

SPK ELECTRONICS CO., LTD.

GPS Module SPK-GPS8063

Product Data Sheet & Design Guide

<V1.0>

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SPK ELECTRONICS CO., LTD.

Date: 2010/01/18

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Status: Released

Revision History

Version	Effective Date	Description of Changes
0.9	2009/10/05	Draft
1.0	2010/01/18	Released

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1. Introduction

SPK's SPK-GPS8063 is a low-power, high-performance compact GPS module. It is designed with the advanced Atheros AR1511 (BF1B-R) GPS IC. The very small form factor and low power consumption of SPK-GPS8063 makes it especially suitable for a variety of embedded GPS applications for mobile devices such as personal and automotive navigation, UMPC, etc.. With its robust design and the extensive support and services backed by SPK ELECTRONICS CO., LTD., SPK-GPS8063 is the solution of choice for the industry.

2. Key Features

- 20 parallel channels all in view tracking
- High GPS Sensitivity:
 - o In Tracking: -159dBm
 - o Acquisition: -143dBm
- Low Power Consumption
 - o Operating Current: < 60 mA @ 3.3V $\pm$ 10%
 - o Tracking : <47 mA @3.3V $\pm$ 10%
 - o Back up power- 3.0V $\pm$ 10%
- High sensitivity
 - o TTFF @ 37.6s (Cold) / 34s (Warm) / 1.5s (Hot)
 - o Re-acquisition@0.1S
 - o Tracking sensitivity : -159dBm
- Small Form Factor
 - o 13 mm $\times$ 16.5 mm $\times$ 2.6 mm
- Accuracy: 5M CEP
- Machine mountable (SMD module, tape and reel packed)
- SBAS (WAAS, EGNOS and MSAS) supported
- Default Software Setting
 - o Baud Rate: 4800
 - o NMEA Output Format : GGA/GSA/RMC/VTG X 1s; GSV X 5s
 - o WAAS ON
 - o Easy to use TTL interface

3. Applications

- Cell phones, UMPC, and personal positioning and navigation system
- Asset tracking
- Security monitoring and tracking
- Location-based services

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4. Technical Specification

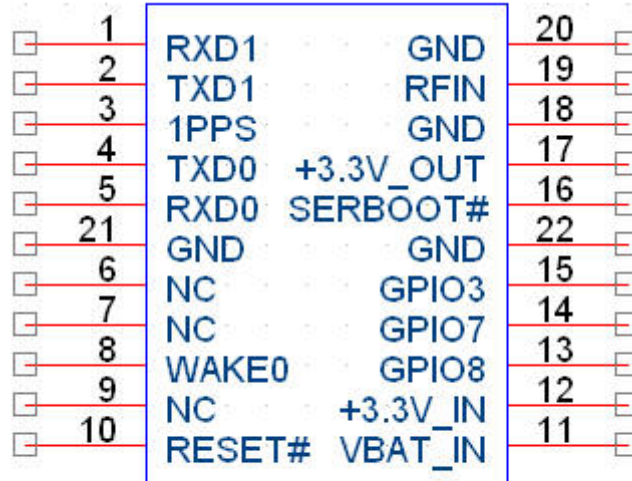
General	
Frequency	L1, 1575.42 MHz
C/A Code	1.023 MHz chip rate
Channels	20 channels
Accuracy	
Position	10 m, 2D RMS
	5 m, 2D RMS, WAAS corrected
	< 5 m (50%), DGPS corrected
Velocity	0.1 m / sec
Time	1 sec synchronized to GPS time
Map/Chart Datum	
Default	WGS-84
Time to First Fix (TTFF)	
Cold Start	37.6 sec
Warm Start	34 sec
Hot Start	1.5 sec
Snap Start	1 sec
Re-acquisition	0.1 sec
Dynamic Conditions	
Altitude	18,000 m (60,000 ft.) above sea level, max.
Acceleration	4 g, max.
Velocity	515 m / sec (1000 knots), max.
Jerk	20 m / sec, max.
Power Consumption	
Supply Voltage	3.3 V $\pm$ 10%
Operating Current	Acquisition: <60mA Tracking: <47mA
Back-up Power	3.0 V $\pm$ 10%
I/O	
Serial Port	TTL
Timing Pulse	
1 pps	Synchronized to the rising edge of GPS sec.
Mechanical	
Size	13 mm $\times$ 16.5 mm $\times$ 2.6 mm
Weight	<2g
I/O	22 SMD pads

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5. I/O Pin Assignment (Top View)



I/O Pin Assignment (Top View)

6. I/O Definitions

Pin No.	Name	Type	Description
1	RXD1	I/O	UART1 RXD Input or GPIO0
2	TXD1	I/O	UART1 TXD Input or GPIO1
3	PPS	O	One Pulse per Second
4	TXD0	I/O	UART0 TXD Output
5	RXD0	I/O	UART0 RXD Input
6	N/C	N/C	N/C
7	N/C	N/C	N/C
8	WAKE0	I	WAKE0 Input
9	N/C	N/C	N/C
10	RESET#	I	Baseband RESET input
11	VBAT_IN	PWR	Back-up power supply voltage
12	VDD	PWR	Vcc_In_ 3.3V
13	GPIO8	I/O	GPIO8
14	GPIO7	I/O	GPIO7
15	GPIO3	I/O	GPIO3
16	BOOT	I	Select BOOT mode
17	RF_OUT	PWR	Antenna bias voltage supply (for active antenna)
18	GND	GND	Ground
19	RF_IN	I	RF signal input
20	GND	GND	Ground

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21	GND	GND	Ground
22	GND	GND	Ground

7. Electrical (DC) Characteristics –

7.1 Operating condition

	Min.	Typical	Max.	Unit
DC Supply Voltage (VCC)	3.0	3.3	3.6	V
Backup Voltage (BATTERY)	2.0	3.0	3.5	V
Voltage Output for Antenna (V_ANT)	2.79	2.85	2.91	V
Supply Current (@ VCC = 3.3V and I _{out} = 0)				
Peak		60		mA
Acquisition		56		
Tracking		45		
Standby		1		
Backup Battery Current			10	μA
Current at 2.7V Output (@VCC = 3.3V)			30	mA

7.2 Maximum Ratings

	Max.	Unit
Supply Voltage (VCC)	6.5	V
Backup Battery Voltage (BATTERY)	7.0	V
Antenna Power Supply Output Current (V_ANT)	50	mA
Operating Temperature	-30 (L) 85 (H)	
Storage Temperature	-40 (L) 100 (H)	

8. Software Interface

8.1 NMEA Message Output

NMEA Record	Description
GGA	Global positioning system fixed data
GLL	Geographic position – latitude/longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view (0.2Hz)
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

8.1.1 GGA – Global positioning system fixed data

\$GPGGA,161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M,,0000*18

Name	Example	Unit	Description
Message ID	\$GPGGA		GGA protocol header

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UTC Position	161229.487		hhmmss.sss
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Name	Example	Unit	Description
Latitude	3723.2475		dmm.mmmm
N/S Indicator	N		N: north ; S: south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E: east ; W: west
Position Fix Indicator	1		0 – position fix not available; 1 – GPS SPS mode, position fix valid; 2 – DGPS SPS mode, position fix valid
Satellite Used	07		Range : 00 - 12
HDOP	1.0		Horizontal dilution of precision
MSL Altitude	9.0	meter	
Units	M	meter	
Geoid Separation		meter	
Units	M	meter	
Age of differential correlator		second	NULL if DOPS is not used
Diff. ref station ID	0000		
Checksum	*18		
<CR><LF>			End of message termination

8.1.2 GLL – Geographic Position – Latitude/Longitude

\$GPGLL,3723.3475,N,12158.3416,W,161229.487,A *2C

Name	Example	Unit	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N: north / S: south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	E		E: east / W: west
UTC Position	161229.467		hhmmss.ss
Status	A		A: data valid / V: data not valid
Checksum	*2C		
<CR><LF>			End of message termination

8.1.3 GSA – GNSS DOP and Active Satellites

\$GPGSA,A,3,07,02,26,27,09,04,15,,,,,1.8,1.0,1.5*33

0	Example	Unit	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		M: manual, forced to operate in 2D or 3D mode; A: automatic, allowed to automatically switch

			2D/3D;
Mode 2	3		1: fix not available; 2: 2D; 3: 3D;
ID of Satellite used	07		SV on Channel 1
ID of Satellite used	02		SV on Channel 2
...			...
ID of Satellite used			SV on Channel 11
ID of Satellite used			SV on Channel 12
PDOP	1.8		Position dilution of precision
HDOP	1.0		Horizontal dilution of precision
VDOP	1.5		Vertical dilution of precision
Checksum	*33		*33
<CR><LF>			End of message termination

8.1.4 GSV – GNSS Satellites in View

\$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71

\$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41

Name	Example	Unit	Description
Message ID	\$GPGSV		GSA protocol header
Total Number of messages	2		Range 1 - 3
Message Number	1		
Satellites in View	07		
Satellite ID	07		Channel 1 (Range: 01 – 32)
Elevation	79	degree	Channel 1 (Range: 00 – 90)
Azimuth	048	degree	Channel 1 (Range: 000 – 359)
SNR (C/N0)	42	dB-Hz	Channel 1 (Range: 00 – 99, null when not tracking)
...	...		
Satellite ID	27		Channel 1 (Range: 01 – 32)
Elevation	27	degree	Channel 1 (Range: 00 – 90)
Azimuth	138	degree	Channel 1 (Range: 000 – 359)
SNR (C/N0)	42	dB-Hz	Channel 1 (Range: 00 – 99, null when not tracking)
Checksum	*71		
<CR><LF>			

8.1.5 RMC – Recommended Minimum Specific GNSS Data

\$GPRMC,053740.000,A,2503.6319,N,12136.0099,E,2.69,79.65,100106,...,A*53

Name	Example	Unit	Description
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Message ID	\$GPRMC		RMC protocol header
UTC Time	053740.000		hhmmss.sss
Status	A		A: data valid / V: data not valid
Latitude	2503.6319		ddmm.mmmm
N/S Indicator	N		N: north / S: south
Longitude	12136,0099		dddmm.mmmm
E/W Indicator	E		E: east / W: west
Speed over ground	2.69	knots	True
Course over ground	79.65	Degrees	
Date	100106		ddmmyy
Magnetic variation		Degrees	
Variation sense			E: east / W: west
Mode	A		A: autonomus
Checksum	*53		
<CR><LF>			Endo

8.1.6 VTG – Course Over Ground and Ground Speed

\$GPVTG,309.62,T,,M,0.13,N,0.2,K, A*23

Name	Example	Unit	Description
Message ID	\$GPVTG		VTG protocol header
Course over ground	309.62		Measured heading
Reference	T		True
Course over ground			Measured heading
Reference	M		Magnetic
Speed over ground	0.13		Measured speed
Units	N		E: east / W: west
Speed over ground	0.2	knots	True
Units	K	Degrees	
Mode	A		A: autonomus
Checksum	*23		
<CR><LF>			End of message termination

9. Recommended PCB land pattern

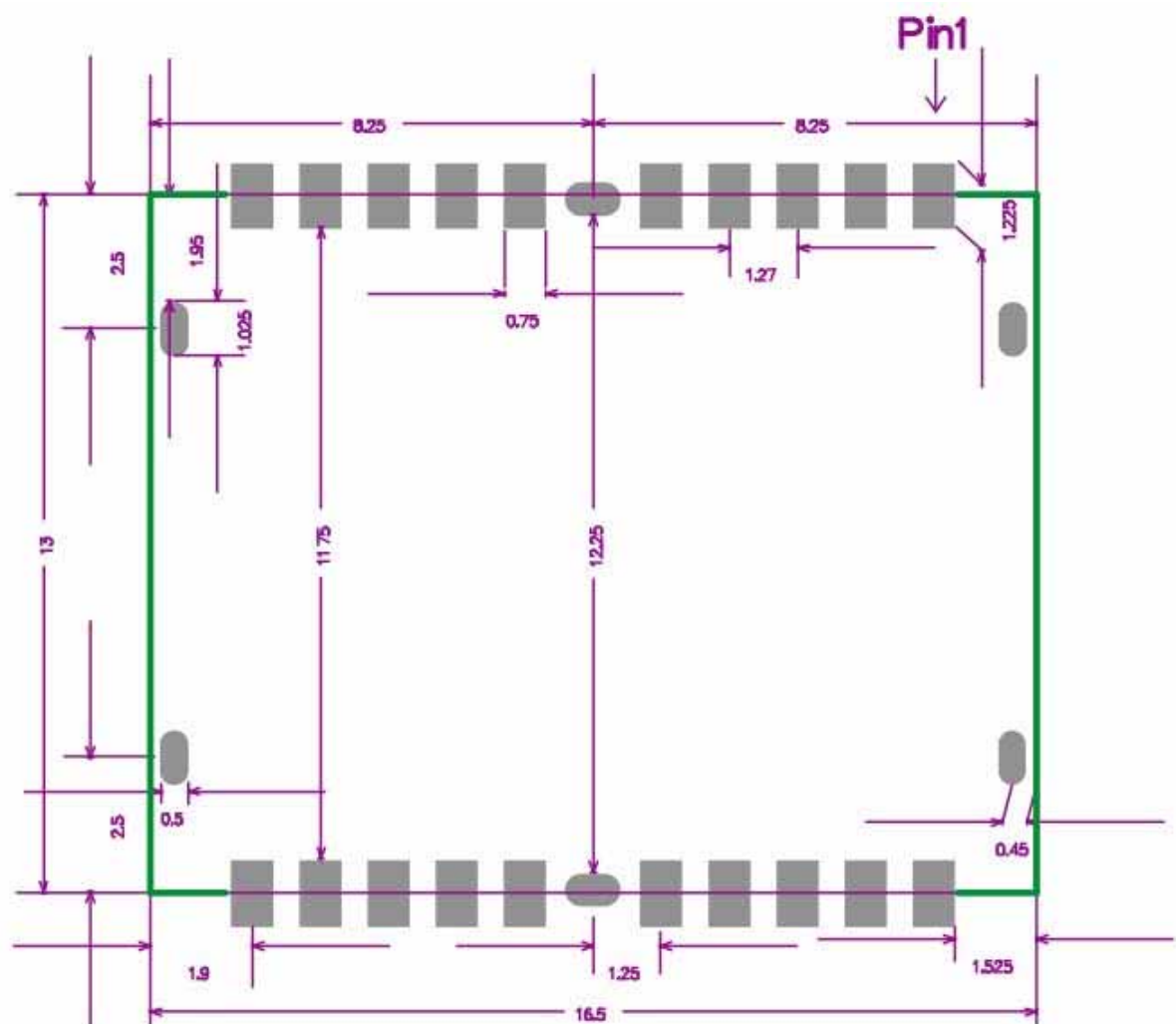
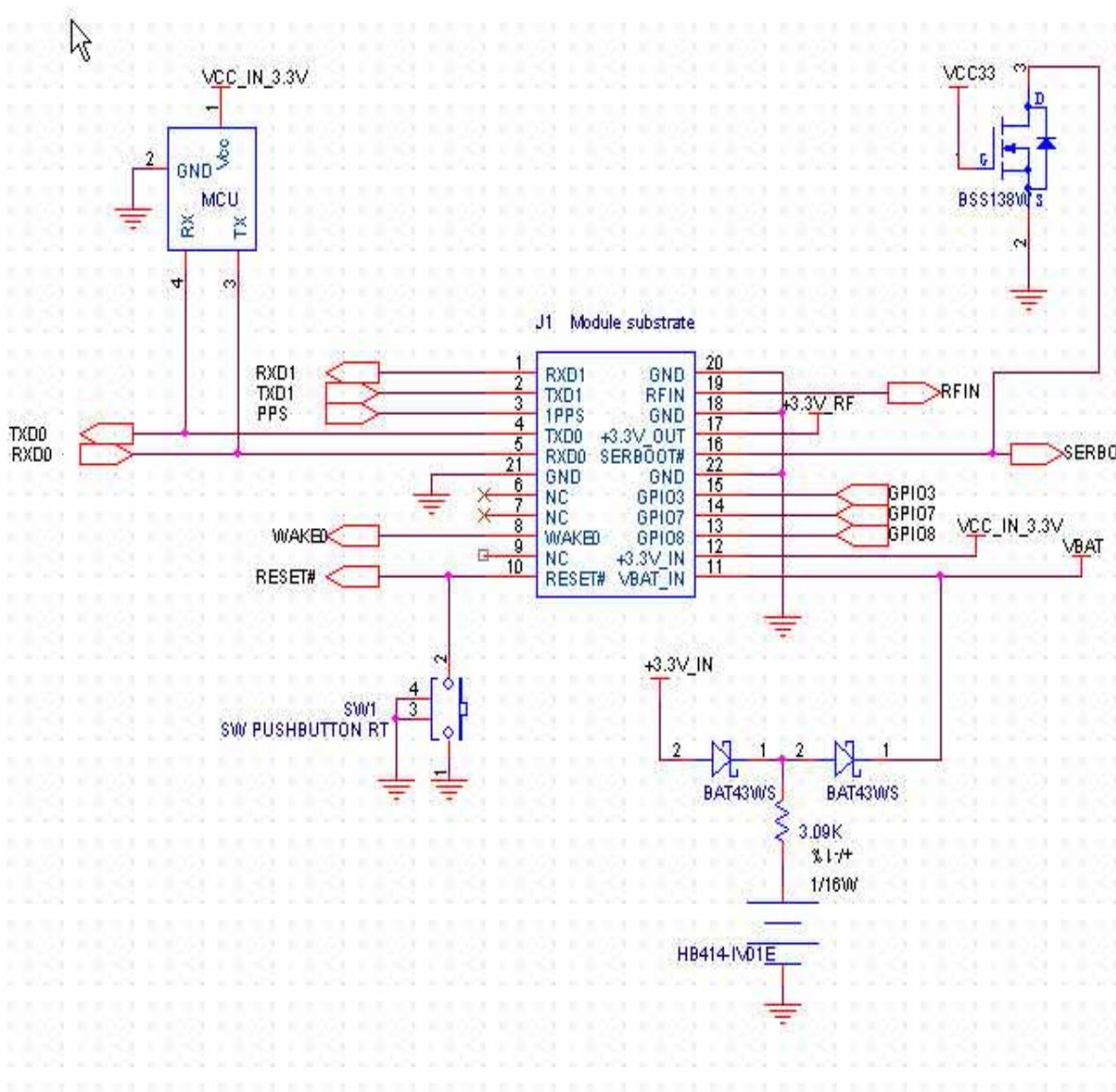
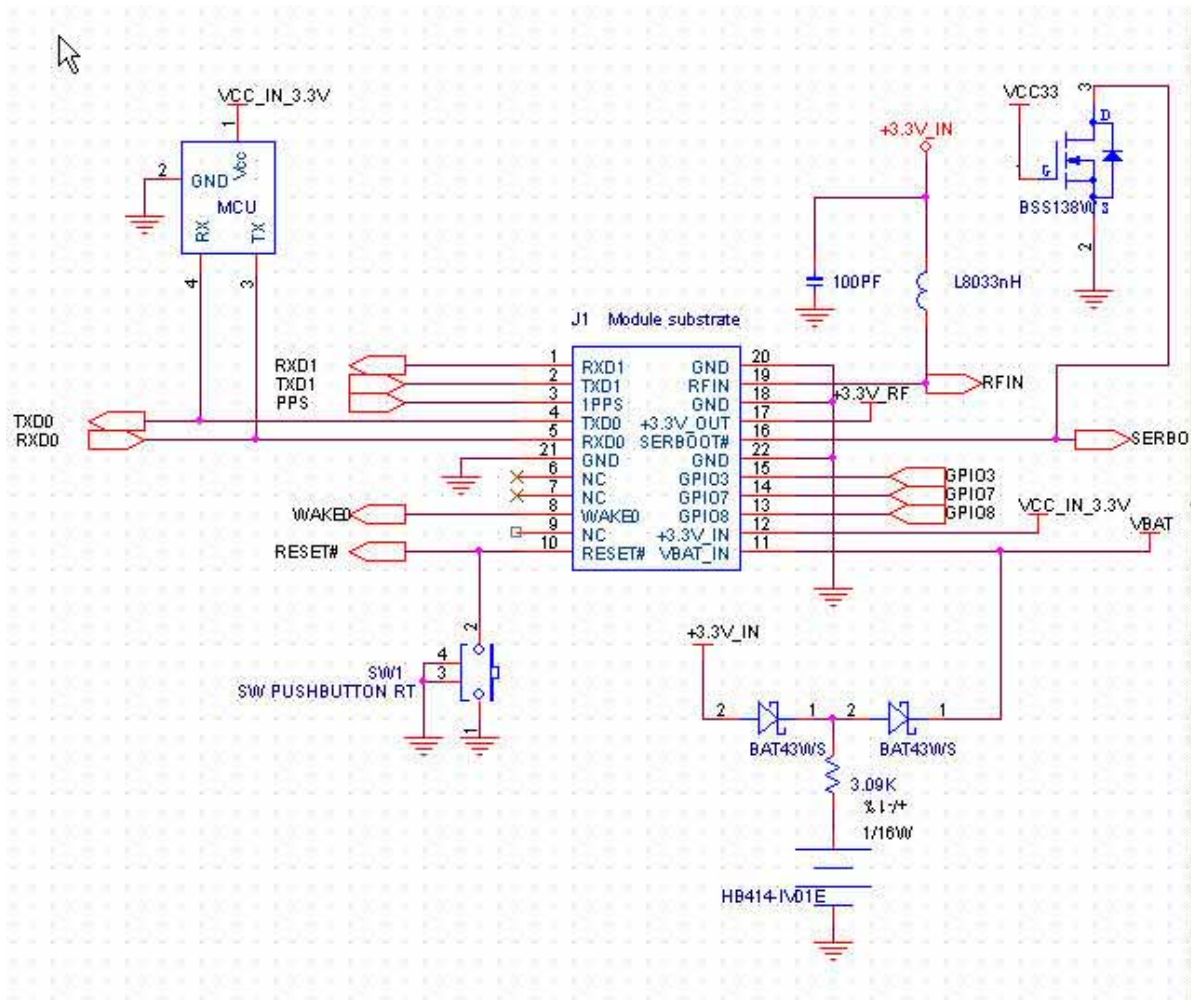


Figure 1 PCB land pattern suggestion (unit: mm)

10. Reference Design

Passive Antenna



Active Antenna**Figure 2 Reference design circuit**