

# GPS Module with patch antenna

## Ct-G433



### Specifications Sheet V0.3

Part No.: 1-1S01-104RS00

Features:

- ◆ *SiRF StarIV ultra low power chipset*
- ◆ *Support 48-channel GPS*
- ◆ *Compact module size for easy integration : 20 x 20 x 7.0 mm*
- ◆ *UART/I<sup>2</sup>C/SPI pins reserved for customizing special user applications*
- ◆ *Fully utilized SS4 upgrade features*

## 1. Introduction

The Ct-G433 is a high sensitivity, low power and very compact smart antenna module, with built in GPS receiver. This 48-channel global positioning system (GPS) receiver is designed for a wide range of OEM applications then based on the fast and deep GPS signal search capabilities of SiRFstarIV GSD4e architecture, SiRF's newest chipset technology. The Ct-G433 provides flexible I/O interfaces (UART , I<sup>2</sup>C and SPI which can be defined by customer).

Ct-G433 is designed to allow quick and easy integration into GPS-related applications such as:

- PDA, MID, and other portable devices
- Car and Marine Navigation
- Fleet Management / Asset Tracking
- AVL and Location-Based Services
- Hand-Held Device for Personal Positioning and Navigation
- Use of software control modules to achieve power saving state

### 1.1. Features

#### 1.1.1 Performance

- ◆ Highest performance GPS PVT engine
- ◆ High acquisition sensitivity for fast TTFF
- ◆ Extremely low weak signal tracking sensitivity
- ◆ Highly integration with small and compact form factor
- ◆ Value added software enhancements
- ◆ Multimode A-GPS (Autonomous, MS-Based, and MS-Assisted) – With operator support
- ◆ Embedded CGEE / SGEE (With back-end server support) speed up TTFF a lot and makes cold start time to be around 20+ seconds.
- ◆ SiRFGeoRecov™ Reverse EE makes positioning process being done under power saving mode.
- ◆ RF Metal Shield for best performance in noisy environments

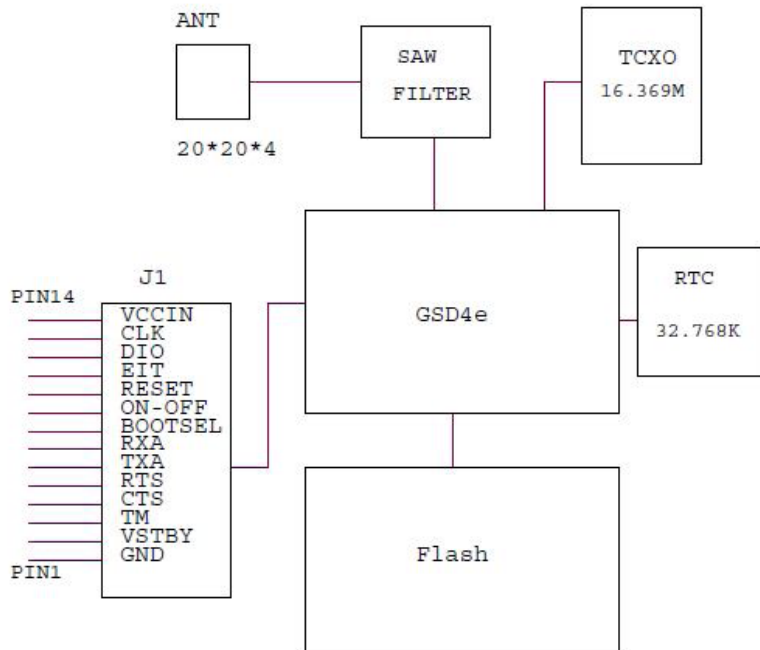
#### 1.1.2 Interface

- ◆ Multiple host interfaces (UART, I<sup>2</sup>C, and SPI)
- ◆ Secondary I<sup>2</sup>C port for MEMS connection
- ◆ Protocol: NMEA-0183

## 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 with limited time 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.
- ◆ Tracking sensitivity as low as -163dBm, even without network assistance. (SiRF StarIII has only -159dBm sensitivity)
- ◆ Support SiRF Aware technology
- ◆ Support adaptive "Micro Power Controller" power management mode
- ◆ Support MEMS sensor through I<sup>2</sup>C interface
- ◆ MEMS interrupt can improve Micro Power Mode performance.
- ◆ Only 8mW Trickle Power, so user can leave power on all day instead of power off
- ◆ 5Hz Navigation Update Rate : user can select 1Hz or 5Hz navigation update rate. (firmware V4.1.0 or later will be supported)
- ◆ SBAS Ranging : SBAS satellite measurements will be used un the navigation solution for improved DOP and coverage. (firmware V4.1.0 or later will be supported)
- ◆ Suitable for battery drive devices that need lower power consumption application
- ◆ 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. Technical specifications

#### 2.1.1 Module Specification

Feature	Item	Description
<b>Chipset</b>	GSD4e	SiRF StarIV core logic
<b>General</b>	Frequency	L1, 1575.42 MHz
	C/A code	1.023 MHz chip rate
	Channels	48
	Sensitivity	-163dB
<b>Accuracy</b>	Position	<2.5 meters
	Velocity	0.1 meters/second
	Time	1 microsecond synchronized to GPS time
<b>Datum</b>	Default	WGS-84
	Other	selectable for other Datum
<b>Time to First Fix (TTFF -122dBm) (Open Sky &amp; Stationary Requirements)</b>	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.
<b>Dynamic Conditions</b>	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.
<b>Power</b>	Main power input	1.71 ~ 1.89 VDC input
	Power consumption	62 mA (Tracking Mode)
	Backup Power(V_RTC)	1.71 ~ 1.89 VDC battery input
<b>Serial Port</b>	Electrical interface	UART/I2C/SPI
	Protocol messages	NMEA-0183
<b>Antenna</b>	Patch Antenna	20*20*4mm
		Gain 4.5 dBic Max* (@ Zenith)
		Polarization Right Hand Circular Polarization
		Bandwidth 10 MHz Min* (@ -10dB)
		Axis Ratio ≤ 3dB*
		* Based on ground size 60* 60 mm2 size

## 2.1.2 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 battery current (On/Off Pin control)	-	30	-	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)	1.35	-	-	V
I/O Output low level (VoL)	-	-	0.4	V

## 2.2 Electrical Specifications

### 2.2.1 Pin Location

PIN	NAME	DESCRIPTION
1	GND	Ground
2	V-RTC	DC +1.8V input, RTC backup battery input
3	TIME MARK	1 PPS time mark output.
4	CTS	SSPI_CLK: slave SPI clock input CTS: clear to send , active low
5	RTS	SSPI_SS_N: slave SPI chip select, active low RTS: ready to send, active low
6	TXA	SSPI_DO: slave SPI data output TX: data transmit I2C_CLK: I <sup>2</sup> C bus clock
7	RXA	SSPI_DI: slave SPI data input RX: data receive I2C_DIO: I <sup>2</sup> C bus data
8	RESERVED	NC
9	ON-OFF	Power control pin

PIN	NAME	DESCRIPTION
10	RESET	System reset (active low)
11	EIT	Interrupt
12	DIO	MEMS_I2C_DIO : MEMS I <sup>2</sup> C bus data
13	CLK	MEMS_I2C_CLK : MEMS I <sup>2</sup> C bus clock
14	VCCIN	DC +1.8V input

## 2.3 Environmental Characteristics

Items	Description
Operating temperature range	-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

## 2.4 Physical Characteristics

Items	Description
Length	20 mm ± 0.5mm
Width	20 mm ± 0.5mm
Height	7.0 mm ± 0.25mm
Weight	9 g

## 2.5 Interface Specifications

Items	Description
I/O	14 pin connect type
Serial I/O	UART, I <sup>2</sup> C, SPI by customer request

Serial I/O :

Item	Communications Speed
UART	4800~115200 bps
I <sup>2</sup> C	400K bit/s (MAX)
SPI	4000K bit/s (MAX)

### 3. Software

The Ct-G433 includes GSW4e, the SiRF standard GPS software for SiRFstarIV low power single chipset receivers and its features include:

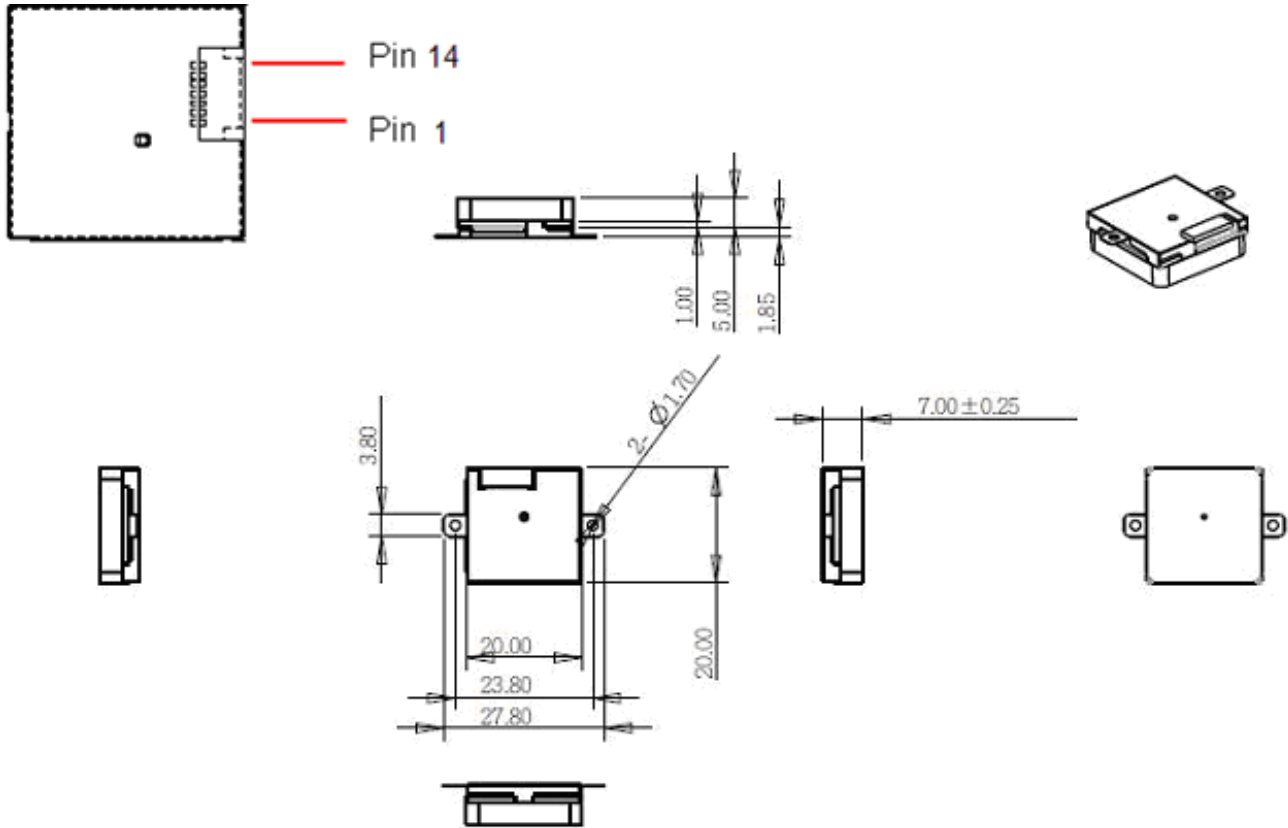
- Excellent sensitivity
- High configurability
- 1 Hz / 5Hz position update rate
- Supports use of SBAS (satellite-based augmentation systems) ,WAAS, EGNOS, MSAS,GAGAN
- Enhanced Navigation Performance
- Improved Jamming Mitigation
- Improved Ephemeris Availability
- Default configuration is as follows:

Item	Description
Core of firmware	SiRF GSW4e
Baud rate	4800 bps
Code type	NMEA-0183 ASCII
Datum	WGS-84
Protocol message	GGA(1sec), GSA(1sec), GSV(5sec), RMC(1sec)
Output frequency	1 Hz



## 4. Mechanical Drawing and Footprint

### 4.1 Outline Drawing



#### ※ Tolerance

Length	$20.0 \pm 0.5 \text{mm}$
Width	$20.0 \pm 0.5 \text{mm}$
Height	$7.0 \pm 0.25 \text{mm}$

## 5. Appendix

Ct-G433 14p connector specification, Please refer following:

FPC CONNECTOR SMD P0.5mm

