

# LEA-5

## u-blox 5 Modules for GPS and GALILEO

### Data Sheet



#### Abstract

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

Features include A-GPS support, low power consumption, SuperSense® Indoor GPS providing best-in-class acquisition and tracking sensitivity, precision timing and an innovative jamming-resistant RF architecture. The compact 17.0 x 22.4 mm form factor of the highly successful LEA-4 series is maintained, enabling easy migration. The LEA 5 series supports passive and active antennas.

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P6	26/06/2008	TG	Current Consumption, Active Antenna Gain
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Data sheet status	
Objective Specification	This data sheet contains target or goal specification for product development.
Advance Information	This data sheet contains data based on early testing. Values may change.
Preliminary	This data sheet contains preliminary data, revised and supplementary data may be published later.
Released	This data sheet contains the final product specification.

	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).
	This is an Electrostatic Sensitive Device (ESD). Observe precautions for handling.

# 1 Functional Description

## 1.1 Overview

The LEA-5 module series by u-blox sets a new standard for GPS and GALILEO receiver modules. Featuring the high performance 50-channel u-blox 5 technology, these modules provide excellent performance and flexibility at an economical price. A 32-channel acquisition engine with over 1 million effective correlators is capable of massive parallel searches. This enables a Time To First Fix (TTFF) of less than 1 second, while long correlation/dwell times make possible the best-in-class acquisition and tracking sensitivity. An available functionality is KickStart, a new feature enabling accelerated acquisition of weak signals. Once acquired, satellites are passed on to a power-optimized dedicated tracking engine. This arrangement allows the GPS and GALILEO engine to simultaneously track up to 16 satellites while searching for new ones. u-blox 5's advanced jamming suppression mechanism and innovative RF architecture provide a high level of immunity to jamming, ensuring maximum GPS and GALILEO performance.

The LEA-5 series maintains the compact 17.0 x 22.4 mm form factor of the highly successful LEA-4 modules. The modules have been designed with backwards compatibility in mind, enabling ease of upgrade and reducing engineering and design costs. A USB port is available for faster data transmission and more flexibility. The optional FLASH Memory provides capacity to store user-specific configuration settings and allows for future updates. The LEA-5 series includes two cost optimized u-blox 5 LITE versions: the LEA-5Q and LEA-5M. These modules are ideal solutions for applications where extra cost savings are needed.

LEA-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 Highlights and Features

### Highlights

- 50-channel u-blox 5 engine with over 1 million effective correlators
- <1 second Time To First Fix for Hot and Aided Starts
- -160dBm SuperSense® sensitivity
- Accelerated startup at weak signals with KickStart feature
- Up to four serial interfaces: 1 UART, 1 USB, 1 DDC (I2C compliant), 1 SPI (where available)
- Supports AssistNow Online and AssistNow Offline A-GPS services; OMA SUPL compliant
- High immunity to jamming
- Hybrid GPS, GALILEO and SBAS (WAAS, EGNOS, MSAS, GAGAN) engine
- 4 Hz position update rate
- Easy migration from LEA-4 modules
- RoHS compliant

### Features

	Voltage Range (V)	Thickness (mm)	50-channel engine	KickStart	SuperSense	FW Update / FLASH	Low Power Modes	GALILEO	UART	USB	SPI	DDC	AssistNow Online	AssistNow Offline	Dead Reckoning	Raw Data	Precision Timing	1PPS	CFG Pins	Reset Input	Antenna Supply	Antenna Supervisor
LEA-5H	2.7-3.6	3.0	✓	✓	✓	✓	P	F	1	1		1	✓	✓				✓		✓	✓	✓
LEA-5S	2.7-3.6	3.0	✓	✓	✓		P		1	1 <sup>1</sup>		1	✓	✓				✓	1	✓	✓	✓
LEA-5A	2.7-3.6	3.0	✓		✓		P		1	1 <sup>2</sup>		1	✓	✓				✓	1	✓	✓	✓
LEA-5Q	2.7-3.6	2.4	✓	✓	✓		P		1	1	1	1	✓	✓				✓	3	✓		
LEA-5M	2.7-3.6	2.4	✓		✓		P		1	1		1	✓	✓				✓	2	✓		
LEA-5T	2.7-3.6	3.0	✓	✓	✓		P		1	1		1	✓	✓			✓	✓		✓	✓	✓

P= Planned

F= Firmware upgrade required when GALILEO system is operational

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

<sup>1</sup> Supported by LEA-5S-0-004 and above.

<sup>2</sup> Supported by LEA-5A-0-003 and above.

### 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>3</sup>	LEA-5H/ LEA-5S/ LEA-5T/ LEA-5Q      LEA-5A/ LEA-5M
	Cold Start (Autonomous)                      29 s                      32s
	Warm Start (Autonomous)                      29 s                      32s
	Hot Start (Autonomous)                      <1 s                      <1s
Aided Starts <sup>4</sup> <1 s                      <3s	
Sensitivity <sup>5</sup>	LEA-5H/ LEA-5S/ LEA-5T/ LEA-5Q      LEA-5A/ LEA-5M
	Tracking & Navigation                      -160 dBm                      -160 dBm
	Reacquisition                                      -160 dBm                      -160 dBm
Cold Start (Autonomous)                      -144 dBm                      -143 dBm	
Horizontal Position Accuracy <sup>6</sup>	Autonomous                                      < 2.5 m
	SBAS    < 2.0 m
Accuracy of Timepulse Signal	RMS    30 ns <sup>8</sup>
	99%    <60 ns
	Compensated <sup>7</sup> (LEA-5T)                      15 ns <sup>3</sup>
Time Pulse	Configurable: 0.25 ... 1000 Hz
Max Navigation Update Rate	4 Hz
Velocity Accuracy <sup>9</sup>	0.1m/s
Heading Accuracy <sup>9</sup>	0.5 degrees
Dynamics	≤ 4 g
Operational Limits	Velocity    600 m/s

**Table 2: LEA-5 GPS Performance**

<sup>3</sup> All satellites at -130 dB

<sup>4</sup> Dependent on aiding data connection speed and latency

<sup>5</sup> Demonstrated with a good active antenna

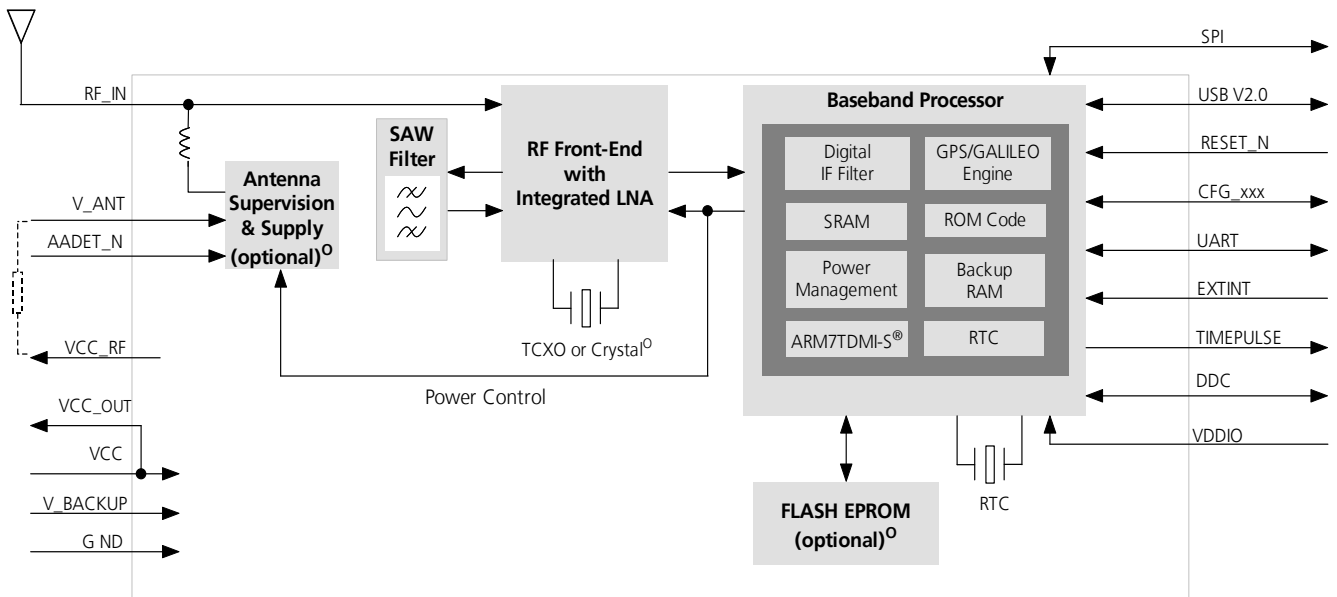
<sup>6</sup> CEP, 50%, 24 hours static, -130dBm. SEP: <3.5m

<sup>7</sup> Quantization error information can be used to compensate the granularity related error of the time pulse signal.

<sup>8</sup> Valid for ROM 5.00 based products only. For ROM 4.0 products if absolute time is required, then a calibration is necessary. For ROM 0.3 based products RMS = 100 ns / 99% = 150 ns.

<sup>9</sup> 50% @ 30 m/s

## 1.4 Block Diagram



**Figure 1: Hardware Block Schematic**  
**O:** 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 LEA-5 modules support the u-blox AssistNow Online and AssistNow Offline A-GPS services and are OMA SUPL compliant.

## 1.6 SuperSense Indoor GPS

All u-blox 5 ICs 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

A new feature available with u-blox 5 receiver modules is KickStart. This functionality uses a TCXO to accelerate weak signal acquisition, enabling faster start and reacquisition times. KickStart is available with the LEA-5H, LEA-5S, LEA-5Q and LEA-5T.

## 1.8 GALILEO

The u-blox 5 is a GNSS chip that receives and tracks GPS and GALILEO signals simultaneously, enhancing accuracy and coverage. When GALILEO-L1 signals become available, u-blox 5 receivers equipped with FLASH memory will be capable of receiving and processing them via a simple upgrade. The ability to receive and track GALILEO satellite signals will result in higher coverage, improved reliability and better accuracy.

## 1.9 Protocols

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 Protocol Specification* [2].

## 1.10 Antenna

LEA-5 modules are designed for use with passive and active antennas.

An optional antenna supervisor is available with the LEA-5H, LEA-5S, LEA-5A and LEA-5T. In the default operation mode the antenna supervisor is activated and enables the receiver to detect short circuits to the active antenna by checking the bias voltage level and can shut down the voltage bias immediately. A series resistor is needed in front of the **V\_ANT** input. UBX and NMEA messages are provided to report the condition of the antenna supply. Open circuit detection can also be supported with an additional external circuit. For details, please refer to the *LEA-5 Hardware Integration Manual* [1].

The LEA-5Q and LEA-5M do not support the antenna supply and antenna supervisor functionalities.

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 4: Antenna Specifications for all LEA-5 Modules**

Parameter	Specification	
Antenna Supply	Using <b>VCC_RF</b> or external voltage source	
Antenna Supervisor	Short circuit detection	Built-in
	Open circuit detection	Enabled with external circuit

**Table 5: Antenna Supervisor Specifications for LEA-5H, LEA-5S, LEA-5A and LEA-5T**

## 1.11 Configuration

### 1.11.1 Power Modes

u-blox 5 technology offers power optimized architecture with built-in autonomous power saving functions that minimize power consumption at any given time.

u-blox 5 can be operated in two different power modes: Maximum Performance and Eco Mode. In both cases, the receiver is operated in continuous mode. The difference lies in how the acquisition engine is used. Maximum Performance Mode freely uses the acquisition engine, resulting in the best possible TTFF at weak signals. With Eco Mode the use of the acquisition engine is optimized to deliver lower current consumption.

Low Power Modes are planned.

For more information, see the *u-blox 5 Protocol Specification [2]*.

### 1.11.2 Boot-Time Configuration (LEA-5A, LEA-5M, LEA-5Q, LEA-5S)

ROM-based modules provide up to 3 pins (**CFG\_COM0**, **CFG\_COM1**, **CFG\_GPS0**) for boot-time configuration. These become effective immediately after start-up. Once the module has started, the configuration settings can 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.

LEA-5A and LEA-5S include only **CFG\_COM1** and can be configured as seen in Table 6. Default settings in bold.

CFG_COM1	Protocol	Messages	UART Baud rate
<b>1</b>	NMEA	<b>GSV, RMC, GSA, GGA, GLL, VTG, TXT</b>	<b>9600</b>
0		GSV <sup>10</sup> , RMC, GSA, GGA, VTG, TXT	4800

**Table 6: Supported CFG\_COM1 settings (LEA-5A, LEA-5S)**

LEA-5Q and LEA-5M 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	UART Baud rate	USB Power
<b>1</b>	<b>1</b>	NMEA	<b>GSV, RMC, GSA, GGA, GLL, VTG, TXT</b>	<b>9600</b>	<b>BUS Powered</b>
1	0			38400	Self Powered
0	1			GSV <sup>10</sup> , RMC, GSA, GGA, VTG, TXT	4800
0	0	UBX	NAV-SOL, NAV-STATUS, NAV-SVINFORM, NAV-CLOCK, INF, MON-EXCEPT	57600	BUS Powered

**Table 7: Supported COM settings (LEA-5Q, LEA-5M)**

LEA-5Q includes 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 (LEA-5Q)**



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

<sup>10</sup> Every 5<sup>th</sup> fix.



### 1.11.3 Configuration (LEA-5H, LEA-5T)

With the LEA-5H and LEA-5T, configuration settings modified with UBX configuration messages can be saved to the FLASH memory. In this case the modified settings remain effective even after power-down and don't require backup battery supply.

For more information, see the *u-blox5 Protocol Specification* [2].

## 1.12 External Serial EEPROM

LEA-5 modules provide an I<sup>2</sup>C compliant DDC interface to connect an optional external serial EEPROM. Only ROM-based modules support storing power-up configuration settings on the EEPROM.



This feature is only supported by modules with ROM 5.0 and above. For more information see the *LEA-5 Hardware Integration Manual* [1] and the *DDC Implementation Application Note* [3].

## 1.13 LEA-5T

### 1.13.1 Time Mode

LEA-5T provides a special Time Mode to provide higher timing accuracy. The LEA-5T is designed for use with stationary antenna setups. The Time Mode features three different settings described in Table 9: Disabled, Survey-In and Fixed Mode.

Time Mode Settings	Description
<b>Disabled</b>	Standard PVT operation
<b>Survey-In</b>	The GPS receiver computes the average position over an extended time period until a predefined maximum standard deviation has been reached. Afterwards the receiver will be automatically set to <b>Fixed Mode</b> and the timing features will be activated.
<b>Fixed Mode</b>	In this mode, a fixed 3D position and known standard deviation is assumed and the timing features are activated. <b>Fixed Mode</b> can either be activated directly by feeding pre-defined position coordinates (ECEF - Earth Center Earth Fixed format) or by performing a <b>Survey-In</b> .  In Fixed mode, the timing errors in the TIMEPULSE signal which otherwise result from positioning errors are eliminated. Single-satellite operation is supported. For details, please refer to the <i>u-blox5 Protocol Specification</i> [2].

**Table 9: Time Mode Settings**

### 1.13.2 Time Mark

LEA-5T can be used for precise time measurements with sub-microsecond resolution using the external interrupt (EXTINT0). Rising and falling edges of these signals are time-stamped to the GPS or UTC time and counted. The Time Mark functionality can be enabled with the UBX-CFG-TM2 message

For details, please refer to the *u-blox5 Protocol Specification* [2].

## 2 Mechanical Specifications

Parameter	Specification	
A	22.4 +0.6/-0.1mm	[882 +24/-4mil]
B	17.0 ±0.1mm	[669 ±4mil]
C	3.0 <sup>11</sup> /2.4 <sup>12</sup> ±0.3mm	[118 <sup>11</sup> /97 <sup>12</sup> ±12mil]
D	2.55 +0.3/-0.1mm	[100 +18/-4mil]
E	1.1 ±0.1mm	[43 ±4mil]
F	3.80 ±0.1mm	[150 ±4mil]
G	1.10 ±0.1mm	[75 ±4mil]
H	2.85 +0.3/-0.01mm	[112 +18/-4mil]
Weight	2.1 g	

Table 10: Dimensions

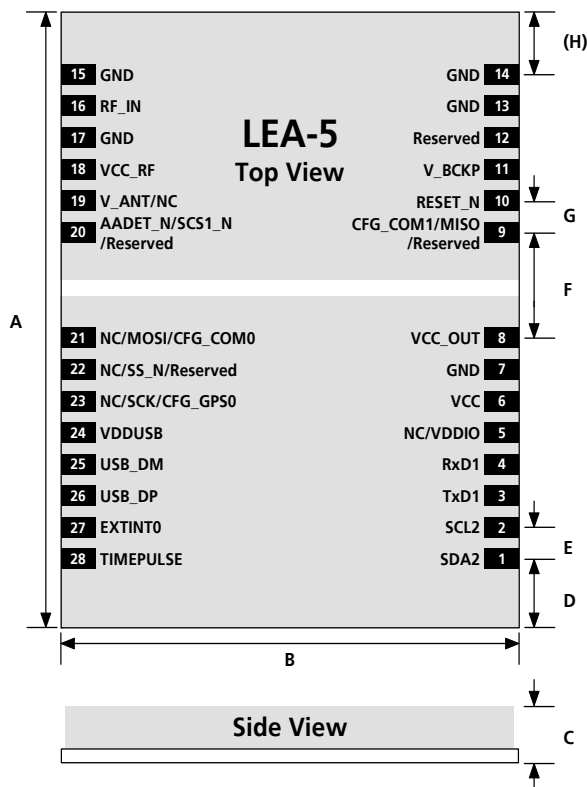


Figure 2: Dimensions



For information regarding the Paste Mask and Footprint see the *LEA-5 Hardware Integration Manual* [1].

<sup>11</sup> LEA-5H, LEA-5S, LEA-5A, LEA-5T

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

## 2.1 Pin Assignment

No	Module	Name	I/O	Description
1	All	SDA2	I/O	DDC Data
2	All	SCL2	I/O	DDC Clock
3	All	TxD1	O	Serial Port 1
4	All	RxD1	I	Serial Port 1
5	LEA-5H, LEA-5S, LEA-5A, LEA-5T	NC		Not Connected
	LEA-5Q, LEA-5M	VDDIO	I	Supply voltage
6	All	VCC	I	Supply voltage
7	All	GND	I	Ground (digital)
8	All	VCC_OUT	O	Output voltage
9	LEA-5A, LEA-5S, LEA-5M	CFG_COM1	I	Configuration Pin
	LEA-5Q	MISO CFG_COM1	I	SPI MISO Configuration Pin
	LEA-5H, LEA-5T	Reserved	I	
10	All	RESET_N	I	
11	All	V_BCKP	I	Backup voltage supply
12	All	Reserved	I	
13	All	GND	I	Ground
14	All	GND	I	Ground
15	All	GND	I	Ground
16	All	RF_IN	I	GPS signal input
17	All	GND	I	Ground
18	All	VCC_RF	O	Output Voltage RF section
19	LEA-5H, LEA-5S, LEA-5A, LEA-5T	V_ANT	I	Antenna Bias voltage
	LEA-5Q, LEA-5M	NC		Not Connected
20	LEA-5H, LEA-5S, LEA-5A, LEA-5T	AADET_N	I	Active Antenna Detect
	LEA-5Q	SCS1_N	O	SPI Chip Select
	LEA-5M	Reserved		Do not connect. Do not pull low.
21	LEA-5H, LEA-5S, LEA-5A, LEA-5T	NC		Not Connected
	LEA-5Q	MOSI CFG_COM0	I/O	SPI MOSI Configuration Pin
	LEA-5M	CFG_COM0	I	Configuration Pin
22	LEA-5H, LEA-5S, LEA-5A, LEA-5T	NC		Not Connected
	LEA-5Q	SS_N	I	SPI Slave Select
	LEA-5M	Reserved	I	
23	LEA-5H, LEA-5T, LEA-5A, LEA-5S	NC		Not Connected
	LEA-5Q	SCK CFG_GPS0		SPI Clock Power Mode Configuration Pin
	LEA-5M	Reserved		Do not connect. Do not pull low.
24	All	VDDUSB	I	USB Supply
25	All	USB_DM	I/O	USB Data
26	All	USB_DP	I/O	USB Data
27	All	EXTINT0	I	External Interrupt Pin
28	All	TIMEPULSE	O	Time pulse (1PPS)

**Table 11: Pinout**



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

## 3 Electrical Specifications

### 3.1 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Power supply voltage (VCC)	Vcc	-0.5	3.6	V
Backup battery voltage (V_BCKP)	Vbckp	-0.5	3.6	V
USB supply voltage (VDDUSB)	Vddusb		3.8	V
Input pin voltage	Vin	-0.5	3.6	V
	Vin_usb	-0.5	Vddusb +0.5	V
VCC_RF output current	Iccrf		100	mA
Input power at RF_IN	Prfin		+5	dBm
Antenna bias voltage	Vant		6	V
Antenna bias current <sup>13</sup>	Iant		100	mA
Storage temperature	Tstg	-40	85	°C

**Table 12: Absolute Maximum Ratings**



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



For Prfin: source impedance=50Ω, continuous wave.

<sup>13</sup> Applied via V\_ANT

### 3.2 Operating Conditions

Parameter <sup>14</sup>	Symbol	Module	Min	Typ	Max	Units	Condition
Power supply voltage (VCC)	Vcc	All	2.7	3.0	3.6	V	
I/O supply voltage (VDDIO)	Vddio		1.65	3.3	3.6	V	
Peak supply current <sup>15</sup>	Iccp	All			150	mA	Vcc = 3.6V
Sustained supply current <sup>16</sup>	Icc Acquisition (Max Performance Mode)	All		102		mA	Vcc = 3.0V
	Icc Tracking (Max Performance Mode) <sup>17</sup>	LEA-5A, LEA-5M		43			
		LEA-5S, LEA-5Q		44			
		LEA-5H, LEA-5T		47			
	Icc Acquisition (Eco Mode)	All		67			
	Icc Tracking (Eco Mode) <sup>18</sup>	LEA-5A, LEA-5M		40			
		LEA-5S, LEA-5Q		41			
		LEA-5H, LEA-5T		42			
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	LEA-5A, LEA-5S, LEA-5H, LEA-5T	Vcc – 0.4			V	Iout = -4 mA
		LEA-5M, LEA-5Q	Vddio – 0.4			V	Iout = -4 mA
VDDUSB (Pin 24) for USB operation	Vddusb1	All	3.0 <sup>19</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			3.2		dB	
V_ANT antenna bias voltage	Vant	All	2.7		5.5	V	I <sub>ANT</sub> < -50 mA
Antenna bias voltage drop	Vant_drop	All		0.1		V	Iccrf=50mA
RF Input Power	Prfin	All			-5	dBm	
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 13: Operating Conditions**



Operation beyond the "Operating Conditions" is not recommended and extended exposure beyond the "Operating Conditions" may affect device reliability.

<sup>14</sup> All specification are at an ambient temperature of 25°C.

<sup>15</sup> Use this figure to dimension maximum current capability of power supply.

<sup>16</sup> Use this figure to determine required battery capacity.

<sup>17</sup> FW 5.00, with strong signals, all orbits available. For Cold Starts typical 10 min after First Fix. For Hot Starts typical 15 sec after First Fix.

<sup>18</sup> FW 5.00, with strong signals. For Cold Starts typical 1 min after First Fix. For Hot Starts typical 15 sec after First Fix

<sup>19</sup> If USB not used connect to GND

## 4 Reliability Tests

Tests for product family qualifications:

Test	Standard
Visual inspection	IPC-A-610 "Acceptability of electronic assemblies" I.T.R.I. Publication No. 700 IPC-SM-840B Class 2.
Thermal shock	-40°C...+125°C, 100 cycles
Function at various temperatures	-40°C/2 hours; RT/2 hours; +85°C/2 hours; function tests at stable temperature
Lifespan test	+85°C/1000 hours, in function
Damp heat, cyclic	+25°C...+55°C; >90% Rh
Vibration	10-500 Hz; 2 hours/axis; 5g
Shock	30g/11ms (halfsine); 3 Shock/axis; no function
Metallographic investigations	IPC-QE-650

**Table 14: Reliability Tests**



This specification is preliminary and subject to confirmation.

## 5 Design-In

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

## 6 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> (in addition to the 6 standard NMEA messages the LEA-5T includes <b>ZDA</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 <sup>20</sup> (in addition to the 6 standard NMEA messages the LEA-5T includes <b>ZDA</b> )
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 <sup>20</sup>
TIMEPULSE (1Hz Nav)	1 pulse per second, synchronized at rising edge, pulse length 100ms
Power Mode	LEA-5H, LEA-5Q, LEA-5S, LEA-5T: Maximum Performance Mode LEA-5A, LEA-5M: Eco Mode

**Table 15: Available Protocols.**

Please refer to the *LEA-5 Hardware Integration Manual* [1] for information about further settings.

<sup>20</sup> Supported with all Flash based modules as well as LEA-5S-0-003, LEA-5A-0-003, LEA-5Q-0-002, LEA-5-M-0-002 and above.

## 7 Ordering Information

Ordering No.	Product
LEA-5A-0	LEA-5A GPS/GALILEO Module, Tape on reel, 250 pieces per reel
LEA-5H-0	LEA-5H GPS/GALILEO Module, Tape on reel, 250 pieces per reel
LEA-5S-0	LEA-5S GPS/GALILEO Module, Tape on reel, 250 pieces per reel
LEA-5M-0	LEA-5M GPS/GALILEO Module, Tape on reel, 250 pieces per reel
LEA-5Q-0	LEA-5Q GPS/GALILEO Module, Tape on reel, 250 pieces per reel
LEA-5T-0	LEA-5T GPS/GALILEO Module, Tape on reel, 250 pieces per reel
EVK-5P-0	u-blox 5 Evaluation Kit with SuperSense®
EVK-5H-0	u-blox 5 Evaluation Kit with KickStart
EVK-5T-0	u-blox 5 Evaluation Kit with Precision Timing

**Table 16: Ordering Information**

## Related Documents

- [1] LEA-5 Hardware Integration Manual, Docu. No GPS.G5-MS5-07005
- [2] u-blox5 Protocol Specification, Docu. No GPS.G5-X-07036
- [3] DDC Implementation Application Note, Docu. No GPS.G5-X-08023

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.



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