

# GPS Module

## Ct-G431



## Specifications Sheet V0.3

### *Features:*

- ◆ *SiRF StarIV ultra low power chipset*
- ◆ *Compact module size for easy integration : 15 x 14 x 2.8 mm*
- ◆ *UART/ I<sup>2</sup>C pins reserved for customizing special user applications*
- ◆ *Fully utilized SS4 upgrade features*

## 1. Introduction

The Ct-G431 GPS module is a high sensitivity, low power, Surface Mount Device (SMD) that fully utilized SiRFstarIV upgrade features. This 48-channel global positioning system (GPS) receiver is designed for a wide range of OEM applications and is based on the GPS signal search capabilities of the SiRFstarIV GSD4e chipset, SiRF's newest chipset technology. The Ct-G431 provides flexible Bus interfaces (UART and I<sup>2</sup>C by customer requirement).

The Ct-G431 is designed to allow quick and easy integration into GPS-related applications such as:

- PDA, Pocket PC, Tablet and other computing devices
- Fleet Management /Asset Tracking
- AVL and Location-Based Services
- Hand-Held Device for Personal Positioning and Navigation
- All applications of battery drive device that needs lower power consumption

### 1.1. Features

#### 1.1.1 Performance

- ◆ Highest performance GPS PVT Engine.
- ◆ High acquisition sensitivity for fast TTFF
- ◆ Extremely low weak signal tracking sensitivity
- ◆ High jamming immunity
- ◆ Smallest footprint and total solution size
- ◆ Highest level of BOM integration
- ◆ Value added software enhancements
- ◆ Multimode A-GPS (Autonomous, MS-Based, and MS-Assisted) – Need operator support
- ◆ Embedded CGEE / SGEE (Need server support) speed up TTFF a lot and makes cold start time to be around 22 seconds.
- ◆ SiRFGeoRecov<sup>™</sup> Reverse EE makes positioning process being done under power saving mode.
- ◆ Reacquisition Time: 0.1 second
- ◆ RF Metal Shield for best performance in noisy environments

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### 1.1.2 Interface

- ◆ On TTL level serial port for GPS communications interface (UART and I<sup>2</sup>C) One I<sup>2</sup>C port for MEMS connection
- ◆ Protocol: NMEA-0183 (default)
- ◆ Baud Rate: 4800 bps

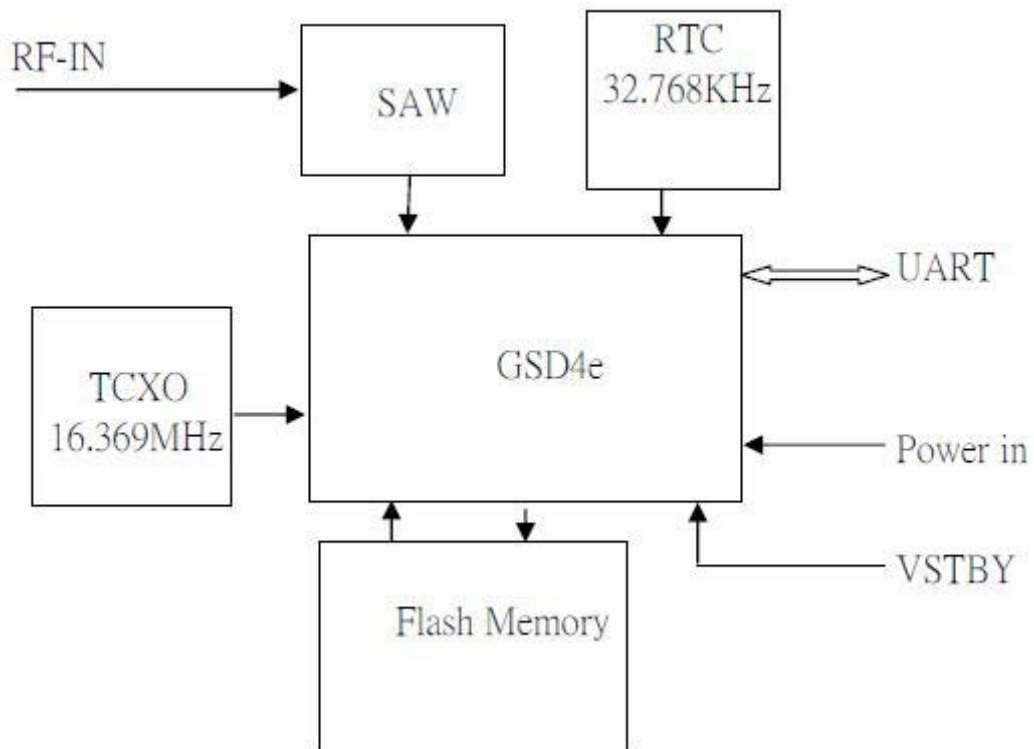
### 1.1.3 Performance

- ◆ Based on the high performance features of the SiRF Star IV low power single chipset.
- ◆ Built-in high gain amplifier and bandpass 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

## 1.2 Advantages

- ◆ Built-in LNA.
- ◆ Embed CGEE (Client Generated Extended Ephemeris) that can capture ephemeris data from satellites locally and predicts ephemeris out to 3 days. So if the module was off within 3 days, it could complete positioning process within 2 seconds just like hot start.
- ◆ It can remove in-band jammer up to 80db-Hz and track up to 8CW jammers, so the module can prevent GPS signal interference when design-in the electrical device with noisy electrical signal interferences such as Laptop, mobile phone, DSC, etc.
- ◆ Maintain tracking sensitivity as low as -163dBm, even without network assistance. (SiRF StarIII has only -159dBm sensitivity)
- ◆ Support SiRFaware technology
  - ◆ Support adaptive "Micro Power Controller" power management mode
  - ◆ Support MEMS sensor through I<sup>2</sup>C interface. (V4.X.X firmware will be supported) MEMS interrupt can improve Micro Power Mode performance.
  - ◆ Only 8mW Trickle Power, so user can leave power on all day instead of power Off
- ◆ 5 Hz Navigation Update Rate: user can select 1 Hz or 5 Hz navigation update rate. (V4.1.0firmware will be supported)
- ◆ SBAS Ranging: SBAS satellite measurements will be used in the navigation solution for improved DOP and coverage. (V4.1.0 firmware will support)
- ◆ Suitable for battery drive devices that need lower power consumption application
- ◆ Ideal for high volume mass production(Taping reel package)
- ◆ Cost saving through elimination of RF and board to board digital connectors
- ◆ Flexible and cost effective hardware design for different application needs

### 1.3 Block Diagram



## 2. Specifications

### 2.1. Hardware Features

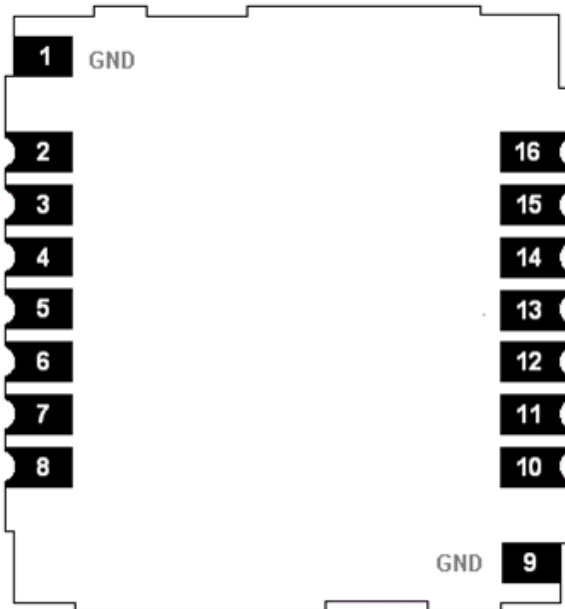
- ◆ Based on the high performance features of the SiRF Star IV low power single chipset
- ◆ Compact module size for easy integration: 15x14x2.8 mm (590.6x551.2x110.2 mil)
- ◆ SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- ◆ RoHS compliant (lead-free). Halogen free is to be available

#### 2.1.1 Module Specification

Feature	Content	Description
Chipset	GSD4e	SiRF starIV low power single chipset
General	Frequency	L1, 1575.42 MHz
	C/A code	1.023 MHz chip rate
	Channels	48
	Sensitivity	-163 dB
Accuracy	Position	<2.5 meters
	Velocity	0.01 meters/second
	Time	1 microsecond synchronized to GPS time
Datum	Default	WGS-84
	Other	Selectable for other Datum
Time to First Fix (TTFF/-122dBm) (Open Sky & Stationary Requirements)	Reacquisition	0.1 sec., average
	Snap start	1 sec., average
	Hot start	1 ~ 2 sec.
	Warm start	9 ~ 15 sec.
	Cold start	25 ~ 35 sec.
Dynamic Conditions	Altitude	18,000 meters (60,000 feet) max.
	Velocity	515 meters/second (1000 knots) max.
	Acceleration	4g, max.
	Jerk	20 meters/second <sup>3</sup> , max.
Power	Main power input	1.71 ~ 1.89 VDC input
	Power Consumption	41mA (Tracking Mode)
	Backup Power	1.71 ~ 1.89 VDC input
Serial Port	Electrical interface Protocol messages	Default UART:NMEA-0183@4800bps (I <sup>2</sup> C TBA)

## 2.2. Pin Specification

### 2.2.1 Pin Location



### 2.2.2 Pin Assignment

PIN	Name	Type	Description
1	GND	PWR	Ground
2	RF_IN	PWR	RF input
3	VSS	PWR	Ground
4	RESETN	I	External reset input, active low
5	VCCIN	PWR	DC +1.8V input
6	VSTBY	PWR	DC +1.8V input, RTC backup battery input
7	BOOTSEL	I	Pull high for programming mode.
8	Reserved	N/A	Keep floating
9	GND	PWR	Ground
10	TXA	O	UART_TX UART data transmit (TX)
11	RXA	I	UART_RX UART data transmit (RX)
12	Reserved	N/A	Keep floating
13	Reserved	N/A	Keep floating
14	TM	O	1 PPS time mark output.
15	CLK	O	DR_I2C_CLK dead reckoning I <sup>2</sup> C bus clock (SCL)
16	DIO	I/O	DR_I2C_DIO dead reckoning I <sup>2</sup> C bus data (SDA)

## 2.3. Physical Characteristics

The Physical dimensions of the Ct-G431 GPS Module are as follow:

Items	Description
Length	15.0 mm $\pm$ 0.3mm
Width	14.0 mm $\pm$ 0.3mm
Height	2.80 mm $\pm$ 0.3mm
Weight	1.8 g

## 2.4 Recommended GPS Antenna Specifications

Parameter	Specifications
Antenna Type	Right-hand circular polarized passive antenna
Frequency	1575.42 $\pm$ 1.023 MHz

## 2.5 Environmental Characteristics

Items	Description
Operating temperature rage	-40 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

## 2.6 ESD Specification

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

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

### 3. Software

The firmware used on Ct-G431 module is GSD4e, the software for SiRF StarIV low power single chipset receivers, and its features include:

- ◆ Excellent sensitivity
- ◆ High configurability
- ◆ 1 Hz / 5 Hz (V4.1.0 firmware supports) position update rate
- ◆ Supports use of SBAS(satellite-based augmentation systems), WAAS, EGNOS, MSAS, GAGAN,
- ◆ Enhanced Navigation Performance
- ◆ Improved Jamming Mitigation
- ◆ Improved Ephemeris Availability

The default configuration is as following description:

Items	Description
Core of firmware	SiRF GSD4e_4.1.0
Baud rate	4800 bps
Code type	NMEA-0183 ASCII
Datum	WGS-84
Protocol message	GGA(1s), GSA(1s), GSV(5s), RMC(1s)
Output frequency	1Hz

#### 3.1 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 3-1.

Port	Protocol	Description
Port A	NMEA 0183, 4800 bps	GGA(1s), GSA(1s), GSV(5s), RMC(1s)
Port B	N/A	N/A

**Table 3-1 Ct-G431 GPS module default baud rates**



### 3.2 NMEA output messages

The output NMEA-0183 messages for the receiver are listed in Table 3-2. A complete description of each message is contained in the SiRF NMEA reference manual.

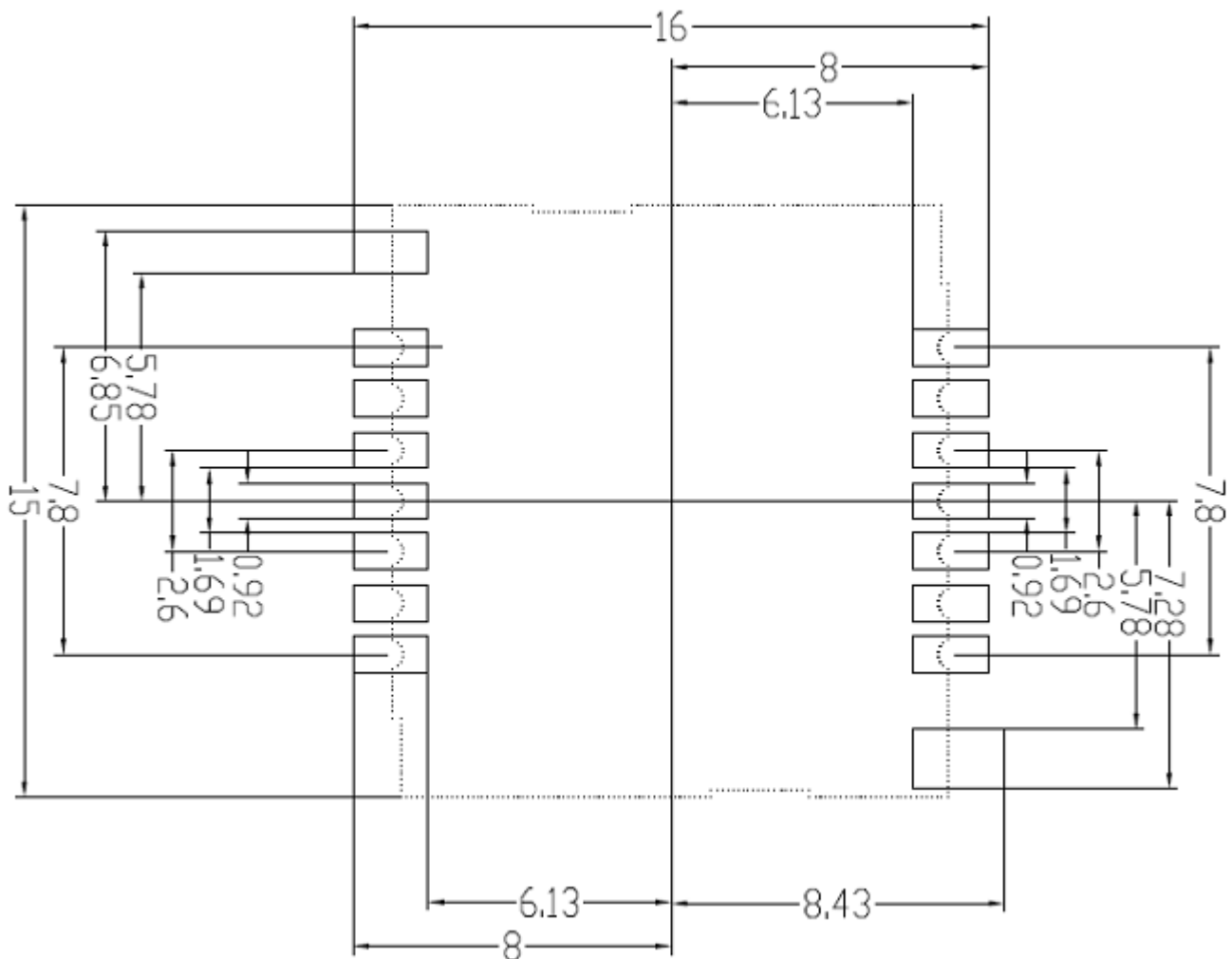
Option	Description
GGA	Time, position, and fix related data for a GPS receiver.
GSA	GPS receiver operating mode, satellites used in the position solution, and DOP values.
GSV	The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values.
RMC	Time, date, position, course and speed data provided by the GPS receiver.

**Table 3-2 NMEA-0183 Output messages**

## 4. Mechanical drawing and footprint

Items	Description
Length	15.0 ± 0.3 mm
Width	14.0 ± 0.3 mm
Height	2.80 ± 0.3 mm

### 4.1 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 )

## 4.2 Outline Drawing

