

GPS Module Ct-G301X



Specifications Sheet V0.1

Part No.: 1-1S01-022RX00

Features:

- Compact module size: 15x14x2.8 mm
- SiRF Star III GSC3f/LPx single chip
- Built-in high gain amplifier and bandpass filter
- RoHS compliance

1. Introduction

The Ct-G301X module is a high sensitivity, high gain, low power and very compact Surface Mount Device (SMD). This 20-channel global positioning system (GPS) receiver is designed for a broad spectrum of OEM applications and is based on the fast and deep GPS signal search capabilities of SiRFStarIII GSC3f/LPx architecture, consuming . Ct-G301X is designed to allow quick and easy integration into GPS-related applications, especially for compact size devices, such as:

- PDA, Pocket PC and other computing devices
- Fleet Management / Asset Tracking
- AVL and Location-Based Services
- Hand-held Device for Personal Positioning and Navigation

1.1. Features

Hardware and Software

- Based on the high performance features of the SiRFStar III GSC3f/LPx chipset.
- Built-in high gain amplifier and band pass filter
- RoHS compliant (lead-free)
- Compact module size for easy integration: 15x14x2.8 mm (590.6x551.2x110.2 mil).
- SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- SiRF Client AGPS support

Performance

- Cold/Warm/Hot Start Time: 35 / 35 / 1 sec.
- Reacquisition Time: 0.1 second
- RF Metal Shield for best performance in noisy environments
- Multi-path Mitigation Hardware
- Enhanced Navigation Performance
- Improved Jamming Mitigation
- Improved Ephemeris Availability

Interface

- TTL level serial port for GPS communications interface
- Protocol: NMEA-0183/SiRF Binary (default NMEA)
- Baud Rate: 4800,9600,19200 bps

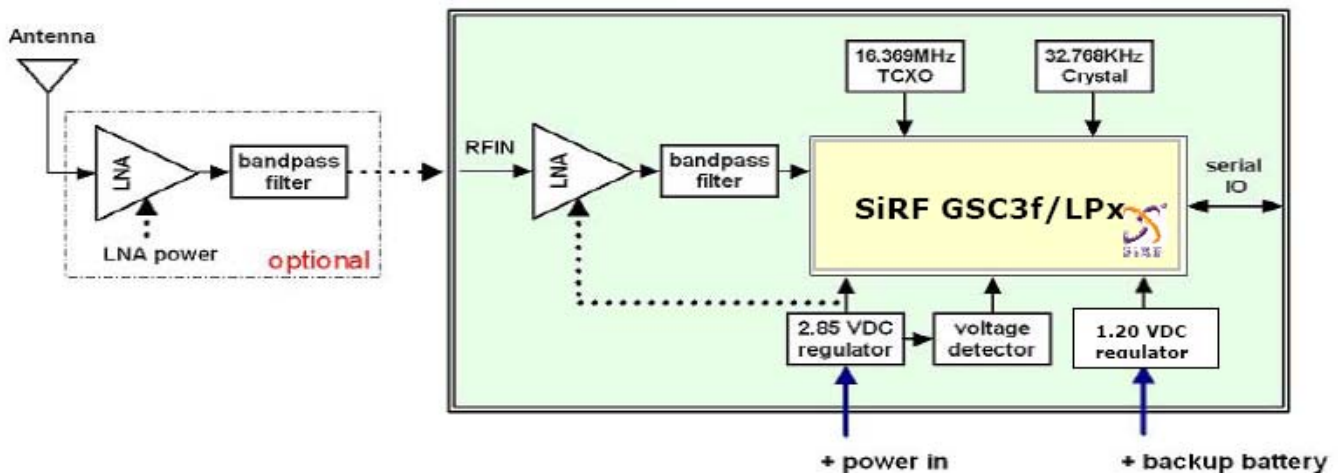
1.2. Advantages

- Ideal for compact size devices
- Data / Power / RF through surface mount pads
- Cost saving through elimination of RF and board to board digital connectors
- Flexible and cost effective hardware design for different application requirements
- Secure SMD PCB mounting method

2. Technical specifications

2.1. Module architecture

Ct-G301X Block Diagram



2.2 Hardware Features

- Based on the high performance features of the SiRFStarIII GSC3f/LPx chipset
- Built-in high gain amplifier and band pass filter
- Compact module size for easy integration: 15x14x2.8 mm (590.6x551.2x110.2 mil)
- SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- RoHS compliant (lead-free)

2.3. Software Features

The firmware used on Ct-G301X module is GSW3.2.5, the software for SiRFStarIII low power single chipset receivers and its features include:

- Excellent sensitivity
- High configurability
- 1 Hz position update rate
- Supports use of satellite-based augmentation systems like the US WAAS or European
- EGNOS system
- Real-time Operating System (RTOS) friendly
- Capable of outputting either NMEA(default) or SiRF proprietary binary protocols
- Designed to accept custom user tasks executed on the integrated ARM7TDM1 processor
- Runs in full power operation (default) or optional power saving modes
- Enhanced Navigation Performance
- Improved Jamming Mitigation
- Improved Ephemeris Availability

Default configuration is as follows:

Item	Description
Core of firmware SiRF	GSW3.2.5
Baud rate	4800,9600,19200 bps
Code type	NMEA-0183 ASCII
Datum	WGS-84
Protocol message	GGA, GSA, GSV, RMC,VTG
Output frequency	1 Hz

2.4. Mechanical specification

The Physical dimensions of the Ct-G301X GPS Module are as follow:

Items	Description
Length	15.0±0.3mm
Width	14.00±0.3mm
Height	2.80±0.3mm
Weight	1.8g

2.5. Recommended GPS Antenna Specification

This Ct-G301X receiver is designed for use with passive antenna.

Parameter	Specification
Antenna Type	Right-hand circular polarized passive antenna
Frequency Range	1575.42 ± 1.023 MHz

2.6. Environmental Specification

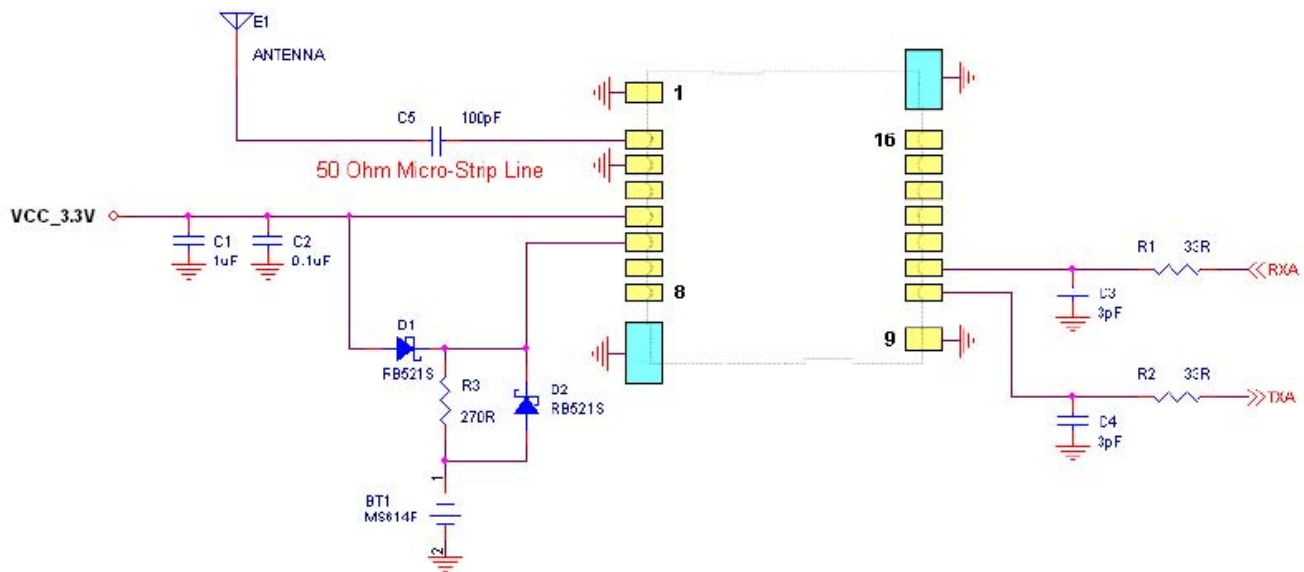
Item	Description
Operating temperature rang	-30 deg. C to +85 deg. C
Storage temperature range	-55 deg. C to +100 deg. C
Humidity	up to 95% non-condensing or a wet bulb temperature of +35 deg. C
Altitude	18,000 meters (60,000 feet) max.
Velocity	515 meters/second (1000 knots) max.
Jerk	20 meters/second ³ , max.
Acceleration	4g, max.

2.7. ESD Specification

Air Discharge: 2 ; 4 ; 8KV (direct)

Contact Discharge: 2 ; 4 KV (direct / indirect)

2.8. Reference design



- All ground pads attach directly to ground plane by way of via.
- All components are reference only

3. Performance Characteristics

3.1. Position and velocity accuracy

Accuracy	Position	10 meters, 2D RMS 5 meters 2D RMS, WAAS corrected <5meters(50%)
	Velocity	0.1 meters/second
	Time	1 microsecond synchronized to GPS time

3.2. Dynamic constrains

Dynamic Conditions	Altitude	18,000 meters (60,000 feet) max.
	Velocity	515 meters/second (1000 knots) max.
	Acceleration	4g, max.
	Jerk	20 meters/second ³ , max.

3.3. Acquisition time ¹

Mode	Ct-G301X GPS Module
TTFH Hot (valid almanac, position, time & ephemeris)	1 s
TTFH Warm (valid almanac, position, & time)	35 s
TTFH Cold (valid almanac)	35 s
re-acquisition (<10 s obstruction with valid almanac, position, time & ephemeris)	100 ms

Note 1: Open Sky and Stationary Environments.

3.4. Timing 1PPS output

The 1PPS pulse width is 1 μ s, this 1PPS is NOT suited to steer various oscillators (timing receivers, telecommunications system, etc).

3.5. Sensitivity

Parameter	Description
Tracking Sensitivity	-159 dBm
Acquisition Sensitivity	-155 dBm

3.6. Battery backup (SRAM/RTC backup)

During 'Powered down' condition, the SRAM and RTC (Real Time Clock) may be kept in operation by supplying power from VBATT. The Ct-G301X GPS module can accept slow VBATT supply rise time (unlike many other SiRFstarII based receivers) due to an on-board voltage detector.

3.7. Differential aiding

3.7.1. Differential GPS (DGPS) **Optional**

DGPS specification improves the Ct-G301X GPS Module horizontal position accuracy to <4M 2dRMS.

3.7.2. Satellite Based augmentation System (WASS/EGONS) **Optional**

The Ct-G301X GPS Module is capable of receiving SBAS (WASS and EGONS) differential corrections. SBAS improves horizontal position accuracy by correcting GPS signal errors caused by ionospheric disturbances, timing and satellite orbit errors. Both SBAS and DGPS should improve position accuracy. However, other factors can affect accuracy, such as GDOP, multipath, distance from DGPS reference station and latency of corrections.

4. Hardware Interface Power supply

Parameter	Ct-G301X GPS Module
Input voltage	3.2~5.0 VDC
Current (typ.) at full power (3.3V)	40 mA
Battery backup voltage	1.5~5.0 VDC

4.1. Power Consumption

Status	Power Consumption
Acquisitioning	40 mA
Tracking	35 mA

5. Software interface

The host serial I/O port of the module's serial data interface supports full duplex communication between the module and the user. The default serials are shown in Table 5-1.

Port	Protocol	Description
Port A	NMEA 0183	GGA, GSA, GSV, RMC, VTG
Port B	N/A	N/A

5.1. NMEA output messages

The output NMEA (0183 v3.0) messages for the receiver are listed in Table 5-2. A complete description of each message is contained in the SiRF NMEA reference manual.

Option	Description
GGA	Time, position, and fix related data for a GPS receiver.
GLL	Latitude and longitude of present position, time of position fix and status.
GSA GSV	GPS receiver operating mode, satellites used in the position solution, and DOP values. The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values.
RMC	Time, date, position, course and speed data provided by the GPS receiver.
VTG	The actual course and speed relative to the ground.

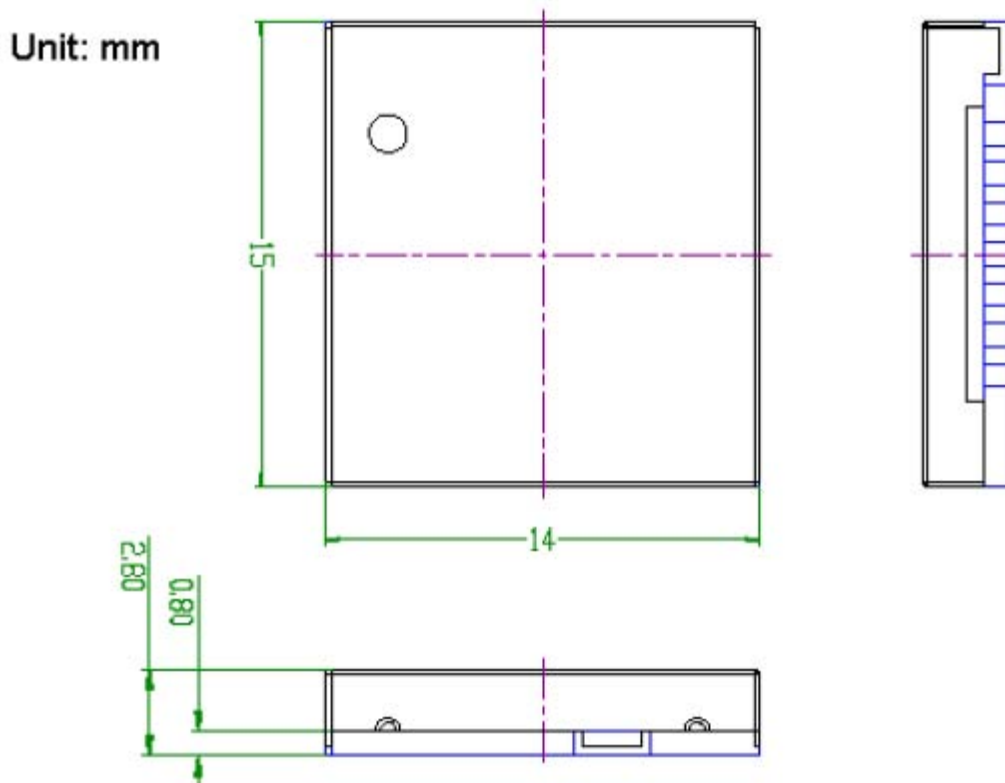
5.2. SiRF binary

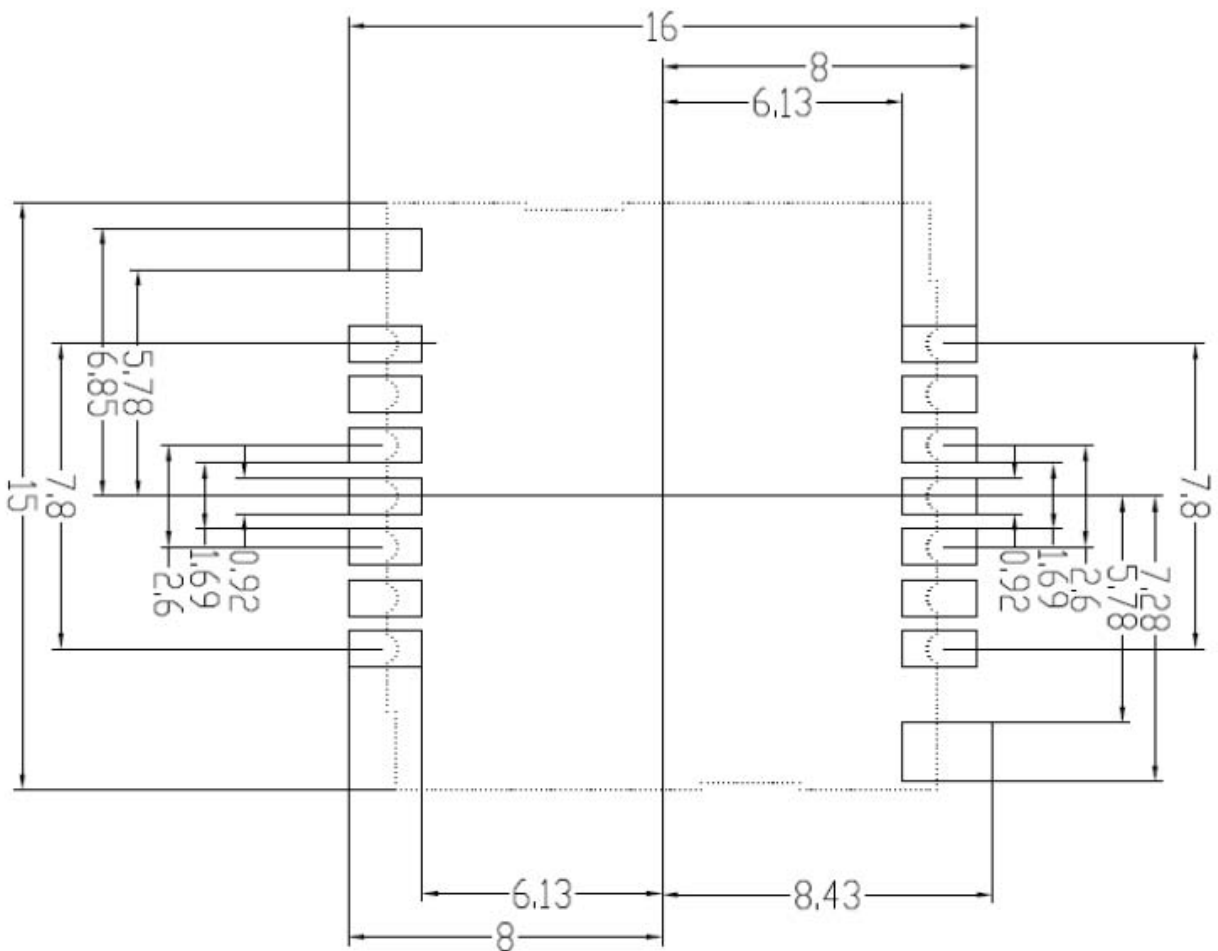
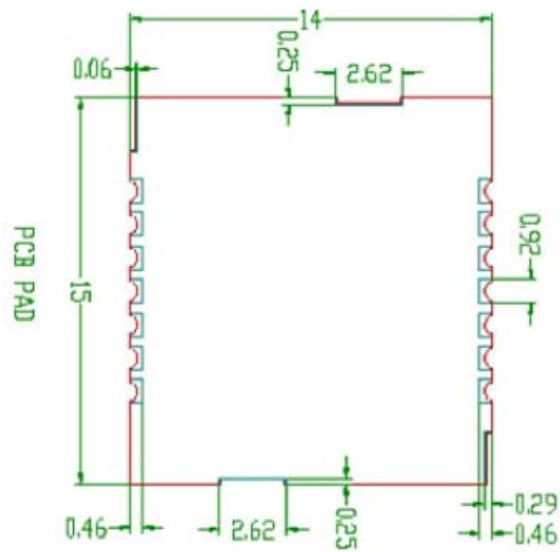
A complete description of each binary message is contained in the SiRF Binary Protocol reference manual.

6. Mechanical drawing and footprint

Items	Description
Length	15.0 ± 0.3 mm (590.6 ± 12 mil)
Width	14.0 ± 0.3 mm (551.2 ± 12 mil)
Height	2.80 ± 0.3 mm (110.2 ± 12 mil)

6.1. Outline Drawing Recommended footprint (Top view)





Note: 1. Tolerance of recommended pad: 1.87 * 0.92 (+/- 0.1 mm)

2. Recommended pad for pin 9 is 2.3 * 1.5 mm (+/- 0.1 mm)

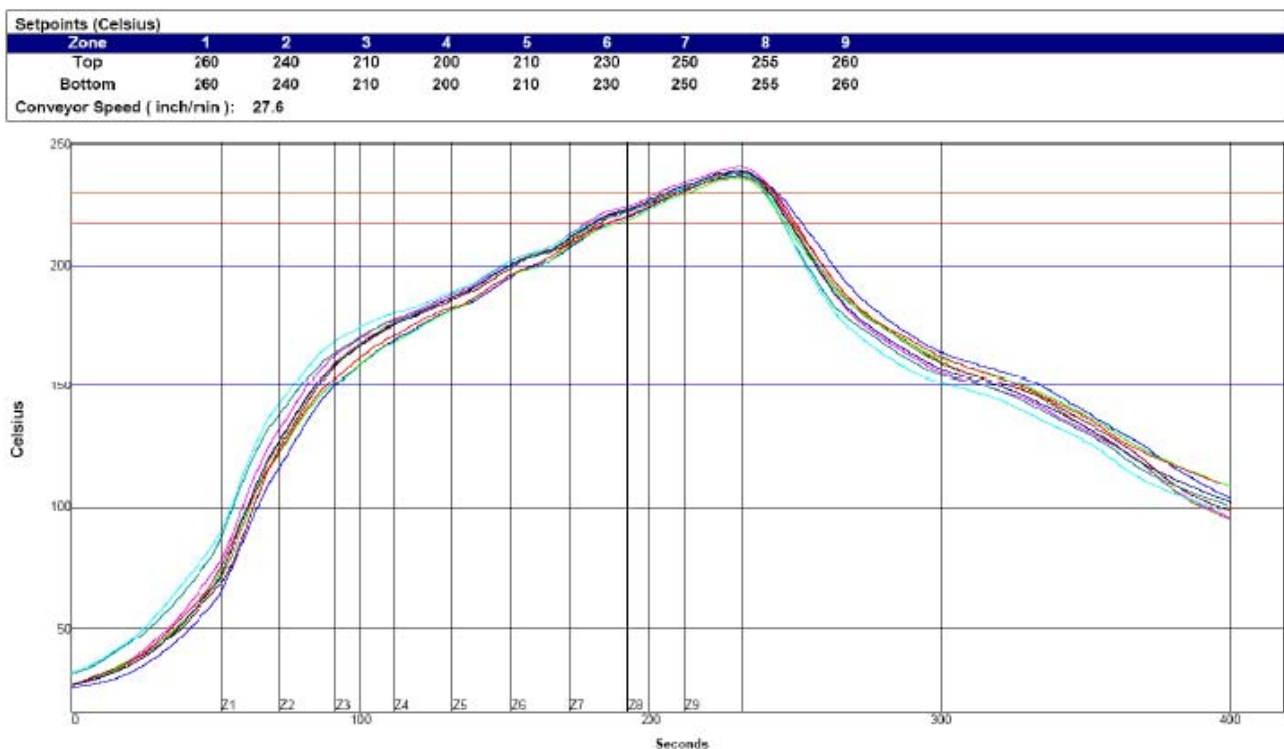
7. Application Notes

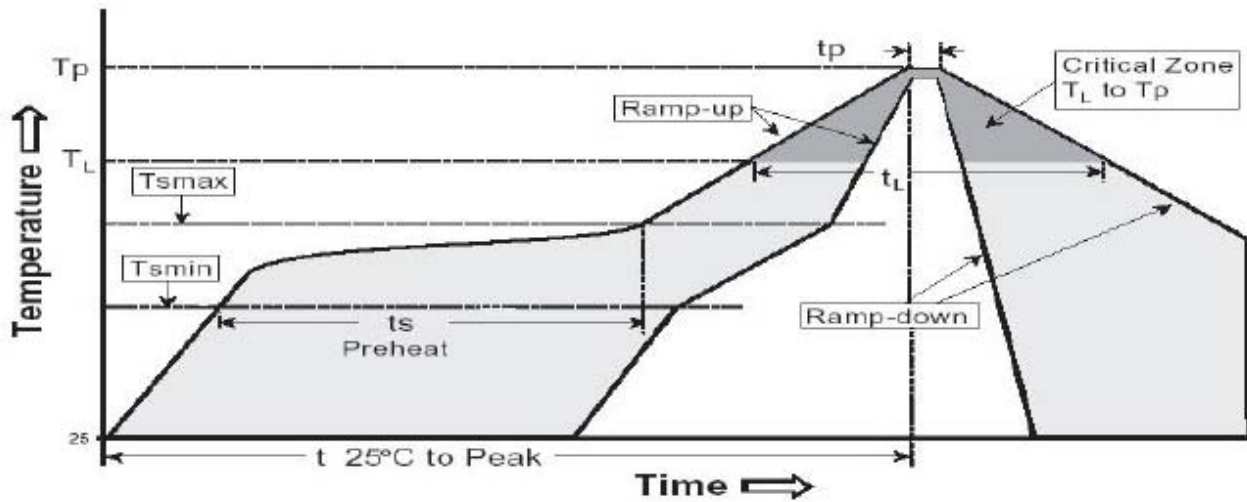
Ct-G301X is a compact-sized GPS module, specific for patch antenna design. It has the pin- to-pin compatibility with Ct-G302, which is specific for active antenna design. It requires additional power supply with 3.3V externally, in case of using active antenna.

8 RoHS soldering profile

Reflow Profile

High quality, low defect soldering requires identifying the optimum temperature profile for reflowing the solder paste. To have the correct profile assures components, boards, and solder joints are not damaged and reliable solder connection is achievable. Profiles are essential for establishing and maintaining processes. You must be able to repeat the profile to achieve process consistency. The heating and cooling rise rates must be compatible with the solder paste and components. The amount of time that the assembly is exposed to certain temperatures must first be defined and then maintained. The following is an example of a typical thermal profile.





Average ramp-up rate	3°C/second max.
Preheat (Tsmmax – Tsmmin, ts)	150~200°C ; 60~180seconds
Time maintained above (TL, tL)	217°C ; 60~150seconds
Peak Temperature (Tp)	255~260°C ; 10~20seconds
Ramp-down rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.