POSITIONING

AMY-6M

u-blox 6 GPS Module

Data Sheet

Abstract

The technical data sheet specifies the AMY-6M ROM-based GPS module featuring the u-blox 6 positioning engine.
The AMY-6M boasts the industry's smallest form factor and is a fully tested standalone solution that requires no additional components and no host integration.
This module provides highly flexible power, design, and serial communication options. The AMY-6M is pin compatible with the AMY-5M.

www.u-blox.com

Document Information	
Title	AMY-6M
Subtitle	u-blox 6 GPS Module
Document type	Data Sheet
Document number	UBX-13004381
Document revision	R07
Document status	Production Information

Document status information	
Objective Specification	This document contains target values. Revised and supplementary data will be published later.
Advance Information	This document contains data based on early testing. Revised and supplementary data will be published later.
Early Production Information	This document contains data from product verification. Revised and supplementary data may be published later.
Production Information	This document contains the final product specification.

This document applies to the following products:

Name	Type number	ROM/FLASH version	PCN reference
AMY-6M	AMY-6M-0-002	ROM7.03	UBX-TN-12032

Contents

1 Functional description

1.1 Overview

The AMY-6M is the world's smallest standalone GPS module dedicated to consumer applications. It has been specifically developed to provide basic GPS functionality required by high-volume, portable products. It is a fully integrated autonomous GPS solution requiring no host integration resulting in fast time-to-market.

The AMY-6M offers four different serial interfaces. The module features an integrated GPS crystal, providing fast acquisition and tracking performance at an economical price. Furthermore, 2-layer PCB integration is supported, which brings additional cost savings.

AMY-6M's miniature size means that it can be integrated into the smallest portable devices. Advanced jamming suppression mechanisms and innovative RF architecture ensures GPS even in hostile signal environments. The AMY-6M is pin compatible with the AMY-5M.

1.2 Product features

Model	Type				Supply		Interfaces				Features						
	GPS	PPP	Timing & Raw Data	Dead Reckoning	1.75 V - 2.0 V	2.7 V - 3.6 V	UART	USB	SPI	DDC (I²C compliant)	Programmable (Flash) FW update	TCXO	RTC crystal	Antenna supply and supervisor	Configuration pins	Timepulse	External interrupt/ Wakeup
AMY-6M	●				●	●	●	●	●	●			o	o	2	1	●

o = Requires external components

Table 1: Features of the AMY-6M

1.3 GPS performance

Parameter	Specification	
Receiver type	50 Channels GPS L1 frequency, C/A Code SBAS: WAAS, EGNOS, MSAS	
Time-To-First-Fix[1]	Cold Start (without Aiding)	27s
	Warm Start (without Aiding)	27s
	Hot Start (without Aiding)	1 s
	Aided Starts[2]	4 s
Sensitivity[3]	Tracking & Navigation	-159 dBm
	Reacquisition	-159 dBm
	Cold Start (without Aiding)	-147 dBm
Maximum Navigation update rate		5 Hz
Horizontal position accuracy[4]	GPS	2.5 m
	SBAS	2.0 m
Configurable Timepulse frequency range		0.1 Hz to 1 kHz
Accuracy of Timepulse signal[4]	RMS	30 ns
	99%	<60 ns
	Granularity	21 ns
Velocity accuracy[5]		0.1m/s
Heading accuracy[5]		0.5 degrees
Dynamics		≤ 4 g
Operational Limits[6]	Altitude	50,000 m
	Velocity	500 m/s

Table 2: AMY-6M GPS performance

[1] All satellites at -130 dBm
[2] Dependent on aiding data connection speed and latency
[3] Demonstrated with a good active antenna
[4] CEP, 50%, 24 hours static, -130 dBm
[5] 50% @ 30 m/s
[6] Assuming Airborne <4g platform

1.4 Block diagram

Figure 1: AMY-6M Hardware Block Schematic

1.5 Assisted GPS (A-GPS)

Supply of aiding information like ephemeris, almanac, rough last position and time and satellite status and an optional time synchronization signal will reduce time to first fix significantly and improve the acquisition sensitivity. The AMY-6M module supports the u-blox AssistNow Online and AssistNow Offline-GPS services[7], and is OMA SUPL ready.

1.6 AssistNow™ Autonomous

AssistNow Autonomous provides functionality similar to Assisted-GPS without the need for a host or external network connection. Based on previously broadcast satellite ephemeris data downloaded to and stored by the GPS receiver, AssistNow Autonomous automatically generates accurate satellite orbital data ("AssistNow Autonomous data") that is usable for future GPS position fixes. AssistNow Autonomous data is reliable for up to 3 days after initial capture.

u-blox' AssistNow Autonomous benefits are:

- Faster position fix
- No connectivity required
- Complementary with AssistNow Online and Offline services
- No integration effort, calculations are done in the background

☞ For more details see the u-blox 6 Receiver Description including Protocol Specification [2].

1.7 GPS Solution for Android

u-blox provides a GPS Android solution enabling customers to easily integrate and evaluate GPS functionality in their Android-based end products. The solution includes A-GPS capabilities for high performance GPS.

u-blox Android GPS Solution is available free of charge. The royalty- free GPS hardware driver library is licensed for reuse in customer products and available upon request. For more information contact u-blox.

1.8 RTC

The RTC crystal is optional as it is only required in stand-alone applications where hot or warm starts are enabled and AssistNow Autonomous applications. In these cases, actual time is maintained in the RTC and Ephemeris

[7] AssistNow Offline requires external memory.

and other last known data is kept in the backup RAM. In A-GPS based systems, the RTC is not required and coarse or fine time information is available from the network or from the host application.

The RTC Crystal is not required if the Host CPU provides the time via a serial interface (UBX-AID-INI message) or a digital 32.768 kHz signal is available.

1.9 Protocols and interfaces

Protocol	Type
NMEA	Input/output, ASCII, 0183, 2.3 (compatible to 3.0)
UBX	Input/output, binary, u-blox proprietary
RTCM	Input, 2.3

Table 3: Available protocols

All listed protocols are available on UART, USB, SPI and DDC. For specification of the various protocols see the *u-blox 6 Receiver Description including Protocol Specification* [2].

1.9.1 UART

The AMY-6M includes a UART interface. The baud rate can be configured at system start-up through configuration pins or settings stored permanently in non-volatile memory.

1.9.2 USB

AMY-6M provides 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. The VDD_USB pin supplies the USB interface, independently from the VDD_IO pin. u-blox provides a Microsoft® certified USB driver for Windows XP, Windows Vista and Windows 7 operating systems.

1.9.3 Serial Peripheral Interface (SPI)

The SPI interface allows for the connection of an external device with a serial interface to permanently store configuration or/and AssistNow offline data , e.g. serial Flash or to interface to a host CPU. The interface can be operated in master or slave mode. In master mode, one chip select signal is available to select external slave. In slave mode a single chip select signal enables communication with the host.

☞ The maximum speed is 100 kbit/s.

1.9.4 Display Data Channel (DDC)

The I²C compatible DDC interface can be used either to access external memory to save configuration data (e.g. EEPROM) or to interface with a host CPU. It is capable of master and slave operation and communicates at a rate of <100kbit/s.

☞ Master Mode is only supported when external EEPROM is used to store configuration. No other nodes are connected to the bus. For additional information consult the *AMY-6M Hardware Integration Manual* [1].

☞ The DDC interface supports a Max speed of 100kbit/s.

1.10 Antenna

The AMY-6M module is designed for use with passive and active[8] antennas.

☞ With AMY-6M an external LNA is required if no active antenna is used.

[8] For information on using active antennas with AMY-6 modules, see the *AMY-6 Hardware Integration Manual* [1].

Parameter	Specification	
Antenna Type		Passive and active antenna
Active Antenna Recommendations	Minimum gain	15 dB (to compensate signal loss in RF cable)
	Maximum gain	50 dB
	Maximum noise figure	1.5 dB

Table 4: Antenna Specification for AMY-6M modules

1.11 Power management

For more information about power management options, see the *u-blox 6 Receiver Description including Protocol Specification* [2] and the *u-blox 6 Power Management Application Note* [3].

1.11.1 Operating modes

AMY-6M modules only operate in Eco mode, this mode optimizes the use of the acquisition engine to deliver lower current consumption.

Power Save Mode is not supported with AMY-6M.

1.11.2 Eco mode

In Eco mode, u-blox 6 receivers use the acquisition engine to search for new satellites only when needed for navigation:

- In cold starts, u-blox 6 searches for enough satellites to navigate and optimizes use of the acquisition engine to download their ephemeris.
- In non-cold starts, u-blox 6 focuses on searching for visible satellites whose orbits are known from the Almanac.

In Eco mode, the u-blox 6 acquisition engine limits use of its searching resources to minimize power consumption.

u-blox 6 deactivates the acquisition engine as soon as a position is fixed and a sufficient number (at least 4) of satellites are being tracked. The tracking engine continues to search and track new satellites without orbit information.

1.11.3 Base-band I/O supply voltage (VDD_IO)

The digital I/Os of the baseband part are supplied with VDD_IO from the host system. The wide range of VDD_IO allows seamless interfacing to standard logic voltage levels independently of the baseband supply voltage level. Without VDD_IO supply the system will be kept in reset state.

1.11.4 External DC/DC converter control

Pin DCDC_EN enables external DC/DC converter.

1.11.5 Dual Power Supply

The AMY-6M provides the following power supply options:

1. A single supply voltage can be used for the complete system.
2. The RF and baseband sections can be separately supplied using different voltages.

Using dual voltages enables significant reductions in power consumption. The highest efficiencies are achieved by supplying the baseband with 1.4V and the RF with 1.8V.

1.12 Configuration

System configuration goes through multiple steps. The priority of the information found at different sources is as follows:

1. Actual configuration in system RAM
2. Configuration in backup RAM
3. Configuration in serial EEPROM, serial Flash (DDC, SPI)
4. Configuration through CFG pins
5. Default (ROM) settings

During system boot, the system first starts from the ROM default settings. Then it tries to find out where the actual configuration can be found, i.e. it searches for EEPROM, backup RAM and looks for valid contents. Thus, a search tree can be built and any configuration setting that is needed by the firmware is searched downwards from the most actual (system RAM) to the most outdated (system ROM) information. The system uses the first valid information it finds.

1.12.1 Configuration Pins

The AMY-6M provides 2 configuration pins (**CFG_xxx**) for boot-time configuration. These become effective immediately after start-up. Once the module has started, the configuration settings may be modified with UBX configuration messages. The modified settings remain effective until power-down or reset. If these settings have been stored in battery-backup RAM, then the modified configuration will be retained, as long as the backup battery supply is not interrupted. In the following tables, all default settings (pin left open) are **bold**.

The first step performed by the system at boot-time is to analyze the SAFEBOOT_N pin. If it is pulled low, the system will start up in safe mode using as few configuration settings as possible and with only the minimum functionality required to establish communication with the host. No GPS operation is started.

TDI / SAFEBOOT_N	
1	**Normal Boot**
0	Safe Mode, minimal ROM boot, Ignore Backup RAM & FLASH.

Table 5: SAFEBOOT Configuration

The protocol and baud rate of the communication interfaces (UART, USB) can be configured using the CFG_COM pins as follows:

PIO20 / CFG_COM1	PIO19 / CFG_COM0	Protocol	Messages	UARTBaud rate	USB power
1	**1**	**NMEA**	**GSV, RMC, GSA, GGA, GLL, VTG, TXT**	**9600**	**BUS Powered**
1	0	NMEA	GSV, RMC, GSA, GGA, GLL, VTG, TXT	38400	Self Powered
0	1	NMEA	GSV[9]RMC, GSA, GGA, VTG, TXT	4800	BUS Powered
0	0	UBX	NAV-SOL, NAV-STATUS, NAV-SVINFO, NAV-CLOCK, INF, MON-EXCEPT[10]	57600	BUS Powered

Table 6: COM Configuration

[9] Every 5th fix.
[10] For more information see the *Firmware 7.03 Release Note* [5].

2 Pin Definition

2.1 Pin assignment

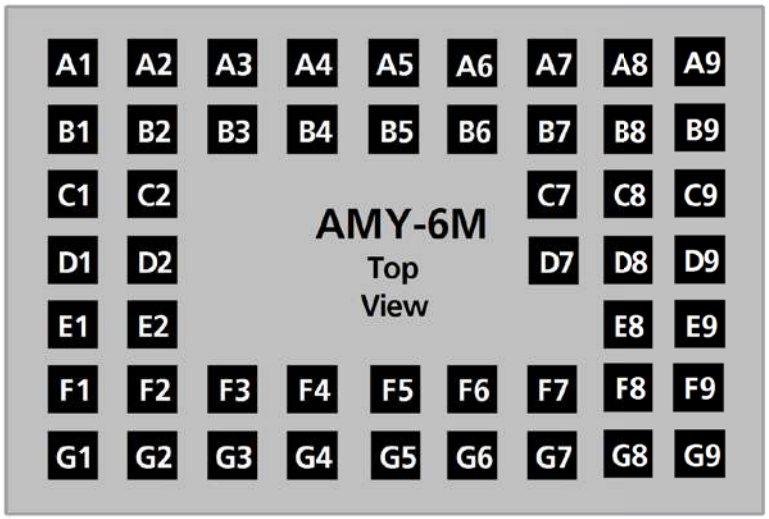


Figure 2: Pin Assignment

No	Name	I/O	Description
A1	RF_IN	I	RF Input
A2	GND	I	Ground
A3	NC		
A4	GND	I	Ground
A5	XTAL_OUT	O	RTC Output
A6	XTAL_IN	I	RTC Input
A7	VDD_LNA	O	LNA Power Supply
A8	VDD_ANA	O	Analog Power
A9	VDD_RF	I	Core Power
B1	GND	I	Ground
B2	GND	I	Ground
B3	Reserved	I/O	Reserved
B4	GND	I	Ground
B5	GND	I	Ground
B6	GND	I	Ground
B7	V_TH	I	Reset Threshold
B8	GND	I	Ground
B9	VDD_USB	I	USB Power
C1	PIO8 / EXTINT1	I	External Interrupt / ANT_DETECT
C2	Reserved	I/O	Reserved
C7	USB_DM	I/O	USB
C8	PIO18	I/O	Alternative function: ANTSHORT_N
C9	PIO21	I/O	Reserved SCK
D1	PIO7 / EXTINT0	I	External Interrupt / Time Mark
D2	Reserved	I/O	Reserved
D7	USB_DP	I/O	USB
D8	V_RESET	I	Supply Monitor
D9	VDD_3V	I	Main RF Supply

No	Name	I/O	Description
E1	Reserved	I	Reserved
E2	Reserved	I	Reserved
E8	PIO23	I/O	Reserved
E9	VDD_B	O	Backup Power
F1	TIMEPULSE	O	
F2	GND	I	Ground
F3	PIO17	I/O	Alternative function: ANTOFF
F4	PIO19 / CFG_COM0 / MOSI	I/O	Configuration
F5	PIO20 / CFG_COM1 / MISO	I/O	Configuration
F6	PIO6 / SS_N	I/O	Reserved SPI
F7	Reserved	I/O	Reserved
F8	GND	I	Ground
F9	V_DCDC	I	Main Core Supply
G1	VDD_IO	I	I/O Ring Supply
G2	TDI / SAFEBOOT_N	I	Boot Mode Selection
G3	PIO3 / SCL2	I/O	DDC for peripherals
G4	PIO2 / SDA2	I/O	DDC for peripherals
G5	PIO5 / TxD1	I/O	Asynchronous Serial
G6	PIO4 / RxD1	I	Asynchronous Serial
G7	V_BCKP	I	Backup voltage supply
G8	VDD_C	O	Core Power
G9	DCDC_EN	O	DC/DC Control Output

Table 7: Pinout

Pins designated Reserved should not be used. For more information about Pinouts see the *AMY-6M Hardware Integration Manual* [1].

3 Electrical specifications

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Where application information is given, it is advisory only and does not form part of the specification.

3.1 Absolute maximum ratings

Symbol	Parameter	Condition	Min.	Max.	Unit
VDD_Cx, VDD_B, VDD_PLL	Supply Voltage digital cores (outputs)		-0.5	1.6	V
VDD_IOx	Supply Voltage I/O ring		-0.5	3.6	V
VDD_USB	Supply Voltage USB		-0.5	3.6	V
VDD_RF	Supply Voltage RF Front-end		-0.5	3.6	V
Ipin	DC Current through any digital I/O pin (except supplies)			10	mA
I_TCXO	DC Current through pin TCXO_POWER			2.5	mA
Vi	Input Voltage on any pin not belonging to digital I/O with respect to ground		-0.5	VDD[11]+0.5	V
Vi_{DIG}[12]	Input Voltage on digital I/O pin with respect to ground		-0.5	3.6	V
V_DCDC	Supply Voltage Baseband main core LDO input		-0.5	3.6	V
V_RUN V_BCKP V_RESET V_TH	Supply Voltage Baseband backup core LDO inputs Supply Voltage Baseband backup core LDO inputs Input Voltage Reset Monitor Input Voltage Reset Threshold level		-0.5	3.6	V
VDD_3V	Input Voltage RF LDO		-0.5	3.6	V
Prfin	RF Input Power on LNA_IN, MIX_IN_P, MIX_IN_N			15	dBm
Ptot	Total Power Dissipation			500	mW
Tjun	Junction Temperature		-40	+105	°C
Ts	Storage Temperature		-40	+125	°C

Table 8: Absolute maximum ratings

GPS receivers are Electrostatic Sensitive Devices (ESD) and require special precautions when handling. For more information see the *AMY-6M Hardware Integration Manual* [1].

Stressing the device beyond the "Absolute Maximum Ratings" may cause permanent damage. These are stress ratings only. The product is not protected against overvoltage or reversed voltages. If necessary, voltage spikes exceeding the power supply voltage specification, given in table above, must be limited to values within the specified boundaries by using appropriate protection diodes.

[11] VDD is the voltage of the power domain connected to the pin.
[12] Includes the following pins: DCDC_EN, SLEEP_N, PIO0..PIO24, TCK, TDI, TDO, TMS, EM_D0..EM_D15, EM_A1..EM_A17, CS2_N, OE_N, WE_N.

3.2 Operating Conditions

The test conditions specified in Table 9 apply to all characteristics defined in this section.

Symbol	Parameter	Min.	Typ.	Max.	Unit
Tamb	Ambient Temperature		+25		°C
VDD_IO	Supply Voltage I/O ring		3.3		V
VDD_USB	Supply Voltage USB		3.3		V
VDD_3V	Supply Voltage RF LDO input		3.3		V
VDD_RF	Supply Voltage RF		1.8		V
Fref	Internal Reference Frequency		26		MHz
V_BCKP	Backup Battery Voltage		3		V

Table 9: Test Conditions

3.2.1 DC Electrical Characteristic (internally generated)

Symbol	Parameter	Min.	Typ.	Max.	Unit
VDD_C VDD_B	Supply Voltage digital cores	1.1	1.2	1.3	V
VDD_ANA	Analog Power		1.7		V
VDD_LNA	LNA Power Supply		1.7		V
VDD_RF	Supply Voltage RF Front-end (internal generation optional)	1.75	1.8	2.0	V

Table 10: Internally Generated LDO Voltages

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_BCKP	Input voltage for VDD_B LDO	Backup mode	1.4		3.6	V
V_DCDC	Input voltage for VDD_C LDO		1.4		3.6	V
VDD_3V	Input voltage for VDD_RF LDO	V_TH open, short VDD_3V +VDD_RF	1.75	1.8	2.0	V
VDD_3V	Input voltage for VDD_RF LDO	V_TH =0V	2.5	3.3	3.6	V
V_RESET_u	Rising Threshold value for V_Reset	V_TH open V_TH = 0V		1.65 2.45		V
V_RESET_l	Falling Threshold value V_Reset	V_TH open V_TH = 0V		1.60 2.35		V
VDD_IO	Supply Voltage I/O ring		1.65	3.3	3.6	V
VDD_USB	Supply Voltage USB		3.0	3.3	3.6	V

Table 11: Externally Supplied Voltages

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Ileak	Leakage current input pins			< 1		nA
Vil	Low level input voltage				0.2*VDD_IO	V
Vih	High level input voltage		0.7* VDD_IO		VDD_IO+0.5	V
Vol	Low level output voltage	Iol=4mA			0.4	V
Voh	High level output voltage	Ioh=4mA	VDD_IO- 0.4V			V
Rpu_iic	Pull-up resistor for PIO0…3			13		kΩ
Rpu	Pull-up resistor			115		kΩ

Table 12: Digital IO Pins

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Ileak	Leakage current input pins				1	uA
Vil	Low level input voltage	VDD_USB >= 3.0 V	0		0.8	V
Vih	High level input voltage	VDD_USB >= 3.0 V	2.0		VDD_USB	V
Vol	Low level output voltage	R_L = 1.425 kΩ to VDD_USB, VDD_USB >= 3.0 V, 22 Ω external series resistor			0.3	V
Voh	High level output voltage	R_L = 14.25 kΩ to GND, VDD_USB >= 3.0, 22 Ω external series resistor	2.8			V
Rpui	Pull-up resistor, Idle State		900	1200	1575	Ω
Rpuo	Pull-up resistor, on State		1425	1925	3090	Ω

Table 13: USB Pins

3.2.2 RF AC Parameters

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Fin	Receiver Input Frequency			1575.42		MHz
NFtot	Receiver Chain Noise Figure	System noise figure		4		dB
RF_IN_S11	LNA Input Return Loss	50 Ohm Environment		-5		dB

Table 14: RF AC Parameters

3.2.3 BB AC parameters

RTC_Fxtal	RTC Crystal Resonant Frequency			32768		Hz
RTC_CL	RTC Load capacitance on Crystal	ESR = 50 kΩ	-20%	10.7	+20%	pF

Table 15: Baseband AC parameters

3.2.4 Power consumption

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_BCKP	V_BCKP Backup current	HW Backup mode VDDIO<=1.23V		22		uA
I_DDIO_RUN	V_DDIO Run current	Normal VDDIO=1.8V, VDCDC=1.8V, VDD_3V=1.8V, all I/O open except PIO23=0, PIO21=0		145		uA
I_RF_ON	VDD_RF ON RF current	Tracking, VDD_RF =1.8V		20		mA

Table 16: Power Consumption

All values in Table 16 are measured at 25°C ambient temperature, VDD_3V, VDCDC=1.8V.

Operation beyond the specified operating conditions is not recommended and extended exposure beyond the operating conditions can affect device reliability.

3.3 Indicative power requirements

Table 17 lists examples of the total system supply current for a possible application.

Parameter	Symbol	Min	Typ	Max	Units	Condition
Max. supply current [13]	Iccp			67	mA	VDCDC = 1.4 3.6 V, VDD_3V=3.0V
Sustained core current[14]	Icc Acquisition		47[15]		mA	VDCDC = 1.4 3.6 V, VDD_3V=3.0V
	Icc Tracking (Eco mode)		37[16]		mA	

Table 17: Indicative power requirements

☞ Values in Table 17 are provided for customer information only as an example of typical power requirements. Values are characterized on samples, actual power requirements can vary depending on FW version used, external circuitry, number of SVs tracked, signal strength, type of start as well as time, duration and conditions of test.

For more information about power requirements, see the *AMY-6M Hardware Integration Manual* [1].

3.4 SPI timing diagrams

In order to avoid a faulty usage of the SPI, the user needs to comply with certain timing conditions. The following signals need to be considered for timing constraints:

Symbol	Description
SS_N	Slave Select signal
SCK	Slave Clock signal

Table 18: Symbol description

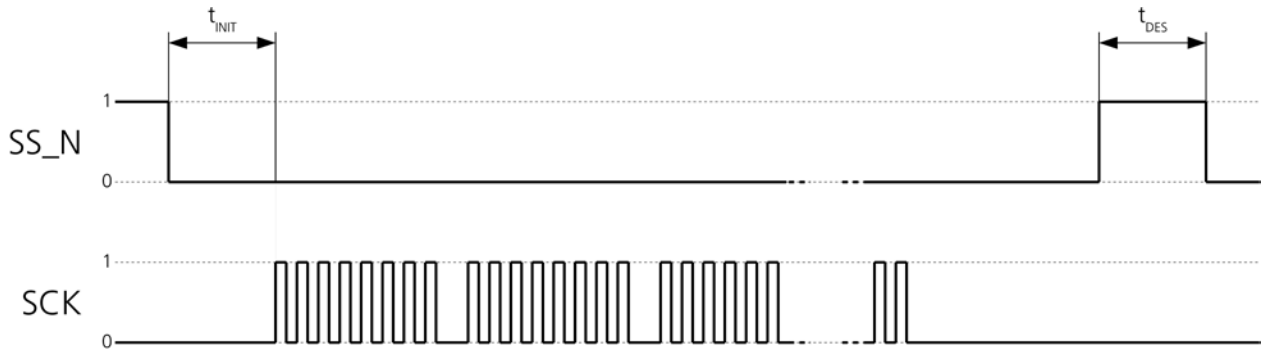


Figure 3: SPI timing diagram

[13] Use this figure to dimension maximum current capability of power supply. Measurement of this parameter with 1 Hz bandwidth.
[14] Use this figure to determine required battery capacity.
[15] >8 SVs in view, CNo >40 dBHz, current average of 30 sec after cold start.
[16] With strong signals, all orbits available. For Cold Starts typical 12 min after First Fix. For Hot Starts typical 15 sec after First Fix.

3.4.1 Timing recommendations

Parameter	Description	Recommendation
t_{INIT}	Initialization Time	500 µs
t_{DES}	Deselect Time	1 ms
Bitrate		100 kbit/s

Table 19: SPI timing recommendations

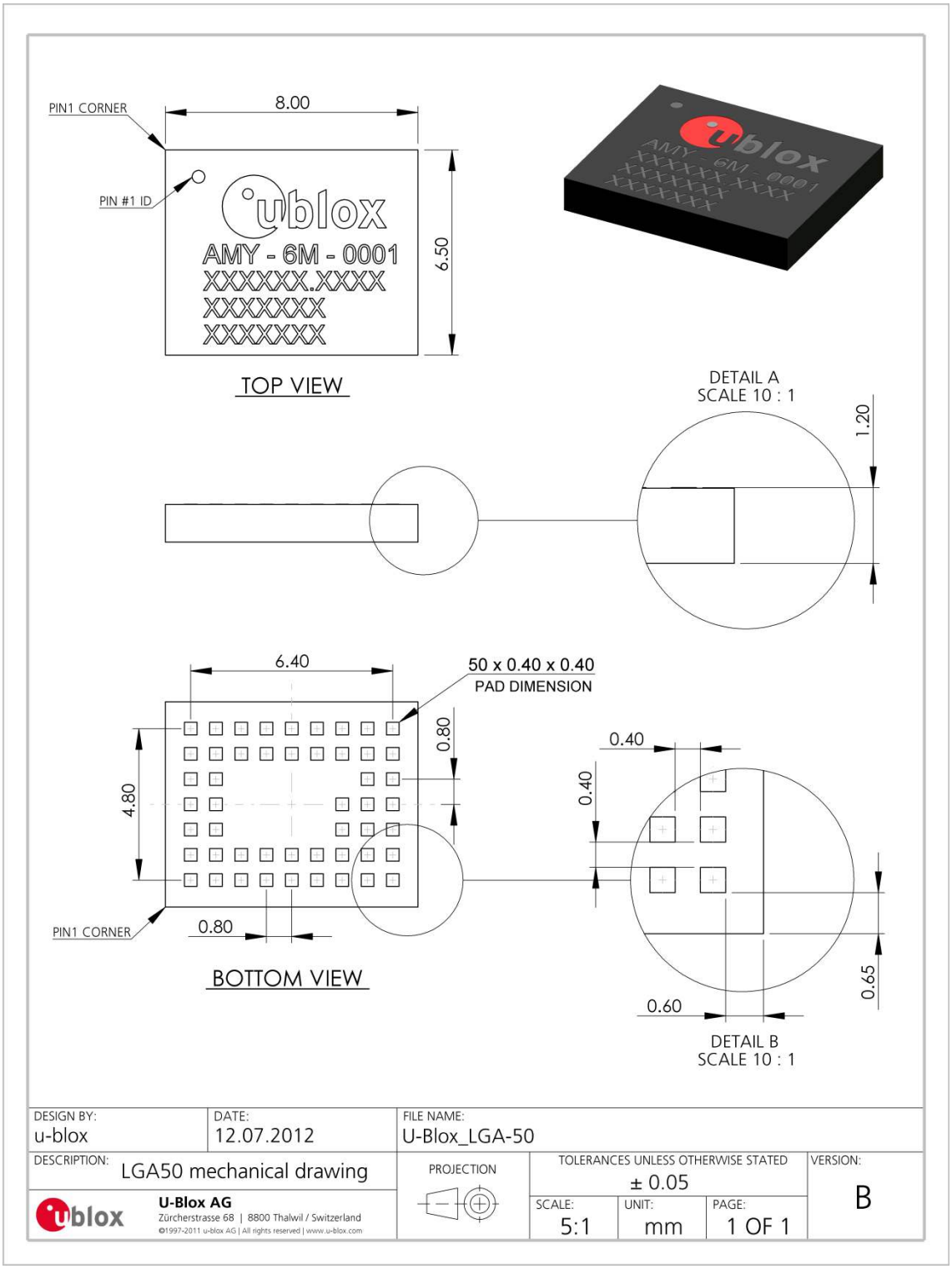
The values in the above table result from the requirement of an error-free transmission. By allowing just a few errors, the byte rate could be increased considerably. These timings – and therefore the byte rate – could also be improved by disabling other interfaces, e.g. the UART.

The maximum speed is 100 kbit/s[17].

[17] This is a theoretical maximum, the protocol overhead is not considered.

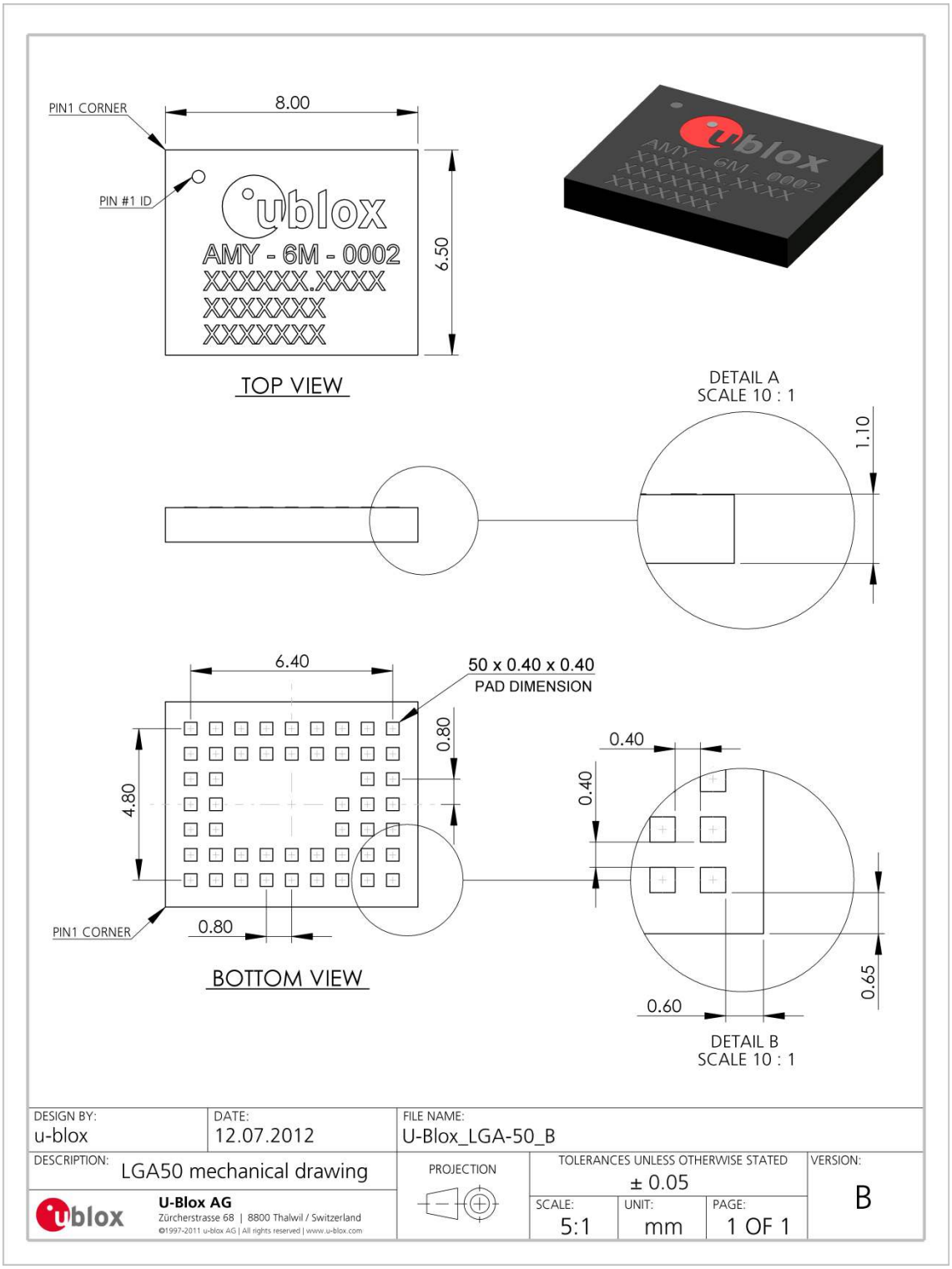
4 Mechanical specifications

4.1 AMY-6M-0-001



For information regarding Paste Mask and Footprint see the *AMY-6M Hardware Integration Manual* [1].

4.1 AMY-6M-0-002



For information regarding Paste Mask and Footprint see the *AMY-6M Hardware Integration Manual* [1].

5 Design-in and migration considerations

For important information for conducting a proper design-in as well as considerations for migration, u-blox strongly recommends consulting the *AMY-6M Hardware Integration Manual* [1].

6 Reliability tests and approvals

6.1 Reliability tests

Qualification tests for AMY-6M conducted according to standards JESD47.

6.2 Approvals

Products marked with this lead-free symbol on the product label comply with Directive 2002/95/EC of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS).

All u-blox 6 GPS modules are RoHS compliant.

7 Product handling

7.1 Packaging

AMY-6M modules are delivered as hermetically sealed, reeled tapes in order to enable efficient production, production lot set-up and tear-down. For more information about packaging, see the *u-blox Package Information Guide* [4].

Figure 4: Reeled AMY-6M modules

7.1.1 Reels

AMY-6M modules are deliverable in quantities of 2000pcs on a reel. AMY-6M modules are delivered using reel Type A as described in the *u-blox Package Information Guide* [4].

Parameter	Specification
Reel Type	A
Delivery Quantity	2000

Table 20: Reel information for AMY-6M modules

☞ Sample quantities are available on request.

7.1.2 Tapes

Figure 5 shows the position and orientation of AMY-6M modules as they are delivered on tape. The orientation of the modules and dimensions of the tapes are specified in Figure 5 and Figure 6.

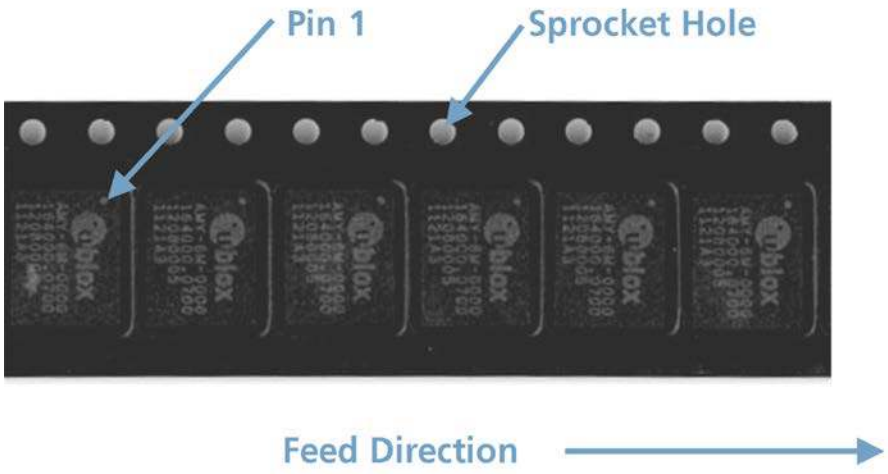


Figure 5: Orientation of AMY-6M modules on tape

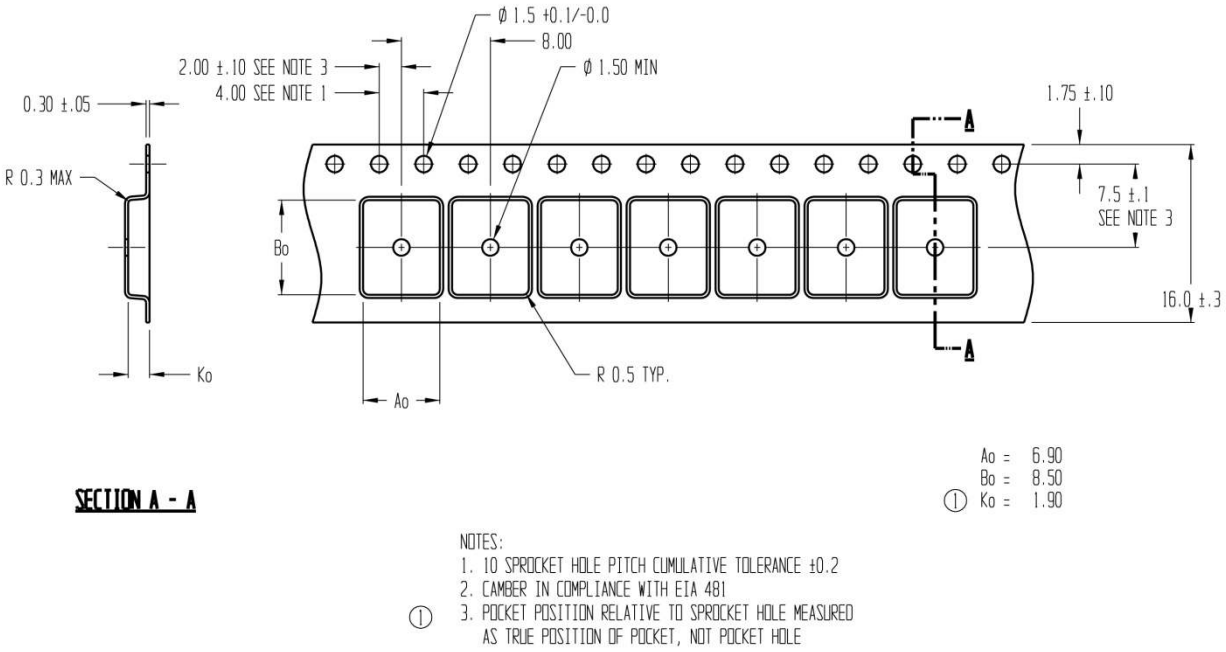


Figure 6: Dimensions for AMY-6M on Tape

7.2 Moisture Sensitivity Levels

AMY-6 modules are Moisture Sensitive Devices (MSD) in accordance to the IPC/JEDEC specification.

AMY-6M modules are rated at MSL level 3. For more information regarding moisture sensitivity levels, labeling, storage and drying see the *u-blox Package Information Guide* [4].

For MSL standard see IPC/JEDEC J-STD-020, which can be downloaded from www.jedec.org.

7.3 Reflow soldering

Reflow profiles are procedures are described in the *AMY-6M Hardware Integration Manual* [1].

7.4 ESD handling precautions

The AMY-6M module is an Electrostatic Sensitive Devices (ESD). Observe precautions for handling! Failure to observe these precautions can result in severe damage to the GPS receiver!

GPS receivers are Electrostatic Sensitive Devices (ESD) and require special precautions when handling. Particular care must be exercised when handling patch antennas, due to the risk of electrostatic charges. In addition to standard ESD safety practices, the following measures should be taken into account whenever handling the receiver:

- Unless there is a galvanic coupling between the local GND (i.e. the work table) and the PCB GND, then the first point of contact when handling the PCB must always be between the local GND and PCB GND.
- Before mounting an antenna patch, connect ground of the device

- When handling the RF pin, do not come into contact with any charged capacitors and be careful when contacting materials that can develop charges (e.g. patch antenna ~10pF, coax cable ~50-80pF/m, soldering iron, …)

- To prevent electrostatic discharge through the RF input, do not touch any exposed antenna area. If there is any risk that such exposed antenna area is touched in non ESD protected work area, implement proper ESD protection measures in the design.

- When soldering RF connectors and patch antennas to the receiver's RF pin, make sure to use an ESD safe soldering iron (tip).

8 Default settings

Interface	Settings
Serial Port 1 Output	9600 Baud, 8 bits, no parity bit, 1 stop bit Configured to transmit both NMEA and UBX protocols, but only following NMEA and no UBX messages have been activated at start-up: **GGA, GLL, GSA, GSV, RMC, VTG, TXT**
USB Output	Configured to transmit both NMEA and UBX protocols, but only following NMEA and no UBX messages have been activated at start-up: **GGA, GLL, GSA, GSV, RMC, VTG, TXT** USB Power Mode: Bus-Powered
Serial Port 1 Input	9600 Baud, 8 bits, no parity bit, 1 stop bit Automatically accepts following protocols without need of explicit configuration: **UBX, NMEA** The GPS receiver supports interleaved UBX and NMEA messages.
USB Input	Automatically accepts following protocols without need of explicit configuration: **UBX, NMEA** The GPS receiver supports interleaved UBX and NMEA messages. USB Power Mode: Bus-Powered
TIMEPULSE (1Hz Nav)	1 pulse per second, synchronized at rising edge, pulse length 100ms
Power Mode	Eco Mode **PIO21 must be set low!**
AssistNow Autonomous	Disabled.

Table 21: Available Protocols.(Default settings in bold)

Refer to the *u-blox 6 Receiver Description including Protocol Specification* [2] for information about further settings.

9 Labeling and ordering information

9.1 Product labeling

The labeling of u-blox 6 GPS modules includes important product information. The location of the product type number is shown in Figure 7.

Figure 7: Location of product type number on AMY-6M packages

9.2 Explanation of codes

3 different product code formats are used. The **Product Name** is used in documentation such as this data sheet and identifies all u-blox 6 products, independent of packaging and quality grade. The **Ordering Code** includes options and quality, while the **Type Number** includes the hardware and firmware versions. Table 22 below details these 3 different formats:

Format	Structure
Product Name	PPP-GV
Ordering Code	PPP-GV-T
Type Number	PPP-GV-TXXX

Table 22: Product Code Formats

The parts of the product code are explained in Table 23.

Code	Meaning	Example
PPP	Product Family	AMY
G	Product Generation	5 = u-blox5,6 = u-blox6
V	Variant	T = Timing, R = DR, etc.
T	Option / Quality Grade	Describes standardized functional element or quality grade such as different RF connector, FLASH size, automotive grade etc.
XXX	Product Detail	Describes product details or options such as hard- and software revision, cable length, etc.

Table 23: part identification code

9.3 Ordering information

Ordering No.	Product
AMY-6M-0	u-blox 6 GPS module, 8x6.5mm, 2000 pcs/reel

Table 24: Product Ordering Codes

☞ Product changes affecting form, fit or function are documented by u-blox. For a list of Product Change Notifications (PCNs) see our website at: www.u-blox.com.

Related documents

[1] AMY-6M Hardware Integration Manual, Docu. No GPS.G6-HW-10037
[2] u-blox 6 Receiver Description including Protocol Specification, Docu. No GPS.G6-SW-10018
[3] u-blox 6 Power Management Application Note, Docu. No GPS.G6-X-10014
[4] u-blox Package Information Guide, Docu. No GPS-X-11004
[5] Firmware 7.03 Release Note, Docu. No GPS.G6-SW-11013

All these documents are available on our homepage (http://www.u-blox.com).

☞ For regular updates to u-blox documentation and to receive product change notifications please register on our homepage.

Revision history

Revision	Date	Name	Status / Comments
-	27/09/2010	cbib	Initial Version
A	31/1/2011	cbib	Update to status Advance Information
A1	17/8/2011	cbib	Change status to Preliminary
B	13/9/2011	cbib	Updated to ROM7.03/ Improved EOS. Revised Sections 1.3, 1.8, 1.10, 2.1, 3.2, 3.4, 4, 5, 7, 9.3 and Revision history
C	11/7/2012	cbib	Added AMY-6M-0-002, replaced Bandwidth with speed, test conditions updated to 25 deg C.
D	10/31/2012	cbib	Removed Preliminary, valid for AMY-6M-0-002 only! Last revision with document number GPS.G6-HW-10052
R07	10/11/2013	ffel	Revised Table 11

Contact

u-blox Offices

North, Central and South America

u-blox America, Inc.

Phone: +1 703 483 3180
E-mail: info_us@u-blox.com

Regional Office West Coast:

Phone: +1 408 573 3640
E-mail: info_us@u-blox.com

Technical Support:

Phone: +1 703 483 3185
E-mail: support_us@u-blox.com

Headquarters
Europe, Middle East, Africa

u-blox AG

Phone: +41 44 722 74 44
E-mail: info@u-blox.com
Support: support @u-blox.com

Asia, Australia, Pacific

u-blox Singapore Pte. Ltd.

Phone: +65 6734 3811
E-mail: info_ap@u-blox.com
Support: support_ap@u-blox.com

Regional Office Australia:

Phone: +61 2 8448 2016
E-mail: info_anz@u-blox.com
Support: support_ap@u-blox.com

Regional Office China (Beijing):

Phone: +86 10 68 133 545
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shenzhen):

Phone: +86 755 8627 1083
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office India:

Phone: +91 959 1302 450
E-mail: info_in@u-blox.com
Support: support_in@u-blox.com

Regional Office Japan:

Phone: +81 3 5775 3850
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Korea:

Phone: +82 2 542 0861
E-mail: info_kr@u-blox.com
Support: support_kr@u-blox.com

Regional Office Taiwan:

Phone: +886 2 2657 1090
E-mail: info_tw@u-blox.com
Support: support_tw@u-blox.com