PEB-616 Engine Board
Product Specification

Version 1.2

2009/9/15

Polstar Technologies Inc.
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1 OVERVIEW

PEB-616 is a high performance; low power consumption, small size, and very easy integrated GPS module board designed for a broad spectrum of OEM system applications. The GPS module receiver will track up to 20 satellites at a time while providing fast time-to-first-fix and one second navigation updates. The highly integrated digital receiver uses the SiRFstarIII single chipset.

PEB-616 uses highly advanced GPS technology and is capable of acquisition and tracking in very low signal-strength environments. This enables effective and reliable operation in all scenarios. Unique algorithms and multi-path mitigation provide an accurate fix in the most challenging GPS environments, such as urban "canyons" and other areas where GPS signals are weak or deflected off of surrounding buildings.

This hardware capability combined with software intelligence makes the board easy to be integrated and used in all kinds of navigation applications or products.

2 PRODUCT FEATURES

- High acquisition and tracking sensitivity
  - Low power consumption
  - Real-time navigation for location-based services
  - Extremely fast TTFF at low signal levels
- Highly integrated component
  - Automatic pick and place assembly
  - Maximum flexibility
  - Extensively configurable
  - EMI shielded
  - 200,000+ effective correlators for fast TTFF
  - Supports 20-channel GPS receiver
  - Digital, RF and 4Mb Flash in a single package (GSC3e/LPx IC)
  - GSC3e/LPx IC with ARM7TDMI inside
  - Integrated TCXO (± 0.5 ppm)
  - SBAS (WAAS and EGNOS) and DGPS support
  - Small size 16mm X 13mm X 2.5mm

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3 APPLICATIONS

- PND
- GPS Phone
- MID / UMPC
- Tracking Unit
- Automatic Vehicle Location

4 TECHNICAL SPECIFICATIONS

4.1 Electrical Characteristics

- General

Frequency	L1, 1575.42MHz
C/A Code	1.023MHz chip rate
Channel	20

- Accuracy

Position	10 meters CEP without SA 2DRMS approximately 5 meters WAAS support
Velocity	0.1 meters/second without SA
Time	1 microsecond synchronized to GPS time

- DGPS Accuracy

Position	1 to 5 meters, typical
Velocity	0.05 meters/second, typical

- Sensitivity

Acquisition	-144 dBm
Tracking	-159 dBm

- Acquisition Rate

Hot start	1 sec, average
Warm start	38 sec, average
Cold start	42 sec, average

- Dynamic condition

Altitude	18,000 meters max.
Velocity	515 m/sec max.
Acceleration	4g, max
Jerk	20 meters/second^3 max.

- DC Power

Main Power	3.3V DC
Continuous Mode	50mA @3.3V DC
Power saving Mode	40uA @3.3V DC
Backup Battery Power	3V DC

- Serial Interface

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UART Port Level TTL
Protocol Message SiRF binary and NMEA-0183 V2.2
Update Rate 1 Hz (min.)

- 1PPS Pulse

Level CMOS
Pulse duration 1us
Time reference At the pulse positive edge
Measurements Aligned to GPS second

- Datum

WGS-84

- Environment Condition

Operating Temperature -30℃~+85℃
Storage Temperature -40℃~+90℃
Operating Humidity 5%~95% RH, no condensing

4.2 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power supply voltage(VCC, VBAT)	-0.3	6.0	V
Serial port input voltage	-0.3	6.0	V
GPIO voltage	-0.3	6.0	V
Storage temperature	-40	90	℃

4.3 Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Power supply voltage	VCC	3.0	3.3	5.5	V
I/O input high level	V_{IH}	2.0			V
I/O input low level	V_{IL}			0.8	V
I/O output high level	V_{OH}	2.4			V
I/O output low level	V_{OL}			0.4	V
External active antenna voltage	VANT	2.7	*1	5	V
Operating temperature	Top	-30		85	℃

*1: Depends on the working voltage using for external active antenna.

4.4 Battery Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Backup battery supply voltage	VBAT	1.7	3.0	3.3	V

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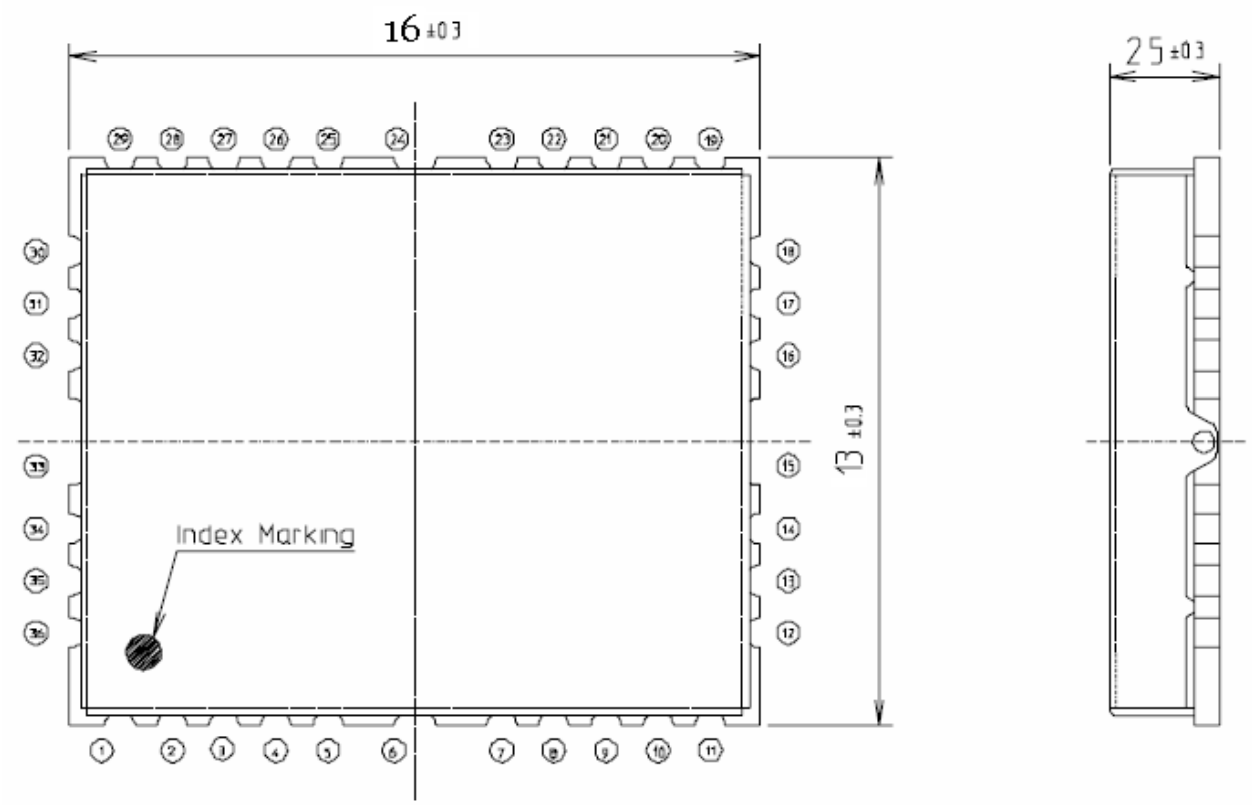
Supply current	IBAT		10		uA

5 MECHANICAL / PCB SPECIFICATION

5.1 Dimension (16x13x2.5, unit: mm)



Note: tolerance: ± 0.3 mm

5.2 Recommend PCB Layout Footprint

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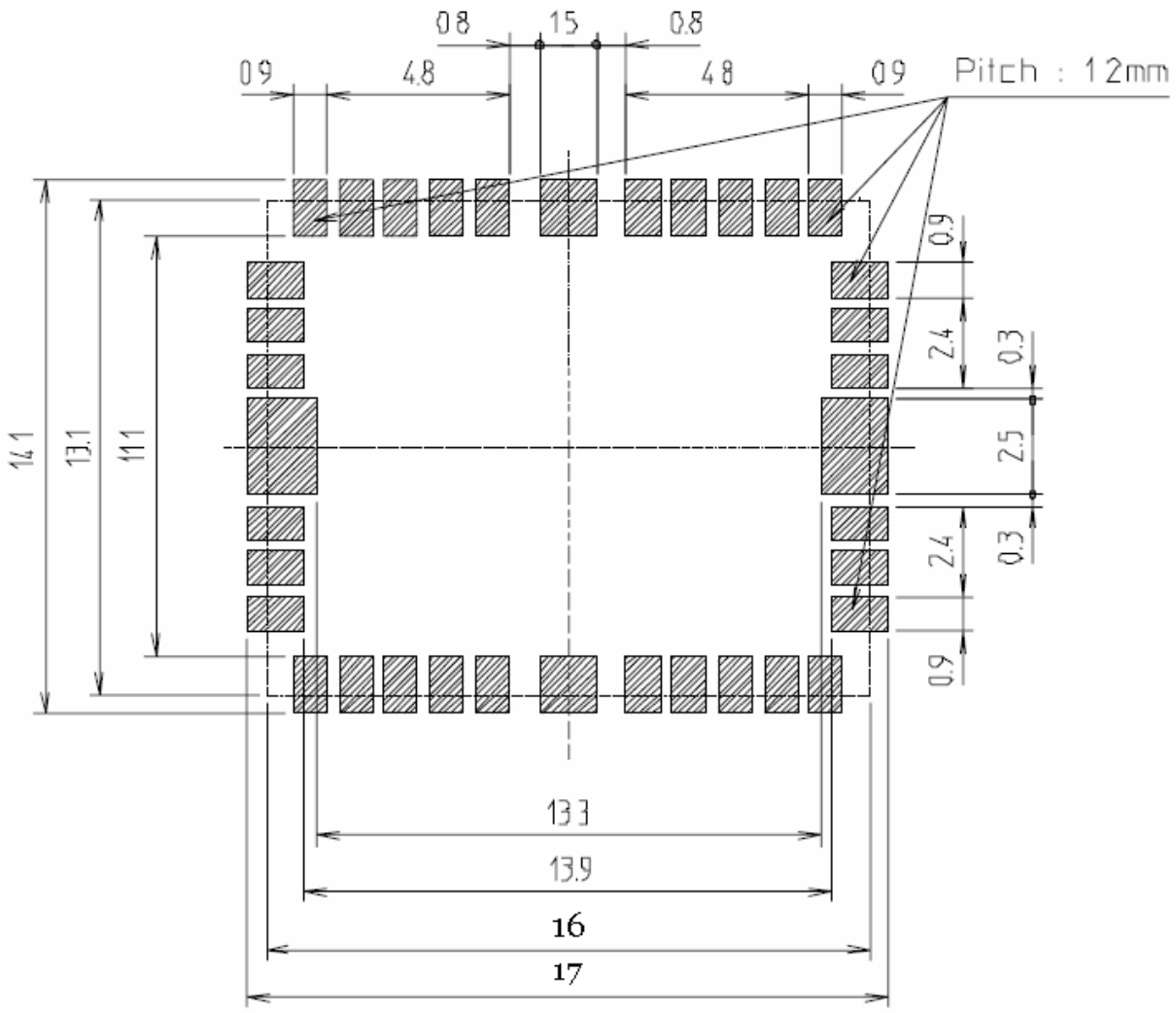

5.3 Pad configuration

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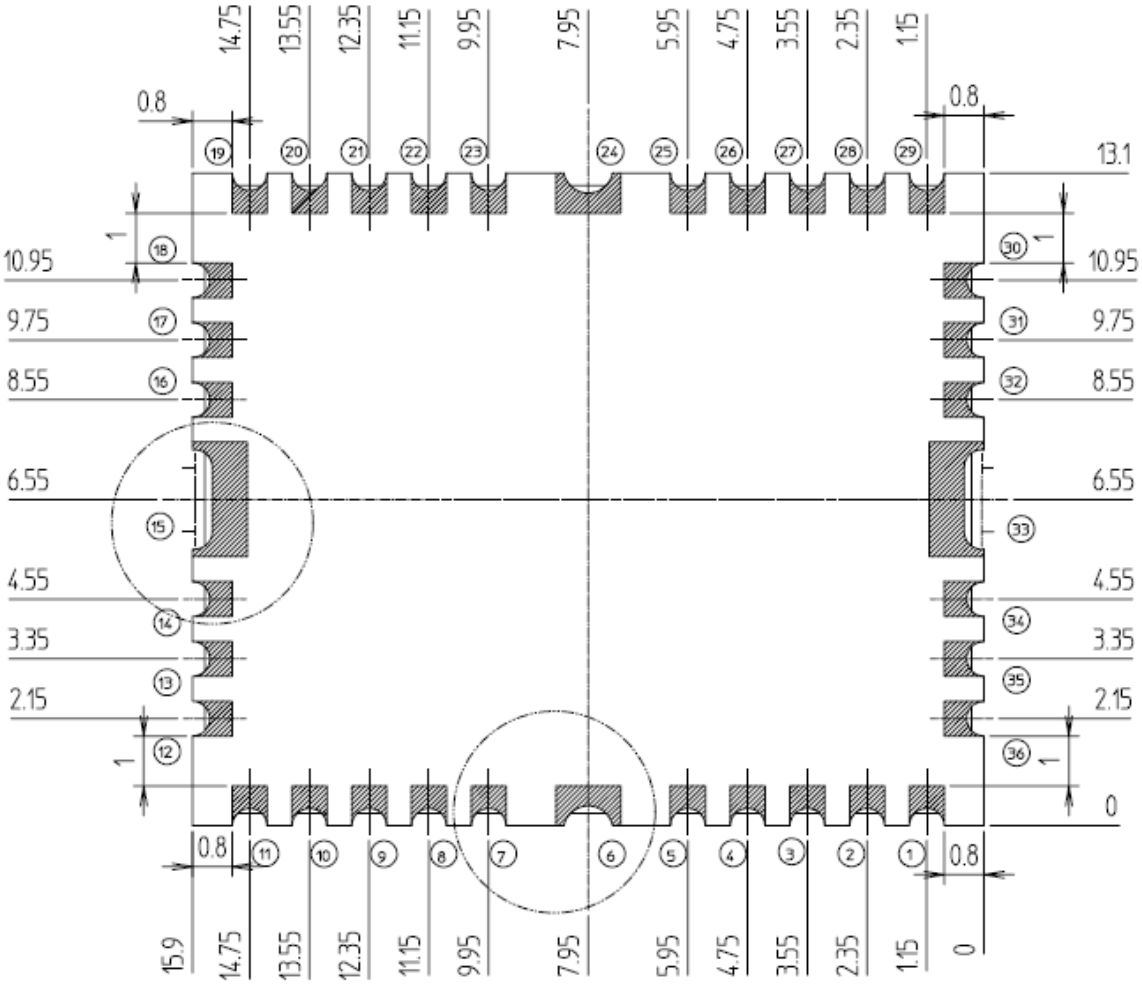

(Bottom view)

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6 PADS DETAILS

Pin no	Name	Description
1	RF_IN	GPS RF input, 1575.42MHz, 50ohm External VANT needed for external active antenna (Page 5)
2	GND	System ground
3	GND	System ground
4	GND	System ground
5	V_BAT	For Internal Battery Backup SRAM Power (1.7V~3.3V)
6	GND	System ground (Chassis GND)
7	NC	No connection
8	GND	System ground
9	GND	System ground
10	GND	System ground
11	VCC	Main power VCC (3V~3.6V)
12	GND	System ground
13	NRESET	Low active reset inside
14	GND	System ground
15	GND	System ground (Chassis GND)
16	ON_OFF	Power saving mode use (Page 12)
17	GND	System ground
18	GPIO1	Indication for GPS fixed as LED blinking
19	GND	System ground
20	Time Mark	1PPS One Pulse output Per Second
21	GND	System ground
22	GND	System ground
23	GND	System ground
24	GND	System ground (Chassis GND)
25	BOOTSEL	Boot mode select
26	GND	System ground
27	NC	No connection
28	GND	System ground
29	GND	System ground
30	TX0	Serial UART interface to processor, module output
31	RX0	Serial UART interface to processor, module input
32	NC	No connection
33	GND	System ground (Chassis GND)
34	NC	No connection
35	GND	System ground
36	GND	System ground

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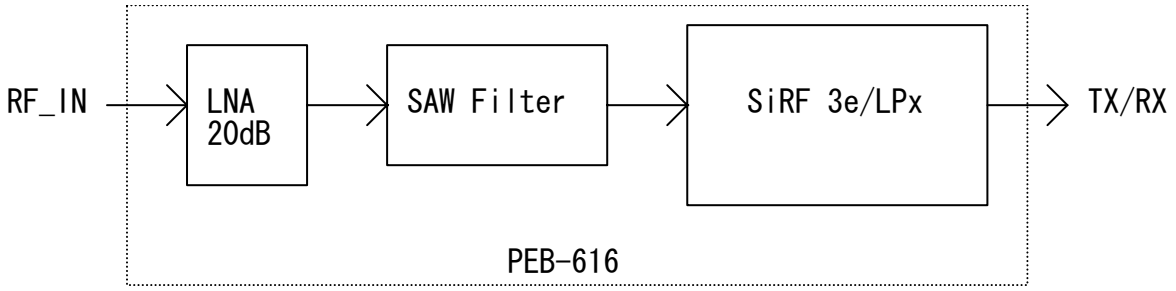
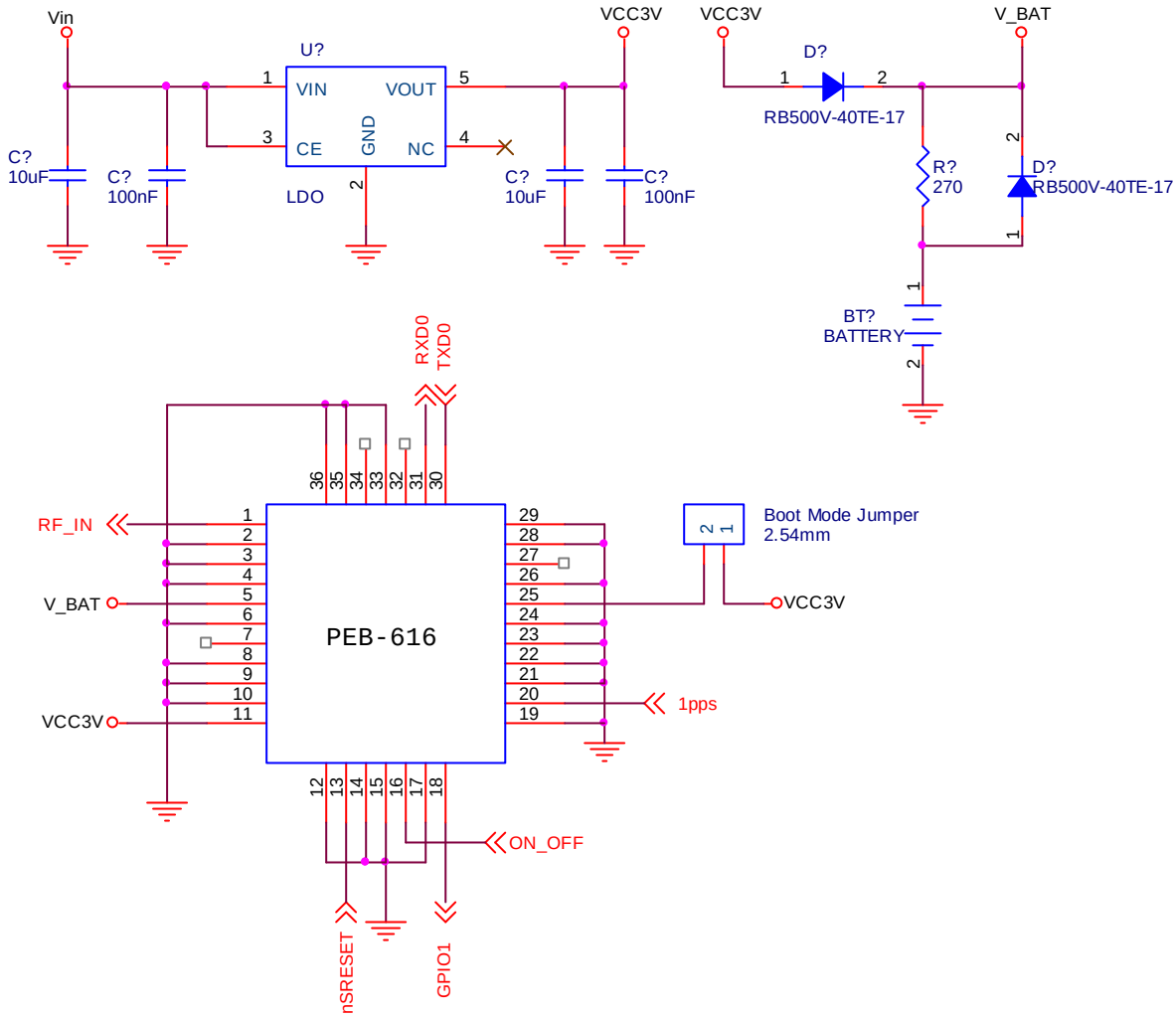
7 APPLICATION NOTE

7.1 Function block and application circuit





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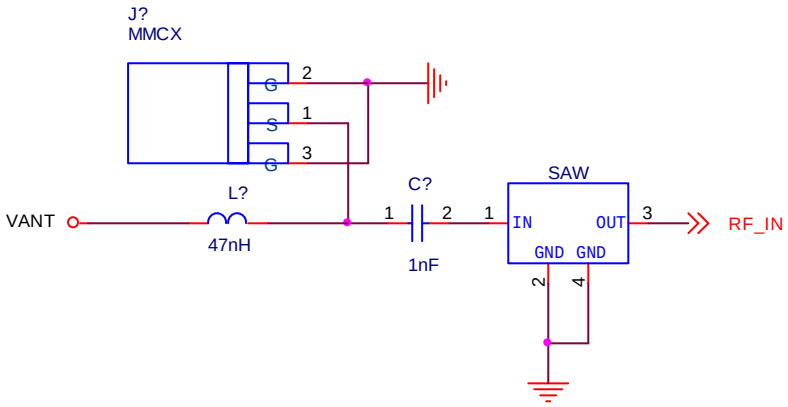
7.2 Reference design

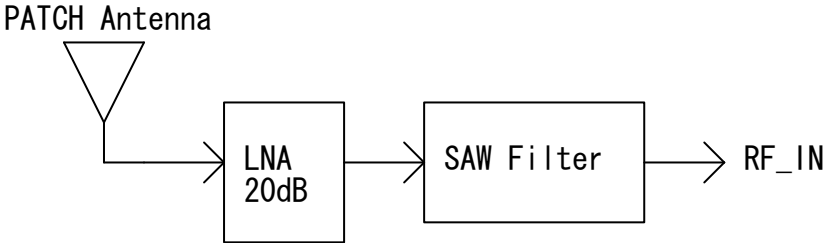
Two kind of RF input can be designed, one is external activate antenna, the other is patch antenna.

7.2.1 External activate antenna



By way of MMCX connector, it can connect with external active antenna with external VANT power supply provided by user. The gain on external active antenna should be less than 20dB to avoid gain saturation on two orders LNA amplifier. The insertion loss for SAW is as small as possible.

7.2.2 Patch antenna



Some applications like GPS mouse receiver need patch antenna to receive GPS signal, it can add another LNA and SAW before PEB-616 to make it more reliable. The gain of LNA should be less than 20dB and the Noise Figure is as small as possible (Typical is 0.8dB). The insertion loss for SAW is as small as possible.

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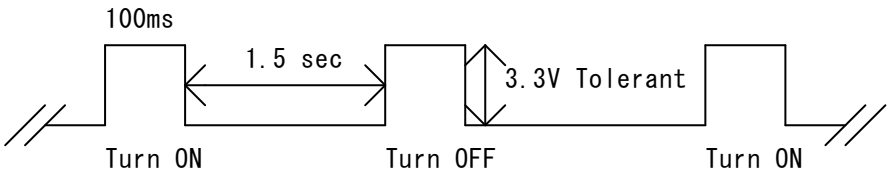
7.3 ON_OFF usage

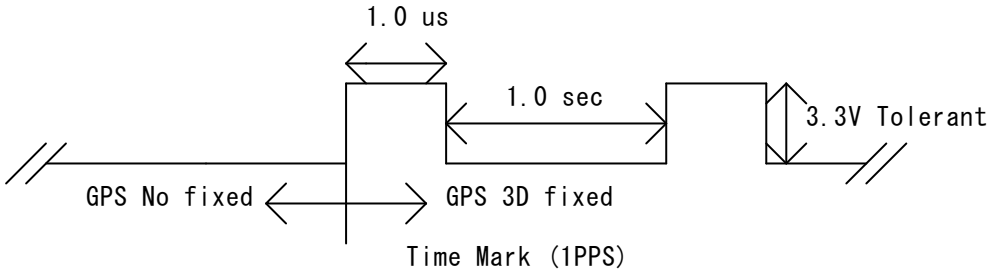
According to SiRF APNT3019C-Power implementation documentation, ON_OFF pin usage is not only use for power saving, SiRF also suggests user to control ON_OFF pin to enter into power saving mode before cut off the power supply on GPS module. To prevent unexpected risk of abnormal happen, do not cut off main power supply suddenly before entering power saving mode.

The procedure to control ON_OFF is as figure below, to turn off (enter power saving mode) or to turn on (wake up) the GPS module is by toggle way. The signal format is to generate a high pulse which is larger than 100ms; the interval between two pulses is larger than 1.5 seconds.



7.4 Time Mark and GPIO1 usage

The time formats for Time Mark and GPIO1 are as below pictures. Time mark will output 1us duration high pulse every 1 second after 3D fixed.



GPIO1 is used to drive LED blinking which indicates the fixed status of GPS, and it is low active output for LED to turn ON.

Low active output for LED to turn ON

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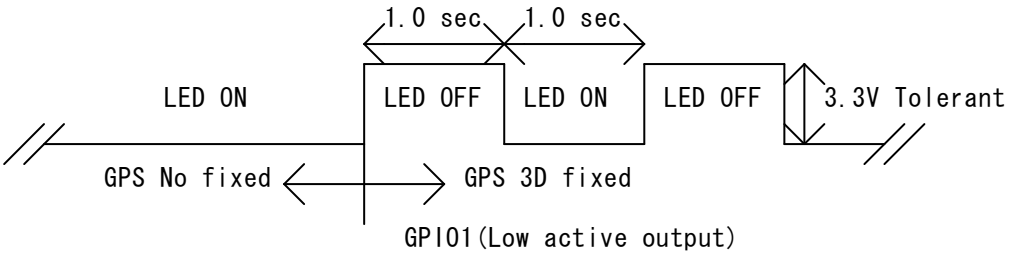

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