



## Product summary

# LEA-F9T series

## u-blox F9 high accuracy timing modules



### 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, including Galileo OSNMA, for highest robustness against malicious attacks
- Extended -40 °C to +105 °C temperature range for superior reliability in challenging environments



### 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, Galileo OSNMA, 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 IATF 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-11B	LEA-F9T-20B	LEA-F9T-21B
<b>Grade</b>				
Automotive				
Professional	•	•	•	•
Standard				
<b>GNSS</b>				
GPS / QZSS	•	•	•	•
GLONASS	•		•	
Galileo	•	•	•	•
BeiDou	•	•	•	•
NavIC	•	•	•	•
Multi-band	L1/L2/E5b and L1/L5/E5a			
<b>Interfaces</b>				
UART	1	1	1	1
USB	1	1	1	1
SPI	1	1	1	1
DDC (I2C compliant)	1	1	1	1
<b>Features</b>				
Programmable (Flash)	•	•	•	•
Galileo OSNMA		•		•
Carrier phase output	•	•	•	•
Additional SAW	•	•	•	•
Additional LNA	•	•	•	•
RTC crystal	•	•	•	•
Oscillator	T	T	T	T
Survey-in and fixed mode	•	•	•	•
Time pulse output	2	2	2	2
Time mark input	2	2	2	2
Temperature range up to [°C]	105	105	85	85
<b>Power supply</b>				
2.7 V – 3.6 V	•	•	•	•

T = TCXO



## Features

Receiver type	184-channel u-blox F9 engine LEA-F9T-10B, LEA-F9T-20B: GPS L1C/A, L2C, L5    QZSS L1C/A, L2C, L5 GAL E1B/C, E5b, E5a    BDS B1I, B1C, B2a, B2I NavIC L5                    GLO L1OF SBAS L1C/A: WAAS, EGNOS, MSAS, GAGAN	
	LEA-F9T-11B, LEA-F9T-21B: GPS L1C/A, L2C, L5    QZSS L1C/A, L2C, L5 GAL E1B/C, E5b, E5a    BDS B1I, B1C, B2a, B2I NavIC L5 SBAS L1C/A: WAAS, EGNOS, MSAS, GAGAN	
Nav. update rate <sup>1</sup>	up to 20 Hz	
Position accuracy <sup>2</sup>	Standalone	1.5 m CEP
Acquisition	Cold starts	26 s
	Aided starts	2 s
	Reacquisition	1 s
Sensitivity	Tracking & Nav.	-167 dBm
	Reacquisition	-160 dBm
	Hot starts	-157 dBm
	Cold starts	-148 dBm
Assistance	AssistNow Live orbits 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 Galileo OSNMA	
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

## Further information

For contact information, see [www.u-blox.com/contact-u-blox](http://www.u-blox.com/contact-u-blox).  
For more product details and ordering information, see the product data sheet.

## 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 and 11B: -40 °C to +105 °C LEA-F9T-20B and 21B: -40 °C to +85 °C
Storage temp.	LEA-F9T-10B and 11B: -40 °C to +105 °C LEA-F9T-20B and 21B: -40 °C to +85 °C

RoHS compliant (lead-free)

ETSI-RED compliant

Qualified according to u-blox qualification policy, based on a subset of AEC-Q104

Manufactured and fully tested in IATF 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.

M2-ZED-F9T	u-blox F9 multi-band GNSS timing card
RCB-F9T	u-blox F9 multi-band GNSS timing board
EVK-F9T	u-blox F9 GNSS timing evaluation kit
ANN-MB2	All-band high precision GNSS antenna

## Product variants

LEA-F9T-10B	u-blox F9 high accuracy timing module with -40 °C to +105 °C temperature range
LEA-F9T-11B	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
LEA-F9T-21B	u-blox F9 high accuracy timing module with -40 °C to +85 °C temperature range

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