Product summary

LEA-F9T series

u-blox F9 high accuracy timing modules

Standard

Professional

Automotive

Multi-band GNSS receiver with extended temperature range

- Meets the most stringent 5G timing requirements
- Ideal for global deployments due to configurable L1/L2/E5b and L1/L5/E5a multiband operation
- Unaffected by ionospheric errors
- Differential timing mode for highly accurate local timing
- Built-in security for highest robustness against malicious attacks
- Extended −40 °C to +105 °C temperature range for superior reliability in challenging environments

17.0 × 22.4 × 2.4 mm

Product description

The LEA-F9T timing modules provide nanosecond-level timing accuracy to the most demanding infrastructure applications.

LEA-F9T is designed to meet the most stringent timing synchronization requirements in 5G mobile networks on a global scale. By significantly reducing the time error of the primary source of cellular network synchronization, the LEA-F9T will help operators maximize the performance of their networks and so optimize the return on their investment in 5G communications.

The timing module's multi-band capability reduces the timing error under clear skies to less than 5 ns without the need for an external GNSS correction service. To further improve accuracy locally, the LEA-F9T features a differential timing mode that exchanges correction data with other neighboring GNSS timing receivers via a communication network.

LEA-F9T timing modules are pin-compatible with previous generations allowing ready migration from earlier designs. The extended temperature range and sulfur resistant components provide superior reliability even in compact urban 5G installations.

Multi-band access to all four global satellite constellations with support for L1/L2/E5b and L1/L5/E5a frequency bands strengthens the receiver's capability for delivering more reliable performance.

LEA-F9T includes advanced security features such as secure boot, secure interfaces, and T-RAIM to provide the highest level timing integrity. The module has a single RF input for all the GNSS bands and dual SAW filters for exceptional signal selectivity and out-of-band attenuation.

u-blox modules use GNSS chips qualified according to AEC-Q100, are manufactured in ISO/TS 16949 certified sites, and are fully tested on a system level. Qualification tests are performed as stipulated in the ISO16750 standard: "Road vehicles – Environmental conditions and testing for electrical and electronic equipment".

	LEA-F9T-10B	LEA-F9T-20B
Grade		
Automotive		
Professional	•	•
Standard		
GNSS		
GPS / QZSS	•	•
GLONASS	•	•
Galileo	•	•
BeiDou	•	•
NavIC	•	•
Multi-band	L1/L2/E5b and L1/L5/E5a	L1/L2/E5b and L1/L5/E5a
Interfaces		
UART	1	1
USB	1	1
SPI	1	1
DDC (I2C compliant)	1	1
Features		
Programmable (Flash)	•	•
Data logging	•	•
Carrier phase output	•	•
Additional SAW	•	•
Additional LNA	•	•
RTC crystal	•	•
Oscillator	T	T
Survey-in and fixed mode	•	•
Time pulse output	2	2
Time mark input	2	2
Temperature range up to [°C]	105	85
Power supply		
2.7 V – 3.6 V	•	•

T = TCXO

LEA-F9T series

Features

Receiver type	184-channel u-blox F9 engine GPS L1C/A, L2C, L5 GLO L1OF GAL E1B/C, E5b, E5a BDS B1I, B1C, B2a QZSS L1C/A, L2C, L5 NavIC L5 SBAS L1C/A: WAAS, EGNOS, MSAS, GAGAN	
Nav. update rate[1]	up to 20 Hz	
Position accuracy[2]	Standalone	1.5 m CEP
Acquisition	Cold starts Aided starts Reacquisition	26 s 2 s 1 s
Sensitivity	Tracking & Nav. Reacquisition Hot starts Cold starts	-167 dBm -160 dBm -157 dBm -148 dBm
Assistance	AssistNow Online OMA SUPL & 3GPP compliant	
Oscillator	TCXO	
RTC crystal	Built-in	
Anti-jamming	Active CW detection and removal Dual onboard band pass filters	
Anti-spoofing	Advanced anti-spoofing algorithms	
Security	Secure boot Secure firmware update	
Memory	Flash	
Supported antennas	Active	

1 The highest navigation rate can limit the number of supported constellations
2 Depends on atmospheric conditions, GNSS antenna, multipath conditions, satellite visibility, and geometry

Features - Timing

Timing accuracy	<5 ns (1-sigma, clear sky, absolute mode) <2.5 ns (1-sigma, clear sky, differential mode)
Time pulse frequency	0.25Hz – 25 MHz
Time pulse jitter	±4 ns
Time mark resolution	8 ns
Integrity reports	T-RAIM active, phase uncertainty Time pulse rate/duty-cycle, inter-constellation biases
Survey-in period	Configurable

Features - Raw data

Measurement data	Carrier phase, code phase & pseudo-range, Doppler on all signals
Message data	GPS, GLONASS, BeiDou, Galileo, QZSS, SBAS

Package

28 pin LCC (Leadless Chip Carrier) with additional middle ground pads
17.0 x 22.4 x 2.4 mm

Environmental data, quality & reliability

Operating temp.	LEA-F9T-10B: –40 °C to +105 °C LEA-F9T-20B: –40 °C to +85 °C
Storage temp.	LEA-F9T-10B: –40 °C to +105 °C LEA-F9T-20B: –40 °C to +85 °C

RoHS compliant (lead-free)

ETSI-RED compliant

Qualification according to ISO 16750

Manufactured and fully tested in ISO/TS 16949 certified production sites

Uses u-blox F9 chips qualified according to AEC-Q100

High vibration and shock resistance

Electrical data

Supply voltage	2.7 V to 3.6 V
Power consumption	78 mA @ 3.0 V (continuous)
Backup supply	1.65 V to 3.6 V

Interfaces

Serial interfaces	1 USB 1 UART 1 SPI 1 DDC (I2C compliant)
Protocols	NMEA, UBX binary, RTCM version 3.3
Time pulse output	2
Time mark input	2

Support products

u-blox support products provide reference design, and allow efficient integration and evaluation of u-blox positioning technology.

RCB-F9T	u-blox F9 multi-band GNSS timing board
EVK-F9T	u-blox F9 GNSS timing evaluation kit
ANN-MB	L1/L2 multi-band active GNSS antenna
ANN-MB1	L1/L5 multi-band active GNSS antenna

Product variants

LEA-F9T-10B	u-blox F9 high accuracy timing module with -40 °C to +105 °C temperature range
LEA-F9T-20B	u-blox F9 high accuracy timing module with -40 °C to +85 °C temperature range

Further information

For contact information, see **www.u-blox.com/contact-u-blox**.
For more product details and ordering information, see the product data sheet.