

ALEX-R5 series



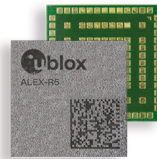
Ultra-small LTE-M / NB-IoT SiP with Secure Cloud

Miniature form factor with integrated u-blox UBX-R5 and UBX-M8 chipsets

- Designed to last an IoT lifetime and 5G-ready
- Super low power, accurate, and reliable positioning with u-blox M8 GNSS receiver
- Optimized for ultra-low power IoT applications
- Built-in, hardware-based Secure Cloud functionality supporting IoT-Security-as-a-Service
- Concurrent accurate positioning and LTE signalling, as needed by tracking applications



14.0 × 14.0 × 1.5 mm



ALEX-R510M8S

Product description

The very small ALEX-R510M8S delivers LTE-M and NB-IoT connectivity with GNSS positioning. It combines the secure u-blox UBX-R5 IoT chipset and the u-blox UBX-M8230 GNSS chipset with the highest level of integration in a System-in-Package (SiP). Measuring just 14 x 14 x 1.5 mm, ALEX-R510M8S occupies less than 50% of SARA-R5's PCB without affecting the overall LTE and positioning performance. It is ideal for size-constrained devices like people and animal wearables, small asset trackers, portable healthcare systems and other small IoT applications. The Super-E mode of the GNSS receiver provides ALEX-R510M8S with an ideal balance between low power and good performance. It is optimized for power-sensitive and battery-powered applications, featuring a market-leading sub- μ A current consumption in PSM mode.

ALEX-R510M8S offers a dedicated GNSS serial interface and a dedicated GNSS antenna interface, which provides highly reliable and accurate positioning data concurrent with LTE communication. In addition, the module offers unique hybrid positioning, in which the GNSS position is enhanced with u-blox CellLocate[®] data, providing location always and everywhere.

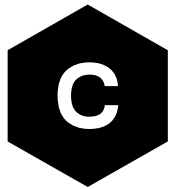
u-blox Secure Cloud functionality, which supports IoT-Security-as-a-Service, makes ALEX-R510M8S the ideal choice for devices that transmit critical and confidential information.

With all in-house technology and full hardware and software ownership, u-blox can guarantee long-term device availability and provide lifetime support of the entire platform, down to the chipset level. u-blox R5 series modules are the only products in the market with a real LTE and GNSS chip-down integration, supporting the standard LTE-M and NB-IoT Power Class 3 of 23 dBm maximum output power, yielding better performance at cell edges and under more challenging network conditions.

The LTE-M and NB-IoT module supports a comprehensive set of 3GPP Rel. 14 features that are relevant for IoT applications, like improvements to power consumption, coverage, data rate, mobility, and positioning. It is 5G-ready, meaning customers will be able to upgrade software on their deployed devices once 5G LTE has been rolled out by mobile operators, which greatly improves product scalability and lifetime.

Grade	
Automotive	
Professional	•
Standard	
Regions	
	Multi-region
Access technology	
LTE bands	*
Data rate	M1/NB2
LTE Power class	23 dBm
Positioning	
Integrated GNSS receiver	•
Dedicated GNSS antenna interface	•
External GNSS control	
AssistNow software	•
CellLocate [®]	•
Interfaces	
UART	2
USB (for diagnostics)	1
DDC (I2C)	1
USIM	1
GPIO	11
Audio	
Digital audio	□
Features	
IoT-Security-as-a-Service	•
Root of trust: secure element	•
ThingStream Anywhere MQTT-SN client	•
MQTT, MQTT-SN	•
Antenna dynamic tuning	•
Ultra low PSM	•
TCP/UDP	•
HTTP, FTP	•
TLS/DTLS	•
FW update via serial (FOAT)	•
uFOTA	•
LwM2M, dynamically loaded objects	•
CoAP	•
Last gasp	•
Jamming detection	•
Antenna and SIM detection	•

* = LTE-M/NB-IoT bands: 1, 2, 3, 4, 5, 8, 12, 13, 18, 19, 20, 25, 26, 28, 66, 71, 85 □ = Available in future FW version
 NB2 = Cat NB2 (125 kbit/s DL, 140 kbit/s UL)
 M1 = LTE Cat M1 (375 kbit/s DL, 1200 kbit/s UL)



Features

LTE	3GPP Release 13 LTE Cat M1 and NB1 3GPP Release 14 LTE Cat M1: Coverage enhancement mode B, Uplink TBS of 2984b, Clot optimizations, and Release Assistance Indication (RAI) 3GPP Release 14 LTE Cat NB2: Higher data rate (TBS of 2536b), mobility enhancement (RRC connection re-establishment), E-Cell ID, lower power class PC6 (14 dBm), two HARQ processes, release assistant, random access on non-anchor carrier, and Clot optimizations Cat M1 Half-duplex, 375 kbit/s DL, 1200 kbit/s UL Cat NB2 Half-duplex, 125 kbit/s DL, 140 kbit/s UL
SMS	MT/MO PDU / text mode SMS over SG/NAS

Security

Foundation Security	Root of trust - embedded secure element EAL5+ high certified Secure boot, updates and production Anticlone detection and rejection Device automatic enrollment and change of ownership
Design Security	Local data protection Local chip-to-chip (C2C) security
End-to-End Security	E2E symmetric key management system (KMS) E2E data protection E2E data integrity
Access Control	Zero touch provisioning for AWS and Azure

Software features

Protocols	Dual stack IPv4 and IPv6 PPP over IPv4 and IPv6 Embedded TCP/IP, UDP/IP, FTP, HTTP, DNS Embedded secure MQTT and MQTT-SN Embedded CoAP and LwM2M Embedded TLS/DTLS SIM provisioning (BIP)
Device management	LwM2M with dynamically loaded objects
Positioning	Integrated u-blox M8 chipset with concurrent GNSS (GPS, GLONASS, BeiDou, Galileo) Dedicated GNSS antenna interface AssistNow for fastest time-to-first-fix CellLocate® and hybrid positioning
Functionalities	Antenna dynamic tuning Last gasp Jamming detection Antenna and SIM detection
Firmware upgrade	Via UART uFOTA client/server solution (firmware upgrade over the air)

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](#).

Package

133-pin LGA: 14.0 x 14.0 x 1.5 mm

Environmental data, quality, and reliability

Operating temperature -40 °C to +85 °C

RoHS compliant (lead-free)

Qualification according to ISO 16750

Manufactured in ISO/TS 16949 certified production sites

Certifications and approvals

ALEX-R5 series FCC, ISED, GCF, PTCRB, Verizon, AT&T, T-Mobile¹, RED, Vodafone¹, Deutsche Telekom¹, KCC¹, SKT¹, Giteki¹, Softbank¹, RCM¹, Telstra¹, ICASA¹, NCC¹

1 = Planned certifications

Electrical data

Power supply 3.8 V nominal, range 3.0 V to 4.5 V

PSM current consumption 0.5 µA

eDRX current consumption 130 µA

LTE Cat M1 195 mA (at 23 dBm)
 Connected mode current consumption

Interfaces

Serial 8-wire UART, configurable as 2x 4-wire UART with ring indication
 DDC (I2C)
 USB for diagnostics

GPIO Up to 11 GPIOs, configurable

(U)SIM Supports 1.8 V and 3.0 V

Support products

EVK-ALEXR510M8S Evaluation kit for ALEX-R510M8S

Product variants

ALEX-R510M8S Secure Cloud LTE-M and NB-IoT SiP with integrated u-blox M8 GNSS receiver for multi-regional use

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