Product summary

SARA-R5 series

LTE-M / NB-IoT modules with Secure Cloud

Standard

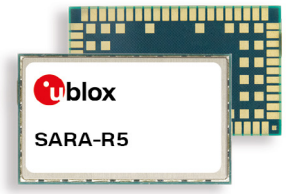
Professional

Automotive

Designed to last an IoT lifetime: 5G-ready with the u-blox UBX-R5 chipset

- Built-in Secure Cloud functionality with hardware-based root of trust inside discrete secure element
- IoT-Security-as-a-Service protects your business-critical data from device to cloud
- Accurate and reliable positioning, always and everywhere, with u-blox M8 GNSS receiver
- Optimized ultra-low power consumption
- Cost-effective, power efficient, end-to-end IoT communication with MQTT Anywhere and MQTT Flex

16.0 × 26.0 × 2.2 mm



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, greatly improving end-product scalability and lifetime.

The SARA-R5 series includes three Secure Cloud variants that support u-blox IoT-Security-as-a-Service, making these the ideal choice for devices that transmit critical and confidential information. The SARA-R5 modules are combined with an internal, hardware-based secure element and a lightweight pre-shared key management system for state-of-the-art security. The overall solution protects your business-critical data from device to cloud and ensures total control of the device certificate lifecycle.

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. All versions work seamlessly with the u-blox AssistNow A-GNSS service as well as the CellLocate mobile network-based location service.

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.

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.

	SARA-R500S	SARA-R510S	SARA-R510M8S
Grade			
Automotive			
Professional	•	•	•
Standard			
Regions			
	Multi-region		
Access technology			
LTE bands	1, 2, 3, 4, 5, 8, 12, 13, 18, 19, 20, 25, 26, 28, 66, 71, 85		
Data rate	M1/NB2	M1/NB2	M1/NB2
LTE Power class	23 dBm	23 dBm	23 dBm
Positioning			
Integrated GNSS receiver			•
Dedicated GNSS antenna interface			•
External GNSS control	•	•	
Compatible u-blox Services			
MQTT Anywhere, MQTT Flex	•	•	•
AssistNow™	•	•	•
CellLocate®	•	•	•
IoT Security-as-a-Service	•	•	•
Interfaces			
UART	2	2	2
USB (for diagnostics)	1	1	1
DDC (I2C)	1	1	1
USIM	1	1	1
GPIO	6	6	6
Digital audio	□	□	□
Features			
Root of trust: secure element	•	•	•
Secure boot, updates, and production	•	•	•
MQTT, MQTT-SN	•	•	•
Antenna dynamic tuning	•	•	•
Ultra low PSM		•	
HTTP, FTP	•	•	•
TCP/UDP	•	•	•
TLS/DTLS	•	•	•
FW update via serial (FOAT)	•	•	•
uFOTA	•	•	•
CoAP	•	•	•
Last gasp	•	•	•
Jamming detection	•	•	•
Antenna and SIM detection	•	•	•
CellTime	•	•	•

NB2 = Cat NB2 (125 kbit/s DL, 140 kbit/s UL)
M1 = LTE Cat M1 (375 kbit/s DL, 1200 kbit/s UL)

□ = Available in future FW version

SARA-R5 series

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Features

LTE	**3GPP Release 13 LTE Cat M1 and NB1** **3GPP Release 14 LTE Cat M1**: Coverage enhancement mode B, Uplink TBS of 2984b, CIoT 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 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

Compatible u-blox services

Communication	MQTT Anywhere MQTT Flex
Location	AssistNow CellLocate
Security	Design Security: Local data protection, Local chip-to-chip (C2C) security End-to-End Security: symmetric key management system (KMS), data protection, data integrity Access Control: Zero Touch Provisioning

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 [1] (GPS, GLONASS, BeiDou, Galileo) Dedicated GNSS antenna interface [1] Direct access to u-blox GNSS via module [2]
Functionalities	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)

1 = On SARA-R510M8S

2 = On SARA-R500S and SARA-R510S

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 [3], 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)

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

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**.

For more product details and ordering information, see the product data sheet.

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SARA-R500S-01B SARA-R510M8S-01B SARA-R510S-01B