SARA-R5 series

LTE-M / NB-IoT modules based on u-blox chipset

Product description

The SARA-R5 series is based on u-blox’s UBX-R5 cellular chipset and the u-blox M8 GNSS receiver chip. By bringing all technology building blocks in house and having full hardware and software ownership, u-blox provides long-term device availability and lifetime support of the entire platform, down to the chipset level.

The LTE-M and NB-IoT modules support 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. They are 5G-ready, meaning customers will be able to (software) upgrade their deployed devices, once 5G LTE has been rolled out by mobile operators, thus greatly improving end-product scalability and lifetime.

The SARA-R5 series includes three hardware configurations that address the different needs of the IoT applications. SARA-R500S is a general purpose LTE module, intended for applications that favor the flexibility of an external GNSS receiver, or that do not need GNSS capabilities at all.

SARA-R510M8S is pre-integrated with the u-blox M8 GNSS receiver and separate GNSS antenna interface, which provides highly reliable, accurate positioning data in parallel to LTE communication.

SARA-R510S has been optimized for extremely low power consumption, using less than 1 μA of current in PSM mode, and is ideal for battery-powered applications.

The SARA-R5 series delivers state-of-the-art security thanks to its secure boot, secure updates, and secure production implementation. All variants work seamlessly with the u-blox AssistNow A-GNSS service as well as with the CellLocate mobile network-based location service.

With u-blox’s communication services – MQTT Anywhere or MQTT Flex – data overhead, time spent on-the-air, and energy consumption can be reduced, thus enabling users to extend device life cycles, lower costs, and improve ROI. SARA-R5 is AWS IoT Core qualified and Microsoft Azure certified.

Product summary

SARA-R500S

SARA-R510S

SARA-R510M8S

Grade

Automotive

Professional

Standard

Regions

Multi-region

Access technology

<table>
<thead>
<tr>
<th>LTE bands</th>
<th>Data rate</th>
<th>LTE Power class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4, 5, 8, 12, 13, 18, 19, 20, 25, 26, 28, 66, 71, 85</td>
<td>M1/NB2</td>
<td>23 dBm</td>
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</tbody>
</table>

Positioning

<table>
<thead>
<tr>
<th>Integrated GNSS receiver</th>
<th>Dedicated GNSS antenna interface</th>
<th>External GNSS control</th>
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<tbody>
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Compatible u-blox Services

<table>
<thead>
<tr>
<th>MQTT Anywhere, MQTT Flex</th>
<th>AssistNow™</th>
<th>CellLocate®</th>
<th>CloudLocate</th>
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<tbody>
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Interfaces

<table>
<thead>
<tr>
<th>UART</th>
<th>USB (for diagnostics)</th>
<th>DDC (I2C)</th>
<th>USIM</th>
<th>GPIO</th>
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<tbody>
<tr>
<td>2</td>
<td>1</td>
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<td>6</td>
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Features

<table>
<thead>
<tr>
<th>Open CPU (μCPU)</th>
<th>Secure boot, updates, and production</th>
<th>MQTT, MQTT-SN</th>
<th>Antenna dynamic tuning</th>
<th>Ultra low PSM</th>
<th>HTTP, FTP</th>
<th>TCP/UDP</th>
<th>TLS/DTLS</th>
<th>FW update via serial (FOAT)</th>
<th>CoAP and LwM2M2</th>
<th>Last gas</th>
<th>Jamming detection</th>
<th>Antenna and SIM detection</th>
<th>CellTime</th>
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| M1 = LTE Cat M1 (375 kb/s DL, 1200 kb/s UL) |
| NB2 = Cat NB2 (125 kb/s DL, 140 kb/s UL) |

= Available in future FW version
SARA-R5 series

Features

**LTE**
- 3GPP Release 13 LTE Cat M1 and NB1
- 3GPP Release 14 LTE Cat M1: Coverage enhancement mode B, Uplink TBS of 2984b, CoIoT 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
- Cat M1 Half-duplex, 375 kb/s DL, 1200 kb/s UL
- Cat NB2 Half-duplex, 125 kb/s DL, 140 kb/s UL

**SMS**
- MT/MD PDU / text mode
- SMS over SG/NAS

Compatible u-blox services

- Communication: MQTT Anywhere, MQTT Flex
- Location: AssistNow, CellLocate, CloudLocate

Software features

- **Protocols**
  - Dual stack IPv4 and IPv6
  - PPP over IPv4 and IPv6
  - Embedded TCP/IP, UDP/IP, FTP, HTTP, DNS
  - Embedded MQTT and MQTT-SN
  - Embedded CoAP and LwM2M
  - Embedded TLS/DTLS
  - SIM provisioning (BIP)

- **Positioning**
  - Integrated u-blox M8 chip with concurrent GNSS (GPS, GLONASS, BeiDou, Galileo)
  - Dedicated GNSS antenna interface
  - Direct access to u-blox GNSS via module

- **Functionality**
  - Antenna dynamic tuning
  - CellTime for robust and accurate timing reference
  - Last gasp
  - Jamming detection
  - Antenna and SIM detection

- **Firmware upgrade**
  - Via UART
  - uFOTA client/server solution
  - (firmware upgrade over the air)

Interfaces

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

- **GPIO**
  - Up to 6 GPIOs, configurable

- **(U)SIM**
  - Supports 1.8 V and 3.0 V

Package

- 96 pin LGA: 16.0 x 26.0 x 2.2 mm, < 3 g

Environmental data, quality & reliability

- Operating temperature: -40 °C to +85 °C
- RoHS compliant (lead-free)
- Qualification according to AEC-Q104
- Manufactured in ISO/TS 16949 certified production sites

Certifications and approvals

- SARA-R5 series
  - FCC, ISED, GCF, PTCRB, Verizon, AT&T, US Cell, T-Mobile, Telus, Rogers 1, RED, Vodafone 3, Deutsche Telekom 3, KCC 3, SKT 3, Giteki, Softbank 3, KDDI 3, RCM, Telstra, ICASA 3, NCC
- SARA-R5 series
  - AWS IoT Core qualified
  - Microsoft Azure certified

3 = Planned certifications

Electrical data

- **Power supply**: 3.8 V nominal, range 3.0 V to 4.5 V
- **PSM current consumption**: 0.5 µA (SARA-R510S), 62 µA (SARA-R500S, SARA-R510M8S)
- **eDRX current consumption**: 180 µA
- **LTE Cat M1 Connected mode current consumption**: 195 mA (at 23 dBm)
- **LTE Cat NB2 Connected mode current consumption**: 135 mA (at 23 dBm)

Support products

- EVK-R500S Evaluation kit for SARA-R500S
- EVK-R510S Evaluation kit for SARA-R510S
- EVK-R510M8S Evaluation kit for SARA-R510M8S

Product variants

- SARA-R500S Secure cloud LTE-M and NB-IoT module for multi-regional use
- SARA-R510S Secure cloud LTE-M and NB-IoT module for multi-regional use with ultra low PSM
- SARA-R510M8S Secure cloud LTE-M and NB-IoT module with 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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