

# NEO-5

## u-blox 5 GPS Modules

### Data Sheet

#### Abstract

Technical data sheet describing the cost effective, high-performance u-blox 5 based NEO-5 series of GPS modules.

Features include AssistNow Online and AssistNow Offline A-GPS services, KickStart accelerated acquisition, SuperSense<sup>®</sup> Indoor GPS providing best-in-class acquisition and tracking sensitivity, small size and an innovative jamming-resistant RF architecture.

The miniature 12.2 x 16.0 mm form factor of the highly successful NEO-4S module is maintained, enabling easy migration. NEO-5 modules support passive and active antennas.

The 1.8V NEO-5D and NEO-5G modules provide the exceptional performance of u-blox 5 positioning while enabling power savings in the order of 40%.



16.0 x 12.2mm

**Document Information**

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**This document applies to the following products:**

<b>Name</b>	<b>Type number</b>	<b>ROM/FLASH version</b>	<b>PCN reference</b>
NEO-5Q	NEO-5Q-0-002	ROM5.00	N/A
NEO-5M	NEO-5M-0-001	ROM5.00	N/A
NEO-5G	NEO-5G-0-000	ROM5.00	N/A
NEO-5D	NEO-5D-0-001	ROM5.00	N/A

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# 1 Functional description

## 1.1 Overview

The NEO-5 module series is a family of stand-alone GPS receivers featuring the high performance u-blox 5 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4mm package. Their compact architecture and power and memory options make NEO-5 modules ideal for battery operated mobile devices with very strict cost and space constraints.

The 50-channel u-blox 5 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 NEO-5 GPS receivers excellent navigation performance even in the most challenging environments.

NEO-5 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.

## 1.2 Product features

Series	Power Voltage range [V]	Size Thickness [mm]	Memory Programmable (Flash) FW update	Function					Antenna		Input / Output					
				Power save mode	KickStart	Dead Reckoning	Raw data	Precision Timing	Antenna supply	Antenna supervisor	UART	USB	SPI	DDC (I <sup>2</sup> C compliant)	Reset input	Configuration pin
NEO-5M	2.7 - 3.6	2.4		P								1	1		1	1
NEO-5Q	2.7 - 3.6	2.4		P	•							1	1	P	1	3
NEO-5D	1.8	2.4		P								1	1		1	1
NEO-5G	1.8	2.4		P	•							1	1	P	1	3

P= Planned

**Table 1: Features of the NEO-5 Series**

## 1.3 GPS performance

Parameter	Specification		
Receiver type	50 Channels GPS L1 frequency, C/A Code GALILEO Open Service L1 frequency		
Time-To-First-Fix <sup>1</sup>		NEO-5G, NEO-5Q	NEO-5D, NEO-5M
	Cold Start (Autonomous)	29 s	32s
	Warm Start (Autonomous)	29 s	32s
	Hot Start (Autonomous)	<1 s	<1s
	Aided Starts <sup>2</sup>	<1 s	<3s
Sensitivity <sup>3</sup>		NEO-5G, NEO-5Q	NEO-5D, NEO-5M
	Tracking & Navigation	-160 dBm	-160 dBm
	Reacquisition	-160 dBm	-160 dBm
	Cold Start (Autonomous)	-144 dBm	-143 dBm
Horizontal position accuracy <sup>4</sup>	Autonomous	< 2.5 m	
	SBAS	< 2.0 m	
Accuracy of Timepulse signal	RMS	30 ns	
	99% Time Pulse	<60 ns Configurable f = 0.25 ... 999 Hz (Tp = 1/f - 1ms)	
Max navigation update rate		<4Hz	
Velocity accuracy <sup>5</sup>		0.1m/s	
Heading accuracy <sup>6</sup>		0.5 degrees	
Dynamics		≤ 4 g	
Operational limits <sup>7</sup>	Altitude	50000 m	
	Velocity	500 m/s	

**Table 2: NEO-5 GPS performance**

<sup>1</sup> All satellites at -130 dBm

<sup>2</sup> Dependent on aiding data connection speed and latency

<sup>3</sup> Demonstrated with a good active antenna

<sup>4</sup> CEP, 50%, 24 hours static, -130dBm, SEP: <3.5m

<sup>5</sup> 50% @ 30 m/s

<sup>6</sup> 50% @ 30 m/s

<sup>7</sup> Assuming Airborne <4g platform

## 1.4 Block diagram

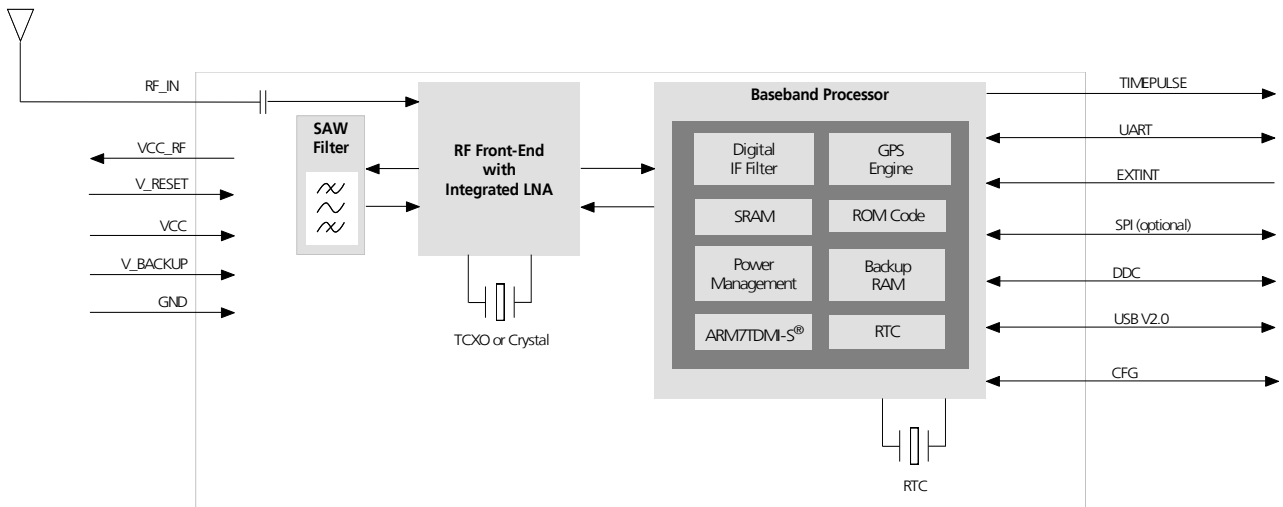


Figure 1: Block diagram (for available options refer to the product features table in section 1.2)

## 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. All NEO-5 modules support the u-blox AssistNow Online and AssistNow Offline A-GPS services<sup>8</sup> and are OMA SUPL compliant.

## 1.6 SuperSense Indoor GPS

All NEO-5 modules come with SuperSense, providing ultra-fast acquisition/reacquisition and exceptional tracking sensitivity. SuperSense enables best-in-class tracking and navigation in difficult signal environments such as urban canyons or indoor locations.

## 1.7 KickStart / Oscillators

An available feature is KickStart. This functionality uses a TCXO to accelerate weak signal acquisition, enabling faster start and reacquisition times. KickStart is available with the NEO-5G and NEO-5Q.

## 1.8 Protocols and interfaces

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

Table 3: Available protocols

Both protocols are available on UART, USB, DDC and SPI. For specification of the various protocols see the u-blox 5 Receiver Description including Protocol Specification [2].

<sup>8</sup> Requires external memory.

NEO-5 modules support a number of peripheral interfaces for serial communication. The embedded firmware uses these interfaces according to their respective protocol specifications. For specific applications, the firmware also supports the connection of peripheral devices, such as external memories, to some of the interfaces.

### 1.8.1 UART

NEO-5 modules include one configurable UART interface for serial communication (for information about configuration see section 1.11).

### 1.8.2 USB

NEO-5 modules 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. 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 and Windows Vista operating systems. Windows 7 will also be supported following certification.

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

**Table 4: Operating systems supported by USB driver**

### 1.8.3 Serial Peripheral Interface (SPI)

An SPI interface is planned for future versions of NEO-5G and NEO-5Q modules.

The SPI interface allows for the connection of external devices with a serial interface, e.g. EEPROM or A/D converters, 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 slaves. In slave mode a single chip select signal enables communication with the host.

### 1.8.4 Display Data Channel (DDC)

The I<sup>2</sup>C compatible DDC interface can be used either to access external devices with a serial interface (e.g. EEPROM or A/D converters) or to interface with a host CPU. It is capable of master and slave operation and communicates at a rate of <100kbit/s.



## 1.9 Antenna

NEO-5 modules are designed for use with passive and active<sup>9</sup> antennas.

Parameter	Specification	
Antenna Type	Passive and active antenna	
Active Antenna Recommendations	Minimum gain	15 - 20 dB (to compensate signal loss in RF cable)
	Maximum noise figure	1.5 dB
	Maximum gain	50 dB

**Table 5: Antenna Specifications for all NEO-5 modules**

## 1.10 Power management



For more information about power management strategies, see the u-blox 5 Receiver Description including Protocol Specification [2].

### 1.10.1 Operating modes

NEO-5 modules have 2 continuous operating modes (Maximum Performance and Eco). Maximum Performance mode freely uses the acquisition engine, resulting in the best possible TTFF, while Eco mode optimizes the use of the acquisition engine to deliver lower current consumption. At medium to strong signals, there is almost no difference for acquisition and tracking performance in these modes.

### 1.10.2 Maximum Performance mode

In Maximum Performance mode, u-blox 5 receivers use the acquisition engine at full performance to search for all possible satellites until the Almanac is completely downloaded.

As a consequence, tracking current consumption level will be achieved when:

- A valid GPS position is fixed
- Almanac is entirely downloaded
- Ephemeris for all satellites in view are valid

### 1.10.3 Eco mode

In Eco mode, u-blox 5 receivers use the acquisition engine to search for new satellites **only when needed** for navigation:

- In cold starts, u-blox 5 searches for enough satellites to navigate and optimizes use of the acquisition engine to download their ephemeris.
- In non-cold starts, u-blox 5 focuses on searching for visible satellites whose orbits are known from the Almanac.

In Eco mode, the u-blox 5 acquisition engine limits use of its searching resources to minimize power consumption. As a consequence the time to find some satellites at weakest signal level might be slightly increased in comparison to the Max. performance mode.

<sup>9</sup> For information on using active antennas with NEO-5 modules, see the NEO-5 Hardware Integration Manual [1].

u-blox 5 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 Configuration

### 1.11.1 Boot-time configuration

NEO-5 modules provide configuration pins 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.

All NEO-5 modules include a **CFG\_COM0** pin, which can be configured as seen in Table 6. Default settings in bold.

CFG_COM0	Protocol	Messages	UARTBaud rate	USB Power
<b>1</b>	<b>NMEA</b>	<b>GSV, RMC, GSA, GGA, GLL, VTG, TXT</b>	<b>9600</b>	<b>BUS Powered<sup>10</sup></b>
0	NMEA	GSV, RMC, GSA, GGA, GLL, VTG, TXT	38400	Self Powered

**Table 6: Supported CFG\_COM0 settings**

NEO-5G and NEO-5Q include both **CFG\_COM0** and **CFG\_COM1** pins and can be configured as seen in Table 7. Default settings in bold.

CFG_COM1	CFG_COM0	Protocol	Messages	UARTBaud rate	USB power
<b>1</b>	<b>1</b>	<b>NMEA</b>	<b>GSV, RMC, GSA, GGA, GLL, VTG, TXT</b>	<b>9600</b>	<b>BUS Powered</b>
1	0	NMEA	GSV, RMC, GSA, GGA, GLL, VTG, TXT	38400	Self Powered
0	1	NMEA	GSV <sup>10</sup> , RMC, GSA, GGA, VTG, TXT	4800	BUS Powered
0	0	UBX	NAV-SOL, NAV-STATUS, NAV-SVININFO, NAV-CLOCK, INF, MON-EXCEPT	57600	BUS Powered

**Table 7: Supported COM settings (NEO-5G, NEO-5Q)**

The NEO-5G and NEO-5Q include a **CFG\_GPS0** pin, which enables the boot-time configuration of the power mode. These settings are described in Table 8. Default settings in bold.

CFG_GPS0	Power Mode
0	Eco Mode
<b>1</b>	<b>Maximum Performance Mode</b>

**Table 8: Supported CFG\_GPS0 settings (NEO-5G, NEO-5Q)**



Static activation of the **CFG\_COM** and **CFG\_GPS** pins is not compatible with use of the SPI interface.

## 1.12 External serial EEPROM

NEO-5 modules allow an optional external serial EEPROM to be connected to the DDC interface.



This feature is only supported by modules with ROM 5.0 and above.

<sup>10</sup> Bus powered mode supported with FW 5.00 and above.

## 2 Mechanical specifications

Parameter	Specification	
A	16.0 +0.6/-0.1mm	[628.8 +24/-4mil]
B	12.2 ±0.1mm	[479.5 ±4mil]
C	2.4 ±0.2mm	[94.3 ±8mil]
D	1.0 +0.3/-0.1mm	[39.3 +18/-4mil]
E	1.1 ±0.1mm	[43.2 ±4mil]
F	3.0 ±0.1mm	[117.9 ±4mil]
G	1.1 ±0.1mm	[43.2 ±4mil]
Weight	1.6 g	

Table 9: Dimensions

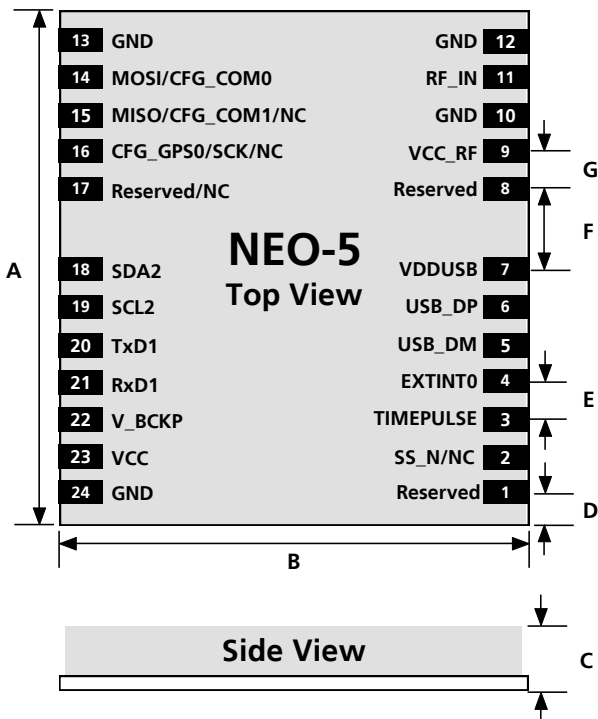


Figure 2: Dimensions (see Table 10 for specification)



For information regarding the Paste Mask and Footprint see the LEA-5, NEO-5, TIM-5H Hardware Integration Manual [1].

## 2.1 Pin assignment

No	Module	Name	I/O	Description
1	All	Reserved	I	
2	NEO-5Q/NEO-5G	SS_N	I	SPI Slave Select (Planned)
	NEO-5M/NEO-5D	NC	I	Not Connected
3	All	TIMEPULSE	O	Time pulse (1PPS)
4	All	EXTINTO	I	External Interrupt Pin
5	All	USB_DM	I/O	USB Data
6	All	USB_DP	I/O	USB Data
7	All	VDDUSB	I	USB Supply
8	All	Reserved		See Hardware Integration Manual Pin 8 and 9 must be connected together.
9	All	VCC_RF	O	Output Voltage RF section Pin 8 and 9 must be connected together.
10	All	GND	I	Ground
11	All	RF_IN	I	GPS signal input
12	All	GND	I	Ground
13	All	GND	I	Ground
14	NEO-5Q/NEO-5G	MOSI/CFG_COM0	O/I	SPI MOSI / Configuration Pin (Planned)
	NEO-5M/NEO-5D	CFG_COM0	I	Configuration Pin
15	NEO-5Q/NEO-5G	MISO/CFG_COM1	I	SPI MISO (Planned) / Configuration Pin. Leave open if not used.
	NEO-5M/NEO-5D	NC	I	Not Connected
16	NEO-5Q/NEO-5G	CFG_GPS0 SCK	I/O	Power Mode Configuration Pin SPI Clock(Planned)
	NEO-5M/NEO-5D	NC	I/O	Not Connected
17	NEO-5Q/NEO-5G	Reserved	O	
	NEO-5M/NEO-5D	NC	O	Not Connected
18	All	SDA2	I/O	DDC Data
19	All	SCL2	I/O	DDC Clock
20	All	TxD1	O	Serial Port 1
21	All	RxD1	I	Serial Port 1
22	All	V_BCKP	I	Backup voltage supply
23	All	VCC	I	Supply voltage
24	All	GND	I	Ground

**Table 10: Pinout**



Pins designated Reserved should only be used with caution. For more information about Pinouts see the LEA-5, NEO-5, TIM-5H Hardware Integration Manual [1].

## 3 Electrical specifications

### 3.1 Absolute maximum ratings

Parameter	Symbol	Condition	Min	Max	Units
Power supply voltage (VCC)	Vcc	NEO-5Q, NEO-5M	-0.5	3.6	V
		NEO-5D, NEO-5G	-0.5	2.0	V
Backup battery voltage (V_BCKP)	Vbckp	All	-0.5	3.6	V
USB supply voltage (VDDUSB)	Vddusb	All		3.8	V
Input pin voltage	Vin	All	-0.5	3.6	V
	Vin_usb	All	-0.5	Vddusb +0.5	V
VCC_RF output current	Iccrf	All		100	mA
Input power at RF_IN	Prfin	All	source impedance = 50 Ω, continuous wave	-5	dBm
Storage temperature	Tstg	All	-40	85	°C
Maximum ESD Stress Level Applied; according to human body model (100pF; 1.5kΩ).	V <sub>ESD(HBM)</sub>	All	RF pins	1500	V
			All other pins	2000	
Maximum ESD Stress Level Applied; according to machine model; (200pF; 0.75mH).	V <sub>ESD(MM)</sub>	All	RF pins	150	V
			All other pins	200	

**Table 11: Absolute maximum ratings**



**GPS receivers are Electrostatic Sensitive Devices (ESD) and require special precautions when handling. For more information see the *LEA-5, NEO-5, TIM-5H 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.**

## 3.2 Operating conditions



All specifications are at an ambient temperature of 25°C.

Parameter	Symbol	Module	Min	Typ	Max	Units	Condition
Power supply voltage (VCC)	Vcc	NEO-5Q, NEO-5M	2.7	3.0	3.6	V	
		NEO-5D, NEO-5G	1.75	1.8	2.0	V	
Peak supply current <sup>11</sup>	Iccp	All			150	mA	$V_{cc} = 3.6V^{12} / 2.0V^{13}$
Sustained supply current <sup>14</sup>	Icc Acquisition (Max Performance Mode)	All		74 <sup>15</sup>		mA	
	Icc Tracking (Max Performance Mode)	All		45 <sup>16</sup>		mA	$V_{cc} = 3.0V^{12} / 1.8V^{13}$
	Icc Acquisition (Eco Mode)	All		61 <sup>15</sup>		mA	
	Icc Tracking (Eco Mode)	All		43 <sup>16</sup>		mA	
Backup battery voltage	Vbckp		1.4		3.6	V	
Backup battery current	Ibckp			25		μA	Vbckp = 1.8V
Input pin voltage range	Vin				Vcc +0.5	V	
Input pin low voltage	Vin_low_1				0.2x Vcc	V	
Input pin high voltage	Vin_high_1		0.7x Vcc			V	
Input pin low voltage for EXTINT0 and RxD1	Vin_low_2				0.22	V	
Input pin high voltage for EXTINT0 and RxD1	Vin_high_2		0.91			V	
Output pin low voltage	Vout_low				0.4	V	Iout = 4 mA
Output pin high voltage	Vout_high	All	Vcc - 0.4			V	Iout = -4 mA
VDDUSB (Pin 24) for USB operation	Vddusb1	All	3.0 <sup>17</sup>		3.6	V	
USB_DM, USB_DP	VinU	All	Compatible with USB with 27 Ohms series resistance				
Antenna gain	Gant	All			50	dB	
Receiver Chain Noise Figure	NFtot			2.5		dB	
VCC_RF voltage	Vccrf	All		Vcc-0.1		V	
VCC_RF output current	Iccrf	All			50	mA	
Operating temperature	Topr	All	-40		85	°C	

**Table 12: Operating conditions**



Operation beyond the specified operating conditions can affect device reliability.

<sup>11</sup> Use this figure to dimension maximum current capability of power supply.

<sup>12</sup> NEO-5Q, NEO-5M

<sup>13</sup> NEO-5D, NEO-5G

<sup>14</sup> Use this figure to determine required battery capacity.

<sup>15</sup> ROM 5.00, >8 SVs in view, CNo >40 dBHz, current average of 30 sec after cold start.

<sup>16</sup> ROM 5.00, with strong signals, all orbits available. For Cold Starts typical 12 min after First Fix. For Hot Starts typical 15 sec after First Fix.

<sup>17</sup> If USB not used connect to GND

## 4 Design-in

In order to obtain the necessary information to conduct a proper design-in, u-blox strongly recommends consulting the LEA-5, NEO-5, TIM-5H Hardware Integration Manual [1].

## 5 Reliability tests and approvals

### 5.1 Reliability tests

Tests for product family qualifications according to ISO 16750.

### 5.2 Approvals



Products marked with this lead-free symbol on the product label comply with the "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 5 GPS modules are RoHS compliant.

## 6 Product handling

### 6.1 Packaging

NEO-5 modules are delivered as hermetically sealed, reeled tapes in order to enable efficient production, production lot set-up and tear-down.



Figure 3: Reeled u-blox 5 modules

#### 6.1.1 Reels

NEO-5 GPS modules are deliverable in quantities of 250pcs on a reel. The dimensions of the reel are shown in Figure 4.

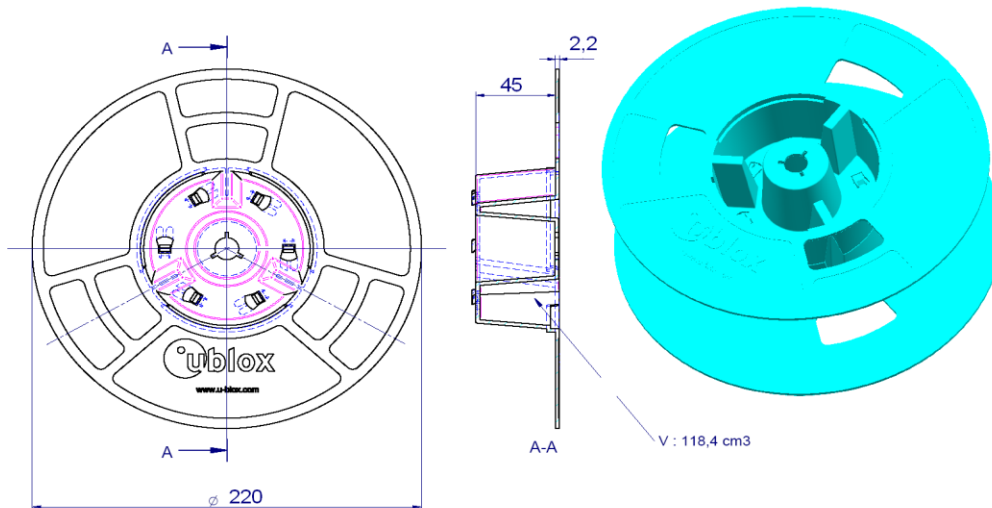


Figure 4: Dimension of reel for 250 pieces (dimensions unless otherwise specified in mm)



## 6.1.2 Tapes

The dimensions and orientations of the tapes for NEO-5 modules are specified in Figure 5.

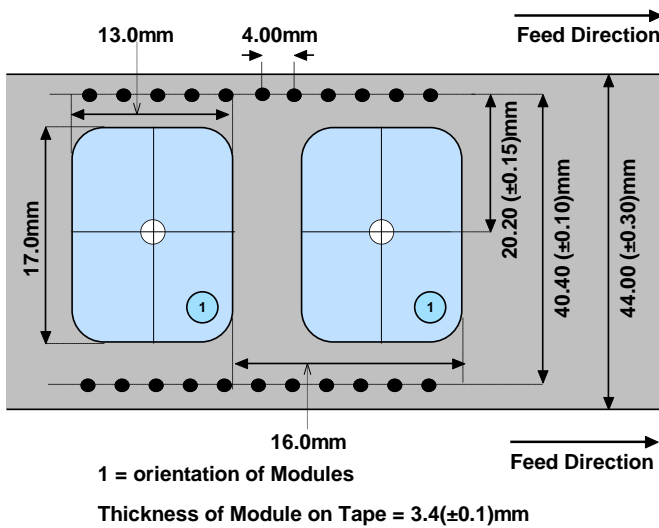


Figure 5: Dimensions and orientation for NEO-5 modules on tape

## 6.2 Shipment, storage and handling

NEO-5 modules are designed and packaged to be processed in an automatic assembly line, and are shipped in Tape-and-Reel.



**NEO-5 modules are Moisture Sensitive Devices (MSD) in accordance to the IPC/JEDEC specification. Appropriate MSD handling instructions and precautions are summarized in Sections 6.2.1 to 6.2.3. Read them carefully to prevent permanent damage due to moisture intake.**



**GPS receivers contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling NEO-5 modules without proper ESD protection may destroy or damage them permanently. See Section 6.2.6 for ESD handling instructions.**

### 6.2.1 Moisture Sensitivity Levels

The Moisture Sensitivity Level (MSL) relates to the packaging and handling precautions required. NEO-5 modules are rated at MSL level 4.



For MSL standard see IPC/JEDEC J-STD-020, which can be downloaded from [www.jedec.org](http://www.jedec.org).

## 6.2.2 Shipment

Table 13 summarizes the dry pack requirements for different MSL levels in the IPC/JEDEC specification.

MSL Level	Dry Pack Requirement
1	Optional
2	Required
2a	Required
3	Required
4	Required

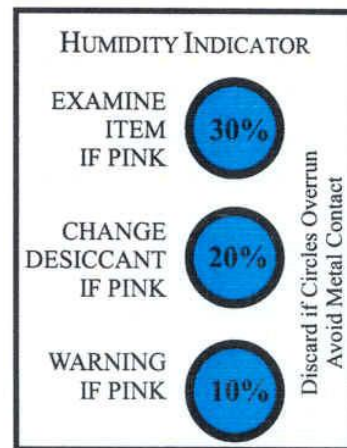
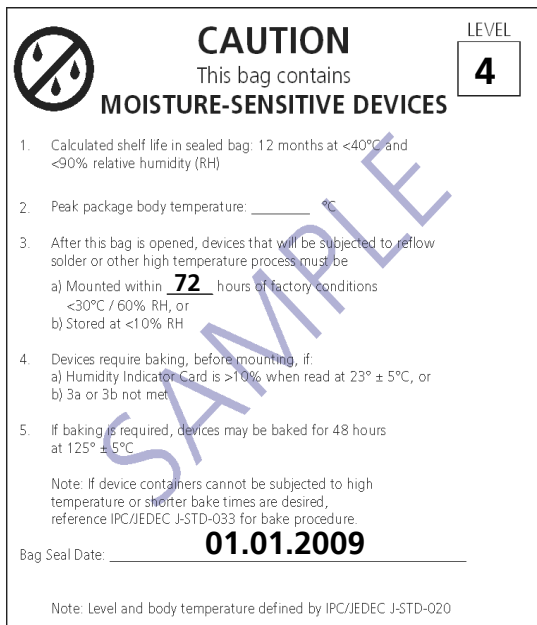
**Table 13: JEDEC specification of dry pack requirements**

According to IPC/JEDEC specification J-STD-020, if a device passes MSL level 1, it is classified as not moisture sensitive and does not require dry pack. If a device fails level 1 but passes a higher numerical level, it is classified as moisture sensitive and must be dry packed in accordance with J-STD-033.

NEO-5 modules are delivered on Tape-and-Reels in a hermetically sealed package ("dry bag") to prevent moisture intake and protect against electrostatic discharge. For protection from physical damage, the reels are individually packed in cartons.

Carrier materials such as trays, tubes, reels, etc., that are placed in the Moisture Barrier Bag (MBB) can affect the moisture level within the MBB. Therefore, the effect of these materials is compensated by adding additional desiccant in the MBB to ensure the shelf life of the SMD packages.

The dry bag provides an IPC/JEDEC compliant MSD label describing the handling requirements to prevent humidity intake. IPC/JEDEC specifications require that MSD sensitive devices be packaged together with a Humidity Indicator Card (HIC) and desiccant to absorb humidity. If no moisture has been absorbed, the three fields in the HIC indicate blue color. Figure 6 shows examples of an MSD label and HIC.



**Figure 6: Examples of MSD label and Humidity Indicator Card**

### 6.2.3 Storage and floor life

The calculated shelf life for dry packed SMD packages is a minimum of 12 months from the bag seal date, when stored in a noncondensing atmospheric environment of <math><40^{\circ}\text{C}/90\% \text{ RH}</math>.

Table 14 lists floor life for different MSL levels in the IPC/JEDEC specification.

MSL level	Floor life (out of bag) at factory ambient $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ or as stated
1	Unlimited at $\leq 30^{\circ}\text{C}/85\% \text{ RH}$
2	1 year
2a	4 weeks
3	168 hours
4	72 hours

**Table 14: JEDEC specification of floor life**

The parts must be processed and soldered within the time specified for the MSL level. If this time is exceeded, or the humidity indicator card in the sealed package indicates that they have been exposed to moisture, the devices need to be pre-baked before the reflow solder process.

### 6.2.4 Drying

Both encapsulant and substrate materials absorb moisture. IPC/JEDEC specification J-STD-020 must be observed to prevent cracking and delamination associated with the "popcorn" effect during reflow soldering. The popcorn effect can be described as miniature explosions of evaporating moisture. Baking before processing is required in the following cases:

- Humidity indicator card: At least one circular indicator is no longer blue
- Floor life or environmental requirements after opening the seal have been exceeded, e.g. exposure to excessive seasonal humidity.

Refer to Section 4 of IPC/JEDEC J-STD-033 for recommended baking procedures. Table 4-1 of the specification lists the required bake times and conditions for drying. For example, a module that has exceeded its floor life by >72 hours shall be baked at  $125^{\circ}\text{C}$  for 48 hours. (Floor life begins counting at time = 0 after bake).



**Do not attempt to bake NEO-5 modules while contained in tape and rolled up in reels. For baking, place parts individually onto oven tray.**



**Oxidation Risk: Baking SMD packages may cause oxidation and/or intermetallic growth of the terminations, which if excessive can result in solderability problems during board assembly. The temperature and time for baking SMD packages are therefore limited by solderability considerations. The cumulative bake time at a temperature greater than  $90^{\circ}\text{C}$  and up to  $125^{\circ}\text{C}$  shall not exceed 96 hours. If the bake temperature is not greater than  $90^{\circ}\text{C}$ , there is no limit on bake time. Bake temperatures higher than  $125^{\circ}\text{C}$  are not allowed.**

### 6.2.5 Reflow soldering

Reflow profiles are to be selected according to u-blox recommendations (see the LEA-5, NEO-5, TIM-5H Hardware Integration Manual [1]).

## 6.2.6 ESD handling precautions

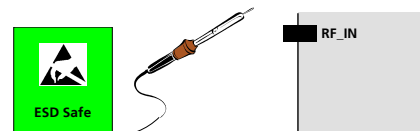
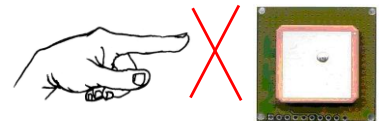
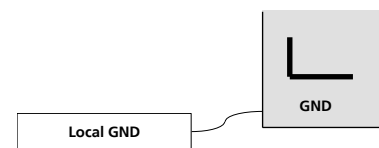


**NEO-5 modules are Electrostatic Sensitive Devices (ESD). Observe precautions for handling! Failure to observe these precautions can result in severe damage to the GPS receiver!**



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



## 7 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: <b>GGA, GLL, GSA, GSV, RMC, VTG, TXT</b>
USB Output	Configured to transmit both NMEA and UBX protocols, but only following NMEA and no UBX messages have been activated at start-up: <b>GGA, GLL, GSA, GSV, RMC, VTG, TXT</b> 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: <b>UBX, NMEA</b> The GPS receiver supports interleaved UBX and NMEA messages.
USB Input	Automatically accepts following protocols without need of explicit configuration: <b>UBX, NMEA</b> 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	NEO-5Q, NEO-5G: Maximum Performance Mode NEO-5M, NEO-5D: Eco Mode

**Table 15: Available Protocols.**

Refer to the LEA-5, NEO-5, TIM-5H Hardware Integration Manual [1] for information about further settings.

## 8 Labeling and ordering information

### 8.1 Product labeling

The labeling of u-blox 5 GPS modules includes important product information. The location of the product type number is shown in Figure 7.

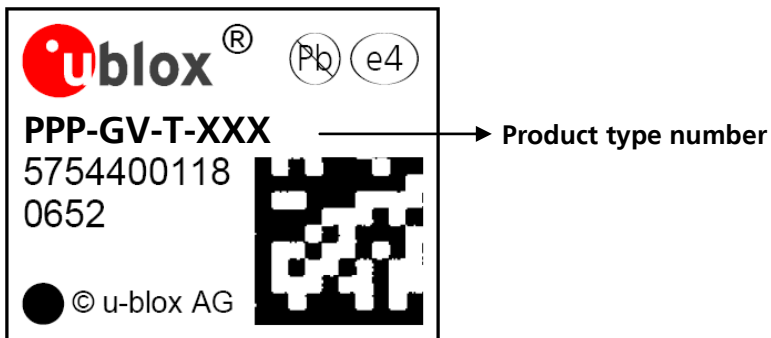


Figure 7: Location of product type number on u-blox 5 module label

### 8.2 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 5 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 16 below details these 3 different formats:

Format	Structure
<b>Product Name</b>	PPP-GV
<b>Ordering Code</b>	PPP-GV-T
<b>Type Number</b>	PPP-GV-T-XXX

Table 16: Product Code Formats

The parts of the product code are explained in Table 17.

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

Table 17: part identification code

## 8.3 Ordering information

Ordering No.	Product
NEO-5D-0	ROM-based u-blox 5 GPS Module 1.8V, 12x16mm, 250 pcs/reel
NEO-5G-0	ROM-based u-blox 5 GPS Module with KickStart 1.8V, 12x16mm, 250 pcs/reel
NEO-5M-0	ROM-based u-blox 5 GPS Module 3V, 12x16mm, 250 pcs/reel
NEO-5Q-0	ROM-based u-blox 5 GPS Module with KickStart 3V, 12x16mm, 250 pcs/reel
EVK-5P-0	u-blox 5 Evaluation Kit with SuperSense®
EVK-5H-0	u-blox 5 Evaluation Kit with KickStart

**Table 18: 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: <http://www.u-blox.com>.

## Related documents

- [1] LEA-5, NEO-5, TIM-5H Hardware Integration Manual, Docu. No GPS.G5-MS5-09027
- [2] u-blox 5 Receiver Description including Protocol Specification, Docu. No GPS-X-07036

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
1	7/07/2008	tgri	Vbckp, Current Consumption, CI
2	1/10/2008	tgri	NEO-5G/D added
3	12/11/2008	tgri	Vddusb, CFG pins
4	26/11/2008	tgri	RMS, EEPROM, Antenna Gain, Operational Limits
B	25/5/2009	tgri	New CI, Overview, Product features (SPI), GPS performance (navigation update rate and operational limits), Protocols and interfaces (addition of sections 1.91-1.9.4), Power management (inclusion of sections 1.11.2-1.11.6), Raw data, Pin assignment (SPI), Absolute maximum ratings (ESD ratings), Operating conditions, reliability tests and approvals, product handling (new chapter), Labeling and ordering information (inclusion of sections 8.1-8.2)
B1	6/4/2009	tgri	Labeling information, Prfin
B2	15/6/2009	tgri	Block diagram
B3	2/2/2009	tgri	Update of baking recommendation in 6.2.4, update of LEA-5, NEO-5, TIM-5H Hardware Integration Manual reference.

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