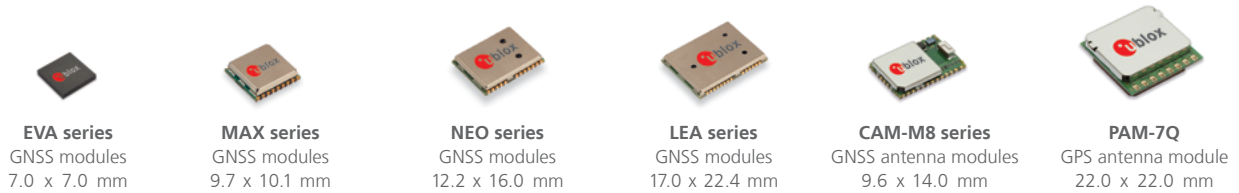


u-blox GNSS module overview

Scalable positioning module families combine optimized cost/performance features with easy integration



Product overview

u-blox offers a wide range of high-quality, scalable GNSS positioning modules based on the company's high-performance u-blox M8 and low-power u-blox 7 chip technologies.

u-blox GNSS modules are perfectly suited for vehicle, industrial and M2M applications, as well as mass-market consumer products with demanding size, cost and quality requirements. For telematics applications, each module provides easy integration with u-blox 2G, 3G and 4G cellular modules. This scalable module approach means u-blox GNSS modules provide exactly the right product variant to deliver the performance, ease of integration, cost and size required by today's as well as tomorrow's demanding applications.

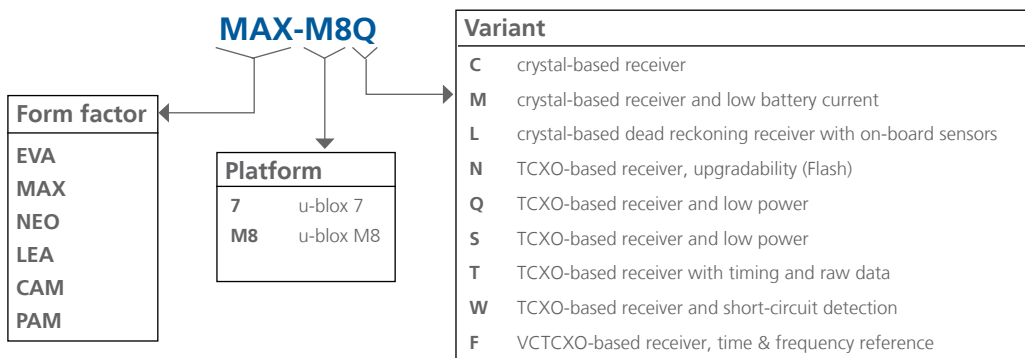
When upgrading a product for improved performance, lower cost or both, compatibility between module generations and variants is maintained. This insures a smooth transition from older to newer designs, as well as between product variants to keep redesign costs minimal. This product philosophy enables lower R&D costs and protects the customer's investment.

Key features and benefits

- u-blox products are available in three grades optimized for our primary market sectors: automotive, industrial (professional) and consumer (standard).
- Support of all available GNSS (GPS/QZSS, GLONASS, BeiDou) and SBAS systems.
- Two platform offerings:
 - u-blox M8 concurrent GNSS for performance
 - u-blox 7 single GNSS for low cost, low power
- u-blox GNSS modules require no host integration and are made to keep customer's eBOM to a minimum
- Flexible variants to meet performance and cost requirements (e.g. PAM, CAM versions with integrated antenna)
- Seamless operation with u-blox 2G, 3G and 4G cellular modules
- Globally available, free-of-charge Assisted-GNSS service for accelerated positioning in difficult environments
- Modules use u-blox' own AEC-Q100 qualified chips and are qualified according to the ISO16750 standard
- Manufacturing according to automotive ISO-TS16949
- Pin-to-pin and software compatible with previous and future u-blox module generations of the same form factor

Product selection

u-blox GNSS modules are available in different form factors and variants to provide flexibility for scaling GNSS solutions to different application requirements, such as cost, performance and level of component integration.



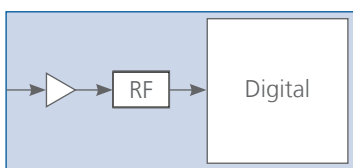
Platform selection guide

u-blox GNSS modules are based on two different in-house GNSS chip platforms, u-blox 7 and u-blox M8. Each supports GPS/QZSS and GLONASS satellites plus all SBAS augmentation systems. u-blox M8 also supports BeiDou satellites. All u-blox modules are standalone, meaning they provide a position without the need for host integration or extra RF components. Both platforms are optimized for keeping eBOM and system costs to an absolute minimum. u-blox RF-architecture provides good immunity performance (e.g. against cellular interference) without the need for an additional SAW filter in most GNSS-hostile environments. The selection of u-blox 7 vs. u-blox M8 modules is based on the following criteria:

u-blox 7 single GNSS platform

Single GNSS reception is recommended for designs requiring low cost and low system power. The u-blox 7 platform provides high sensitivity for positioning with fast acquisition times. Its sophisticated architecture ensures minimum cost and power.

⇒ Excellent performance at lowest power and costs for most applications

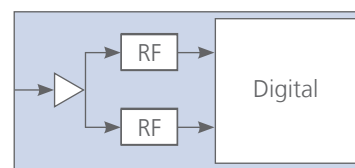


- GPS/QZSS or GLONASS
- -162 dBm Navigation sensitivity
- AssistNow Online
- AssistNow Offline (14 days)
- AssistNow Autonomous (3 days)
- Up to 10 Hz Navigation Rate
- Active CW jamming detection

u-blox M8 concurrent GNSS platform







Concurrent GNSS reception is recommended for best performance with difficult antenna placement or weak/blocked signal environments. u-blox M8 modules process signals concurrently from two GNSS systems to increase the number of visible satellites for faster acquisition and more reliable positioning. They operate with industry leading -167dBm navigation sensitivity.

⇒ Best performance for challenging environments, such as urban environments or difficult antenna placement



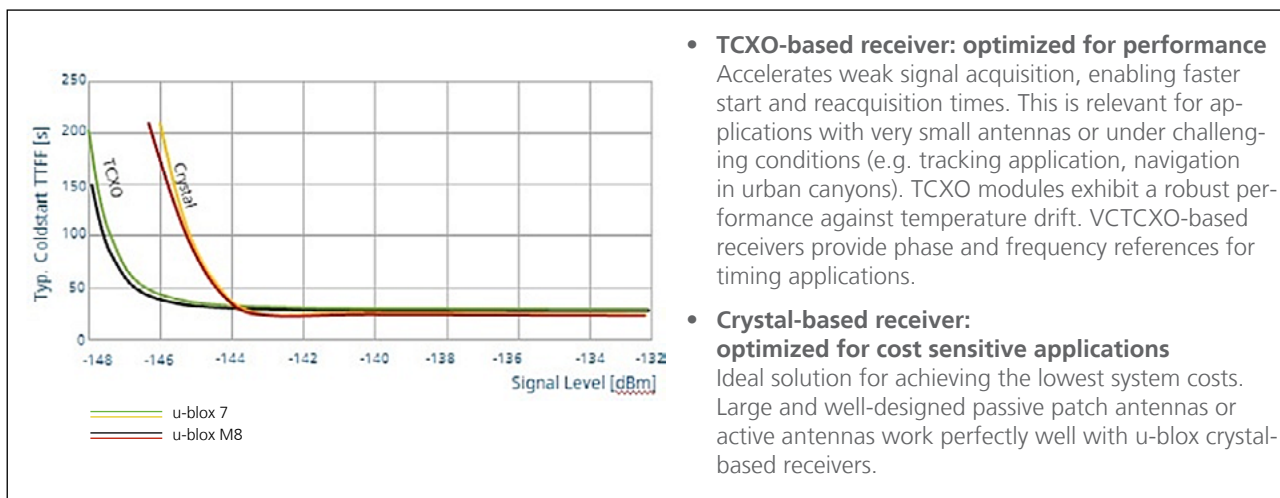
- GPS/QZSS + GLONASS or BeiDou
- -167 dBm Navigation sensitivity
- AssistNow Online
- AssistNow Offline (35 days)
- AssistNow Autonomous (6 days)
- Up to 18 Hz Navigation Rate
- Active CW jamming detection

Form factor selector guide

Form factor		Variant								Grade		
		Crystal-based <small>Optimized for cost sensitive applications</small>			TCXO-based <small>Optimized for performance</small>				VCTCXO-based	Standard	Professional	Automotive
Module	Distinguishing features	C	M	L	N	Q/S	T	W	F			
EVA 	Minimal system cost, smallest form factor		✓									
MAX 	Scalable to various performance, cost, and antenna integration requirements	✓				✓		✓ Short-circuit protection				
NEO 	Versatile HW connectivity (USB, UART, SPI, I ² C) for easier integration		✓	✓ on-board sensors	✓ Flash, additional SAW, LNA	✓ additional SAW, LNA	✓ additional SAW, LNA					
LEA 	For migration from existing LEA designs					✓ additional SAW	✓ additional SAW		✓ additional SAW, LNA			
CAM 	Concurrent GNSS module with integrated chip antenna in LCC package	✓ additional SAW, LNA				✓ additional SAW, LNA						
PAM 	GPS module with integrated patch antenna					✓ additional SAW, LNA						

GNSS oscillator selector guide

u-blox GNSS modules are available in crystal and TCXO versions to meet different performance and cost requirements. Oscillators used in u-blox modules are selected and screened for stability and against frequency perturbations across the full operating temperature range (-40° to $+85^{\circ}$ C). The high reliability of u-blox modules is due in part to stringent selection and qualification of critical parts such as GNSS oscillators.



Ease of design with any GNSS antenna

u-blox modules integrate a sophisticated RF-architecture and interference suppression for maximum performance, even in GNSS-hostile environments. The combination of this advanced RF-architecture and low noise figure allows connection of either a passive antenna or an active antenna directly to the module without compromising on immunity performance. The excellent out-of-band immunity of u-blox 7 and u-blox M8 platforms allows operation in most RF interference environments.

All modules are suitable for active antennas. When small size is crucial, any MAX or EVA module is a particularly good choice. EVA, u-blox' smallest GNSS module, is ideal for extremely compact and cost-sensitive applications. MAX-M8W is ideal whenever active antenna short-circuit detection and protection are required, which is typically the case with device-external active antennas. For devices with internal active antennas, all modules work well in the presence of moderate jamming (e.g. with a cellular module as long as the transmitting antenna is at least 10 cm away from the GNSS antenna). NEO-7N, NEO-M8N/Q and LEA modules have extra RF components onboard for more robustness when in closer proximity to a more hostile jamming environment.

All modules, with the exception of MAX-7W/M8W, are suitable for passive antennas. Incorporating PAM and CAM into customer designs is simple and straightforward, thanks to the embedded antenna and integration of all RF components for best RF performance and robustness even in hostile jamming environments. The CAM-M8 series provides wide-band reception capability across the whole L1 band, ranging from BeiDou 1560 MHz to GLONASS 1608 MHz, which is not possible with traditional patch antenna solutions.

NEO-M8N/Q modules provide more flexibility for the antenna layout and location, and work particularly well with small passive antenna design (e.g. 13 x 13 mm), thanks to the lower noise figure and higher outband immunity in hostile environments. If a cellular antenna is in close proximity to the GNSS passive antenna (e.g. on the same board), an extra SAW filter may be needed in some cases. For more HW design information, consult the u-blox hardware integration manual.

Why choose a u-blox GNSS module?

Module form factor consistency

When it comes to modules, u-blox adheres to a core design philosophy: maintain form factor and software compatibility to allow customers to easily upgrade their products with each new generation of u-blox positioning modules. The key benefit is simple: customers do not need to keep changing their PCB designs whenever u-blox introduces an improved version of a module product. Simply drop in the next generation module on the existing PCB and start testing!

In-house GNSS chip technology

u-blox' in-house GNSS chip design expertise and end-to-end management of the entire IC and module manufacturing processes gives u-blox full control over features, quality and production. This enables u-blox to react quickly to customer requirements. Being independent of third party GNSS chip suppliers means u-blox offers customers exactly the right feature set, chip and module options, smooth upgrade path, excellent and highly competent support, technology know-how, and a clearly defined and transparent product roadmap extending years into the future.

Product variants optimized for every antenna configuration

u-blox offers by far the widest range of GNSS modules in the industry, addressing all customer needs at competitive price points. These surface-mount components are complete GNSS receivers with either integrated antenna for easy integration or scalable antenna input for more flexibility of the antenna placement. The variants include modules allowing firmware upgrade, modules for time and frequency synchronization, dead reckoning modules and high precision GNSS modules. Each module results in a complete, high-performance, easy-to-integrate solution, which enables fast time to-market, easier active and passive antenna integration, and minimal eBOM and simplified logistics.

Automotive quality and reliability

- u-blox design-centers and manufacturing sites adhere to the industry's strictest standards: ISO/TS 16949, ISO 9001, ISO 14001 and ISO/IEC 80079-34 quality standards
- Stringent product change notification process with advanced notification. Smooth end-of-life
- In-house reliability and test equipment
- Our modules are ISO 16750 qualified, automotive end-of-life (ELV) compliant, and use GNSS chips qualified according to AECQ100
- Zero defect strategy (e.g. testing of functions within tolerance, ongoing reliability tests, X-Ray inspection)
- Performance and component selection qualified across the full operating range
- Reliable firmware with low release frequency philosophy allows shipping most u-blox products as ROM-based
- Flash-based products are intended for upgrades to future features, and not for correction of bugs!

u-blox is a reliable supplier

- Lowest ppm level in customer production and in the field
- Very short delivery lead time due to multiple locations of well stocked products
- Flexible, responsive delivery for small, medium and high volume shipment
- Financially solid company
- Global support network with excellent and highly competent local support
- Fast and convenient availability of samples and kits – samples and pre-production quantities can be purchased directly from our online shop: www.u-blox.com/online-shop

Evaluation kits: take the next step!

u-blox provides comprehensive, easy-to-use evaluation tools and kits for gaining familiarity with u-blox 7 or u-blox M8 positioning products, evaluating functionality, and visualizing GNSS performance:

- **u-center**: powerful GNSS receiver evaluation software for Windows; free-of-charge from u-blox
- **EVK-7x** and **EVK-M8x**: for a list of available evaluation kits, see www.u-blox.com/evaluation-tools-a-software

Contact us!

For more information, please contact the u-blox sales representative nearest you: www.u-blox.com/contact-us
For support information, visit our website at: www.u-blox.com/support-section