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LEA-4

ANTARIS® 4 GPS Modules

Data Sheet

Abstract
Technical Data Sheet describing the economical and flexible ANTARIS®4 based LEA-4 series (LEA-4A, LEA-4H, LEA-4M, LEA-4P, LEA-4R, LEA-4S, LEA-4T) of GPS Modules. The available features include USB and serial interface, SuperSense indoor GPS, Precision Timing, raw measurement data, and Dead Reckoning. The modules are integrated within a compact 17 x 22.4 mm housing, and support passive and active antennas.

your position is our focus

Data Sheet

Title	LEA-4
Subtitle	ANTARIS® 4 GPS Modules
Doc Type	Data Sheet Released
Doc Id	GPS.G4-MS4-06143-3

Revision Index	Date	Name	Status / Comments
	1. Dec. 2006	TG	Release
1	25. May 2007	TG	Ordering Information
2	10. Apr. 2008	TG	CI, LEA-4R max. update rate
3	17. Jul. 2008	TG	SBAS

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The current document replaces the following Data Sheets:		
Data Sheet Document Name	**Identification of applicable hardware**	**Comments**
GPS.G4-MS4-05017	LEA-4A	
GPS.G4-MS4-05019	LEA-4H	
GPS.G4-MS4-06108	LEA-4M	
GPS.G4-MS4-05021	LEA-4P	
GPS.G4-MS4-05072	LEA-4S	
GPS.G4-MS4-05070	LEA-4T	

Data sheet status	
Objective Specification	This data sheet contains target or goal specification for product development.
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-4A, LEA-4H, LEA-4M, LEA-4P, LEA-4R, LEA-4S, LEA-4T are a series of GPS modules featuring u-blox' 16-channel ANTARIS®4 receiver technology. They provide high performance with low power consumption and feature a USB port for faster data transmission and more flexibility. The ANTARIS®4 GPS engine offers outstanding navigation performance even in the most challenging metropolitan areas.

As the successors to the LEA-LA module, the LEA-4 modules also share the 17 x 22.4 mm form factor. The small form factor and SMT pads allow for fully automatic assembly processes with standard pick-and-place equipment and reflow soldering, enabling cost-efficient, high-volume production. The combination of these features make these modules suitable for a broad spectrum of GPS products, for which high performance, low cost, low power consumption and small size are key requirements.

The LEA-4 modules are fully interchangeable, providing the flexibility to use the module with the optimal features for application specific requirements.

1.2 Highlights and Features

- **Cost-optimized and flexible architecture**
- **Low power consumption**
- **A-GPS and autonomous operation, AssistNow ready**
- **Up to 4Hz Position Update rate**
- **Support DGPS, WAAS, EGNOS and MSAS**[1]

For an overview of the various features available with the different LEA-4x models please see Table 1.

Module	*16 Channel ANTARIS®4 GPS Engine*	*SuperSense®*	*Nonvolatile Memory*	*Serial Ports*	*USB*	*AssistNow Online*	*AssistNow Offline*	*Configuration Pins*	*Antenna Supervisor*	*Antenna Bias Voltage*	*Dead Reckoning*	*Timing Mode*	*Raw Data*	*Temperature Range (°C)*
LEA-4A	✓		ROM	2	✓	✓		✓	✓	✓				-40 ... +85
LEA-4H	✓	✓	Flash	1	✓	✓	✓		✓	✓				-40 ... +85
LEA-4M	✓		ROM	2	✓	✓		✓						-30 ... +70
LEA-4P	✓		Flash	1	✓	✓	✓		✓	✓				-40 ... +85
LEA-4R	✓		Flash	1	✓	✓			✓	✓	✓			-40 ... +85
LEA-4S	✓	✓	ROM	2	✓	✓		✓	✓	✓				-40 ... +85
LEA-4T	✓	✓	Flash	1	✓	✓			✓	✓		✓	✓	-40 ... +85

Table 1: Available features of the LEA-4 series

[1] SBAS (WAAS, EGNOS, MSAS) is not supported by LEA-4R

1.3 Block Diagram

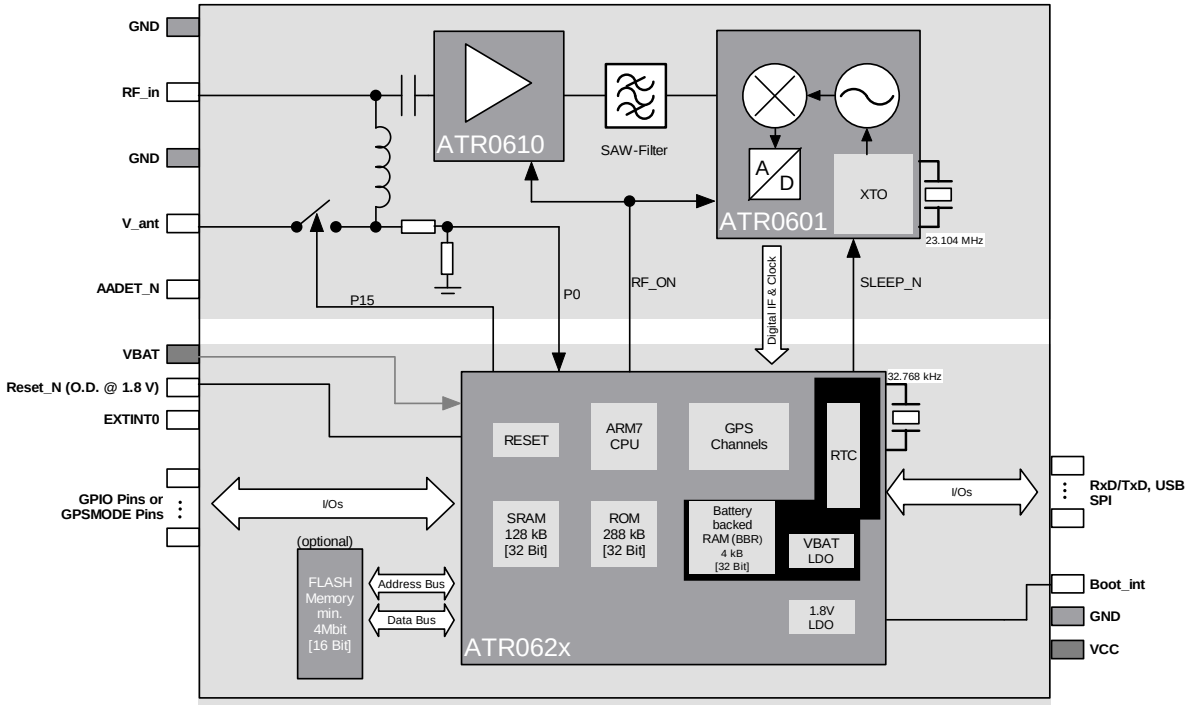

Figure 1: Hardware Block Schematic

1.4 Operating Modes

The ANTARIS®4 GPS Technology supports the following Operating Modes:

Operating Modes	Description
Continuous Tracking Mode (CTM)	In this mode, the Autonomous Power Management (APM) automatically optimizes power consumption. It powers off parts of the receiver when they are not used. Also, the CPU speed is reduced when the CPU workload is low.
Power Saving Modes	A configurable power saving mode is available where the GPS is put into sleep mode and activated up on a selectable time interval or upon external request (signal activity on serial port or EXTINT input). This mode is ideally suited in applications with stringent power budget requirements in mobile and battery operated end products.

Table 2: Operating Modes

For more information see the *ANTARIS®4 System Integration Manual* [1].

1.5 Assisted GPS (A-GPS)

The ANTARIS®4 GPS engine supports Mobile Station (MS) based A-GPS for accelerated acquisition and position computation in the GPS receiver. In addition, timing receivers (such as the LEA-4T) support MS assisted (output of raw tracking information for position computation by the service provider). 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. All LEA-4x modules support the u-blox AssistNow Online A-GPS service. The LEA-4H and LEA-4P are also AssistNow Offline ready.

1.6 Antenna

The LEA-4 modules are designed for use with passive and active antennas. An antenna supervisor is provided on all modules except the LEA-4M. If activated, the GPS receiver is capable of detecting 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 *ANTARIS®4 System Integration Manual* [1].

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 3: Antenna Specifications for all LEA-4 Modules

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

Table 4: Antenna Supervisor Specifications (feature not available with the LEA-4M)

1.7 Configuration

1.7.1 Boot-Time GPSMODE Configuration

The LEA-4A, LEA-4M and LEA-4S provide four GPSMODE pins for boot-time configuration. They 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 (with the CFG-CFG message), then the modified configuration will be retained, as long as the backup battery supply is not interrupted.

GPSMODE 2	GPS sensitivity settings
0	Normal sensitivity mode
1	High sensitivity mode

Table 5: GPSMODE Configuration for LEA-4A, LEA-4M

GPSMODE 23	GPS sensitivity settings
0	Auto mode
1	High sensitivity mode

Table 6: GPSMODE Configuration for LEA-4S

GPSMODE 7	USB power settings
0	Bus-Powered USB Interface
1	Self-Powered USB Interface

Table 7: USB Settings

GPSMODE		Activated Message Set	Serial Port 1		Serial Port 2	
6	5		Baud Rate	Protocol	Baud Rate	Protocol
0	0	High	19.2 Kbaud	NMEA	57.6 Kbaud	UBX
0	1	Low	4.8 Kbaud	NMEA	19.2 Kbaud	UBX
1	0	Medium (default)	9.6 Kbaud	NMEA	38.4 Kbaud	UBX
1	1	Reserved for factory use	115.2 Kbaud	UBX	19.2 Kbaud	NMEA

Table 8: Supported GPSMODE settings

1.7.2 Configuration (LEA-4H, LEA-4P, LEA-4R, LEA-4T)

With the LEA-4H, LEA-4P, LEA-4R and LEA-4T the configuration settings can be modified with UBX configuration messages. The modifications can be saved to the Flash memory.

For more information see the *ANTARIS®4 System Integration Manual* [1].

1.8 Dead Reckoning (LEA-4R)

Dead reckoning GPS receivers supplement the GPS information with an incoming signal from a gyroscope (turn rate sensor) and odometer pulses to do dead reckoning navigation through periods of poor GPS reception. Depending on the quality of the available GPS signals, the LEA-4R uses an algorithm specially developed by u-blox in order to compute the next positions accurately by using an automatically weighted average of the GPS and sensor inputs. This provides precise navigation in locations with no or impaired GPS reception, for example in tunnels, indoor car parks and deep urban canyons.

The LEA-4R is a low power dead reckoning GPS receiver module. It is the ideal solution for high-volume applications requiring a cost-effective and tightly integrated product that provides a continuous and reliable positioning fix 100% of the time.

! **Note** LEA-4R does not support SBAS corrections.

1.8.1 Supported Peripheral Components (LEA-4R)

The LEA-4R supports the following peripheral components (Table 9):

A/D converters with SPI interface	digital temperature sensors with SPI interface
Linear Technology, LTC1860, 12-bit A/D converter	National Semiconductors, LM70, precision: 10 bits plus sign

Table 9: Supported peripheral components

Gyroscopes should at least meet the requirements listed below:

Parameter	Specification
Supply Voltage	5.0V ± 0.25V
Zero Point	2.5V ± 0.4V
Scale factor	25mV/°/s ± 5mV/°/s
Dynamic Range	± 60°/s to ± 125°/s
Linearity	± 0.5% (Full scale)
Recommended operating temperature range	-40 to +85°C

Table 10: Required Specifications for Gyroscopes

Gyroscopes with a sensitivity (scale factor) of lower than 20mV/°/s may work but the performance will be degraded. For this reason u-blox does not recommend using gyros with a lower sensitivity.

For implementation details as well as a list of supported gyroscopes that u-blox is currently aware of, or for more information about Dead Reckoning and other special features of the LEA-4R please refer to the *TIM/LEA-4R System Integration Manual* [3].

1.9 Protocols

The LEA-4 series supports different serial protocols.

Protocol	Type	Runs on
NMEA	Input/output, ASCII, 0183, 2.3 (compatible to 3.0)	All serial ports and USB
UBX	Input/output, binary, u-blox proprietary	All serial ports and USB
RTCM	Input, messages 1,2,3,9	All serial ports and USB

Table 11: Available Protocols

For specification of the various protocols see the *ANTARIS®4 Protocol Specification* [2].

1.10 LEA-4T

1.10.1 Time Mode

LEA-4T provides a special Time Mode to provide higher timing accuracy. The LEA-4T is designed for use with stationary antenna setups. The Time Mode features three different settings described in Table 12: Disabled, Survey-In and Fixed Mode.

Time Mode Settings	Description
Disabled	Standard PVT operation with SuperSense® enabled
Survey-In	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 **Fixed Mode** and the timing features will be activated.
Fixed Mode	In this mode, a fixed 3D position and known standard deviation is assumed and the timing features are activated. **Fixed Mode** can either be activated directly by feeding pre-defined position coordinates (ECEF - Earth Center Earth Fixed format) or by performing a **Survey-In**. In Fixed mode, the timing errors in the TIMEPULSE signal which otherwise result from positioning errors are eliminated. Single-satellite operation is supported, but must be activated separately using the UBX-CFG-NAV2 message. For details, please refer to the *ANTARIS®4 System Integration Manual* [1].

Table 12: Time Mode Settings

In **Fixed Mode**, the accuracy of the TIMEPULSE signal is higher. Note that the TIMEPULSE signal has a granularity is 43 ns which results from the 23.104 MHz GPS clock. Using the available quantization error information (see UBX-TIM message) in external post-processing, a significantly higher timing accuracy can be achieved.

1.10.2 Time Mark

LEA-4T can be used for precise time measurements with a sub microseconds resolution using the external interrupt (EXTINT0 and EXTINT1). 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 *ANTARIS®4 System Integration Manual* [1].

1.10.3 Raw Data Output

The LEA-4T supports raw data output at an update rate of 10 Hz. The UBX-RXM-RAW message includes carrier phase with half-cycle ambiguity resolved, code phase and Doppler measurements, which can be used in external applications that offer precision positioning, real-time kinematics (RTK) and attitude sensing.

2 GPS Performance

Parameter	Module	Specification				
Receiver Type	All	L1 frequency, C/A Code, 16-Channels 8192 time / frequency search windows				
Max Navigation Update Rate	LEA-4A LEA-4H LEA-4P LEA-4S LEA-4T LEA-4M	4 Hz				
	LEA-4R	1 Hz				
	LEA-4T	Raw Data	10 Hz			
Accuracy	All	Position Position DGPS / SBAS[2]	2.5 m CEP[3] 2.0 m CEP	5.0 m SEP[4] 3.0 m SEP		
Acquisition[5, 6]	All	GPS Mode: Cold Start Warm Start Hot Start Reacquisition	Fast Acq. 34 s 33 s <3.5 s <1 s	Normal 36 s	High Sens. 41 s	Auto 34 s
Sensitivity[7]	LEA-4A LEA-4M LEA-4P LEA-4R	Tracking Acquisition & Reacquisition Cold Starts	-150 dBm -140 dBm -140 dBm			
	LEA-4H LEA-4S LEA-4T	Tracking Acquisition & Reacquisition Cold Starts	-158 dBm -148 dBm -142 dBm			
Accuracy of Timepulse Signal	All	RMS 99% Granularity Compensated[8] (LEA-4T) Time Pulse	50 ns <100 ns 43 ns 15 ns Configurable: 0.1 … 1000 Hz			
Dynamics	All		≤ 4 g			
Operational Limits	All	Maximum Speed	515 m/s			

Table 13: Performance Specification

[2] Depends on accuracy of correction data of DGPS or SBAS service. Not supported by LEA-4R.
[3] CEP = Circular Error Probability: The radius of a horizontal circle, centered at the antenna's true position, containing 50% of the fixes.
[4] SEP = Spherical Error Probability. The radius of the sphere, centered at the true position, contains 50% of the fixes.
[5] The different start-up modes like cold, warm and hot start are described in the *ANTARIS®4 System Integration Manual* [1]
[6] Measured with good visibility and -125 dBm signal strength
[7] Demonstrated with a good active antenna
[8] Quantization error information can be used to compensate the granularity related error of the time pulse signal

3 Mechanical Specifications

3.1 Dimensional Specifications

Parameter	Specification
Length	22.4±.1mm [881 ±4mil]
Width	17.0±.1mm [669 ±4mil]
Thickness	3.0 ±0.3mm [118 ±12mil]
Pitch RF pins	1.1±0.1mm [43 ±4mil]
Pitch Digital pins	1.1±0.1mm [43 ±4mil]
Weight	2.1g

Table 14: Mechanical Specification

3.2 Dimensional Diagrams

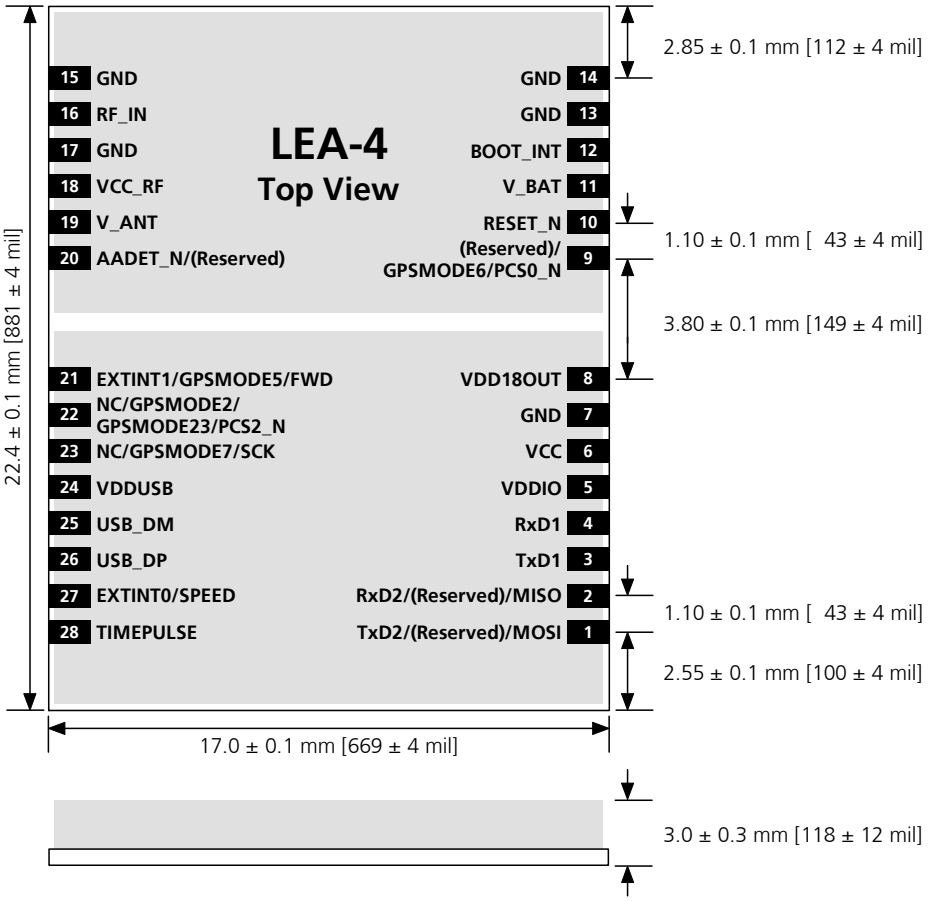

Figure 2: Dimensions

! **Note** For detailed information for a design in, including detailed dimensional diagrams, footprints, paste mask recommendations, pinout tables and a recommended pad layout, please see the *ANTARIS®4 System Integration Manual* [1].

Pinout

Standard Function				
No	Module	Name	I/O	Description
1	LEA-4A, LEA-4S, LEA-4M	TxD2	O	Serial Port 2
	LEA-4H, LEA-4P, LEA-4T	(Reserved)	I	
	LEA-4R	MOSI	O	SPI MOSI
2	LEA-4A, LEA-4S, LEA-4M	RxD2	I	Serial Port 2
	LEA-4H, LEA-4P, LEA-4T	(Reserved)		
	LEA-4R	MISO	I	SPI MISO
3	All	TxD1	O	Serial Port 1
4	All	RxD1	I	Serial Port 1
5	All	VDDIO	I	Pad voltage supply
6	All	VCC	I	Supply voltage
7	All	GND	I	Ground
8	All	VDD18OUT	O	1.8V output
9	LEA-4A, LEA-4S, LEA-4M	GPSMODE6	I	Boot-time config. pin
	LEA-4H, LEA-4P, LEA-4T	(Reserved)	I	
	LEA-4R	PCS0_N	O	SPI Chip Select 0 (Temperature Sensor)
10	All	RESET_N	I/O	Reset
11	All	V_BAT	I	Backup voltage supply
12	All	BOOT_INT	I	Boot mode
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 sect.
19	LEA-4A, LEA-4H, LEA-4P, LEA-4R, LEA-4S, LEA-4T	V_ANT	I	Antenna Bias voltage
	LEA-4M	NC	I/O	Not Connected
20	LEA-4A, LEA-4H, LEA-4P, LEA-4R, LEA-4S, LEA-4T	AADET_N	I	Active Antenna Detect
	LEA-4M	(Reserved)	I	
21	LEA-4A, LEA-4S, LEA-4M	GPSMODE5	I	Boot-time config. pin
	LEA-4H, LEA-4P, LEA-4T	EXTINT1	I	External Interrupt pin
	LEA-4R	FWD	I	Direction Indication (1=Forward)
22	LEA-4A, LEA-4M	GPSMODE2	I	Boot-time config. pin
	LEA-4S	GPSMODE23	I	Boot-time config. pin
	LEA-4H, LEA-4P, LEA-4T	NC	I	Not Connected
	LEA-4R	PCS2_N	O	SPI Chip Select 2 (A/D Converter)
23	LEA-4A, LEA-4S, LEA-4M	GPSMODE7	I	Boot-time config. pin
	LEA-4H, LEA-4P, LEA-4T	NC		Not Connected
	LEA-4R	SCK	O	SPI Clock
24	All	VDDUSB	I	USB Supply
25	All	USB_DM	I/O	USB Data
26	All	USB_DP	I/O	USB Data
27	LEA-4A, LEA-4H, LEA-4M, LEA-4P, LEA-4S, LEA-4T	EXTINT0	I	External Interrupt Pin
	LEA-4R	SPEED	I	Odometer Speedpulses
28	All	TIMEPULSE	O	Time pulse (1PPS)
Shaded pins have dead reckoning specific function. For implementation details see the *TIM/LEA-4R System Integration Manual* [3].				

Table 15: Pinout

! **Note** Pins designated Reserved should only be used with caution. For more information about Pinouts see the *ANTARIS®4 System Integration Manual* [1].

4 Electrical Specifications

4.1 Absolute Maximum Ratings

Parameter	Symbol	Module	Min	Max	Units
Power Supply					
Power supply voltage (VCC)	Vcc	All	-0.3	3.6	V
I/O supply voltage (VDDIO)	Vddio	All	-0.3	3.6	V
Backup battery voltage (V_BAT)	Vbat	All	-0.3	3.6	V
Input Pins					
Digital input pin voltage (except RESET_N, VDDUSB, USB_DP, USB_DM)	Vin	All	-0.3	5	V
Input pin voltage of RESET_N	Vin_reset	All	-0.3	1.95	V
Input pin voltage VDDUSB	Vin_usb	All	-0.3	3.6	V
Input pin voltage USB_DP, USB_DM	Vin_usbio	All	-1	4.6	V
Voltage Supply output for Active Antenna and RF Section					
VCC_RF output current	Iccrf	All		50	mA
RF Input					
Antenna bias voltage (applied via V_ANT)	Vant	All	0	6	V
Antenna bias current (applied via V_ANT)	Iant	All		100	mA
Input power at RF_IN (source impedance 50Ω, continuous wave)	Prfin	All		-5	dBm
Environment					
Storage temperature	Tstg	LEA-4H, LEA-4S, LEA-4T	-40	85	°C
		LEA-4A, LEA-4M, LEA-4P, LEA-4R	-40	125	°C

Table 16: Absolute Maximum Ratings

! **Warning** 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.

4.2 Operating Conditions

Parameter[9]	Symbol	Module	Min	Typical	Max	Units	Condition
Power Supply							
Power supply voltage (VCC)	Vcc	All	2.7		3.3	V	
I/O supply voltage (VDDIO)	Vddio	All	1.65		3.6	V	
Power supply voltage ripple	Vcc_PP	All			50	mV	
Sustained supply current [10]	Icc	LEA-4A LEA-4H LEA-4M LEA-4P LEA-4R LEA-4S LEA-4T		35 39 35 36 48 38 39		mA	Vcc = 3.0 V
Peak supply current [11]	Iccp	All			70	mA	Vcc = 3.3 V
Sleep mode current	Iccs	All		65		µA	Vcc = 3.0 V
Backup battery voltage	Vbat	All	1.5		3.6	V	
Backup battery current	Ibat	All		5		µA	Vbat = 3.3V
1.8V output voltage (VDD18OUT pin)	Vdd18out	All	1.65	1.8	1.95	V	
1.8V output current (VDD18OUT pin)	Idd18out	All			30	mA	
UART and all I/O Signals[12]							
Input pin voltage range	Vin	All	0		5	V	
Input pin low voltage	Vin_low	All			0.41	V	
Input pin high voltage	Vin_high	All	1.46			V	
Output pin voltage range	Vout	All	0		VDDIO	V	
Output pin low voltage	Vout_low	All			0.4	V	Iout = 1.5mA
Output pin high voltage	Vout_high	All	VDDIO-0.5			V	Iout = -1.5mA
USB							
VDDUSB (Pin 24) for USB operation	Vddusb1	All	3.0		3.6	V	
VDDUSB (Pin 24) if USB not used (low)	Vddusb0	All	0		2	V	
USB_DM, USB_DP	VinU	All	Compatible with USB with 27 Ohms series resistance				
RESET_N Input (Open-Drain I/O)							
Input and output pin voltage range	VinR	All	0		VDD18OUT	V	
Input pin low voltage	Vin_lowR	All			0.46	V	
Input pin high voltage[13]	Vin_highR	All	1.3			V	
Output pin low voltage	Vout_lowR	All			0.1	V	Iout = 0.3 mA
Output pin high voltage	Vout_highR	All	VDD18OUT -0.2			V	Iout = 0.1 mA

[9] All specification are at an ambient temperature of 25°C.
[10] Average current drawn during Continuous Tracking Mode with 1 Hz update rate, using 9 channels for tracking and navigation and 3 channels for searching satellites (= acquisition). Use this figure to determine required battery capacity.
[11] Peak current drawn during initial acquisition phase. Use this figure to dimension maximum current capability of power supply.
[12] RxD1, RxD2 and EXTINT0 provide internal pull-up to V_BAT18 (Battery supply regulated to 1.8V) and not VCC. For more information consult the *ANTARIS®4 System Integration Manual* [1]
[13] Do not drive high.

Parameter[14]	Symbol	Module	Min	Typical	Max	Units	Condition
Dead Reckoning Signals							
Input frequency (SPEED)	fspeed	LEA-4R	1 [15]		5000	Hz	
Odometer Scale Factor	Skf_t	LEA-4R	1100		40000	Pulse /km	Odometer Scale Factor
DR calculation rate		LEA-4R			40	Hz [16]	
RF input							
Antenna gain	Gant	All			50	dB	
V_ANT antenna bias voltage[17] (must connect to ground if not used)	Vant	LEA-4A LEA-4H LEA-4P LEA-4R LEA-4S LEA-4T	2		6	V	
Antenna bias voltage drop[17]	Vant_drop	LEA-4A LEA-4H LEA-4P LEA-4R LEA-4S LEA-4T		20	50	mV	Iant=10mA
VCC_RF voltage	Vccrf	All		Vcc – 0.1		V	
VCC_RF output current	Iccrf	All		20	50	mA	
Environment							
Operating temperature	Topr	LEA-4A LEA-4H LEA-4P LEA-4R LEA-4S LEA-4T LEA-4M	-40 -40 -40 -40 -40 -40 -30		85 85 85 85 85 85 70	°C °C °C °C °C °C °C	

Table 17: Operating Conditions

Running this device beyond the "Operating Conditions" is not recommended and extended exposure beyond them may affect its reliability.

[14] All specification are at an ambient temperature of 25°C.
[15] Frequencies below this threshold will be recognized as standstill of the vehicle.
[16] Internal calculation rate for high accuracy in DR calculation. Not to be confused with Max Update Rate.
[17] Not supported by LEA-4M

5 Reliability Tests

Tests for product family qualifications:

Test		Standard	Samples
Visual inspection		IPC-A-610 D, class 2 "Acceptability of electronic assemblies"	176
Temperature step	-40°C...+85°C, steps of 5K, operating	ISO 16750-4, IEC68-2-1, IEC68-2-2	176
Metallographic investigations		IPC-A-600 F, Class 2"Acceptability of printed boards"	6
Dry heat	+60°C, 5% rH, 1000 hours, operating +125°C, 1000 hours, non-operating	IEC68-2-2 IEC68-2-2	32 16
Damp heat	+60°C, 95% rH, 1000 hours, operating	IEC68-2-3	32
Damp heat, cyclic	+25°C...+55°C; >90% rH, operating	IEC 68-2-30, Db variation 1	16
Thermal shock	-40°C...+125°C, 100 cycles	IEC 68-2-14	42
Lifespan test	+85°C/1000 hours, operating	IEC 68-2-2	50
Vibration	5-500 Hz, 5g, 2.5 hours/axis at –40°C, +25° and 85°C, operating	IEC 68-2-6	8
Shock	30g/11ms (half sine), 3 shocks/axis; non-operating	IEC 68-2-27	8

Table 18: Environmental Specification

6 Settings

6.1 Default Settings

Following default settings apply if all GPSMODE pins are left open. Please refer to the *ANTARIS®4 System Integration Manual* [1] for information about further settings.

Interface	Module	Settings
Serial Port 1 Output USB Output	All	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, ZDA, TXT**
Serial Port 1 Input	All	9600 Baud, 8 bits, no parity bit, 1 stop bit, Autobauding disabled Automatically accepts following protocols without need of explicit configuration: **UBX, NMEA, RTCM** The GPS receiver supports interleaved UBX and NMEA messages.
USB Input	All	Automatically accepts following protocols without need of explicit configuration: **UBX, NMEA** The GPS receiver supports interleaved UBX and NMEA messages. USB Power Mode: Self Powered
TIMEPULSE	All	1 pulse per second, synchronized at rising edge, pulse length 100ms

Table 19: Available Protocols.

Module	Sensitivity Setting	Remark
LEA-4P, LEA-4R	Normal	The sensitivity mode can be changed with the CFG-RXM message.
LEA-4H, LEA-4T	Auto	
LEA-4A, LEA-4M, LEA-4S	High	

Table 20: sensitivity settings

7 Product Lineup

7.1 Ordering Information

Ordering No.	Product
LEA-4A-0-000-2	LEA-4A GPS Module
LEA-4H-0-000-1	LEA-4H GPS Module
LEA-4M-0-000-2	LEA-4M GPS Module
LEA-4P-0-000-1	LEA-4P GPS Module
LEA-4R-0-000-1	LEA-4R GPS Module
LEA-4S-0-000-2	LEA-4S GPS Module
LEA-4T-0-000-1	LEA-4T GPS Module
└──	Delivery Packing **0** = Single samples **1** = Tape on reel (100 pieces) LEA-4A, LEA-4H, LEA-4P, LEA-4R, LEA-4S, LEA-4T **2** = Tape on reel (250 pieces) LEA-4M

Table 21: Ordering Information

Related Documents

[1] ANTARIS®4 System Integration Manual, Doc No GPS.G4-MS4-05007

[2] ANTARIS®4 Protocol Specification, Doc No GPS.G3-X-03002

[3] TIM/LEA-4R System Integration Manual, Doc No GPS.G4-MS4-05043

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

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