Microdis
Innovation & Reliability
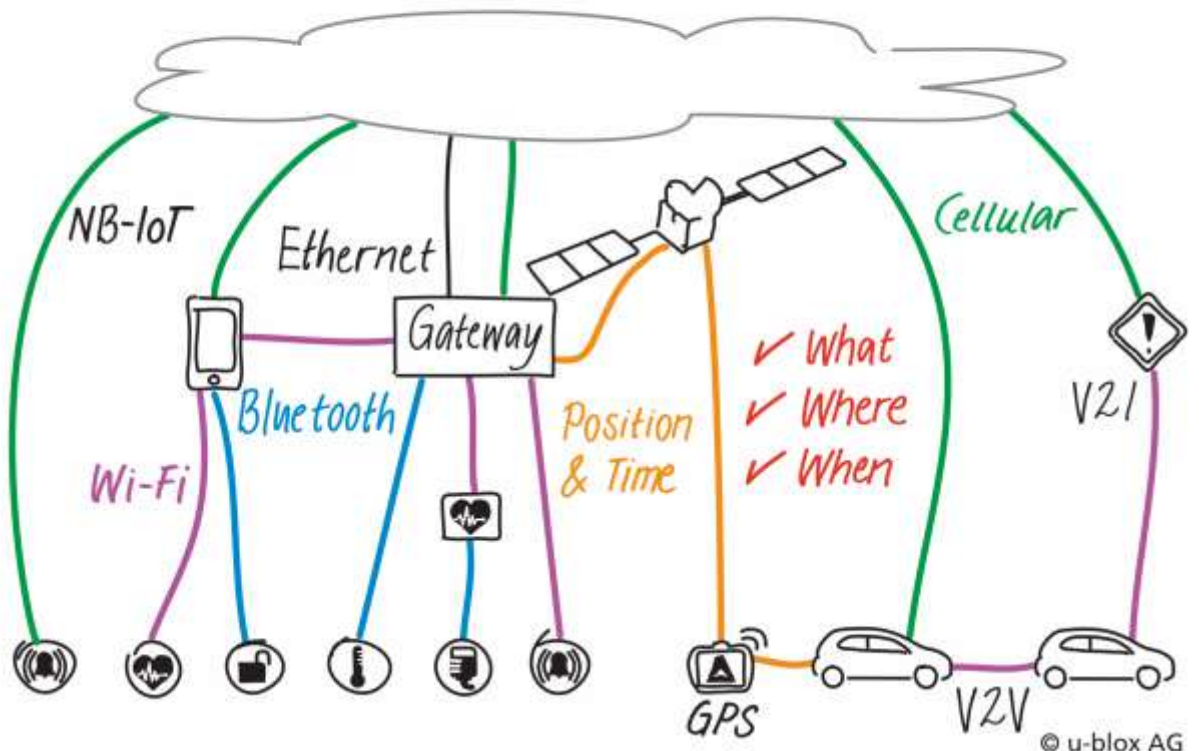
GPS/GALILEO/GLONASS/BEIDOU
IRIDIUM

GSM/GPRS/UMTS/CDMA
LTE/LTE Low Category
NBIoT (Narrow Band IoT)

V2V/V2X (vehicle-to-everything)

ISM (433MHz, 868MHz, 2.4GHz)
Bluetooth, WiFi
RFID
Antennas & accessories

IoT Connectivity

NB-IoT
Ethernet
Gateway
Cellular
Wi-Fi
Bluetooth
Position & Time
✔ What
✔ Where
✔ When
V2I
GPS
V2V
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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 in Russia. Both, based on the state of the art GPS/Glonass technology and dedicated GSM and UMTS features provided by u-blox, will save human lives in case of car accidents.

Content:

GNSS: GPS, GALILEO, GLONASS, BEIDOU, QZSS

u-blox

u-bloxM8, u-blox8 - the latest multiple GNSS navigation technology dedicated to applications requiring high sensitivity, short wake-up time, low energy consumption and stable functionality under harsh conditions in vehicles.

- Modules support GPS, Glonass, BeiDou (Compass), QZSS, and Galileo*
- High performance navigation, ultra fast acquisition (<1s)
- True, dynamic sensitivity as high as -167dBm
- Position accuracy (CEP, SBAS): 2.0m
- High precision NEO-M8P, accuracy < 0.025m
- Ultra low energy consumption (6.6mA/1.8V, 1Hz tracking)
- Assisted positioning service for GPS, Galileo* and Glonass: Online, Offline (up to 35 days) and Autonomous
- Best in class jamming immunity
- Spoofing and Jamming detection
- Geofencing to warn when leaving defined area
- Built in sensors for navigation without sky view (NEO-M8L/U)
- Dedicated modules (NEO-M8T, LEA-M8F) for precise timing
- ZOE – the smallest standalone, complete GNSS module
- Extremely small modules with built in antenna (CAM-M8x)
- Backward pin compatibility (ublox5/ublox6/ublox7 generations)
- Versions dedicated to cost sensitive applications
- **Easy to design, manufacture and integrate with various antennas**

*Galileo is supported by the latest FW

In-band jamming immunity - the best on the market

u-blox M8 high performance positioning - new platform combining advanced technology, sophisticated algorithms, true concurrent GNSS reception and multi GNSS aiding services. u-blox M8 sets the new benchmark for navigation in challenging environments.

NEO-M8P for 2.5cm accuracy

New

SAM   **CAM**   **NEO**   **MAX**   **EVA**   *New* **ZOE**
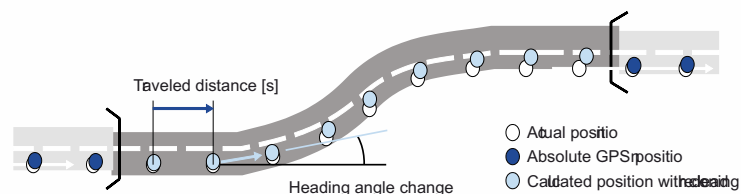4.5x4.5x1 mm
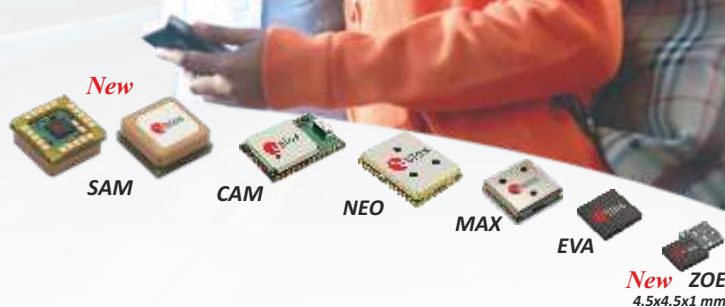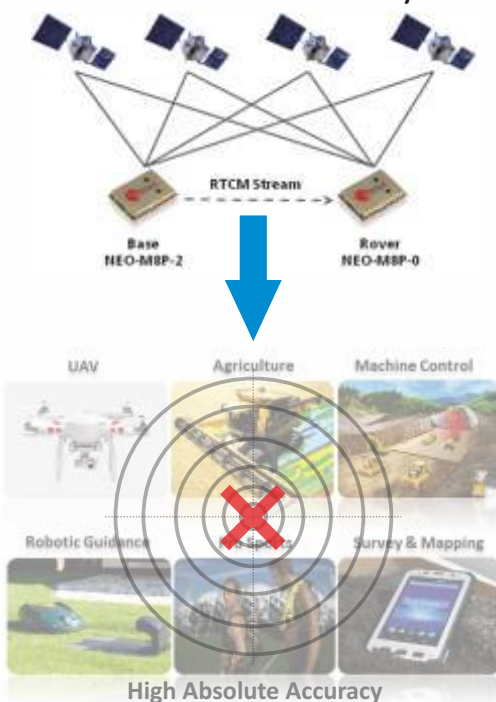
Fast, sensitive, power and cost optimized swiss made u-bloxM8 modules.

We offer Swiss made receivers, produced by a well-known u-blox company, to ensure superb technical parameters, the highest reliability, but also additional features and market leading technologies.
All modules are qualified for in-vehicle use (ISO16750)

3-Dimensional Dead Reckoning GNSS - the ability to calculate a position in the X, Y, and Z axis when satellites signals are blocked. Built in sensors (gyroscope, accelerometer) allow full coverage even without GNSS signal (tunnels, car parks).

Traveled distance [s]

Heading angle change

○ Actual position
● Absolute GPS position
○ Calculated position with reading

Security - Spoofing detection indicates tries to forge a GNSS signal for false positioning, **Jammer detection** indicates the presence of GNSS jammer.

Multi GNSS support - u-bloxM8 is the new quality on the market, bringing real advantage of using for fix calculation few positioning systems in parallel. Multiple GNSS Assisted data (MGA) are available for all systems. Combined with high sensitivity it makes u-bloxM8 modules the best performance. Limitation to one system is possible, for energy saving.

Wrist mode - to filter out arm motion for wrist worn applications.

Odometer - provides ground distance using solely the position and Doppler-based velocity.

Geofencing - receiver reports (by command or I/O pin) if fix lies within defined area (up to 4 can be defined).

Multiple GNSS Assisted data (MGA) - using GPS, Galileo, Glonass, BeiDou and QZSS data from the u-blox' server to boost acquisition, or to be able to get fix despite weak signals and a harsh environment.
Available as Online, Offline (up to 35 days ahead) and Autonomous (calculated internally by the GNSS receiver, no access to ublox' server required, up to 6 days).

Precise Positioning - u-blox' PPP algorithm provides position accuracy better then 1.0m, under good sky visibility. RTK based system (NEO-M8P) offers **centimeter-level accuracy** (<0.025m).

RTCM Stream

Base
NEO-M8P-2

Rover
NEO-M8P-0

UAV   Agriculture   Machine Control

Robotic Guidance   Survey & Mapping

High Absolute Accuracy

GNSS ANTENNA SELECTION GUIDE

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.

	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	●●●●●	●●●●	●●●●●	●●●	●●●	●●	●

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.

Freq=0.9 GHz   Az=45   EL=45

Azimuthal Pattern (X, Y or E-Plane)
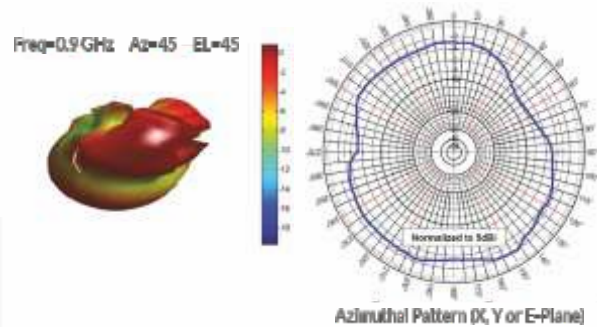
Passive or Active

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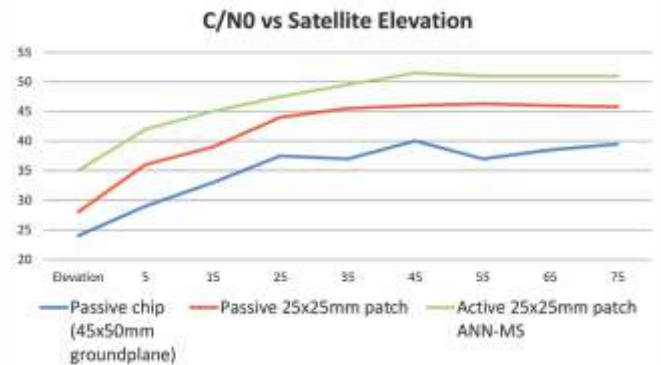
*Low-noise amplifier (LNA) is an electronic amplifier used to amplify possibly very weak signals (captured by an antenna). The LNA boosts the antenna signal to compensate for the feedline losses going from the (outdoor) antenna to the (indoor) receiver. It amplifies both noise and signal, so it does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

25x25mm Active antenna module

18x18mm Passive patch 25x25mm groundplane

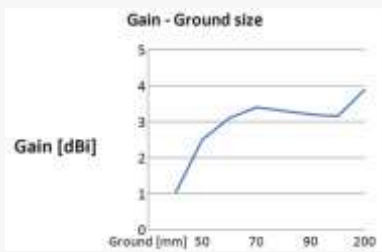3.2x1.2mm Passive chip 20x45mm groundplane

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.

C/N0 vs Satellite Elevation

Passive chip (45x50mm groundplane) — Passive 25x25mm patch — Active 25x25mm patch ANN-MS

Example performance chart

Gain - Ground size

Gain [dBi]

Ground [mm]   50   70   90   200

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 measurments done with the antenna placed on a 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.

GNSS ANTENNAS

External

ME431MP / ME431GMP

- GPS 1575.42 MHz (ME431MP)/
  /GPS+GLONASS 1572-1610 MHz (ME431GMP)
- Gain 26 dBi/3 V, 27 dBi/5 V
- magnetic version, sticker option

- RG174 cable with the type of connector upon request
- size 41 mm x 34 mm x 13.7 mm
- operating temperature -40°C to +85°C

ME9001

- GPS (1575.42 MHz)
  GLONASS (1592 - 1610 MHz)
- LNA Gain: 23dB at 3V, 24dB at 5V
- Operating temperature: -40°C to +85°C

- size 116.2 mm x 74 mm x 110 mm
- **Marine antenna**
- **Available with Tetra or AIS also as Iridium, and in black housing**

ME435MP

- GPS 1575.42 MHz
- Gain 26 dBi/3 V, 27 dBi/5 V
- RG174 cable with the type of connector upon request

- **size 21.2 mm x 28.2 mm x 13.2 mm**
- operating temperature -40°C to +85°C
- **Mini GPS Antenna**

Combo GPS+GSM

ME660B/ME664B

- AMPS/GSM/Bluetooth-Wifi 2.4 GHz
  GPS 1575.42 MHz
- available as Combo, or just GSM
- GNSS gain: 26 dBi/3 V, 27 dBi/5 V, GSM: 2.2 dBi max
- mounting in a hole with the screw

- VSWR: < 2:1 for GSM, < 1.2:1 for GPS
- two cables RG174 with the type of connector upon request
- size 75 mm x 17.5 mm
- operating temperature -40°C to +85°C
- aluminium base

ME860B

- AMPS/900/1800/1900/2100 MHz /
  Bluetooth-Wifi 2.4 GHz / GPS /Glonass
- GNSS gain: 26 dBi/3 V, 27 dBi/5 V, GSM: 2.2 dBi max
- mounting in a hole with the screw
- VSWR: < 2:1 for GSM, < 1.2:1 for GPS

- two cables RG174 with the type of connector upon request
- size 98 mm x 59.5 mm x 64 mm
- operating temperature -40°C to +85°C

Internal

ME4050S / ME4050GS

- GPS 1575.42 MHz (ME4050S) /
  /GPS+GLONASS 1575.42 MHz (ME4050GS)
- Gain 16 dB/5 V
- size 25 mm x 25 mm x 8.1 mm

- Current consumption
  3 mA (1.8 V), 7 mA (3.3 V), 12mA (5V)
- to be mounted in the customers casing
- cable and connector to be arranged
- small size version also available:
  18.5 mm x 18.5 mm x 4.7 mm (MEM015)

ME408 / ME408G

- GPS 1575.42MHz (ME408) / GPS+GLONASS
  1572-1610MHz(ME408G)
- Patch with groundplane
- Gain 26dB at 3V, 27db at 5V
- Size 35 mm x 35 mm x 6.3 mm

- Current consumption 15mA-25mA
  Cable and connector to be arranged
- Limiter diode (option)
- Operating temperature -40°C to +85°C

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

MAXTENA

HELICAL GPS/GLONASS ANTENNAS

MAXTENA™

For embedded helical antennas Maxtena offers the possibility to use a tuning kit. Similar as the patch antenna solution this tuning kit is an inexpensive, quick and effective way to determine the correct GPS antenna to use inside a device. The tuning kit contains five standard samples optimized for a range of different loading conditions commonly encountered in devices requiring an embedded antenna configuration. The tuning kit was designed to empower engineers responsible for devices requiring an embedded antenna configuration. The tuning kit allows for both quick and easy antenna selection and removes the need for a lengthy and costly custom antenna integration process.

M1575HCT-22P

Passive embedded antenna Tuning kit for the best performance to eliminate the effect of frequency shifts

24.3x12.85mm, **2 grams**

Frequency 1575 Mhz	**Axial Ratio** 1 dB (typical) / 1.5 dB (max)
Polarization RHCP	**VSWR** 1.5 (max)
Antenna element peak gain -0.5 dBic (typical)	**Impedance** 50 Ohm
Efficiency 25% (typical)	**Operating temp.** from -40°C to 85°C
Bandwidth (-1dB) 20 Mhz	**RF connector** 3 pin

M1575HCT-22P-SMA

Passive external GPS antenna waterproof after mounting

38x18.5mm, 11 g, IP67

Frequency 1575 Mhz	**Axial Ratio** 1 dB (typical) / 1.5 dB (max)
Polarization RHCP	**VSWR** 1.5 (max)
Antenna element peak gain -0.5 dBic (typical)	**Impedance** 50 Ohm
Efficiency 25% (typical)	**Operating temp.** from -40°C to 85°C
Bandwidth (-1dB) 20 Mhz	**RF connector** SMA (M)

M1227HCT-A2-SMA

Active external antenna GPS+Glonass and military band (L2)

51x30mm, 24 g, L1/L2 GPS-GLONASS bands

Frequency Bands 1217-1250 MHz (L2), 1565-1610 MHz (L1)	
Polarization RHCP	
Passive Peak Gain 2 dBic @ 1227Mhz (typical)	
2 dBic @ 1575 MHz (typical)	
Total Gain **30 dBic @ 1227 MHz (typical)**	
28 dBic @ 1575 MHz (typical)	
28 dBic @ 1602 MHz (typical)	

Out-of-Band Rejection >50 dB	**Current Drain** 25 mA (typical)	**Voltage** 3-12 V	
RF Interference Rating 50 V/m. out of band	**Operating temp.** from -40°C to 85°C	**RF connector** SMA (M)	**Noise Figure** 1.5 dB (Typical)

## M1516HCT-P

Passive external GPS +Glonass antenna

48x18.5mm, 10 g, L1+Glonass

Frequency 1575 MHz (GPS)	**Axial Ratio** 0.5 dB (typical) / 1 dB (max)
1602 MHz (GLONASS)	**VsWr** 1.5 (max)
Polarization RHCP	**Operating temp.** from -40°C to 85°C
Antenna element peak gain 1.5 dBic (GPS)	**RF connector** SMA (M)
1.5 dBic (GLONASS)	

GNSS TOOLS

Hardware and software **evaluation kits**, tools and reference designs created by u-blox to make evaluation and design efforts as simple as possible.
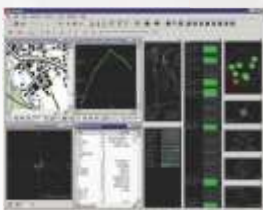
Evaluation kits EVK-M8x, EVK-8x

Evaluation kits EVK-M8xCAM for CAM-M8Q/M8C

u-blox offers Reference Designs - ready projects with complete information (including PCB design file in Gerber) to be used in different applications. The example on the picture demonstrates the integration of EVA-M8M with 18x18 ceramic patch antenna, and USB + UART interfaces. Can be used as ready OEM product, or to simplify and speed up customers' design. For information about available Reference Designs please ask your local Microdis office, or application support at marketing@microdis.net.

u-center GNSS evaluation software provides a powerful tool for testing, performance analysis and configuration of u-blox GNSS receivers. U-blox GNSS receivers can be configured using the u-center evaluation software with a highly flexible platform to test GNSS products and visualize the collected GNSS data. It supports NMEA as well as a u-blox UBX binary protocol, calibrated map files and data recording with a u-center mobile. Debugging of a target application is also possible.

GPS/GLONASS/BEIDOU/QZSS/GALILEO MODULES

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 (as u-blox7, u-blox6), which anyway will remain in production for a long time.

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. GPS and wireless products are designed and tested to operate in a wide variety of applications, including in vehicle usage.

Pin compatibility — 2005 LEA-4A · 2007 LEA-5A · 2010 LEA-6A · 2014 LEA-M8S

Newest technology — 2005 LEA · 2007 NEO · 2011 MAX · 2014 EVA · 2017 ZOE

GPS/Glonass/BeiDou/QZSS/Galileo modules suggested for new designs

Model	Size lxwxh [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: PPP/RTK	Dead Reckoning	Precision Timing	Frequency output	External Interrupt/Wakeup	Antenna supply, short detection & protection	Antenna power control	Extra LNA, SAW
ZOE-M8B	4.5x4.5	1.71-1.89 **Super L.Power****	●	●	3	T	●	●	E	●		●	●		M					●		P	●
ZOE-M8G	4.5x4.5	1.71-1.89	●	●	3	T	●	●	E	●		●	●		M					●		P	●
ZOE-M8Q	4.5x4.5	2.7-3.6	●	●	3	T	●	●	E	●		●	●		M					●		P	●
EVA-M8M	7.0x7.0	1.65-3.6	●	●	3	C	●	●	E	●	●	●	●		M					●	O	P	
EVA-M8Q	7.0x7.0	2.7-3.6	●	●	3	T	●	●	E	●	●	●	●		M					●	O	P	
MAX-M8C	10.1x9.7	1.65-3.6	●	●	3	C	●	●		●			●		M					●	O	P	
MAX-M8Q	10.1x9.7	2.7-3.6	●	●	3	T	●	●		●		●	●		M					●	O	P	
MAX-M8W	10.1x9.7	2.7-3.6	●	●	3	T	●	●		●		●	●		M					●	●	●	
NEO-M8M	16x12.2	1.65-3.6	●	●	3	C	●	●		●		●	●		M					●	O		
NEO-M8Q	16x12.2	2.7-3.6	●	●	3	T	●	●		●		●	●		M					●	O	P	●
NEO-M8N	16x12.2	2.7-3.6	●	●	3	T	●	●	●	●		●	●		M					●	O	P	●
EVA-8M	7.0x7.0	1.65-3.6	●/-	●/-/-	1	C	●	●	E	●	●	●	●		M					●	O	P	
MAX-8C	10.1x9.7	1.65-3.6	●/-	●/-/-	1	C	●	●		●			●		M					●	O	P	
MAX-8Q	10.1x9.7	2.7-3.6	●/-	●/-/-	1	T	●	●		●		●	●		M					●	O	P	
GNSS modules with dedicated features																							
NEO-M8U	16x12.2	2.7-3.6	●	●	3	C	●	●		●		●	●		M		UDR*			●	O	P	
EVA-M8E	7.0x7.0	2.7-3.6	●	●	3	T	●	●	E	●	●	●	●		M		UDRex*			●	O	P	
NEO-M8L	16x12.2	2.7-3.6	●	●	3	C	●	●		●		●	●		M		ADR*			●	O	P	
NEO-7P	16x12.2	2.7-3.6	●/-	●/●/-	1	C		-/-/●		●	●	●	●	●	G	PPP<1.0m				●	O	P	S
NEO-M8P	16x12.2	2.7-3.6	●/-	●	2	T	●	●		●	●	●	●	●	M	RTK<0.025m				●	O	P	●
LEA-M8F	22.4x17	3.0-3.6	●/-	●	2	V	-/●	-/-/●		●		●	●		M			●	●	●			●
LEA-M8T	22.4x17	2.7-3.6	●	●	3	T	●	●		●		●	●		M			●	●	●	O	●	S
NEO-M8T	16x12.2	2.7-3.6	●	●	3	T	●	●		●		●	●		M			●	●	●	O	P	●
GNSS modules with integrated antenna																							
SAM-M8Q	15.5x15.5	2.7-3.6	●	●/●/-	3	T	●	●		●			●		M					●		●	●
CAM-M8C	14x9.6	1.65-3.6	●	●	3	C	●	●		●			●		M					●			●
CAM-M8Q	14x9.6	2.7-3.6	●	●	3	T	●	●		●			●		M					●			●

O- requires external components   P- control pin to handle active antenna   E-External Flash required

* DR = Navigation without sky view, based on sensors. NEO-M8U has built in sensors (UDR), EVA-M8E needs external sensors (UDRex), NEO-M8L requires information about speed of vehicle (ADR)

** - Super E-Low Power Technology, 6.6mA@1.8V, 1Hz

Multi GNSS u-bloxM8 modules can work with several GNSS systems in parallel. For cost and power optimized solutions u-blox offers u-blox8 modules, which are pin-to-pin compatible equivalents to u-bloxM8 ones. u-blox8 modules also support several GNSS systems, but must be configured to work with one of them.

All wheels are round,

but are they all the same?
There are also many GNSS receivers....

u-blox

# ASSISTING SERVICES FOR POSITIONING APPLICATIONS

The expectations of modern applications that use GNSS positioning are very demanding. Devices must be low power, small size, and able to calculate position under difficult conditions.

Small size means degraded performance of antenna, as size is very important factor of the GNSS antenna performance. Difficult conditions – weak, reflected and corrupted signal due to small antennas, or bad sky visibility due to pocket design, indoor navigation, or urban canyons.


Cold Start - **strong, stable signal**
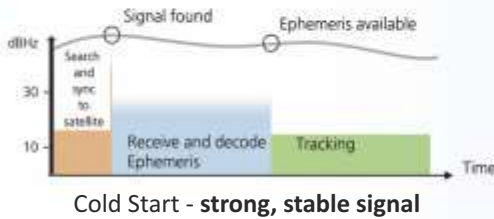
Under **good signal conditions Acquisition** process (cold start) takes appx. 30s, consisting with 2 stages.

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.

Cold Start - **poor signal**
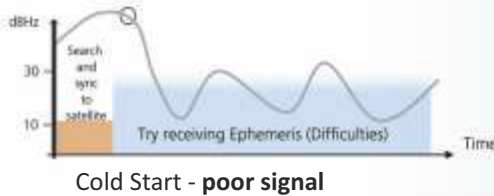
Under **poor signal conditions Acquisition** takes much more time, or is not possible at all. Collecting Ephemeris from 4 SVs needs uninterrupted good quality signal from each SV for appx. 30s. Under adverse signal conditions, it can take minutes, hours or even fail altogether.

Aided Cold Start – using **Assisted gnss** data provided by u-blox
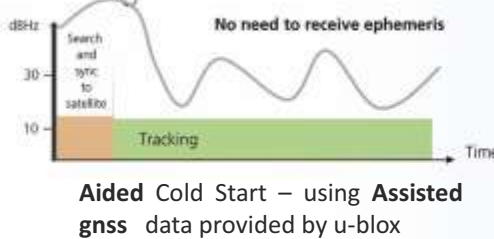
u-blox is the leader, and pioneer, in **Assisted GNSS (A-GNSS) technology**, which accelerates calculation of position by delivering satellite data such as Ephemeris, Almanac, accurate time and satellite status to the GNSS receiver via wireless networks or the Internet. This aiding data enables a GNSS receiver to compute a position within seconds, even under poor signal conditions. Assisted GPS was introduced by u-blox in previous generations of the receivers, and is already a market proven technology. The latest implementation includes also Assisted Glonass data, improving significantly the performance, and will be extended by Assisted Galileo and other systems– so is called 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 **A-GNSS Online** – GNSS device downloads data (real ephemeris, time, etc.) from u-blox' server. It's the most helpful way to get position under difficult conditions, but must be triggered every time when position is necessary (validity of data is 2-4 hours). Usually used in personal trackers (in case of emergency like heart attack of the user), theft protection systems etc.

A-GNSS Offline - Differential Almanac Correction Data downloaded from u-blox' server , which is valid for up to 35 days. It needs 10kB (1 day file) …. up to 125kB (28 days GPS&GLO) memory to be stored. GNSS module uses the data whenever the signal conditions are poor – which improves navigation performance of the unit. It's used in all kind of applications, also to decrease power consumption (A-GNSS makes acquisition – the most power demanding process - shorter).

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

Although using A-GNSS is simple, u-blox GSM/UMTS modules (SARA, LISA, LARA, TOBY) offer a built in client handling Assisted GNSS features, and using own resources (flash memory).

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

DEAD RECKONING — NAVIGATION WITHOUT THE SKY VIEW

Increasingly dense urban environments, park houses and multi-level interchanges pose a significant problem to navigation systems. Signal reflected from buildings makes position not accurate, vehicles are also more and more often used in areas where GNSS signal is blocked (tunnel, garage etc). Reduced size of antenna necessary in many applications also harms the positioning performance.

The latest NEO-M8L and NEO-M8U Dead Reckoning modules provide simple in implementation and convenient solution:
- leading GNSS platform u-bloxM8 optimized for the best performance with Dead Reckoning
- due to built-in sensors (gyro, accelerometer, temperature), NEO-M8U provides accurate 3D position even in case of reflections, or lack of GNSS signal. NEO-M8L requires distance provided by CAN messages or analog speed tick pulses.
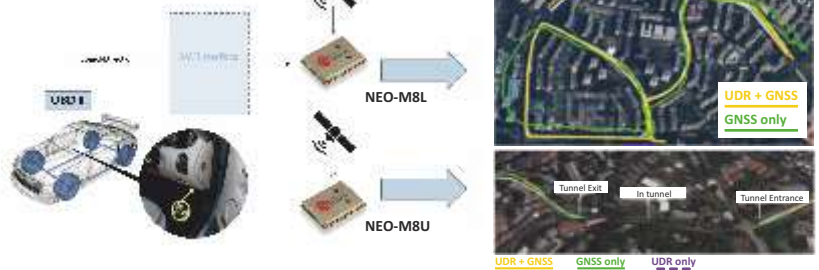
RAW sensor data
- information from sensors can be read (up to 100Hz) and used for example to register behaviour of vehicle during accident
- very precise information about fuel consumption
- simple integration and pin compatibility with the other NEO-M8 family modules for the fast time to market
- dedicated interface to connect u-blox cellular module (SARA, LARA, LISA, TOBY)
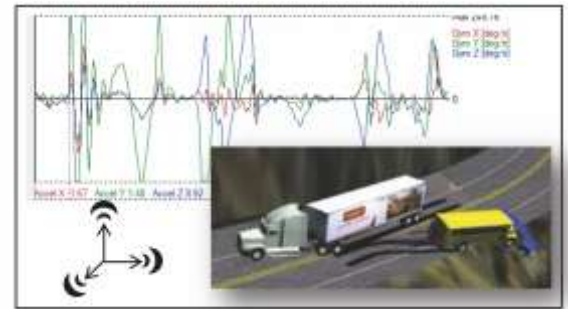
temperature, acceleration, angle reported by NEO-M8L/U during accident

NEW GNSS SOLUTIONS

ZOE-M8G - more than usual performance in smaller than usual, simple in use module

ZOE
4.5x4.5x1 mm
Extremely small size

ZOE measures only 4.5x4.5x1.0mm, weight is 0.04 gram. In addition to standard GNSS modules it contains double stage LNA, SAW filter and TCXO.
Super-E technology, integrated in the ZOE-M8B, is breaking point for portable and wearable applications. Positioning every second (1Hz) needs as low as 12mW, which is 85% power saving vs. usual receivers.
**Double LNA** makes ZOE the perfect solution for devices working with weak GNSS signal, using hidden or small passive antennas with limited performance. SAW filter helps to eliminate noise, including the one coming from GSM or other RF transmitters nearby.
Superb, usual for u-blox, parameters - like the market leading **-167dBm real navigation sensitivity**, parallel work with up to 3 navigation systems (including Galileo), real Assisted GNSS, Geofencing, filtering of arm motion and many others - fulfills the picture of outstanding product.
Design with ZOE-M8G does not need deep RF skills - critical components (double LNA, SAW, TCXO) are intergated and matched.

u-blox F9 platform benefits

Multipath   Lane Level Navigation   Limited Sky View

SAM-M8Q - "plug & play" design concept, high performance receiver with antenna

SAM-M8Q 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 and plenty of redesigns.

SAM
Performance optimized (15.5x15.5x6.3mm) antenna module
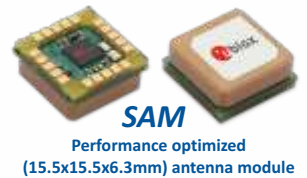
Antenna size was carefully selected to keep good performance in small form factor. Smaller antennas significantly degradate navigation performance and should be considered only if there is no other option. However, solution is scalable, bigger ground plane can be used to achieve even more optimal performance, depending on available space on PCB.

New u-blox F9 - multiband, next level of positioning

The u-blox F9 platform was created for reliable navigation under challenging conditions met in nowadays environment. Uses multiple bands (L1/L2/L5) to correct errors caused by the ionosphere and delivers fast TTFF.

Works with all constellations (GPS, GLONASS, Galileo, Beidou) and can be integrated with u-blox field proven features like Dead Reckoning or High Precision navigation with RTK corrections. The first modules based on u-blox F9 platform are expected in 2018.

CELLULAR: GSM, UMTS, LTE, NBIoT

u-blox cellular modules like TOBY, SARA, LARA and LISA are based on the LTE, UMTS/HSPA+ and GSM/GPRS standards. The modules are optimized for low-cost, mass market location-based applications requiring mobile connectivity such as mobile internet and VoIP routing, in-car multimedia systems, asset tracking, fleet management, road pricing, vehicle recovery and mobile emergency services like eCall. They are also ideal as stand-alone embedded wireless communication solutions for M2M applications such as Automatic Meter Reading (AMR) and RMAC.
All modules are qualified according to ISO16750 for „in vehicle use".

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

The evolution of technology - do not leave your application behind
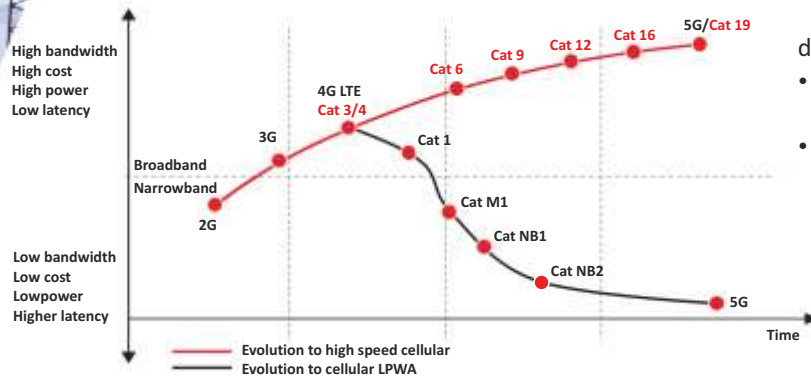
The cellular data transmission technology is evolving in two different directions:
- High bandwidth/data rate: delivered by LTE high Cat. at the cost of power needed, is required mostly by the consumer market,
- Longevity: IoT/M2M application customers are aware of evening of the 2G/3G technology.
  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 requirements.
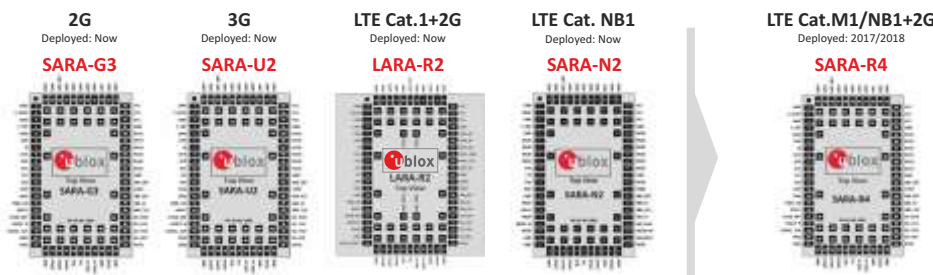
SARA, LARA, LISA and TOBY - selected features
Modules optimized for low power consumption, small size and cost saving.

Feature	Description
Multiband	global LTE modules with plenty of bands to be selected by the application
Security	built in features like SSL/TLS, Secure Boot etc. (more information on page 19)
CellLocate	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). The GSM module becomes a very important supporting component for GNSS systems
In-band Modem	embedded modem for communication within eCall, the European security system, and Era Glonass (Russian system)
Pin compatibility between technologies	common concept of the same SARA form factor for modules supporting GSM 2G (SARA-Gx), UMTS 3G (SARA-U2), LTE low cat. (SARA-Rx, LARA-Rx, TOBY-Rx uses the same pads as SARA), and NBIoT (SARA-Nx, SARA-Rx). Reference PCB design to support SARA and TOBY (fast LTE cat. 4)
Low power	the market leading low power consumption across technologies (ie. 2G: 0.6mA IDLE, 2.9mA active mode; NBIoT: 3uA Deep Sleep etc.)
Antenna detection, SIM detection, BIP	simplifies control, BIP supports eSIM (embedded SIM)
Jamming detection	detects and reports potential jamming
GNSS support	cooperation with GNSS modules (more information on page 13)
Smart Temperature Supervisor	monitoring of the module board temperature, warning notifications or shutdown to prevent damage of the module
Dynamic update	allows to assign a domain name to a host that owns a dynamic IP address
TCP sockets always on	automatic TCP direct link connection at each start up
Last gasp	sending a predefined last notification (via SMS or TCP/UDP) in case of power outage, just before the power goes off
Custom timers	commands used to control the search and sleep time when there is no network available, and to thereby reduce power consumption
CellTime	a command set that allows applications to retrieve precise timing using CellLocate (SARA-U201)
CoAP, MQTT, LWM2M	support of protocols dedicated to IoT/M2M
FOTA	Firmware Over The Air update allows to keep even the deployed devices up to date with the newest functionalities

START NOW

MIGRATE WHEN READY

2G	3G	LTE Cat.1+2G	LTE Cat. NB1	LTE Cat.M1/NB1+2G
Deployed: Now	Deployed: Now	Deployed: Now	Deployed: Now	Deployed: 2017/2018
SARA-G3	SARA-U2	LARA-R2	SARA-N2	SARA-R4

Easy migration path
u-blox nested concept

Various modules can be alternatively mounted on same board space: One board for GSM, WCDMA, CDMA and LTE, NBIoT.

AT command compatibility to minimize software migration effort.

2G and 3G - traditional technology in well established on the market SARA form factor. Highly reliable modules pin compatible with new LTE Low Cat. /NBIoT products: LARA-R2, SARA-N and SARA-R. Small SARA-U201 covers all 2G/3G bands for global operation.
SARA-G3/U2 provide an entry point into the current cellular networks, preparing an application for new technologies.

LGA 26.0x16.0 mm

2G GSM/GPRS

Module	ATEX variant available	Region	2G 850/1900 MHz	2G 900/1800 MHz	3G 850/1900 MHz	3G 900/2100 MHz	3G 800 MHz	Downlink/Uplink	UART	USB 2.0 (480Mb/s)	GPIO	DDC(I2C) to connect GNSS module	Analog/Digital audio	GNSS via Modem	Assisted GNSS client	CellLocate	eCall / ERA GLONASS	Antenna supervisor	Jamming detection	TCP/IP, UDP, FTPS, HTTPS	BIP (eSIM, eUICC)	SSL	FOTA FW update	FW update over AT (FOAT)
SARA-G300		EU,AP		●				G	2															●
SARA-G310		GLOBAL	●	●				G	2															●
SARA-G340	●	EU,AP		●				G	2		4	●	1/1	●	●	●	●	●	●	●	●	●	●	●
SARA-G350	●	GLOBAL	●	●				G	2		4	●	1/1	●	●	●	●	●	●	●	●	●	●	●

3G UMTS/HSPA

Module	ATEX variant available	Region	2G 850/1900 MHz	2G 900/1800 MHz	3G 850/1900 MHz	3G 900/2100 MHz	3G 800 MHz	Downlink/Uplink	UART	USB 2.0 (480Mb/s)	GPIO	DDC(I2C) to connect GNSS module	Analog/Digital audio	GNSS via Modem	Assisted GNSS client	CellLocate	eCall / ERA GLONASS	Antenna supervisor	Jamming detection	TCP/IP, UDP, FTPS, HTTPS	BIP (eSIM, eUICC)	SSL	FOTA FW update	FW update over AT (FOAT)
SARA-U201	●	GLOBAL	●	●	●	●	●	M	2	●	9	●	-/1	●	●	●	●	●	●	●	●	●	●	●
SARA-U270	●	EU,AP		●		●		M	●	●	9	●	-/1	●	●	●	●	●	●	●	●	●	●	●
SARA-U260		NA,SA	●		●			M	●	●	9	●	-/1	●	●	●			●	●	●	●	●	●
SARA-U280		NA,SA		●				M	●	●	9	●	-/1	●	●	●			●	●	●	●	●	●

G - GPRS Class 10, CS1-CS4 - up to 85.6 kbit/s, CSD - GSM max 9.6 kbit/s   M = 7.2/5.76 Mb/s Downlink/Uplink

u-blox offers LISA-U2xx family, modules in LCC form factor, with features analogue to SARA-U2xx. Please contact the nearest Microdis office if more details are requested.

LTE Cat.NB1 (Narrow Band IoT) - technology breaking point, u-blox is the leading company working on this new way of communication with „things", that require small amounts of data, over long periods, in hard to reach places.

- excellent coverage (based on current 3G/4G infrastructure), with -20dB better penetration than GSM, to perform well ie. under the ground.
- very low power consumption (3µA IDLE, 10y on battery)
- low cost
- high data rate is not necessary

U-blox offers modules based on well known SARA platform to simplify migration to this new technology.

U-blox - the technology leader in NBIoT development:

- SARA-N2 modules verified by tests on the field
- 1st technology demonstration in 2015 - MWC Barcelona
- 1st pre-standard message - Spain
- 1st NBIoT module announcement - June 27, 2016
- Successful trials in Germany, China, Norway and Singapore for metering, parking and smart lighting applications

Smart Cities — Streetlights, parking, waste mgmt

Smart Home & Buildings — Alarm systems, energy mgmt, access control

Consumer — White goods, people / animal tracking

Agriculture / Environmental — Land, noise, rain, pollution monitoring

Smart Metering — Gas & water

LGA 26.0x16.0 mm

The latest M1/NBIoT modules	ATEX	LTE category	Europe+EMEA(EU), APAC (AP), N.America (NA), S.America(SA)	2G Quad Band	LTE Cat.M1/NB1 bands	Downlink/Uplink	UART	USB 2.0	GPIO	DDC(I2C) to connect GNSS module SPI, SDIO	VoLTE (Voice over LTE)	GNSS via Modem	Assisted GNSS client	CellLocate	Antenna Supervisor	Jamming Detection	Last Gasp	TCP, FTPS, HTTPS	UDP	BIP (eSIM, eUICC)	SSL/TLS 1.2	FOTA FW update	Deep sleep mode power consumption	Power Save Rel. 12	eDRX	CoAP	MQTT	IP / Non-IP communication
SARA-N211	●	NB1	EU,AP		B8,B20	NB	2		2	□		□		□		□			●	□		●	3uA	●	●	●		●
SARA-N200		NB1	EU,AP		B8	NB	2		2	□		□		□		□			●	□		●	3uA	●	●	●		●
SARA-N201		NB1	AP		B5	NB	2		2	□		□		□		□			●	□		●	3uA	●	●	●		●
SARA-N210		NB1	EU		B20	NB	2		2	□		□		□		□			●	□		●	3uA	●	●	●		●
SARA-N280		NB1	SA,AP		B28	NB	2		2	□		□		□		□			●	□		●	3uA	●	●	●		●
SARA-R410M-02B		NB1/M1	GLOBAL		SELECT	NB/M1	1	1	6	●	□	□	●	●	●	□	●	●	□	●	●	●	8uA	●	●	□	●	□
SARA-R412M-02B		NB1/M1	GLOBAL	●	SELECT	NB/M1	1	1	6	●	□	□	●	●	●	□	●	●	□	●	●	●	8uA	●	●	□	●	□

SELECT - technology (M1/NB1/2G) and band can be selected by the application. Bands: B1,2,3,4,5,8,12,13,17,18,19,20,25,26,28,39
NB = Cat.NB1, 27.2/62.5 kb/s Downlink/Uplink   M1 = Cat.M1, 375kb/s Downlink/Uplink
□ - available in future FW version

LTE Low Category – the latest proposal for IoT customers looking not for the highest speed, but for price reasonable successor of retiring 2G/3G technology. LTE Low Cat. offers long availability of network, with price significantly lower then high speed versions. LARA-R2, compatible with SARA, supports LTE Cat. 1 available in standard LTE networks. Lower Cat. version (M1) is currently supported mostly in US and will be deployed worldwide soon.

LTE Cat.1. LARA/TOBY

LGA 26.0x24.0mm
LGA 35.6x24.8mm

	ATEX	Europe+EMEA(EU), APAC (AP), N.America (NA), S.America(SA) 2G Quad (Q),	Dual (D) Band	3G 850/1900MHz	3G 900MHz	3G 2100MHz	LTE Cat.1.	Downlink/Uplink	UART, USB 2.0	HSIC	GPIO	DDC(I2C) to connect GNSS module	SDIO	Digital audio	VoLTE (Voice over LTE)	GNSS via Modem	Assisted GNSS client	CellLocate	Antenna Supervisor	Jamming Detection	Last Gasp	TCP, FTPS, HTTPS, UDP	LWM2M	BIP (eSIM, eUICC)	SSL/TLS 1.2	FOTA FW update	Rx diversity	Dual stack IPv4/IPv6	Secure boot
LARA-R211		EU	D				B3,7,20	C1	●	●	9	●	●	●	●	●	●	●	●	□	□	●	□	●	●	●	●	●	□
LARA-R202		NA (A)		●			B2,4,5,12	C1	●	●	9	●	●	●	●	●	●	●	●	□	□	●	□	●	●	●	●	●	□
LARA-R203		NA (A)		●			B2,4,12	C1	●	●	9	●	●	●	●	●	●	●	●	□	□	●	□	●	●	●	●	●	□
LARA-R204		NA (V)					B4,13	C1	●	●	9	●	●	●	□	●	□	□	□	●	●	●	●	●	●	●	●	●	□
LARA-R220		Japan					B1,19	C1	●	●	9	●	●	●	●	□	●	C	●	●	●	●	●	●	●	●	●	●	□
LARA-R280		AP				●	B3,8,28	C1	●	●	9	●	●	●	●	C	●	●	●	●	●	●	●	●	●	●	●	●	
LARA-R3121		EU					B3,7,20	C1	●	●	10	●	●	●	●	●	●	●	●	□	●	●	□	●	●	●	●	●	●
TOBY-R200		NA (A)	Q	●	●	●	B2,4,5,12	C1	●	●	9	●	●	●	●	●	●	●	●	□	□	●	□	●	●	●	●	●	●
TOBY-R202		NA (A)		●			B2,4,5,12	C1	●		9	●	●	●	●	●	●	●	●	□	□	●	●	●	●	●	●	●	●

NA(A) - AT&T, T-Mobile version   NA(V) - Verizon version   Japan - NTT docomo   C1 = Cat.1, 10/5 Mb/s Downlink/Uplink   C - CSFB only   □ - available in future FW version

LTE – the fastest cellular technology supported by u-blox' TOBY modules and MPCI - mini PCI Express cards. Reference PCB design available to make application ready for SARA/LARA modules, and TOBY.

LTE Cat.6 / Cat.4 TOBY-L4/L2

LGA 35.6x24.8mm

|	Europe+EMEA(EU), APAC(AP), N.America(NA), S.America(SA), Asia-Pac(APAC) 2G Quad (Q), 900/1800 (D1), 850/1900 (D2) MHz	3G 850MHz	3G 1700MHz	3G 1900MHz	3G 900/2100MHz	LTE FDD bands	LTE TDD bands	Downlink/Uplink	UART	USB	GPIO	DDC(I2C)	SDIO	RGMII/RMII	Analog audio	Digital audio	GNSS via Modem	Assisted GNSS client	CellLocate	Antenna Supervisor	Jamming Detection	TCP, FTPS, HTTPS, UDP	BIP (eSIM, eUICC)	SSL/TLS 1.2	FOTA FW update	Rx diversity	Dual stack IPv4/IPv6	MIMO 2x2
LTE Cat.6 modules																												
TOBY-L4006-00/-50	NA(A+V)	D2	●	●	●		B2,4,5,7,12,13,17,29		C6	4/-	*/1	14/9	2/1	2/-	1/□	●	●	x/□	□	□	●	●	x/□	●	x/□	●	●	●
TOBY-L4106-00/-50	EU	D1				●	B1,3,7,8,20	B38	C6	4/-	*/1	14/9	2/1	2/-	1/□	●	●	x/□	□	□	●	●	x/□	●	x/□	●	●	●
TOBY-L4206-00/-50	AP,Brazil	Q	●			●	B1,3,5,7,8,9,19,28		C6	4/-	*/1	14/9	2/1	2/-	1/□	●	●	x/□	□	□	●	●	x/□	●	x/□	●	●	●
TOBY-L4906-00/-50	China	D1				●	B1,3	B39,40,41	C6	4/-	*/1	14/9	2/□	2/-	1/□	●	●	x/□	□	□	●	●	x/□	●	x/□	●	●	●
LTE Cat.4 modules																												
TOBY-L200	NA(A)	Q	●	●	●		B2,4,5,7,17		C4	1	1	14	1	1			1					●	●	●	●	●	●	●
TOBY-L201	NA(A+V)		●		●		B2,4,5,13,17		C4	1	1	14		1								●	●	●	●	●	●	●
TOBY-L210	EU	Q		●	●		B1,3,5,7,8,20		C4	1	1	14	1	1			1					●	●	●	●	●	●	●
TOBY-L220	Japan				●		B1,3,5,8,19		C4	1	1	14	1	1			1					●	●	●	●	●	●	●
TOBY-L280	SA,AP	Q		●	●		B1,3,5,7,8,28		C4	1	1	14	1	1			1					●	●	●	●	●	●	●
MPCI-L2xx	MPCI-L2 mini PCI Express cards are based on TOBY-L2 modules																											

NA(A) - AT&T, T-Mobile   NA(V) - Verizon   C6 = Cat.6, 300/50 Mb/s Download/Upload   * - USB used for tracing and FW update   □ - available in future FW version

NBIoT by u-blox - ability to modify the network settings for lower power

In high latency transmission technologies the most important measured parameter is the power consumption. The throughput as well as the time needed to get ackowledgements are secondary issues. In NBIoT the amount of data is predicted to be very small, and sent infrequently, with no need for immediate responses from the server. With the publish-subscribe approach, utilized by using CoAP or MQTT, the responses are stored in the network until the application is ready to receive them. To gain the long battery lifetime benefits, it is crucial to understand which supported feature to use in a specific application. It is of course possible to use a combination of the features.

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 - on a Mobile Originated Transfer, or on a schedule - when T3412 timer expires (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. This mode is dedicated for Device Terminated applications.
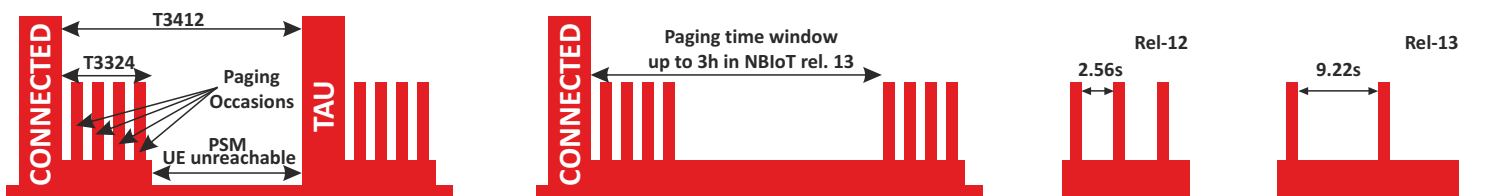

Power Saving Mode   **Idle eDRX**   **Connected eDRX**

SMART AND EFFICIENT COOPERATION
## WIRELESS (GSM, UMTS, LTE) + GNSS (GPS, GLONASS , GALILEO,..)

There are many modern applications on the market that require two technologies: GNSS positioning and 2G/3G/4G communication. Expectation is to have a small, low power, and highly integrated solution.

Since GSM/GPS combo modules are not a flexible solution, and do not fit into the market, u-blox has implemented special features to ease the design effort required for such integration.


Typical Solution **u-blox Optimized Solution**
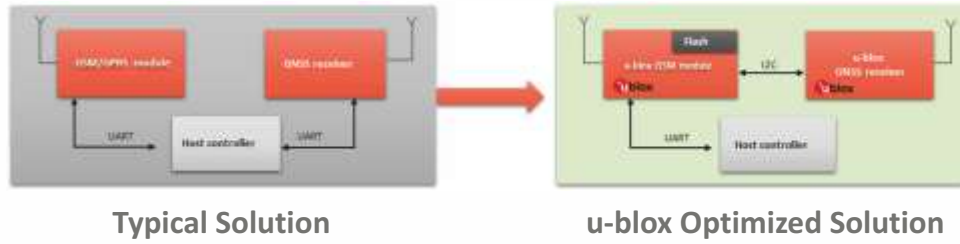
For example, connecting u-blox' wireless and GNSS modules together simplifies design (one UART is enough), allowing full access to GNSS module via the wireless modem. It is also possible to use very useful features built in GSM/UMTS module like:

◄ GNSS power control with AT commands (GNSS supply enable)
◄ Assisted GNSS client built in GSM module, handling of A-GNSS data exchange and storage (Flash memory built in GSM module)
◄ time synchronization between modules (GNSS RTC sharing)
◄ GNSS data ready – optimizes the wireless module power consumption, since it wakes-up only when there is data ready from the GNSS receiver
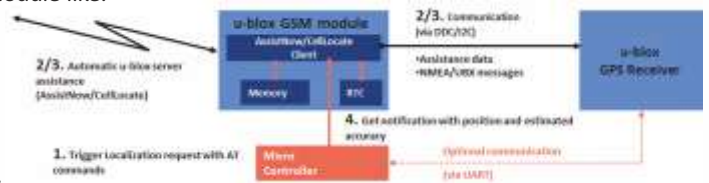
Full cooperation between u-blox' wireless and GNSS modules is possible with very simple hardware design, presented on picture.
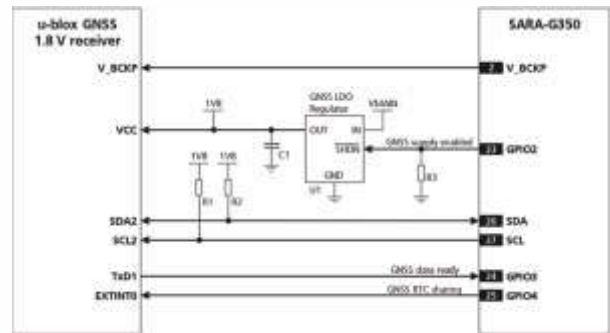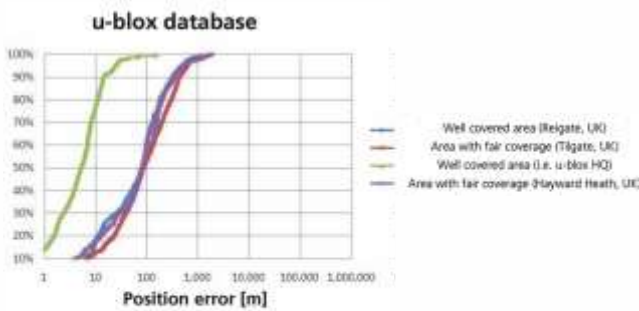
Moreover, u-blox' GSM/UMTS modules offer additional service, **CellLocate**, making such GSM + GNSS tandem not only highly integrated and low power, but also an extremely functional solution, offering information about position even under poor or no sky visibility and no GNSS signal conditions, or jamming. Wireless module collects information from visible cells, and reports to ublox' server. CellLocate calculates position based on proprietary algorithm and database, and returns to the wireless module. CellLocate database is self learning structure, which continuously improves accuracy.

GSM TOOLS

EVK-xxx evaluation kits provide a simple, flexible and ready to use environment for evaluating of u-blox' SARA, LARA, LISA and TOBY cellular modules, as well as for designing and testing of wireless and GNSS applications (GNSS module on board). Kits are user-friendly, and have both USB and RS232 interfaces for development, testing and tracing. Modular design allows to replace adapter board (ADP-xx with cellular module) to test selected technology on the same main board. The kits come with a built-in u-blox GNSS receiver module, to either test cellular functionality alone or to integrate it together with u-blox GNSS technology. For evaluating Assisted-GNSS (A-GNSS) a u-blox A-GNSS client is embedded in the firmware stack.

C030 Universal NBIoT and 2G/3G, ARM mbed-enabled IoT board is an out-of-the-box starter kit powered by Cortex-M4 host MCU. Allows quick prototyping of a variety of applications for the "Internet of Things" (IoT). Includes ie.: MAX-M8C Multi GNSS receiver, SARA-N211 (NBIoT) or SARA-U201 (global 3G) cellular module, eUICC (embedded SIM), sensors, ethernet, battery charger and monitor, on-board debugger with SWD connector. The board is powered by a Cortex-M4 (STM32F437VG) fully supported by the ARM Mbed platform (http://mbed.org) providing free software libraries and online tools for professional rapid prototyping. The programming is done using a standard-based C/C++ SDK. C030 contains simple USB drag-n-drop programming and ST-Link debug interface for the Host microcontroller.
Board is compatible with u-blox Bluetooth and WiFi modules.

The **m-center** wireless modules evaluation software from u-blox provides a powerful platform for evaluation, configuration and testing of u-blox' SARA, LARA, LISA, TOBY families of GSM/GPRS, UMTS/HSDP+ and LTE products. m-center is PC-compatible, and provides an intuitive, easy to understand and use graphical interface.

GSM ANTENNAS

ME500L
- 433 MHz, 824~894 MHz, GSM 900 / 1800, PCN 1.9 GHz UMTS 2.1 GHz Bluetooth 2.4 GHz
- gain: 2.2 dBi
- vswr < 2:1
- to be mounted on flat surfaces (eg. glass)
- RG174 cable with the type of connector upon request
- dimensions: 22 mm x 126.5 mm
- operating temperature: -40°C to +85°C

ME301M
- 824~894 MHz, GSM 900 / 1800 MHz, PCN 1.9 GHz, UMTS 2.1 GHz
- gain: 2.2 dBi
- max power: 30 W
- vswr < 2:1
- magnetic, mounting on metal surface
- RG174 cable with the type of connector upon request
- dimensions: 71.95 mm x 30.85 mm
- operating temperature: -40°C to +85°C

ME200GP
- 433 MHz, 824~894 MHz,
- GSM 900 / 1800, PCN 1.9 GHz
- UMTS 2.1 GHz Bluetooth 2.4 GHz
- Gain: 2.2 dBi Max
- VSWR: <2:1
- **Wall mount**
- cable and the type of connector upon request
- **Whip length: 290mm, diameter: 22mm**
- Operating temperature: -40°C to +85°C

ME0104
- 868 MHz, GSM / PCN / UMTS
- 2 band (900/1800MHz) version available
- Gain: 2.9 dBi Max
- Max height 48mm, diameter 9mm
- SMA connector in straight or angle version
- operating temperature: -40°C to +85°C

MEW031
- 433 MHz, 824~894 MHz,
- GSM 900 / 1800, PCN 1.9 GHz
- UMTS 2.1 GHz Bluetooth 2.4 GHz, WIFI(2.4 GHz, 5.1 - 5.9 GHz)
- Gain: 3dBi Avg.
- VSWR: <2:1
- Type of connector upon request
- Ground Plane Independent
- Max height: 114.6mm
- Max diameter: 10mm
- Operating temperature: -40°C to +85°C

MEMAS01/MEMAS01A
- 824-894 MHz, GSM 900 / 1800 MHz, PCN 1.9 GHz, UMTS 2.1 GHz, Bluetooth 2.4 GHz
- gain 0.0 dBi
- max power: 25 W
- vswr <2.5:1
- cable and the type of connector upon request
- operating temperature: -40°C to +85°C

ME664B
- 824-894 MHz, GSM 900 / 1800 MHz, PCN 1.9 GHz, UMTS 2.1 GHz, Bluetooth-Wifi 2.4 GHz
- gain 2.2 dBi
- mounting in a hole with the screw
- vswr: < 2:1 for GSM
- RG174 cable with the type of connector upon request
- dimensions: 70 mm x 15 mm
- operating temperature: -40°C to +85°C

MEE03/MEE04
- 824-894 MHz, GSM 900 / 1800 MHz, PCN 1.9 GHz, UMTS 2.1 GHz
- **ceramic GSM antenna**
- vswr: <3.0:1
- size 24 mm x 5.5 mm x 4.4 mm
- gain max
  - MEE03: AMPS 1.3 dBi / GSM 2.4 dBi / DCS 6.4 dBi / PCS 5.9 dBi / UMTS 4.8 dBi
  - MEE04: AMPS 0.7 dBi / GSM 0.7 dBi / DCS 5.7 dBi / PCS 4.8 dBi / UMTS 4.6 dBi
- operating temperature -35°C to+ 85°C

HF CONNECTORS

For many years Microdis Electronics has provided wireless products for customers in Eastern Europe. Including ISM solutions (Bluetooth, ZigBee), GSM/UMTS/CMDA modules, GPS/Galileo/Glonass modules.

Together with the wireless products Microdis can also offer a comprehensive range of accessories necessary to support wireless applications, including: antennas, HF connectors, HF adapter cables and SIM card holders.

Right angle, SMA female, THT
SMA_FEMALE_PCB_ANGLE_LF

Right angle, SMA female, Edge mounted
SMA_FEMALE_PCB_THROUGH_SMD

Right angle, MMCX female, SMD
MMCX_FEMALE_SMD_ANGLE_LF

Right angle, MCX female, SMD
MCX_FEMALE_SMD_ANGLE_LF

Right angle, MCX female, THT
MCX_FEMALE_PCB_ANGLE_LF

Compatible with u.fl
I-PEX_FEMALE_SMD

Global Connector Technology and Alps Electric portfolio includes Push-push SIMholders, Low-profile SIM holders, Combo SIM/ microSD memory card holders, Dual SIM holders and also many standard SIM holders.

The RF portfolio of Microdis Electronics consists also of customized pigtails, prepared according to the specifications sent by customers.

These products are only a small fraction of the high frequency portfolio of Microdis Electronics.
The standard offer contains other connectors and adapters which are not presented here.

RADIO FREQUENCY IDENTIFICAtiON

AEG ID
INTELLIGENTIFICATION™

We have provided application support for RFID projects for over 10 years.
At this time we have gained tremendous experience and developed a range of components that work best on the market. They are both products of primary and cheaper technology, 125 kHz (popular products Unique and EM Marin) and more advanced systems for industrial applications (134.2 kHz) or logistics (13.56 MHz) and electronic billing (Mifare).

Access Control

Microdis offers a range of contactless ISO cards, key fobs and bracelets designed for corporate access control, time & attendance, ski-lift ticketing and event management applications. Prelaminated RFID inlays for contactless card production are also available. Furthermore Microdis is able to provide quality printed, graphically personalized cards.

Animal identification

The present Animal Identification uses widely transponders, injection implanters and RFID readers for livestock, pet, bird and fish identification and tracking applications. Tag form factors include glass-encapsulated tags, pigeon rings, ear tag inlays and boluses. Animal tracking applications based on AEG ID RFID technology enable end users to automatically record the origin and history of each individual animal.

◀ Pet identification: hand readers, glass tubes, injectors and complete cannulas with barcode assigned to each transponder.

◀ Life stock identification: hand readers, stationary readers with antennas, glass tubes, inlays and animal ear rings.

◀ Pigeon identification: readers, and leg ring with a glass tube.

Industrial & logistic applications

Tags and readers for RFID supply chain management and industrial automation solutions. These systems are used in the beverage and gas industries to track kegs and gas bottles, in the automotive industry for production control, in logistics to track cases and pallets, and in waste management to identify containers. Transponders for industrial use include durable plastic disc tags designed to withstand harsh environmental conditions, including humidity, aggressive chemicals and temperatures in the range from -40°C to +220°C.

◀ Container management: stationary readers with industrial grade antennas, hand readers, disc tags, special KEG tags (welded to metal) or moulded transponders.

◀ Waste identification: hand and stationary readers, inlays and disc tags, special temperature resistant transponders.
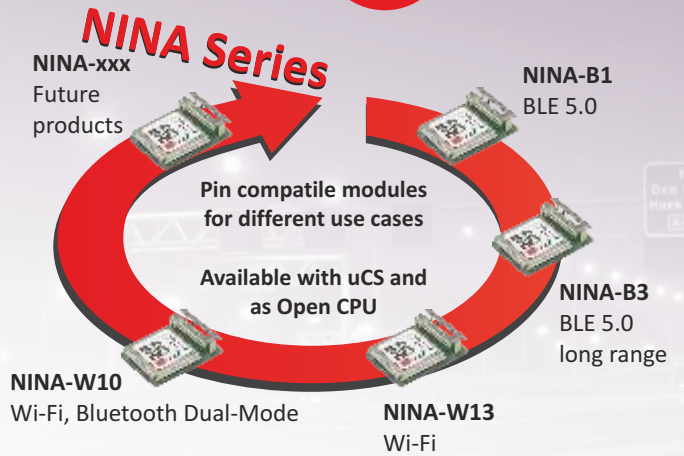
SHORT RANGE: WIFI, BLUETOOTH

Stand-alone short range radio modules

u-blox

Stand alone modules are the best solution for fast time to market applications. The device is already equipped with a powerful processing unit, and does not require an additional MCU with stacks and drivers.

Keeping the pin compatibility, but providing different technologies, is one of the driving forces that draws the professional industrial customers to u-blox. A concept that started at first with GNSS modules, then used widely with Cellulars, is now once again copied to short range devices.

The NINA series - designed for IoT - allows a flexibility of communication solutions, for different use cases, with only one hardware design. Bluetooth classic with BLE, or secure Wi-Fi modules may be mounted on one - designed for all - pad layout.

NINA Series

NINA-xxx Future products

NINA-B1 BLE 5.0

Pin compatile modules for different use cases

Available with uCS and as Open CPU

NINA-B3 BLE 5.0 long range

NINA-W10 Wi-Fi, Bluetooth Dual-Mode

NINA-W13 Wi-Fi

NINA Series, selected features:

- **u-blox Connectivity Software (uCS)** - pre-flashed application deveoped by u-blox, allows immediate use of the module with simple control via AT commands
- **Open CPU** - allows to upload customized stacks and customer specific applications using third party APIs
- **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

6.5 × 6.5 × 1.2 mm with internal antenna

	Supply voltage [V]	Power consumption, idle [mA] - connected*	Power consumption, Tx [mA]**	u-blox connectivity software	Open CPU for embedded customer applications	Bluetooth qualification	Bluetooth Dual-Mode	Wi-Fi Band: 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 Protocol	Extended Data Mode prot.	uAccess point [max stations]	Low Energy Serial Port (SPS)	Wi-Fi enterprise security	Secure boot	Mesh networking	FOTA	ATEX/IECEx cert.
Bluetooth modules in compact SiP package																														
ANNA-B112	1.7-3.6	2.2μ	5.3	○		v5.0			160 300	I P	○						14		0.8	○	8	○		○		○				
ANNA-B112	1.7-3.6	2.2μ	5.3		○	v5.0			160 300	I P	○	○	○				26	8	1.4		20								○	○
Bluetooth modules																														
NINA-B301	1.7-3.6	1.3μ	6.6		○	v5.0			TBD	P	○	○	○	○			38	8	1.4		20			□		□	○		○	
NINA-B302	1.7-3.6	1.3μ	6.6		○	v5.0			TBD	I	○	○	○	○			38	8	1.4		20						○		○	
NINA-B311	1.7-3.6	1.3μ	6.6	○		v5.0			TBD	P	○	□					28		0.8	○	8	○		○		○			○	
NINA-B312	1.7-3.6	1.3μ	6.6	○		v5.0			TBD	I	○	□					28		0.8	○	8	○		○		○			○	
NINA-B111	1.7-3.6	2.2μ	5.3	○		v5.0			350	P	○						7		0.8	○	8	○		○		○				
NINA-B111	1.7-3.6	2.2μ	5.3		○	v5.0			350	P	○	○	○				19	8	1.4		20								○	○
NINA-B112	1.7-3.6	2.2μ	5.3	○		v5.0			300	I	○						7		0.8	○	8	○		○		○				
NINA-B112	1.7-3.6	2.2μ	5.3		○	v5.0			300	I	○	○	○				19	8	1.4		20								○	○
Wi-Fi modules																														
NINA-W131	3.0-3.6	115	190	○				S	400	P	○					□	13		20	○	8	○	○		10		○	○		
NINA-W132	3.0-3.6	115	190	○				S	300	I	○					□	13		20	○	8	○	○		□		□	○		
Multiradio (Wi-Fi + Bluetooth) modules																														
NINA-W101	3.0-3.6	115	250	○		v4.2	○	S	400	P	○	○	○	○		○	20	4	150		8				10		○		○	
NINA-W102	3.0-3.6	115	250	○		v4.2	○	S	300	I	○	○	○	○		○	20	4	150		8				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					○

10 x 11.6 x 1.9 / **10 x 15.0 x 3.5**

10 x 10.6 x 2.2 / **10 x 14.0 x 3.8**

10 x 10.6 x 2.2 / **10 x 14.0 x 3.8**

10 x 10.6 x 2.2 / **10 x 14.0 x 3.8**

14.8 x 22.3 x 4.7 / **14.8 x 22.3 x 3.2**

Bluetooth Dual-Mode modules support SPP, DUN, PAN and GATT profiles, Single-Mode BLE modules support GATT
* Power consumption in idle mode: WiFi 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, P - antenna pin, 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

SHORT RANGE: WIFI, BLUETOOTH, V2X
Host-based short range radio modules

Host based modules require an additional MCU with drivers and stacks for the specific technology. The Host can also be an Android, Windows or Linux based unit. Using such modules requires long 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 applications, especially the V2X VERA Series.
U-blox' Automotive grade guarantees that the units will perform without a hitch even in demanding conditions.

Fleet management · **Interior vehicle entertainment system** · **e-call & insurance data collection** · **Navigation & road conditions information service** · **360° obstacle awareness** · **Toll booth**

Wi-Fi modules (10 x 14 x 2.2)

Module	Supply voltage [V]	Bluetooth profiles	Bluetooth BR/EDR	Bluetooth Low Energy	Wi-Fi IEEE 801.11 version	Bluetooth qualification	Wi-Fi 2.4 GHz	Wi-Fi 5 GHz	Antenna type	LTE Filter	High-spped UART for Bluetooth only	PCIe for Wi-Fi only	SDIO [version]	USB 2.0	GPIO	1PPS and SPI	PCM (Bluetooth audio)	Android/Linux support via u-blox free of charge	QNX support via third party	Micro Access Point [max stations]	AES hardware support	Wi-Fi direct	Simultaneous STA/AP on different channels	Factory calibrated RF	MAC address stored in module	Router function with TOBY-L2 LTE module	Antenna diversity	Single channel operation	Concurrent dual-channel operation
LILY-W131	1.7-3.6			b/g/n			○		1a				v2	○				○		8	○	○		○	○				
LILY-W132	1.7-3.6			b/g/n				○	int	○			v2	○				○		8	○	○		○	○				

Multiradio (Wi-Fi + Bluetooth) modules (13.8 x 19.8 x 2.5)

Module	Supply voltage [V]	Bluetooth profiles	Bluetooth BR/EDR	Bluetooth Low Energy	Wi-Fi IEEE 801.11 version	Bluetooth qualification	Wi-Fi 2.4 GHz	Wi-Fi 5 GHz	Antenna type	LTE Filter	High-spped UART for Bluetooth only	PCIe for Wi-Fi only	SDIO [version]	USB 2.0	GPIO	1PPS and SPI	PCM (Bluetooth audio)	Android/Linux support	QNX support	Micro Access Point [max]	AES hardware support	Wi-Fi direct	Simultaneous STA/AP	Factory calibrated RF	MAC address stored	Router function	Antenna diversity	Single channel operation	Concurrent dual-channel operation
EMMY-W161	3.0-3.6	H	○	○	a/b/g/n/ac	v4.2	○	○	1p	○	○		v3			○	○	○	○	10	○	○	○	○	○				
EMMY-W163	3.0-3.6	H	○	○	a/b/g/n/ac	v4.2	○	○	2p		○		v3			○	○	○	○	10	○	○	○	○	○				
EMMY-W165	3.0-3.6	H	○	○	a/b/g/n/ac	v4.2	○	○	1p				v3			○	○	○	○	10	○	○	○	○	○				
ELLA-W131	3.1-3.6 / 1.74-1.89	H	○		b/g/n	v3.0+HS	○		1p				v2			○	○	○	○	10	○	○		○	○	○	○		
ELLA-W133	3.1-3.6 / 1.74-1.89	H	○		b/g/n	v3.0+HS	○		2p				v2			○	○	○	○	10	○	○		○	○				
ELLA-W161	3.1-3.6 / 1.74-1.89	H	○	○	a/b/g/n	v3.0+HS	○		1p				v2			○	○	○	○	10	○	○		○	○				
ELLA-W163	3.1-3.6 / 1.74-1.89	H	○	○	a/b/g/n	v3.0+HS	○		2p				v2			○	○	○	○	10	○	○		○	○				
JODY-W164	3.2-4.8	H	○	○	a/b/g/n/ac	v4.2	○	○	2p	●	○	○	v3			○	○	○	○	10	○	○	○	○	○				
JODY-W167	3.2-4.8	H	○	○	a/b/g/n/ac	v4.2	○	○	3p	●	○	○	v3			○	○	○	○	10	○	○	○	○	○				

V2X modules* (24.8 x 29.6 x 4.0 — 13.8 x 19.8 x 2.5)

Module	Supply voltage [V]	Bluetooth profiles	Bluetooth BR/EDR	Bluetooth Low Energy	Wi-Fi IEEE 801.11 version	Bluetooth qualification	Wi-Fi 2.4 GHz	Wi-Fi 5 GHz	Antenna type	USB 2.0	GPIO	1PPS and SPI	Android/Linux support	Single channel operation	Concurrent dual-channel operation
VERA-P171	3.3 & 5			p					1a	○	○	○	○	○	
VERA-P173	3.3 & 5			p					2a	○	○	○	○	○	○
VERA-P174	3.3 & 5			p					2a	○	○	○	○	◇	◇

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
H - HCI profile
● - on request,   ◇ - Can be configured by the user as dual-channel diversity

*V2V/V2X standard, as well as modules and stacks, are currently in development. U-blox, as the wireless technology leader, is providing the harware expertise, stacks should be delivered by third parties.

ISM TOOLS

EVK-xxx evaluation kits provide a simple, flexible and ready to use environment for evaluating of u-blox' ANNA, NINA, ODIN, LILY, OBS, ELLA, EMMY, JODY of Wi-FI and Bluetooth products. The evaluation kits are designed for use with Arm® Mbed™ and are complete starter kist that allow quick prototyping. In BLE NINA-B kits the included NFC antenna can be used for use cases requiring NFC.

For easy application development u-blox provides reference designs called Blueprints, which in many cases may be used without changes in the customers application.
For example the **B200-NINA-B1** blueprint is a small battery powered solution. The board integrates the NINA-B1 module with the inertial measurement unit BMI160. It has been created to match the size of a 20mm coin cell battery, providing a small form factor solution.

The **s-center** wireless modules evaluation software from u-blox provides a powerful platform for evaluation, configuration and testing of u-blox' ANNA, NINA, ODIN, LILY, OBS, ELLA, EMMY, JODY of Wi-FI and Bluetooth products
S-center is PC-compatible, and provides an intuitive, easy to understand and use graphical interface.

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, is providing security built into their solutions. If you're using u-blox GNSS , Cellular or Short-range modules - your application is protected.

Threats	Principle	The u-blox approach
Modifications to the way that u-blox and customers' products work	Secure Boot Secure FW upgrades Secure interfaces Secure APIs	u-blox products are secured against security threats originating from attacing the module behavior, man-in-the-middle and replay attacks. Bootloader accepts only authenticated Software
Changing the data as it flows through the system	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
Unauthorised systems taking control of u-blox products	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
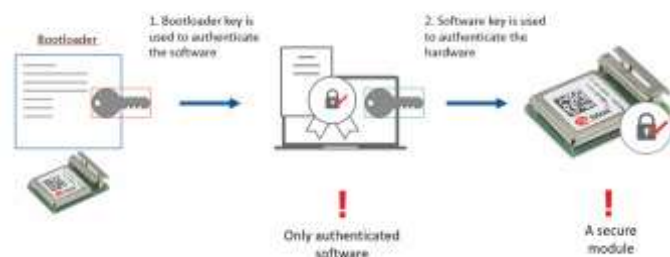
ISM ANTENNAS

MEW031

- 433 MHz, 824~894 MHz
  GSM 900 / 1800, PCN 1.9 GHz
  UMTS 2.1 GHz Bluetooth 2.4 GHz
- WIFI(2.4 GHz, 5.1 - 5.9 GHz)
- gain: 3dBi Avg.

- VSWR: <2:1, type of connector upon request
- Ground Plane Independent
- max height: 114.6mm
- max diameter: 10mm
- operating temperature: -40°C to +85°C

ME0115

- ISM/TETRA (433 MHz)
  ISM (868 MHz)
  ISM (915 MHz)
- Polarization: Linear

- Gain: 0 dBi
- VSWR: <2:1
- Power handling: 25W
- Connector: SMA Straight, SMA male R/A

ME3015

- ISM (868 MHz)
- Polarization: VERTICAL
- Gain: 3 dBi, VSWR: <1.5:1

- Power handling: 25W
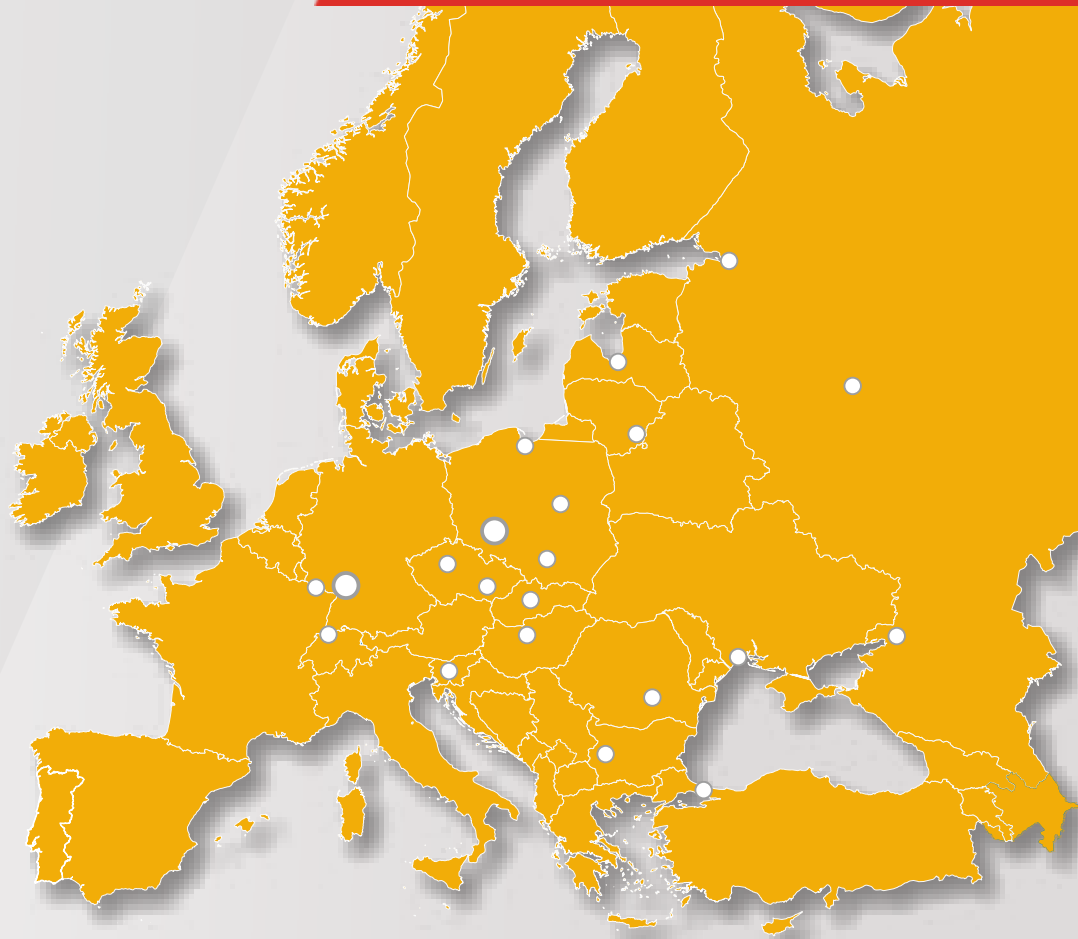- Operating temperature: -40°C to +85°C
- Size: 93.8mm x 30.9mm

MEF0102

- 2.4/5.0 GHz ISM
  Wi-Fi/Bluetooth 2410-2490 MHz
  Wi-Fi 4920-5925 MHz
- Flexible and adhesive PCB

- Gain [dB]: -1.2@2.4GHz, -0.8 @5GHz
- VSWR: <1.5:1
- Dimensions: 39.6 × 8.4 × 0.1 mm
- Customizable connector & cable

AAEON	Industrial computers and panels	www.aaeon.com
AEGID	RFID systems and transponders	www.aegid.de
ASROCK	Mini-ITX industrial board	www.asrock.com
BRIGHTEK	Power, THT and chip LEDs and LED modules	www.brightekeurope.com
CAMDENBOSS	Interconnect components, electronic housings, 19" cabinets	www.camdenboss.com
EPSON	Crystals, oscillators, filters and sensors	www.epson-electronics.de
FISCHER CONNECTORS	Military, medical and industrial connectors	www.fischerconnectors.com
FISCHER ELEKTRONIK	Heatsinks, connectors, 19'' and case technology	www.fischerelektronik.de
GLOBAL CONNECTOR TECHNOLOGY	SIM-Holders, memory card connectors, USB connectors	www.gct.co
IIYAMA	Large Format Displays	www.iiyama.com
ISOCOM	Optocouplers, optoswitches	www.isocom.com
JST	Signal connectors	www.jst.de
LEAR	Automotive and white goods connectors	www.lear.com
LG INNOTEK	Lighting LEDs, mid and high power, CSP packages, UV LEDs	led.lginnotek.com
MAXTENA	GPS, Galileo, Glonass, Iridium antennas	www.maxtena.com
MECAL	Machines and systems for wire crimping	www.mecal.com
MEDER	Reed switches, sensors and relays	www.meder.com
MEDIKABEL	UL/CSA/DIN certified, customized industrial cables	www.medikabel.de
METZ CONNECT	Terminal block connectors - screw, spring and pins	www.metz-connect.com
NEXCOM	Industrial computers and panels	www.nexcom.com
SEOUL SEMICONDUCTOR	Lighting LEDs, AC modules & drivers, Wicop2 packages	www.seoulsemicon.com
TAIWAN SEMICONDUCTOR	Semiconductor devices	www.taiwansemi.com
U-BLOX	GNSS, GSM, UMTS/HSPA/CDMA/LTE/NBIoT modules, WiFi, Bluetooth, NFC, V2V/V2X, antennas	www.u-blox.com
WEZAG	Hand tools for crimping, pneumatic presses	www.wezag.de

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

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.

EN v.5.6

GSM/3G/LTE   **GPS/GNSS**   **LED**   **Embedded**   **Passive**   **Semicon**   **Electromech**