



## WIRELESS TECHNOLOGIES

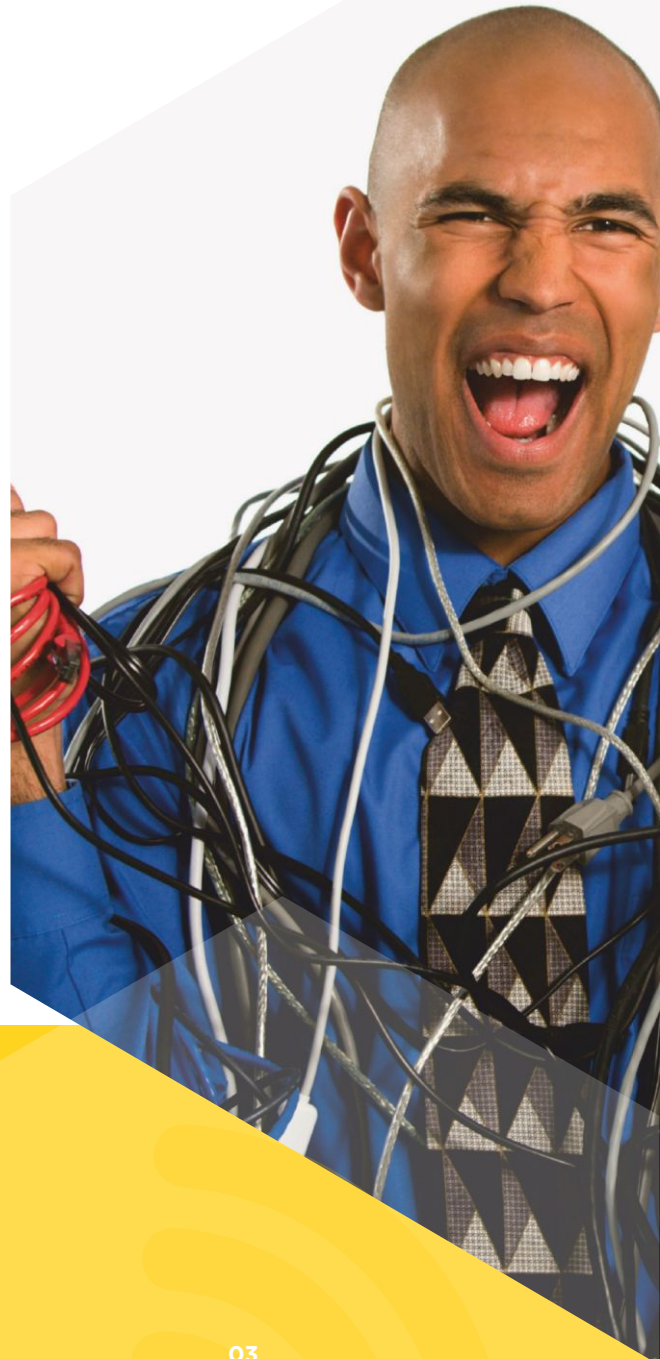
- I STANDARD & HIGH PRECISION GNSS
  - I GPS / GALILEO / GLONASS / BEIDOU
- I NB-IOT / LTE-M / LTE CAT.1 / LTE CAT.4
- I GSM / GPRS / UMTS
- I WI-FI / BLUETOOTH
- I ZIGBEE / THREAD / MATTER
- I IRIDIUM
- I ISM (433MHZ / 868MHZ / 2.4GHZ)
- I ANTENNAS & ACCESSORIES
- I SERVICES

# NO MORE WIRES!

## **MICRODIS ELECTRONICS**

acts as a high-tech distributor for many years, collecting experience in wireless communication devices. We offer not only the latest technology provided by well known suppliers, but also professional technical and commercial support, evaluation kits and reference designs, comprehensive deliveries including accessories such as antennas, connectors and adapters.

Microdis Electronics supports the most sophisticated wireless applications, like Emergency Call - eCall in Europe and Era Glonass. Both, based on the state of the art positioning technology and cellular features provided by u-blox, will save human lives in case of car accidents.



# CONTENT

GNSS RECEIVERS	03
HIGH PRECISION POSITIONING	06
DEAD RECKONING - IMU NAVIGATION WITHOUT THE SKY VIEW	08
ASSISTNOW SERVICES FOR POSITIONING APPLICATIONS	09
DOUBLE CHIP MODULES	10
GNSS ANTENNA SELECTION GUIDE	11
POSITIONING TOOLS	12
CELLULAR FOR M2M:2G, NB-IOT, LTE-M, LTE-Cat.1, LTE-Cat.4	13
LPWA BY U-BLOX	13
CAAS - COMPLETE IOT COMMUNICATION SOLUTION	16
SECURITY-AS-A-SERVICE (SAAS)	17
CELLULAR TOOLS	17
SMART AND EFFICIENT COOPERATION CELLULAR + GNSS	18
SHORT RANGE MODULES	19
BLUETOOTH INDOOR POSITIONING	19
BLUETOOTH STAND-ALONE MODULES	20
WI-FI, BLUETOOTH STAND-ALONE MODULES	21
WI-FI, BLUETOOTH HOST-BASED MODULES	22
SHORT RANGE TOOLS	23
AOA/AOD	23
U-BLOX WIRELESS SECURITY	23
HF CONNECTORS	24
GNSS ANTENNAS	25
CELLULAR ANTENNAS	26
ISM ANTENNAS	27

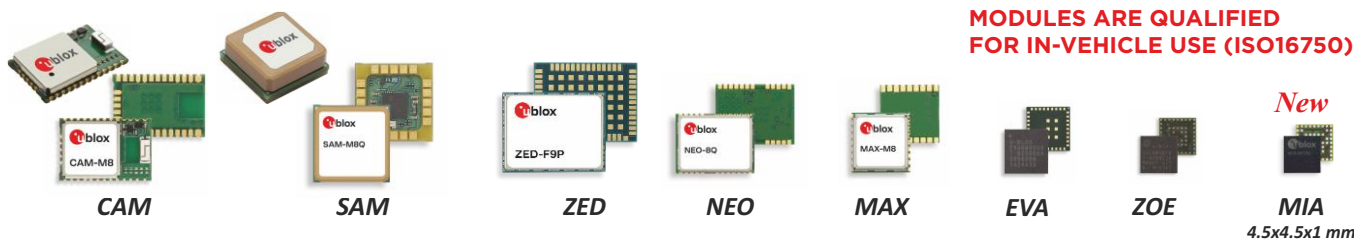


# GNSS RECEIVERS

## GPS+QZSS (L1, L2, L5), GALILEO BeiDou, Navic, GLONASS

### FAST, SENSITIVE, POWER AND COST OPTIMIZED, MARKET PROVEN U-BLOX MODULES

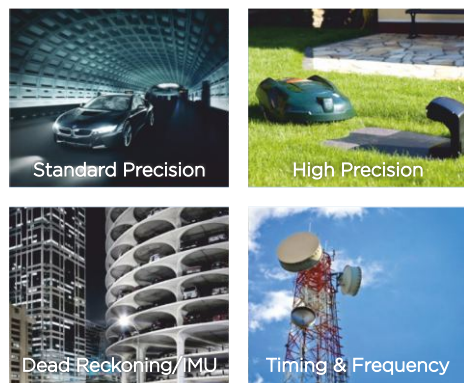
We offer Swiss made receivers, produced by a well known company, u-blox, to ensure superb technical parameters, the highest reliability of the market proven products, but also additional features and market leading technologies.



**MODULES ARE QUALIFIED FOR IN-VEHICLE USE (ISO16750)**

**u-bloxM10/F10, u-blox-M9/F9** – the latest GNSS technology dedicated to applications requiring high sensitivity, short wake-up time, low energy consumption and stable functionality under harsh conditions in vehicles or in small, wearable devices.

- | Predefined profiles tune algorithms to specific application
- | Supports up to 4 GNSS in parallel
- | Multiband versions for high precision also in the cities
- | True, dynamic sensitivity as high as -167dBm
- | Position accuracy (CEP, SBAS): 1.0m
- | High precision ZED-F9P accuracy < 0.01m
- | Low Power: <9 mW at 1Hz (MIA-M10C)
- | CloudLocate with up to 90% power saving
- | Assisted positioning service for all 4 GNSS
- | Built in sensors (IMU) for navigation without sky view (NEO-M9V, ZED-F9R)
- | Dedicated modules for precise timing
- | Backward pin compatibility (ublox5/ublox6/ublox7/ubloxM8 generations)
- | Versions dedicated to cost sensitive applications
- | Easy to design, manufacture and integrate with antennas



Feature	Description
<b>Compatibility across technologies</b>	Different technologies available at one, experienced manufacturer. Fast development of any application by u-blox familiar engineer. Standard GNSS, Centimetre-level GNSS, Single and Dual band GNSS, GNSS with sensors (IMU, Dead Reckoning), Receivers for satellite GNSS corrections, Precise timing and time synchronization based on GNSS.
<b>Flexibility</b>	Chipset, firmware and module - designed by u-blox for professional users. Rich of configuration options brings the most optimized fit to the particular use case.

### POSITION BECAME CRITICAL INFORMATION U-BLOX PROVIDES SOLUTION TO SECURE YOUR GNSS PLATFORM

<b>Anti-Jamming detection, mitigation</b>	Security: RF interference and jamming detection and reporting, including jammers. The best on the market jamming immunity. Mitigation using embedded filters, and IMU sensors (Dead Reckoning receivers).
<b>Anti-Spoofing detection, mitigation</b>	Security: spoofing detection and reporting. Spoofing is delivering a fake GNSS data to the receiver resulting in wrong position calculation. Spoofing attack can be mitigated by using an authenticated signal Galileo OS-NMA*, and IMU sensors (Dead Reckoning receivers).
<b>Message integrity</b>	Security: message authentication protects the communication from the receiver to the host, against sending fake GNSS time or position data to the host like by the "record and replay".
<b>Device integrity</b>	Security: receiver configuration can be locked by command to prevent unwanted modification. Secure boot of firmware downloaded from host or flash.

\* ready for implementation when service from GSA is available



# GPS, GALILEO, GLONASS, BEIDOU, QZSS MODULES

All wheels are round, but are they all the same?



There are also many GNSS receivers...

## Quality

u-blox places extraordinary emphasis on delivering high-quality products. The company's internal quality control process extends to all its manufacturing partners who comply to strict processes imposed by standards, such as ISO/TS16949. GNSS and wireless products are designed and tested to operate in a wide variety of applications, including in vehicle usage.

## Development and Reliability

u-blox, continuously introducing new products, takes special care of their existing customers. New families of the modules are designed to keep pin compatibility with the previous ones, which anyway will remain in production for a long time.



**u-bloxM10:** the latest, low power, accurate GNSS technology recommended for new designs (i.e. MAX-M10x, MIA-M10x).

**u-bloxM9:** core designed by u-blox for high update rate (25Hz) or Dead Reckoning/IMU integration (i.e. NEO-M9x).

**u-bloxM8:** market proven and very popular u-blox GNSS technology (i.e. NEO-M8x, MAX-M8x, ZOE-M8x, EVA-M8x).

Previous generations of GNSS receivers are maintained in production not to force to redesign (i.e. u-blox6, u-blox7, u-bloxM8). Modules recommended for new designs are collected in the table below.

Model	Size l x w [mm]	Vcc [V]	GPS, Galileo	Glonass, QZSS, BeiDou	Number of Parallel GNSS systems	Additional LNA, SAW	Navigation update GPS/AGNSS [Hz]	Crystal/TCXO/VCTCXO	RTC crystal	Super low power CloudLocate	Super-S improved performance	Protection level	Data batching	Odometer	Spooing detection, reporting/mitigation	Signed (protected) messages	Jamming detection, reporting	Device integrity	UART	USB	SPI	DDC (I2C)	Assisted: GPS (G), MULTI GNSS (M) Online, Offline, Autonomous	External interrupt /Wakeup	Antenna supervisor		
<b>u-bloxM10</b>																											
MAX-M10S	LCC 10.1x9.7	1.76-3.6	●	●	4	●	18/5	T	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○	
MAX-M10M	LCC 10.1x9.7	1.76-5.5	●	●	4		18/5	C	●	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○		
MIA-M10Q	S-LGA 4.5x4.5	1.76-1.98 2.7-3.6	●	●	4	●	18/5	T	○	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○		
MIA-M10C	S-LGA 4.5x4.5	1.3-1.98	●	●	4		18/5	C	○	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○		
<b>u-bloxM9</b>																											
NEO-M9N	LCC 12.2x16	2.7-3.6	●	●	4	●	25/25	T	●	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○		
<b>GNSS receivers with IMU / Dead Reckoning, accelerometer and gyro built-in</b>																											
NEO-M9V	LCC 12.2x16	2.7-3.6	●	●	4	●	50*	T	●	●	●	F	●	●	●	●	●	●	●	●	●	●	MO	●	○		
ZED-F9R	LGA 17x22	2.7-3.6	●	●	4	S	30*	T	●	●	●	●	●	●	●	●	●	●	●	2	●	●	MO	●	○		
<b>GNSS receivers with antenna</b>																											
SAM-M10Q	15.5x15.5x6.3	2.7-3.6	●	●	4	●	18/5	T	●	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○		
CAM-M8Q	14x9.6x1.95	2.7-3.6	●	●	3	●	18/10 <sup>2</sup>	T	R	●	●	●	●	●	●	●	●	●	●	●	●	●	M	●	○		

\* - priority navigation mode ○ - requires external components MO - Multi GNSS Online R - supported but with the higher backup current S - SAW filter 2 - GPS+Glonass F - next FW release

Feature	Description
<b>Low Power</b>	Power optimization (i.e. MIA-M10C: 9mW at 1Hz), power saving modes: Cyclic and ON/OFF tracking.
<b>CloudLocate GNSS service</b>	The snapshot technology, using a cloud location, brings 90% lower power consumption vs stand-alone GNSS. More details in CloudLocate service section on next pages.
<b>Navigation modes</b>	Predefined user profiles (modes) tune algorithms to specific use case (i.e. Wrist mode to filter out arm motion for wrist worn device).
<b>Super-S (weak signals handling)</b>	Configuration to improve dynamic position accuracy with weak signal (small or hidden antennas).
<b>High accuracy also in the cities</b>	Mitigation of GNSS reflections by dual band receivers, and IMU sensors (Dead Reckoning receivers).
<b>Antenna supervisor</b>	Active antenna control and short detection (external components can be required).
<b>Assisted multi GNSS service</b>	Data provided by the u-blox server to boost acquisition, or to be able to get fix despite weak signals and a harsh environment. Brings better performance and lower power. Available as Online, Offline (up to 35 days ahead) and Autonomous (calculated internally, access to u-blox server not required, up to 6 days). More details in Assisting Services section on next pages.
<b>Odometer</b>	Embedded algorithms measure travelled distance using the position, Doppler-based velocity, and selected navigation mode.
<b>Protection level</b>	Real-time position accuracy estimate with 95% confidence in automotive environment.
<b>Galileo return link messages</b>	Search and rescue (SAR) return link messages (RLM) via Galileo satellite signal.
<b>Data batching</b>	Tracking and storing data in memory up to 10 min. at 1 Hz, while host uC can stay in sleep mode saving the power.
<b>Wake-on motion</b>	Feature available in Dead Reckoning modules, to identify motion of the device (to save power of central unit, to detect vandalism, towing away for stealing, parking accident).
<b>Design support</b>	Spectrum analyzer built in modules, jamming flags, efficient tool (u-center), high level of support to optimize the final product (including design and log review).

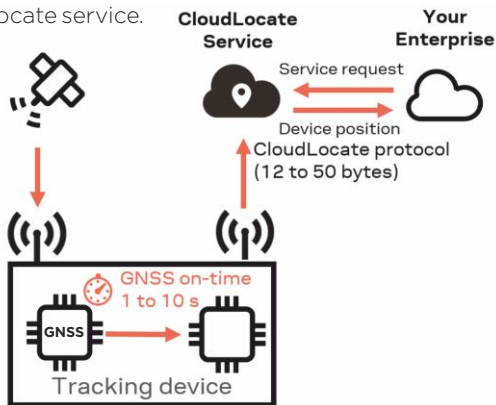
## CloudLocate

GNSS on-time just 3 seconds 10% power of standalone GNSS



Recently introduced by u-blox service, to support energy- or size- constrained applications. Use 10x smaller battery, saving space, weight and significant cost. Or extend 10x your device lifetime!

switch your GNSS On just for 3s  
 collect data and switch Off  
 deliver measurements to the CloudLocate service  
 That's it! Your server will get the position from the CloudLocate service.



GNSS receiver does not spend time and energy to download ephemeris, and use algorithms to provide the fix. Runs 1-10 seconds (configurable), sends 12-50 bytes of data and lets u-blox server to calculate the position. Position can be delivered directly to your server without additional energy consumption.

Measurements can be live, as in example above, or collected for up to 1 month.

CloudLocate provides 90% energy savings over standalone GNSS power-savings approach CloudLocate fits the best if location is required not more than few times per day, for more often updates try our Power Save Modes.

Service is supported by u-bloxM10 receivers, where this feature and native messages have been built-in, and by u-bloxM8/M9 receivers (50 or 170 bytes, no native commands). Including double chip modules.

Contact our sales team to get free access to up to 300 CloudLocate requests per month and try it.

## MIA-M10Q/C - more than usual performance in smaller than usual, simple in use module



**MIA**  
 4.5x4.5x1 mm  
 Extremely small size

MIA is miniature, light-weight (0.04g) module. ubloxM10 brings extra low power consumption, reducing the size of battery. Super-S, built-in TCXO and LNA make working with small antenna doable. MIA is the perfect product for small, portable applications for devices working with weak GNSS signal, using

hidden or small passive antennas. SAW and Notch filters help to eliminate noise, including the one coming from GSM or other RF transmitters nearby. Superb, usual for u-blox, parameters, real Assisted GNSS, filtering of arm motion and many others - fulfils the picture of an outstanding product.

Design with MIA-M10Q does not need deep RF skills - critical components (LNA, SAW, TCXO) are integrated and matched.

## MAX-M10S/M - the latest u-bloxM10 GNSS platform in well known MAX form factor

u-blox did create MAX in 2011, with u-blox6 technology, and keeps pin compatibility over the years and generations.

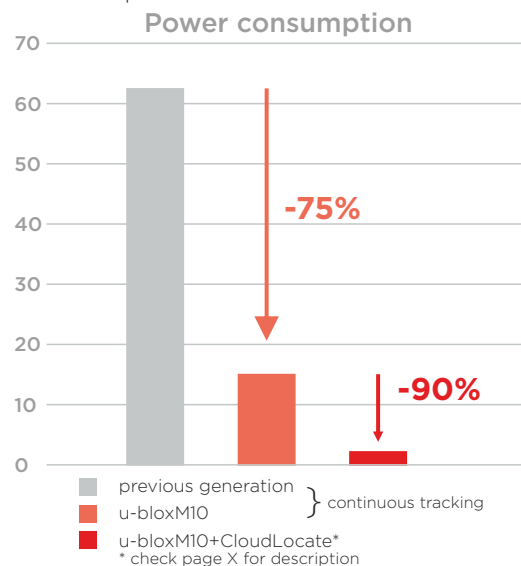
u-bloxM10 brings leading on the market power optimization, and supports CloudLocate service working with single mW. Smaller battery significantly reduces the cost of system.

Moreover, u-bloxM10 provides superb performance and accuracy also with smaller antennas, due to parallel work with up to 4 navigation systems, Super-S weak signal compensation and sophisticated, u-blox algorithms.

Odometer provides accurate distance, and Protection level provides position accuracy with 95% confidence.

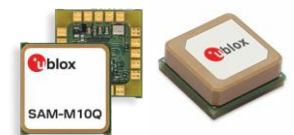
Two versions - MAX-M10S and MAX-M10M - allow to select the most suitable solution for the particular use case.

Advanced Anti-Spoofing, Anti-Jamming and security umbrella built-in u-bloxM10 protect your device against attacks and manipulations.



## SAM-M10Q - "plug & play" design concept, high performance, low power receiver with antenna

SAM-M10Q is the best solution for simple and reliable GNSS integration. Customer can design an application, with robust performance regardless of installation, without deep RF expertise, without long tests



**SAM - Performance optimized (15.5x15.5x6.3mm) antenna module** and plenty of redesigns.

Antenna size was carefully selected to keep good performance in small form factor. Smaller antennas significantly degrade navigation performance and should be considered only if there is no other option. However, solution is scalable, bigger ground plane can be used to achieve even more optimal performance, depending on available space on PCB.



# HIGH PRECISION POSITIONING

u-blox, a global provider of leading positioning and wireless communication technologies, has released the ZED-F9P multi-band GNSS module with **integrated multi-band real-time kinematics (RTK)** technology for machine control, ground robotic vehicles and high precision unmanned aerial vehicles (UAV) applications.

The ZED-F9P measures 22 x 17 x 2.4 millimetre and uses technology from the u-blox F9 platform to deliver robust high-precision positioning performance in seconds - fully geared to clearing the three main hurdles that have kept centimetre-level positioning accuracy from breaking into mass-market applications: **cost, size and power consumption**. Significantly smaller and more energy efficient than existing solutions, and as a cost efficient alternative, the ZED-F9P will enable new high precision positioning applications.

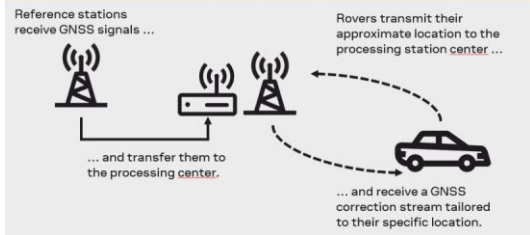
The u-blox ZED-F9P is a mass market multi-band receiver that concurrently uses GNSS signals from all four GNSS constellations (GPS, GLONASS, Galileo and BeiDou). **Combining GNSS signals from multiple frequency bands (L1/L2/L5/E5) and RTK technology** lets the ZED-F9P achieve centimetre-level accuracy in seconds. Receiving more satellite signals at any given time maximizes the availability of centimetre-level accuracy even in challenging environments such as cities.

With its high update rate, the ZED-F9P is suitable for highly dynamic applications such as UAVs. Featuring on-chip integration of advanced RTK multi-band RTK algorithms, it requires no additional hardware or third-party RTK libraries. **Using OSR or SSR provides flexibility to the platform.**

The u-blox F9 platform may work with both of the standard correction services - the OSR (which includes network RTK but also the single Baseline RTK used f.e. by the NEO-M8P) and the SSR.



## Observation State Representation (OSR)



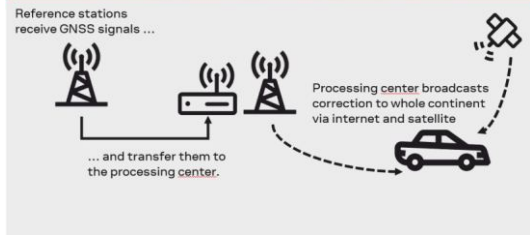
### Basic idea

- ✓ Rover sends position to server every 5 s
- ✓ Iono/tropo modelled via nearby reference stations
- ✓ Iono/tropo removed from nearest base corrections
- ✓ Correction GNSS observations sent to rover
- ✓ One stream per rover
- ✓ Rover observations removes common errors
- ✓ Centimetre-level performance enabled

### Benefits

- ✓ Centimetre-level accuracy
- ✓ Only local coverage
- ✓ High bandwidth needed
- ✓ Correction data tailored only to a single location
- ✓ Two-way communication necessary

## State Space Representation (SSR)



### Basic idea

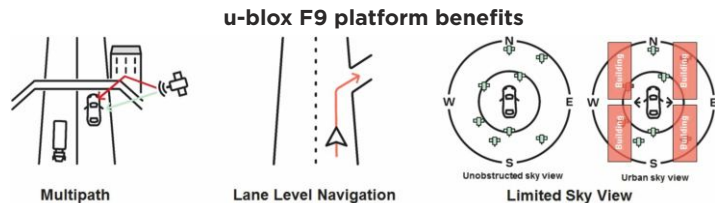
- ✓ Network models errors over a continent
- ✓ SSR broadcast stream received by many rover
- ✓ Rover able to create localized iono/tropo model
- ✓ Errors removed from rover observations
- ✓ cm-level performance enabled

### Benefits

- ✓ Centimetre-level accuracy
- ✓ Global coverage
- ✓ Low bandwidth needed
- ✓ Correction data valid over entire serviced area
- ✓ One-way communication

### Downsides

The u-blox F9 platform may work also as a stand alone GNSS module. The multi-band, multi-constellation GNSS receiver enables sub-metre level performance without the use of any premium correction services.



## High Precision GNSS modules

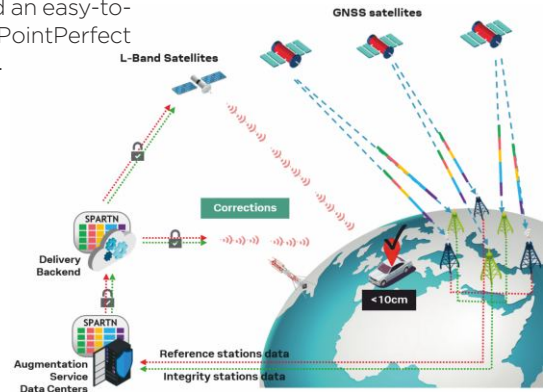
Model	Size l x w [mm]	Power Supply [V]	GPS, Galileo	Glonass, QZSS, BeiDou	Number of Parallel GNSS systems	Crystal / TCXO / VCTCXO	Geofencing, Odometer	Spoofing detection, Wrist mode, Anti-jamming	Data Logger	UART	USB	SPI	DDC (I2C)	RAW data	Assisted: GPS (G), MULTI GNSS (M) Online, Offline, Autonomous	Precise Positioning	Dead Reckoning	Precision Timing	Frequency output	External interrupt/Wakeup	Antenna supply, short detection & protection	Antenna power control	Extra LNA, SAW
ZED-F9P	22.0x17.0	2.7-3.6	Multi Band		4	T				2					MO	RTK<0.01m					O	P	
NEO-M8P	16.0x12.2	2.7-3.6	0/-		2	T									M	RTK<0.025m					O	P	
ZED-F9R	22.0x17.0	2.7-3.6	Multi Band		4	T		0/0		2					MO	RTK<0.2m	ADR				O	P	

# POINTPERFECT



PointPerfect is a high performance GNSS augmentation service. Delivering cm-level accuracy positioning within seconds combined with flexible service plans and an easy-to-use delivery cloud platform. Providing the best of the other available solutions PointPerfect brings reliable high accuracy position into a range of mass market applications.

	RTK networks	PointPerfect	PPP services
<b>Technology</b>	OSR (RTK)	PPP-RTK SSR	PPP Some with regional PPP/RTK
<b>Performance</b>	cm level in 10-20 sec.	cm level in 10-30 sec.	<10 cm in 3-30 sec.
<b>Data format</b>	RTCM3.x Open data format	SPARTN Open data format	Proprietary
<b>Required bandwidth</b>	-4.5 kbps	~ 2.5 kbps w/ reduced bandwidth options	-2.5 - 5 kbps
<b>Coverage</b>	Regional / National	Continental Seamless performance	Global Some with areas with localized PPP/RTK; Not seamless
<b>Data stream</b>	Bi-directional	Unidirectional	Unidirectional
<b>Communication</b>	IP-based only	IP-based Satellite L-Band	IP-based Satellite L-Band

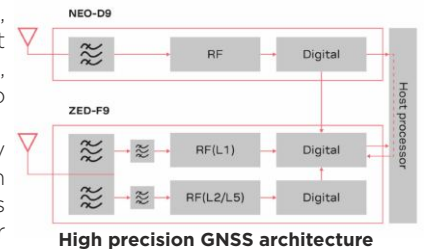


## L-BAND RECEIVER



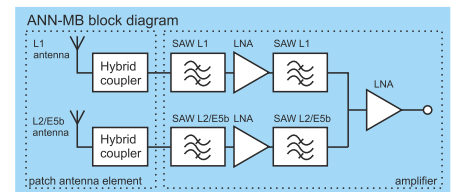
NEO-D9S is a satellite data receiver for L-band correction broadcast, which can be configured for use with a variety of correction services. It decodes the satellite transmission and outputs a correction stream, enabling a high precision GNSS receiver to reach accuracies down to centimeter level.

Depending on the capabilities of the receiver used, it can consume the data output by NEO-D9S as is, or external preprocessing on the host might be needed. By providing an independent correction data stream delivered via satellite L-band, NEO-D9S ensures high availability of the position output and decreases dependency on cellular connectivity for correction service delivered via IP.



## MULTIBAND ANTENNA

A technology which was reserved for military and niche applications is now presented to the mass market - a consumer market - where many times the antenna was not even a part of the design process, and its selection was the last part of the production. Choosing an antenna for the multiband receivers is even more important than with standard single band modules, because providing superb signal levels is crucial for the centimeter level positioning. It is a premium accuracy, and needs additional efforts to guarantee the performance.



The **u-blox ANN-MB (L1, L2/E5b/B2I) and ANN-MB1 (L1, L5/E5a/B2a/NavIC) multi-band** active GNSS antennas are designed to reduce time to market for the next generation of high precision GNSS applications, which require highly accurate location abilities. The compact design, excellent price-performance ratio and versatile mounting & connector choices provide customers with fast, easy and reliable multi-band antenna solutions. The ANN-MB antenna is a perfect match to the latest u-blox F9 platform including the ZED-F9P module, thus providing customers with the valuable antenna solution they need to minimize design-in efforts.

### Mechanical data

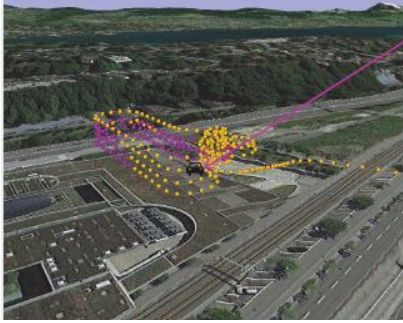
<b>Weight</b>	173 g (typ. including cable)
<b>Size</b>	60.0 x 82.0 x 22.5 mm
<b>Cable</b>	5 m RG174 standard
<b>Connectors</b>	(choice) SMA, SMB, MCX
<b>Mounting</b>	Magnetic base, fixed installation option
<b>Waterproof</b>	IP 67
<b>Operating temperature</b>	-40 °C to +85 °C



	L1	L2/E5b/B2I	L5/E5a/B2a
<b>Frequency</b>	1559-1606 MHz	1197-1249 MHz	1164 - 1188 MHz
<b>Peak gain</b>	Typ. 3.5 dBic	Typ. 0.0-2.0 dBic	Typ. 1.3 dBic
<b>LNA Gain</b>	Typ. 28 dB	Typ. 28 dB	Typ. 33 dB
<b>VSWR</b>	Max. 2.0	Max. 2.0	Max. 2.0

## TYPICAL HIGH PRECISION APPLICATIONS

<b>UAV</b>  Precise automated trajectories, fast convergence, accurate geo-tagging	<b>Precision Agriculture</b>  Precise guidance, fast convergence for seeding and herbicides	<b>Automotive</b>  Navigation for AD/ADAS Level 2 driving automation	<b>Heavy Machinery</b>  Machine control, construction and mining environments	<b>Service Robots</b>  Robotic lawnmower Unmanned service delivery	<b>Specialty Vehicles</b>  Shared micro mobility that meets locality regulations
--	---	---	---	---	--



# DEAD RECKONING: GNSS + IMU NAVIGATION WITHOUT THE SKY VIEW, MITIGATION OF REFLECTIONS

Increasingly dense urban environments, park houses and multilevel interchanges pose a significant problem to navigation systems. Signal reflected from buildings makes position not accurate. Vehicles are often used in areas where GNSS signal is blocked (tunnel, garage etc).

The latest NEO-M9V and ZED-F9R Dead Reckoning (IMU) receivers are result of know-how and experience collected by u-blox over the years of the proprietary Dead Reckoning platform optimizations, providing:

- | excellent navigation performance of u-blox algorithms
- | mitigation of reflections i.e. in city centres
- | navigation in garage, tunnel etc.
- | Anti-Jamming and Anti-Spoofing
- | Wake-on motion
- | RAW sensors data
- | centimeter accuracy (ZED-F9R)

Modern applications require comfort for end user, reliable position and high accuracy also in urban environment with reflections. The solution is Dead Reckoning, GNSS navigation combined with market proven, u-blox sensor based algorithms (IMU). NEO-M9V and ZED-F9R is simple in implementation and efficient solution.

**NEO-M9V** is based on high performance single band u-bloxM9 platform, built-in sensors (gyro, accelerometer, temperature) provide accurate 3D position even in case of reflections, or lack of GNSS signal. Both, ADR (with wheel tick signal) and UDR (no wheel tick signal) scenarios are supported. Dual output is available (GNSS+IMU and GNSS only). Priority navigation mode updates position up to 50 times per second.

Typical applications are the ones working in city centres, expecting reliable position and navigation also in tunnels, garage, and comfort on multilayer roads, like: road tolling, public transportation, fleet management, micromobility (i.e. comfort of end user to find e-scooter fast), insurance boxes and motor sport.



**ZED-F9R**, in addition to NEO-M9V, is dual band receiver with RTK high precision algorithms. Combined with PointPerfect service provides centimeter level accuracy important i.e. for: micromobility in cities with restrictions (like keeping the bike line and speed limits, parking only in marked zones), slow moving robots and lawn movers, agriculture and heavy machines.

### RAW sensor data

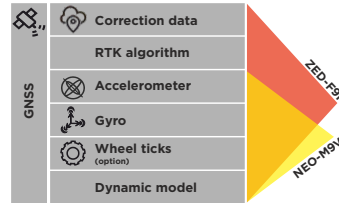
| information from sensors can be read (up to 100Hz) and used for example to register behaviour of vehicle during an accident

### Wake-on motion

- | detect accident when vehicle is parked
- | detect towing away or stealing
- | detect vandalism with e-scooters

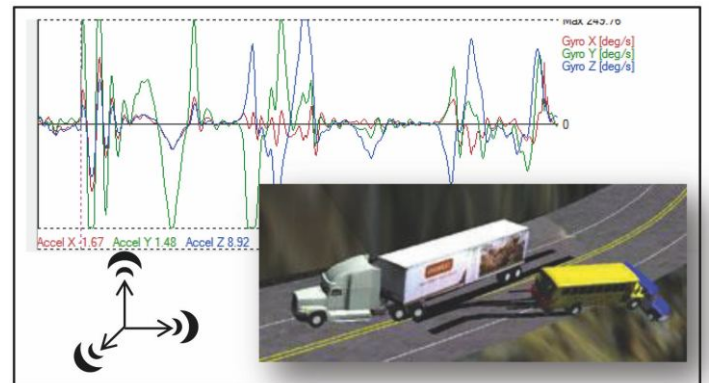


### Reliable navigation



	ZED-F9R	NEO-M9V	NEO-M9N
GNSS bands	L1, L2	L1	L1
GNSS systems in parallel	4	4	4
DR, IMU	●	●	
accelerometer, gyro	●	●	
GNSS precision	centimeter	meter	meter
Mitigation of reflections	●●	●	
Navigation without sky view	●	●	
Wake-on motion	●	●	
Anti-spoofing	●●	●●	●
Anti-jamming	●●	●●	●
Max. position update freq.	30Hz	50Hz	25Hz
Accelerometer, gyro RAW data (100Hz)	●	●	
<b>Examples of applications</b>			
Urban (city centre)	●●	●●	●
Tunnel, garage, multilevel roads	●	●	
Fleet management, bus, truck	●●	●●	●
Road tolling, vehicle sharing	●●	●●	●
E-scooters, e-bikes city restrictions	●●	●	
Heavy vehicles, agriculture	●		
Slow moving robots, lawn movers	●		
Motor sport	●	●	●

### RAW sensor data



temperature, acceleration, angle reported by NEO-M8L/U during accident

**ZED-F9R** and **NEO-M9V**, with built-in sensors, bring another level of navigation. Simple integration makes time to market short. u-blox provides complex solution: GNSS receivers, cellular modules (SARA, LARA, LENA) with dedicated interface to simplify cooperation with GNSS receiver, and location services (i.e. PointPerfect, AssitNow)

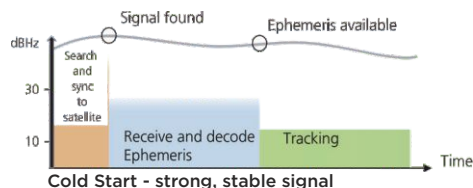
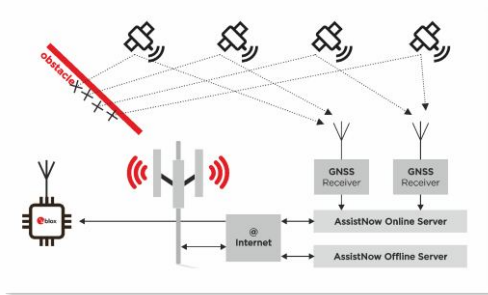


# ASSISTNOW SERVICES FOR POSITIONING APPLICATIONS

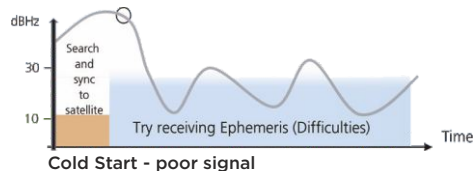


AssistNow

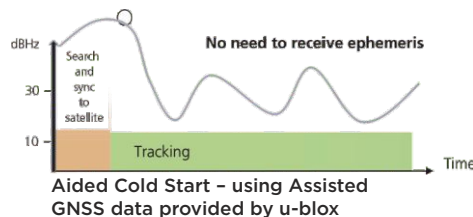
The modern positioning applications are very demanding. Devices must be low power, small size and able to calculate position under difficult conditions. Small size brings degraded performance of the antenna, as size is very important factor of the GNSS antenna performance. Difficult conditions are effect of small antenna (weak, reflected and corrupted signal), or bad sky visibility due to pocket design, indoor navigation, or urban canyons.



Under **good signal conditions** Acquisition process (cold start) takes appx. 30s, consisting of 2 stages. Searching and synchronization with satellites (SVs) - takes short time. Receiving orbital position data (called Ephemeris) from minimum 4 (3D fix) SVs takes appx. 30s and the receiver starts to navigate (Tracking). Tracking does not need a signal as strong and stable as acquisition.



Under **poor signal conditions** Acquisition takes much more time, or is not possible at all. Collecting Ephemeris from 4 SVs needs uninterrupted good quality signal from each SV for appx. 30s. Under adverse signal conditions it can take minutes, hours or even fail altogether. Lengthy or repeated attempts at data download can also quickly drain power.

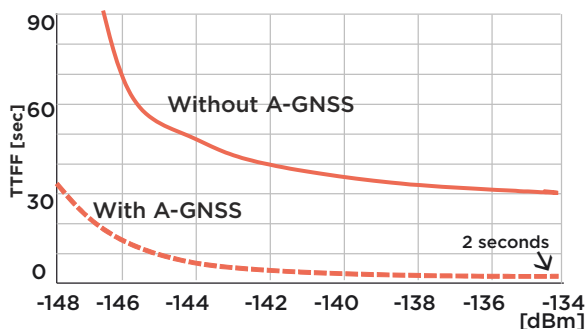


u-blox is the leader, and pioneer, in **Assisted GNSS (A-GNSS) technology**, which accelerates calculation of position by delivering satellite data such as Ephemeris, Almanac, accurate time and satellite status to the GNSS receiver via wireless networks or the Internet. This aiding data enables a GNSS receiver to compute a position within seconds, even under poor signal conditions. Assisted GPS, introduced by u-blox in previous generations of the receivers, is already a market proven technology. The latest implementation supports 4 GNSS, including Assisted Glonass, Galileo and BeiDou, improving the performance - it is called AssistNow ,Multi GNSS Assistance (MGA), or A-GNSS.

The system is very simple in configuration and makes applications using GNSS receivers really shining among the competitive units on the market.

**With AssistNow Online** - is the most helpful service to get fix in difficult conditions. The receiver downloads data (real ephemeris) from u-blox' server every time the position is necessary (validity of data is 2-4 hours). Used i.e. in personal trackers (emergency button), theft protection etc.

**AssistNow Offline** - the receiver downloads the Offline data when Internet connection is available and stores in local memory. Data are valid for up to 35 days. Device uses the data whenever the signal conditions are poor - which improves navigation performance and achieve fast TTFF. AssistNow Offline is useful in all kinds of applications, also to decrease the power consumption (AssistNow makes acquisition shorter - the most power demanding process).



**AssistNow Autonomous** does not need any data exchange with external server. Orbit prediction data is calculated by the GNSS module itself and is valid for up to 6 days. Activation of this feature is highly recommended.

Although using AssistNow is simple, u-blox cellular modules (SARA, LARA, LENA) offer a built-in client handling AssistNow features and using own resources (flash memory).

	ASSISTNOW ONLINE	ASSISTNOW OFFLINE	ASSISTNOW AUTONOMOUS
<b>Data download frequency</b>	At every start-up	Once every X days	Never
<b>Data retrieval at start-up</b>	Data downloaded from server	Pre-downloaded data from local memory	Retrieved from local memory
<b>Aiding data type</b>	Ephemeris, almanac, time, health	Differential almanac correction data	Automatically generated
<b>Data validity period</b>	2-4 hours	35 days	Up to 6 days
<b>Size of downloaded data</b>	1-3 kB	125kB (GPS&GLO 28days)	None
<b>Acquisition (TTFF) performance</b>	Typ. 1-3s	5-20s	13-18s (after 3 days)

# DOUBLE CHIP MODULES

## A way to integrate cellular technology and GNSS **without compromise**

Combination of cellular and positioning, in the modern IoT applications, often in small device, is not a trivial task. Cellular transmitter uses up to 2W RF power, while GNSS receiver works with signals 100,000 times weaker than GSM. GNSS requires high sensitivity, which also means sensitivity to noise and interference from other components and radio paths. Integration of these demanding wireless technologies can be done in three ways.

### 1. Separate modules

Professional applications, where stable and reliable location is important, usually use cellular module and GNSS module working independently, with own RF paths. It reduces the issues with coexistence of both technologies. Bringing also flexibility, like replacing the module by the other one, with different technology or features to fit the use case.

u-blox supports such concept. Cellular modules, with different technologies are offered in compatible form factors (SARA, LARA, LENA), different variants of GNSS receivers are available in the same housings (i.e. MAX, NEO, MIA, ZED). Building one platform serving many use cases is simple. For closer integration, u-blox modules are equipped with dedicated interface (DDC/I2C), and built-in client to connect GNSS receiver directly to the cellular. (more details on page 18)

### 2. Devices called "combo"

The second solution comes from consumer market, where the location is often needed as just add-on not important feature. Price is the priority, even if functionality is sacrificed. To reduce costs an integrated cellular block is used also as GNSS engine, sometimes even dedicated GNSS antenna is removed.

One chipset and one radio for both, so much different, technologies, lead to serious limitations. Position fix is not always available, and is significantly less accurate. Simultaneous GSM data upload and positioning becomes impossible, energy consumption is higher, the GNSS sensitivity is greatly decreased.

Such compromises are not acceptable by many professional applications, and are not supported by u-blox hardware solution. However, for low cost applications not expecting reliable positioning, u-blox offers similar to "combo" feature of LTE receivers, called by u-blox as one of the Location-as-a-Service software services.

### 3. Double chip

u-blox Double chip approach is to provide high integration of cellular and positioning without performance compromises.

Double chip is one module, but built on the basis of two independent chipsets and radio paths - one for the cellular, working with high power, the second one as a GNSS receiver, working with very low signals.

It is a golden solution wherever reliable GNSS localization is required, with low power, cost optimization and working in parallel cellular communication.

The size and cost of Double chip is similar to "combo". Quality of RF parameters, both GNSS and cellular, are like for separate modules. u-blox does offer Double chip modules in SARA and LENA form factors - same as standard cellular modules. It's flexible solution to upgrade the platform with GNSS.

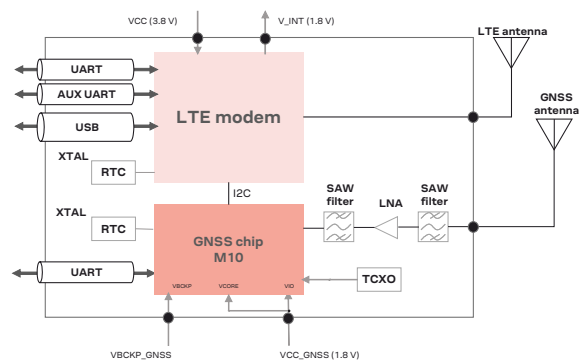


Fig.1 LENA-R8001M10 Double chip module

#### Double chip - parallel work

Communication in Double chip modules is independent from positioning. In case of "Combo" the communication with the cellular (network attachment, sending data) blocks the RF interface, and the attachment procedure may take a long time. Likewise, the GNSS receiver with weak satellite signal needs a long time to fix the position, blocking the cellular communication.

#### Double chip - energy consumption

The parallel cellular and GNSS operation in Double chip modules optimizes the energy consumption

The problem of "combo", with no parallel operation demonstrates figure 2. If the GNSS receiver requires more time and therefore is blocking the RF interface, the LTE modem is not maintaining the signaling (paging) with a network, which will result in disconnecting. New registration is a significant energy expense.

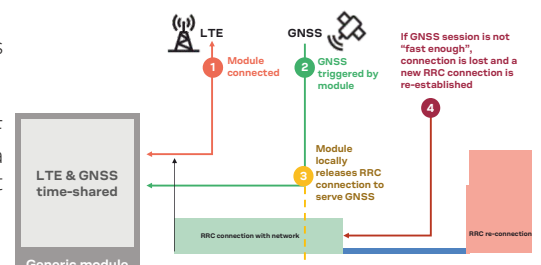


Fig. 2 „combo“ communication issues

#### Double chip - GNSS path

Double chip modules are equipped with an additional LNA amplifier and a SAW filter. GNSS signal quality has a direct impact on the time needed to fix the position. The amplifier and filter allow to work with less efficient, passive antennas, and make the time-to-fix shorter, which lowers energy consumption.

Modules support also complementary u-blox location services - AssistNow, CellLocate and CloudLocate - making the final solution complete.

Double chip, the new, u-blox approach brings awaited optimization of the end devices that have to combine cellular and GNSS technologies, without incurring severe compromises in terms of quality and functionality.

Double chip modules	Cellular technology	GNSS technology
SARA-R510M8S	LTE Cat.M, NBIoT	u-bloxM8
SARA-R422M10S	LTE Cat.M, NBIoT, 2G	u-bloxM10
LENA-R8001M10	LTE Cat.1-bis, 2G	u-bloxM10

# GNSS ANTENNA SELECTION GUIDE

	Embedded				External		
	Passive patch (RHCP)	Active patch (RHCP)	Passive chip (linear polarization)	Passive Helical (tuned)	Active patch	Passive Helical	Active Helical
High gain	●●●●	●●●●	●●●●	●●●●	●●●●●●	●●●●	●●●●●●
Small size	●●●●	●●●●	●●●●●●	●●●●	●●	●●	●●
Power efficiency	●●●●●●	●●●●	●●●●●●	●●●●●●	●●●●	●●●●●●	●●●●
Ground plane independence	●●	●●●●	●●●●	●●●●●●	●●●●	●●●●●●	●●●●●●
De-tuning resistance	●●●●	●●●●	●●●●	●●●●●●	●●●●	●●●●●●	●●●●●●
Cost	●●●●●●	●●●●	●●●●●●	●●●●	●●●●	●●	●●

Choosing an antenna, and properly implementing it, is the second most important part of GNSS system design, right behind the module selection.

An antenna choice is a series of trade-offs that an engineer must take into account. Depending on the desired outcome this part of the system must be either power efficient, have high gain or have small size. These three are the main technological arguments, additional ones would be: polarization (linear polarization antennas tend to be more affected by reflected signals than RHCP), de-tuning resistance and ground plane dependence. A sum of six points that are important for antenna operation.

Other arguments that must be considered are based on End-device requirements, and they may include: ease of installation, ease of servicing, robustness, visual design traits (embedded or external antenna) and one of the most significant - cost.

## Passive or Active

Because of the weak GNSS signals using passive antennas that are additionally mounted via a long cable can be impossible. That is where active antennas are mostly used. An active antenna is a passive patch with an LNA, and the gain is mostly described as the LNA\* gain. Such antennas need to be supplied from a power source, which makes the system less power efficient (an active antenna can consume 10-20mA), but for some applications it is necessary. External antennas are also very popular because there is very little design needed - just plug the antenna to the RF connector.

\*Low-noise amplifier (LNA) is an electronic amplifier used to amplify possibly very weak signals (captured by an antenna). The LNA boosts the antenna signal to compensate for the feedline losses going from the (outdoor) antenna to the (indoor) receiver. It amplifies both noise and signal, so it does not affect the SNR.

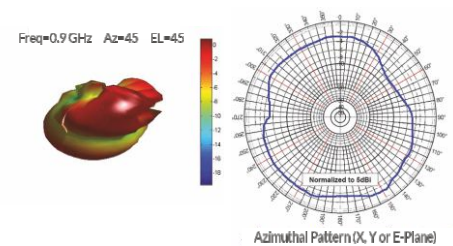
## Patch, chip or helical

Deciding which antenna to use is directly connected to the end-device application. Some rules of thumb for the designer exist however:

- ! A power hungry antenna in a battery driven system is not desired.
- ! A ceramic patch or chip in a pocket application will detune due to human body proximity.
- ! A fixed system will work better with a big 25x25mm patch, with optimal ground plane, than with a helical or chip antenna
- ! A small patch will never have optimal performance, it is a trade - acceptable performance with small size. The performance depends on groundplane size.
- ! A chip will be worse than a patch in almost all cases - exception: it will work better if the device is flipped upside down.
- ! A helical antenna has lower directional gain, but will work better inside a pocket and in a device position changing application.
- ! An external active antenna mounted on a i.e. car (metal) roof will have the best possible gain and may be used as a reference.

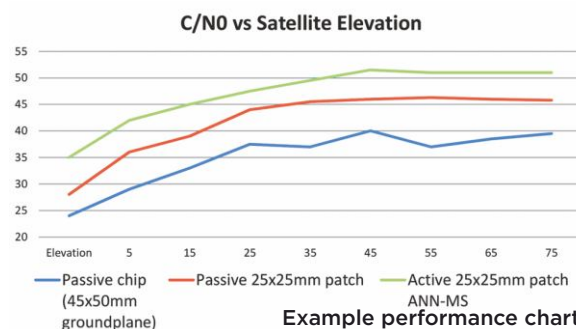
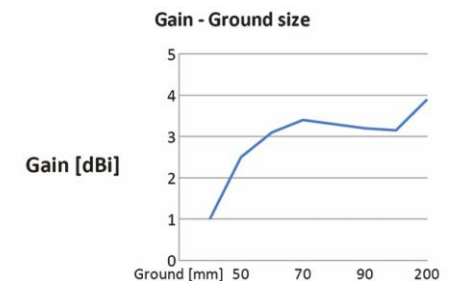
## Gain

Gain describes how well the antenna converts radio waves arriving from a specified direction into electrical power or how well it converts input power into radio waves headed in a specified direction. When no direction is specified, gain is understood to refer to the peak value of the gain. A plot of the gain as a function of direction is called the radiation pattern.



## Ground plane

A ground plane is the most important design issue to consider while developing a GNSS receiver system. A dependable antenna can lose all attributes (gain, polarization, center frequency) if a ground plane is small or non-existent. In almost all cases the parameters stated in the datasheets are based on measurements done with the antenna placed on an optimal ground plane (i.e. 50x50mm), which is a very important point to remember when testing the antenna. The distance to ground plane edge has a similar effect to the size of the ground plane.



# POSITIONING TOOLS

## SOFTWARE TOOLS

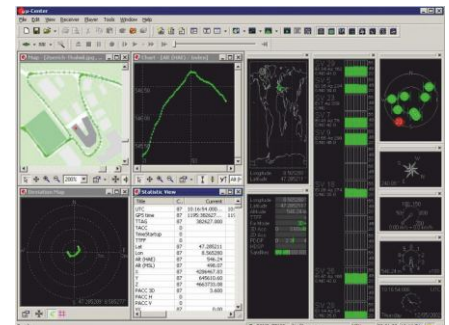
For easy evaluation, configuration, testing and performance analysis u-blox provides a series of software tools, called u-center (for GNSS), m-center (for Cellular) and s-center (for Short Range products). The "centers" are PC-compatible, and provide an intuitive, easy to understand and use graphical interface. They may also be used for firmware upgrades.

**u-center** - a highly intuitive GNSS evaluation software that is easy to use, personalized, and compatible with leading u-blox technologies. u-center supports F9/M9 products and below.

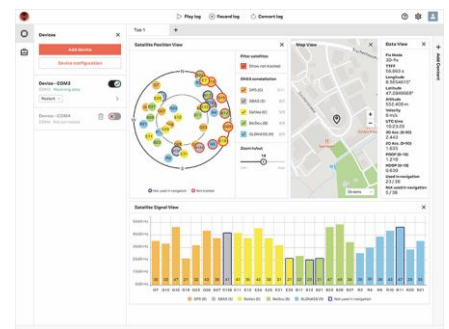
u-center optimized user experience includes personalized workspaces and adaptive window elements. Its log player provides easy message-based and time-based navigation with adjustable playback speed and u-center log file import.

**u-center 2**, the next generation of the software, supports the u-blox M10 platform. It's quick product configuration allows users to define or apply GNSS product configurations for specific use cases. Saving, restoring, or sharing configurations between different products and users is easy. The software supports product evaluation with a choice of views to observe static and dynamic behaviour of the connected u-blox GNSS receiver. The software enables easy setup and evaluation of u-blox GNSS services such as AssistNow.

Regular updates of u-center 2 are provided to ensure the software always has the latest functionalities and pre-defined configurations, and to add support for the most recent firmware of u-blox GNSS receivers. The user is informed at startup and can install the update with a single click



u-center



u-center 2

## HARDWARE TOOLS

**EVK-xxx evaluation kits** provide a simple, flexible and ready to use environment for evaluating of u-blox' modules, as well as for designing and testing of wireless and GNSS applications. EVK is a typical, but proven design, and can be used as reference to compare performance of device under tests or development.

**GNSS kits** enable simple evaluation of the high performance u-blox positioning technology. The built-in USB interface provides both power supply and high-speed data transfer, and eliminates the need for an external power supply. The evaluation kits are compact, and their user-friendly interface and power supply make them ideally suited for use in laboratories, vehicles and outdoor locations. The kits are to be used with a PC via USB interface. USB drivers are provided with the software package.

For easy application development u-blox provides reference designs called **Blueprints** and ready boards called **application boards**, both in many cases may be used without changes in the customers application.

For improved access to the superb u-blox timing technologies, the **RCB-F9T** timing board has been introduced. With industry standard form factor and an SMB antenna connector for fast deployment.

**C099-F9P** application board, with multi-band RTK, allows efficient evaluation of ZED-F9P, the u-blox F9 high precision positioning module. The ZED-F9P module provides multi-band GNSS positioning and comes with built-in RTK technology providing centimeter level accuracy to users. Augmentation services may be formatted as SPARTN 2.0 or RTCM 3.3. The C099-F9P application board integrates the ZED-F9P module and includes an ODIN-W2 short range module for connectivity options.

The application board is designed to support evaluation of the ZED-F9P module, while the ODIN-W2 module provides wireless connectivity capabilities for common use cases. Refer to the C099-F9P User Guide for details on supported configurations. The u-center evaluation software provides a powerful platform for evaluation of u-blox GNSS receivers. With u-center, data can be logged as well as visualized in real time. The u-center desktop application contains an NTRIP server/client to allow a C099-F9P to serve as a RTCM base or rover and also an MQTT client to easily stream PPP-RTK corrections using the PointPerfect service.



EVK-F9P evaluation kit



RCB-F9T timing board



C099-F9P application board

# CELLULAR FOR M2M:

## 2G, NB-IOT, LTE-M, LTE-Cat.1, LTE-Cat.4

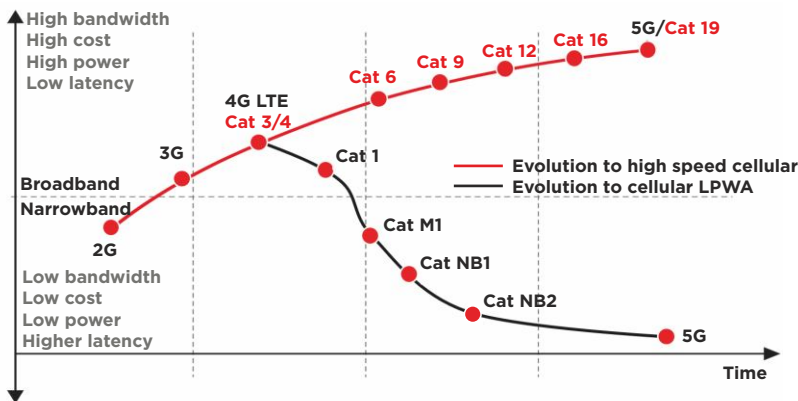
u-blox offers scalable and secure cellular modules for the devices with demanding size, cost, and quality requirements. LPWA (5G), LTE (4G), 3G and 2G modules are optimized for professional applications such as micromobility, asset tracking, fleet management, road pricing, vehicle recovery, security or metering.



The use of u-blox' GSM, UMTS, LTE modules does not lead to consequences from infringement of patents and copyrights.

Modules are qualified according to ISO16750 for „in vehicle use“.

### The evolution of technology - do not leave your application behind



The cellular data transmission technology is evolving in two different directions:

**High data rate:** LTE High Cat. modules, with high data rate (streaming) and high power consumption, required mostly by the consumer market

**Longevity:** LTE Low Cat. modules for IoT/M2M customers aware of evening of the 2G/3G technology.

They are looking for longer availability of the network, keeping the cost and power consumption low, with limited data throughput.

u-blox is a leading supplier of LTE Low Cat. modules meeting such industrial IoT requirement.

**2G:** matured but still good coverage in some regions, like Europe, the lowest cost modules to use global cellular network. Data and voice available.

**LTE-M, NB-IoT:** new, power & cost optimized LTE standard (LPWA). Tailored for IoT, extremely low power and ability to work with weak signal. Supported by most, but not yet all cellular network providers. Considered as 5G. Cost optimized solution in LTE family. Data (voice considered in the future), 2G fallback available.

**LTE Cat.1:** "traditional" LTE with excellent coverage and roamings, Rx diversity (two antennas) for improved link quality. Balanced cost between Cat.4 and LTE-M. Data and voice, 2G/3G fallback available.

**LTE Cat.1-bis:** simplified LTE Cat.1, with removed features, to reach cost level below LTE-M. Data and voice, 2G fallback available.

**LTE Cat.4+:** high LTE category optimized for high data rates and data link quality, causing higher power consumption and price. Data and voice, 2G fallback available.

**5G:** currently category eMBB was introduced, for high speed data streaming.

## LPWA BY U-BLOX

### ABILITY TO MODIFY THE NETWORK SETTINGS FOR LOWER POWER

Power consumption is the most important parameter for NB-IoT technology. The throughput and response time are not critical. Amount of data is small, sent infrequently. Responses from the server can be buffered by the network, which is simplified by publish-subscribe services utilized by CoAP or MQTT.

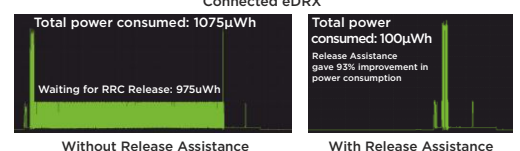
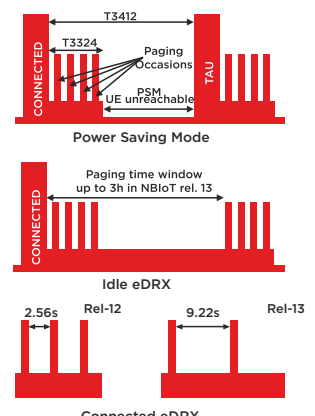
NB-IoT brings many additional features to tune the application and network for the lowest energy consumption in a given scenario. u-blox modules are well tuned by experienced team of engineers to support these features.

**FAEs provide support to u-blox customers for efficient configuration.**

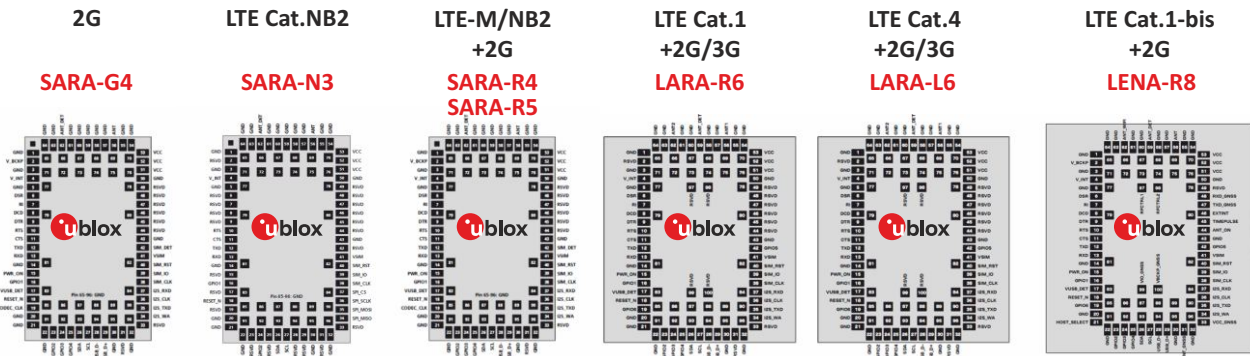
**Power Saving Mode (PSM)** - the module shall remain registered but in deep sleep (3uA) for most of the time. Wake up is possible with data to be sent, or on a schedule by T3412 timer (even once per several days). Dedicated for applications where most traffic will be Mobile Originated.

**eDRX (extended Discontinuous Reception)** - the module wakes up in scheduled paging occasions, during which reception is possible, with an interval of up to 3 hours between them. Dedicated for Device Terminated applications.

**RRC Release Assistance** - unique feature for NB-IoT supported by u-blox modules, can influence RRC Release network timer to significantly reduce the power consumption. After data package is sent application requests immediate RRC release from the network, instead of default network behaviour which is 10-20s RRC release time.



# CELLULAR FOR M2M: 2G, NB-IOT, LTE-M, LTE-Cat.1, LTE-Cat.4



## Easy migration path u-blox nested concept

Various modules can be alternatively mounted on the same board space:  
one PCB for 2G, 3G, NB-IoT, LTE-M, LTE Cat.1, LTE Cat.1-bis and LTE Cat.4.  
High level of pads compatibility and example of design to minimize migration effort.

## SARA, LARA, LENA - selected features Modules optimized for low power, small size, cost saving and superb security

Feature	Description
Pin compatibility between technologies	Different technologies (2G, 3G, NB-IoT, LTE-M, Cat.1-bis, Cat.1, Cat.4) are available in SARA, LARA, LENA pads compatible form factors. One PCB can be ready for any technology.
MNO Profiles	Preconfigured MNO profiles implemented in u-blox modules simplifies proper configuration requested by the particular network provider.
Design support to reduce time-to-market	Features built-in by u-blox to support development, i.e. greeting message (detects unexpected resets), low level trace logs (provides log with low level module-network communication for the further analyze), test command (+UTEST) to simplify production testing.
Production testing	
Dynamic LTE antenna tuning	Simplifies efficient antenna design. Control via two GPIOs an external antenna matching IC according to the LTE band used by the module.
Security	Built in Secure Boot and u-blox secure ecosystem (see more on page 23).
Security-as-a-Service	u-blox unique secure ecosystem, including device security (authentication, updates, beside other) and data security (PSK, E2E encryption, local encryption beside other). (see more on page 17)
Last Gasp	Sending a predefined last notification (via SMS or TCP/UDP) in case of power outage, just before the power goes off.
Low power	The market leading low power consumption across technologies.
RRC Release Assistance (RAI)	Feature supported by the most low power advanced LTE Cat.NB2 (NB-IoT) modules like SARA-N3. Request to drop RRC connection as soon as the message has been received by the network. Saves even 93% of power (calculated with 200 bytes data packages).
Antenna/SIM detection	Provides antenna/SIM presence detection capability.
CoAP, MQTT, LWM2M	Support of protocols dedicated to IoT/M2M.
BIP	Bearer Independent Protocol for Over-the-Air SIM provisioning (eUICC) – remote network provider profile change.
eSIM	Embedded SIM with profile of network provider (MNO).
SNi	Server Name Identification - extension of SSL/TLS which allows the server to present different certificates for different base URL's pointing at the same IP address
RPM	The Radio Policy Manager (RPM) - reduction of the power consumption as the module does not retry an unnecessary service. User friendly for networks – a must demand from some providers.
Jamming detection	Detects and reports potential jamming.
CellLocate service	Localization using signals from BTS, not as accurate as GNSS, but very helpful and supplementary (i.e. in a car park, where a GNSS signal is unavailable).
AssistNow client	Embedded AssistNow Online and Offline service clients to provide better GNSS performance and faster Time-to-First-Fix.
GNSS support	GNSS receiver can be connected directly to cellular module, creating tandem. (see more on page 18).
LTE Rx Diversity	Improved cellular link quality and reliability on all operating bands, by means of 2 receiving antenna.
FOTA / uFOTA	Firmware Over The Air update allows to keep even the deployed devices up to date with the newest functionalities.
AWS modules	The embedded AWS IoT ExpressLink certified software provides tailored AT commands to access AWS cloud straight out-of-the-box, without the need to integrate any additional API on the MCU. Feature significantly accelerates time-to-market.
ATEX modules	ATEX certified modules.

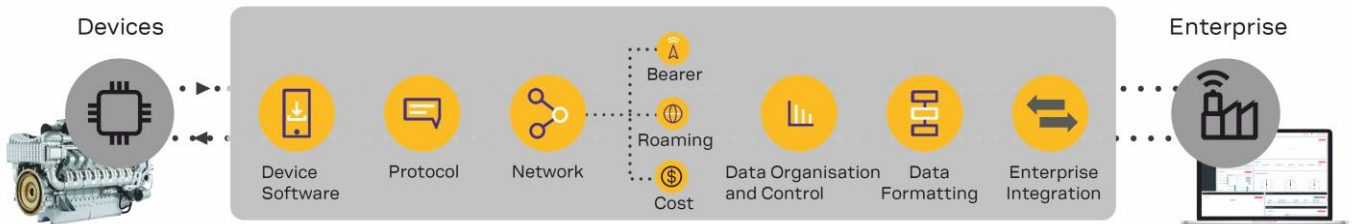


# CAAS - COMPLETE IOT COMMUNICATION SOLUTION



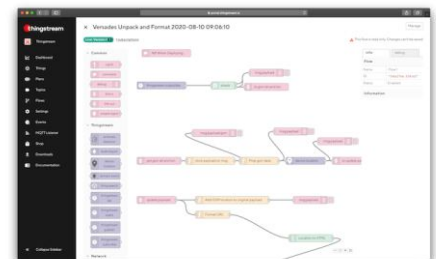
Thingstream provides a comprehensive, end-to-end solution for global IoT connectivity using the industry standard MQTT protocol. The product is offered "as-a-service" which provides predictable cost and on-demand scalability for customers.

MQTT has become a widely used data transfer protocol in the Internet of Things, along with MQTT-SN, which is tailored to the needs of sensor networks. Designed for constrained environments characterized by low power and bandwidth requirements, MQTT transmits messages from one device to one or many others via a broker.



**Communication is so much more than connectivity. u-blox solves the problems of complexity, cost and availability**

u-blox bearer-agnostic approach to getting data from devices to the enterprise is simplified through the availability of complimentary products. These products are built on top of the foundation of a scalable, high performance MQTT broker and powerful Data Flow Manager, allowing simple processing, transformation, control and integration of messages into the enterprise.

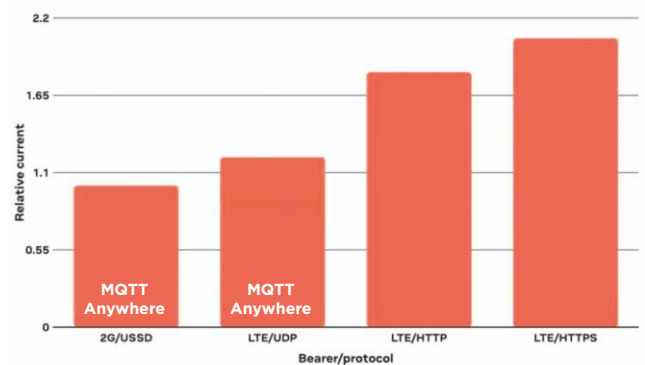
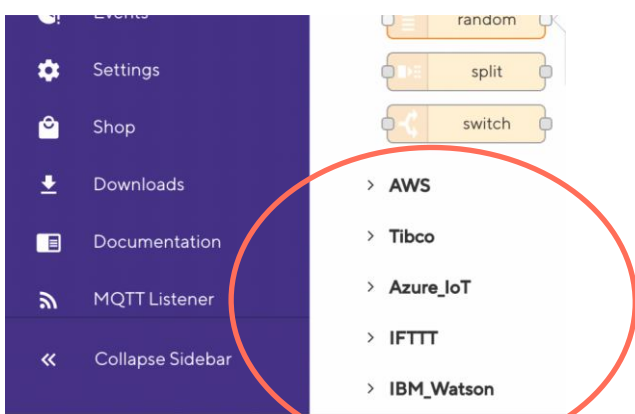
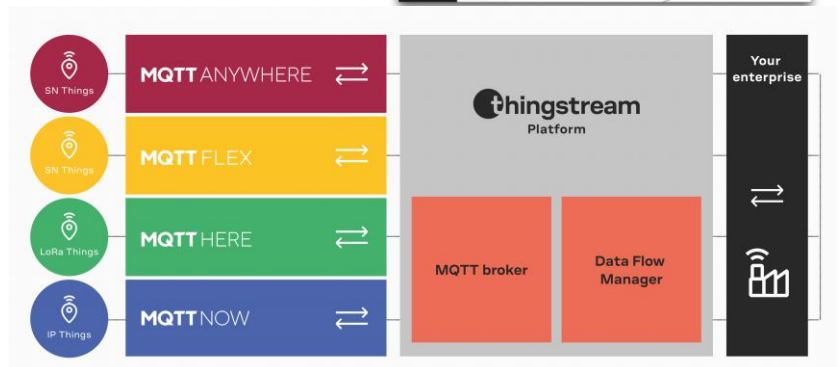


**MQTT Anywhere:** u-blox SIM based service operating across multiple cellular carriers in 190 countries around the world. Fixed price, low-cost, global connectivity, globally ubiquitous, seamless roaming.

**MQTT Flex:** any SIM based service to keep the relationship with the preferred network provider. Predictable cost and on-demand scalability.

**MQTT Here:** solution for LoRaWAN, simplifies LoRaWAN rollout.

**MQTT Now:** Cloud-based MQTT integration for IP devices.



**ultra low power solution**

**Seamless integration into leading cloud platforms**



# SECURITY-AS-A-SERVICE (SAAS)



## Protect your business-critical data from device to cloud with u-blox IoT Security-as-a-Service

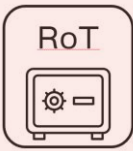



u-blox's innovative IoT security solution makes it extremely simple to protect your data, both on the device and during the transmission of data from the device to the cloud. This ensures that you can focus on your business and enjoy faster time-to-market.

The u-blox approach ensures minimal code development and investment and the highest standards of security, leveraging the Root of Trust in R4, R5, and R6 module platforms to bring a unique and immutable identity for a univocal identification and on-boarding in the leading IoT cloud platforms.

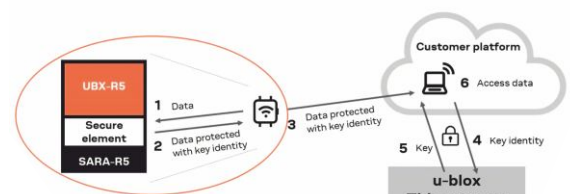
The innovative symmetric key management system delivers an unprecedented level of IoT security giving the possibility to generate on-the-fly an infinite number of crypto keys different for each device to be used for (D)TLS or for any other purpose.

All u-blox IoT security solutions are accurately designed for LPWA constrained devices, reducing the data usage and number of flights, thus minimizing the power consumption that is a critical metric for most IoT devices.

## The four pillars of Security-as-a-Service

 <p><b>Foundation Security</b></p> <p>A unique and immutable device identity and robust root of trust are the foundation of IoT Security</p>	 <p><b>Design Security</b></p> <p>Guard sensitive information on your device without the need of a specialized trusted chip</p>	 <p><b>End-to-end Security</b></p> <p>Ensure the real end-to-end privacy, integrity and authenticity of your data in transit from silicon to cloud</p>	 <p><b>Certificate Lifecycle Control</b></p> <p>Out-of-the-box on boarding to IoT cloud platforms with total control of device certificate lifecycle</p>
---	--	---	---

## Connected Health use case: Patient monitoring



A glucose meter collects blood glucose level and encrypts this data before sending it to the cloud by using the RoT inside SARA-R5



End-to-end security via the u-blox Thingstream server allows only the final target to decrypt sent data



# CELLULAR TOOLS

## SOFTWARE TOOLS

**m-center** - The m-center cellular evaluation software is a powerful and easy to use tool for evaluating, configuring, and testing u-blox cellular modules. It includes an intuitive, easy to understand and easy to use graphical interface.

m-center is available free-of-charge. m-center provides a convenient means to configure u-blox cellular modules and save the configuration in the module EPROM. It is also possible to view and edit SIM phonebook entries, send text messages, and communicate with the wireless module using AT commands - with the possibility to save them and provide to technical support.

The software also supports scripts for quick evaluation of multiple products and is equipped with predefined commands available at a click.

m-center can be used to restore the cellular modules' factory default settings and to perform traces (diagnostic logs). In addition, when using u-blox cellular evaluation kits, m-center allows for simple communication with the onboard GNSS module.



m-center

## HARDWARE TOOLS

**EVK-xxx evaluation kits** are a simple, flexible and ready to use environment for evaluating of u-blox' modules, as well as for designing and testing of wireless but also GNSS applications.

The **cellular EVKs** provide a modular design that allows replacing an adapter board (ADP-xx with cellular module) to test selected technology on the same main board. The cellular kits come with a built-in u-blox GNSS receiver module (or are equipped with the Double Chip cellular module, with integrated GNSS), to either test cellular functionality alone or to integrate it together with u-blox GNSS technology. For evaluating AssistNow (A-GNSS) a u-blox A-GNSS client is embedded in the firmware stack.



EVK-R422M8S kit

# SMART AND EFFICIENT COOPERATION CELLULAR AND POSITIONING

Modern applications often requires two technologies: GNSS positioning and cellular communication.

Expectation is to have cost, size and power optimized solution, but providing reliable positioning service without compromise. Possible options have been described on page 10.

Performance of one chipset „combo” modules is often too much degraded to be accepted for the professional application (more details on page 10).

Double chip solution brings high integration without compromise, but the number of combinations of technologies supported by available double chip modules is limited.

Full flexibility, simple replacing one module, with the other, with different features or technology, is ensured by two modules design, especially considering u-blox strategy to offer same/similar form factor across technologies.

Following common on the market two modules concept u-blox offers optimized integration:

- dedicated interface (DDC/I2C) allows to connect GNSS receiver directly to cellular module
- dedicated features merge two platform into one localization platform
- additional services (CellLocate, AssistNow, CloudLocate) make the package complete

Connecting u-blox' cellular and GNSS modules together simplifies design (one UART is enough), allowing full access to GNSS receiver via the cellular module. It is also possible to use very useful features built-in GSM/LTE modules like:

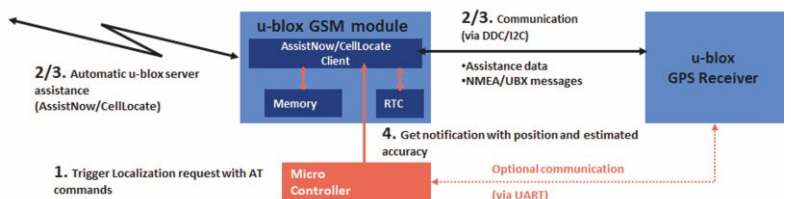
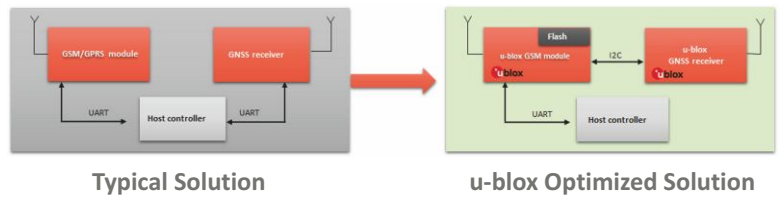
- GNSS power control with AT commands (GNSS supply enable)
- AssistNow client, handling of A-GNSS data exchange and storage (Flash memory in cellular module)
- time synchronization between modules (GNSS RTC sharing)
- GNSS data ready - optimizes power consumption, since it wakes-up application only when there is data ready from the GNSS receiver



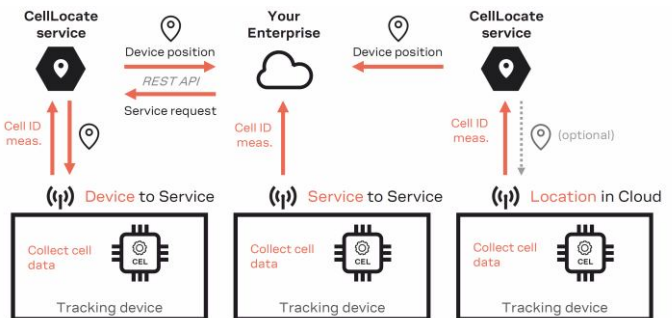
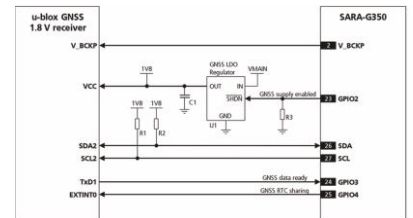
Moreover, u-blox cellular modules offer CellLocate service, making such cellular + positioning tandem not only highly integrated and low power, but also an extremely functional solution, offering information

about position even under poor or no sky visibility and no GNSS signal conditions, or jamming.

Cellular module collects information from visible cells and reports to CellLocate server, where position is calculated. CellLocate server returns the position and position confidence level, i.e. 95% confidence level means a 5% probability that the device is farther than the exposed value, from the estimated position



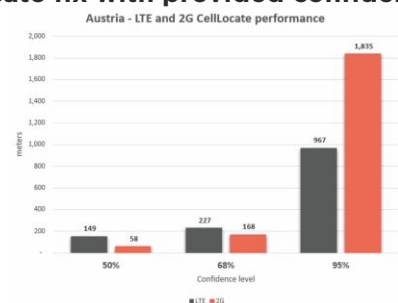
Full cooperation between u-blox' wireless and GNSS modules is possible with very simple hardware design, presented on picture.



Three different CellLocate implementations



CellLocate fix with provided confidence level

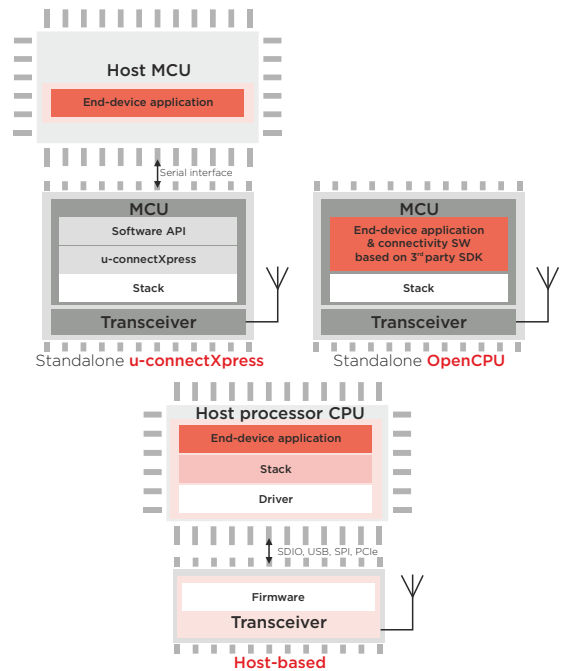


Regional confidence level statistics

# SHORT RANGE MODULES

**Stand-alone modules** are equipped with a powerful processing unit and built-in Wi-Fi/ BT stacks. They work as a Wi-Fi or BT transceiver, with reliable, secure and approved by u-blox firmware (uCX), or customer application (open CPU).  
Make design time shorter, and certification, due to u-blox approvals, easier.

**Host-based modules** run the stack and applications on an external host processor. The Host can be an Android, Windows or Linux based unit. Integration with an OS requires experience and longer development time, but allows higher flexibility in application design and utilization of specialized software from third party companies. Most of the Host-based modules are dedicated for Automotive and demanding Industrial applications. u-blox' Automotive grade guarantees that the units will perform without a hitch even in demanding conditions.



**Providing different technology in pin compatible form factor** (like NINA, MAYA or NORA series) is one of the driving forces that draws the professional industrial customers to u-blox.

**Classic Bluetooth v2.1/v3.0** – robust communication, but needs time to connect, high data rates, older phones are equipped with it. Agreement with Apple must be signed to communicate with iOS devices.

**BLE - Bluetooth low energy (v.4.0-5.3)** also known as Bluetooth Smart, low payload, fast negotiation and connection, low power, most smartphones are equipped with BLE, works also with iOS. BLE is not compatible with Classic.

**Bluetooth dual-mode (BLE +Classic BT)** modules are known as Bluetooth Smart Ready.

**Thread** is an IPv6-based, low-power IEEE 802.15.4 mesh networking technology for Internet of things (IoT) products, uniquely making each node an access point in the network.

**Matter** is a unified IP-based protocol to securely and robustly connect smart devices with each other, regardless of brand, and across smart home ecosystems. Matter is using Thread, Wi-Fi, and Ethernet for transport and Bluetooth LE for commissioning.

All Matter devices based on Thread are required to feature Bluetooth LE concurrently to enable adding new devices to a network.

## BLUETOOTH INDOOR POSITIONING

**Bluetooth direction finding**, introduced with Bluetooth 5.1, lets users locate assets, people, and anything else indoors with meter-level accuracy, paving the way for new indoor positioning use cases and business models.

Bluetooth direction finding makes it possible to determine the direction that radio signals travel between the mobile client and one or several fixed anchor points. Bluetooth has developed two solution architectures, one based on the radio signal's angle of arrival (AoA) at the anchor point, the other based on its angle of departure (AoD).

Only specific modules can transmit and receive the dedicated data streams, and upon reception only raw data is provided. It is up to the application to use that information and calculate the angles and latencies into a viable position.

This is why u-blox has developed the **u-connectLocate** embedded software, that can run on dedicated u-blox modules. u-connectLocate runs on top of the stack and offers developers an easy-to-use command API for calculating the angle right on the Bluetooth module. The embedded software handles RF data collection and preprocessing, and it also suppresses multipath components on each individual antenna.

**In the case of AoA**, the mobile asset is equipped with a tag that transmits a Bluetooth direction finding signal, which includes a constant tone extension packet (CTE). In this scenario, measurements made by the antenna arrays are used to determine the angle of the incoming signals using a network-based engine. Assuming that the signal propagates a planar wave, the slight phase differences observed at each antenna can be used to calculate its angle of arrival.

**In the case of AoD**, the mobile client receives Bluetooth direction finding signals transmitted by one or several antenna arrays. In this case, the mobile client uses measurements of the incoming signal to compute the signal's direction of departure from the antenna array. With information on the geometry of the antenna arrays, the client can calculate the angle of departure of the signal from the antenna array using the measured phase differences.



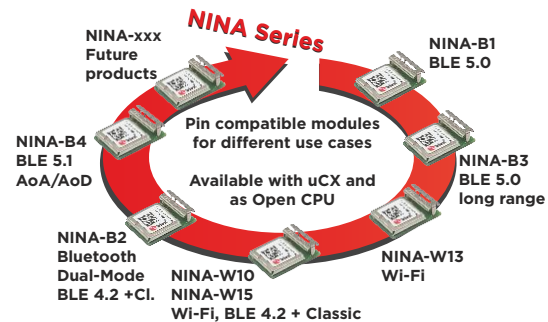
# BLUETOOTH

## Stand-alone short range radio modules

The **NINA Series** complying with the u-blox pin-compatibility concept, supports the design of one simple PCB layout that can be populated with either of the NINA modules - allowing for a quick, and with minimal software tweaks, change of the used connection technology. The choice between Bluetooth, WiFi or both now depending only on the specific use case requirements.

### NINA Series, selected features:

- u-blox Connectivity Software (uCS)** - pre-flashed u-blox application, allows immediate use of the module with reliable, approved by u-blox firmware, simple control via AT commands and added features like SPS (Serial Port Service) or GATT
- Open CPU** - allows to upload customized stacks and customer specific applications using third party APIs, allowing f.e. to use a NINA-B3 with a Thread, Zigbee stacks, Apple HomeKit or AirFuel
- FOTA** - Firmware Over the Air update
- Secure boot** - the module boots up only in the presence of original certified software, preventing network hacks via compromised hardware




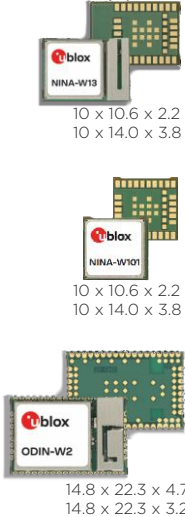
Bluetooth in SiP package	Supply voltage [V]	Power consumption, idle [mA] - connected*	Power consumption, Tx [mA]**	u-blox uCS software	Open CPU	BLE qualification	Bluetooth Classic Wi-Fi: 2.4GHz (S), 2.4GHz & 5GHz (D)	Max range [meters]	Antenna type	UART	SPI	I2C	I2S	USB	RMII	GPIO pins	AD converters (ADC)	Throughput [Mbps]	AT commands support	Maximum connections	Point-to-Point	Extended Data Mode	uAccess point [stations]	BLE Serial Port (SPS)	Wi-Fi enterprise security	Secure boot	Mesh networking	FOTA	AoA/AoD	ATEX/IECEx cert.		
<b>ANNA-B412</b> 6.5 x 6.5 x 1.2 mm	1.7-3.6	35 μ	0.8	●		v5.1		800 1400	I	●						19		0.8	●	8												
<b>ANNA-B402</b>	1.7-3.6	2.6 μ	6.0			v5.1		800 1400	I	●	●	●	●	●		33	8	1.4		20												
<b>ANNA-B112</b>	1.7-3.6	2.2 μ	5.3	●		v5.0		160 300	I	●						14		0.8	●	8												
<b>ANNA-B112</b>	1.7-3.6	2.2 μ	5.3			v5.0		160 300	I	●	●	●				26	8	1.4		20												
<b>Bluetooth modules with u-connect or Open CPU</b>																																
<b>NINA-B111</b>	1.7-3.6	2.2 μ	5.3	●		v5.0		350	E	●						7		0.8	●	8												
<b>NINA-B111</b>	1.7-3.6	2.2 μ	5.3			v5.0		350	E	●	●					19	8	1.4		20												
<b>NINA-B112</b>	1.7-3.6	2.2 μ	5.3	●		v5.0		300	I	●						7		0.8	●	8												
<b>NINA-B112</b>	1.7-3.6	2.2 μ	5.3			v5.0		300	I	●	●	●				19	8	1.4		20												
<b>NINA-B221</b>	3.0-3.6	95	130	●		v4.2	●	200	E	●						21		1.0	●	7												
<b>NINA-B222</b>	3.0-3.6	95	130			v4.2	●	200	I	●						21		1.0	●	7												
<b>NINA-B301</b>	1.7-3.6	1.3 μ	6.6			v5.0		1400	E	●	●	●	●	●		38	8	1.4		20												
<b>NINA-B302/6</b>	1.7-3.6	1.3 μ	6.6			v5.0		1400	I/P	●	●	●	●	●		38	8	1.4		20												
<b>NINA-B311</b>	1.7-3.6	1.3 μ	6.6			v5.0		1400	E	●	●					28		0.8	●	8												
<b>NINA-B312/6</b>	1.7-3.6	1.3 μ	6.6			v5.0		1400	I/P	●	●					28		0.8	●	8												
<b>NINA-B400/1</b>	1.7-3.6	1.3 μ	6.0	●		v5.1		1400	U/P	●	●	●	●	●		40	8	0.8		20												
<b>NINA-B406</b>	1.7-3.6	1.3 μ	6.0			v5.1		1400	I	●	●	●	●	●		40	8	0.8		20												
<b>NINA-B410/1</b>	1.7-3.6	1.3 μ	6.0			v5.1		1400	U/P	●						28		0.8	●	8												
<b>NINA-B416</b>	1.7-3.6	1.3 μ	6.0			v5.1		1400	I	●						28		0.8	●	8												
<b>Rigado series Open CPU Bluetooth modules</b>																																
<b>BMD-380</b>	1.7-5.5	1.5 μ	4.8			v5.0		500	I	●	●	●	●	●		44	12	1.4		20												
<b>BMD-360</b>	1.7-3.6	1.5 μ	4.6			v5.1		200	P	●						32	12	1.4	●	4												
<b>BMD-350</b>	1.7-3.6	1.5 μ	5.3	●		v5.0		190	I	●	●	●	●			32	12	1.4	●	20												
<b>BMD-345</b>	2.0-3.6	2.3 μ	12			v5.0		1000	U	●	●	●	●	●		44	12	1.4	●	20												
<b>BMD-341</b>	1.7-5.5	1.5 μ	4.8			v5.0		750	U	●	●	●	●	●		48	12	1.4	●	20												
<b>BMD-340</b>	1.7-5.5	1.5 μ	4.8			v5.0		350	P	●	●	●	●	●		48	12	1.4		20												
<b>BMD-330</b>	1.7-3.6	1.5 μ	4.6			v5.0		200	P	●	●					32	12	1.4	●	4												
<b>BMD-301</b>	1.7-3.6	1.5 μ	5.3			v5.0		400	U	●	●	●	●			32	12	1.4		20												
<b>BMD-300</b>	1.7-3.6	1.5 μ	5.3			v5.0		200	P	●	●	●	●			32	12	1.4	●	20												
<b>R41Z</b>	1.7-3.6	1.8 μ	6.1			v4.2		150	P	●	●	●				25	16	1.0	●	2												

Bluetooth Dual-Mode modules support SPP, DUN, PAN and GATT profiles, Single-Mode BLE modules support GATT  
 \* Power consumption in idle mode: Wi-Fi enabled, connected, Bluetooth Classic and BLE discoverable and connectable, average value  
 \*\* Power consumption in Tx mode: All available technologies transmitting, average value  
 Antenna type: I - internal antenna, P - antenna pin, U - UFL connector for external antenna  
 Shown sizes are for modules with internal antenna and external antenna connections (UFL or Pin) ● - available in future FW version

# WIFI, BLUETOOTH

## Stand-alone short range radio modules

	Supply voltage [V]	Power consumption, idle [mA] - connected*	Power consumption, Tx [mA]**	u-blox uCS software	Open CPU	BLE qualification	Bluetooth Classic	Wi-Fi: 2.4GHz (S), 2.4GHz & 5GHz (D)	Max range [meters]	Antenna type	UART	SPI	I2C	I2S	USB	RMII	GPIO pins	AD converters (ADC)	Throughput [Mbps]	AT commands support	Maximum connections	Point-to-Point	Extended Data Mode	uAccess point [Stations]	BLE Serial Port (SPS)	Wi-Fi enterprise security	Secure boot	Mesh networking	FOTA	AoA/AoD	ATEX/IECEx cert.
<b>Wi-Fi modules</b>																															
 NINA-W131	3.0-3.6	115	190	●			S	400	E	●							13		20	●	8	●	●	10	●	●					
NINA-W132	3.0-3.6	115	190	●			S	300	I	●							13		20	●	8	●	●	10	●	●					
<b>Multiradio (Wi-Fi + Bluetooth) modules</b>																															
NINA-W101	3.0-3.6	115	250	●	●	v4.2	●	S	400	E	●	●	●	●	●	●	20	4	150	●	8	●	●	10	●	●	●	●	●		
NINA-W102	3.0-3.6	115	250	●	●	v4.2	●	S	300	I	●	●	●	●	●	●	20	4	150	●	8	●	●	10	●	●	●	●	●		
NINA-W151	3.0-3.6	35	320	●	●	v4.2	●	S	400	E	●						13		20	●	7	●	●	10	●	●	●	●			
NINA-W152	3.0-3.6	35	320	●	●	v4.2	●	S	300	I	●						13		20	●	7	●	●	10	●	●	●	●			
ODIN-W260	3.0-3.6	130	300	●	●	v4.0	●	D	300	U	●						23		20	●	7	●	●	10	●	●	●	●			
ODIN-W260	3.0-3.6	130	300	●	●	v4.0	●	D	300	U	●	●	●				29	3	20	●	7	●	●	10	●	●	●	●			
ODIN-W262	3.0-3.6	130	300	●	●	v4.0	●	D	250	I	●						23		20	●	7	●	●	10	●	●	●	●			
ODIN-W262	3.0-3.6	130	300	●	●	v4.0	●	D	250	I	●	●	●				29	3	20	●	7	●	●	10	●	●	●	●			
ODIN-W263***	3.0-3.6	130	300	●	●	v4.0	●	D	250	I	●						23		20	●	7	●	●	10	●	●	●	●			
ODIN-W263***	3.0-3.6	130	300	●	●	v4.0	●	D	250	I	●	●	●				29	3	20	●	7	●	●	10	●	●	●	●			



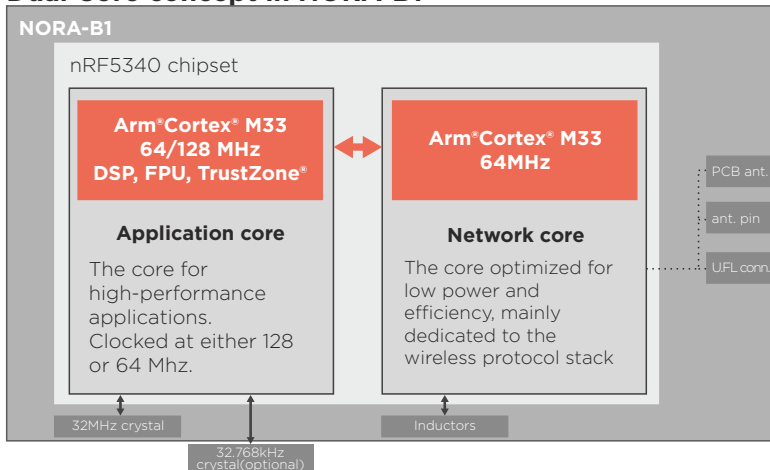
## THE NORA SERIES - DUAL CORE MODULES

	Supply voltage [V]	Power consumption, idle [mA] - connected*	Power consumption, Tx [mA]**	u-blox uCS software	Open CPU	BLE qualification	Bluetooth Classic	Wi-Fi: 2.4GHz (S), 2.4GHz & 5GHz (D)	Max range [meters]	Antenna type	UART	SPI	I2C	I2S	USB	RMII	GPIO pins	AD converters (ADC)	Throughput [Mbps]	AT commands support	Maximum connections	Point-to-Point	Extended Data Mode	uAccess point [Stations]	BLE Serial Port (SPS)	Wi-Fi enterprise security	Secure boot	Mesh networking	FOTA	AoA/AoD	ATEX/IECEx cert.
<b>Bluetooth modules</b>																															
NORA-B100	1.7-5.5	1.3μ	5.3	●		v5.2			700	U	●	●	●	●	●	●	48	8	1.4	64						●	●	●	●		
NORA-B101	1.7-5.5	1.3μ	5.3	●		v5.2			700	E	●	●	●	●	●	●	48	8	1.4	64						●	●	●	●		
NORA-B106	1.7-5.5	1.3μ	5.3	●		v5.2			400	P	●	●	●	●	●	●	48	8	1.4	64						●	●	●	●		
NORA-B120	1.7-3.6	2.3μ	22.3	●	●	v5.2			1700	I	●	●	●	●	●	●	46	8	1.4	64					●	●	●	●			
NORA-B121	1.7-3.6	2.3μ	22.3	●	●	v5.2			1700	E	●	●	●	●	●	●	46	8	1.4	64					●	●	●	●			
NORA-B126	1.7-3.6	2.3μ	22.3	●	●	v5.2			1500	P	●	●	●	●	●	●	46	8	1.4	64					●	●	●	●			
<b>Multiradio (Wi-Fi + Bluetooth) modules</b>																															
NORA-W101	3.0-3.6	0.8	190	●	●	v5.0	●	S	500	E	●	●	●	●	●	●	20	12	150	●	10	●	●	10	●	●	●	●			
NORA-W106	3.0-3.6	0.8	190	●	●	v5.0	●	S	500	P	●	●	●	●	●	●	20	12	150	●	10	●	●	10	●	●	●	●			
NORA-W251AWS	3.0-3.6	TBD	TBD	●	●	v5.0	●	S	500	E	●	●	●	●	●	●	20	12	150	●	5	●	●	10	●	●	●	●			
NORA-W256AWS	3.0-3.6	TBD	TBD	●	●	v5.0	●	S	500	P	●	●	●	●	●	●	20	12	150	●	5	●	●	10	●	●	●	●			



Bluetooth Dual-Mode modules support SPP, DUN, PAN and GATT profiles, Single-Mode BLE modules support GATT  
 \* Power consumption in idle mode: Wi-Fi enabled, connected, Bluetooth Classic and BLE discoverable and connectable, average value  
 \*\* Power consumption in Tx mode: All available technologies transmitting, average value  
 Antenna type: I - internal PIFA antenna, E - antenna pin, P - PCB antenna, U - U.FL connector for external antenna  
 Shown sizes are for modules with internal antenna and external antenna connections (U.FL or Pin) ● - available in future FW version  
 \*\*\* version only for EU, supports more channels from start up

### Dual Core concept in NORA-B1



**NORA-B1 series** are small, stand-alone Bluetooth Low Energy, wireless microcontroller unit (MCU) modules that comply with the Bluetooth 5.2 specification. The modules are built on the Nordic nRF5340 chip as an open CPU solution where customer applications run on two Arm® Cortex®-M33 processor cores with integrated flash and RAM memory.

Features:



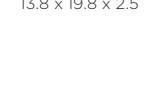
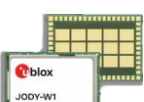



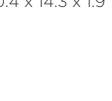
- Arm® TrustZone® and CryptoCell® 312 for enhanced security
- Multi-protocol support for Bluetooth 5.2, Bluetooth mesh, Matter, Thread, Zigbee, and NFC
- Support for Bluetooth Low Energy audio and Bluetooth Direction Finding
- Option with front-end module PA/LNA for extended range
- Extended temperature range up to 105 °C
- Global certification

**Applications on the first core can run without being interrupted by network activity on the second**



# WI-FI, BLUETOOTH

## Host-based short range radio modules

	Supply voltage [V]	Chipset	Bluetooth BR/EDR	Bluetooth Low Energy	Bluetooth qualification	Wi-Fi: 2.4GHz (S), 2.4GHz & 5GHz (D)	Antenna type	LTE Filter	High-speed UART for Bluetooth only	PCIe for Wi-Fi only	SDIO [Version]	USB 2.0	PCM or I2S (Bluetooth audio)	Android/Linux support via u-blox free of charge	GNX support via third party [max stations]	Micro Access Point [max stations]	AES hardware support	Wi-Fi direct	Simultaneous STA/AP on different channels	Factory calibrated RF	RF calibration in OTP	MAC address stored in module	WPA3	Antenna diversity	MIMO	
<b>Wi-Fi modules</b>																										
 10 x 14 x 2.2	LILY-W131	1.7-3.6	NXP 88W8801		Wi-Fi4		S	1a			v2					8										
	LILY-W132	1.7-3.6	NXP 88W8801		Wi-Fi4		S	int			v2					8										
	LILY-W133	1.7-3.6	NXP 88W8801		Wi-Fi4		S	int			v2					8										
<b>Multiradio (Wi-Fi + Bluetooth) modules</b>																										
 13.8 x 19.8 x 2.5	EMMY-W161	3.0-3.6	NXP 88W8887A		Wi-Fi5	v4.2	D	1p			v3					10										
	EMMY-W163	3.0-3.6	NXP 88W8887A		Wi-Fi5	v4.2	D	2p			v3					10										
	EMMY-W165	3.0-3.6	NXP 88W8887A		Wi-Fi5	v4.2	D	1p			v3					10										
 13.8 x 19.8 x 2.5	JODY-W163	3.2-4.8	CYW89359		Wi-Fi5	v5.0	D	2p			v3					10										
	JODY-W164	3.2-4.8	CYW89359		Wi-Fi5	v5.0	D	2p			v3					10										
	JODY-W167	3.2-4.8	CYW89359		Wi-Fi5	v5.0	D	3p			v3					10										
 13.8 x 19.8 x 2.5	JODY-W174	3.2-4.8	CYW89359		Wi-Fi5	v5.1	D	2p			v3					12										
	JODY-W263	2.8-5.5	NXP 88W8987		Wi-Fi5	v5.2	D	2p			v3					8										
	JODY-W354	3.14-3.46	NXP AW690		Wi-Fi6	v5.3	D	2p			v3					2x32										
 13.8 x 19.8 x 2.5	JODY-W374	3.14-3.46	NXP Q9098		Wi-Fi6	v5.3	D	2p			v3					2x32										
	JODY-W377	3.14-3.46	NXP Q9098		Wi-Fi6	v5.3	D	3p			v3					2x32										
	JODY-W377	3.14-3.46	NXP Q9098		Wi-Fi6	v5.3	D	3p			v3					2x32										
<b>Multiradio (Wi-Fi + Bluetooth) modules</b>																										
 10.4 x 14.3 x 1.9	MAYA-W160	3.0-3.6	NXP IW416		Wi-Fi4	v5.2	D	2u			v3					8										
	MAYA-W161	3.0-3.6	NXP IW416		Wi-Fi4	v5.2	D	2p			v3					8										
	MAYA-W166	3.0-3.6	NXP IW416		Wi-Fi4	v5.2	D	int			v3					8										
 10.4 x 14.3 x 1.9	MAYA-W260	3.0-3.6	NXP IW611		Wi-Fi6	v5.2	D	2u			v3					16										
	MAYA-W261	3.0-3.6	NXP IW611		Wi-Fi6	v5.2	D	2p			v3					16										
	MAYA-W266	3.0-3.6	NXP IW611		Wi-Fi6	v5.2	D	int			v3					16										
 10.4 x 14.3 x 1.9	MAYA-W271	3.0-3.6	NXP IW612		Wi-Fi6	v5.2	D	2p			v3					16										
	MAYA-W276	3.0-3.6	NXP IW612		Wi-Fi6	v5.2	D	int			v3					16										

1p = 1 antenna pin for combined Bluetooth and Wi-Fi    1a = 1 pin for external antenna  
 2p = 2 antenna pins, one each for Bluetooth and Wi-Fi    2a = 2 pins for 2 external antennas  
 3p = 3 pins, 2 for Wi-Fi and 1 for Bluetooth antenna    int = Internal antenna  
 □ - Linux drivers in source code  
 ○ - on request

## M.2 CARDS



The u-blox M.2 cards combine the maximum performance of the modules mounted on them with the flexibility and ease of use of an M.2 card. The used industry standard M.2 type 2230 Key E form factor and U.FL connectors for antennas, or integrated PCB antennas, allow for minimal design effort. The module featured on the card, like all u-blox modules, undergoes extensive qualification tests to ensure reliability over its lifetime, and each module is fully tested before leaving the assembly line. The cards are compatible with NXP i.MX evaluation and development boards, but are also available in single quantities - with included antennas, and as simple evaluation kits (f.e. EVK-M2-...)

Available cards:

- M2-JODY-W263**  
**EVK-M2-W262**  
Standard grade M.2 card module with two antenna connectors (one for 2.4 GHz and 5 GHz 802.11ac, and one for Bluetooth/Bluetooth Low Energy 5.2)
- M2-JODY-W377**  
**EVK-M2-W377**  
Standard grade M.2 card module with three antenna pins; concurrent dual band Wi-Fi 2x2 2.4 GHz and 5 GHz, 802.11ax; Bluetooth 5.3 BR/EDR and LE
- M2-MAYA-W161**  
**EVK-M2-W161**  
Standard grade M.2 card module with two separate U.FL antenna connectors for Wi-Fi and Bluetooth
- M2-MAYA-W166**  
**EVK-M2-W166**  
Standard grade M.2 card module with embedded PCB antenna for Wi-Fi and Bluetooth
- M2-MAYA-W271**  
**EVK-M2-W271**  
Standard grade M.2 card module with two separate antenna U.FL connectors for Wi-Fi and Bluetooth/802.15.4

# SHORT RANGE TOOLS

The **short range kits** are equipped with a J-Link debugger and a processor for own application development - designed for use with Arm® Mbed™ or radio chipset manufacturers SDK. They are complete starter kits that allow quick prototyping of a variety of Bluetooth low energy and Wi-Fi sensor applications for Internet of Things.



EVK-MAYA-W16

For easy application development u-blox provides reference designs called **Blueprints** and ready boards called **application boards**, both in many cases may be used without changes in the customers application.



s-center

**s-center** - dedicated software to connect with u-blox ANNA, NINA, ODIN Wi-Fi and Bluetooth products, providing intuitive tools to test the unique functionalities of the modules.

## AOA/AOD

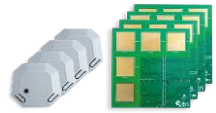
Bluetooth indoor positioning is among the most promising technologies for scaling up indoor tracking in a wide range of use cases including logistics, healthcare, manufacturing, retail, and in warehouses and smart buildings.

With the **XPLR-AOA-1** explorer kit you can evaluate and experiment with the Bluetooth 5.1 direction finding feature. The kit comprises an antenna board (C211) and a tag (C209) as well as the necessary software for leveraging the angle-of-arrival (AoA) technology in your specific application.



XPLR-AOA-1

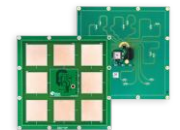
The **XPLR-AOA-2** explorer kit provides everything needed to evaluate high accuracy positioning with Bluetooth 5.1 direction finding technology. The kit comprises 4 antenna boards (C211) and 4 tags (C209) as well as the necessary software for setting up a system to evaluate Angle-of-Arrival (AoA) technology for high accuracy positioning indoors.



XPLR-AOA-2

The antenna boards, equipped with a NINA-B411 Bluetooth LE module, applies an angle calculation algorithm to extract the direction to the tag. The angle is calculated by the u-connectLocate software, running on the embedded MCU in NINA-B411. No additional processing is required, the angle is delivered directly from the USB port of the antenna board.

The **ANT-B10** is a compact antenna board designed specifically for Bluetooth angle of arrival (AoA) direction finding systems. It features eight patch-antenna elements in an arrangement that offers optimal performance in the presence of multipath effects. To test the antenna u-blox provides the **XPLR-AOA-3** kit.



ANT-B10 antenna board

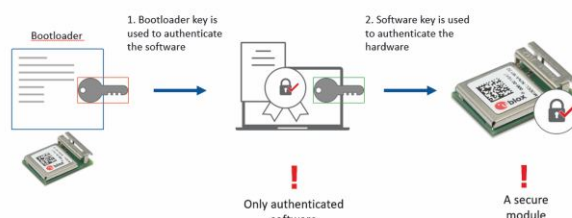
# U-BLOX WIRELESS SECURITY

The Internet of Things concept is the road the whole world is taking, but in a connected world security breach prevention is one of the most important aspects of proper system design. u-blox, as manufacturer of reliable industrial, professional products, provides exceptional security built into their solutions. Protect your application by using u-blox GNSS, Cellular or Short-range modules.



Threats	Principle	The u-blox approach
<b>Modifications to the way that u-blox and customers' products work</b>	Secure Boot Secure FW upgrades Secure interfaces Secure APIs	u-blox products are secured against security threats originating from attacking the module behaviour, man-in-the-middle and replay attacks Bootloader accepts only authenticated Software
<b>Changing the data as it flows through the system</b>	Secure communications TLS (Transport Layer Security) SSL (Secure Socket Layer) EAP-TLS for Wi-Fi stations Secure Simple pairing	u-blox AssistNow service cannot be used to attack the GNSS receivers Encrypted and authenticated via certificate connections for Wi-Fi and Cellular modules EAP-TLS Wi-Fi modules will connect to APs only with a trusted certificate BLE secure connections use Elliptic Curve Diffie Hellman (ECDH) for key generation
<b>Unauthorised systems taking control of u-blox products</b>	Spoofing and jamming protection Protected management frames (802.11w)	Protection against malicious attacks, also at the antenna side Management action frames are protected from both eavesdropping and forging

**Secure boot will not allow the module to run with malicious software**







# GNSS ANTENNAS

## THE MOST POPULAR VERSIONS

### ME4D01MP / ME4D01GMP



- I Active GNSS antenna
- I **GPS (ME4D01MP)**
- I **GPS+GLONASS (ME4D01GMP)**
- I Magnetic version, sticker option
- I RG174 cable with the type of connector upon request
- I Dimensions (mm) 41 x 34 x 13.7
- I Operating temperature -40°C to +85°C

### ANN-MB/ANN-MB1



- I **Active multi-band L1, L2/E5 (MB), or L1, L5/E5a/B2a/NavIC (MB1)**
- I GNSS antennas with excellent price performance ratio
- I GPS, GLONASS, Galileo, and BeiDou
- I Fast and easy antenna solution for high precision applications
- I Many mounting and connector options
- I Extended temperature range: up to +105°C

### MEF0301P



- I Passive GNSS antenna
- I Gain -3.9 dBi
- I Efficiency -76%
- I cable with the type of connector upon request
- I Dimensions (mm) 55.4 x 12.4 x 0.2
- I Operating temperature -40°C to +85°C
- I **Flexible**

### ME6600B



- I 1x GPS (ME6600B)
- I 1x GPS+GLONASS (ME6600BG)
- I 1x 2G, 3G
- I **Vandal proof**
- I **Screw mount**  
screw diameter M14
- I Dimensions (mm) Ø 77 x H 15
- I Operating temperature -40°C to +85°C

### ME7041BGa



- I **2 x 4G LTE/3G/2G MIMO**
- I **1 x GPS/GLONASS/Galileo**
- I Vandal proof
- I Screw mount
- I Dimensions (mm) Ø 96 x H 90
- I Operating temperature -40°C to +85°C
- I Versions with additional ISM connections available

### ME4441GP



- I **1x 4G LTE/3G/2G**
- I **1x GPS/GLONASS/Galileo**
- I Dimensions (mm) 161 x 76.5 x 16
- I Cellular efficiency -70%
- I GNSS gain 23 dB@3 V, 24 dB@ 5 V
- I Operating temperature -40°C to +85°C

### ACTIVE PATCH



Active patch antennas are a perfect solution for devices where an internal antenna is needed, but a RF signal path SMD design is challenging.

- I Available in various sizes  
18 x 18 mm  
25 x 25 mm
- I **Pre-filter and mid-filter versions** for saturation protection or low noise figure
- I **Two LNA gain possibilities**  
14 dB for low power consumption  
28 dB for weak signal environments
- I cable length and connector upon request
- I **GPS or GPS/GLONASS versions**
- I **Available parts:**  
MEM001F, MEM003F (GF),  
MEM004F (GF), MEM005F (GF),  
MEM006F (GF), MEM007F (GF),  
MEM008F (GF)

### I Active quadrifilar antenna for RTK applications

- I Concurrent GNSS reception on L1: GPS, GLONASS, Galileo, Beidou L2: GPS L2C, Galileo E5B, and GLONASS L3OC
- I Gain 28 dB ± 3 dB
- I Dimensions (mm) 75 x 70 x 23

### M9706CWT



### I Active quadrifilar helix antenna for RTK applications

- I Concurrent GNSS reception on L1: GPS, GLONASS, Galileo, Beidou L2: GPS L2C, GAL E5B, GLO L3OC L5: GPS (M8HCT-A-SMA) L-Band (M9HCT-A-SMA)
- I Rugged IP-67 rating with SMA
- I Ultra lightweight - 25 grams
- I Dimensions (mm) Ø 35 x H 57

### M7HCT-A-SMA



### I High performance passive GPS or GPS/GLO antenna

- I Very low axial ratio
- I IP-67 mounted and unmounted
- I Ultra light weight - 10 grams
- I Ground plane independent
- I Dimensions (mm) Ø 18.5 x H 38
- I SMA connector
- I **Internal version available: Ø 12.85 x H 24.30, only 2g weight**

### M1575HCT-22P-SMA (GG)



### I Active L1/L2 GPS/GLONASS bands

- I Rugged IP-67 rating
- I Superior out-of-band rejection
- I 50 V/m jamming resistant
- I Very low noise figure
- I SMA connector
- I Dimensions (mm) Ø 30 x H 51
- I Ground plane independent
- I **GIS & RTK applications**
- I Ultra light weight - 24 grams

### M1227HCT-A2-SMA



### I Passive GPS/GLONASS antenna

- I Very low axial ratio
- I IP-67 mounted
- I Ultra light weight - 12 grams
- I Ground plane independent
- I Dimensions (mm) Ø 18.5 x H 48

### M1516HCT-P



### I High performance Active GPS antenna

- I Very low axial ratio
- I IP-67 mounted and unmounted
- I Ultra light weight - 10 grams
- I Ground plane independent
- I Dimensions (mm) Ø 18.5 x H 38
- I SMA connector

### M1575HCT-15A-SMA



### MAXTENA PATCH



Microstrip GPS/GPS+GLONASS patch type antennas are offered by the American company Maxtena in several sizes, to fit almost any application. Starting from **10 mm x 10 mm** for very small GNSS receivers and ending with 25mmx25mm.

**Engineering kits (tuning kits)** contain 10 pcs of the antennas, but with different resonance frequencies (with a 2MHz interval), which allows a selection of an antenna tuned to a particular environment (housing and other components have a major impact on the efficiency of GNSS antennas).



# CELLULAR ANTENNAS

## THE MOST POPULAR VERSIONS

### ME0B04



**I Standards** 2G and 3G  
**I VSWR** -2.2:1, -2.4:1  
**I Efficiency (%)** -70.6, -56.4  
**I Peak Gain (dBi)** -2.9, -1.8  
**I Dimensions (mm)** 44 x 19.1 x 9  
**I Operating temperature** -40 °C to +85 °C

**I Standards** 2G, 3G and 4G  
**I VSWR** -2.8:1, -2.5:1, -2.7:1  
**I Efficiency (%)** -58, -52, -41.9  
**I Peak Gain (dBi)** -3.0, -2.3, -0.7  
**I Dimensions (mm)** 208.3 x Ø16  
**I Operating temperature** -40 °C to +85 °C

### ME2124K-B07H



### ME3704M



**I Standards** 2G and 3G  
**I VSWR** -1.6:1, -1.8:1  
**I Efficiency (%)** -49, -28  
**I Peak Gain (dBi)** -1.7, -0.3  
**I Dimensions (mm)** 30.9 x 71.5  
**I Operating temperature** -40 °C to +85 °C  
**I Magnetic**

**I Standards** 2G, 3G and 4G  
**I VSWR** -2.4:1, -1.6:1, -2.2:1  
**I Efficiency (%)** -62, -75, -50  
**I Peak Gain (dBi)** -0.4, -2.6, -1.3  
**I Dimensions (mm)** 171 x 38 x 13.8  
**I Operating temperature** -40 °C to +85 °C  
**I Magnetic version available**

### MEW0124



### ME5004PL



**I Standards** 2G and 3G  
**I VSWR** -1.5:1, -1.4:1  
**I Efficiency (%)** -52, -43  
**I Peak Gain (dBi)** -3.5, -4.6  
**I Dimensions (mm)** 126.5 x 22 x 6.7  
**I Operating temperature** -40 °C to +85 °C  
**I Adhesive mount**

**I Standards** 2G, 3G and 4G  
**I VSWR** -2.0:1, -1.5:1, -1.8:1  
**I Efficiency (%)** -53, -52, -41  
**I Peak Gain (dBi)** -2.0, -4.1, -4.1  
**I Dimensions (mm)** 117.4 x 12.5 x 6.5  
**I Operating temperature** -40 °C to +85 °C  
**I Adhesive mount**

### ME5224P



### MEW0304



**I Standards** 2G and 3G  
**I VSWR** -2.1:1, -1.6:1  
**I Efficiency (%)** -30, -59  
**I Peak Gain (dBi)** -1.3, -2.0  
**I Dimensions (mm)** 113 x 10  
**I Hinge**  
**I Operating temperature** -40 °C to +85 °C

**I Standards** 2G, 3G and 4G  
**I VSWR** -3.1:1, -1.7:1, -1.5:1  
**I Efficiency (%)** -58, -67, -74  
**I Peak Gain (dBi)** -0.1, -2.9, -4.6  
**I Dimensions (mm)** Ø 10 x 71  
**I Hinge**  
**I Operating temperature** -20 °C to +65 °C

### MEW1024



### ME3104M



**I Standards** 2G and 3G  
**I VSWR** -1.6:1, -1.5:1  
**I Efficiency (%)** -48.6, -34.5  
**I Peak Gain (dBi)** -2.2, -3.0  
**I Dimensions (mm)** Ø 31 x 248.4  
**I Operating temperature** -40 °C to +85 °C

**I Standards** 2G, 3G and 4G  
**I VSWR** -2.8:1, -1.5:1, -1.7:1  
**I Efficiency (%)** -54.8, -67.5, -70.1  
**I Peak Gain (dBi)** -1.2, -4.1, -4.2  
**I Dimensions (mm)** 40 x 7 x 3  
**I Operating temperature** -40 °C to +85 °C

### MEE18



### MEE017



**I Standards** 2G and 3G  
**I VSWR** -3.3:1, -1.8:1  
**I Efficiency (%)** -67.5, -70.8  
**I Peak Gain (dBi)** -2.2, -2.2  
**I Dimensions (mm)** 26 x 7.6 x 3  
**I Operating temperature** -40 °C to +85 °C

**I Standards** 2G, 3G and 4G  
**I VSWR** -1.5:1, -1.8:1, -2.1:1  
**I Efficiency (%)** -45, -48, -48  
**I Peak Gain (dBi)** -0.3, -1.5, -2.8  
**I Dimensions (mm)** 89.7 x 14.1 x 0.8  
**I Operating temperature** -40 °C to +85 °C

### MEP0624P



### MEF0304P



**I Standards** 2G and 3G  
**I VSWR** <=2.4:1, <=1.5:1  
**I Efficiency (%)** -41, -61  
**I Peak Gain (dBi)** -1, -2.1  
**I Dimensions (mm)** 70.4 x 26.4 x 0.1  
**I Operating temperature** -40 °C to +85 °C  
**I Flexible antenna**

**I 1x 2G and 3G**  
**I 1x WiFi, BT, ZigBee, ISM (2.4GHz)**  
**I 1x GPS/QZSS/Galileo/GLONASS**  
**I 1x IRIDIUM**  
**I Peak Gain (dBi)** -1.8, -2.3, -2.5, 28 @ 2.7 V, -4.5  
**I Heavy Duty antenna**  
**I Screw mount**  
**I Dimensions (mm)** Ø 146 x 31.5  
**I Operating temperature** -40 °C to +85 °C

### ME6551BG



### MEP0104P



**I Standards** 2G and 3G  
**I VSWR** <=2:1, <=2.6:1  
**I Efficiency (%)** -45, -60  
**I Peak Gain (dBi)** -0.5, -3  
**I Dimensions (mm)** 75 x 25 x 0.8  
**I Operating temperature** -40 °C to +85 °C

**I 2x 2G, 3G and 4G**  
**I 2x WiFi, BT, ZigBee, ISM (2.4GHz)**  
**I 1x GPS/QZSS/Galileo/GLONASS**  
**I Heavy Duty antenna**  
**I For 43,2mm Mast Mounting**  
**I Dimensions (mm)** Ø 96 x H 90  
**I Operating temperature** -40 °C to +85 °C

### ME7050JGa



# ISM ANTENNAS

## THE MOST POPULAR VERSIONS

### MEOA02-2.4



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4 GHz ISM  
**I VSWR** -4.1:1  
**I Efficiency (%)** -61  
**I Peak Gain (dBi)** -3.5  
**I Dimensions (mm)** 44 x 9.6  
**I Operating temperature** -40 °C to +85 °C

**I Standards** Sigfox/LoRa/  
 ZigBee/RFID/LPWA/ISM/UHF  
**I Frequency** 868 MHz ISM  
**I VSWR** -1.8:1  
**I Efficiency (%)** -69.3  
**I Peak Gain (dBi)** -1.2  
**I Dimensions (mm)** 44 x 19.1 x 9  
**I Operating temperature** -40 °C to +85 °C

### MEOB15-868



### ME3702M



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4 GHz ISM  
**I VSWR** -1.2:1  
**I Efficiency (%)** -4.3  
**I Magnetic**  
**I Peak Gain (dBi)** -1.6  
**I Dimensions (mm)** Ø 31 x 71.5  
**I Operating temperature** -40 °C to +85 °C

**I Standards** ZigBee, ISM,  
 SIGFOX, LoRa  
**I Frequency** 868 MHz ISM  
**I VSWR** -1.4:1  
**I Efficiency (%)** -37.0  
**I Peak Gain (dBi)** --0.3  
**I Dimensions (mm)** 50 x Ø16  
**I Operating temperature** -40 °C to +85 °C  
**I Through hole mount**

### ME1015-868



### MEW0302-2.4



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4 GHz ISM  
**I VSWR** -1.9:1  
**I Efficiency (%)** -62  
**I Peak Gain (dBi)** -1.5  
**I Dimensions (mm)** 113 x 10  
**I Operating temperature** -40 °C to +85 °C  
**I Hinge**

**I Standards** ZigBee, ISM,  
 SIGFOX, LoRa  
**I Frequency** 868 MHz ISM  
**I VSWR** -1.3:1  
**I Efficiency (%)** -64.5  
**I Magnetic**  
**I Peak Gain (dBi)** -2.6  
**I Dimensions (mm)** Ø 30.9 x 91  
**I Operating temperature** -40 °C to +85 °C

### ME3915M-868



### MEF0202P



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4/5.0 GHz ISM  
**I VSWR** -1.2:1, -1.5:1  
**I Efficiency (%)** -76.3, -74.7  
**I Peak Gain (dBi)** -4.4, -6.7  
**I Dimensions (mm)** 30 x 30 x 0.2  
**I Operating temperature** -40 °C to +85 °C  
**I Flexible antenna**

**I Standards** ZigBee, ISM,  
 SIGFOX, LoRa  
**I Frequency** 868 MHz ISM  
**I VSWR** -1.2:1  
**I Efficiency (%)** -59.1  
**I Peak Gain (dBi)** -2.6  
**I Dimensions (mm)** 117.4 x 12.5 x 6.5  
**I Operating temperature** -40 °C to +85 °C  
**I Flexible antenna**

### ME5215P-868



### MEP0102



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4/5.0 GHz ISM  
**I VSWR** -2.4:1, -2.2:1  
**I Efficiency (%)** -53, -64  
**I Peak Gain (dBi)** -3.2, -5.0  
**I Dimensions (mm)** 16.4 x 5.4 x 0.4  
**I Operating temperature** -40 °C to +85 °C

**I Standards** ZigBee,  
 ISM, SIGFOX, LoRa  
**I Frequency** 868 MHz ISM  
**I VSWR** -1.9:1  
**I Efficiency (%)** -32.7  
**I Peak Gain (dBi)** -0.8  
**I Dimensions (mm)** 40.0 x 7.0 x 0.2  
**I Operating temperature** -40 °C to +85 °C

### MEF0115P



### MEW035



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4/5.0 GHz ISM  
**I VSWR** -2.1:1, -2.8:1  
**I Efficiency (%)** -35, -60  
**I Peak Gain (dBi)** -1.4, -3.2  
**I Dimensions (mm)** 76 x Ø 10  
**I Operating temperature** -40 °C to +85 °C

**I Standards** ISM, LoRa  
**I Frequency** 433 MHz ISM  
**I VSWR** -1.5:1  
**I Peak Gain (dBi)** --10.3  
**I Dimensions (mm)** 12 x 4 x 1.6  
**I Operating temperature** -40 °C to +85 °C

### MEE15b



### MEWIFI12



**I Standards** WiFi, BT, ZigBee, ISM  
**I Frequency** 2.4/5.0 GHz ISM  
**I VSWR** -1.6:1, -1.8:1  
**I Efficiency (%)** -60, -63  
**I Peak Gain (dBi)** -7.2, -5.2  
**I Dimensions (mm)** 104 x 104 x 90  
**I Operating temperature** -40 °C to +85 °C  
**I Mast mount**

**I Standards**  
**WiFi, Bluetooth, ISM**  
**I Frequency** 2400-2500 MHz  
 5700-5870 MHz  
**I Waterproof**  
**I Various mounting options available**  
**I Efficiency over 60%**

### MAXTENA MPA-254-WIFI



### ME7002Bc



**I Standards** WiFi, BT, ZigBee, ISM  
**I 4 x 2.4/5.0 GHz ISM MIMO**  
**I VSWR** -1.9:1, -1.6:1  
**I Efficiency (%)** -58, -64  
**I Peak Gain (dBi)** -5.6, -5.5  
**I Dimensions (mm)** Ø 96 x H 90  
**I Operating temperature** -40 °C to +85 °C

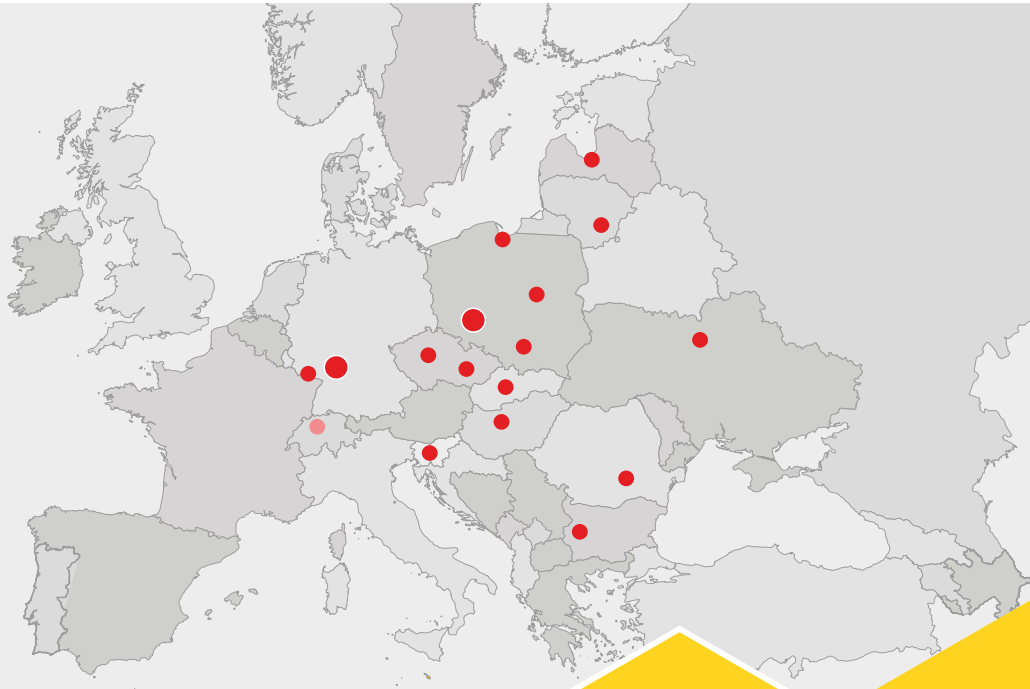
### MAXTENA MEA-2400-UWB-SM



### MAXTENA MEA-2400-MM



**Bulgaria@microdis.net**  
**Croatia@microdis.net**  
**Czech@microdis.net**  
**Estonia@microdis.net**  
**France@microdis.net\***  
**Germany@microdis.net**  
**Hungary@microdis.net**  
**Latvia@microdis.net**  
**Lithuania@microdis.net**  
**Poland@microdis.net**  
**Romania@microdis.net**  
**Serbia@microdis.net**  
**Slovakia@microdis.net**  
**Slovenia@microdis.net**  
**Turkey@microdis.net**  
**Ukraine@microdis.net**



**Europe@microdis.net**

\*Electromechanical Competence Center for France

Currently the Microdis Group employs over 100 people, with a large number of electronic engineers, mostly involved in sales and application support.

As a company with an extensive experience in the distribution of electronic components, and a purchasing center in Germany for many years, we are able to offer almost any product from a wide variety of electronic components. We offer also the production of cable harnesses and programming of crystal oscillators for a customised frequency.

Cooperation with a catalogue distributor provides fast deliveries (2 days) of a wide range of catalogue products.

We have certificates of quality management DIN EN ISO 9001:2015 for the distribution of electronic components.



**AAEON**  
**AEGID**  
**ASROCK INDUSTRIAL**  
**BRIGHTTEK**  
**CAMDENBOSS**  
**EPSON**  
  
**FISCHER CONNECTORS**  
**FISCHER ELEKTRONIK**  
**GERSYS**  
**GLOBAL CONNECTOR TECHNOLOGY**  
**IYAMA**  
**ISOCOM**  
**JST**  
**LEAR**  
**MAXTENA**  
**MECAL**  
**MEDER**  
**MEDIKABEL**  
**METZ CONNECT**  
**NEOUSYS TECHNOLOGY**  
**NEXCOM**  
**NEXAIOT**  
**RICARDO & BARBOSA**  
  
**RAKON**  
**SAVOY TECHNOLOGY**  
**SHARP/NEC**  
**TAIWAN SEMICONDUCTOR**  
**U-BLOX**  
  
**WEZAG**

Industrial computers and panels  
 RFID systems and transponders  
 3.5" & mini-ITX industrial boards  
 Power, THT and chip LEDs and LED modules  
 Interconnect components, electronic housings, 19" cabinets  
 Crystals, oscillators, filters and sensors  
 Programmable oscillator web-shop  
 Military, medical and industrial connectors  
 Heatsinks, connectors, 19" and case technology  
 Railway computers  
 SIM-Holders, memory card connectors, USB connectors  
 Large Format Displays  
 Optocouplers, optoswitches  
 Signal connectors  
 Automotive and white goods connectors  
 GPS, Galileo, Glonass, Iridium antennas  
 Machines and systems for wire crimping  
 Reed switches, sensors and relays  
 UL/CSA/DIN certified, customized industrial cables  
 Terminal block connectors - screw, spring and pins  
 Wide-temperature fanless computers  
 Industrial computers and panels  
 Industry 4.0 computer solutions  
 Crimping tools like standard applicators and heavy duty dies for loose terminals  
 Advanced Frequency control and Timing solutions  
 Automotive and white goods connectors  
 Displays & projectors  
 Semiconductor devices  
 Modules & services: GNSS, GSM, UMTS/HSPA/CDMA/LTE/NB-IoT  
 modules, WiFi, Bluetooth, NFC, antennas  
 Hand tools for crimping, pneumatic presses

[www.aaeon.com](http://www.aaeon.com)  
[www.aegid.de](http://www.aegid.de)  
[www.asrockind.com](http://www.asrockind.com)  
[www.brighttekeurope.com](http://www.brighttekeurope.com)  
[www.camdenboss.com](http://www.camdenboss.com)  
[www.epson-electronics.de](http://www.epson-electronics.de)  
[epson.microdis.net](http://epson.microdis.net)  
[www.fischerconnectors.com](http://www.fischerconnectors.com)  
[www.fischerelektronik.de](http://www.fischerelektronik.de)  
[www.gersys.de](http://www.gersys.de)  
[www.gct.co](http://www.gct.co)  
[www.iyama.com](http://www.iyama.com)  
[www.isocom.com](http://www.isocom.com)  
[www.jst.de](http://www.jst.de)  
[www.lear.com](http://www.lear.com)  
[www.maxtena.com](http://www.maxtena.com)  
[www.mecal.com](http://www.mecal.com)  
[www.meder.com](http://www.meder.com)  
[www.medikabel.de](http://www.medikabel.de)  
[www.metz-connect.com](http://www.metz-connect.com)  
[www.neousys-tech.com](http://www.neousys-tech.com)  
[www.nexcom.com](http://www.nexcom.com)  
[www.nexaiot.com](http://www.nexaiot.com)  
[www.ricardo-barbosa.com](http://www.ricardo-barbosa.com)  
[www.rakon.com](http://www.rakon.com)  
[www.savoy-technology.com](http://www.savoy-technology.com)  
[www.sharpnecdisplays.eu](http://www.sharpnecdisplays.eu)  
[www.taiwansemi.com](http://www.taiwansemi.com)  
[www.u-blox.com](http://www.u-blox.com)  
  
[www.wezag.de](http://www.wezag.de)

