MICRODIS

COMPETENCE & RELIABILITY

WIRELESS TECHNOLOGIES

❚ 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, Wi-Fi
❚ ZIGBEE, THREAD
❚ ANTENNAS & ACCESSORIES

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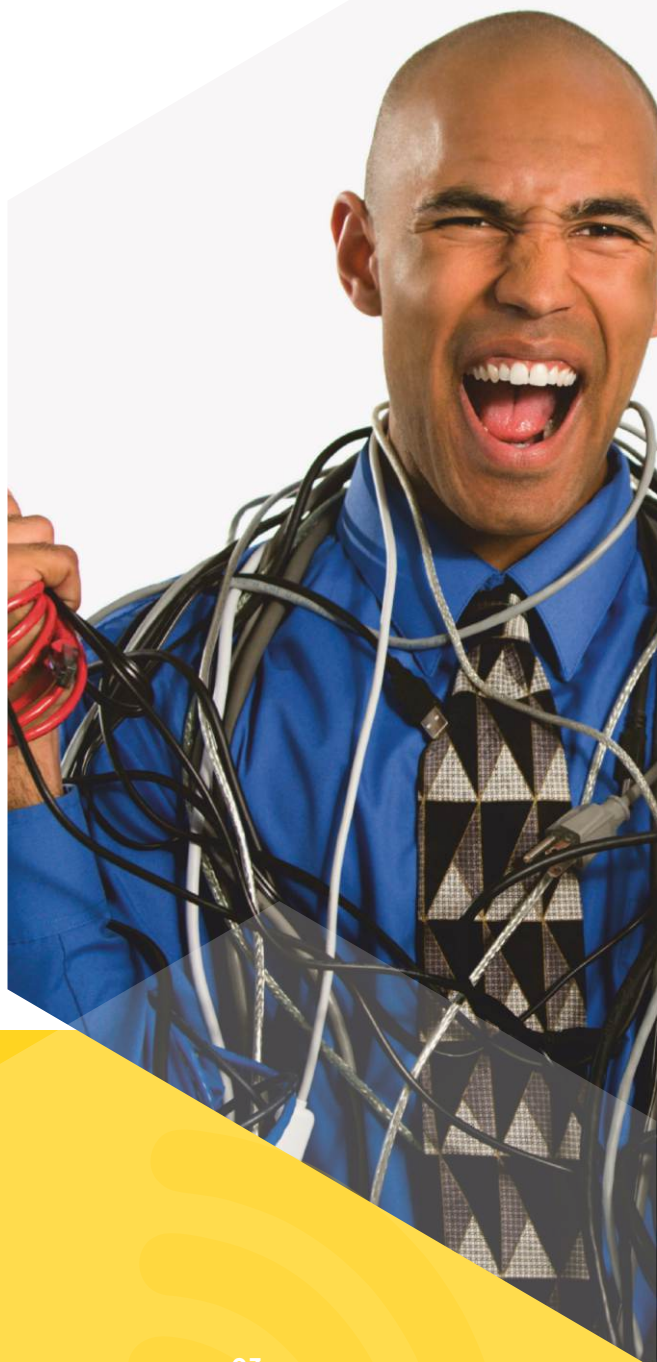
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NO MORE WIRES!

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 RECEIVERS
GPS+QZSS (L1C/A+L2C), BeiDou (B1I+B2I)
GALILEO (E1B/C+E5b), GLONASS (L1OF+L2OF)

u-bloxF9, u-bloxM9, u-bloxM8 - 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.

▌ Supports: GPS, Glonass, BeiDou, QZSS and Galileo
 Up to 4 systems used in parallel
▌ Multiband versions for high precision also in the cities
▌ Superb security features:
 Spoofing & Jamming detection, Message Integrity protection
▌ High performance navigation, ultra fast acquisition (<1s)
▌ True, dynamic sensitivity as high as -167dBm
▌ Position accuracy (CEP, SBAS): 1.5m
▌ High precision NEO-M8P, ZED-F9P accuracy < 0.01m
▌ Super Efficient low power mode: (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
▌ 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 antennas

SECURE GNSS PLATFORM FROM U-BLOX

Message Integrity - protection against providing falsification of GNSS position i.e. by the communication "record and replay".
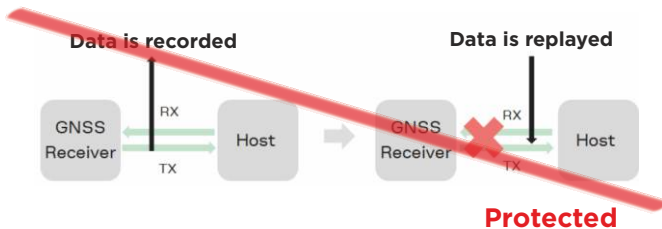
Jammer detection - indicates the presence of GNSS jammer The best on the market in-band **jamming immunity.**

Anti-spoofing protection - indicates attempts to forge a GNSS signal for false positioning.

Fake data package or jammer

**FAST, SENSITIVE, POWER AND COST OPTIMIZED SWISS MADE U-BLOX M8 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.

SAM CAM NEO MAX EVA *New* ZOE
4.5x4.5x1 mm

MODULES ARE QUALIFIED FOR IN-VEHICLE USE (ISO16750)

u-bloxM8 high performance positioning - platform combines advanced technology, sophisticated algorithms, true concurrent GNSS reception and multi GNSS aiding services. u-bloxM8 sets the new benchmark for navigation in challenging environments.

3-Dimensional Dead Reckoning GNSS - the ability to calculate a position in the X, Y, and Z axis when satellite signals are blocked. Built in sensors (gyroscope, accelerometer) allow full coverage even without GNSS signal (tunnels, car parks).
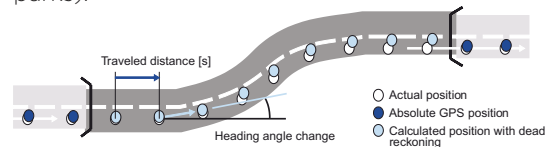
Geofencing - receiver reports (by command or I/O pin) if fix lies within defined area (up to 4 can be defined).

Multi GNSS support - u-bloxM8 brings real advantage of using 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 products.

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

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

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 Auto-nomous (calculated internally by the GNSS receiver, no access to ublox' server required, up to 6 days).

Precise Positioning - u-blox' HPG algorithms (NEO-M8P, ZED-F9P) provide centimeter-level accuracy (up to <0.01m), and line level navigation even in the cities.

GPS, GALILEO, GLONASS, BEIDOU, QZSS MODULES

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

u-blox

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.

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 lxw [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
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		
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					●	O		●
NEO-M8M	16x12.2	1.65-3.6	●	●	3	C	●	●		●	●	●	●		M					●	O		
NEO-M8Q	16x12.2	2.7-3.6	●	●	3	C	●	●		●	●	●	●		M					●		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	

High Precision GNSS modules

Model	Size lxw [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	Precise Positioning	Dead Reckoning	Precision Timing	Frequency output	External Interrupt/Wakeup	Antenna supply	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	●/–	●	2	T	●	●	●	●		●	●	●	M	RTK<0.025m				●	O	P	
ZED-F9R	22.0x17.0	2.7-3.6	Multi Band***	●	4	T	●//●	●		2	●	●	●	●	MO	RTK<0.2m	ADR*			●	O	P	●

GNSS modules with dedicated features

Model	Size lxw [mm]	Power Supply [V]	GPS, Galileo	Glonass, QZSS, BeiDou	Number of Parallel GNSS systems	Crystal / TCXO / VCTCXO	Geofencing, Odometer	Spoofing detection	Data Logger	UART	USB	SPI	DDC (I2C)	RAW data	Assisted	Precise Positioning	Dead Reckoning	Precision Timing	Frequency output	External Interrupt/Wakeup	Antenna supply	Antenna power control	Extra LNA, SAW
NEO-M8U	16.0x12.2	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	16.0x12.2	2.7-3.6	●	●	3	C	●	●		●	●	●	●		M		ADR*			●	O	P	
LEA-M8F	22.4x17.0	3.0-3.6	●/–	●	2	V	–/●	–/–/●		●	●	●	●		M			●	●	●			●
ZED-F9T	22.0x17.0	2.7-3.6	Multi Band***	●	4	T	●	●		●	●	●	●	●	M			●	●	●	O	P	S
NEO-M8T	16.0x12.2	2.7-3.6	●	●	3	T	●	●		●	●	●	●	●	M			●	●	●	O	P	

GNSS modules with integrated antenna

Model	Size lxw [mm]	Power Supply [V]	GPS, Galileo	Glonass, QZSS, BeiDou	Number of Parallel GNSS systems	Crystal / TCXO / VCTCXO	Geofencing	Spoofing	Data Logger	UART	USB	SPI	DDC (I2C)	RAW data	Assisted	Precise Positioning	Dead Reckoning	Precision Timing	Frequency output	External Interrupt/Wakeup	Antenna supply	Antenna power control	Extra LNA, SAW
SAM-M8Q	15.5x15.5	2.7-3.6	●	●/●/–	3	T	●	●		●		●	●		M					●		●	●
CAM-M8C	14.0x9.6	1.65-3.6	●	●	3	C	●	●		●		●	●		M					●			●
CAM-M8Q	14.0x9.6	2.7-3.6	●	●	3	T	●	●		●		●	●		M					●			●

O- requires external components P- control pin to handle active antenna E-External Flash required *MO- Multi GNSS Online
*** Multi Band = ZED-F9P/T/R supports: GPS/QZSS L1C/A+L2C, Glonass L1OF+L2OF, Galileo E1-B/C+E5b, BeiDou B1I+B2I
** Super E-Low Power Technology, 6mA@1.8V, 1Hz
*   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)
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.

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 millimeters 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 centimeter-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/E5) and RTK technology** lets the ZED-F9P achieve centimeter-level accuracy in seconds. Receiving more satellite signals at any given time maximizes the availability of centimeter-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 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 (f.e. the Sapcorda services provided by u-blox, Bosch, Geo++ and Mitsubishi Electric joint venture).

OSR – using actual observations from nearby reference stations (private base station, or other) – needs a two way communication usually (the rover needs to report a position to get the corrections for its area), resulting in high bandwidth requirements. The solution is also a local one – the data from the reference station applies only to a small area. It is however a free system, that can be tailored for the customer specific needs.

SSR – worldwide service providing corrections via internet or satellites, where only one way communication is used. Low data rate is needed, as the rover will apply the received corrections, by performing calculations, only to its area. The result is a global coverage. The SSR corrections will be supported by future versions of the F9 platform.
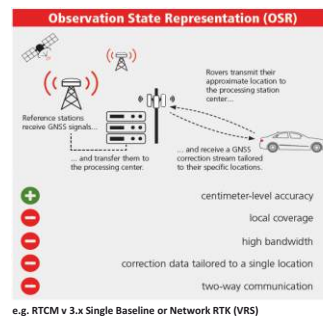

Observation State Representation (OSR)

e.g. RTCM v 3.x Single Baseline or Network RTK (VRS)

State Space Representation (SSR)

e.g. Sapcorda services

	without corrections	with corrections
Type	Stand-alone GNSS	Stand-alone RTK / SSR-RTK
GNSS	GPS, GLONASS, BeiDou, Galileo, QZSS, NAVIC, SBAS	
Bands	L1 and E5	L1 and L2/E5
Corrections	SBAS, Sapcorda Basic	SBAS, SSR, RTCM 3.x
Accuracy (1-sigma)	<1.0m w/ SBAS	<1.0m w/ SBAS <0.03m (RTCM 3.x) <0.20m (SSR*)
Dead Reckoning	optional	optional

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

Multipath — Lane Level Navigation — Limited Sky View
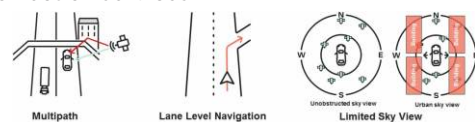
u-blox F9 platform benefits

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.
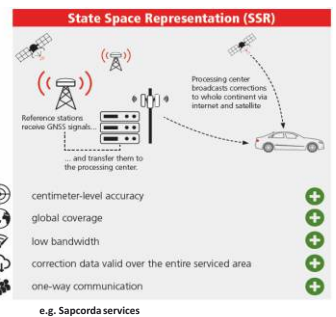

ANN-MB block diagram

The u-blox ANN-MB multi-band (L1, L2/E5) 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

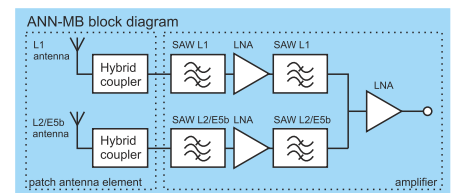|	
Weight 167 g (Typ. including cable)	
Size 60.0 x 55.0 x 22.5 mm	
Cable 5 m RG174 standard	
Connectors (choice) SMA, SMB, MCX	
Mounting Magnetic base, fixed installation option	
Waterproof IP 67	
Operating temperature –40 ° C to +105 ° C	

|	L1 Band	L2/E5 Band
Frequency	1559 - 1606 MHz	1197 - 1249 MHz
VSWR	Max. 2.0	Max. 2.0
Bandwidth (@ -10dB)	Min. 200 MHz	Min. 200 MHz
Peak gain (on Ø15 cm ground plane)	Typ. 3.5 dBic	Typ. 0 - 2.0 dBic

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
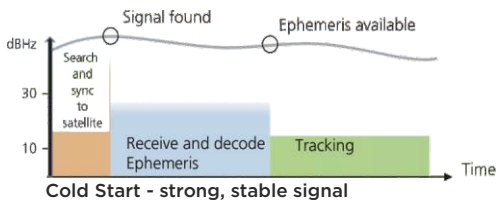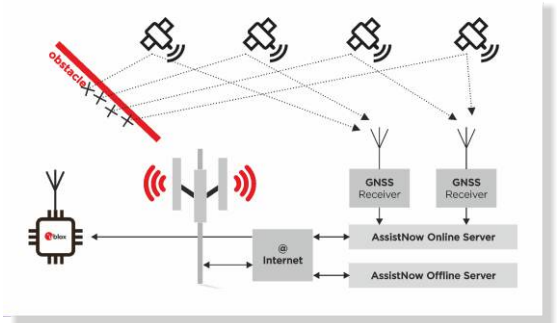
Under **good signal conditions Acquisition** process (cold start) takes appx. 30s, consisting from 2 stages.

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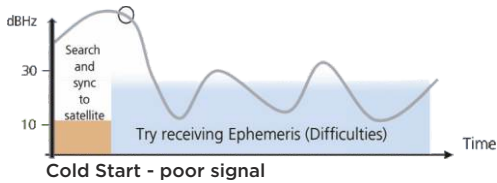
Under **poor signal conditions Acquisition** it takes much more time, or is not possible at all. Collecting Ephemeris from 4 SVs needs uninterrupted good quality signal from each SV for appx. 30s. Under adverse signal conditions it can take minutes, hours or even fail altogether.

Aided Cold Start – using Assisted GNSS data provided by u-blox
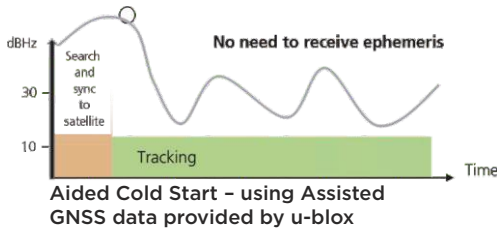
u-blox is the leader, and pioneer, in **Assisted GNSS (A-GNSS) technology**, which accelerates calculation of position by delivering satellite data such as Ephemeris, Almanac, accurate time and satellite status to the GNSS receiver via wireless networks or the Internet. This aiding data enables a GNSS 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 it 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 kinds 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 itself and is valid for up to 6 days. Activation of this feature is highly recommended.

Although using A-GNSS is simple, u-blox GSM/UMTS/LTE 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	Retrieved 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)
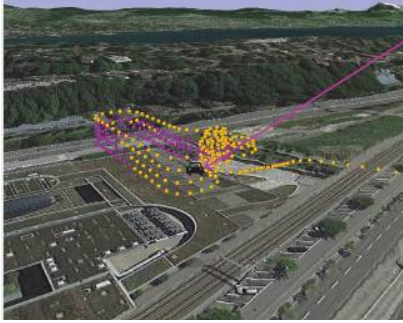
# DEAD RECKONING - NAVIGATION WITHOUT THE SKY VIEW

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:
l leading GNSS platform u-bloxM8 optimized for the best performance with Dead Reckoning
l 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
l DR technology is suitable for 4 wheels cars, trucks, buses and 2 wheels motorbikes or scooters (not for lightweight i.e. bikes)

RAW sensor data
l information from sensors can be read (up to 100Hz) and used for example to register behaviour of vehicle during an accident
l very precise information about fuel consumption
l simple integration and pin compatibility with the other NEO-M8 family modules for the fast time to market
l dedicated interface to connect u-blox cellular module (SARA, LARA, LISA, TOBY)
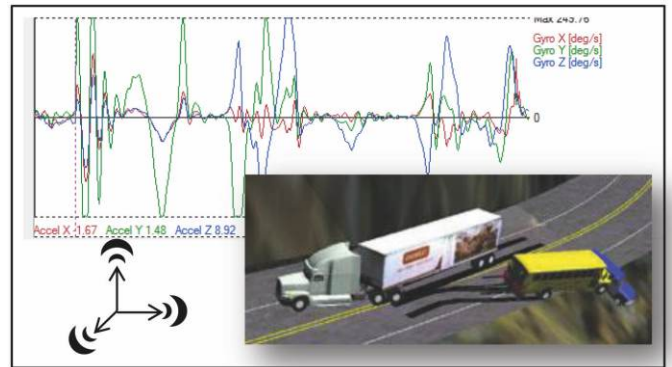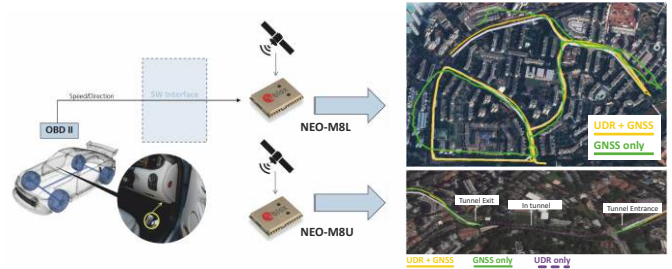
temperature, acceleration, angle reported by NEO-M8L/U during accident

NEW GNSS SOLUTIONS

ZOE-M8G/Q - 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 a double stage LNA, SAW filter and TCXO.
Double LNA makes ZOE the perfect solution for devices working with weak GNSS signal, using hidden or small passive antennas with limited perfor-mance. 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 - fulfils the picture of an outstanding product.
Design with ZOE-M8G does not need deep RF skills - critical components (double LNA, SAW, TCXO) are integrated and matched.

## ZOE-M8B - Super-Efficient low power receiver in ZOE form factor
Super-E technology, integrated in the ZOE-M8B, is a breaking point for portable and wearable applications with limited space for antenna and battery. Positioning every second (1Hz) needs as low as 12mW, which is 83% power saving vs. usual receivers with similar position accuracy.
Pin compatible with other ZOE modules.

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.

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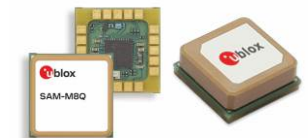
Antenna size was carefully selected to keep good perform-ance in small form factor. Smaller antennas significantly degrade navigation performance and should be considered only if there is no other option. However, solution is scalable, bigger ground plane can be used to achieve even more optimal performance,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

3x less power using Super-E low power technology
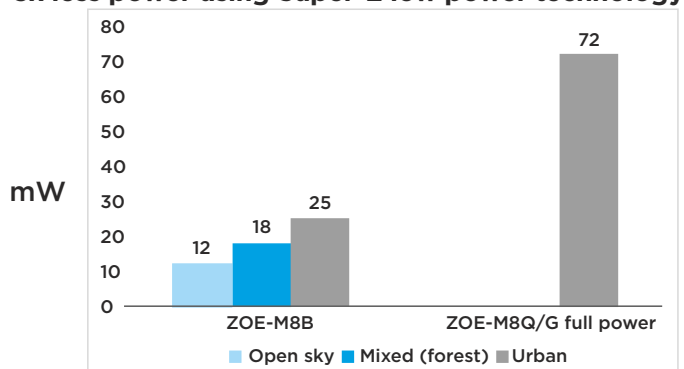
CELLULAR:
## GSM, UMTS, LTE Cat.6, Cat.4, Cat.1, Cat.M1, Cat.NB2 - NBIoT

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.

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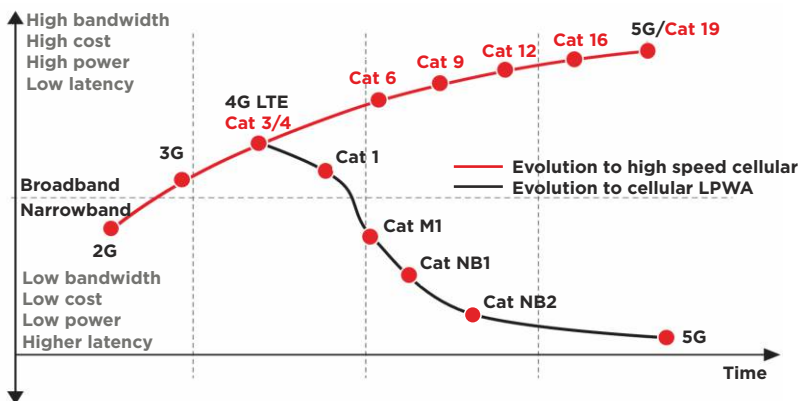
The cellular data transmission technology is evolving in two different directions:

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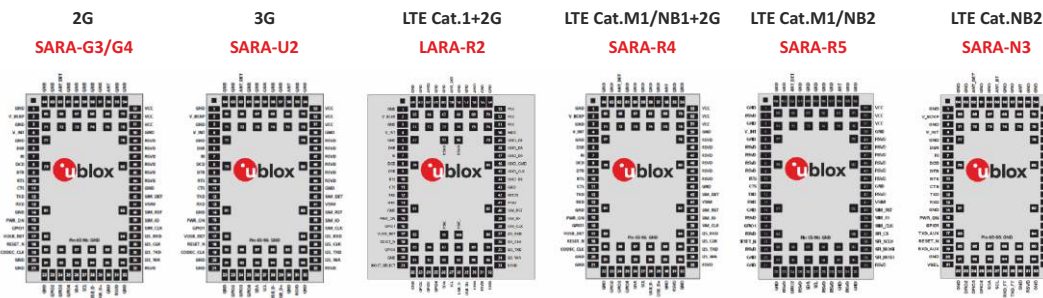
u-blox is a leading supplier of LTE Low Cat. modules meeting such industrial IoT requirements.

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

Feature	Description
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 use the same pads as SARA), and NBIoT (SARA-Nx, SARA-Rx). Reference PCB design to support SARA and TOBY (fast LTE Cat.4 and Cat.6)
Multiband	global LTE modules with plenty of bands and network profiles to be selected by the application
Security	built in features like SSL/TLS, Secure Boot etc. (see more on page 13)
Last Gasp	sending a predefined last notification (via SMS or TCP/UDP) in case of power outage, just before the power goes off
TCP sockets always on	automatic TCP direct link connection at each start up
Low power	the market leading low power consumption across technologies (i.e. 2G: 0.6mA IDLE, 2.9mA active mode; NBIoT: 3uA Deep Sleep etc.)
RRC Release Assistance	feature supported by the most low power advanced LTE Cat.NB1 (NBIoT) modules like SARA-N2. Changing network timer SARA-N2 saves even 93% of power (calculated with 200 bytes data packages)
Custom timers	commands used to control search and sleep time when there is no network available, and to thereby reduce power consumption
Antenna/SIM detection	provides antenna/SIM presence detection capability
Smart Temperature Supervisor	monitoring of the module board temperature, warning notifications or shutdown to prevent damage of the module
CoAP, MQTT, LWM2M	support of protocols dedicated to IoT/M2M
BIP	Bearer Independent Protocol for Over-the-Air SIM provisioning (eSIM / embedded SIM, eUICC)
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
Jamming detection	detects and reports potential jamming
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). Cellular module becomes a very important component for GNSS systems
GNSS support	GNSS receiver can be connected directly to cellular module, creating tandem. Built in Assisted GNSS client (see more on page 11)
In-band Modem	embedded modem for communication within eCall, the European security system, and Era Glonass, Russian system
CellTime	a command set that allows applications to retrieve precise timing using CellLocate (SARA-U201)
FOTA / uFOTA	Firmware Over The Air update allows to keep even the deployed devices up to date with the newest functionalities

2G SARA-G3/G4	3G SARA-U2	LTE Cat.1+2G LARA-R2	LTE Cat.M1/NB1+2G SARA-R4	LTE Cat.M1/NB2 SARA-R5	LTE Cat.NB2 SARA-N3

Easy migration path u-blox nested concept

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

AT command compatibility to minimize migration effort.

2G and 3G - traditional technology in highly reliable, well established SARA form factor. Small SARA-U201 covers all 2G/3G bands for global operation. SARA-G/U is an entry point into the current networks, preparing an application for the new technologies.

LGA 26.0x16.0 mm

2G GSM/GPRS	ATEX variant available	Europe+EMEA(EU), Asia-Pac(AP)	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, FTP, HTTP	BIP (eSIM, eUICC)	SSL(TLS)/SNI**	Last Gasp**	FOTA FW update	FW update over Serial
SARA-G340	○	EU,AP		●				G	2		4	●	1/1	●	●	●		●	●	●		●/-			
SARA-G350	○	GLOBAL	●	●				G	2		4	●	1/1	●	●	●		●	●	●		●/-			○
SARA-G450	○	GLOBAL	●	●				G	3		4	●	1/-	●	●	●		●	●	●		●/-	○	●	○

3G UMTS/HSPA																									
SARA-U201	○	GLOBAL	●	●	●	●	●	M	2	●	9	●	-/1	●	●	●	●	●	●	●	●	●/○	●	●	●
SARA-U270/U2x0		REGIONAL		REGIONAL				M	1	●	9	●	-/1	●	●	●		●	●	●	●	●/-			●

G - GPRS CS1-CS4 - up to 85.6 kbit/s, CSD - GSM max 9.6 kbit/s   M = 7.2/5.76 Mb/s Downlink/Uplink
Regional 3G versions are not recommended for new designs, for seamless migration to SARA-U201 please contact the nearest Microdis office if more details are requested.

LTE Low Category – proposal for IoT customers looking not for the highest speed, but for price reasonable successor of retiring 2G/3G technology (LTE Cat.1, LTE Cat.M1), or low power solution (LTE Cat.NB1).

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 i.e. 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 family, verified on the field since 2015
❚ superb power saving features
❚ comprehensive roadmap of NBIoT
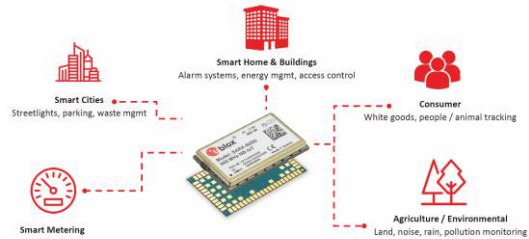
LTE Cat.M1 – aspiring to be the successor of 2G/3G, with long network availability (LTE), cost lower than 3G and voice (VoLTE) available soon. Currently deployed in US and will be supported worldwide soon.

LGA 26.0x16.0 mm

LTE Cat. NB / M1	ATEX	LTE Category Downlink/Uplink (kbps)	2G/GPRS support	LPWA extended coverage, Tx Power	GLOBAL REGIONAL versions**	UART/USB	GPIO	Digital audio	u-blox GNSS integrated enhanced RF, two stages LNA&SAW	GNSS via Modem (I2C)	Assisted GNSS client	CellLocate	Dynamic LTE antenna tunning	Antenna and SIM detection	Jamming Detection	Last Gasp	Connected Mode Mobility Enhancement (Handover, CMME)	Coverage Enhancement (CE)	TCP;UDP / FTP,HTTP,FTPS,HTTPS	DNS³ / BIP ((U)SIM)	TLS(SSL), SNI / DTLS	Root of Trust security (RoT)/ Secure cloud services	PSM Power Saving Mode, Deep Sleep current	eDRX / RAI (RRC Release Assistance)	COAP / MQTT¹, MQTT-SN	LWM2M / LWM2M with dynamically loaded objects	uFOTA FW update
SARA-N211	○	NB1		YES,23dBm	REG	2/-	2											●					.3uA	●	●/-		●
SARA-N300¹/N310	○¹	NB2		YES,23dBm	GLOB¹	1+D/-	5				●	●		●	●		●	●	●/-				.3uA		●/-¹	●/-	●
SARA-R500S		M,NB2²		YES,23dBm	GLOB	2/D	6	●	●	●	●		●	●	●		●	●	●		●	●	.65uA	●²	●	●	●
SARA-R510S		M,NB2²		YES,23dBm	GLOB	2/D	6	●	●	●	●		●	●	●		●	●	●		●	●	<1uA	●²	●	●	●
SARA-R510M8S		M,NB2²		YES,23dBm	GLOB	2/D	6	●	●	n/a	●		●	●	●		●	●	●		●	●			●	●	●
SARA-R422	●	M,NB2	●	YES,23dBm	GLOB	1/D	6				●	●		●	●		●	●	●/-	●	●/-		.3uA	●	●	●	●
SARA-R422S	●	M,NB2	●	YES,23dBm	GLOB	1/D	6				●	●		●	●		●	●	●	●	●	●	.3uA	●	●	●	●
SARA-R422M8S	●	M,NB2	●	YES,23dBm	GLOB	1/D	6			n/a	●	●		●	●		●	●	●	●	●	●	.3uA	●	●	●	●
SARA-R410M-x03B		M		YES,23dBm	REG	1/1	6				●	●		●	●		●	●	●		●/-		.8uA	●	●		●
SARA-R412M-02B	○	M1,NB1	●	YES,23dBm	GLOB	1/1	6				●	●		●	●		●	●	●		●/-		.8uA	●/-	●/-	●/-	●

** - technology (M/NB/2G) and band can be selected by the application (not supported by SARA-N211).
¹ -SARA-N300 is dedicated to China, feature not supported by SARA-N300   ² - SARA-R5 will support LTE Cat.NB in the next FW release (Q4'20)
³ - not every NBIoT network supports DNS   Data rates: NB1 = Cat.NB1, 27.2/62.5 kb/s, NB2 = Cat.NB2 2HARQ, 125/140 kb/s, M = Cat.M1, 300/375 kb/s, M = Cat.M 375/1200 kb/s
○ - available in future FW versions   D - for Diagnostic

LTE Cat.1 – offers coverage already now (supported by usual LTE providers), and long availability of LTE networks, with price of modules significantly lower than high speed versions.
LARA-R2 with efficient Cat.1 data rate (10 Mb/s DL, 5 Mb/s UL) are suitable for the voice implementation (VoLTE) and enough for majority of data streaming applications.

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	GPIO	DDC(I2C) to connect GNSS module	SDIO (master)	Digital audio	Voice: VoLTE and CSFB	Integrated u-blox GNSS	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				V															
LARA-R204		NA (V)					B4,13	C1		9																			
LARA-R220		Japan					B1,19	C1		9																			
LARA-R280		AP				○	B3,8,28	C1		9				C															
LARA-R281		EU				○	B1,3,8,20,28	C1		9				C															
LARA-R3121		AP				○	B1,3,5,7,8,28	C1		10																			
TOBY-R200-82B		GLOBAL	Q	○	○	○	B1,2,4,5,8,12	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   V - VoLTE only
○ - available in future FW version
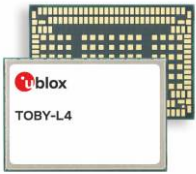
LTE High Category – fast cellular technology, supported by u-blox' TOBY modules and MPCI - mini PCI Express cards. Reference PCB design available to make application ready for SARA/LARA modules and TOBY.
TOBY-L4xxx-0x is uCPU with embedded Linux for customer application, dedicated for high volume automotive customers.

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-L4006-01/-51	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-L4106-01/-51	EU	D1				○	B1,3,7,8,20	B38	C6	4/-	*/1	14/9	2/1	2/-	1/○			x/○							x/○				
TOBY-L4206-01/-51	AP,Brazil	Q				○	B1,3,5,7,8,9,19,28		C6	4/-	*/1	14/9	2/1	2/-	1/○			x/○							x/○				
TOBY-L4906-01/-51	China	D1				○	B1,3	B39,40,41	C6	4/-	*/1	14/9	2/○	2/-	1/○			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   C4 = Cat.4, 150/50 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

Power consumption is the most important parameter for NBIoT 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.
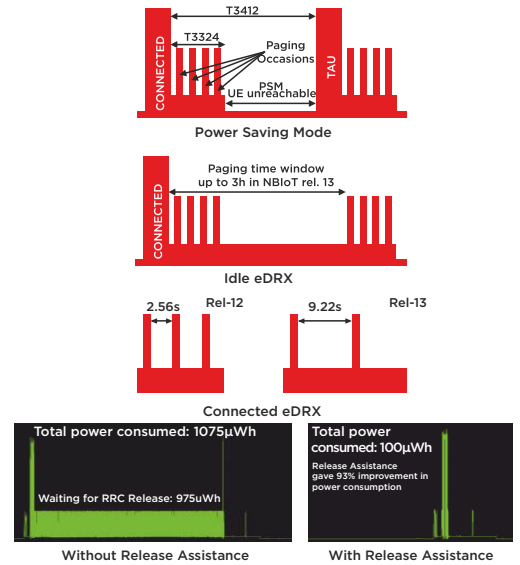
NBIoT brings many additional features to tune the application and network for the lowest energy consumption in a given scenario. u-blox modules are well tuned by experienced team of engineers to support these features.
FAEs provide support to u-blox customers for efficient configuration.

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 NBIoT 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.

Power Saving Mode

Idle eDRX

Connected eDRX

Total power consumed: 1075µWh

Waiting for RRC Release: 975uWh

Total power consumed: 100µWh

Release Assistance gave 93% improvement in power consumption

Without Release Assistance   With Release Assistance

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.

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.

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 a self learning structure, which continuously improves accuracy.

Typical Solution   **u-blox Optimized Solution**
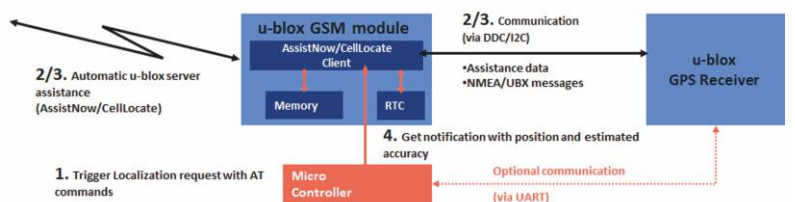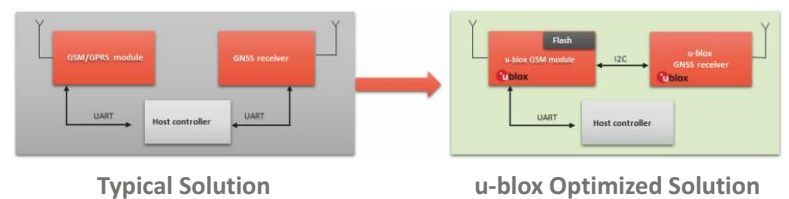
Full cooperation between u-blox' wireless and GNSS modules is possible with very simple hardware design, presented on picture.
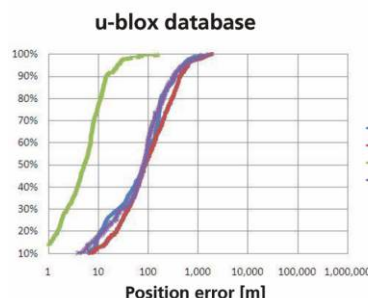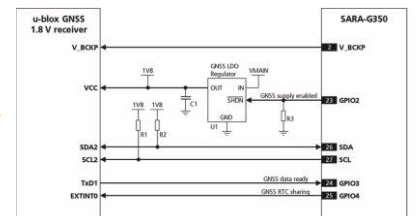
CellLocate accuracy depends on the coverage of the area

BLUETOOTH
Stand-alone short range radio modules

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

Providing different technology in pin compatible form factor (i.e. NINA) is one of the driving forces that draws the professional industrial customers to u-blox.
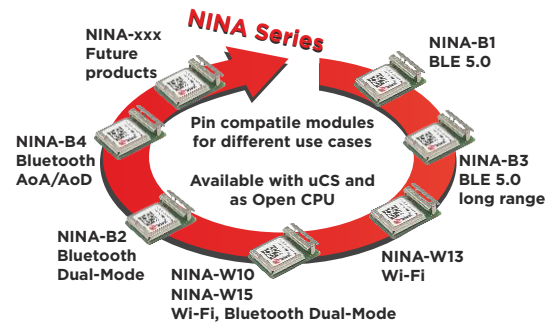The NINA series - designed for IoT - allows a flexibility of communication solutions.

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.4.0-5.1) 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.

NINA Series, selected features:

l **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

l **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

l **FOTA** - Firmware Over the Air update

l **Secure boot** - the module boots up only in the presence of original certified software, preventing network hacks via compromised hardware

NINA-xxx Future products — NINA-B1 BLE 5.0 — NINA-B3 BLE 5.0 long range — NINA-W13 Wi-Fi — NINA-W10 NINA-W15 Wi-Fi, Bluetooth Dual-Mode — NINA-B2 Bluetooth Dual-Mode — NINA-B4 Bluetooth AoA/AoD

Pin compatible modules for different use cases — Available with uCS and as Open CPU

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.
ANNA-B112	1.7-3.6	2.2µ	5.3	●		v5.0			160 300	I E	●						14		0.8	●	8		●		●			●			
ANNA-B112	1.7-3.6	2.2µ	5.3		●	v5.0			160 300	I E	●	●	●				26	8	1.4		20								●	●	
Bluetooth modules with u-connect or Open CPU																															
NINA-B301	1.7-3.6	1.3µ	6.6	●		v5.0			1400	E	●	●	●	●	●	●	38	8	1.4		20						●	●	●		
NINA-B302/6	1.7-3.6	1.3µ	6.6		●	v5.0			1400	I/P	●	●	●	●	●	●	38	8	1.4		20								●	●	
NINA-B311	1.7-3.6	1.3µ	6.6	●		v5.0			1400	E	●	●					28		0.8	●	8		●		●			●	●		
NINA-B312/6	1.7-3.6	1.3µ	6.6		●	v5.0			1400	I/P	●	●					28		0.8	●	8		●		●				●	●	
NINA-B400	1.7-3.6	1.3µ	6.6		●	v5.1			1400	E	●	●					28		0.8	●	8		●		●			●	●		
NINA-B406	1.7-3.6	1.3µ	6.6		●	v5.1			1400	P	●	●					28		0.8	●	8		●		●			●	●	●	●
NINA-B111	1.7-3.6	2.2µ	5.3	●		v5.0			350	E	●						7		0.8	●	8		●		●			●			
NINA-B111	1.7-3.6	2.2µ	5.3		●	v5.0			350	E	●	●	●				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								●		
NINA-B221	3.0-3.6	95	130	●		v4.2	●		200	E	●						21		1.0	●	7		●		●			●			
NINA-B222	3.0-3.6	95	130	●		v4.2	●		200	I	●						21		1.0	●	7		●		●			●			
Rigado series Open CPU Bluetooth modules																															
BMD-380	1.7-5.5	1.5µ	4.8		●	v5.0			500	I	●	●	●	●	●	●	44	12	1.4		20						●	●	●		
BMD-360	1.7-3.6	1.5µ	4.6		●	v5.1			200	P	●	●	●	●			32	12	1.4		4								●	●	
BMD-350	1.7-3.6	1.5µ	5.3		●	v5.0			190	I	●	●	●	●			32	12	1.4		20						●	●	●		
BMD-345	2.0-3.6	2.3µ	12		●	v5.0			1000	U	●	●	●	●			44	12	1.4		20						●	●	●		
BMD-341	1.7-5.5	1.5µ	4.8		●	v5.0			750	U	●	●	●	●			48	12	1.4		20						●	●	●		
BMD-340	1.7-5.5	1.5µ	4.8		●	v5.0			350	P	●	●	●	●			48	12	1.4		20						●	●	●		
BMD-330	1.7-3.6	1.5µ	4.6		●	v5.0			200	P	●	●	●	●			32	12	1.4		4								●		
BMD-301	1.7-3.6	1.5µ	5.3		●	v5.0			400	U	●	●	●	●			32	12	1.4		20						●	●	●		
BMD-300	1.7-3.6	1.5µ	5.3		●	v5.0			200	P	●	●	●	●			32	12	1.4		20						●	●	●		
R41Z	1.7-3.6	1.8µ	6.1		●	v4.2			150	P	●	●	●	●			25	16	1.0		2								●		

6.5 × 6.5 × 1.2 mm

10 × 11.6 × 1.9
10 × 15.0 × 3.5

10 × 10.6 × 2.2
10 × 14.0 × 3.8

9.8 × 14.0 × 1.9
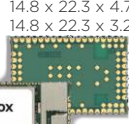
6.4 × 8.65 × 1.5

10.2 × 15.0 × 2.0

9.8 × 14.0 × 1.9

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, 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

Stand-alone short range radio modules

10 x 10.6 x 2.2
10 x 14.0 x 3.8
NINA-W13

10 x 10.6 x 2.2
10 x 14.0 x 3.8
NINA-W101

14.8 x 22.3 x 4.7
14.8 x 22.3 x 3.2
ODIN-W2

Wi-Fi 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.
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	○	○	○		○	○				
Multiradio (Wi-Fi + Bluetooth) modules																															
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		○					○

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
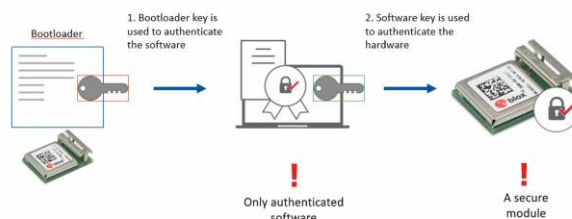*** version only for EU, supports more channels from start up

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
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 attacking 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

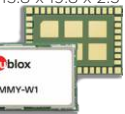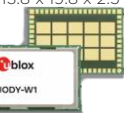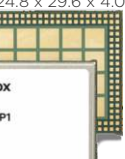**Secure boot will not allow the module to run with malicious software**

1. Bootloader key is used to authenticate the software

2. Software key is used to authenticate the hardware

Only authenticated software

A secure module

Host-based short range radio modules

Host-based modules require an additional host MCU with Wi-Fi / BT drivers and stacks. The Host can be an Android, Windows or Linux based unit. Integration with 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, especially the V2X VERA Series.

u-blox' Automotive grade guarantees that the units will perform without a hitch even in demanding conditions.

| Module	Supply voltage [V]	Bluetooth profiles	Bluetooth BR/EDR	Bluetooth Low Energy	Wi-Fi IEEE 801.11 (Wi-Fi4: 802.11n, Wi-Fi5: 802.11ac)	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	RMII	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	MIMO	Single channel operation	Concurrent dual-channel operation
Wi-Fi modules (10 x 14 x 2.2)																														
LILY-W131	1.7-3.6				Wi-Fi4		S	1a				v2	●					●		8	●	●	●	●	●					
LILY-W132	1.7-3.6				Wi-Fi4		S	int	●			v2	●					●		8	●	●		●	●					
Multiradio (Wi-Fi + Bluetooth) modules (13.8 x 19.8 x 2.5)																														
EMMY-W161	3.0-3.6	H	●	●	Wi-Fi5	v4.2	D	1p	●	●		v3					●	●	●	10	●	●	●	●	●					
EMMY-W163	3.0-3.6	H	●	●	Wi-Fi5	v4.2	D	2p		●		v3					●	●	●	10	●	●	●	●	●					
EMMY-W165	3.0-3.6	H	●	●	Wi-Fi5	v4.2	D	1p		●		v3					●	●	●	10	●	●	●	●	●					
JODY-W163	3.2-4.8	H	●	●	Wi-Fi5	v4.2	D	2p	○	●		v3					●	●	●	10	●	●	●	●	●			●		
JODY-W164	3.2-4.8	H	●	●	Wi-Fi5	v4.2	D	2p	○	●	●	v3					●	●	●	10	●	●	●	●	●			●		
JODY-W167	3.2-4.8	H	●	●	Wi-Fi5	v4.2	D	3p	○	●	●						●	●	●	10	●	●	●	●	●			●		
JODY-W263	2.8-5.5	H	●	●	Wi-Fi5	v5.0	D	2p		●		v3					●	●	●	8	●	●	●	●	●			●		
JODY-W374	TBD	H	●	●	Wi-Fi6	v5.1	D	2p		●							●	●	●	32	●	●	●	●	●			●		
JODY-W374	TBD	H	●	●	Wi-Fi6	v5.1	D	2p		●	●	v3					●	●	●	32	●	●	●	●	●			●		
V2X modules* (24.8 x 29.6 x 4.0)																														
VERA-P171	3.3 & 5				p			1a							●	●		●											●	
VERA-P173	3.3 & 5				p			2a					●		●	●		●									●		●	
VERA-P174	3.3 & 5				p			2a							●	●		●									◇	●	●	◇
VERA-P311	3.3 & 5				p			1a		●		v3	●	●	●			●											●	
VERA-P321	3.3 & 5				p			2a		●		v3	●	●	●	●		●									●	●	●	◇

1p = 1 antenna pin for combined Bluetooth and Wi-Fi
2p = 2 antenna pins, one each for Bluetooth and Wi-Fi
3p = 3 pins, 2 for Wi-Fi and 1 for Bluetooth antenna
H - HCI profile
1a = 1 pin for external antenna
2a = 2 pins for 2 external antennas
int = Internal antenna
○ - 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 hardware expertise, stacks should be delivered by third parties.

CONNECTED VEHICLES
CONNECTED INFRASTRUCTURE

SAFE, EFFICIENT, SMART

U-BLOX TOOLS
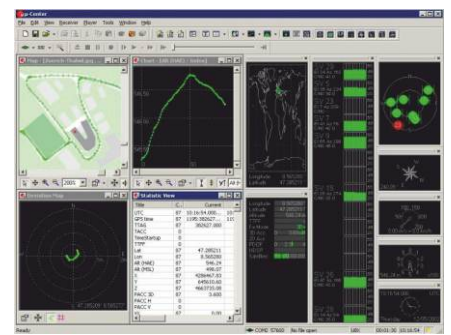
u-center

u-blox 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 proucts). 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 - 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 u-blox UBX binary protocol, calibrated map files and data recording with u-center mobile. Debugging of a target application is also possible.

m-center

m-center - m-center makes configuration of u-blox cellular modules simple and convenient. It is also possible to view and edit SIM phonebook entries, send text messages and communicate with the wireless module using AT commands. In addition, when using u-blox cellular evaluation kits, m-center allows for simple communication with the onboard GNSS module. u-blox wireless modules may also be used for collection of trace files for debugging if the module and BTS communication is affecting the modules performance.

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.

Bluetooth iOS and Android app - source code for developers to evaluate u-blox stand-alone Bluetooth Low Energy modules.

Smartphone App.

u-track - software tool that replicates a real low-power tracking application. Within 15 minutes of installing it, the user can see the first results. It covers three main use cases (sport tracking, people tracking and asset tracking) with optimized presets and is based on the most power-optimized GNSS and LTE Cat M1/NB1 u-blox technology. It is designed to easily record and visualize logs, including power consumption. The solution is composed of embedded firmware that runs on a C030-R412M board and the u-track PC application software.
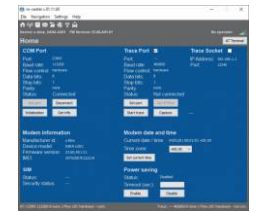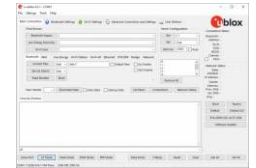
u-track and the C030-R412M

u-blox 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-M8x kit

GNSS kits enable simple evaluation of the high performance u-blox 8 and u-blox M8 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. u-blox 8/M8 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.

EVK-G35 kit

In case of **cellular EVKs** a modular design allows to replace 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, 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.
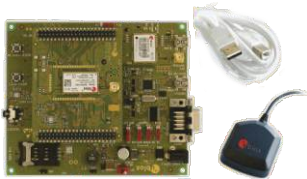

EVK-NINA-B112 kit

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 WiFi sensor applications for Internet of Things.

B200 Blueprint

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.

C99-F9P
application board

C93-M8E
application board

For example the B200-NINA-B1 blueprint is a small Bluetooth battery powered solution. The C030 board is a Mbed enabled IoT starter kit with various cellular modules and a GNSS module. The C099 (for ZED-F9P) board may be used to test the RTK functionality without an effort. Based on the EVA-M8E module, the C93-M8E enables immediate evaluation of u-blox's Untethered Dead Reckoning technology in most vehicle applications.

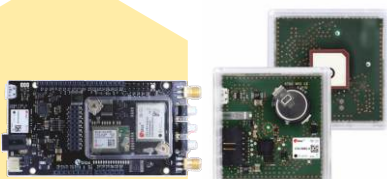For many years Microdis Electronics has provided wireless products for customers in Eastern Europe. Including ISM solutions (Bluetooth, Wi-Fi), GSM/UMTS/LTE modules, GPS/Galileo/Glonass modules. Together with the wireless products Microdis can also offer a comprehensive range of accessories necessary to support wireless applications, including: antennas, HF connectors, HF adapter cables and SIM card holders.

HF CONNECTORS

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 portfolio includes Push-push SIM holders, Low-profile SIM holders Dual SIM holders and also many standard SIM holders.
The whole SIM holder portfolio may be found on www.gct.co

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.

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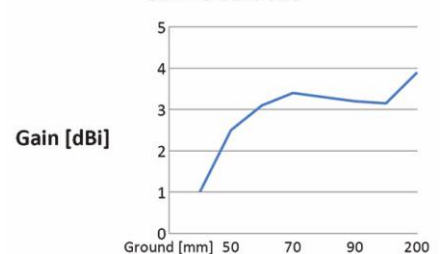
Gain
Gain describes how well the antenna converts radio waves arriving from a specified direction into electrical power or how well it converts input power into radio waves headed in a specified direction. When no direction is specified, gain is understood to refer to the peak value of the gain. A plot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

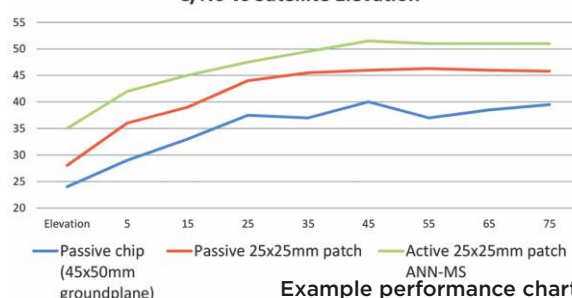Freq=0.9 GHz   Az=45   EL=45
Azimuthal Pattern (X, Y or E-Plane)
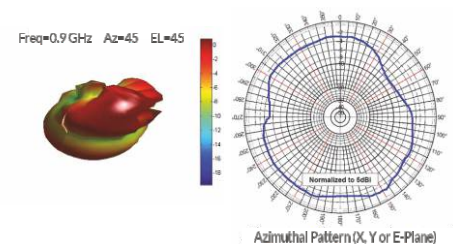
Ground plane
A ground plane is the most important design issue to consider while developing a GNSS receiver system. A dependable antenna can lose all attributes (gain, polarization, center frequency) if a ground plane is small or non-existent. In almost all cases the parameters stated in the datasheets 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.

Gain - Ground size

C/N0 vs Satellite Elevation

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

Example performance chart

Active antenna module

18x18mm Passive patch 25x25mm groundplane

3.2x1.2mm Passive chip 20x45mm groundplane

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

M9706CWT

I **Active qaudrifilar 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

ANN-MB

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

M7HCT-A-SMA

I **Active qaudrifilar helix antenna for RTK applications**
I Concurrent GNSS reception on L1: GPS, GLONASS, Galileo, Beidou L2: GPS L2C, Galileo E5B, and GLONASS L3OC L5: GPS (M8HCT-A-SMA)
I Rugged IP-67 rating with SMA
I Ultra lightweight - 25 grams
I Dimensions (mm) Ø 35 x H 57

MEF0101P

I Passive GNNS antenna
I Gain -2.9 dBi
I Efficiency -70%
I RG174 cable with the type of connector upon request
I Dimensions (mm) 42 x 8.9 x 0.2
I Operating temperature -40°C to +85°C
I **Flexible**

M1575HCT-22P-SMA (GG)

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**

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

M1227HCT-A2-SMA

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

ME7041BGa

I 2 × 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

M1516HCT-P

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

ME4441GP

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

M1575HCT-15A-SMA

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
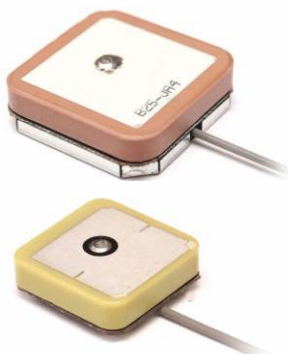
ACTIVE PATCH

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)

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 25 mm x 25 mm.

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).

MAXTENA PATCH

CELLULAR ANTENNAS
THE MOST POPULAR VERSIONS

ME0B04

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

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

ME2124K-B07H

ME3704M

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

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

MEW0124

ME5004PL

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

- Standards 2G, 3G and 4G
- VSWR -2.0:1, -1.5:1, -1,8:1
- Efficiency (%) -53, -52, -41
- Peak Gain (dBi) -2.0, -4.1, -4.1
- Dimensions (mm) 117.4 x 12.5 x 6.5
- Operating temperature -40 °C to +85 °C
- **Adhesive mount**

ME5224P

MEW0304

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

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

MEW1024

ME3104M

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

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

MEE18

MEE017

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

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

MEP0624P

MEF0304P

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

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

ME6551BG

MEP0104P

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

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

ME7050JGa

ISM ANTENNAS
THE MOST POPULAR VERSIONS

ME0A02-2.4
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4 GHz ISM
- VSWR ~4.1:1
- Efficiency (%) ~61
- Peak Gain (dBi) ~3.5
- **Dimensions (mm) 44 x 9.6**
- Operating temperature -40 °C to +85 °C

- Standards ZigBee, ISM, SIGFOX, LoRa
- Frequency 868 MHz ISM
- VSWR ~1.4:1
- **Efficiency (%) ~77.4**
- Peak Gain (dBi)~1.3
- Dimensions (mm) 53 × 10 × 18
- Operating temperature -40 °C to +85 °C

ME0115-868

ME3702M
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4 GHz ISM
- VSWR ~1.2:1
- Efficiency (%) ~43
- **Magnetic**
- Peak Gain (dBi) ~1.6
- Dimensions (mm) Ø 31 x 71.5
- Operating temperature -40 °C to +85 °C

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

ME1015-868

MEW0302-2.4
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4 GHz ISM
- VSWR ~1.9:1
- Efficiency (%) ~62
- Peak Gain (dBi) ~1.5
- Dimensions (mm) 113 x 10
- Operating temperature -40 °C to +85 °C
- **Hinge**

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

ME3915M-868

MEF0202P
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4/5.0 GHz ISM
- VSWR ~1.2:1, ~1.5:1
- Efficiency (%) ~76.3, ~74.7
- Peak Gain (dBi) ~4.4, ~6.7
- **Dimensions (mm) 30 x 30 x 0.2**
- Operating temperature -40 °C to +85 °C
- Flexible antenna

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

ME5215P-868

MEP0102
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4/5.0 GHz ISM
- VSWR ~2.4:1, ~2.2:1
- Efficiency (%) ~53, ~64
- Peak Gain (dBi) ~3.2, ~5.0
- **Dimensions (mm) 16.4 x 5.4 x 0.4**
- Operating temperature -40 °C to +85 °C

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

MEF0115P

MEW035
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4/5.0 GHz ISM
- VSWR ~2.1:1, ~2.8:1
- Efficiency (%) ~35, ~60
- Peak Gain (dBi) ~1.4, ~3.2
- **Dimensions (mm) 76 x Ø 10**
- Operating temperature -40 °C to +85 °C

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

MEE15b

MEWIFI12
- Standards WiFi, BT, ZigBee, ISM
- Frequency 2.4/5.0 GHz ISM
- VSWR ~1.6:1, ~1.8:1
- Efficiency (%) ~60, ~63
- Peak Gain (dBi) ~7.2, ~5.2
- Dimensions (mm) 104 x 104 x 90
- Operating temperature -40 °C to +85 °C
- **Mast mount**

MAXTENA MEA-DSRC-01P

MAXTENA MEA-DSRC-02Z

- Standards **V2V, V2X**
- Frequency 5850 - 5950 MHz
- DSRC (Dedicated Short Range Communications) products
- Waterproof
- Several versions available
- **Peak Gain 5.0 dBi**
- Efficiency over 60%

ME7002Bc
- Standards WiFi, BT, ZigBee, ISM
- **4 × 2.4/5.0 GHz ISM MIMO**
- VSWR ~1.9:1, ~1.6:1
- Efficiency (%) ~58, ~64
- Peak Gain (dBi) ~5.6, ~5.5
- Dimensions (mm) Ø 96 x H 90
- Operating temperature -40 °C to +85 °C

MAXTENA MEA-DSRC-03Z

MICRODIS

COMPETENCE & RELIABILITY

Bulgaria@microdis.net
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Estonia@microdis.net
France@microdis.net*
Germany@microdis.net
Hungary@microdis.net
Latvia@microdis.net
Lithuania@microdis.net
Poland@microdis.net
Romania@microdis.net
Russia@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	Industrial computers and panels	www.aaeon.com
AEGID	RFID systems and transponders	www.aegid.de
ASROCK INDUSTRIAL	3.5" & mini-ITX industrial boards	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
	Programmable oscillator web-shop	epson.microdis.net
FISCHER CONNECTORS	Military, medical and industrial connectors	www.fischerconnectors.com
FISCHER ELEKTRONIK	Heatsinks, connectors, 19" and case technology	www.fischerelektronik.de
GERSYS	Railway computers	www.gersys.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
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
NEOUSYS TECHNOLOGY	Wide-temperature fanless computers	www.neousys-tech.com
NEXCOM	Industrial computers and panels	www.nexcom.com
RAKON	Advanced Frequency control and Timing solutions	www.rakon.com
SAVOY TECHNOLOGY	Automotive and white goods connectors	www.savoy-technology.com
TAIWAN SEMICONDUCTOR	Semiconductor devices	www.taiwansemi.com
u-blox	GNSS, GSM, UMTS/HSPA/CDMA/LTE/NBIoT modules, Wi-Fi, Bluetooth, NFC, V2V/V2X, antennas	www.u-blox.com
WEZAG	Hand tools for crimping, pneumatic presses	www.wezag.de