u-blox cellular product overview

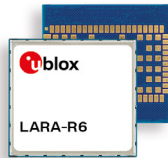## Powerful, easy-to-integrate, comprehensive cellular modules and chips

Cellular modules for all kinds of applications

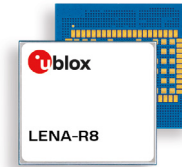u-blox cellular modules optimize performance and cost, while supporting seamless technology transitions.

SARA series
LTE-M, NB-IoT, and 2G
LGA modules
16.0 x 26.0 x 2.2-3.0 mm

LARA series
LTE Cat 1 and Cat 4
LGA modules
24.0 x 26.0 x 2.6 mm

LENA series
LTE Cat 1bis
LGA modules
27 x 30 x 2.6 mm

Key features and benefits

Market-specific differentiators
- Unique features for automotive, industrial, and consumer markets

Technology designed for IoT
- Built to last an IoT lifetime: Long-term availability of integrated chipset platforms
- Secure by design: Industry-leading, foundational hardware and software security with proven and lightweight key management system
- Compatible with u-blox communication, location and security services

Reduced system complexity
- Pin/pad compatible through nested design
- Seamless operation with u-blox GNSS and Wi-Fi / Bluetooth modules, along with flexibility to choose the best-suited module for specific applications
- Extensive set of features accessible via AT commands to simplify development
- Common AT commands simplify developing applications for multiple products

Ecosystem enablement
- Broad portfolio of technologies provide great flexibility and top performance
- Comprehensive set of worldwide cellular certifications that increase scalability and reduce cost for IoT solutions

Technology selection

IoT and automotive applications are very diverse. Different cellular technologies provide capabilities for a large variety of use cases. The comprehensive portfolio of u-blox cellular modules provides the right option for your product development:

	2G	3G	NB-IoT	LTE-M	LTE Cat 1	LTE Cat 4
Data rate	kb/s	Mb/s	kb/s	kb/s	10 Mb/s	150 Mb/s
Low latency	•	•		1	•	•
Indoor / underground penetration			•	2		
Low power			•	•		
Voice	•	•		3	•	3
2G/3G fallback				4	4	4

1 = Low latency if the device is not operating in PSM and eDRX
2 = Partly fulfilled: MCL GPRS -144 dB, LTE-M -155 dB, NB-IoT -164 dB
3 = Supported in a subsequent firmware version
4 = Variant dependent

u-blox cellular product overview

Why choose a u-blox cellular module?

As the world is becoming increasingly connected, cellular modules are critical components in the development of IoT devices and automotive communication hubs. They collect data from sensors, transmit it between connected objects and, in some cases, store data locally on devices deployed in the field. Choosing the right supplier to ensure a properly functioning, secure and sustainable module for your IoT or automotive application is an important business decision.

Financial stability and IPR protection
- Publicly traded on the Swiss stock exchange, providing transparency and guaranteeing quality and security
- Full intellectual property indemnity based on FRAND for standard essential patents at the module level

First class technical support
- Highly responsive and competent support teams with strong technical know-how
- Global technical support network with local support through all stages of development
- Extensive technical documentation
- Evaluation kits and application boards for design testing with minimal resources

High quality and reliability
- Lowest ppm level during customer production and in the field
- Very short delivery time due to multiple well-stocked locations
- Stringent product change notification process with advanced notification
- In-house reliability and test equipment
- Zero defect strategy, e.g. testing of functions within tolerance, X-ray inspection

GNSS integration

u-blox's unrivalled core competencies in cellular and positioning technologies bring strong synergies, as both are often required together in today's sophisticated applications.

External GNSS: Provides utmost flexibility to choose GNSS features, accuracy, and sensitivity. GNSS-related commands are tunneled, allowing the host processor to fully control both subsystems through single serial interface and user-friendly AT commands.

Integrated GNSS: Modules based on u-blox cellular chipsets include u-blox M8/M10 GNSS reception, delivering high performance satellite positioning alongside cellular data connectivity.

Chipset integration

Modules based on our chipsets are not dependent on third parties and are focused on IoT-specific feature development. This translates into long-term availability, roadmap stability, and technical support down to the silicon level.

- Designed to last an IoT lifetime: Long-term availability of the platform
- Excellent customer support: down to a chip level, thanks to the u-blox R5 core
- Unique and IoT-focused services: via access to low-level chip data

Product grades

	Standard grade	Professional grade	Automotive grade
Environmental conditions	Consumer environment	Industrial environment	Automotive environment
Temperature	-20 °C to +65 °C	-40 °C to +85 °C	-40 °C to +85 °C or extended (up to +105 °C on some products)
Product qualification	JESD47 (ICs) Subset of AEC-Q104 non-biased (modules)	AEC-Q100 (ICs) u-blox policy / sub-set of AEC-Q104 (modules)	AEC-Q100 (ICs) AEC-Q104 (modules)
Process levels for design, manufacturing, and testing	• 100% outgoing test • Product traceability • PCN process • Failure analysis	Standard grade, plus: • 100% automatic X-ray and optical inspection of modules	Professional grade, plus: • PPAP, automotive test flow, ISO/TS 16949 manufacturing, component traceability, 8D failure reporting, automotive PCN process, long product life cycles, 0-ppm program

Form factors, technologies, and regions

For each module variant, the main and fallback technologies are shown in the regions where they are to be used.

Modules	EMEA					North America					South America					APAC				
	G	U	N	R	L	G	U	N	R	L	G	U	N	R	L	G	U	N	R	L
SARA-R500S-01B			•	•				•	•				•	•				•	•	
SARA-R500S-61B																		J	J	
SARA-R510S-01B			•	•				•	•				•	•				•	•	
SARA-R510S-61B																		J	J	
SARA-R510M8S-01B			•	•				•	•				•	•				•	•	
SARA-R510M8S-61B																		J	J	
SARA-R510M8S-71B																		K	K	
SARA-R540S			•	•				•	•				•	•				•	•	
SARA-R510AWS			•						•				•						•	
SARA-R500E									•											
SARA-R422	•		•	•		•		•	•		•		•	•		Δ		•	•	
SARA-R422S	•		•	•		•		•	•		•		•	•		Δ		•	•	
SARA-R422M10S	•		•	•		•		•	•		•		•	•		Δ		•	•	
SARA-N310			•										•					•		
LARA-L6004	•	•			•	•	•	•		•	•	•			•	•	•	•		•
LARA-L6004D	•	•			•	•	•	•		•	•	•			•	•	•	•		•
LARA-L6404D										•										
LARA-R6001	•	•		•		•	•		•		•	•		•		Δ	•		•	
LARA-R6001D	•	•		•		•	•		•		•	•		•		Δ	•		•	
LARA-R6401									•											
LARA-R6401D									•											
LARA-R6801	•	•		•							•	•		•		Δ	•		•	
LENA-R8001	•			•		•			o		•			•		Δ			•	
LENA-R8001M10	•			•		•			o		•			•		Δ			•	
SARA-G450	•										•					Δ				

Legend:

G = GSM/GPRS

U = UMTS/HSPA

N = NB-IoT

R = LTE-M, LTE Cat 1

L = LTE Cat 4

• = Main technology

• = Fallback technology

o = LTE Cat1bis with supported roaming but not certified by MNOs

Δ = GSM/GPRS in APAC, but not supported in Japan or Korea

♦ = Special firmware version for Japan and Korea is available for some variants; refer to product documentation

**J** = Japan only

K = Korea only

For a detailed view of our cellular product offering, see our overview here:

www.u-blox.com/cellular-modules
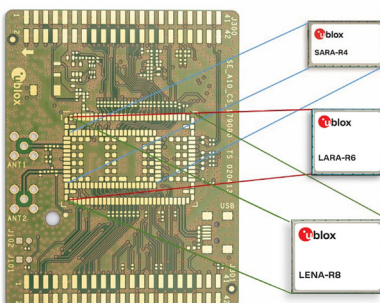
Nested design

Thanks to u-blox nested design, alternate modules can be mounted on the same PCB space as assembly options. This allows a single PCB design to be retrofitted with GSM, HSPA, NB-IoT, or LTE u-blox technologies, thus enabling a straightforward migration between cellular technologies and module generations. This in turn protects the customer's development investment.

u-blox cellular product overview
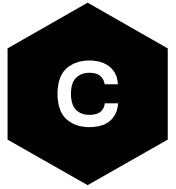
Secure by design

Robust
- Commercially hardened Root of Trust is the foundation of advanced security functionality in modules containing a secure element
- Lightweight, scalable, and proven key management system, ideal for high-volume LPWA deployments
- Latest (D)TLS stack and cipher suites with hardware-based crypto acceleration

Efficient
- Reduced data overhead in (D)TLS communications, resulting in lower power consumption
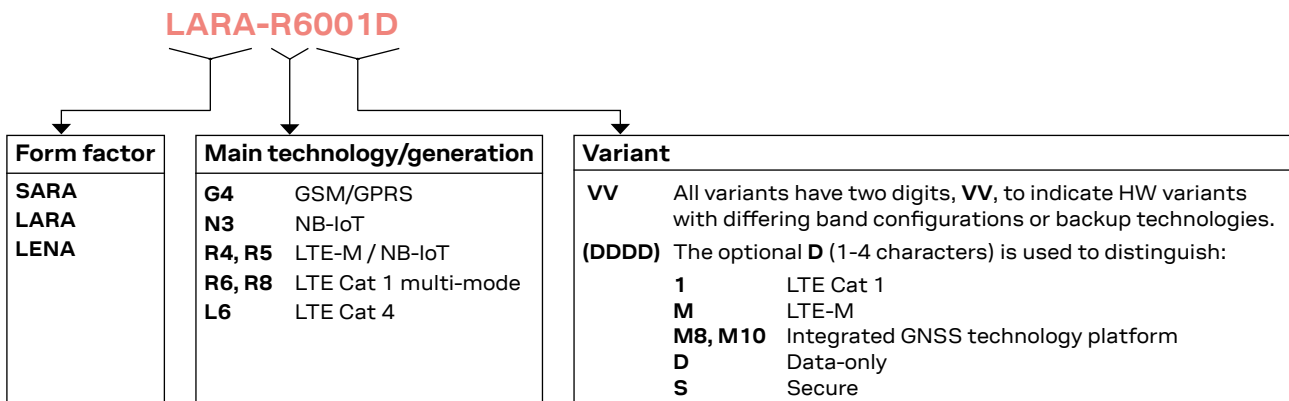- Support of IoT Security-as-a-Service: Design Security, End-to-end Security, and Certificate Lifecycle Control

Time-to-market
- Deploy more rapidly by minimizing integration efforts and removing the need for an external crypto chip, while reducing device size and saving component costs
- Eliminate the need to develop your own certificate delivery solution with out-of-the-box Zero Touch Provisioning to the most widely used IoT cloud platforms and your servers

u-blox cellular product naming

u-blox cellular modules are available in different form factors and variants to provide flexibility for scaling different cellular technologies to various application and geographical requirements, such as band support, cost, performance, and level of component integration.

LARA-R6001D

Form factor
SARA
LARA
LENA

Main technology/generation	
G4	GSM/GPRS
N3	NB-IoT
R4, R5	LTE-M / NB-IoT
R6, R8	LTE Cat 1 multi-mode
L6	LTE Cat 4

Variant		
VV	All variants have two digits, **VV**, to indicate HW variants with differing band configurations or backup technologies.	
(DDDD)	The optional **D** (1-4 characters) is used to distinguish:	
	1	LTE Cat 1
	M	LTE-M
	M8, M10	Integrated GNSS technology platform
	D	Data-only
	S	Secure

u-blox values and promise

Competent technical support worldwide
- Over 20 years of R&D in GNSS technology
- Lifetime support and maximum competence

Quick time to market
- Short and reliable delivery times
- Module form factor consistency

High quality
- Global leader in positioning and wireless communication
- In-house chip technology

Broad spectrum of solutions
- Strong synergies between technologies: Wi-Fi, Bluetooth, cellular, positioning
- Hardware, software, services, and solutions

Security
- End-to-end data protection from device to end-user
- Symmetric key management and integrated root of trust

Further information

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

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