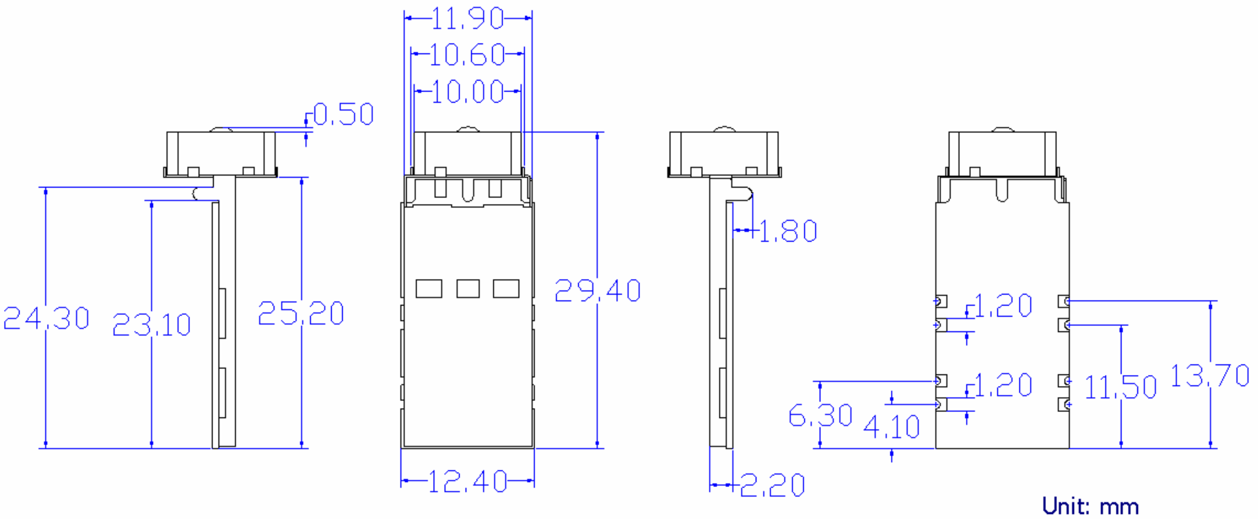
8 Mechanical specification

8.1 Appearance



8.2 Outline Dimensions



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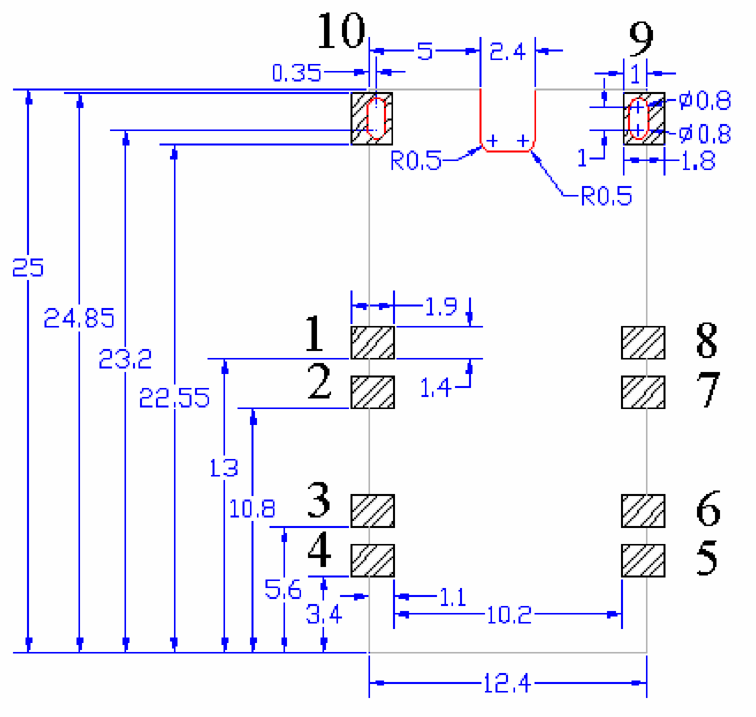
8.3 Recommended Land Pattern Dimensions



Note:

1. Red line: CNC route
2. Pin9, 10: Plated through hole

8.4 Installation position on the main PCB

The figure 8.4-1 is the guideline that describes the relative position between the main PCB and the antenna of LS20126. If the width of notch is smaller than 5mm, the both left and/or right areas will have obvious ground effects to the antenna.

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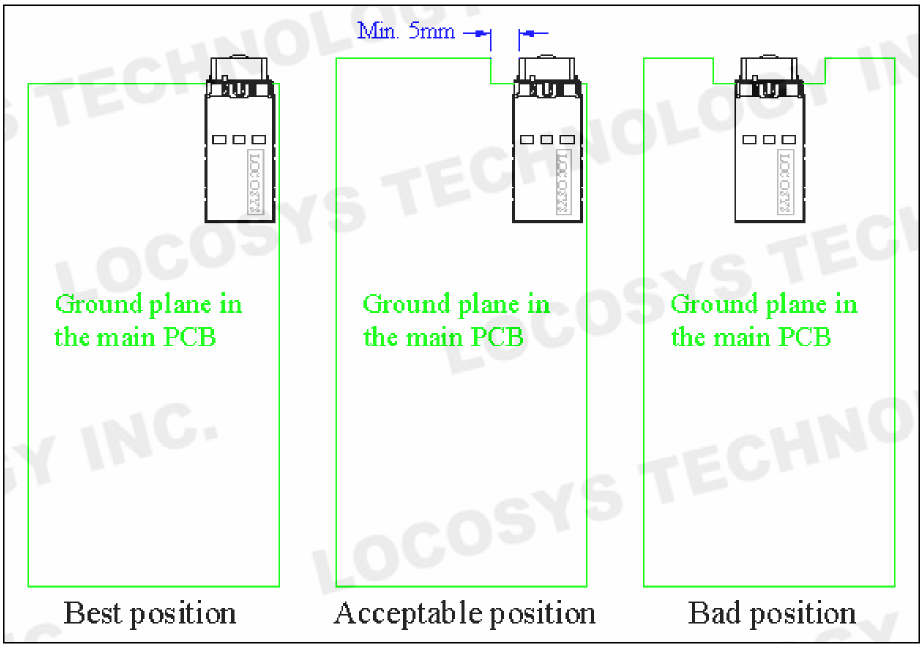
Figure 8.4-1



8.5 Order Information

There are 8 possible directions mounted on PCB (Figure 5.3-1), please contact LOCOSYS to get a proper firmware before placing an order.

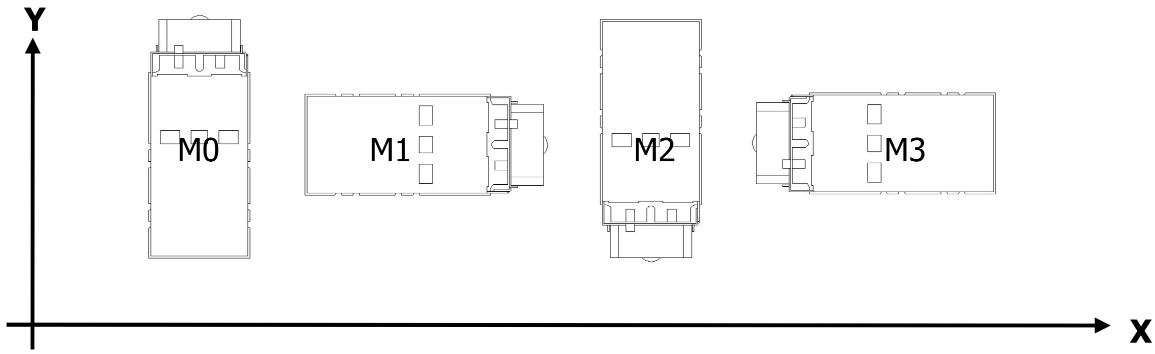


Figure 8.5 Examples of Mounting Mode (Axis Y: Heading Direction)

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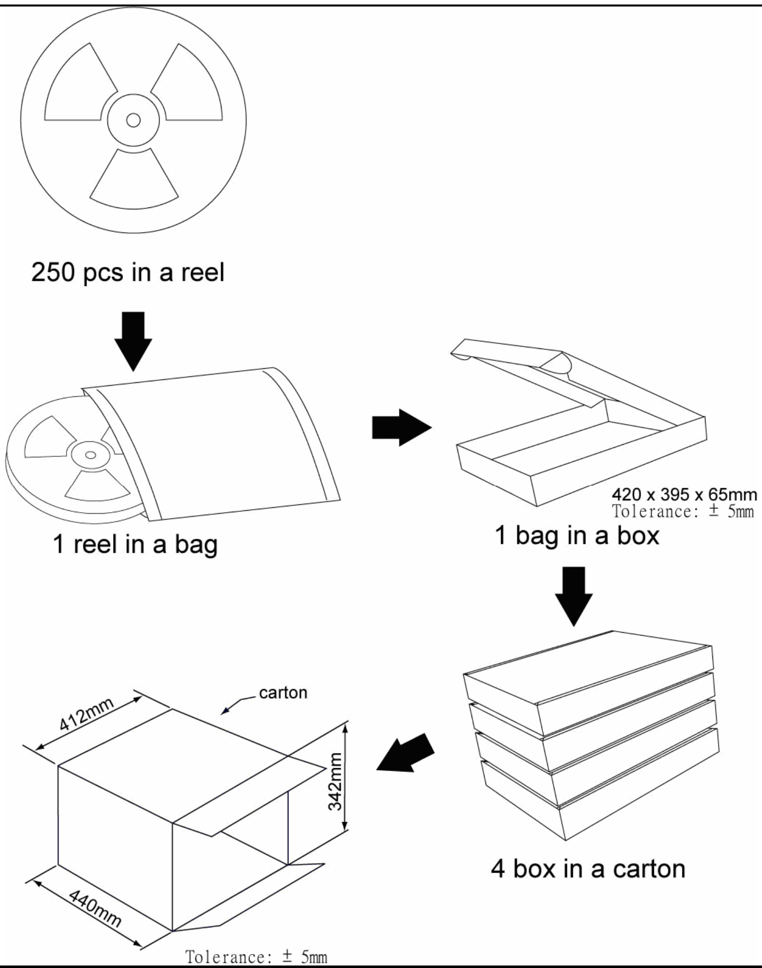
9 Reel packing information

1. Packaging Material (per carton)					
No.	**Item**	**Model**	**Dimensions**	**Unit Weight(g)**	**Quantity**
1	Module	LS20126		10.0	
2	Reel				
3	Product Box				
4	Carton				
5	Package Bag				
6	Total Weight				

2. Packing Specification and Quantity
   (1) Module quantity per reel: 250
   (2) Module quantity per box: quantity per reel 250 x quantity of reel 1 = 250
   (3) Total module quantity in a carton: quantity per box 250 x quantity of boxes 4 = 1,000



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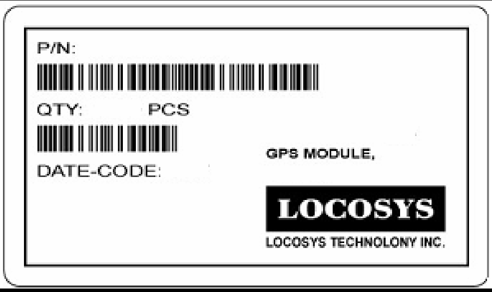
3. Label Specification

(1) Box Label



10 Quality Units

10.1 Inspection Criterion

The GPS CNo ratio must be higher than 41dB-Hz when GPS Signal generator output strength (Absolute Value) is -125dBm.

10.2 Precaution in Use of LS20126

a. Handling of Module

ESD sensitive device: use proper precautions when handling this module.

b. Storage

The module belongs to moisture sensitive device (IPC/JEDEC J-STD-020C Level II). Please storage it at humidity control area (<30°C, 60%RH).

c. Soldering

The module belongs to RoHS device. The maximum of reflow temperature, real on top of PCB, is not over 240 Celsius.

d. Recommended soldering reflow profile

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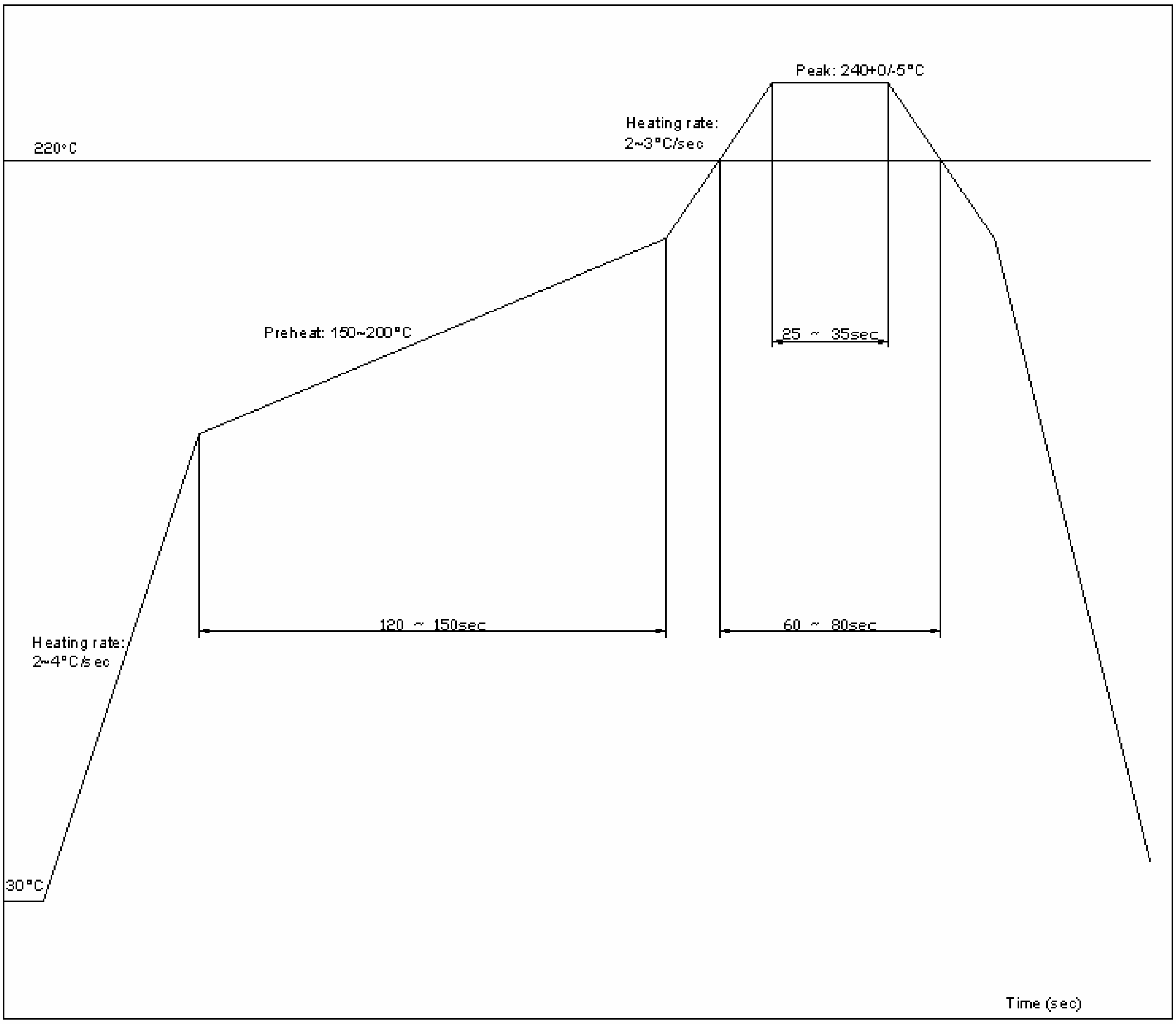

Document change list

Revision	Comments	Date	Note
1.0	Initial release	2010/6/26	
1.01	Revise the description of Measuring magnetic field range in section 4.2 Magnetic Sensor.	2010/7/4	