

RB2217

Enhanced ATHEROS GPS Module with
ultra high sensitivity and antenna
open/short detection/protection

Documentation History

Revision	Description	Date	Remark
V0.1	RB2217 release	Aug 2008	
V1.0	Modify application circuit	Oct 2008	

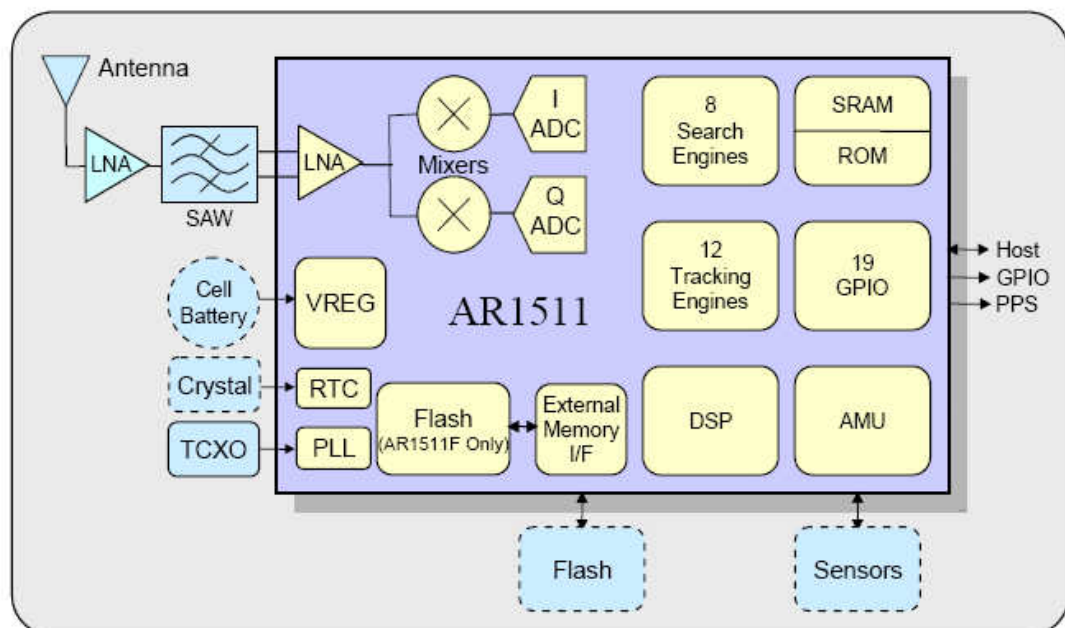
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Features

- ✓ 20 channel Atheros AR1511 positioning engine
- ✓ Ultra high sensitivity to -160 dBm
- ✓ Supports AGPS, WAAS, EGNOS and MSAS
- ✓ Support 2 USART ports
- ✓ Support 5 Hz position update rate capability @ 3D fix
- ✓ Support power saving modes.
- ✓ Support external interrupt pin (wake up) in power saving mode
- ✓ Antenna short/open circuit detection and protection
- ✓ Built-in 29dBm LNA
- ✓ Low power consumption 57mA
- ✓ 14 μ A backup current @ 3V
- ✓ Low position/velocity drift in static mode
- ✓ Small form factor 22.4 x 17.0 mm with SMT pads (micro package)
- ✓ RoHS compliant (lead-free)

Block diagram



RB2217 GPS module

Technical Specifications

1. Electrical Characteristics

1.1 Chipset	AR1511	Atheros GPS chip
1.2 General	Frequency	L1, 1575.42MHz
	Channels, C/A code	16, 1.023 MHz chip rate, 8192 time/frequency search windows
1.3 Accuracy	Position	2.5 meters CEP
	Time	1 usecond rms (1 PPS)
1.5 Acquisition Rate	Cold start	35 sec, typical
	Warm start	33 sec, typical
	Hot start	1.3 sec, typical
1.6 Sensitivity	Tracking	-160dBm
	Navigation	-157dBm
	Cold start	-144dBm
1.7 Dynamic Condition	Altitude	18,000 meters (60,000 Feet) max.
	Velocity	515 meters /sec (1000 Knots) max.
1.8 Power	Main Power	3.3 VDC typical
	Supply current	57 mA
	Backup power	1.5 ~ 3.6V
	Backup current	14µA @ 3V
1.9 Serial Port	Electrical interface	USART,
	Protocols	NMEA, 3GPP, 5 Hz position update rate capability @3D fix

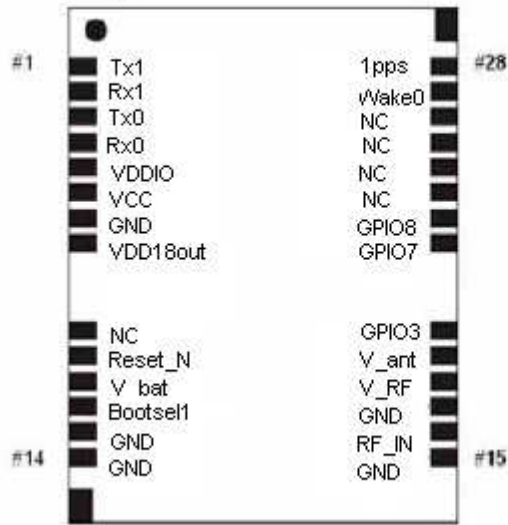
2. Environmental Characteristics

2.1 Temperature	Operating range	- 40 °C to + 85 °C
2.2 Mechanical dimensions	L x W x H	22.4 x 17.0 x 3.0 mm
2.3 Interface	I/O connector	28 pin SMD micro package

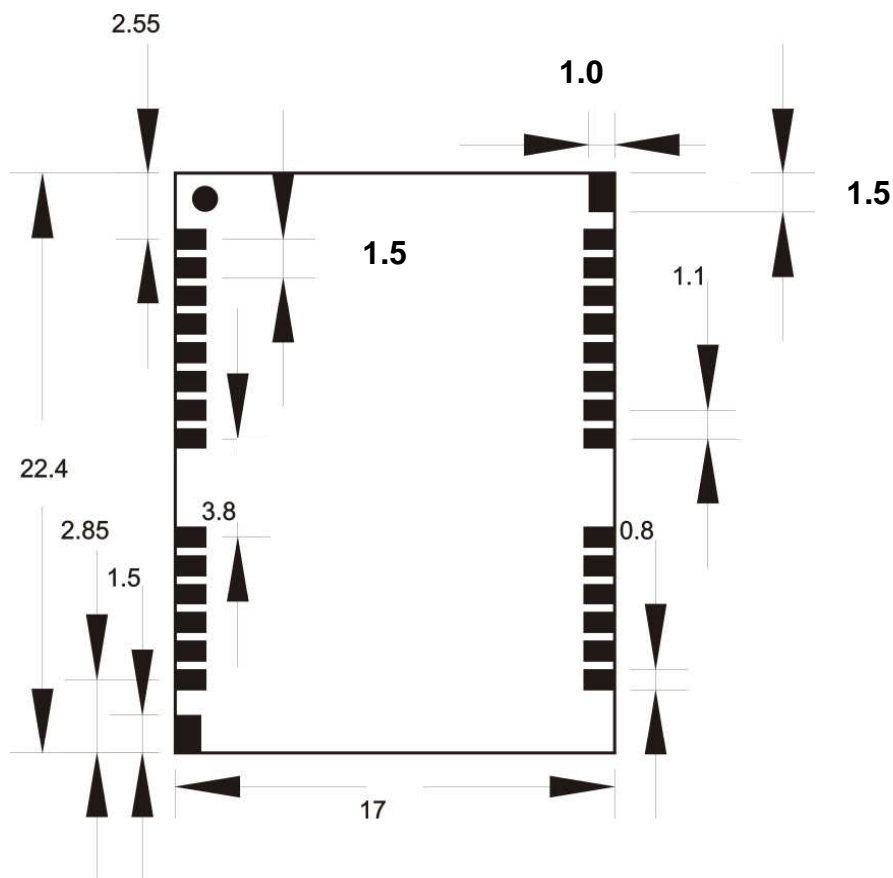
3 Antenna

Parameter	Specification
3.1 Antenna type	Passive and/or active antenna
3.2 Active Antenna	15 ~ 25 dB Gain recommended (50dB max.) 1.5 dB noise figure max.
3.3 Antenna Supply	Using VCC_RF (pin #18) or external voltage source V_ANT (pin#19)
3.4 Antenna Supervisor (see application circuit)	Short circuit detection (built-in) Open circuit detection enabled with external circuit

Pin Assignment



Top View



Unit: mm

Pin Definition

Pin#	Name	Type	Description
1	Tx1	O	UART1 TXD output or GPIO1 input/output
2	Rx1	I	UART1 RXD input or GPIO0 input/output
3	Tx0	O	UART0 TXD output
4	Rx0	I	UART0 RXD input
5	VDDIO	PWR	GPIO Segment IO Power Input
6	Vcc	PWR	Digital Power input
7	GND	GND	Digital GND
8	NC		Not Connected, keep floating
9	VDD18out		Linear regulator output voltage: (Nominally 1.8V).
10	Rest_N		Baseband RESET input. '0' = reset and '1' = normal operation
11	V_BAT	PWR	Linear regulator battery input voltage: 2 - 3.6V.
12	BootSEL1	I	High Boot from Flash, Low Boot from serial port
13	GND	GND	Digital GND
14	GND	GND	Digital GND
15	GND_RF	GND	RF-GND
16	RF_IN	I	GPS single input
17	GND_RF	GND	RF-GND
18	V_RF	PWR	Output Voltage RF section
19	V_ant	PWR	Antenna Bias voltage
20	GPIO3/AADET	I/O	GPIO3, AADET, High antenna open, Low antenna OK
21	GPIO7	I/O	GPIO7
22	GPIO8	I/O	GPIO8
23	NC		Not Connected, keep floating
24	NC		Not Connected, keep floating
25	NC		Not Connected, keep floating
26	NC		Not Connected, keep floating
27	Wake0	I	Wake 0 input, Sleep Timer Output
28	1 pps	O	1pps output

Output NMEA Messages

Table 3 NMEA-0183 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

GGA--Global positioning system fixed data

\$GPGGA,hhmmss.dd,xxmm.dddd,<N/S>,yyymm.dddd,<E/W>,v,ss,d.d,h.h,M,g.g
,M,a.a,xxxx*hh<CR><LF>

hhmmss.dd	UTC time of the fix. hh = hours. mm = minutes. ss = seconds. dd = decimal part of seconds.
xxmm.dddd	Latitude coordinate. xx = degrees. mm = minutes. dddd = decimal part of minutes.
<N/S>	Character denoting either N = North or S = South.
yyymm.dddd	Longitude coordinate. yyy = degrees. mm = minutes. dddd = decimal part of minutes.
<E/W>	Character denoting either E = East or W = West.
v	Fix valid indicator 0 = Fix not valid 1 = Fix is valid
ss	Number of satellites used in position fix, 00-12. Notice: Fixed length field of two letters.
d.d	HDOP – Horizontal Dilution Of Precision.
h.h	Altitude (mean-sea-level, geoid)
M	Letter M.
g.g	Difference between the WGS-84 reference ellipsoid surface and the mean-sea-level altitude.
M	Letter M.
a.a	NULL (not implemented)
xxxx	NULL (not implemented)
*hh	Check sum
<CR><LF>	End

Example :

\$GPGGA,084053.39,6016.3051,N,02458.3735,E,0,00,0.0,46.6,M,18.2,M,,*5D

GSA--Geographic position- latitude/longitude

\$GPGSA,a,b,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,p.p,h.h,v.v*hh<CR><LF>

a	Mode: M = Manual, forced to operate in 2D or 3D mode. A = Automatic, allowed to automatically switch 2D/3D.
b	Mode: 1 = Fix not available, 2 = 2D, 3 = 3D,
xx	ID (PRN) numbers of GPS satellites used in solution
p.p	PDOP
h.h	HDOP
v.v	VDOP
*hh	Check sum
<CR><LF>	End

Example :

\$GPGSA,A,3,06,10,15,16,21,25,30,,,,,2.1,1.2,1.8*38

GSV--GNSS satellites in view

\$GPGSV,n,m,ss,xx,ee,aaa,cn,.....,xx,ee,aaa,cn*hh<CR><LF>

n	Total number of messages, 1 to 9
m	Message number, 1 to 9
ss	Total number of satellites in view
xx	Satellite ID (PRN) number
ee	Satellite elevation, degrees 90 max
aaa	Satellite azimuth, degrees True, 000 to 359
cn	Signal-to-noise ration (C/No) 00-99 dB-Hz. Value of zero means that the satellite is predicted to be on the visible sky but it isn't being tracked.
*hh	Check sum
<CR><LF>	End

Example :

\$GPGSV,4,1,14,03,66,207,50,08,09,322,44,11,01,266,42,14,00,155,00*79

\$GPGSV,4,2,14,15,41,088,48,17,21,083,44,18,57,087,51,21,57,173,50*78

\$GPGSV,4,3,14,22,05,203,00,23,52,074,49,26,17,028,44,27,00,300,00*79

\$GPGSV,4,4,14,28,32,243,00,31,48,286,00*70

RMC--Recommended minimum specific GNSS data

\$GPRMC,hhmmss.dd,S,xxmm.dddd,<N/S>,yyymm.dddd,<E/W>,s.s,h.h,ddmmyy
,d.d,<E/W>,M*hh<CR><LF>

hhmmss.dd	UTC time of the fix. hh = hours. mm = minutes. ss = seconds. dd = decimal part of seconds.
S	Status indicator A = valid V = invalid
xxmm.dddd	Latitude coordinate. xx = degrees. mm = minutes. dddd = decimal part of minutes.
<N/S>	Character denoting either N = North or S = South.
yyymm.dddd d	Longitude coordinate. yyy = degrees. mm = minutes. dddd = decimal part of minutes.
<E/W>	Character denoting either E = East or W = West.
s.s	Speed in knots.
h.h	Heading.
ddmmyy	UTC Date of the fix. dd = day of month mm = month yy = year
d.d	Magnetic variation in degrees, i.e. difference between geometrical and magnetic north direction.
<E/W>	Letter denoting direction of magnetic variation. Either E = East or W = West.
M	Mode indicator A=autonomous N=data not valid
*hh	Check sum
<CR><LF>	End

Example :

\$GPRMC,095035.91,A,6016.3066,N,02458.3832,E,1.08,210.6,131204,6.1,E,A*0
A

GLL--Geographic position-latitude/longitude

\$GPGLL,xxmm.dddd,<N/S>,yyymm.dddd,<E/W>,hhmmss.dd,S,M*hh<CR><LF>

xxmm.dddd	Latitude coordinate. xx = degrees. mm = minutes. dddd = decimal part of minutes.
<N/S>	Character denoting either N = North or S = South.
yyymm.dddd	Longitude coordinate. yyy = degrees. mm = minutes. dddd = decimal part of minutes.
<E/W>	Character denoting either E = East or W = West.
hhmmss.dd	UTC time of the fix. hh = hours. mm = minutes. ss = seconds. dd = decimal part of seconds.
S	Status indicator A = valid V = invalid
M	Mode indicator A=autonomous N=data not valid
*hh	Check sum
<CR><LF>	End

Example :

\$GPGLL,6016.3073,N,02458.3817,E,090110.10,A,A*61

VTG--Course over ground and ground speed

\$GPVTG,h.h,T,m.m,M,s.s,N,s.s,K,M*hh<CR><LF>

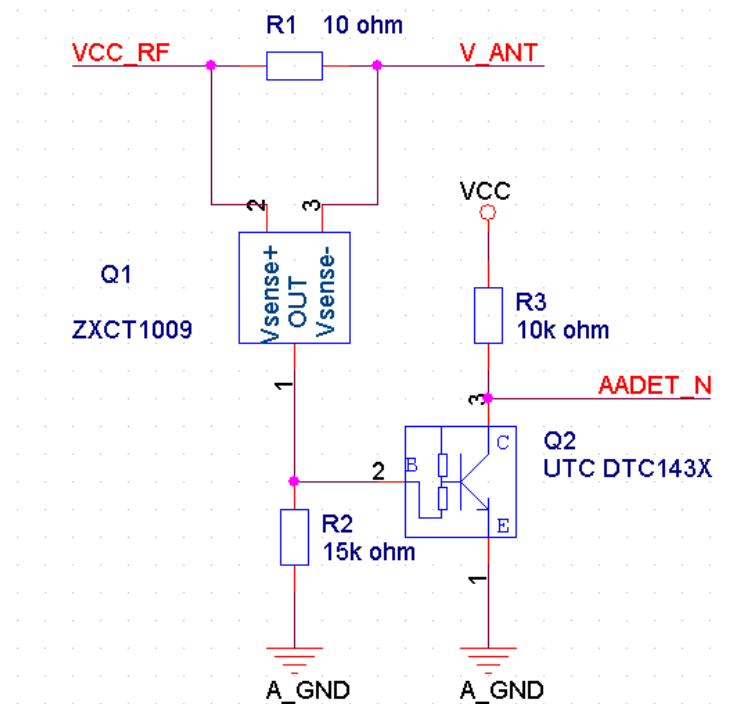
h.h	Heading in degrees.
T	Letter 'T' denoting True heading in degrees.
m.m	Magnetic heading in degrees.
M	Letter 'M' denoting Magnetic heading in degrees.
s.s	Speed in knots.
N	Letter 'N' denoting speed in knots.
s.s	Speed, km/h.
K	Letter 'K' denoting speed in km/h.
M	Mode indicator A=autonomous N=data not valid
*hh	Check sum
<CR><LF>	End

Example :

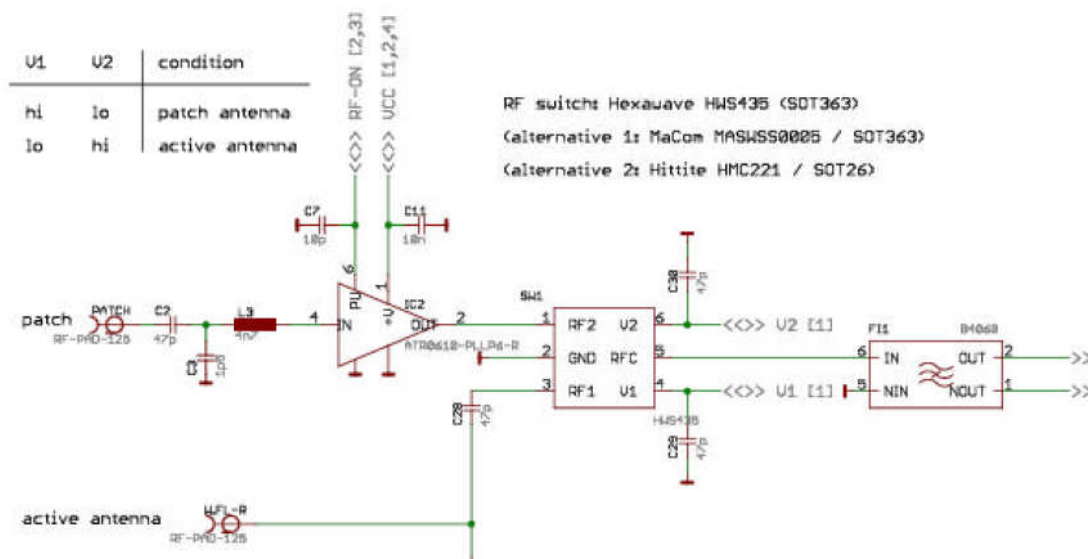
\$GPVTG,202.6,T,208.7,M,0.38,N,0.7,K,A*0D

Application Circuit

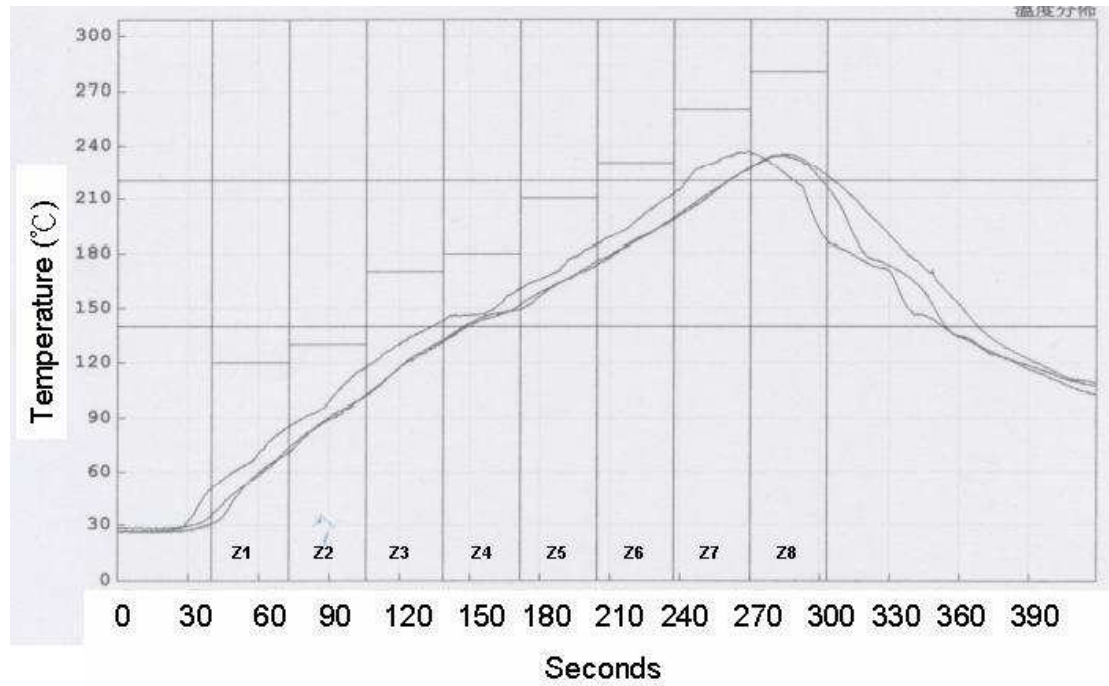
Antenna open/short detection/protection circuit



Active/Passive antenna switch circuit



Reflow Profile



Setpoints (°C)

Zone	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8
Top	120	130	170	180	210	230	260	280
Bottom	120	130	170	180	210	230	260	280

Conveyer Speed (cm/min): 73