

# GPS Module Ct-G432



## Specifications Sheet V0.2

### *Features:*

- ◆ *SiRF StarIV internal ROM-based ultra low power chipset*
- ◆ *Compact module size for easy integration : 10.6 x 10 x 2.3 mm*
- ◆ *Ct-G432 module provide an I<sup>2</sup>C compliant interface to connect an optional external serial \*1 EEPROM to store power-up configuration settings*
- ◆ *Operating at 1.8V signal level*

*\*1 Please refer to the related External EEPROM Application Note*

## 1. Introduction

The Ct-G432 is a high sensitivity, low power ,Surface Mount Device (SMD), that fully utilized SiRF star IV upgraded features. This 48-channel global positioning system (GPS) receiver is designed for a wide range of OEM applications then based on the GPS signal search capabilities of SiRFstarIV GSD4e ROM chipset, SiRF's newest chipset technology.

The Ct-G432 provides flexible bus interface (Optional : UART , I2C or SPI ).

Ct-G432 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.
- \*<sup>2</sup> Full support for client-based and server-based SiRFInstantFix™
- \*<sup>3</sup> Dynamic contextual awareness, temperature monitoring, and MEMS sensors that work in concert to conserve power and boost performance  
(\*<sup>2</sup>/<sup>3</sup>, Above features should be combined with external EEPROM, please refer to application note.)
- Use of software control modules to achieve power saving state

## 1.1. Features

### 1.1.1 Performance

- ◆ High Performance Solution:
  - High sensitivity 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
- ◆ \*4 Embedded CGEE / SGEE (Need b server support) speed up TTFF a lot and makes cold start time to be around 22 seconds
- ◆ 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  
( \*4, Above features should be combined with external EEPROM, please refer to application note. )

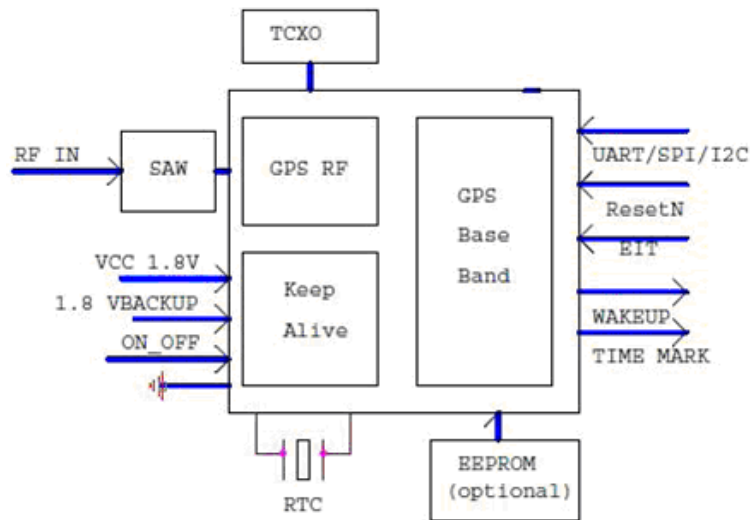
### 1.1.2 Hardware and software

- ◆ Based on the high performance features of the SiRF Star IV low power single chipset.
- ◆ Adaptive Micropower Controller :
  - Only 50 to 500  $\mu$ A maintains hot start capability.
  - <10mW required for TricklePower™ modeRoHS compliant (lead-free)
- ◆ SMT pads allow for fully automatic assembly processes equipment and reflow soldering
- ◆ Advanced Navigation Feature :
  - Smart sensor I2C interface
  - Interrupt input for context change detection

## 1.2 Advantages

- ◆ Built-in LNA.
- ◆ Built-in internal ROM and based on Firmware 4.5.x
- ◆ <sup>\*5</sup> 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 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 -159 dBm sensitivity)
- ◆ Support SiRFaware technology
- ◆ Support adaptive "Micro Power Controller" power management mode
- ◆ <sup>\*6</sup> Support MEMS sensor through I<sup>2</sup>C interface. (V4.5.X firmware is available for now)
- ◆ 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  
( <sup>\*5</sup>/<sup>\*6</sup>, Above features should be combined with external EEPROM, please refer to application note. )

### 1.3 Block Diagram



\*7 EEPROM(optional) : The external EEPROM can be part of storage for SiRFstat IV GSD4e, which can add-on more features and benefits for Ct-G432 GPS application.

## 2. Technical 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 Ct-G432 Module specifications

Feature	Item	Description
<b>Chipset</b>	GSD4e/ROM base	SiRF StarIV-low power single chipset
<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	0.01 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 @-130dBm)</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	Average: 53mA (Tracking Mode)
	Backup Power	1.71 ~ 1.89 VDC input
<b>Serial Port</b>	Electrical interface	Default SPI
	Protocol messages	NMEA-0183@4800bps

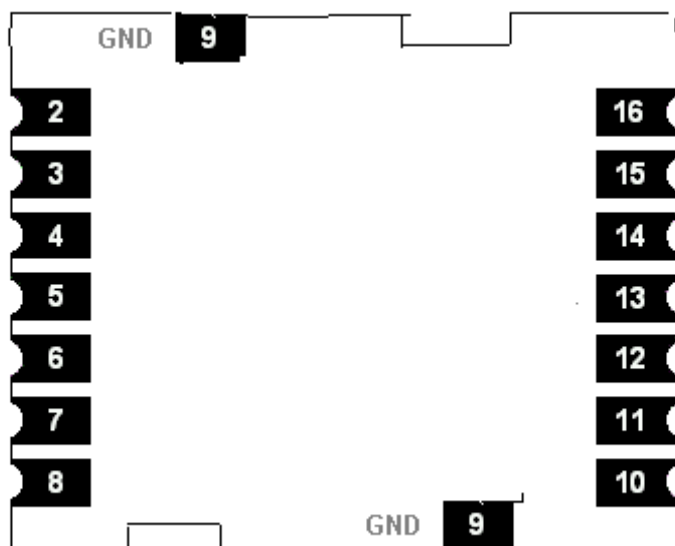
\* With external EEPROM

## 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 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 Pin Specifications

### 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	ON-OFF	I	Power control pin
4	RESET	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	WAKEUP	O	External Control for LNA or memory, active high
8	EIT	I	Interrupt
9	GND	PWR	Ground
10	TXA	O	SSPI_DO slave SPI data output (MISO) UART_TX UART data transmit (TX) I2C_CLK I <sup>2</sup> C bus clock (SCL)
11	RXA	I	SSPI_DI slave SPI data input (MOSI) UART_RX UART data receive (RX) I2C_DIO I <sup>2</sup> C bus data (SDA)
12	CTS	I	SSPI_CLK slave SPI clock input (CLK) UART_CTS_N UART clear to send (CTS) active low
13	RTS	O	SSPI_SS_N slave SPI chip select (CS#) active low UART_RTS_N UART ready to send (RTS) active low
14	TM	O	1 PPS time mark output.
15	CLK	I	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

This Ct-G432 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



## 2.4 Environment Specification

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

## 2.5 ESD Specification

- ◆ Air Discharge: 2 ; 4 ; 8KV ( direct )
- ◆ Contact Discharge: 2 ; 4 KV ( direct / indirect )

### 3. Software

The firmware used on Ct-G432 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:

Item	Description
Core of firmware	SiRF GSD4e/ROM_4.0.5
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

#### 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(1sec), GSA(1sec), GSV(5sec), RMC(1sec)

Table 3-1 Ct-G432 GPS module default baud rates

### 3.2 NEMA Output Message

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

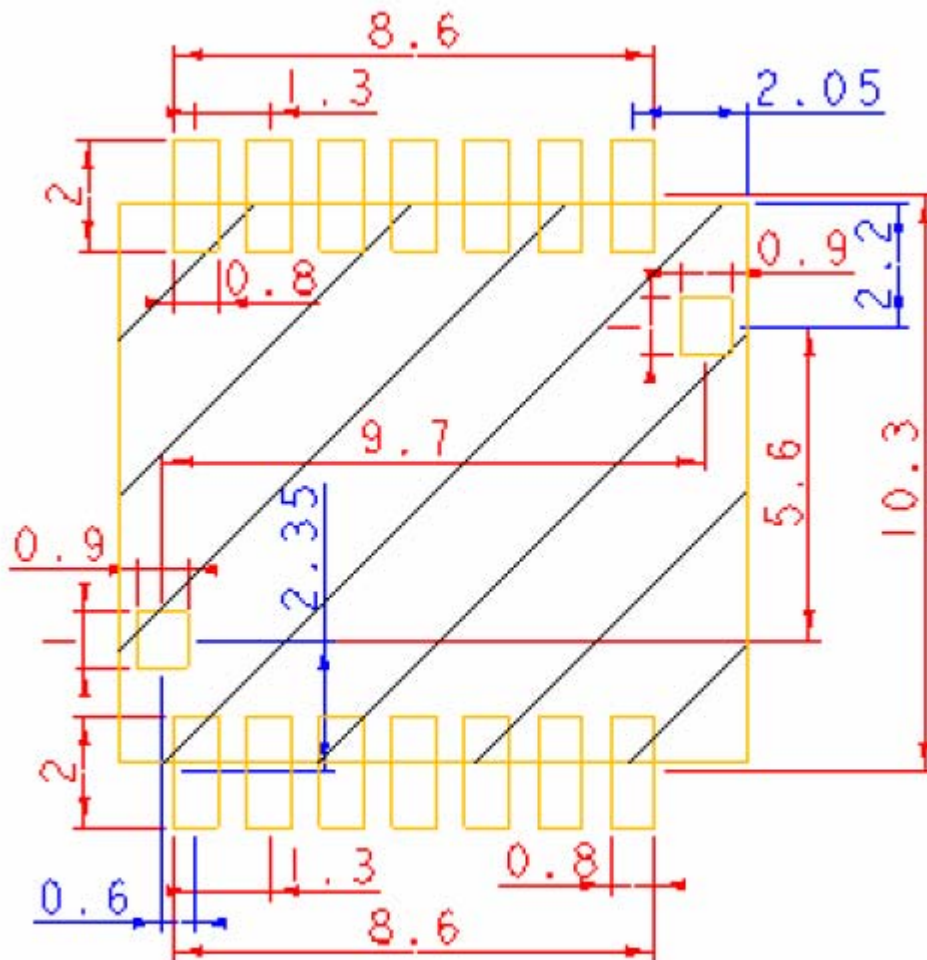
Option	Description
GGA	Time, position, and fix related data for a GPS receiver.
GSA	GPS receiver operating mode, satellites used in the position solution and DOP values.
GSV	The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values.
RMC	Time, date, position, course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

Table 3-2 NMEA-0183 Output messages

## 4. Mechanical Drawing and Footprint

Items	Description
Length	10.6±0.3mm
Width	10.0±0.3mm
Height	2.3±0.3mm
weight	1g

### 4.1 Recommended Footprint (TOP View)



PCB LAYOUT

### 4.2 Outline Drawing

