GPS Module Series

Model: BG-710FS

Flash version

Technical Manual

BG-710FS

Fast-Acquisition High-Sensitivity 44-Channel SMD GPS Receiver Module

BG-710FS is a miniature 44-channel OEM GPS receiver module. It is optimized for high-performance, ease-of-use, flexibility, and low-cost. The GPS receiver is suitable for a wide range of navigation and tracking applications.

44 parallel channels and 20000+ correlators provide fast satellite signal acquisition and short start-up time. Acquisition sensitivity of -150dBm and tracking sensitivity of -159 dBm offer good performance even under difficult environments.

The **BG-710FS** provides two 3.3V UART serial I/O, two SPI interface, and four I/O pins. Self-contained LNA supports direct connection to passive or active antenna. On-board Flash-based program memory allows firmware upgrade and

Satellite-based augmentation systems, such as WAAS and EGNOS, are supported to yield improved accuracy.

Small size and SMD mounting allow standard SMT assembly process, making it ideal for high volume production.

FEATURES

- 44 channel to acquire and track satellites simultaneously
- SMD type packaging
- Industry-leading TTFF speed
- Signal detection better than -159 dBm
- 0.5 PPM TCXO for quick cold start
- Integral LNA with low power control
- SBAS (WAAS/EGNOS) capable
- Selectable User Profiles with ability to change and save configuration to Flash
- Cold start < 40sec @ -145dBm
- Hot start < 1sec under open sky
- Accuracy 5m CEP
- 25 mm L x 25 mm W x 3.3 mm
- RoHS compliance

Order Information

BG-710FS-A (0.5 PPM TCXO, fast cold start version)
BG-710FS-B (2.5 PPM TCXO, standard version)

DK-710 **BG-710FS Development kit**

- BG-710FS
- USB output adapter board for PC/Notebook
- USB power/signal cable
- GPS active antenna (SMA, 3.3V)
- CD user manual and MightyGPS testing programming

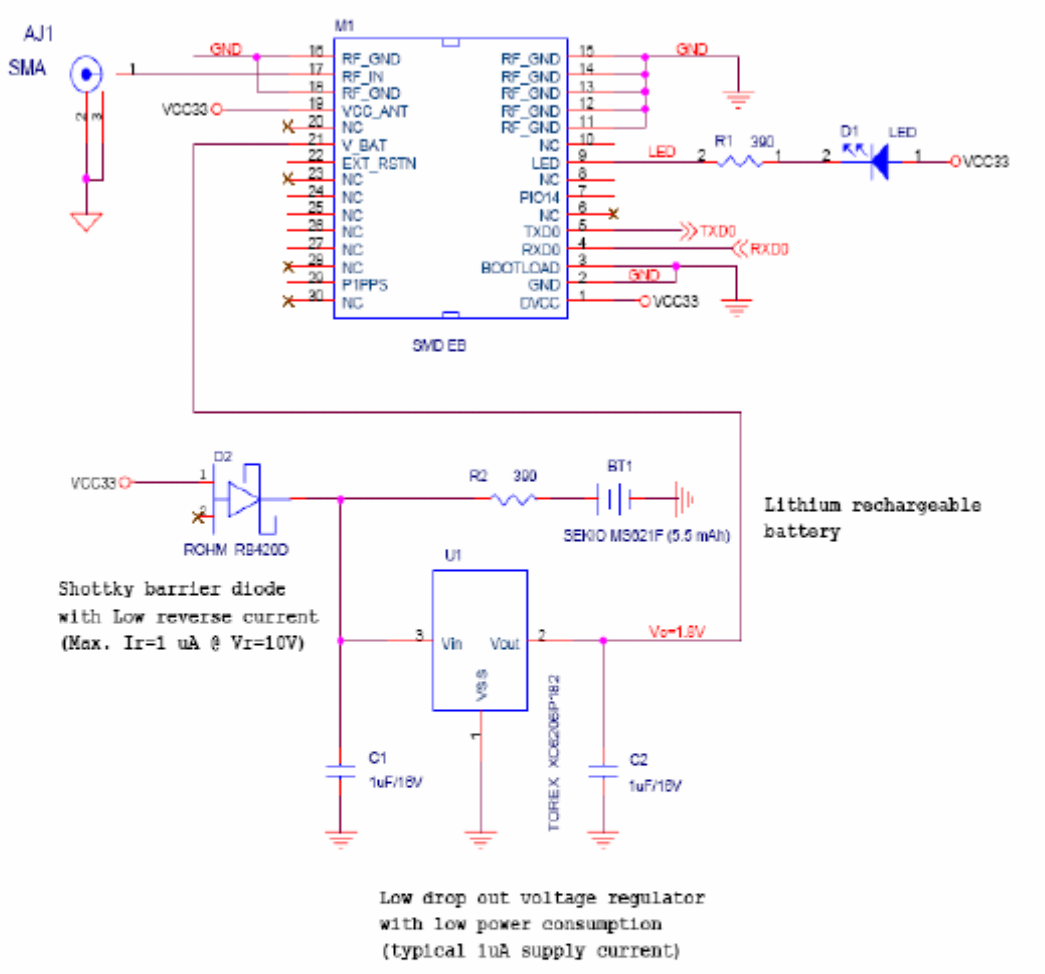
TECHNICAL SPECIFICATIONS

Receiver Type	44 parallel channel, L1 C/A code
Accuracy	Position 5m CEP Velocity 0.1m/sec 1PPS Timing +/-1us
Startup Time	< 1 sec hot start < 10 sec warm start < 35 sec cold start
Signal Reacquisition	1s
Sensitivity	-150dBm acquisition -159dBm tracking
Update Rate	1Hz standard (5Hz special order)
Dynamics	4G (39.2m/sec^2)
Operational Limits	Altitude < 18,000m or velocity < 515m/s (COCOM limit, either may be exceeded but not both)
Serial Interface	LVTTL level
Protocol	NMEA-0183 V3.01 GPGGA, GPGLL, GPGSA, GPGSV, GPRMC, GPVTG, GPZDA 4800 baud, 8, N, 1
Datum	Default WGS-84 User definable
Input Voltage	3.3V DC +/-10%
Current Consumption	< 60mA @ Tracking
Dimension	25 mm L x 25 mm W x 3.3mm H
Weight:	3g
Operating Temperature	-40°C ~ +85°C
Humidity	5% ~ 95%

PINOUT DESCRIPTION

Pin	Nane	Description	Note
1	DVCC	+3.3V DC power input	DC Power Supply
2	GND	System ground	
3	BOOTLOAD	Not used, tie to GND	
4	RXD0	Serial input, 3.3V LVTTL	
5	TXD0	Serial output, 3.3V LVTTL	
6	NC	NC	
7	PIO14	Not used, leave NC	
8	NC	NC	
9	LED	GPS status indicator,	No fix: ON 1sec, OFF 2sec Pos fix: ON 1sec, OFF 1sec
10	NC	NC	
11	RF-GND	RF ground	Ground for RF
12	RF-GND	RF ground	Ground for RF
13	RF-GND	RF ground	Ground for RF
14	RF-GND	RF ground	Ground for RF
15	RF-GND	RF ground	Ground for RF
16	RG-GND	RF ground	Ground for RF
17	RF_IN	RF signal input	
18	RF_GND	RF ground	
19	VCC_ANT	Power to active antenna	Should apply suitable voltage for the active antenna
20	NC	NC	
21	V-BAT	Backup Supply Voltage, 1.8V	The backup supply voltage powers onboard realtime clock and sustains data in the battery-backed SRAM for fast startup time
22	EX_RSTN	External reset input, leave NC	Used when some system prefers to reset the GPS module. Active LOW input reset signal.
23	NC	NC	NC
24	NC	NC	NC
25	NC	NC	NC
26	NC	NC	NC
27	NC	NC	NC
28	NC	NC	NC
29	P1PPS	1PPS Time Mark Output	1 pulse per second
30	NC	NC	NC

Module Application Reference Circuit



NMEA MESSAGES

The serial interface protocol is based on the National Marine Electronics Association's NMEA 0183 ASCII interface specification. This standard is fully define in "NMEA 0183, Version 3.01" The standard may be obtained from NMEA, www.nmea.org

GGA - GPS FIX DATA
Time, position and position-fix related data (number of satellites in use, HDOP, etc.).

Format:
$GPGGA,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,M,<10>,M,<11>,<12>,*<13><CR><LF>

Example:
$GPGGA,104549.04,2447.2038,N,12100.4990,E,1,06,01.7,00078.8,M,0016.3,M,,*5C<CR><LF>

Field	Example	Description
1	104549.04	UTC time in hhmmss.ss format, 000000.00 ~ 235959.99
2	2447.2038	Latitude in ddmm.mmmm format Leading zeros transmitted
3	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
4	12100.4990	Longitude in dddmm.mmmm format Leading zeros transmitted
5	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
6	1	Position fix quality indicator 0: position fix unavailable 1: valid position fix, SPS mode 2: valid position fix, differential GPS mode
7	06	Number of satellites in use, 00 ~ 12
8	01.7	Horizontal dilution of precision, 00.0 ~ 99.9
9	00078.8	Antenna height above/below mean sea level, -9999.9 ~ 17999.9
10	0016.3	Geoidal height, -999.9 ~ 9999.9
11		Age of DGPS data since last valid RTCM transmission in xxx format (seconds) NULL when DGPS not used
12		Differential reference station ID, 0000 ~ 1023 NULL when DGPS not used
13	5C	Checksum

Note: The checksum field starts with a '*' and consists of 2 characters representing a hex number. The checksum is the exclusive OR of all characters between '$' and '*'.

GLL - LATITUDE AND LONGITUDE, WITH TIME OF POSITION FIX AND STATUS

Latitude and longitude of current position, time, and status.

Format:
$GPGLL,<1>,<2>,<3>,<4>,<5>,<6>,<7>*<8><CR><LF>

Example:
$GPGLL,2447.2073,N,12100.5022,E,104548.04,A,A*65<CR><LF>

Field	Example	Description
1	2447.2073	Latitude in ddmm.mmmm format Leading zeros transmitted
2	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
3	12100.5022	Longitude in dddmm.mmmm format Leading zeros transmitted
4	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
5	104548.04	UTC time in hhmmss.ss format, 000000.00 ~ 235959.99
6	A	Status, 'A' = valid position, 'V' = navigation receiver warning
7	A	Mode indicator 'N' = Data invalid 'A' = Autonomous 'D' = Differential 'E' = Estimated
8	65	Checksum

GSA - GPS DOP AND ACTIVE SATELLITES

GPS receiver operating mode, satellites used for navigation, and DOP values.

Format:

$GPGSA,<1>,<2>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<4>,<5>,<6>*<7><CR><LF>

Example:

$GPGSA,A,3,26,21,,,09,17,,,,,,10.8,02.1,10.6*07<CR><LF>

Field	Example	Description
1	A	Mode, 'M' = Manual, 'A' = Automatic
2	3	Fix type, 1 = not available, 2 = 2D fix, 3 = 3D fix
3	26,21,,,09,17,,,,,	PRN number, 01 to 32, of satellite used in solution, up to 12 transmitted
4	10.8	Position dilution of precision, 00.0 to 99.9
5	02.1	Horizontal dilution of precision, 00.0 to 99.9
6	10.6	Vertical dilution of precision, 00.0 to 99.9
7	07	Checksum

GSV - GPS SATELLITE IN VIEW

Number of satellites in view, PRN number, elevation angle, azimuth angle, and C/No. Only up to four satellite details are transmitted per message. Additional satellite in view information is sent in subsequent GSV messages.

Format:
$GPGSV,<1>,<2>,<3>,<4>,<5>,<6>,<7>,...,<4>,<5>,<6>,<7> *<8><CR><LF>

Example:
$GPGSV,2,1,08,26,50,016,40,09,50,173,39,21,43,316,38,17,41,144,42*7C<CR><LF>
$GPGSV,2,2,08,29,38,029,37,10,27,082,32,18,22,309,24,24,09,145,*7B<CR><LF>

Field	Example	Description
1	2	Total number of GSV messages to be transmitted
2	1	Number of current GSV message
3	08	Total number of satellites in view, 00 ~ 12
4	26	Satellite PRN number, GPS: 01 ~ 32, SBAS: 33 ~ 64 (33 = PRN120)
5	50	Satellite elevation number, 00 ~ 90 degrees
6	016	Satellite azimuth angle, 000 ~ 359 degrees
7	40	C/No, 00 ~ 99 dB Null when not tracking
8	7C	Checksum

RMC - RECOMMANDED MINIMUM SPECIFIC GPS/TRANSIT DATA

Time, date, position, course and speed data.

Format:

$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12>*<13><CR><LF>

Example:

$GPRMC,104549.04,A,2447.2038,N,12100.4990,E,016.0,221.0,250304,003.3,W,A*22<CR><LF>

Field	Example	Description
1	104549.04	UTC time in hhmmss.ss format, 000000.00 ~ 235959.99
2	A	Status, 'V' = navigation receiver warning, 'A' = valid position
3	2447.2038	Latitude in dddmm.mmmm format Leading zeros transmitted
4	N	Latitude hemisphere indicator, 'N' = North, 'S' = South
5	12100.4990	Longitude in dddmm.mmmm format Leading zeros transmitted
6	E	Longitude hemisphere indicator, 'E' = East, 'W' = West
7	016.0	Speed over ground, 000.0 ~ 999.9 knots
8	221.0	Course over ground, 000.0 ~ 359.9 degrees
9	250304	UTC date of position fix, ddmmyy format
10	003.3	Magnetic variation, 000.0 ~ 180.0 degrees
11	W	Magnetic variation direction, 'E' = East, 'W' = West
12	A	Mode indicator 'N' = Data invalid 'A' = Autonomous 'D' = Differential 'E' = Estimated
13	22	Checksum

VTG - COURSE OVER GROUND AND GROUND SPEED

Velocity is given as course over ground (COG) and speed over ground (SOG).

Format:
GPVTG,<1>,T,<2>,M,<3>,N,<4>,K,<5>*<6><CR><LF>

Example:
$GPVTG,221.0,T,224.3,M,016.0,N,0029.6,K,A*1F<CR><LF>

Field	Example	Description
1	221.0	True course over ground, 000.0 ~ 359.9 degrees
2	224.3	Magnetic course over ground, 000.0 ~ 359.9 degrees
3	016.0	Speed over ground, 000.0 ~ 999.9 knots
4	0029.6	Speed over ground, 0000.0 ~ 1800.0 kilometers per hour
5	A	Mode indicator 'N' = Data invalid 'A' = Autonomous 'D' = Differential 'E' = Estimated
6	1F	Checksum

ZDA TIME AND DATE

Format:
$GPZDA,<1>,<2>,<3>,<4>,<5>,<6>*<7><CR><LF>

Example:
$GPZDA,104548.04,25,03,2004,,*6C<CR><LF>

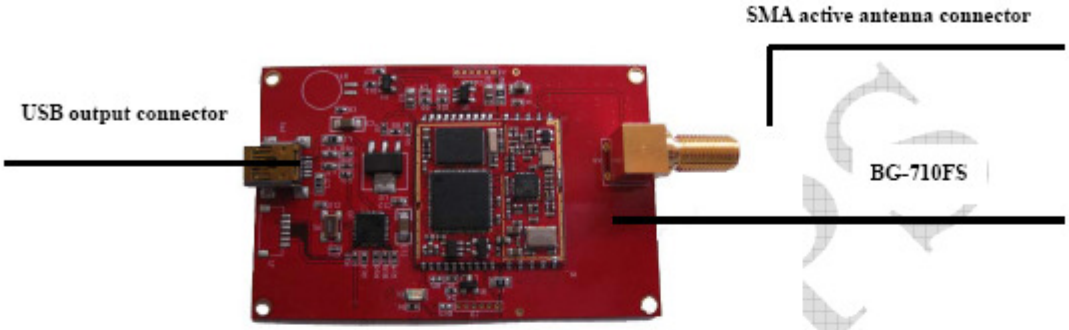
Field	Example	Description
1	104548.04	UTC time in hhmmss.ss format, 000000.00 ~ 235959.99
2	25	UTC time: day (01 ... 31)
3	03	UTC time: month (01 ... 12)
4	2004	UTC time: year (4 digit year)
5		Local zone hour Not being output by the receiver (NULL)
6		Local zone minutes Not being output by the receiver (NULL)
7	6C	Checksum

Binary Messages

See *Binary Message Protocol User's Guide* for detailed descriptions.

Development Kit

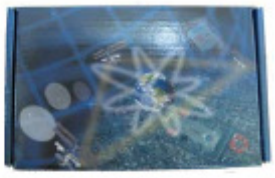
1. Adapter board



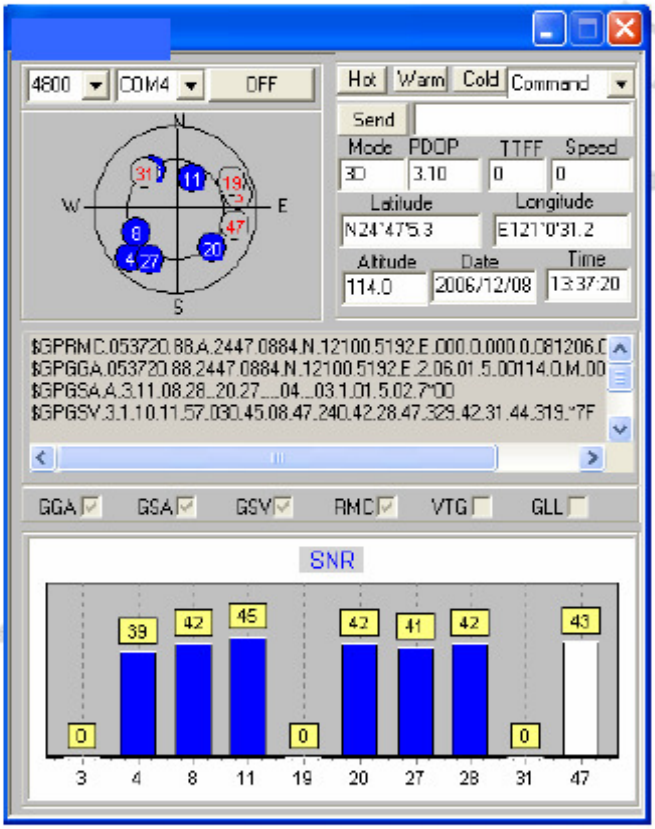
2. USB Output Cable

3. GPS SMA Active Antenna

4. Color Box



MightyGPS Testing Programming



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