

## General Description

The GAM-3525BZ-GKBD module series is a family of stand alone GPS&Beidou receivers featuring the high performance GK9501 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 35.8x25.2x7.6mm package. Their compact architecture and power and memory options make GAM-3525BZ-GKBD modules ideal for battery operated mobile devices with very strict cost and space constraints.

The 66-channel GK9501 positioning engine boasts a Time-To-First-Fix (TTFF) of under 1 second. The dedicated acquisition engine, with over 1 million correlators is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving GAM-3525BZ-GKBD GPS&Beidou receivers excellent navigation performance even in the most challenging environments.

GAM-3525BZ-GKBD modules are not designed for life saving or supporting devices or for aviation and should not be used in products that could in any way negatively impact the security or health of the user or third parties or that could cause damage to goods.

## Applications

- LBS (Location Based Service)
- PND (Portable Navigation Device)
- Vehicle navigation system
- Mobile phone

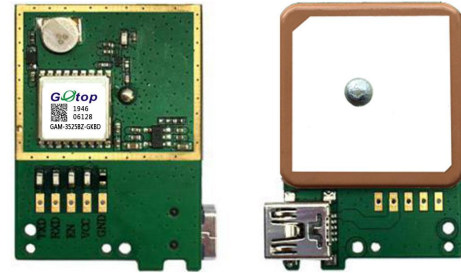


Figure : GAM-3525BZ-GKBD Top View

## Features

- Build on high performance, low-power GK9501 chip set
- Ultra high sensitivity: -165dBm
- Extremely fast TTFF at low signal level
- Built in high gain LNA
- Low power consumption: Max 45mA@3.3V
- NMEA-0183 compliant protocol
- Operating voltage: 3.3V--5.5V
- Operating temperature range: -40to85°C
- Patch Antenna Size: 25x25x4mm
- Module Size: 35.8x25.2x7.6mm
- Communication type: UART/TTL
- RoHS compliant (Lead-free)

# 1 Description

## 1.1. Key Features

Parameter	Specification
Power Supply	<ul style="list-style-type: none"> <li>Supply voltage: 3.3V~5.5V Typical: 3.3V</li> </ul>
Power Consumption	<ul style="list-style-type: none"> <li>Acquisition: 45mA @VCC=VBAT=3.3V</li> <li>Tracking: 40mA @VCC=VBAT=3.3V</li> <li>Backup: 20uA @VBAT=3.3V</li> </ul>
Receiver Type	<ul style="list-style-type: none"> <li>Code 66 search channels ,22 synchronous tracking channels</li> <li>GPS&amp;QZSS L1 1575.42MHz C/A , Beidou B1 1561.098MHz</li> <li>SBAS: WAAS, EGNOS, MSAS, GAGAN</li> </ul>
Sensitivity	<ul style="list-style-type: none"> <li>Tracking: -165dBm</li> <li>Re-acquisition: -156dBm</li> <li>Acquisition: -147dBm</li> </ul>
TTF (Autonomous)	<ul style="list-style-type: none"> <li>Cold start: 35s typ @-130dBm</li> <li>Warm start: 30s typ @-130dBm</li> <li>Hot start: 1s typ @-130dBm</li> </ul>
Horizontal Position Accuracy (Autonomous)	<ul style="list-style-type: none"> <li>&lt;2.5m CEP @-130 dBm</li> </ul>
Update Rate	<ul style="list-style-type: none"> <li>1Hz</li> </ul>
Accuracy of 1PPS Signal	<ul style="list-style-type: none"> <li>not enabled</li> </ul>
Acceleration Accuracy	<ul style="list-style-type: none"> <li>Without aid: 0.1m/s<sup>2</sup></li> </ul>
Dynamic Performance	<ul style="list-style-type: none"> <li>Maximum altitude: 18,000m</li> <li>Maximum velocity: 515m/s</li> <li>Acceleration: 4G</li> </ul>
UART Port	<ul style="list-style-type: none"> <li>UART Port: TXD and RXD</li> <li>Supports baud rate from 4800bps to 115200bps, 9600bps by default</li> <li>UART port for NMEA output, binary or GK proper Agreement input</li> </ul>
Temperature Range	<ul style="list-style-type: none"> <li>Normal operation: -40°C ~ +85°C</li> <li>Storage temperature: -45°C ~ +125°C</li> </ul>
Physical Characteristics	<ul style="list-style-type: none"> <li>Size: 35.8±0.50 ×25.2±0.5 ×7.6±0.5mm</li> <li>Weight: Approx. 12.9g</li> </ul>

### 1.2 Power Supply

Regulated power for the GAM-3525BZ-GKBD is required. The VCC Pin Need a stable DC voltage supply. Power supply ripple must be less than 30mV. The input voltage Vcc should be 3.3V~5.5V, Recommended power supply voltage is 3.3V . maximum current is 45mA. Suitable decoupling must be provided by external decoupling circuitry.

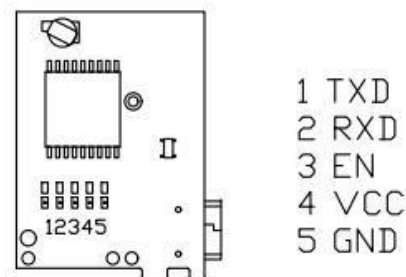
### 1.3 UART Ports

The module supports two full duplex serial channels UART. All serial connections are at 3V CMOS logic levels, if need different voltage levels, use appropriate level shifters. The baud rate of both serial ports are fully programmable, the data format is however fixed: X, N, 8, 1, i.e. X baud rate, no parity, eight data bits and one stop bit, no other data formats are supported, LSB is sent first. The modules default baud rate is set up 9600bps, however, the user can change the default baud rate to any value from 4800 bps to 115kbps. UART port can be used for firmware upgrade, NMEA output and GK proprietary commands input.

## 2 Application

The module is equipped with a 5-pin pad that connects to your application platform. The GAM-3525BZ-GKBD module It consists of a MediaTek MT3337 single chip GPS IC which includes the RF part and Baseband part, a patch antenna, a LNA, a SAW filter, a TCXO, a crystal oscillator, Also comes with a 0.22F crystal capacitor ,can backup satellite ephemeris about 2 hour.

### 2.1. Pin Assignment



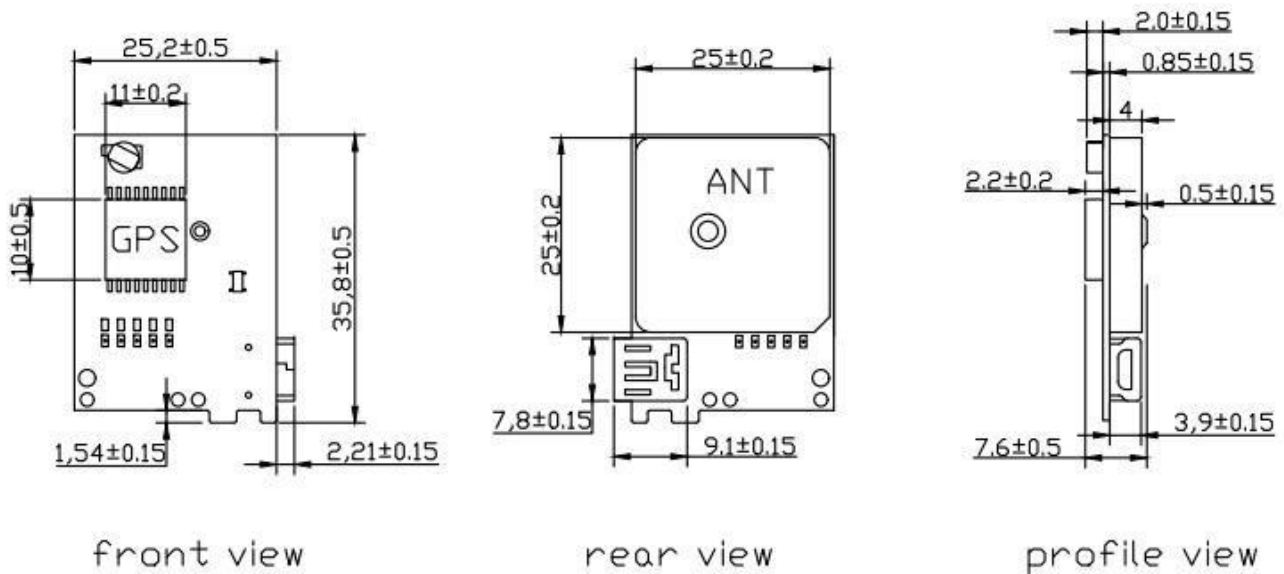
**Figure 2:** Pin Assignment

**CON Pin Description**

Pin No.	Pin name	I/O	Description	Remark
1	TXD	O	UART Serial Data output	
2	RXD	I	UART Serial Data Input	
3	EN	I	Enable pin (high level valid, low level invalid)	
4	VCC	I	Module Power Supply	
5	GND	G	Ground	

**2.2 Mechanical Dimensions**

This chapter describes the mechanical dimensions of the GAM-3525BZ-GKBD module. Size unit (mm)



**Figure 3:** Specification size chart

### 3 Configuration instruction Explain

The module supports the commonly used commands in configuration, The following table describes some of the parameters of the UART port configuration command, The Module power up initialization requires 300ms, Please send the sixteen system from CPU via serial port.

**Table 1: Common instruction**

Common commands	Instructions
<b>Cold star</b>	\$PGKC030,3,1*2E <CR><LF>
<b>Warm start</b>	\$PGKC030,2,1*2F <CR><LF>
<b>Hot start</b>	\$PGKC030,1,1*2C <CR><LF>
<b>Reset</b>	\$PGKC030,3,1*2E <CR><LF>
<b>LOW Power</b>	\$PGKC105,8*3F <CR><LF>
<b>Baud rate is 4800bps</b>	\$PGKC147,4800*D <CR><LF>
<b>Baud rate is 9600bps</b>	\$PGKC147,9600*E <CR><LF>
<b>Baud rate is 19200bps</b>	\$PGKC147,19200*3B <CR><LF>
<b>Baud rate is 38400bps</b>	\$PGKC147,38400*3E <CR><LF>
<b>Baud rate is 57600bps</b>	\$PGKC147,57600*35 <CR><LF>
<b>Baud rate is 115200bps</b>	\$PGKC147,115200*6 <CR><LF>

### 4 NMEA 0183 Protocol

The NMEA protocol is an ASCII-based protocol, Records start with a \$ and with carriage return/line feed. GPS&Beidou specific messages all start with \$GPxxx/\$BDxxx where \$GNxxx is a three-letter identifier of the message data that follows. NMEA messages have a check sum, which allows detection of corrupted data transfers.

- ◇ The GOTOP GAM-3525BZ-GKBD Initialization location mode for GPS&Beidou dual mode,  
Output data: \$GNRMC.\$GNGGA.\$GPGSV.\$BDGSV.\$GPGSA.\$BDGSA.\$GNGLL.\$GNVTG.

**4.1 GGA-Global Positioning System Fixed Data**

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

**Table 2: GGA Data Format**

Name	Example	Units	Description
Message ID	\$xxGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.2457		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 2-1
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoids Separation		meters	
Units	M	meters	
Age of Diff.Corr.		second	Null fields when DGPS is not Used
Diff.Ref.Station ID	0000		
Check sum	*18		
<CR> <LF>			End of message termination

**Table 2-1: Position Fix Indicators**

Value	Description
0	Fix not available or invalid
1	GPS &BDSPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS&BD PPS Mode, fix valid

**4.2 GLL-Geographic Position – Latitude/Longitude**

\$xxGLL , 3723.2475, N,12158.3416, W,161229.487, A\*2C.

**Table 3: GLL Data Format**

Name	Example	Units	Description
Message ID	\$xxGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm

N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Check sum	*2C		
<CR> <LF>			End of message termination

### 4.3 GSA-GNSS DOP and Active Satellites

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

**Table 4: GSA Data Format**

Name	Example	Units	Description
Message	\$xxGSA		GSA protocol header
Mode 1	A		See Table 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	02		Sv on Channel 2
...	...		...
Satellite Used			Sv on Channel 66
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Check sum	*33		
<CR> <LF>			End of message termination

**Table 4-1: Mode 1**

Value	Description
1	Fix not available
2	2D
3	3D

**Table 4-2: Mode 2**

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

#### 4.4 GSV-GNSS Satellites in View

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

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

**Table 15: GGA Data Format**

Name	Example	Units	Description
Message ID	\$xxGSV		GSV protocol header
Number of Message	2		Range 1 to 3
Message Number	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 66)
Elevation	79	degrees	Channel 1(Maximum 90)
Azinmuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99,null when not tracking
...			...
Satellite ID	27		Channel 4(Range 1 to 66)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR(C/NO)	42	dBHz	Range 0 to 99, null when not tracking
Check sum	*71		
<CR> <LF>			End of message termination

Depending on the number of satellites tracked multiple messages of GSV data may be required.

#### 4.5 RMC-Recommended Minimum Specific GNSS Data

\$xxRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13,309.62, 120598,, \*10

**Table 5: RMC Data Format**

Name	Example	Units	Description
Message ID	\$xxRMC		RMC protocol header
UTS Position	161229.487		hhmmss.sss



Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	Knots	
Course Over	309.62	Degrees	True
Ground			
Date	120598		Dummy
Magnetic variation		Degrees	E=east or W=west
Check sum	*10		
<CR> <LF>			End of message termination

#### 4.6 VTG-Course Over Ground and Ground Speed

\$xxVTG, 309.62, T, M, 0.13, N, 0.2, K\*6E

**Table 6: VTG Data Format**

Name	Example	Units	Description
Message ID	\$xxVTG		VTG protocol header
Course	309.62	Degrees	Measured heading
Reference	T		True
Course		Degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	Knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Check sum	*6E		
<CR> <LF>			End of message termination

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