

SARA-R5 series



LTE-M / NB-IoT modules with secure cloud

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

- Built-in end-to-end security with hardware-based root of trust inside discrete secure element
- Full security suite with foundation, design and end-to-end security, as well as access control
- Accurate and reliable positioning, always and everywhere, with u-blox M8 GNSS receiver
- Optimized ultra-low power consumption
- Critical firmware updates delivered and services enabled via uFOTA



Standard

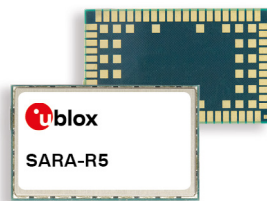


Professional



Automotive

16.0 × 26.0 × 2.5 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 can guarantee long-term device availability and provide 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 unique security based services, making these the ideal choice for devices that transmit critical and confidential information. The SARA-R5 modules benefit from the technology ownership of the entire value chain and are combined with an internal, hardware-based, secure element and a lightweight pre-shared key management system that guarantee state-of-the-art security. Thanks to this implementation, the SARA-R5 series offers security-based features and services like local data encryption and decryption, zero touch provisioning, anti-cloning, and secure chip-to-chip communication.

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. 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.

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.

Customers can future-proof their solutions by means of OTA firmware updates, thanks to the uFOTA client/server solution, which utilizes LWM2M, a light and compact protocol ideal for IoT applications.

	SARA-R500S	SARA-R510S	SARA-R510M8S
Grade			
Automotive			
Professional	•	•	•
Standard			
Regions	Multi-region		
Access technology			
LTE bands	*	*	*
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			•
Position via modem	•	•	•
AssistNow software	•	•	•
CellLocate®	•	•	•
Interfaces			
UART	2	2	2
USB (for diagnostics)	1	1	1
DDC (I2C)	1	1	1
USIM	1	1	1
GPIO	6	6	6
Audio			
Digital audio	□	□	□
Features			
Secure cloud services	v1.1	v1.1	v1.1
Root of trust: secure element	•	•	•
Antenna dynamic tuning	•	•	•
CellTime	•	•	•
Ultra low PSM		•	
TCP/UDP	•	•	•
HTTP, FTP	•	•	•
TLS/DTLS	•	•	•
FW update via serial (FOAT)	•	•	•
uFOTA	•	•	•
LWM2M, dynamically loaded objects	•	•	•
MQTT, MQTT-SN	•	•	•
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, 26, 28
 LTE-M only band: 25
 NB-IoT only bands: 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 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

Security

Foundation Security	Root of trust - embedded secure element EAL5+ high certified Secure boot, updates and production Anticlone detection & rejection Device automatic enrollment and change of ownership
Design Security	Local authenticated data en-/decryption Chip-to-Chip (C2) security
End-to-End Security	Pre-shared keys (PSK) provisioning E2E data en-/decryption E2E data integrity & authenticity
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 chip with concurrent GNSS ¹ (GPS, GLONASS, BeiDou, Galileo) Dedicated GNSS antenna interface ¹ Direct access to u-blox GNSS via module ² AssistNow for fastest time-to-first-fix CellLocate® & hybrid positioning
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

Further information

For contact information, see www.u-blox.com/contact-us.

For more product details and ordering information, see the [product data sheet](#).

Package

96 pin LGA: 16.0 x 26.0 x 2.5 mm, < 3 g

Environmental data, quality & 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

SARA-R5 series	FCC, ISED, GCF, PTCRB, Verizon, AT&T, T-Mobile ³ , Sprint ³ , RED, Vodafone ³ , Deutsche Telekom ³ , KCC ³ , SKT ³ , Giteki ³ , Softbank ³ , RCM ³ , Telstra ³ , ICASA ³ , NCC ³
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3 = Planned certifications

Electrical data

Power supply	3.8 V nominal, range 3.0 V to 4.5 V
PSM current consumption	0.7 µA SARA-R510S 67 µA SARA-R500S, SARA-R510M8S
eDRX current consumption	1.2 mA (eDRX = 81.92 s)
LTE Cat M1 Connected mode current consumption	175 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	Ordering code: SARA-R500S-00B Secure cloud LTE-M and NB-IoT module for multi-regional use
SARA-R510S	Ordering code: SARA-R510S-00B Secure cloud LTE-M and NB-IoT module for multi-regional use with ultra low PSM
SARA-R510M8S	Ordering code: SARA-R510M8S-00B Secure cloud LTE-M and NB-IoT module with integrated u-blox M8 GNSS receiver for multi-regional use

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