

ST-200

GPRS Tri Band Module with GPS Receiver

for Automatic Vehicle Locator



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1. Overview

The ST-200 is consisting of a Tri-band GSM/GPRS data Module and GPS receiver for AVL (Automatic Vehicle Location) systems. The tri-band GSM/GPRS data module is designed to work with North American E-GSM 850 or European E-GSM 900 and DCS 1800 and also North American PCS 1900. GPRS multi-slot class 8 and terminal class B is supported. This Class B data module can be connected to a packet data network, i.e. Internet or an intranet, and at the same time be able to be paged for incoming telephone calls (or circuit switched data calls). Therefore a user can be connected to a packet data for a long time (always connected) and at the same time not miss any telephone calls. This data module supports all four coding scheme from CS-1 through CS-4, thus it can support download speed of 36.2 kbps for coding scheme 1 up to 85.6 kbps for coding scheme 4. It also supports upload speed of 9.05 kbps for coding scheme 1 up to 21.4 kbps for coding scheme 4.

- GPRS class 8 data module supports download speed of 36.2 kbps for coding scheme 1 up to 85.6 kbps for coding scheme 4. It also supports upload speed of 9.05 kbps for coding scheme 1 up to 21.4 kbps for coding scheme 4.
- GPRS class 10 data module supports download speed of 36.2 kbps for coding scheme 1 up to 85.6 kbps for coding scheme 4. It also supports upload speed of 18.1 kbps for coding scheme 1 up to 42.8 kbps for coding scheme 4.

The GPS receiver is designed for high acquisition and tracking sensitivity having excellent navigation accuracy even at low signal levels. The GPS receiver is working with active external antenna included LNA via SAM connector and shielded GPS module.

2. General Description

2.1 DC Characteristics of GSM Module

Parameter	Test Condition	min	typical	max	unit
Peak VBAT current	GSM900			2	A
Average VBAT	GSM900(2 TX slot)		500		mA
Average Standby mode			5		mA
Supply voltage		3.4		4.2	V
Ambient temperature	Operation	-10	25	55	degree
Ambient temperature	storage	-40		85	degree

2.2 RF Characteristics of GSM Module

RF Output Power	GSM Power Level 5	31	33	35	dBm
	DCS and PCS Power Level 0	28	30	32	dBm
	GSM Power Level 19	0	5	10	dBm
	DCS and PCS Power Level 15	-5	0	5	dBm
RMS Phase Error	GSM, DCS and PCS			5	deg
Phase Error	GSM, DCS and PCS			20	deg
Impedance	Antenna Port		50		ohm

2.3 Frequency Range of GSM Module

GSM850

GSM900

880 MHz to 915 MHz: Mobile Transmit, Base Receive.

925 MHz to 960 MHz: Base Transmit, Mobile receives

DCS1800

1710 MHz to 1785 MHz: Mobile Transmit, Base Receive.

1805 MHz to 1880 MHz: Base Transmit, Mobile receives

PCS1900

1850 MHz to 1910 MHz: Mobile Transmit, Base Receive.

1930 MHz to 1990 MHz: Base Transmit, Mobile receives

2.4 Operating Condition of GPS Receiver

Parameter	Symbol	Condition	Min	Typ	Max	Units
Power Supply Voltage	Vcc		2.7		3.3	V
Power Supply Voltage ripple	Vpp				50	mV
Sustained Supply Current	Icc	Vcc = 3.0V		60		mA
Peak Supply Current	Iccp	Vcc = 3.3V			125	mA
Sleep Mode Current	Iccs	Vcc = 3.0V		130		uA
Backup Battery Voltage	Vbat		1.95			V
Backup Battery Current	Ibat	Vbat= 3.3V		15	40	uA

2.5 Specification of GPS Receiving Unit

- Receiver Channel : Digital 16-channel parallel/sequential
- Receiving Frequency : civil 1575.42MHz (C/A code)
- Max update rate : 4Hz
- Accuracy(Selective_Availability_off) : Position 2.5m CEP, 5.0m SEP
- Minimum units of measurement
 - Position : 1/10000min
 - Velocity : 0.1Km/h
 - Bearing : 0.1 Degree
 - Position Update rate : 1Hz
- Time to First Fix(TTFF) @ good sky view:
 - Cold Start : Within 40sec typically(at normal temperature)
 - Warm start : Within 38sec typically(at normal temperature)
 - Hat start : Within 5sec typically(at normal temperature)
 - Re-acquisition time : 3sec typical (within 5sec block out)
8sec typical (within 120sec block out)
 - Protocol : MNEA0183 (default) 9600bps
Activated message : GLL, GGA, RMC, VTG, GSV,GSA
All with checksum enabled

* Definition at system startup

1) Cold start:

The system has no information about last position and current time.

2) Warm start:

The last position is known / the current time is known / the almanac data are valid/
the ephemeris are not available or outdated (older than 2hr)

3) Hot start

The last position is known / the current time is known / the almanac data are valid/
the ephemeris data are valid.

2.6 Dimension

- W 59 x L96 x 15.3 (mm)

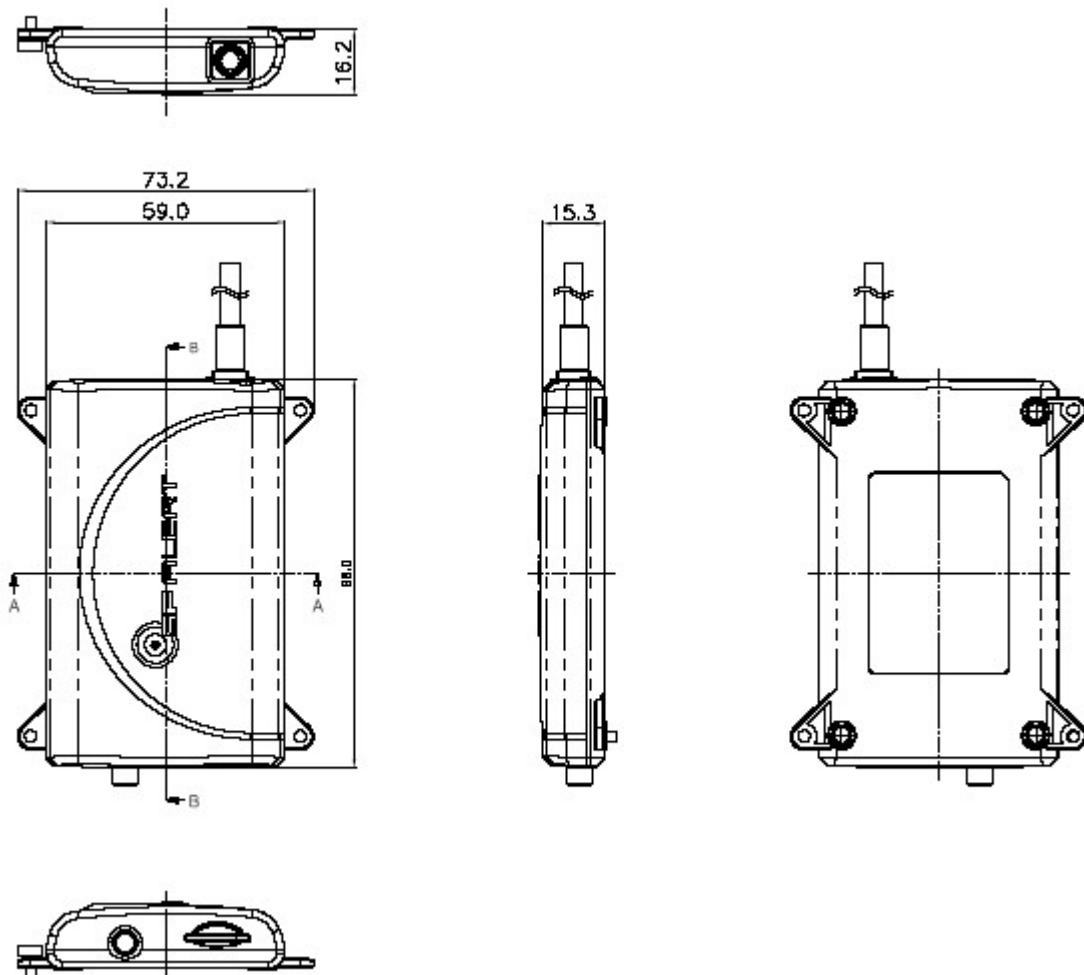


Fig 1. ST-200 Mechanical Drawing

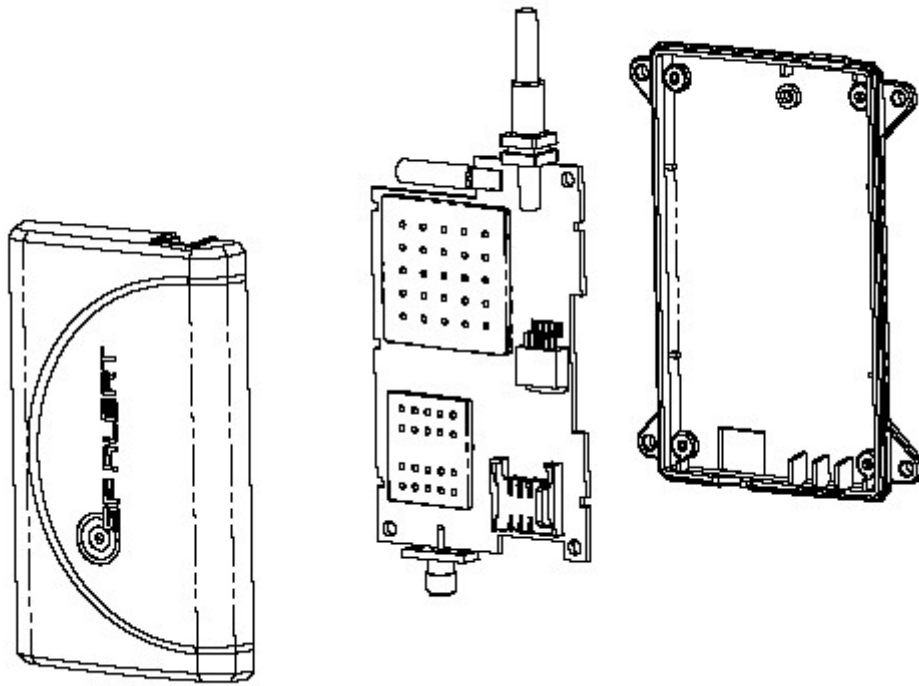


Fig.2 ST-200 Exploded View



Fig. 3 Picture of ST-200

3. Block Diagram

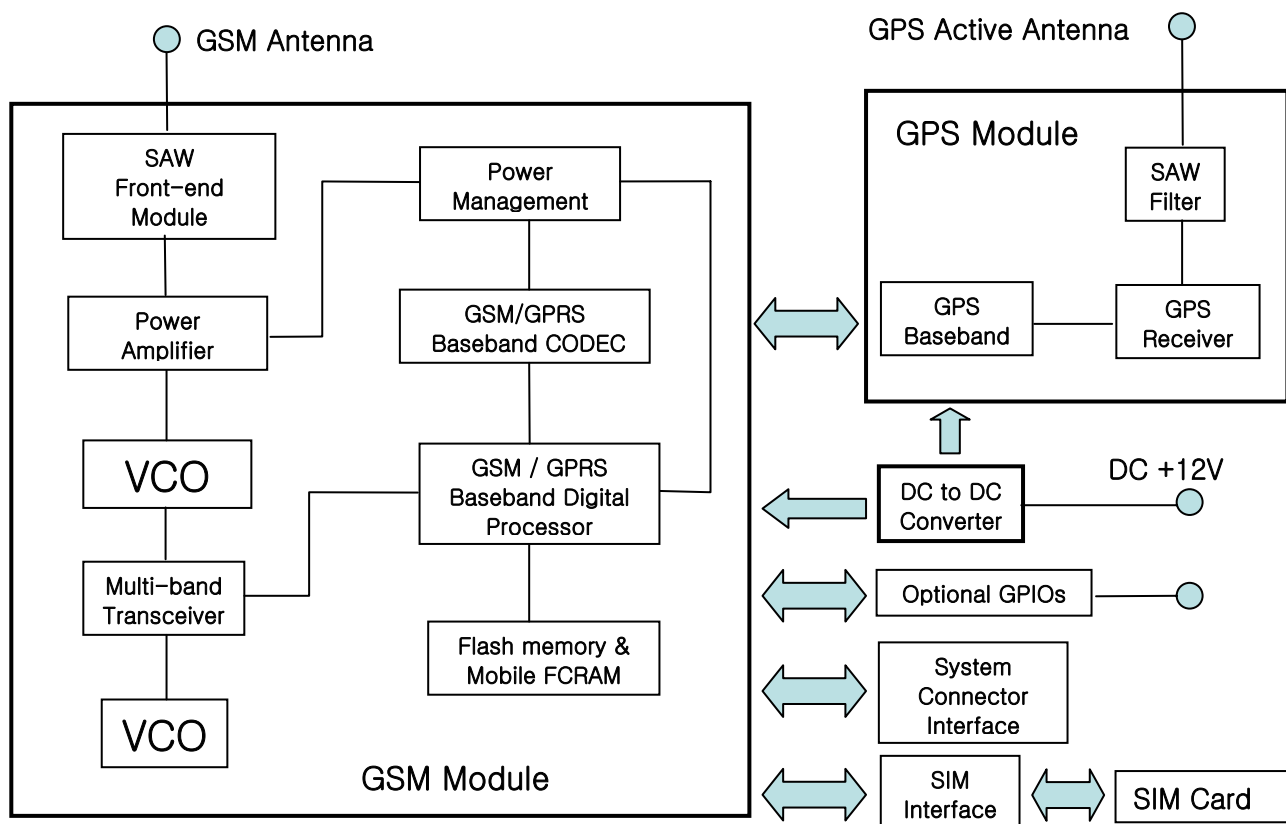


Fig. 4 ST-200 Block Diagram

4. Key Features

Feature	Characteristics
Power Supply	+8V to +30V
Power Consumption for VBATT	Active mode (peak) < 1.0A Active mode (avg.) < 300mA Idle mode < 50mA Sleep mode < 5mA
Operating Temperature Range	-20°C to +60°C
Storage Temperature Range	-20°C to +70°C
Humidity	Up to 75% non-condensing
External Antenna	Connected via the 50Ω coax connector
External SIM card	Connected via SIM Card connector
SIM card type	3V
Transmit Power	Class 4 (2W) for E-GSM 900 and 850 Class 1 (1W) for DCS 1800 Class 1 (1W) for PCS 1900
Sensitivity	-104 dBm minimum for E-GSM 900 and 850 -102 dBm minimum for DCS 1800 -102 dBm minimum for PCS 1900
Speech Codec	Triple rate Codec: Half rate – ETS 06.20 Full rate – ETS 06.10 Enhance Full rate – ETS 06.50/06.06/06.08
GPRS	Multi-slot Class 8 (4Rx, 1Tx, 5slot Max.) Support all 4 coding schemes (CS-1, CS-2, CS-3 and CS-4) <ul style="list-style-type: none"> ● Maximum download speed is 85.6kbps ● Maximum upload speed is 21.4kbps
Circuit-Switched Data Rate	14.4kbps
Interface	Full duplex 3V CMOS-level serial interface for AT commands protocol

4.1 Pin Assignment

No.	Name	Type
1	Vcc	Power Supply
2	Gnd	Ground
3	Ignition	Car Ignition
4	Opt. 1	Optional GPIO
5	Opt. 2	Optional GPIO
6	Opt. 3	Optional GPIO

5. GPS Active Antenna

5.1 Dimension

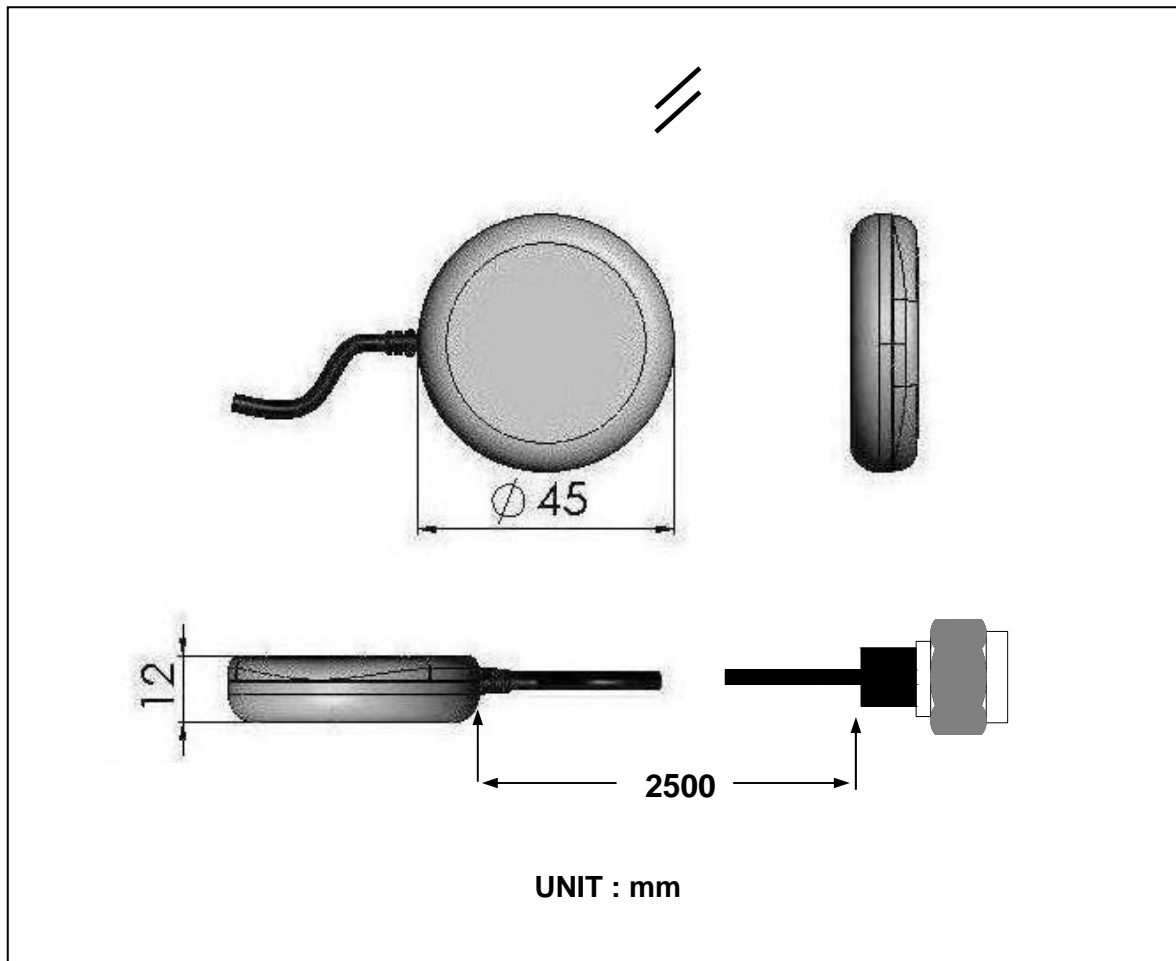


Fig. 5 GPS Active Antenna Demension

5.2 Electrical Characteristics

($V_{DD}=+3V$, $P_{IN}=-30dBm$, $Z_0=50\Omega$, $T_A=+25^\circ C$)

1) Antenna Element

ITEM	UNIT	SPECIFICATION
1. Frequency Range	MHz	1575.42 \pm 2
2. VSWR		2:1 max.
3. Bandwidth	MHz	15
4. Polarization		R H C P
5. Axial Ratio	dB	3.0 max
6. Input Impedance	Ω	50
7. Gain	dBi	5.0 dBi typical @zenith

2) LNA

ITEM	UNIT	SPECIFICATION
1. Frequency Range	MHz	1575.42 \pm 1.023
2. VSWR		1.5:1 max @Center Freq.
3. Noise Figer	dB	1.8 max
4. Out Band Rejection	dBc	-45dBc @1475.42 -18dBc @1625.42
5. Operation Voltage	V	3.0 \pm 0.3
6. Current Consumption	mA	13mA Typical , 18mA max
7. LNA Gain	dB	23dB min 24dB Typical
8. Input Impedance	Ω	50
9. Receive Satellite No		> 4
10. S N R		> 40 (2of 4)
11. PDOP		< 5.00

5.3 BLOCK DIAGRAM

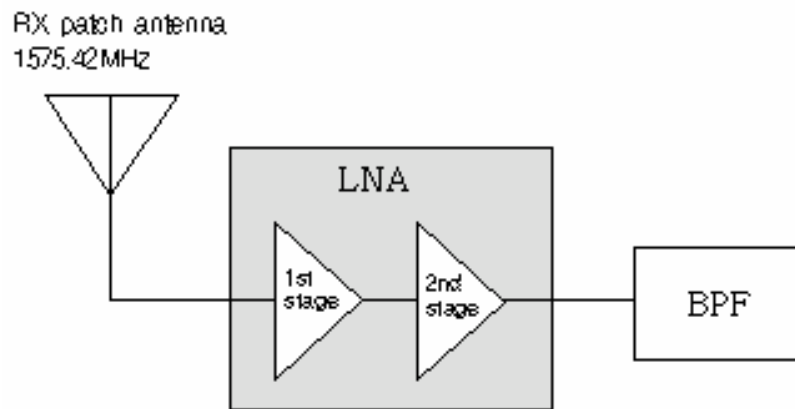


Fig. 6 Block Diagram of GPS Antenna

5.4 Mechanical Specification

Color and Materials	
Material	ABS
RF Cable	RG 174 (2.5 m ±0.1)
Color	Black
Connectors	SMA (Male)
Mounting	VELCRO (30mm ×30mm)