Quectel L89 GNSS Module

Product Overview

December, 2019

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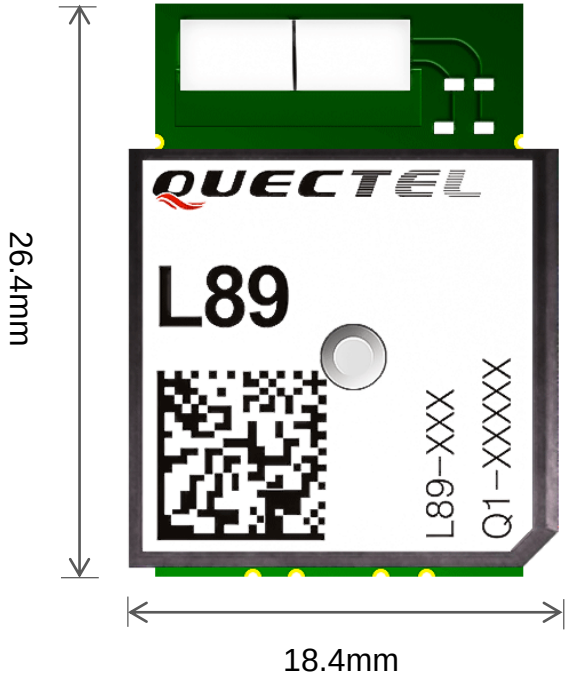
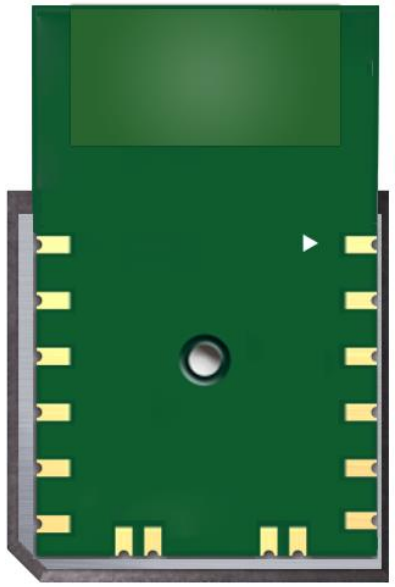
L89 is a multi-band and multi-constellation GNSS module. With two embedded antennas, it can work at L1 and L5 bands simultaneously, and makes it very easy for customers to update devices to support IRNSS.

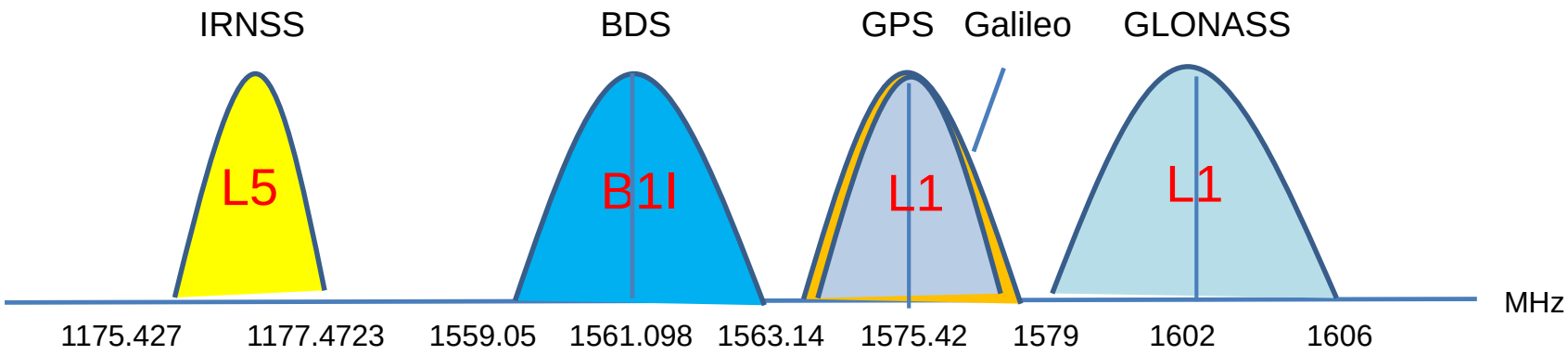
It supports GPS/Galileo/IRNSS/QZSS by default. Through software configuration, it also supports GPS/IRNSS/QZSS, GPS/GLONASS/Galileo/QZSS, or GPS/BeiDou/QZSS navigation.





OC:
L89: L89-S90
L89 EVB Kit: L89EVB-KIT

GNSS Frequency Span



L89 supports GPS, Galileo and IRNSS by default. As IRNSS works on L5 band and GPS/Galileo works on L1 band, one patch antenna (< 20 mm) cannot cover the two bands, so L89 integrates two antennas to support the dual bands.

L89 Specifications

Multi-constellation GNSS	GPS L1/ Galileo E1 C/A IRNSS L5 C/A GLONASS L1 C/A (optional) BD2 B1 C/A (optional) QZSS	
Support 48 channels	Support 48 channels	
SBAS	WAAS, EGNOS, MSAS, GAGAN	
Horizontal Position Accuracy	Autonomous	1.8 m CEP
Velocity Accuracy	Without Aid	<0.1 m/s
Acceleration Accuracy	Without Aid	0.1 m/s²
Timing Accuracy	1PPS	3.9 ns
TTFF @-130dBm with AGPS	Cold Start	< 13 s
	Warm Start	< 5 s
	Hot Start	< 2 s
TTFF @-130dBm without AGPS	Cold Start	< 32 s
	Warm Start	< 25 s
	Hot Start	< 2 s
Sensitivity	Acquisition	-147 dBm
	Tracking	-163 dBm
	Re-acquisition	-156 dBm

Supply Voltage Range	3.1~4.3V, typical 3.3V
Operation Temperature	-40°C~ +85°C
Dimensions	26.4 mm × 18.4 mm × 6.8 mm
Weight	Approx. 8.2 g
Low Power Consumption	Acquisition: 99 mA @3.3V (GPS+IRNSS+Galileo) Tracking 95 mA @3.3V (GPS+IRNSS+Galileo)
Power Saving Modes	7 μA @Standby Mode
I2C	• Max bit rate up to 400 Kbps • Support 7-bit address • Support output of NMEA sentences
UART	• UART port: TXD and RXD • 4800~921600 bps baud rate (9600 bps by default) • Used for NMEA output and firmware upgrade

** preliminary data*

IRNSS Status

The constellation consists of seven active satellites. Three of the seven satellites in constellation are located in geostationary orbit (GEO) and four in inclined geosynchronous orbit (GSO). All satellites launched or proposed for the system are as follows:

Satellite	Launch Date	Launch Vehicle	Orbit	Status	Remarks
IRNSS-1A	1 July 2013	PSLV-XL-C22	Geosynchronous (IGSO) / 55° E, 29° inclined orbit	Failed in orbit	Atomic clocks failed.
IRNSS-1B	4 April 2014	PSLV-XL-C24	Geosynchronous (IGSO) / 55° E, 29° inclined orbit	Operational	
IRNSS-1C	16 October 2014	PSLV-XL-C26	Geostationary (GEO) / 83° E, 5° inclined orbit	Operational	
IRNSS-1D	28 March 2015	PSLV-XL-C27	Geosynchronous (IGSO) / 111.75° E, 31° inclined orbit	Operational	
IRNSS-1E	20 January 2016	PSLV-XL-C31	Geosynchronous (IGSO) / 111.75° E, 29° inclined orbit	Operational	
IRNSS-1F	10 March 2016	PSLV-XL-C32	Geostationary (GEO) / 32.5° E, 5° inclined orbit	Operational	
IRNSS-1G	28 April 2016	PSLV-XL-C33	Geostationary (GEO) / 129.5° E, 5.1° inclined orbit	Operational	
IRNSS-1H	31 August 2017	PSLV-XL-C39		Launch Failed	The payload fairing failed to separate and satellite could not reach the desired orbit. It was meant to replace defunct IRNSS-1A.
IRNSS-1I	12 April 2018	PSLV-XL-C41	Geosynchronous (IGSO) / 55° E, 29° inclined orbit	Operational	

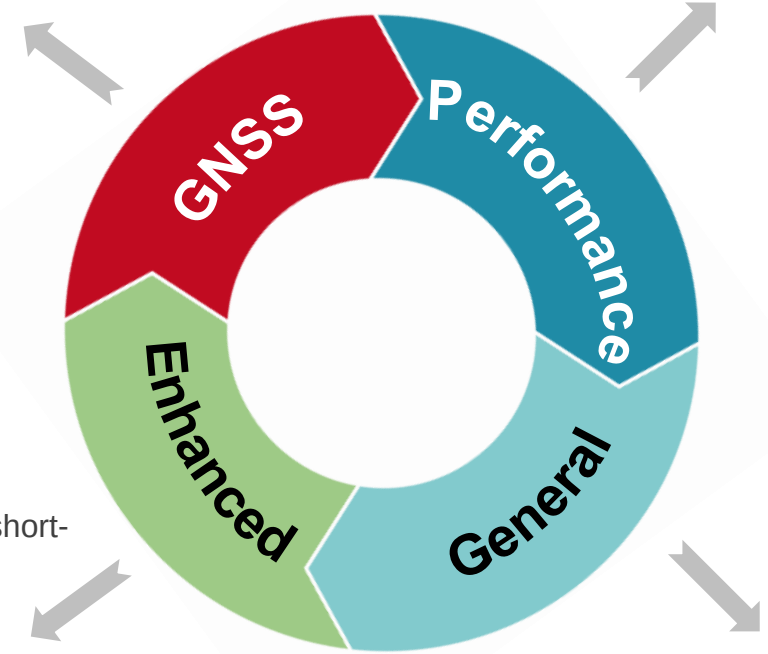
Highlights

GNSS Features

- GPS/IRNSS/GLONASS/Galileo/BeiDou
- SBAS/QZSS
- Autonomous AGPS
- ST-AGPS ™
- 1PPS
- AIS-140 compliant

Enhanced Features

- Embedded dual antennas
- External antenna supported
- Antenna status detection (open-circuit & short-circuit)
- Antenna auto-switch
- Anti-jamming: multi-tone active interference cancellation
- Build-in SAW and LNA for better performance in weak signal areas
- Geofence configurable
- Odometer management



High Performance

High Accuracy

- 1.8 m CEP50

High Sensitivity

- -163 dBm @Tracking mode
- -147 dBm @Acquisition mode

Low-power Mode

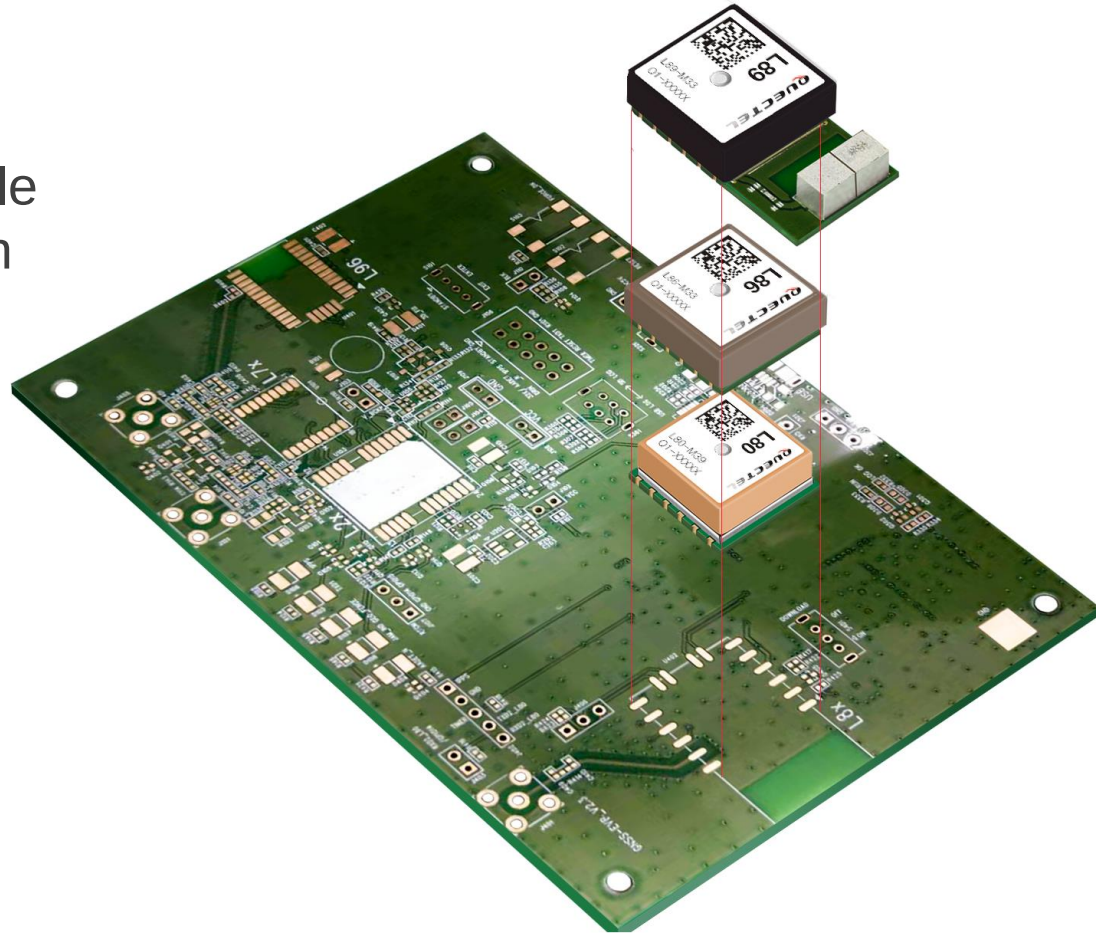
- Backup mode

General Features

- LCC package: 26.4 mm × 18.4 mm × 6.8mm
- Extended temperature range: -40°C~ +85°C
- I2C: maximum bit rate up to 400 kbps
- UART: 4800~921600 bps (9600 bps by default)
- Protocols: NMEA 0183/PSTM

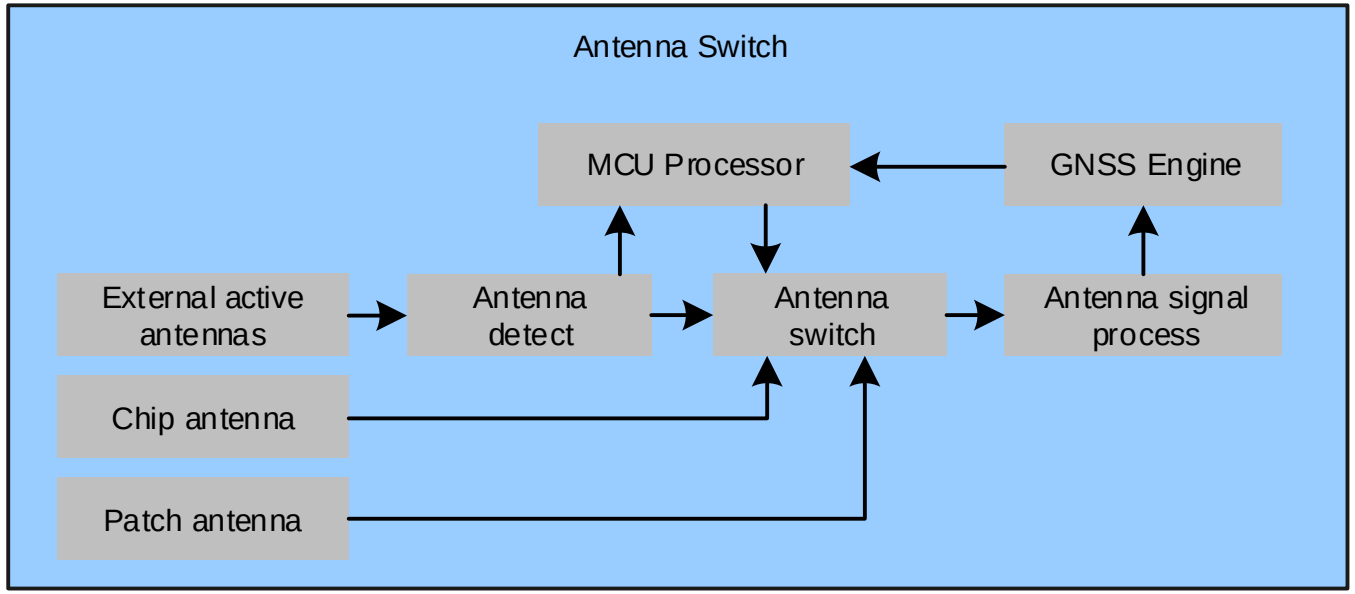
L89 Compatibility

Quectel L8x series modules are pin-to-pin compatible with each other, so it is easy for customers to design only one PCB for different SKUs.



Note: As compared with L80/L86, L89 has one more chip antenna for IRNSS, so it is a must to design a keep-out area under the additional antenna.

Antenna Status Detection and Auto-switching

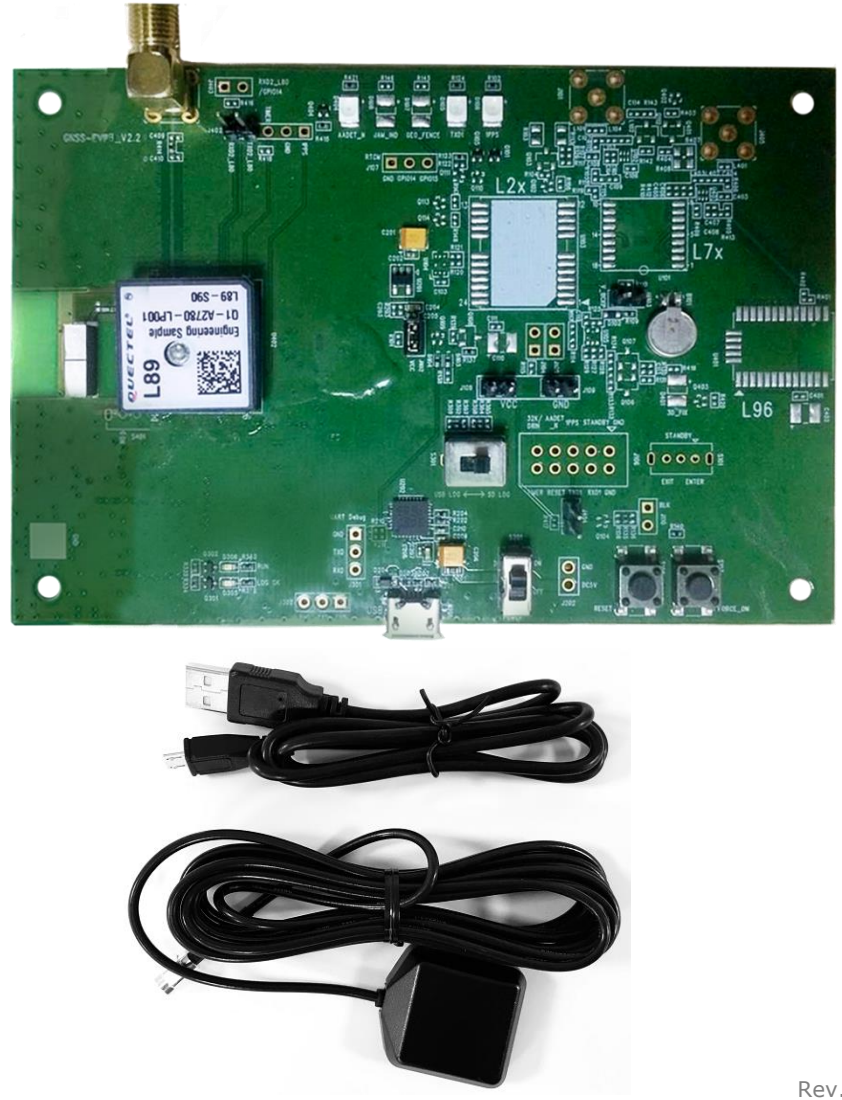


1. When the external antenna is open-circuited, the integrated chip antenna and patch antenna will work.
2. When the external antenna is short-circuited to GND, the module will switch off VBAT_RF and the integrated chip antenna and patch antenna will work.
3. When an external active antenna is detected, the external antenna will work and the integrated patch antenna and chip antenna will stop working.

Support Package - EVB Kit & Technical Materials

L89 EVB Kit

- L89 EVB
- USB Cable
- GNSS Active Antenna



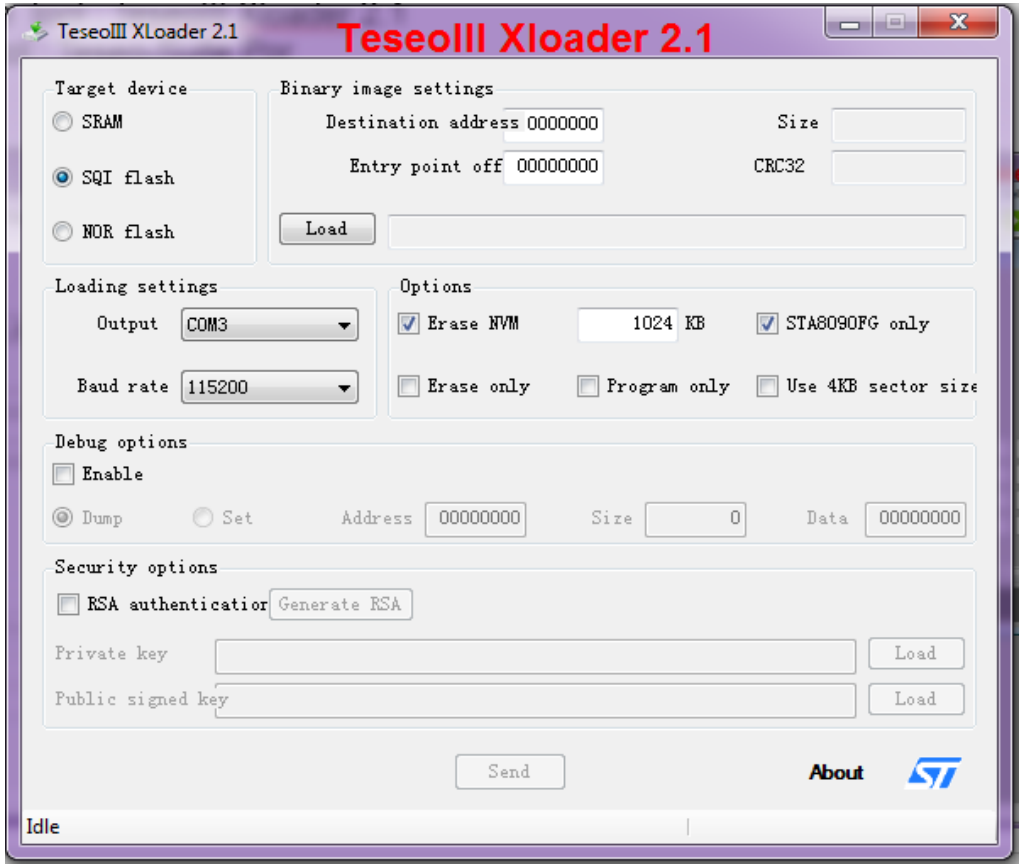
Technical Materials Package

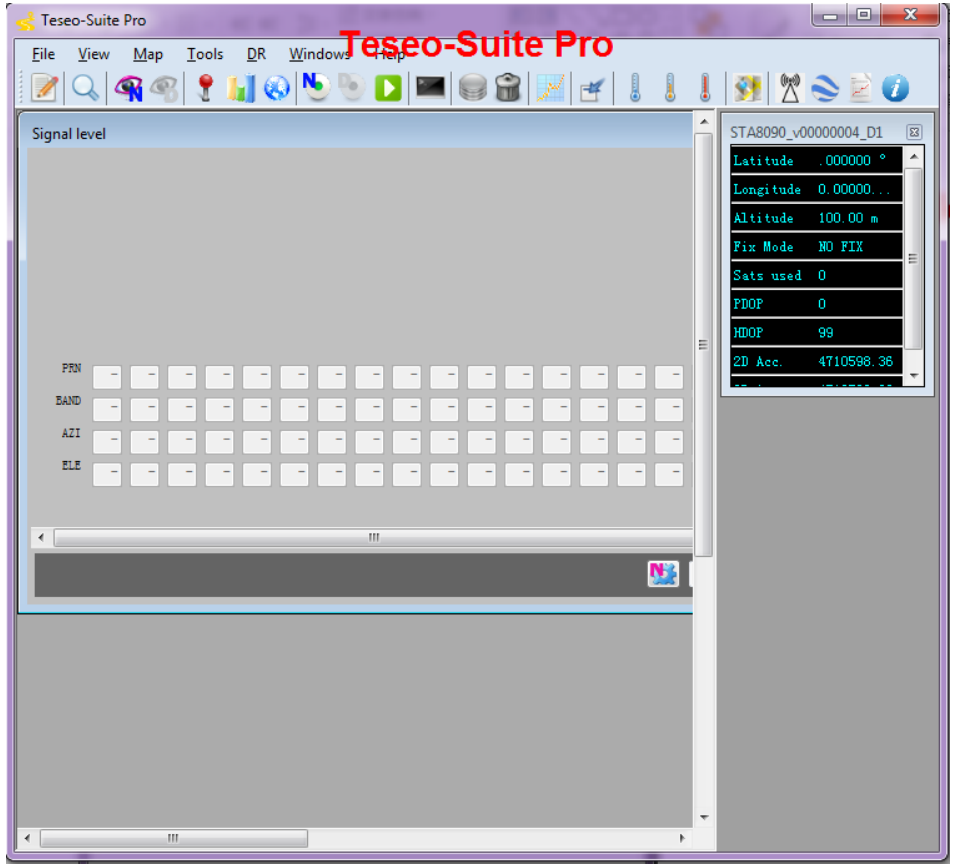
- Specification
- Hardware Design
- Reference Design
- Protocol Specification
- EVB User Guide
- Application Notes

Support Package - Test Tool

PC Tool

- Update tool : TeseoIII Xloader 2.1
- Test tool : Teseo-Suite Pro





Thank you!

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