

S4F1513

Ultra High Sensitivity SiRF StarIV GSD4e
GPS Module with Miniature Dimension

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Documentation History

| Revision | Description | Date | Remark |
|-----------------|--------------------|-------------|---------------|
| V0.1 | S4F1513 release | Mar 2011 | |
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| | | | |

Content

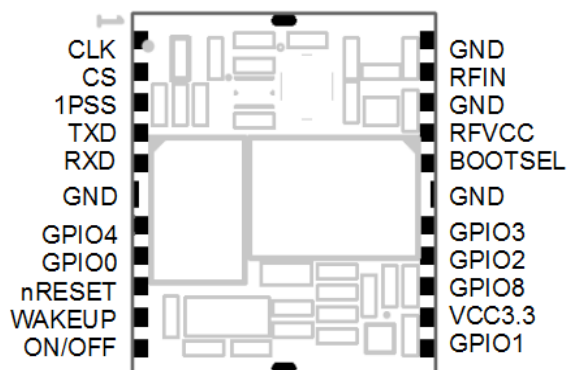
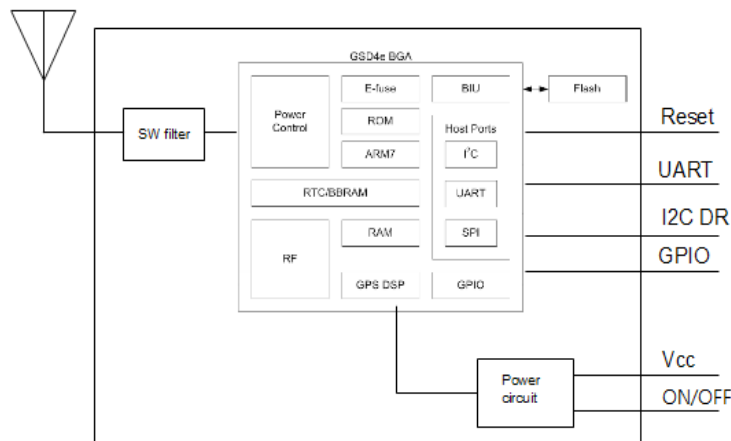
| | |
|------------------------------------|----|
| Features..... | 4 |
| Block diagram..... | 4 |
| Technical Specifications..... | 5 |
| Dimension..... | 6 |
| Recommended Solder Pad Layout..... | 6 |
| Pin Definition..... | 7 |
| Output NMEA Messages..... | 8 |
| NMEA Sentence..... | 8 |
| Description..... | 8 |
| Application Circuit..... | 9 |
| Reflow information..... | 10 |
| Packing handling..... | 10 |
| Labeling information..... | 12 |
| Humidity card..... | 12 |

Features

- ✓ 48 channel SiRF StarIV GSD4e positioning engine.
- ✓ Ultra high sensitivity to -163 dBm.
- ✓ SBAS (WAAS, MSAS, and EGNOS) support.
- ✓ Support 5Hz Update rate
- ✓ Supports UART, I2C and SPI interface.
- ✓ Backup battery for quick position fix.
- ✓ I2C interface to connect with MEMS sensor.
- ✓ Ultra low power consumption. <10mW required for TricklePower™ mode
- ✓ Ultra miniature 15 x 13 mm dimension with SMT pad package
- ✓ Operating temperature range: -30 to 85°C
- ✓ RoHS compliant (lead-free)



Block diagram



Technical Specifications

1. Electrical Characteristics

| | | |
|-----------------------|------------------------|---|
| 1.1 Chip set | SiRF StarIV GSD4e9411 | |
| 1.2 General | Frequency | L1, 1575.42MHz |
| | Channels, C/A code | 48, 1.023 MHz chip rate, 8192 time/frequency search windows |
| 1.3 Accuracy | Position | 3 meters CEP |
| | Time | 200 msec (1 PPS) |
| 1.4 DGPS Accuracy | Position | 2.5 meters CEP |
| 1.5 Acquisition Rate | Reacquisition | < 1 sec, typical |
| | Cold start | 32 sec, typical |
| | Cold start (CGEE*) | Under 15 sec |
| | Hot start | 1 sec, typical |
| 1.6 Sensitivity | Tracking | -163dBm (with external LNA) |
| | Navigation | -160dBm (With external LNA) |
| | Autonomous Acquisition | -148dBm (With external LNA) |
| 1.7 Dynamic Condition | Altitude | 18,288 meters (60,000 Feet) max. |
| | Velocity | 515 meters /sec (1000 Knots) max. |
| 1.8 Power | Main Power | 3.3 VDC typical |
| | Supply current | 46 mA (Maximum) |
| | Peak current | 130 mA |
| 1.9 Serial Port | Electrical interface | UART, I2C or SPI, |
| | Protocols | NMEA0183 v3.0 |

2. Environmental Characteristics

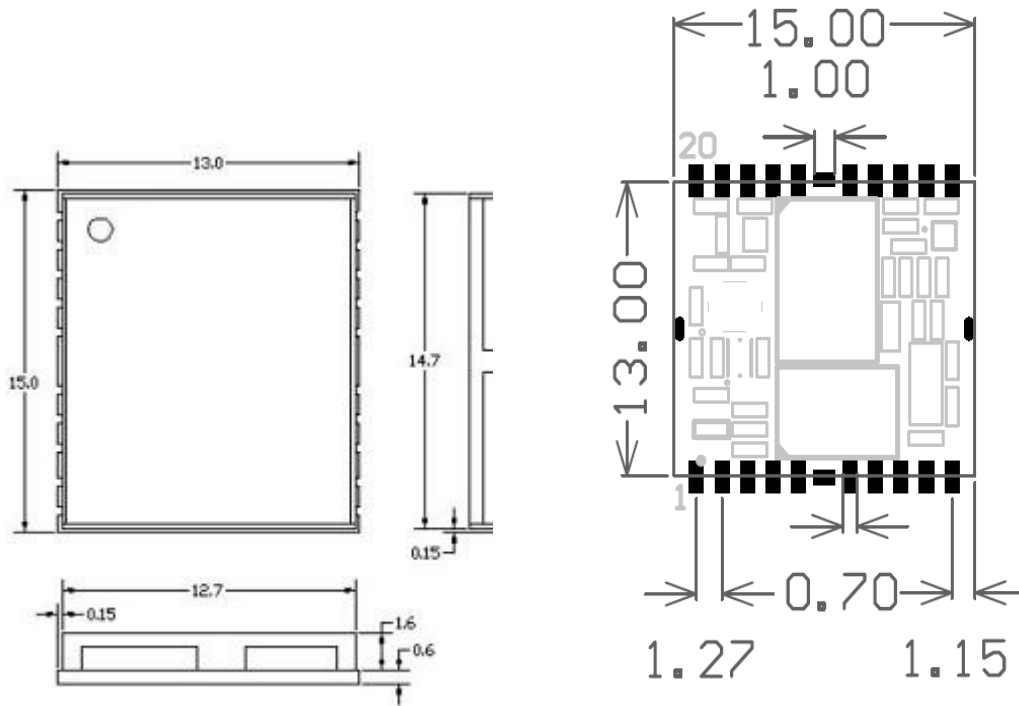
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|---------------------------|-----------------|--------------------------|
| 2.1 Temperature | Operating range | - 40 °C to + 85 °C |
| 2.2 Mechanical dimensions | L x W x H | 15.0 x 13.0 x 2.2 mm |
| 2.3 Interface | I/O connector | 22 pin SMD micro package |

*CGEE: Client Generated Extended Ephemeris

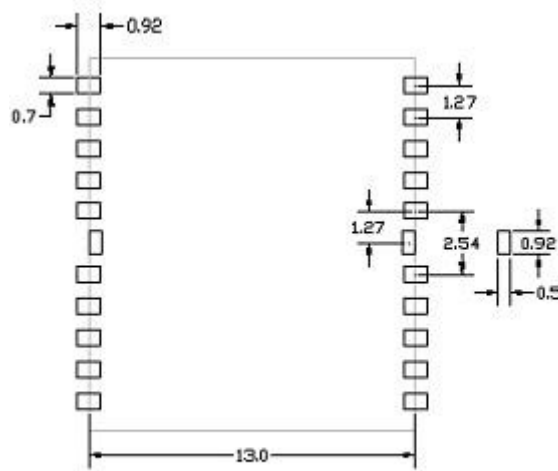
3 Antenna

| Parameter | Specification |
|--------------------|---|
| 3.1 Antenna type | Passive or active antenna |
| 3.2 Active Antenna | 15 ~ 27 dB Gain recommended, 1.5 dB noise figure max. |
| 3.3 Antenna Supply | Using VCC_RF (pin #17) input pin to provide antenna bias voltage to RF_IN (pin #19) |

Dimension



Recommended Solder Pad Layout



unit: mm

Note: The tolerance of foot pad is +/-10%.

Pin Definition

| Pin# | Name | Type | Description |
|------|-----------|--------|---|
| 1 | CS/GPIO7 | Input | UART, I2C, SPI control PIN |
| 2 | CLK/GPIO6 | Input | UART, I2C, SPI control PIN |
| 3 | 1PPS | Output | Time plus 200msec |
| 4 | TXA | Output | UART TXA output |
| 5 | RXA | Input | UART RXA output |
| 6 | GND | PWR | Ground |
| 7 | GPIO4 | Input | General purpose I/O |
| 8 | GPIO0 | Output | General purpose I/O, connect 2.2K Ohm to VCC |
| 9 | nRESET | Input | Base band RESET input. '0' = reset and '1' = normal operation |
| 10 | WAKEUP | Output | "H" GPS in operational model, "L" GPS in low power model. GPS Wake up output for control of external LNA or active antenna, or can also enable an external regulator, e.g. battery to 1.8V for the main input to the switch-mode regulator when full current mode is entered. |
| 11 | ON/OFF | Input | Ground |
| 12 | GPIO1 | PWR | Linear regulator battery input voltage: 2.4 - 5V. |
| 13 | VCC3.3 | PWR | DC power input 3.3V |
| 14 | GPIO8 | I/O | General purpose I/O. Please connect 100K Ohm to GND |
| 15 | GPIO2 | I/O | General purpose I/O |
| 16 | GPIO3 | I/O | General purpose I/O |
| 17 | GND | PWR | Ground |
| 18 | BOOTSET | Input | High Boot from Flash, Low Boot from serial port |
| 19 | VCC_RF | PWR | Input power for antenna |
| 20 | GND | PWR | Ground |
| 21 | RF_IN | Input | GPS RF signal input |
| 22 | GND | PWR | Ground |

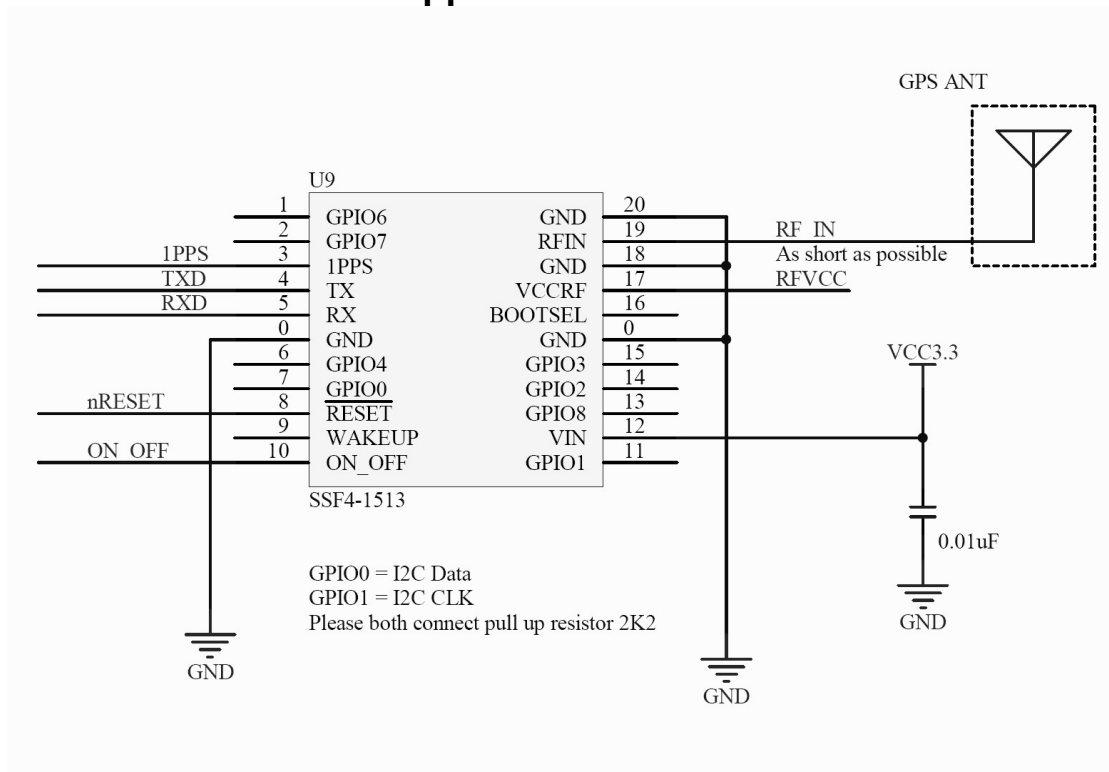
Output NMEA Messages

NMEA-0183 V3.0 Output Messages

| NMEA Sentence | Description |
|----------------------|--|
| GGA (default) | Global Positioning System Fixed Data |
| GLL | Geographic Position - Latitude/Longitude |
| GSA (default) | GNSS DOP and Active Satellites |
| GSV (default) | GNSS Satellites in View |
| RMC (default) | Recommended Minimum Specific GNSS data |
| VTG | Course Over Ground and Ground Speed |
| ZDA | Time and Date |

The detail information please refers to SSFXXXX series GPS module NMEA protocol reference manual.

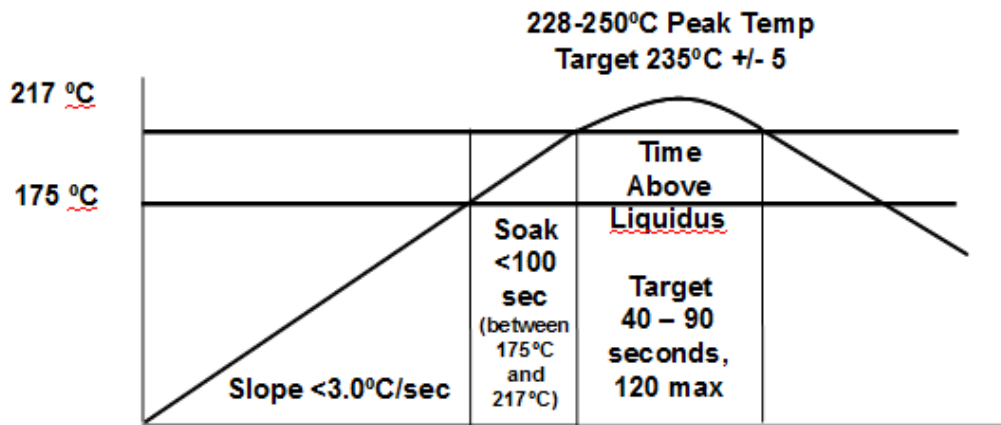
Application Circuit



Reflow information

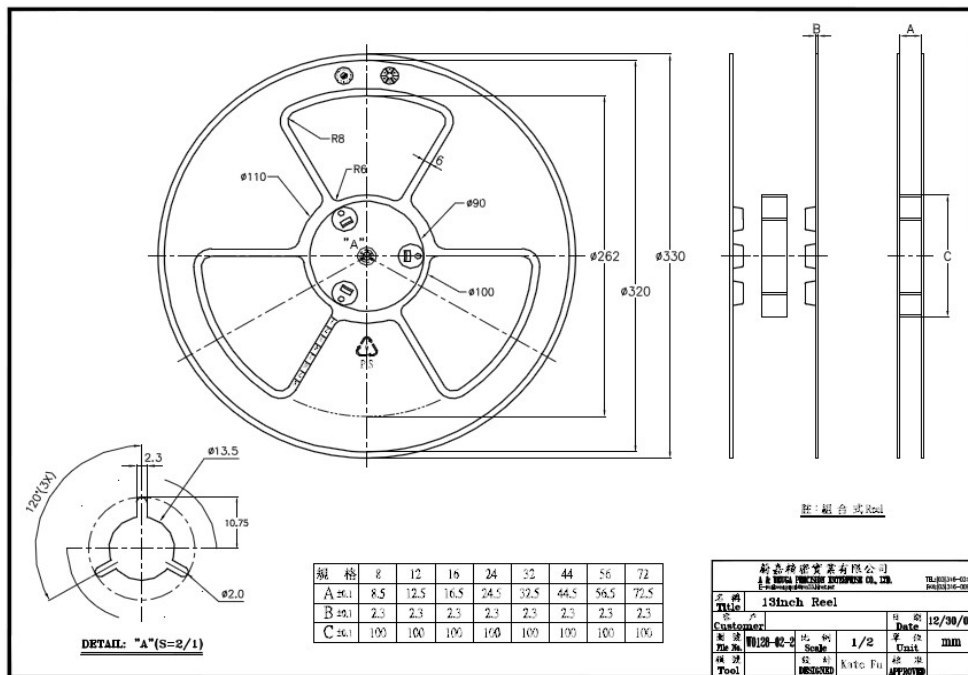
Reflow Profile Graphic, assuming:

1. Kester R905 Sn/4Ag/0.5Cu solder paste.
2. All solder ball alloys melt at 217°C.
3. Component joints do not exceed temperatures as per J-STD-02

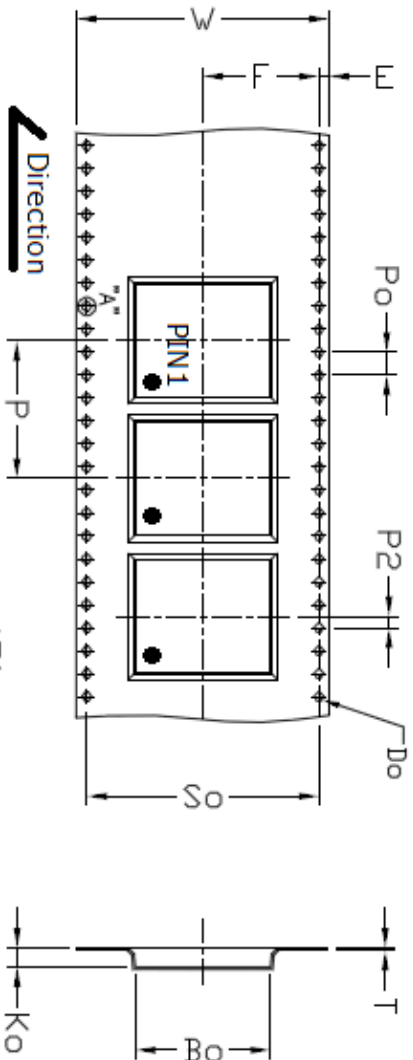


Packing handling

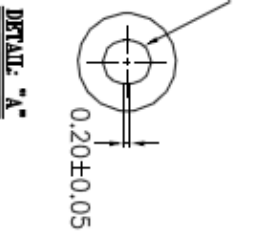
1000pcs per reel



| REV | NOTES | APPRO | DATE |
|-----|-------|-------|------|
| △ | | | |
| △ | | | |
| △ | | | |



| ITEM | DIM | TOLERANCE |
|------|-------|----------------|
| W | 44.00 | +0.30 -0.30 |
| E | 1.75 | +0.10 -0.10 |
| F | 20.20 | +0.15 -0.15 |
| S0 | 40.40 | +0.10 -0.10 |
| P | 24.00 | +0.10 -0.10 |
| P0 | 4.00 | +0.10 -0.10 |
| P2 | 2.00 | +0.15 -0.15 |
| D0 | Ø1.50 | +0.10 -0.00 |
| T | 0.40 | +0.05 -0.05 |
| A0 | 19.60 | +0.10 -0.10 |
| B0 | 23.55 | +0.10 -0.10 |
| K0 | 3.3 | +0.10 -0.10 |
| K1 | 3.50 | +0.10 -0.10 |



DETAIL: "A"

- 1.10 sprocket hole pitch cumulative tolerance 10.20mm.
2. Carrier camber not to exceed 1mm in 250mm.
3. Axial B measured on a plane 0.3mm above the bottom of the pocket.
4. Measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
5. All dimensions meet EIA-481-B requirements.
6. Packing length per 22" reel : 48.6 Meters.
7. Component load per 13" reel : 650 pcs. (CC-131 : 4'core)

| | | | | | |
|---------------------------------------|--|--------------|--|----------|--|
| 料帶 黑色抗靜電 PS | | 客戶確認 | | 日期: | |
| 客戶確認 | | 接受 | | 日期: | |
| Accepted | | 拒絕 | | Date | |
| 拒絕的原因: | | Causes | | | |
| 名稱 | | 比例 | | 日期 | |
| 23.13X19.20X3.0 | | 1/1 | | 99.11.25 | |
| 客戶 | | 比例 | | 單位 | |
| 興聯 | | 1/1 | | MM | |
| 圖號 | | 圖號 | | 核准 | |
| T1125-10-01 | | DESIGNER | | EDEN | |
| Tooling | | DESIGNER | | APPROVED | |
| A & TECH DESIGN ENGINEERING CO., LTD. | | T8400316-016 | | 版本 | |
| E-mail: tech@attech.com.hk | | F8400316-005 | | REV | |
| | | | | 1 | |

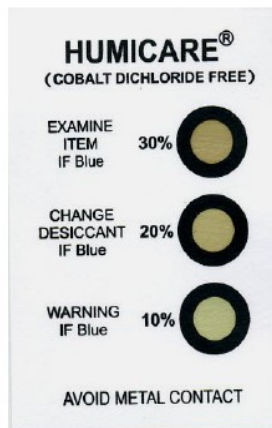
Labeling information

The Labeling of GPS modules includes product information. The location of the product type number and serial number are show in the figure.



Humidity Card

The dry bag provide an MSD label describing the handling requirement to prevent humidity intake. JEDEC J-STD-033B specifications require that MSD sensitive device be packaged together with a Humidity indicator Card and desiccant to absorb humidity. If no moisture has been absorbed, the three field in the HIC indicate blue color.



The calculated shelf life for dry packed SMD packages is a minimum of 12 months from the bag seal date, when stored in a non-condensing atmospheric environment of <math><40^{\circ}\text{C}/90\% \text{RH}</math>. The parts must be processed and soldered within the time specified for the MSL level 3 168 hours. If this time is exceeded, or the humidity indicator card in the sealed package indicates that they have been exposed to moisture, the devices need to be pre-baked before the reflow solder process.