

# GPS Module Ct-G431R



## Specifications Sheet V0.1

### *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-G431R 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 ROM chipset, SiRF's newest chipset technology. The Ct-G431R provides flexible bus interfaces (Optional: UART , I<sup>2</sup>C or SPI reserved for customizing special user applications).

The Ct-G431R is designed to allow quick and easy integration into GPS-related applications such as:

- Mobile gaming
- Cellular handsets
- Cameras
- Asset tracking
- Other location-aware consumer devices Premium on-chip software provides a new level of continuous location awareness by employing.
- Opportunistic ephemeris decode and advanced power management, which enable the GPS receiver to stay in a hot-start condition nearly continuously while consuming very little power
- Full support for client-based and server-based SiRFInstantFix™
- Dynamic contextual awareness, temperature monitoring, and MEMS sensors that work in concert to conserve power and boost performance
- Use of software control modules to achieve power saving state

### 1.1. Features

#### 1.1.1 Performance

- ◆ Highest performance Solution :
- ◆ Highest performance navigation engine (PVT) tracks as low as -163dBm
- ◆ 48 track verification channels
- ◆ SBAS (WAAS or EGNOS)
- ◆ Active Jammer Remover
- ◆ Removes in-band jammers up to 80 dB-Hz
- ◆ Tracks up to 8 CW jammers
- ◆ Multimode A-GPS (Autonomous, MS-Based, and MS-Assisted) – Need operator support

- ◆ SiRFGeoRecov™ 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

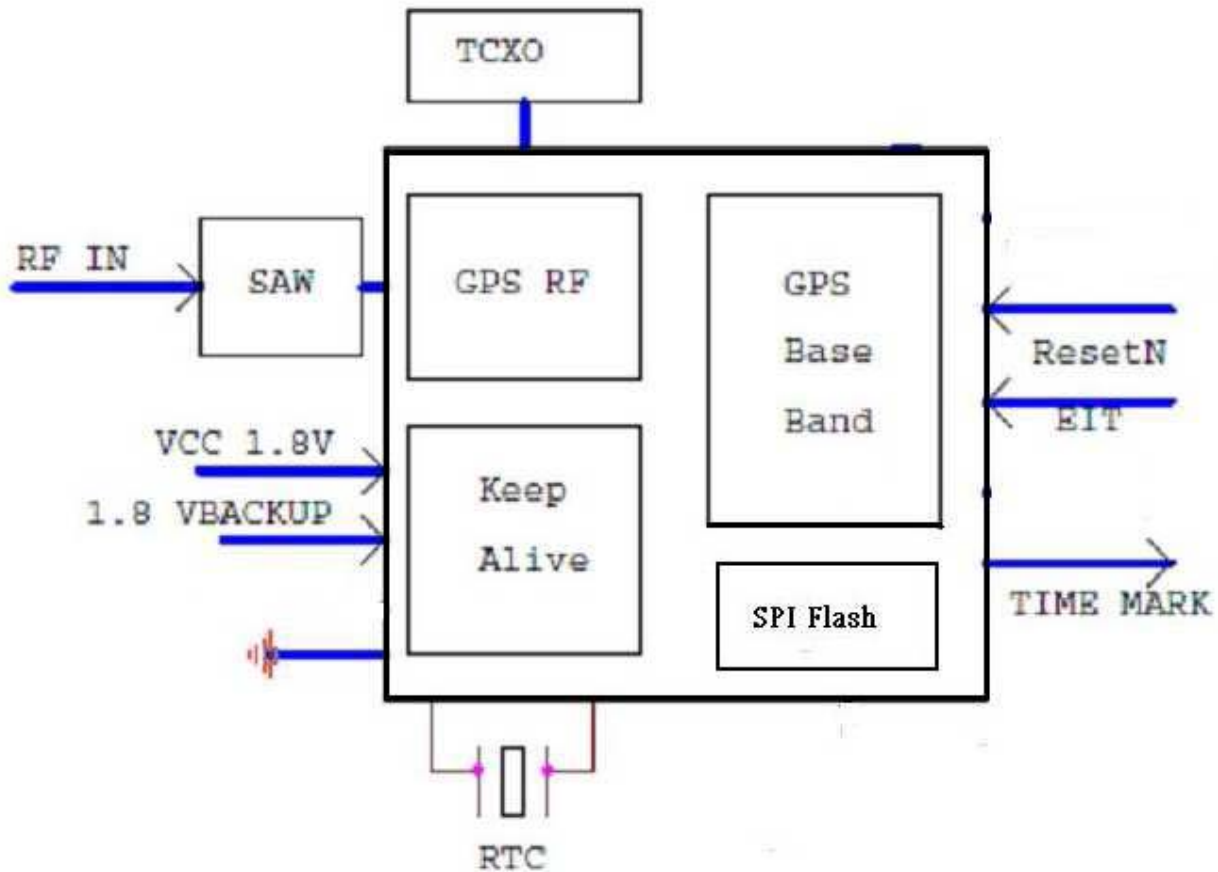
### **1.1.2 Hardware Software**

- ◆ Based on the high performance features of the SiRF Star IV low power single chipset.
- ◆ Adaptive Micropower Controller
- ◆ Only 50 to 500µA maintains hot start capability
- ◆ <10mW required for TricklePower™ mode RoHS compliant (lead-free)
- ◆ SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- ◆ Advanced Navigation Features
- ◆ Smart sensor I<sup>2</sup>C interface
- ◆ Interrupt input for context change detection

## **1.2 Advantages**

- ◆ Built-in LNA.
- ◆ Built-in internal ROM and based on Firmware 4.1.X
- ◆ 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.
- ◆ Only 8mW Trickle Power, so user can leave power on all day instead of power off
- ◆ 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

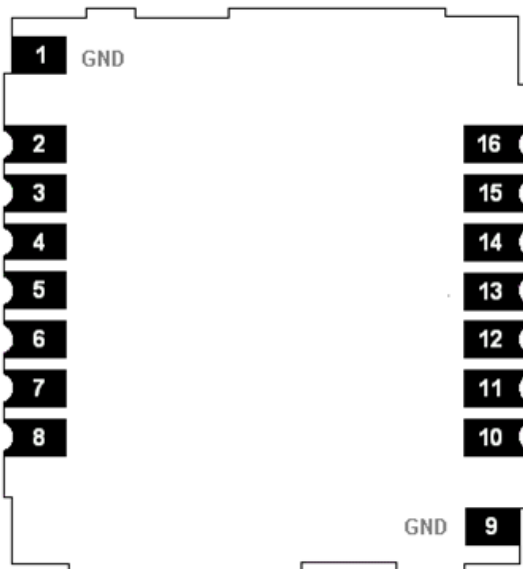
- ◆ Based on the high performance features of the SiRF Star IV low power single chipset
- ◆ SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- ◆ RoHS compliant (lead-free). Halogen free is to be available

#### 2.1.1 Module Specification

Feature	Content	Description
Chipset	GSD4e/ROM Base	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.
Dynamic Conditions	Cold start	25 ~ 35 sec.
	Altitude	18,000 meters (60,000 feet) max.
	Velocity	515 meters/second (1000 knots) max.
	Acceleration	4g, max.
Power	Jerk	20 meters/second <sup>3</sup> , max.
	Main power input	1.71 ~ 1.89 VDC input
	Power Consumption	Average 53mA (Tracking Mode)
	Backup Power(V RTC)	1.71 ~ 1.89 VDC battery input
Serial Port	Electrical interface	Default SPI
	Protocol messages	NMEA-0183@4800bps

## 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	I	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	Reserved	N/A	Keep floating
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 Recommended GPS Antenna Specifications

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

## 2.4 Physical Characteristics

The Physical dimensions of the Ct-G431R GPS Module are as follow:

Items	Description
Length	15.0 mm ± 0.3mm
Width	14.0 mm ± 0.3mm
Height	2.80 mm ± 0.3mm
Weight	1.8 g

## 2.5 Environmental Characteristics

Items	Description
Operating temperature rage	-40 deg. C to +85 deg. C
Storage temperature range	-40 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)

## 2.7 Electrical Characteristics

Operation Conditions				
Parameter	Min	Typ	Max	Units
Input Operation supply voltage	1.71	1.8	1.89	V
Peak supply current	--	70	--	mA
Sustained supply current	--	60	--	mA
Standby Backup current	--	1	--	uA
Input Backup battery voltage (V_RTC)	1.71	1.8	1.89	V
Input Backup battery current (V_RTC)	--	1.5	--	mA
I/O Input high level (VIH)	1.26	--	3.6	V
I/O Input low level (VIL)	-0.4	--	0.45	V
I/O Output high level (VoH)	1.28	1.35	1.41	V
I/O Output low level (VoL)	0	--	0.4	V



### 3. Software

The firmware used on Ct-G431R module is GSD4e, the software for SiRF StarIV low power single chipset receivers, and its features include:

- ◆ Excellent sensitivity
- ◆ High configurability
- ◆ 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/ROM_4.1.X
Baud rate	4800 bps(Default ,Configurable up to 115200 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
UART/I2C/SPI	NMEA 0183, 4800 bps	GGA(1s), GSA(1s), GSV(5s), RMC(1s)

Table 3-1 Ct-G431R GPS module default baud rates

### 3.2 NMEA output messages

The output NMEA-0183 messages for the receiver are listed in Table 3-2.

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**



## 4.2 Outline Drawing

