
GR-87 GPS Receiver Module

1. Main Feature

- Build on high performance SiRF GSC3f/LP chipset.
- Average Cold Start time and under 42 seconds.
- Low power consumption
- 20 channels “All-in-View” tracking.
- 200,000+ effective correlators for fast TTFF and high sensitivity acquisitions
- Integrated ARM7TDMI CPU with software engineering services and available for embedded customer defined applications.
- On chip 1Mb SRAM.
- Dual TTL level serial ports with one for GPS receiver command message interface, another one for RTCM-104 DGPS input.
- Compact Board Size 1”x1”x0.27”(25.4x25.4x7mm) for easy integration into hand-held device.
- Reacquisition Time 0.1 seconds
- Support Standard NMEA-0183 and SiRF Binary protocol
- Support Accurate 1PPS output signal aligned with GPS Timing
- Multi-path Mitigation Hardware
- On-board WAAS /EGNOS Demodulator
- Built-in a lithium battery make GPS fast positioning

2. Technical Specifications

2.1. Electrical Characteristics

2.1.1 General

- 1). Frequency : L1, 1575.42 MHz.
- 2). C/A code : 1.023 MHz chip rate.
- 3). Channels : 20(according to SiRF's spec.).

2.1.2 Accuracy (Open Sky)

- 1). Position : 10 meters, 2D RMS.
- 2). 7 meters 2D RMS, WAAS corrected.
- 3). 1-5 meters, DGPS corrected.

- 4). Altitude : $< \pm 35\text{m}$ Vertical in term of 95%.
- 5). Velocity : 0.1 meters/second.
- 6). Time 1 microsecond synchronized to GPS time.

2.1.3 Datum

- 1). Default : WGS-84.
- 2). Other Support different datum by request.

2.1.4 Acquisition Rate (Open sky, stationary requirements)

- 1). Reacquisition : 0.1 sec, average.
- 2). Hot start : 1 sec, average.
- 3). Warm start : 38 sec, average.
- 4). Cold start : 42 sec, average.

2.1.5 Dynamic Conditions

- 1). Altitude : 18,000 meters (60,000 feet) max.
- 2). Velocity : 515 meters/second (1000 knots) max.
- 3). Acceleration : 4g, max.
- 4). Jerk : 20 meters/second, max.

2.1.6 Power

- 1). Input power input : 3.3 ~ 5.5 VDC input.
- 2). Input current: 50 mA (without antenna) .
- 3). Backup power: 3V Rechargeable Lithium cell battery, up to 500 hours discharge.

2.1.7 RF interface

- 1). Antenna connector type: MMCX, output 3.0 VDC. (optional output VCC_IN)
- 2). Minimum signal tracking: -159 dBm (according to SiRF's spec)

2.1.8 Serial Port

- 1). Two full duplex serial communication, CMOS 3.0V interface, with user selectable baud rate (4800-Default, 9600, 19200, 38400).
- 2). NMEA 0183 Version 2.2 & 3.0 ASCII output (GGA, GSA, GSV, RMC (VTG , GLL and ZDA for optional)).
- 3). SiRF binary-position, velocity, altitude, status output.

2.1.9 TIMEMARK-1PPS Pulse

- 1). Level CMOS 3.0V.
- 2). Pulse duration 1 microsecond.
- 3). Time reference at the pulse positive edge.
- 4). Measurements aligned to GPS second, ± 1 microsecond.

2.2. Environmental Characteristics

- 1). Operating temperature range $-10\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$
- 2). Storage temperature range $-20\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$

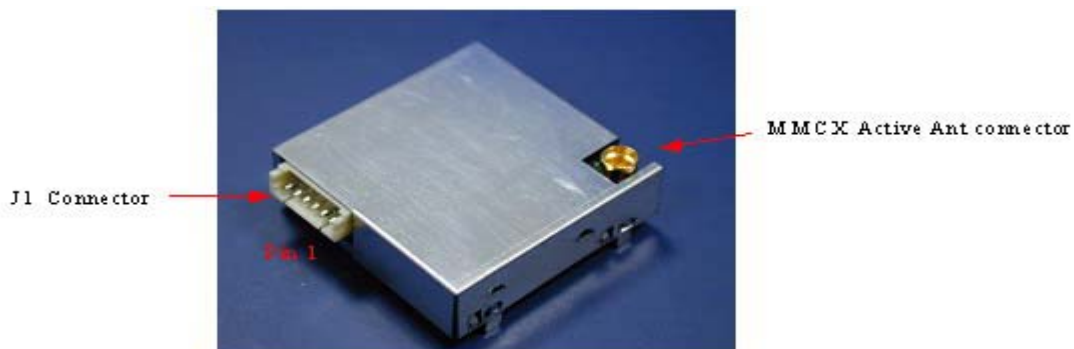
2.3. Physical Characteristics

- 1) Active Size: 25.4(W) x 25.4(D) x 7(H) (mm) .
- 2) Weight: 8 g.
- 3) Interface connector 6-pin straight male header, 1.25 mm pitch .

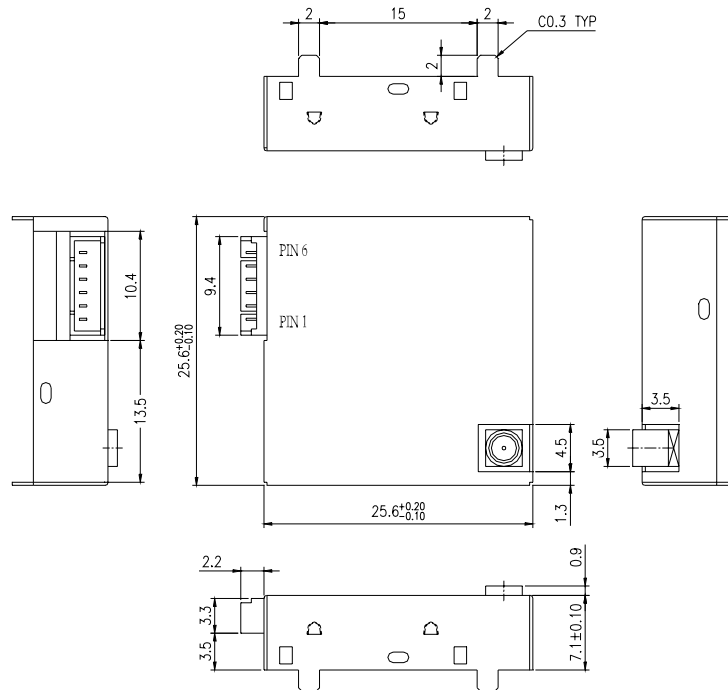
3. Mechanical Dimensions

3.1 . GR-87-T0A, GR-87-T0C outline:

- Picture

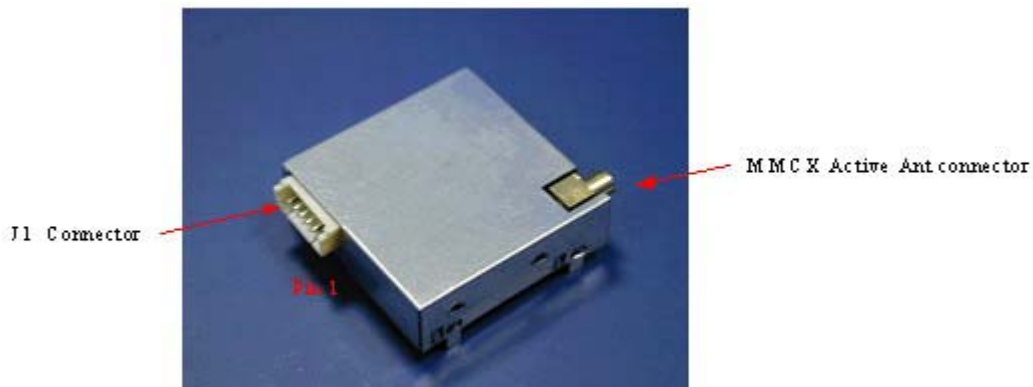


- Design Layout Diagram: (unit mm)

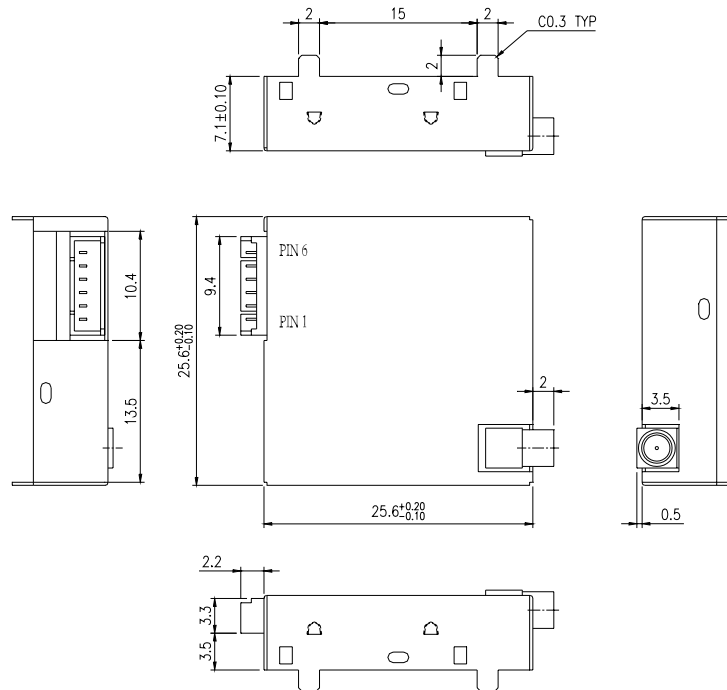


3.2 . GR-87-T0B, GR-87-T0D outline:

- Picture



- Design Layout Diagram: (unit mm)



3.3. Pin assignment of connector :

Table 4-1 is pin list of the 6-Pin Interface Connector. Connector is Male header 1.25mm pitch DIP R/A type. Actual pin size see appendix B.

Table 4-1 J1 connector pin definition:

Pin	Pin Name	Function description
1	VCC_IN	+3.3~5.5VDC power input
2	TXA	Serial Data output port A(CMOS Level: $V_{oh} \geq 2.4V$ $V_{ol} \leq 0.4V$ $I_{oh}=I_{ol}=2mA$)
3	RXA	Serial Data input port A(CMOS Level $V_{ih} \geq 0.7*VCC$ $V_{il} \leq 0.3*VCC$)
4	RXB	Serial Data input port B(CMOS Level $V_{ih} \geq 0.7*VCC$ $V_{il} \leq 0.3*VCC$)
5	GND	Power ground
6	TIMEMARK/ RESET (option)	TIMEMARK: 1PPS Time mark output($V_{il} \leq 0.2V$ Pulse Width 1μ sec) RESET: Reset Input (Active Low)(option function)

3.3.1 VCC_IN

This is the main DC power supply for a +3.3 ~ 5.5 V engine board.

3.3.2 TXA

This is the main transmitting channel and is used to output navigation and measurement data for user written software.

3.3.3 RXA

This is the main receiving channel and is used to receive software commands to the board from user written software.

3.3.4 RXB

This is the auxiliary receiving channel and is used to input differential corrections to the board to enable DGPS navigation.

3.3.5 GND

GND provides the ground for the board. Connect all grounds.

3.3.6 TIMEMARK (default)/ RESET (option)

This pin default is provides 1 pulse per second output from the GR-87 engine board, which is synchronized to within 1 microsecond of GPS time. The output is a CMOS 3.0V positive level signal. Only upon a situation of tracking or navigating will output once per second. This is not available in Trickle-Power mode.

The secondary option function is provides an active-low reset input to the engine board. It causes the engine board to reset and start searching for satellites. (This second function setting need contact factory).

4. Ordering Information

Model No.	Output Level (CMOS 3.0V or RS-232)	RF interface output voltage (V)	Back-up battery (Rechargeable Lithium)	Power Saving	RF Connector Type
GR-87-T0A	CMOS 3.0V	3.0	Y	Y	MMCX(180°)
GR-87-T0B	CMOS 3.0V	3.0	Y	Y	MMCX(90°)
GR-87-T0C	CMOS 3.0V	VCC_IN	Y	Y	MMCX(180°)
GR-87-T0D	CMOS 3.0V	VCC_IN	Y	Y	MMCX(90°)