Product summary

ALEX-R5 series

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

Miniature form factor with integrated u-blox SIP 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

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-μA 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.
# ALEX-R5 series

## Features

### LTE
- **3GPP Release 13 LTE Cat M1 and NB1**
  - Coverage enhancement mode B, Uplink TBS of 2984b, CIoT optimizations, and Release Assistance Indication (RAI)
- **3GPP Release 14 LTE Cat M1**
  - 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 CIoT 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/MD PDU / text mode
- SMS over SG/NAS

### Security
- **Foundation Security**
  - Root of trust - embedded secure element
  - EAL5+ high certified
  - Secure boot, updates and production
  - Anti-cloning 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 MB chipset with concurrent GNSS (GPS, GLONASS, BeiDou, Galileo)
  - Dedicated GNSS antenna interface
  - AssistNow for fastest time-to-first-fix
  - CellLocate® and hybrid positioning
- **Functionality**
  - Antenna dynamic tuning
  - Last gasp
  - Jamming detection
  - Antenna and SIM detection
- **Firmware upgrade**
  - Via UART
  - uFOTA client/server solution (firmware upgrade over the air)

## Package
- 133-pin LGA: 14.0 x 14.0 x 1.5 mm

## 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 Connected mode current consumption**
  - 195 mA (at 23 dBm)

## 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-ALEXR510M8** Evaluation kit for ALEX-R510M8

## Product variants
- **ALEX-R510M8**
  - Secure Cloud LTE-M and NB-IoT SIPvC
  - Integrated u-blox M8 GNSS receiver for multi-regional use

## 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.

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