	GOTOP GAM-3020-UB
	Ultra High Sensitivity and Low Power GPS Antenna Module
www.gotop-zzu.com	

General Description

The GAM-3020-UB module series is a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 30 x 20 x 7.0mm package. Their compact architecture and power and memory options make GAM-3020-UB modules ideal for battery operated mobile devices with very strict cost and space constraints.

The 50-channel u-blox 6 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-3020-UB GPS receivers excellent navigation performance even in the most challenging environments.

GAM-3020-UB 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



GAM-3020-UB Top View

Features

- Build on high performance, low-power UBLOX chipset
- Ultra high sensitivity: -160dBm
- Extremely fast TTFF at low signal level
- Built in high gain LNA
- Low power consumption: Max 45mA@5.0V
- NMEA-0183 compliant protocol or custom protocol
- Operating voltage: 3.3V--5.0V
- Operating temperature range: -40 to 85°C
- Patch Antenna Size: 18.4(w)mmX18.4(d)mmX4(h)mm
- Small form factor: 30x20x7.0mm
- RoHS compliant (Lead-free)

Performance Specification

Parameter	Specification	
Receiver Type	L1 frequency band, C/A code, 50-channels SBAS: WAAS, EGNOS, MSAS, GAGAN	
Sensitivity	Tracking	-160dBm
	Acquisition	-160dBm
Accuracy	Position	5m CEP without SA
	Velocity	0.1m/s without SA
	Timing (PPS)	60ns RMS

Acquisition Time	Cold Start	38s
	Warm Start	35s
	Hot Start	1s
	Re-Acquisition	<1s
Power Consumption	Tracking	40mA @5.0V Vcc
	Acquisition	45mA
	Sleep/Standby	TBD
NavigationDataUpdate Rate	1Hz	
Operational Limits	Altitude	Max 18,000m
	Velocity	Max 515m/s
	Acceleration	Less than 4g

Interfaces Configuration

Power Supply: Regulated power for the GAM-3020-UB is required. The input voltage Vcc should be 3.3V \pm 10%, maximum, current is no less than 100mA. Suitable decoupling must be provided by external decoupling circuitry.

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 38.4kbps. UART&USB is used e.g. for booting and NMEA interface.

Backup Battery Power: In case of a power failure on pin Vcc, real-time clock and backup RAM are supplied through pin V_BAT. This enables the GAM-3020-UB GPS Receiver to recover from power failure with either a hot start or a warm start (depending on the duration of Vcc outage). If no Backup Battery is connected, the receiver performs a cold start upon powered up.

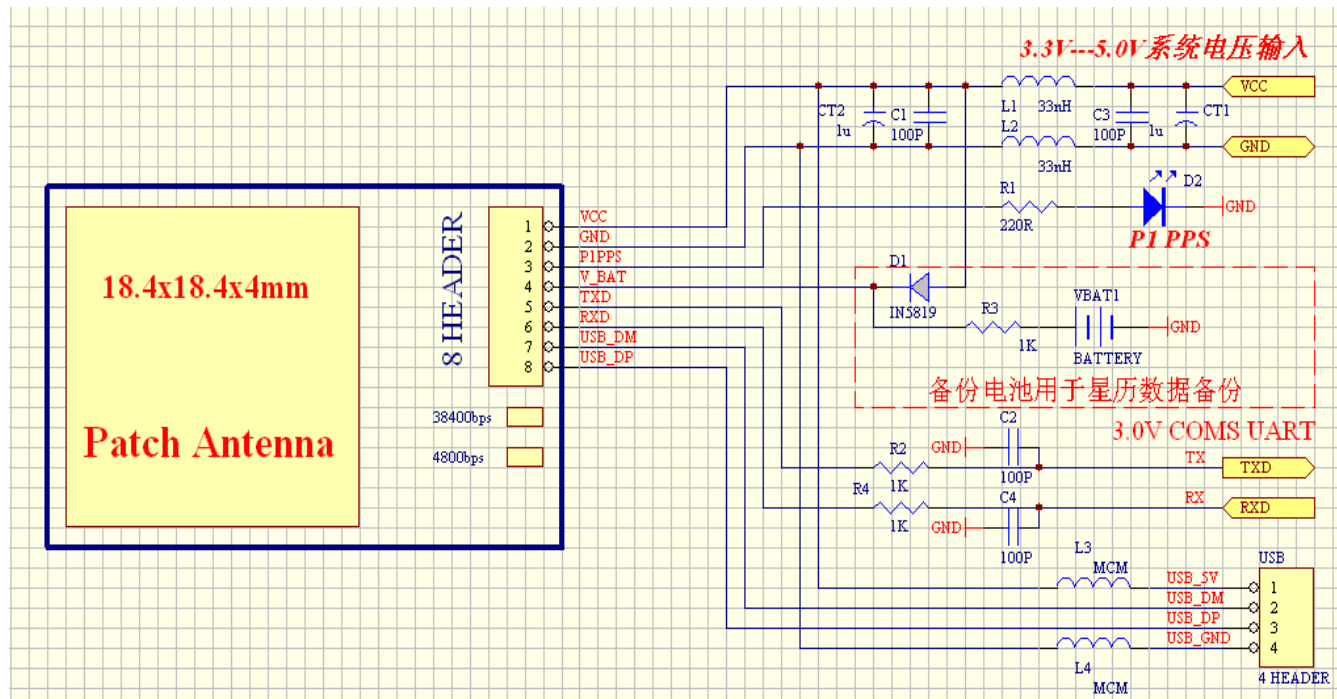
USB:GAM-3020-UBmodules provide a USB version 2.0 FS (Full Speed, 12Mbit/s) interface as an alternative to the UART. The pull-up resistor on USB_DP is integrated to signal a full-speed device to the host.u-blox providesaMicrosoft®certifiedUSBdriver for Windows XP and WindowsVista operating systems. Windows 7 will also be supported following certification

. Operating System	Support level
Windows XP	Certified
Windows Vista	Certified
Windows 7	Certification pending

Pin Description

Pin No.	Pin name	I/O	Description	Remark
1	Vcc	I	Module Power Supply	3.3V--5.0V
2	GND	G	Ground	
3	P1PPS	O	Time pulse (1PPS)	
4	V_BAT	I	Backup voltage supply	
5	TXD	O	UART Serial Data Output Pull up (75KΩ) if not used	

6	RXD	I	UART Serial Data Input Pull up (75KΩ) if not used
7	USB_DM	I/O	USB Data
8	USB_DP	I/O	USB Data



Absolute Maximum Rating

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	Vcc	3.3	5.5	V
Input Pins				
Input Pin Voltage I/O	RX/TX	-0.3	3.0	V

Input Pin Voltage I/O	DM/DP	-0.3	5.0	V
Input Pin Voltage I/O	V_BAT	2.0	5.0	V
Environment				
Storage Temperature	Tstg	-40	125	°C
PeakReflow Soldering Temperature	Tpeak		260	°C
Humidity			95	%

Note: Absolute maximum ratings are stress ratings only, and functional operation at the maxims 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, refer to the operating conditions tables as follow.

Operating Conditions

Parameter	Symbol	Condition	Min	Typ	Max	Units
Power supply voltage	Vcc		3.0	3.3	5.5	V
Power supply voltage ripple	Vcc_PP	Vcc=5.0V			40	mV
Consumption current	Icc	Vcc=5.0V		40	50	mA
Input high voltage	V _{IH}		0.7xVcc		Vcc+1.0	V

Input low voltage	V_{IL}		-0.3		$0.3 \times V_{cc}$	V
Output high voltage	V_{OH}		$0.8 \times V_{cc}$		V_{cc}	V
Output low voltage	V_{OL}		0		$0.2 \times V_{cc}$	V
Operating temperature	T_{opr}		-40		85	°C

NMEA 0183 Protocol

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

The Label Jet GAM-3020-UB supports the following NMEA-0183 messages: GGA, GLL, GSA, GSV, RMC and VTG.

Table 1: NMEA-0183 Output Messages

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
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:

\$GPGGA, 161229.487,3723.24751,N, 12158.34161,W, 1,07,1.0,9.0,M.0000*18

Table 2: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.24571		ddmm.mmmmm
N/S indicator	N		N=north or S=south
Longitude	12158.34161		ddmm.mmmmm
E/W Indicator	W		E=east or W=west
Position Indicator	Fix 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		
Checksum	*18		
<CR> <LF>			End of message termination

Table 2-1: Position Fix Indicators

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

GLL-Geographic Position – Latitude/Longitude

Table 3 contains the values of the following example:

\$GPGLL , 3723.24751, N,12158.34161, W,161229.487, A*2C.

Table 3: GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	3723.24751		Ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		Ddmm.mmmmm
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
Checksum	*2C		
<CR> <LF>			End of message termination

GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

\$GPGSA , 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	\$GPGSA		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 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision

Checksum	*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

GSV-GNSS Satellites in View

Table 5 contains the values of the following example:

\$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.

Table 5: GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of	2		Range 1 to 3

Message			
Message Number	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
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 32)
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
Checksum	*71		
<CR> <LF>			End of message termination

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

RMC-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:

\$GPRMC, 161229.487, A, 3723.24751, N, 12158.34161, W, 0.13,309.62, 120598,, *10

Table 6: RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTS Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.24751		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34161		Ddmm.mmmmm
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
Checksum	*10		
<CR> <LF>			End of message termination

VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

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

Table 7: VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		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
Checksum	*6E		
<CR> <LF>			End of message termination

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