KNCTEK GPS Module

KBE-1613 Specification

Version 2.0
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Revision History

1. 2008-02-18 : Initiated Version 1.0
2. 2008-07-04 : Updated Version 1.0.1 for packing information on page 12.
3. 2008-08-07 : Updated Version 1.0.2 for mechanical pin layout on page 7.
4. 2009-02-13 : Updated Version 1.0.3 for Recommended Land Pattern Dimension on page 7
5. 2009-04-11 : Updated Version 2.0 for re-organized Electrical characteristics and performance characteristics chart on page 6&7

KBE-1613 Operational Manual

INTRODUCTION

The **KBE-1613** is the newest generation of KNCTEK GPS Module. The GPS Module is powered by STMicroelectronics TESEO technology and KNCTEK proprietary navigation algorithm that providing you more stable navigation data. The miniature design is the best choice to be embedded in a portable device like PND, PDA, Telematics and vehicle locator. The excellent sensitivity of **KBE-1613** gets the great performance when going though the urban canyon and foliage environmental condition.

PRODUCT FEATURES

- ✧ 16 Channels High Performance GPS(HPGPS)
- ✧ 66MHz ARM7TDMI & Complete Embedded Memory System
  - Flash 256K bytes, 16K bytes and 64K bytes SRAM
- ✧ Galileo Ready GPS module in RF Front End
- ✧ Achieved -159dBm in Tracking Sensitivity
- ✧ Enhanced Warm/Hot Acquisition Sensitivity at -146dBm
- ✧ Fast TTFF <34seconds in Warm Start
- ✧ Enhanced Algorithm for Navigation Stability
- ✧ Excellent Sensitive for Urban Canyon and Foliage Environmental condition
- ✧ Dual Multi-path Rejection
- ✧ Applied Static and Prediction Filters
- ✧ SBAS(WAAS and EGNOS) supported
- ✧ NMEA-0183 compliant protocol/custom protocol
- ✧ Automotive-grade Quality GPS solution
- ✧ Small form factor (16.0 X 13.0 X 2.2mm)
- ✧ ODM/OEM development is fully supported by Application Engineering
- ✧ Hardware and Software support from a dedicated GPS team

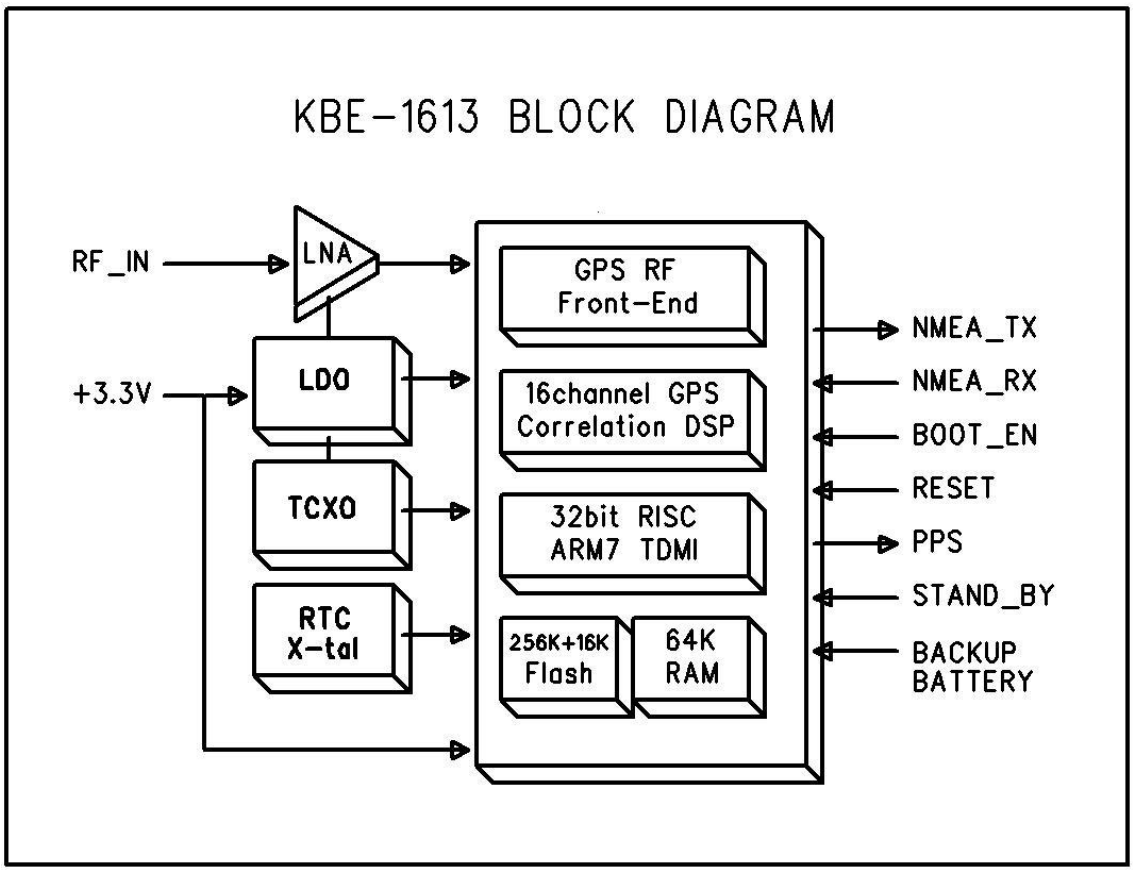
PRODUCT APPLICATION

- ✧ Automotive applications
- ✧ Speed camera detector
- ✧ Personal and Car navigation Devices
- ✧ Marine navigation
- ✧ Timing application

PRODUCT PICTURE

KBE-1613 SYSTEM BLOCK DIAGRAM

The KBE-1613 consists of STMicroelectronics TESEO chipsets Technology, KNCTEK LNA and proprietary software. The system is described as follows.



TECHNICAL SPECIFICATION

1. Electrical Characteristics

1.1 Absolute Maximum Rating

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	VCC	-0.3	8	V
Input Pins				
Input Pin Voltage I/O	RX	-0.3	3.6	V
Backup Battery	V_bat	1.8	3.6	V
Environment				
Operating Temperature	Topr	-40	85	℃
Storage Temperature	Tstg	-40	125	℃
Backup Battery operating temperature[1]	Tbat	-20	65	℃
Peak Reflow Soldering Temperature < 10S	Tpeak		260	℃
Humidity			95	%

** [1] Backup Battery operating temperature depends on Battery characteristics

Note : Absolute maximum ratings are stress ratings only, and functional operation at the maximums is not guaranteed. Stress beyond the limits specified in this table may affect device reliability or cause permanent damage to the device.

For functional operating conditions, please refer to the operating conditions tables as follow.

1.2 Operating Condition

Parameter	Symbol	Condition	Min	Typ	Max	Units
Power supply voltage	Vcc		3.3	5.0	6.0	V
Power Supply voltage ripple	Vcc_PP	Vcc = 5.0V			30	mV
Acquisition current	IccA	Vcc = 3.3V		80	85	mA
Tracking current	IccT	Vcc = 3.3V		80	85	mA
Input high voltage	V_{IH}		2.0			V
Input low voltage	V_{IL}				0.8	V
Output high voltage	V_{OH}		2.9			V
Output low voltage	V_{OL}				0.4	V

2. General & Performance Specification

Parameter	Specification	
Receiver Type	L1 frequency band, 1575.42MHz, 16 Channels	
Sensitivity	Tracking	-159dBm
	Re-acquisition	-151dBm
	Acquisition(Warm Start) Sensitivity	-146dBm
Accuracy	Position	2.0m CEP
Acquisition Time	Cold Start	39 sec. typical (Open sky[1])
	Warm Start	34 sec. typical (Open sky)
	Hot Start	2.5 sec. typical (Open sky)
	Reacquisition Time	1 sec
Power Consumption	Tracking & Acquisition	80mA @ 3.3V
	Back-up	6uA @ 3V
Navigation Data Update Rate	1Hz	
Operational Limits	Velocity	Max 515 m/s
	Altitude	Max 18,000m
	Acceleration	Less than 4g
Mechanical data	Dimension	16.0X13.0X2.2mm
	Weight	1.0grams ±5%
Protocol	NMEA-0183 V3.0	

** [1]Open Sky means no obstructions in the sky

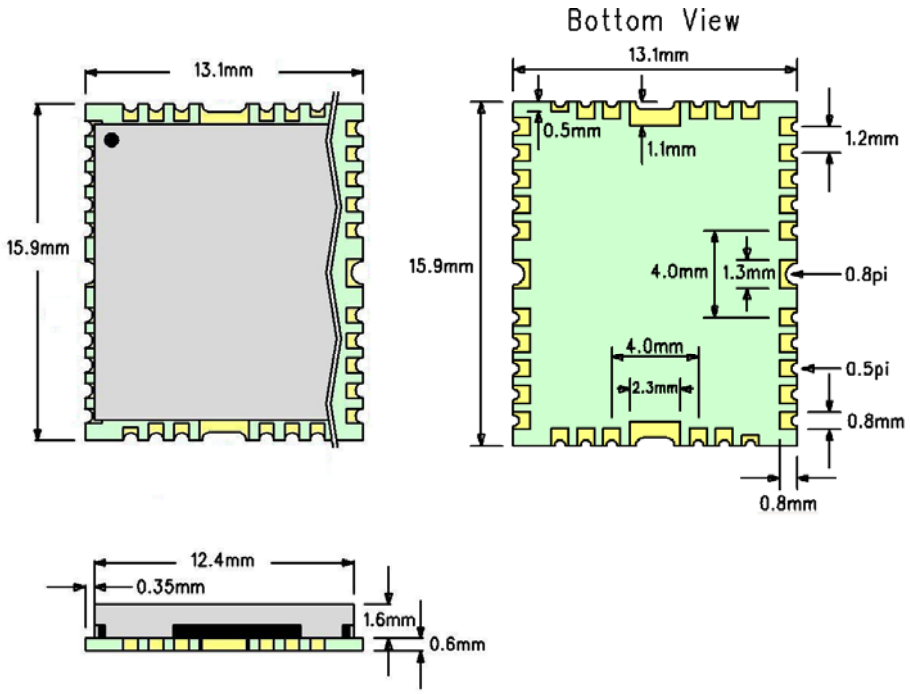
RECOMMENDED GPS ACTIVE EXTERNAL ANTENNA

It's recommended to use an GPS active external antenna with supply voltage of 3VDC and a current draw of 15mA maximum. The quality of the GPS active external antenna chosen is of paramount importance for the overall sensitivity of the GPS system. An GPS active external antenna should have a gain ≥ 27dB and a noise figure ≤ 1.5dB, which applies to more than 90% of the antennas available in the market.

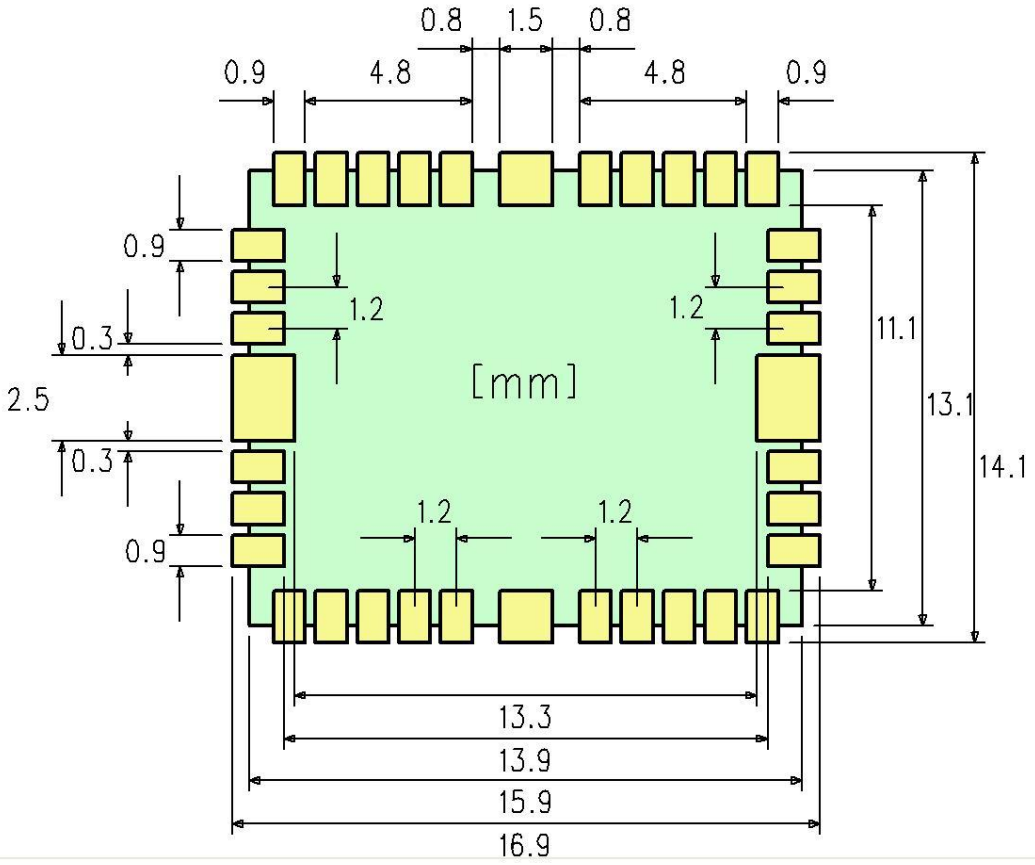
3V GPS Active External Antenna Specification

Characteristics	Specification
Center Frequency	1575.42±1.023MHz
Band Width(-10dB return loss)	10MHz
Gain at Zenith	5.0dBi Typical
VSWR	2.0 : 1 Max
Polarization	R.H.C.P
Axial Ratio	3.0dB max
Gain	27 dB Typical
Noise Figure	1.5dB
Out Band Attenuation	20dB min for ±50MHz
Voltage	3 ± 10%VDC or 2.7 ~ 3.3 VDC
Current	< 15 mA

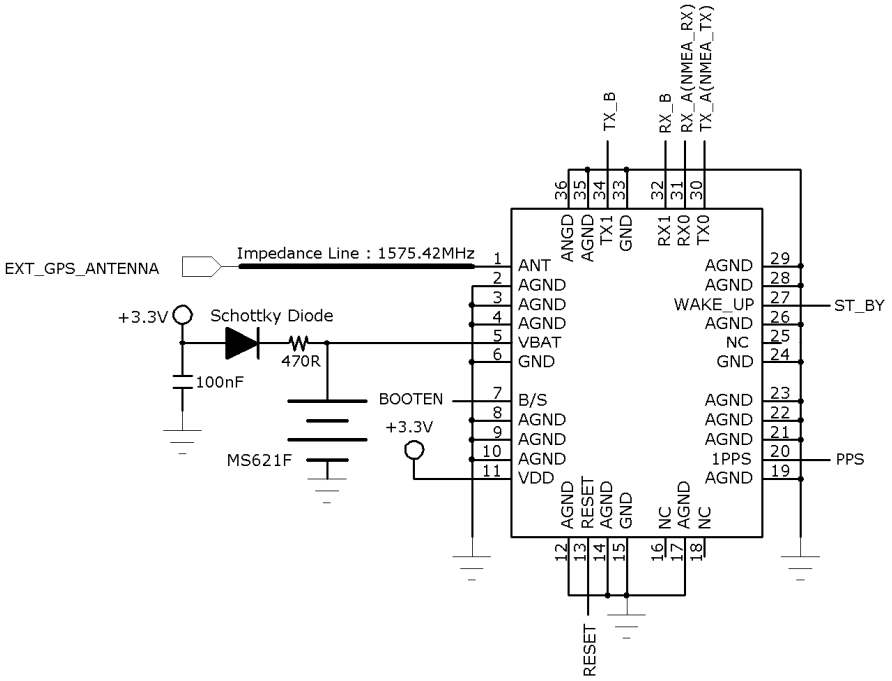
MECHANICAL PIN LAYOUT



RECOMMENDED LAND PATTERN DIMENSION



HARDWARE INTERFACE



DEFINITION OF PIN ASSIGNDMENT

PIN	SIGNAL NAME	I/O	DESCRIPTION	CHARACTER
1	ANT	I	GPS SIGNAL INPUT	50Ω 1.57542GHz
2	GND	GND	Ground	
3	GND	GND	Ground	
4	GND	GND	Ground	
5	VBAT	I	Backup Battery supply	DC +1.8V ~ +3.3V
6	GND	GND	Ground	
7	B/S	I	Enable Boot[1:0]	Applicable to Manufacture
8	GND	GND	Ground	
9	GND	GND	Ground	
10	GND	GND	Ground	
11	VDD	I	DC Power Supply Voltage input	DC +3.3V ±5%
12	GND	GND	Ground	
13	RESET	I	RESET(Active LOW)	Active LOW
14	GND	GND	Ground	
15	GND	GND	Ground	

16	NC	–	Not connecting	
17	GND	GND	Ground	
18	NC	–	Not connecting	
19	GND	GND	Ground	
20	1PPS	–	Not connecting	
21	GND	GND	Ground	
22	GND	GND	Ground	
23	GND	GND	Ground	
24	GND	GND	Ground	
25	NC	–	Not connecting	
26	GND	GND	Ground	
27	WAKE_UP	I	Enable Standby Mode	Active Low
28	GND	GND	Ground	
29	GND	GND	Ground	
30	TX_0	O	UART TXA	NMEA_TXA
31	RX_0	I	UART RXA	NMEA_RXA
32	RX1	I	UART RXB	DEBUG_RXB
33	GND	GND	Ground	
34	TX1	O	UART TXB	DEBUG_TXB
35	GND	GND	Ground	
36	GND	GND	Ground	

VCC DC Power Input

This is the main power supply for the Engine board. The power range is from 3.3V ±5%.

GND

GND provides the ground for the Engine board. Connect all grounds.

VBAT

This is the battery backup supply that powers the SRAM and RTC when main power is removed. The input voltage level is from 1.8V ~ 3.3V. Max current draw is 40uA at 3.3volt. Without an external backup battery or on board battery, engine board will execute a cold start after every turn on. To achieve the faster start-up offered by a hot or warm start, either a backup battery must be connected or battery installed on board.

TX0

NMEA_TX, UART output, 3.3V LVTTL logic level. This is the main transmit channel and is used to output navigation and measurement data to user written software. The default setup is NMEA Output, 9600bps, 8 data bits, no parity, 1 stop bit.

RX0

NMEA_RX, UART input,3.3V LVTTL logic level. This is the main receiving channel and is used to receive software commands to the Engine board from user written software.

TX1, RX1

This is used for DEBUG PORT

B/S

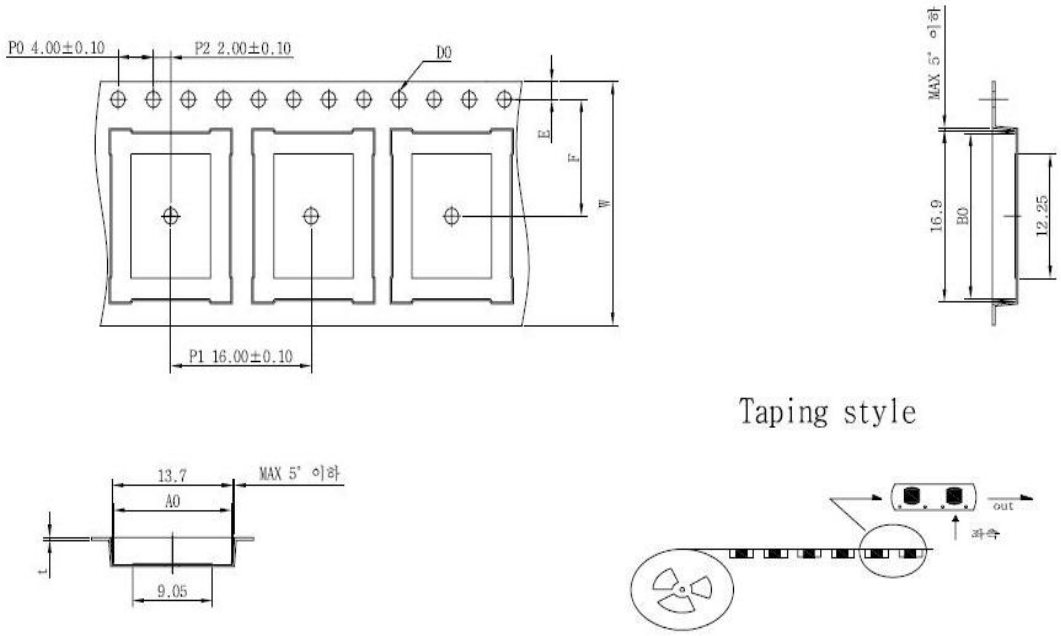
Pull Booten pin high, then it will get into boot mode.

ANT

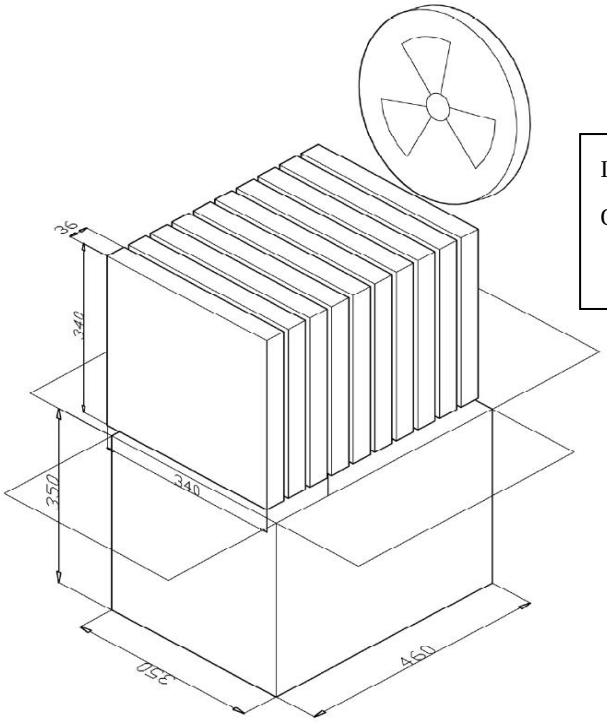
THE line on the PCB from the antenna(or antenna connector)has to be a controlled line (Micro strip at 50Ω)

Packing Information

1. Carrier Tape Dimension



2. Inner & Out Box (Carton Box)



Inner Box : 1,500pcs by one Tape & Reel packing

Out Box : Contained 10sets of Inner Boxes.

(Total 15,000pcs)

GPS Receiver User's Tip

1. GPS signal will be affected by weather and environment conditions, thus suggest to use the GPS receiver under less shielding environments to ensure GPS receiver has better receiving performance.
2. When GPS receiver is moving, it will prolong the time to fix the position, so suggest to wait for the satellite signals to be locked at a fixed point when first power-on the GPS receiver to ensure to lock the GPS signal at the shortest time.
3. The following situation will affect the GPS receiving performance:
   a. Solar control filmed windows.
   b. Metal shielded, such as umbrella, or in vehicle.
   c. Among high buildings.
   d. Under bridges or tunnels.
   e. Under high voltage cables or near by radio wave sources, such as mobile phone base stations.
   f. Bad or heavy cloudy weather.
4. If the satellite signals can not be locked or encounter receiving problem (while in the urban area), the following steps are suggested:
   a. Please plug the external active antenna into GPS receiver and put the antenna on outdoor or the roof of the vehicle for better receiving performance.
   b. Move to another open space or reposition GPS receiver toward the direction with fewer blockages.
   c. Move the GPS receiver away from the interference resources.
   d. Wait until the weather condition is improved.

While a GPS with a backup battery, the GPS receiver can fix a position immediately at next power-on if the build-in backup battery is full-recharged.

Contact Information Section

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*** As for the explantion of NMEA-0183 V3.0 Protocol : Please refer to KNCTEK Website (www.knctek.com)**