L86 GNSS Module Presentation

May, 2016

Contents

Highlights

Support Multi-GNSS Systems

99 acquisition channels
33 tracking channels

Ultra Low Power Consumption

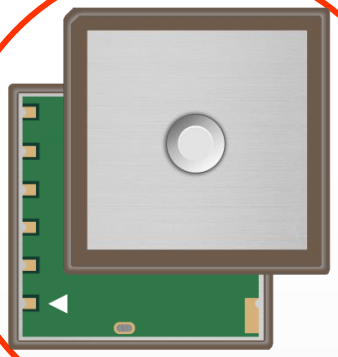
26mA@Tracking mode
30mA@Acquisition mode

AlwaysLocate™

An intelligent controller of power consumption

LOCUS

Embedded logger function without the need of host and external flash



Embedded Patch Antenna

18.4 x 18.4 x 4.0 mm
Automatic antenna switching function

EASY™

Advanced AGPS technology without external memory

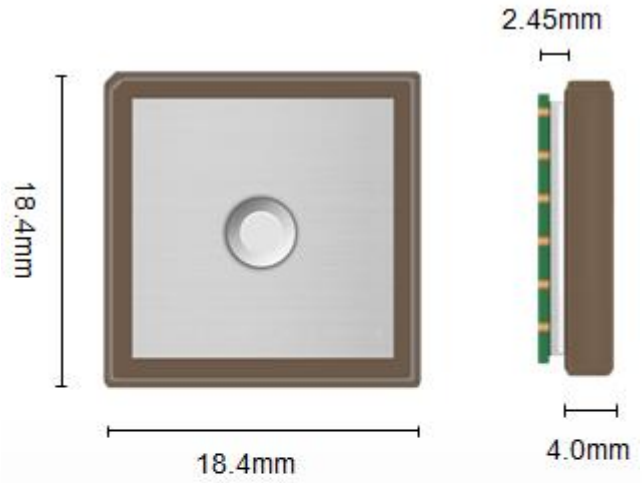
Anti-Jamming

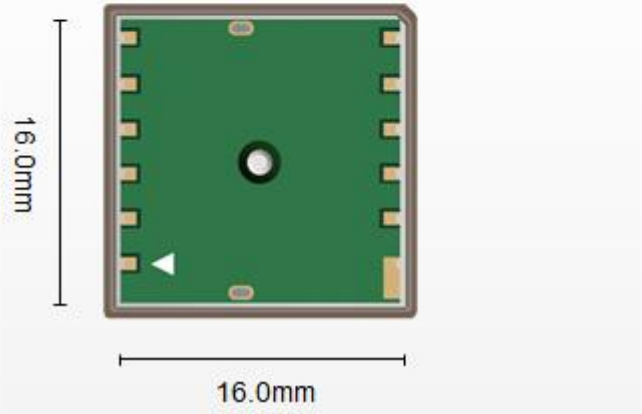
Multi-tone active interference canceller

Highest Sensitivity

-167dBm@Tracking mode
-149dBm@Acquisition mode

Mechanical Dimensions





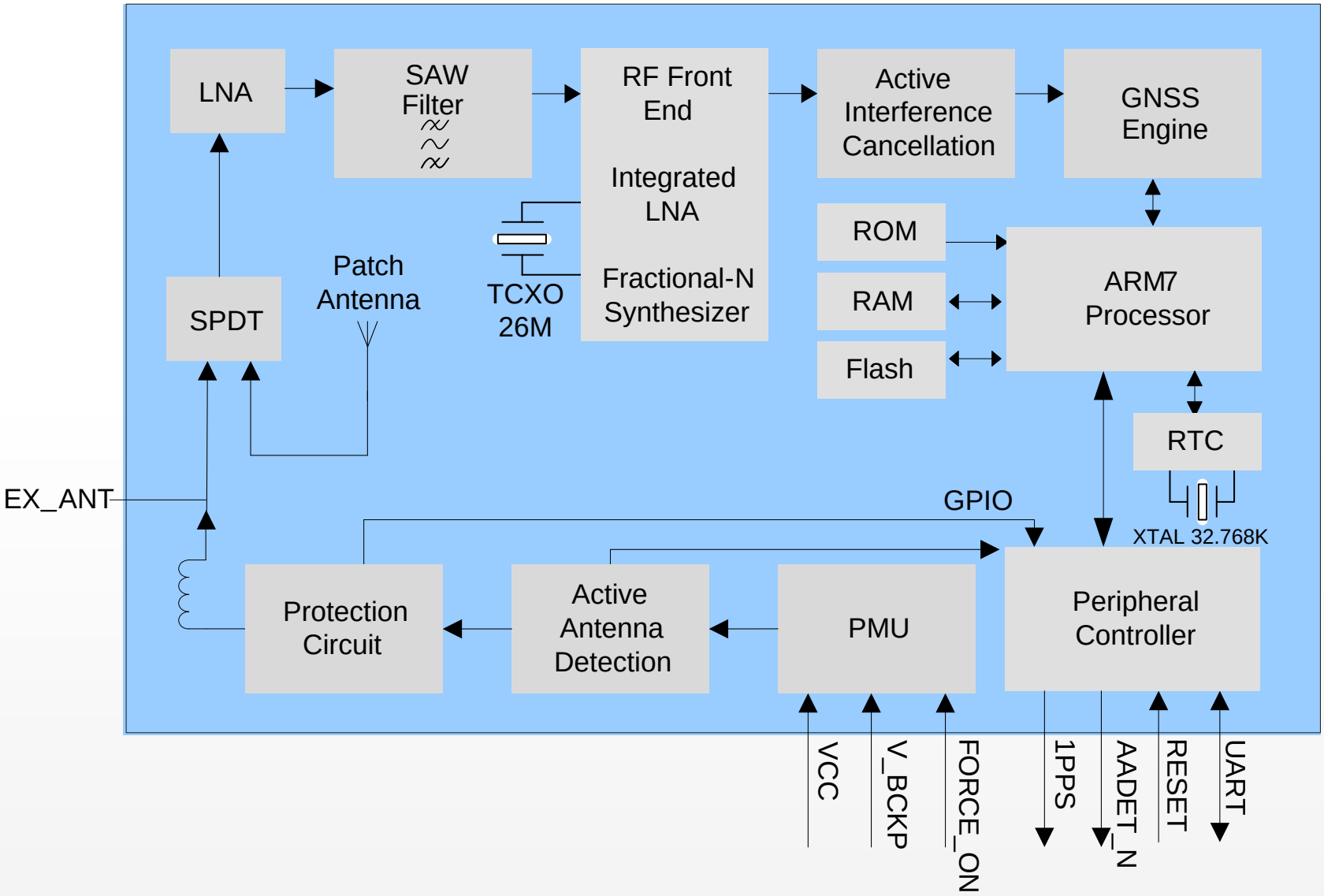
➢ Patch Antenna Dimensions

Length: 18.4 mm
Width: 18.4 mm
Thickness: 4.0 mm

➢ L86 Module Footprint Dimensions

Length: 16.0 mm
Width: 16.0 mm
Height: 6.45 mm
Weight: 7.6 g

Hardware Architecture



Firmware

- Protocol
  - NMEA 0183 standard V3.01
  - MTK Private Protocol: PMTK
- Configurable Operating Modes
  - UART: Adjustable 4800~115200bps (default: 9600bps)
  - Update rate: 1Hz (default), up to 10Hz
  - Selectable output NMEA messages
  - Configurable periodic standby mode
  - Selectable navigation mode

Target Applications

- Portable Devices
- Vehicle Management
- Asset Tracking
- Security System
- Connected PND
- GIS Application
- Industrial PDA

Contents

Receiver Performance

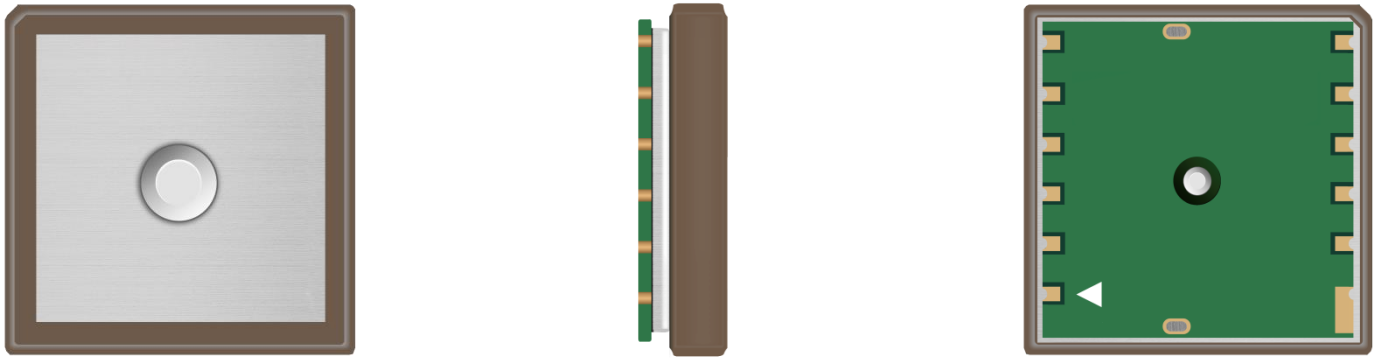
- EASY™, advanced AGPS technology without the need of external memory
- Embedded patch antenna: 18.4 x 18.4 x 4.0mm
- Automatic antenna switching function
- Support short circuit protection and antenna detection
- Built-in LNA for better sensitivity, -167dBm@Tracking, -149dBm@Acquisition
- Extremely low power consumption, 26mA@tracking mode (GPS+GLONASS)
- LOCUS, embedded logger function without the need of host and external flash
- 99 acquisition channels, 33 tracking channels
- Balloon mode, for high altitude up to 80km
- Support DGPS, QZSS, SBAS (WASS/EGNOS/MSAS/GAGAN)
- Great anti-jamming performance due to multi-tone active interference canceller
- PPS VS. NMEA can be used in time service
- Support SDK command developed by Quectel

Specifications

GPS L1 Band Receiver (1575.42MHz) GLONASS L1 Band Receiver (1601.71MHz)	Channel	33 (tracking) / 99 (acquisition)
	C/A Code	
	SBAS	WAAS, EGNOS MSAS,GAGAN
Horizontal Position Accuracy	Autonomous	<2.5m CEP
Velocity Accuracy	Without Aid	<0.1m/s
Acceleration Accuracy	Without Aid	0.1m/s²
Timing Accuracy	1PPS	10ns
Reacquisition Time		<1s
TTFF@-130dBm with EASY™	Cold Start	<15s
	Warm Start	<5s
	Hot Start	<1s
TTFF@-130dBm without EASY™	Cold Start	<35s
	Warm Start	<30s
	Hot Start	<1s
Sensitivity	Acquisition	-149dBm
	Tracking	-167dBm
	Re-acquisition	-161dBm

Environmental Conditions	Operating Temperature	-40℃ to 85℃
	Storage Temperature	-45℃ to 125℃
Dynamic Performance	Maximum Altitude	Max.18000m
	Maximum Velocity	Max.515m/s
	Maximum Acceleration	4G
Footprint Dimensions	16.0 x 16.0 x 6.45mm	
Weight	Approx. 7.6g	
Serial Interface	UART: Adjustable 4800~115200 bps Default: 9600bps	
Update Rate	1Hz by default, up to 10Hz	
I/O Voltage	2.7V ~ 2.9V	
Protocols	NMEA 0183 PMTK	
Power Supply	3.0V ~ 4.3V	
Power Acquisition	30mA@3.3V(GPS+GLONASS)	
Power Tracking	26mA@3.3V(GPS+GLONASS)	
Power Saving	3.5mA@AlwaysLocate™ (GPS+GLONASS)	
	7uA@Backup Mode	
	1mA@Standby Mode	
	Periodic Mode	

Advantages of Soldering (1)



- L86 is a GNSS POT (Patch on Top) module. Its patch antenna's feed point is embedded in the PCB. So the feed point is concave, rather than convex .

- L86 has 12 pins, which are very practical and easy for SMD soldering. Meanwhile, the pins are easily soldered by manual because of its large size (length=1.5mm; width=1.0mm).

Advantages of Soldering (2)

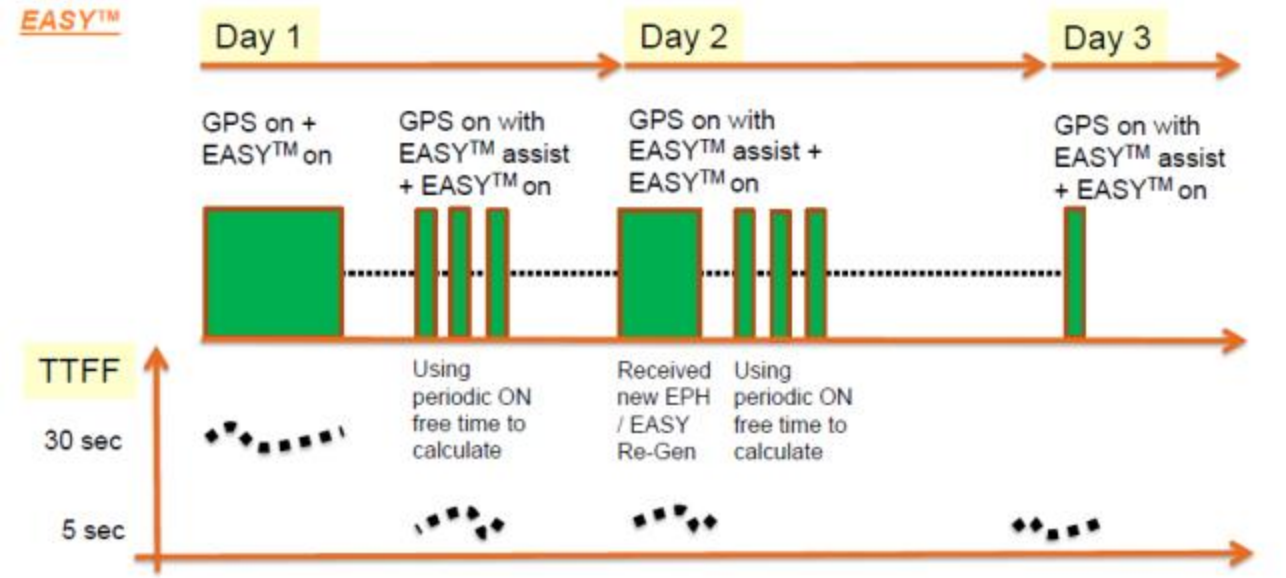
➢ L86 can be easily soldered into all kinds of evaluation boards through five cables (RXD, TXD, VCC, GND and V_BCKP), which is convenient for different customers to evaluate the module's performance on their own boards.

➢ Base on simple design and compact size, L86 module is suitable for special applications, such as GNSS mouse, OBD, etc.

Self-AGPS EASY Technology (1)

- EASY™ is the abbreviation for Embedded Assist System for quick positioning. With EASY™ technology, the GNSS engine can calculate and predict automatically single ephemeris (up to 3 days) when the power is on, and then save the predict information into the memory. So the GNSS engine can use the information for positioning later if there are not enough information received from the satellites.

- This function will be helpful for positioning and TTFF improvement under indoor or urban conditions.



Self-AGPS EASY Technology (2)

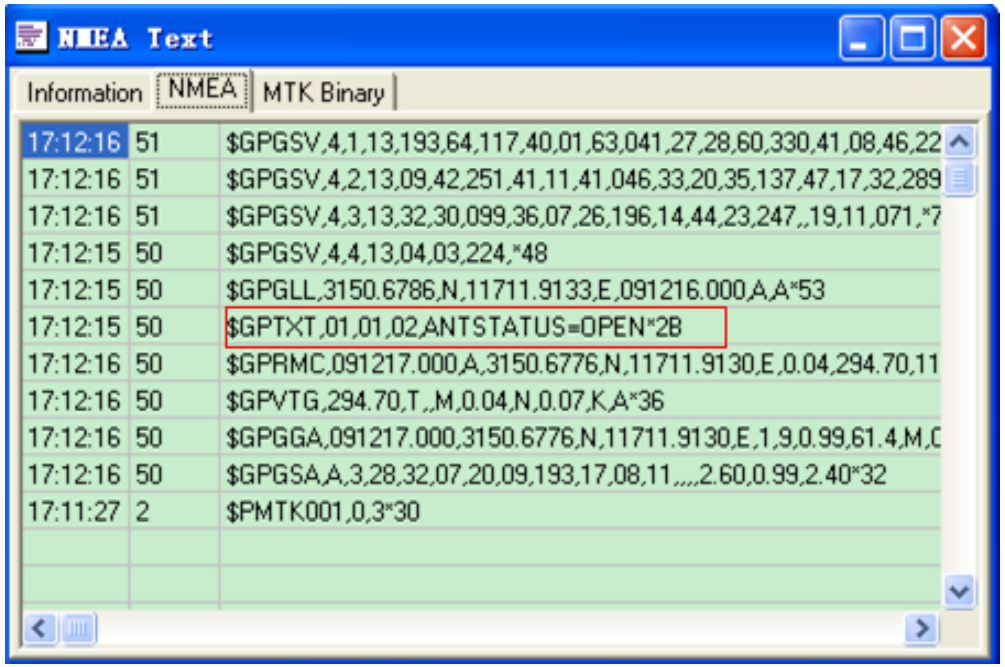
➢ **TTFF Comparison**

Test Condition		TTFF without EASY™	TTFF with EASY™
Under GNSS signal Generator, conductive power level -130dBm	Cold Start	<35s	<15s
	Warm Start	<30s	<5s

With EASY™ technology, L86 accelerates TTFF obviously.

Automatic Antenna Switching Function (1)

➢ Patch Antenna Status

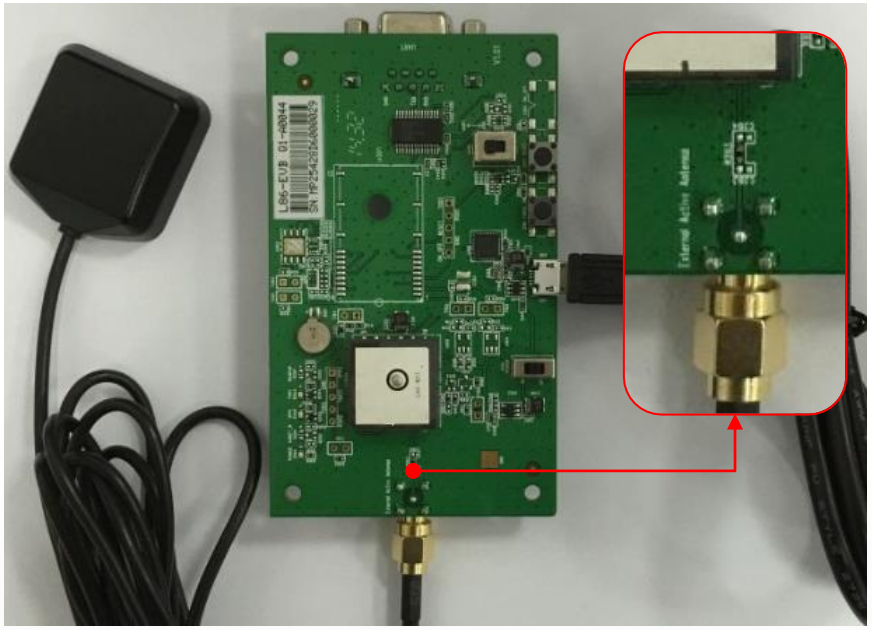


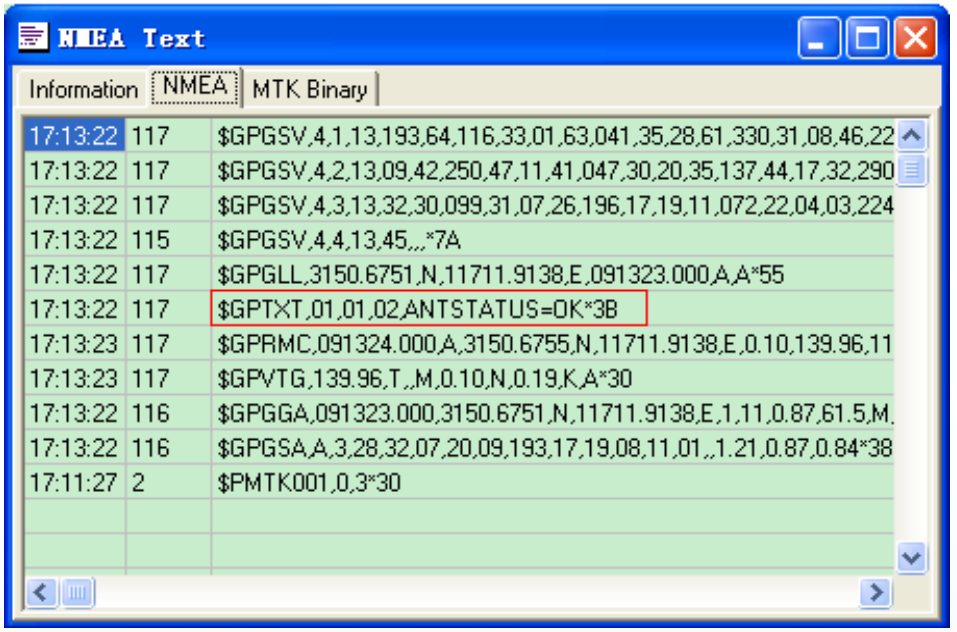
Notes:

1. The patch antenna is used by default, and “OPEN” is displayed in the GPTXT sentence of NMEA.
2. The L86 module with patch antenna could achieve 3D fix even inside concrete buildings.

Automatic Antenna Switching Function (2)

➢ External Active Antenna Status (1)



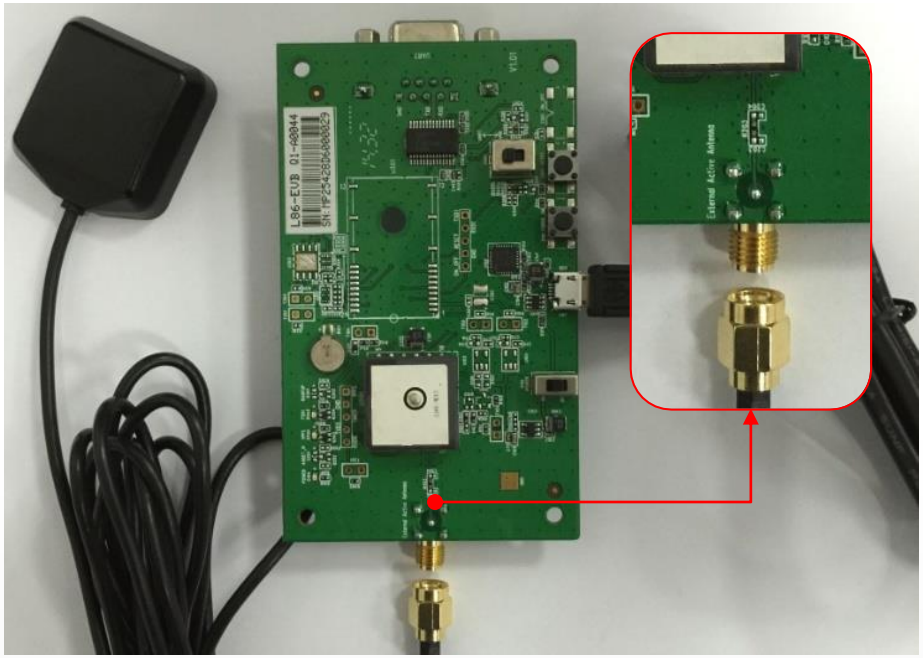


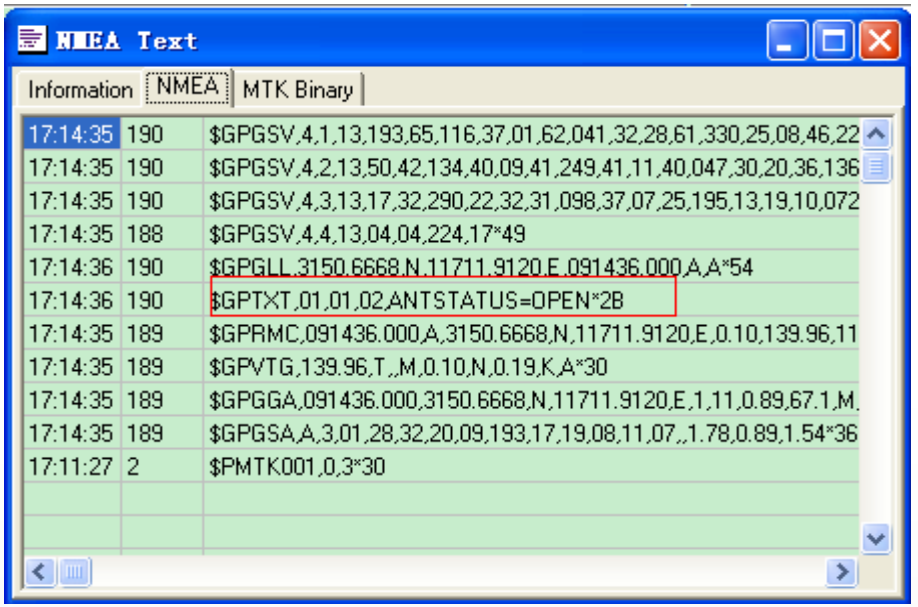
Notes:

1. When the external active antenna is connected well, L86 module will switch to use external active antenna automatically. L86 module keeps positioning during the switching process.
2. “OK” will be displayed in the GPTXT sentence of NMEA, which means the external active antenna works well.

Automatic Antenna Switching Function (3)

➢ External Active Antenna Status (2)



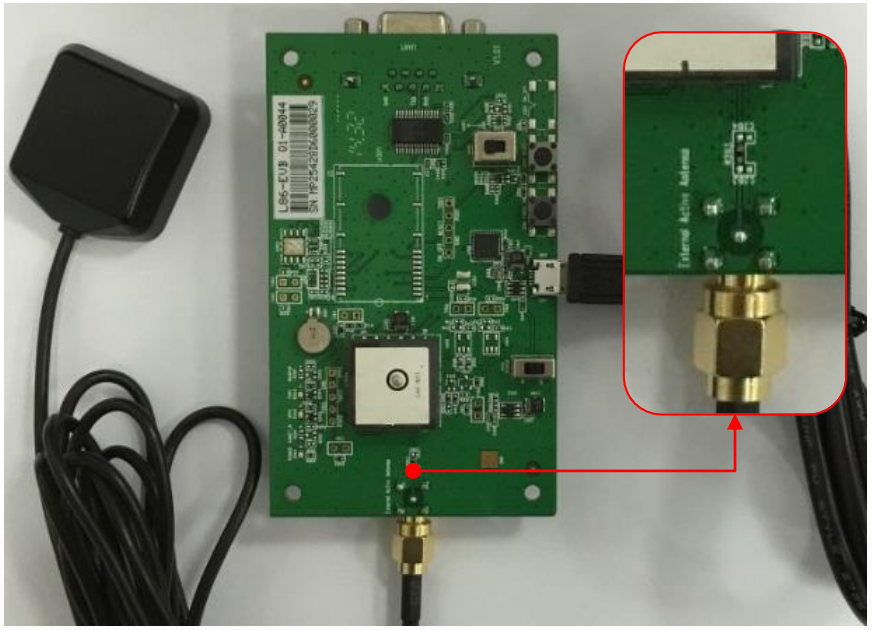


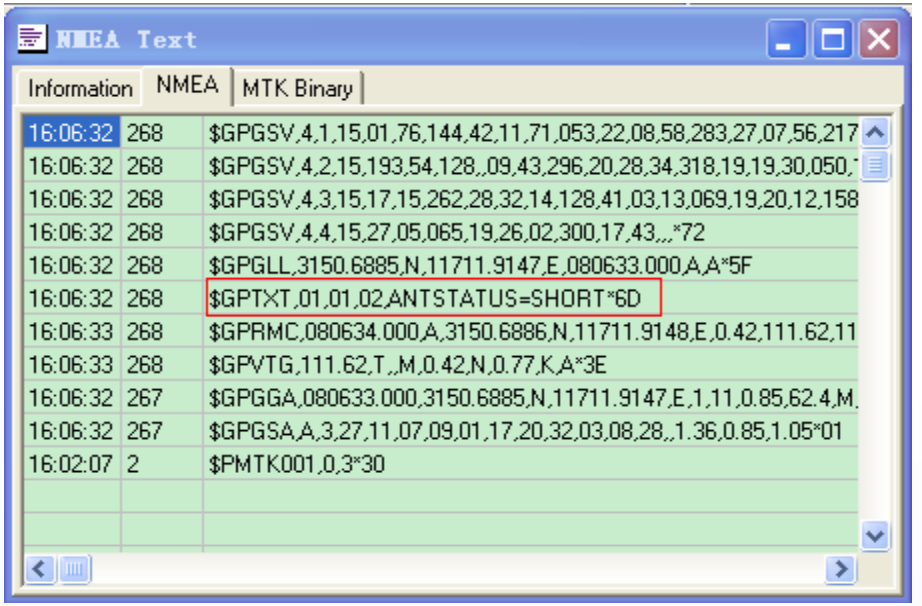
Notes:

1. When external active antenna is removed, the internal patch antenna of L86 module will take effect automatically because of antenna switching function. During the switching process, L86 module keeps positioning.
2. “OPEN” will be displayed in the GPTXT sentence of NMEA at this time.

Automatic Antenna Switching Function (4)

➢ External Active Antenna Status (3)





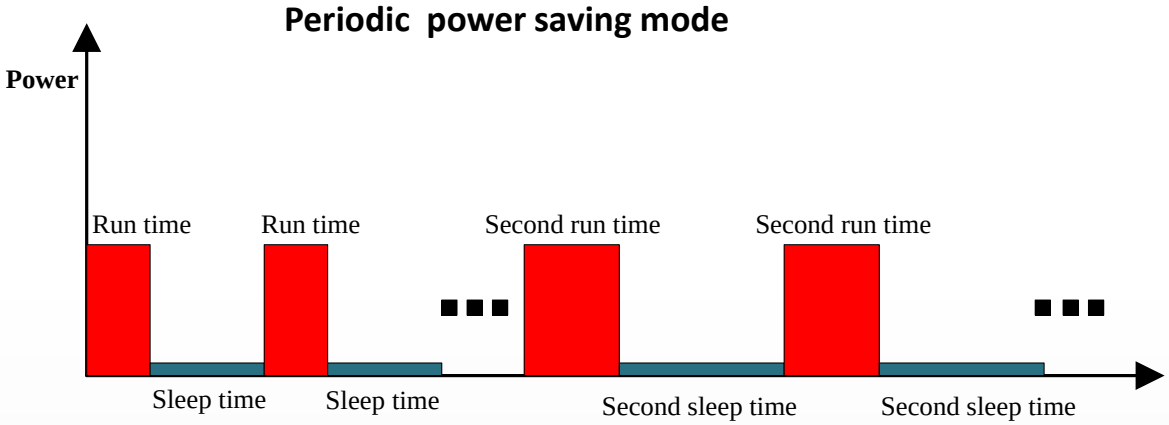
Notes:

1. If external active antenna is short-circuited or damaged, L86 module will use internal patch antenna automatically. There is no need to worry about position fixing because L86 module is persistently positioning during the switching process. What's important is that you need to check the external active antenna and find out the reason when "SHORT" is appeared in the NMEA sentence.
2. "SHORT" will be displayed in the GPTXT sentence of NMEA at this time.

Periodic Standby Mode

Periodic standby mode can control power on/off time of GNSS module periodically to reduce average power consumption, and the on/off time can be configured by using PMTK command. For details, see the figure below. Periodic standby mode can be entered by sending the following PMTK command.

$PMTK255, Type, Run time, Sleep time, Second run time, Second sleep time



Run time: racking period (ms)
Sleep time: standby period (ms)
Second run time: extended acquisition period (ms) when GNSS module acquisition fails during the Run time
Second sleep time: extended standby period (ms) when GNSS module acquisition fails during the Run time

Notes:

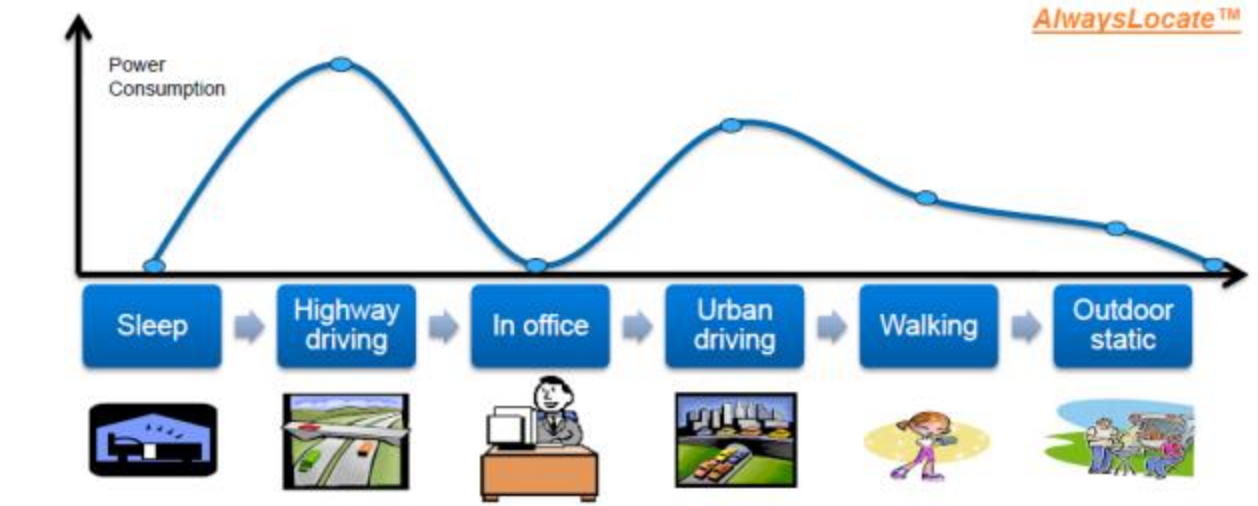
1. Normally, the GNSS module will enter the periodic mode after successfully fixing position. But if acquisition fails, the GNSS module still can enter this mode.
2. If GNSS acquisition fails during the Run time, in order to ensure the success of reacquisition, it is better to set a longer Second run time.

Example: PMTK225, 2, 3000, 12000, 18000, 72000*15 with 3s wakeup time and 12s sleep time in periodic standby mode. The average current is about 4.8mA.

AlwaysLocate™ Technology

- AlwaysLocate™ is an intelligent controller of periodic mode.

- L86 can adaptively adjust the on/off time to achieve balance between positioning accuracy and power consumption according to the environmental and motion conditions. So the average power consumption is lower in AlwaysLocate™ power saving mode than that in periodic power saving mode. Typical average power consumption is 3.0mA.



Contents

L86 vs. Gcompany Gms_g9 (1)

➢ Specification Comparison

Product Features		**L86 (Patch Antenna)**	**Gms_g9 (patch Antenna)**
Power supply		3.0V~4.3V	3.0V~4.3V
Power Consumption	Acquisition Mode	30mA@3.3V (GPS+GLONASS)	35mA@3.3V (GPS+GLONASS)
	Tracking Mode	26mA@3.3V (GPS+GLONASS)	29mA@3.3V (GPS+GLONASS)
Sensitivity	Acquisition	-149dBm	-148dBm
	Tracking	-167dBm	-165dBm
	Re-acquisition	-161dBm	-160dBm
TTFF @ -130dBm	Hot Start	<1s	<1s
	Warm Start	<5s (EASY™)	30s (typical)
	Cold Start	<15s (EASY™)	35s (typical)
Position Accuracy		2.5m CEP	2.5m CEP
Timing Accuracy	1PPS	10ns	10ns
Data Update Rate		Up to 10Hz	Up to 10Hz

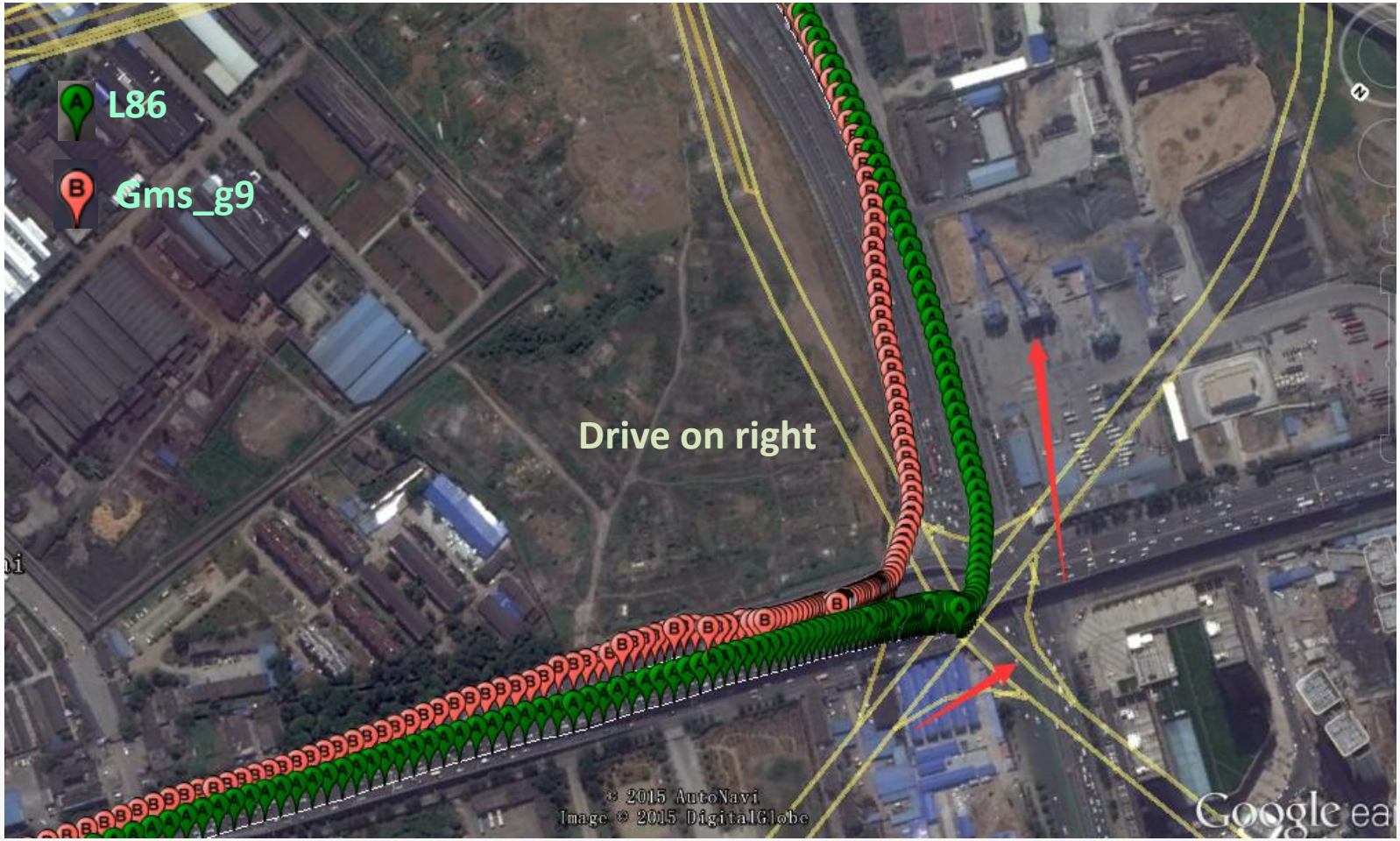
L86 vs. Gcompany Gms_g9 (2)

➢ **Tracking Comparison**

When driving on a straight road, L86 module has better performance.

L86 vs. Gcompany Gms_g9 (3)

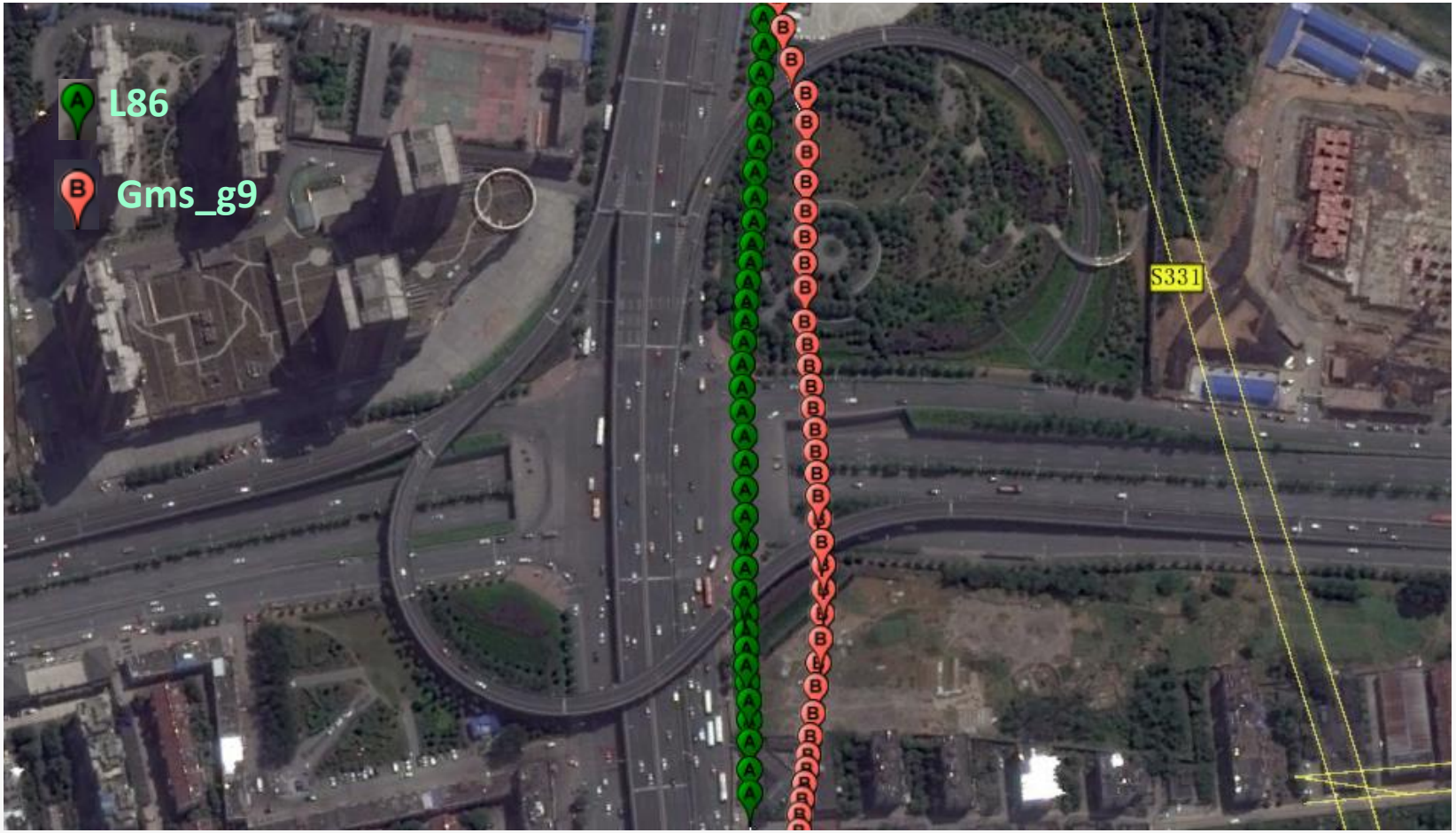
➢ **Tracking Comparison**



When making a turn, L86's performance is much better than the competitor's.

L86 vs. Gcompany Gms_g9 (4)

➢ **Tracking Comparison**



When driving under the overpass, L86 module shows its excellent performance.

Contents

Support Package (1)

Evaluation Board

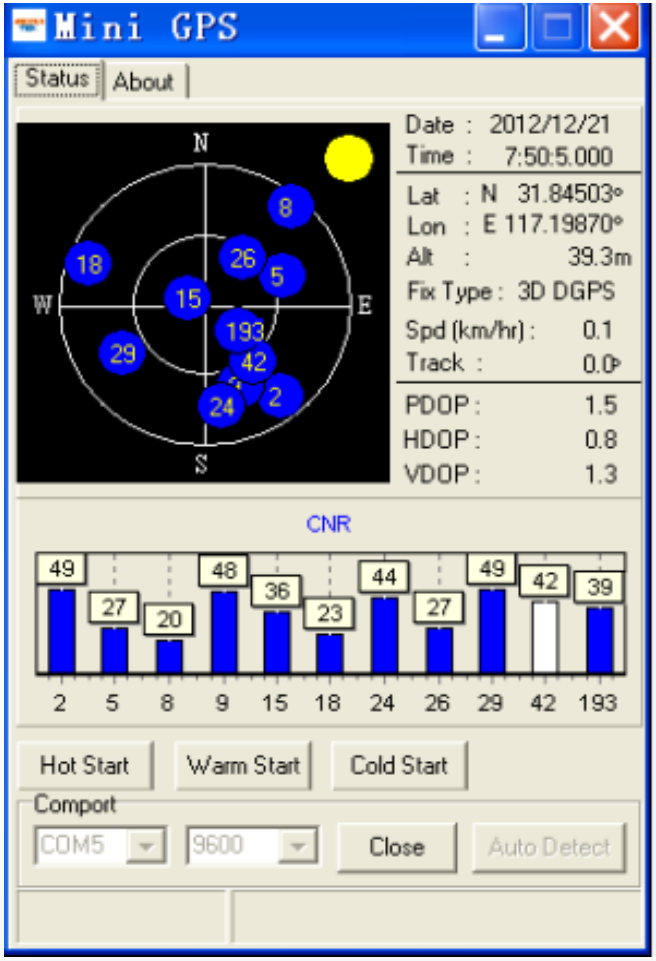
- Interfaces
  - GPS serial port
  - Active antenna interface
  - Micro-USB interface

- Accessories
  - Micro-USB cable

Support Package(2)

- Documents
  - Hardware Design
  - Protocol Specification
  - Part&Decal in PADS and Protel Format
  - Evaluation Board User Guide
  - Circuit Reference Design

- PC tool
  - Mini GPS-GPS testing tool



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Thank you