acal bfi

IoT and Wireless Technology solutions

Developing an enhanced technological future together

acalbfi.com

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Our purpose

Is to develop solutions with our customers that advance tomorrow's technologies.

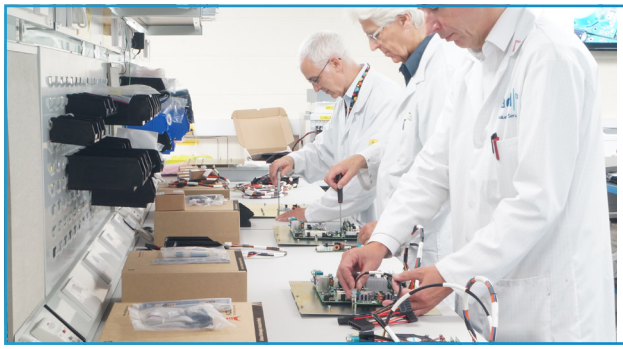
Over the 12 countries we operate in, we're committed to working with customers to develop custom solutions that enhance our technological future, through a consultative, design-led approach. This approach works effectively by combining the following four core elements that set us apart.

Specialist technologies

Our depth of expertise is within a specific group of technologies which enables us to really dedicate our focus on the technology characteristics and market applications.

Dedicated engineers

Our highly trained, technical engineers work with you using a tried and tested approach to provide the right solution for our customers.



Technology Centres

Working in conjunction with our field engineers, our Technology Centres provide dedicated technical excellence and support for our customers.

Strategic partners

Specialising in enabling leading edge technology, our strong partnerships with suppliers ensures we are highly knowledgeable through in-depth training workshops and application expertise.

Explore our technology offer

A carefully selected portfolio of specialist technologies support our chosen markets.

Our expertise

We can offer a choice of standard off-the-shelf products as well as custom solutions for unique and complex designs, across many specialist technology areas. Whether you take this brochure for inspiration, are evaluating our offer or only just discovering us for the first time, this is just a sample of how we can help you succeed in the world of IoT.

Our technologies

Communications

Scale and accelerate your designs seamlessly with our wireless connectivity, fibre optics, radio frequency, cellular, cloud services, and frequency control solutions.

Power

We have an expansive portfolio of off-the-shelf standard power solutions as well as modified and bespoke solutions. Competitively priced, you can source solutions to support a variety of markets.

Sensors

A comprehensive range of leading-edge and specialist sensor solutions. You'll find high-quality and reliable options covering all key parameters that will enable you to achieve the best performance within any environment or application.

Magnetics

Source, customise, and integrate the optimum technology for your application's performance with a choice of both off-the-shelf and custom design solutions.

Our Technology Centres

We provide access to a large range of specialist services and capabilities across our specialist technologies, enabling you to build tailored solutions and bring your concept to reality. Discover how we can support you through our knowledgeable engineers and our dedicated Technology Centres.

Complete support

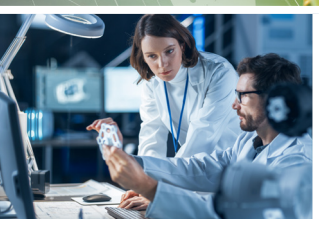
We'll work with you to ensure you always source the right technology for your solution – to meet both your resource and budget requirements, along with providing any technical expertise for more challenging projects.

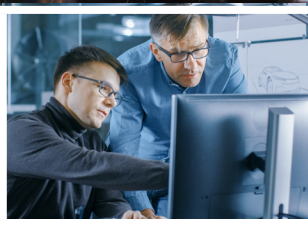
Our IoT and Wireless Technology Centre is a vital part of our consultative, design-led approach

> We blend specialist expertise and state-of-the-art facilities to support semi-custom and custom designs.

Our IoT and Wireless Technology Centre drives our pursuit of excellence. By facilitating and developing both our expertise and capabilities, we can deliver industry-leading technology solutions.

This also ensures that we're able to effectively collaborate with our customers to design custom solutions that meet a project's specific requirements.





Sensors

> For any data journey, the data must first be generated and collected, so let's start our IoT journey with our comprehensive sensor range.

Sensors are being used and connected into many new applications, such as air quality monitoring and HVAC systems used in domestic, industrial, automotive and consumer applications from classrooms, offices, homes, public buildings, factories and vehicles.

With our miniature, low-power sensors you can measure almost any physical parameter from nearly anywhere in the world.

Environmental

Gas

- CO_2, VOC, CO, HVHO and air-quality monitoring
- Wall-mounted, duct-mounted, handheld and PCB-mount versions for domestic and industrial applications
- No calibration required
- High-accuracy, wide measurement range

Dust, smoke and particle

- PM1.0, PM2.5 and PM10.0 sensors

Temperature

- Thermistor elements and sensors, ideal for demanding and harsh environments which require very high quality, reliability and accuracy
- Clip sensors, platinum sensors and thermocouples
- Over-moulded temperature probes, waterproof to IP68

Humidity

- Small size and low weight – leaded and SMD variants
- Analogue and digital output variants
- Low-power variants

Interface options

- HMI
- External display

Combination

- Relative humidity (RH) and temperature
- Dust, CO_2, VOC, HCHO RH and temperature
- Complete air quality monitoring unit with Wi-Fi connectivity to the cloud

Pressure

Pressure

- Board-mount through to heavy-duty industrial solutions
- Absolute, differential and gauge pressure
- Amplified and unamplified, analogue and digital output
- Wide range of port and termination styles

Position, movement and location

Accelerometers

- Low-power, digital-output, miniature LGA packages
- MEMS-based, three-axis, measuring tilt, motion and shock
- Unbeatable long-term bias

Gyro/angular rate

- High-performance MEMS inertial sensors
- Best-in-class bias stability and angular random walk
- Packaged, multi-axis inertial solutions

Position

- Linear and rotary position sensors
- Cable-extension transducers
- Non-contacting, Hall-Effect, rotary position sensors

Vibration and tilt

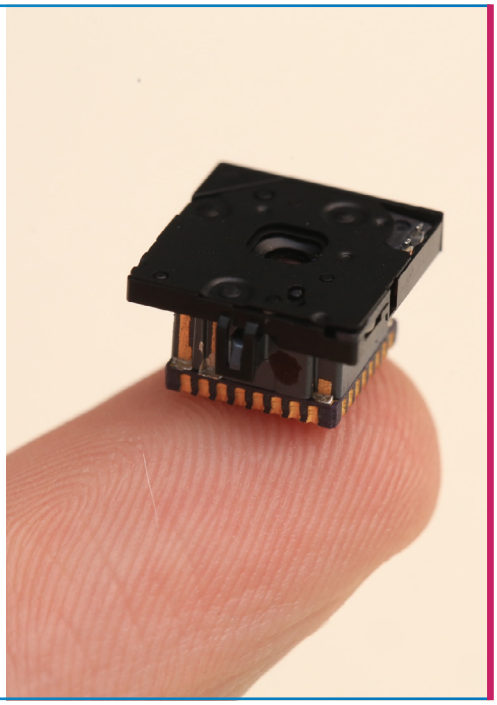
- Long-term stability in harsh environments
- Wide temperature range from -40 to 175˚C
- Lowest noise and non-linearity
- High stability under shock and vibration
- No recalibration or maintenance required

Gain greater situation intelligence with one tiny thermal-imaging solution

When operating over a large area, such as in a public space, conference hall, industrial facility or outdoor location, designs can often benefit from observing, monitoring and gathering multiple data points.

The FLIR Lepton range of tiny, cost-effective thermal cores can be integrated into your design to give you intelligence beyond the visible spectrum.

This lightweight, low-power solution can be used with even the strictest requirements, from drones to mobile phones. With this enhanced intelligence, your actions can be more effective, whether this is responding to a potential intruder or improving the efficiency of the home.



Outdoor location/GNSS

> Global Navigation Satellite System (GNSS) refers to a constellation of satellites sending signals from space that transmit positioning and timing data to GNSS receivers.

With our partners OriginGPS and Allystar, we provide a range of GNSS solutions, including modules, antenna modules and SoC (System on Chip) solutions to meet your exact requirements, be it adding a beneficial feature to being an essential part of your design.

The performance of GNSS is assessed using three critical points

- **Accuracy** - the difference between a receiver's measured and real position, speed or time
- **Continuity** - a system's ability to function without interruption
- **Availability** - the percentage of time a signal fulfils the above accuracy, integrity and continuity criteria

Key features for our solutions

- Very small, SMT form factors with or without antenna
- Industrial standardised form factors
- Accuracy range from 'meter', 'sub-meter' up to 'centimeter'
- Band range: L1, L2, L5 and even L6 (raw data) versions

Modules

Our modules range is easy to integrate from both hardware and software perspectives. It includes the smallest, fully integrated solutions on the market for both navigation and timing, suitable for a wide range of end markets from tracking to wearables and drones to smart cities.

The OriginGPS Spider module series provides unmatched sensitivity and uncompromised performance in compact packages for exceptional design flexibility.

The Allystar portfolio comes with industrial standardised form factor (10 x 10 mm and 12 x 16 mm) which allows customers to integrate these modules into existing designs without the need for any hardware and software changes.

Antenna-modules

Antenna modules, such as OriginGPS's 'Hornet' GNSS series provide an integrated antenna that helps minimise the design resources and risks associated with antenna and GNSS receiver integration. With a faster time to market, these modules will support your design, reducing risk and in most cases, overall design cost.

System-on-Chip

For high-volume applications an integrated SoC solution maybe more beneficial. We can provide unique access to the portfolio of chip-based, location intelligence solutions from Allystar, supporting customers with the technical expertise to integrate this innovative technology into new designs.

Allystar's SoC chip portfolio consists of highly integrated, GNSS receiver chips. They are multi-band, multi-system SoC chips which support BDS-3. They are capable of tracking all global civil navigation systems (BDS, GPS, GLONASS, Galileo, IRNSS, QZSS and SBAS) in all bands (L1, L2, L5).

Highlights

- Concurrent multi-band GNSS reception
- Supports all civil GNSS signals
- Ultra-low power RTC mode
- Built-in AES/DES/SM4 data encryption engine
- Smart jammer detection and suppression

Please see also Acal BFi's antenna portfolio and discover how we can support integrating antenna into your design (refer to 'Antennas' page 28).

Bluetooth

One of the most popular wireless technologies for short-range communications.

Together with our partner Insight SiP, Acal BFi is offering Bluetooth® Low Energy (BLE) solutions which are perfectly suited for devices requiring low cost and low-power wireless connectivity. Our modules are based on chips from Nordic Semiconductor and offer a comprehensive range of compact pin-to-pin compatible packages. All modules integrate the antenna, the RF matching circuit, all decoupling and load capacitors plus crystal oscillators. The antenna has been designed to be compatible with several end applications, illustrating Insight SiP's expertise in RF & Front-End miniaturisation and antenna integration.

Key features

- Pin-to-pin compatibility over the different SiP families
- All modules include antenna, RF matching, decoupling, crystals and capacitors for simple HW integration
- Module range from high-end dual-core 5.2, low cost, easy-to-integrate, up to the latest Bluetooth direction finding solutions and state-of-the-art digital Bluetooth LE audio solutions

The modules are specifically designed for PC, smart phone peripherals, IoT smart objects and M2M applications in the following fields: domestic/home automation, fitness, healthcare, industrial, sport, wearable devices. Ultra-low power consumption and advanced power management enables a battery lifetime of up to several years on a coin cell battery.

All our modules are full certified by the Bluetooth SIG and by global regulatory bodies such as the FCC, CE and Telec.

Why should you consider using our module approach versus a discrete chip design?

In most cases, not even the volume can justify the discrete Bluetooth design effort.

Acal BFi's experienced Field Application Engineers can recommend the most appropriate solution based on your specific project requirements, from preferred Bluetooth release to price/performance balance.

Industrialised discrete design		Module based design
Design efforts + 3 to 6 months	Versus	Time to market 3 to 9 months saving no NRE
Certification 3 months + 30-50k$ cost		
PCB requirement larger dimension		Size optimisation
Purchasing about 20 components		Unique component
Yield rework needed		100% tested
Technical risk management		Modules are proven components

Indoor Positioning Systems (IPS)

GNSS is a satellite-based positioning system and therefore the signal cannot penetrate solid walls or structures. Moreover, the accuracy achieved with GNSS is limited and is not suitable for applications that need sub-meter accuracy.

These shortcomings of GNSS have given rise to the Indoor Positioning Systems (IPS) to cater for applications like warehouse inventory and personnel management and Care-Home Monitoring.

Ultra-Wideband (UWB)

UWB is a short-range, low power, high bandwidth and secure communication protocol mainly used in indoor localisation with accuracy unmatched by any other wireless technology. The measurements are based on the Time-of-Flight (ToF) of the UWB signal instead of the Received Signal Strength Indicator (RSSI). This enables accurate indoor localisation within a few centimeters.

Our partner Insight SiP offers a range of modules which are the smallest on the market, allowing customers to add wireless technologies into the smallest footprint with ultra-low power. Insight SiP has created a unique UWB and Bluetooth 5.3 combination SiP using nRF52833 to implement UWB based applications.

Bluetooth

Newer Bluetooth Low Energy standards have introduced the direction-finding capabilities using Angle of Arrival (AoA) and Angle of Departure (AoD) techniques. These techniques have made it possible to achieve around 0.1-meter accuracy. Moreover, the locating anchor (Bluetooth 5.1+) is backward compatible with all Tags with Bluetooth 4.0 and above. We enable this using Insight SiP's modules based on nRF52 Nordic Semiconductor 2.4GHz wireless System on Chip (SoC).

The advantages of Bluetooth based localisation are that it is low-cost, energy efficient and easy to deploy. The biggest benefit is that it integrates into the existing Bluetooth ecosystem, thus enabling localisation with existing Bluetooth devices without the need for a new technology.

Wi-Fi

A fast, reliable and efficient way of transferring large amounts of data.

As more devices use this technology to communicate with other devices, services and users, the requirements for Wi-Fi solutions have become more demanding.

We offer a range of solutions for all levels of integration, from industrial and professional-grade Wi-Fi modules that are quick and easy to integrate with on-board software stacks and device servers, to some of the most compact and advanced solutions in the world including cutting-edge SiP's, mini cards and embedded modules solutions from industry leaders USI, SparkLAN and Lantronix.

Our product range in a nutshell

Key features

- Complete device server application with full IP stack and webserver
- Plug and play modules for Windows, Linux and Android operating systems
- Modules for embedded micro-controller applications
- Wi-Fi 4, Wi-Fi 5 up to Wi-Fi 6/6E
- USB, SDIO, Mini-PCIe, M.2 and SiP modules
- Supporting the latest secure standards
- Modular RF certification – FCC Class B, UL and EN EMC certification, CE RED
- Integrated and external antenna versions

Modules for plug and play implementations

Modules and embedded solutions make it easy to add Wi-Fi connectivity to your design, connecting to any host via an industrial standard interface. Put simply, we have a quick-to-integrate solution for almost any application within our vast portfolio.

Our experienced Field Application Engineers can recommend the most appropriate solution based on specific requirements, preferred form factor and price/performance balance. SparkLAN offer a range of solutions ideal for industrial and professional applications, which could benefit top-end, premium consumer products where failure is not an option, from thermostats to wireless projectors.

System-in-Package

For medium to high volume projects, we offer SiP solutions, which provide excellent power management performance to deliver low-power consumption and extended battery life.

Why and when does System-in-Package make sense?

- Wi-Fi 4 to Wi-Fi 6, single and dual band, with or without Bluetooth
- Advanced security with WEP 64/128, WPA and TKIP, AES, CCX
- Client, Wi-Fi direct and soft AP functions
- Serial interface to host – SPI, UART and USB
- RF certification - FCC, CE - with metal-lid shielding

These highly integrated, cost-effective and low-power consumption modules have all the usual Wi-Fi functionality.

SiP modules are the best choice if trying to improve the battery life and extend the Wi-Fi range of a device.

What is Wi-Fi 6E?

Wi-Fi 6 and previous generations of Wi-Fi use the 2.4 GHz and 5 GHz radio bands. A “Wi-Fi 6E” device is one that is capable of operating on the 6 GHz band, too.

The 6 GHz spectrum should work similarly to Wi-Fi 6 over 5 GHz but also offers additional non-overlapping channels. As the Wi-Fi Alliance puts it, Wi-Fi 6E allows for “14 additional 80 MHz channels and 7 additional 160 MHz channels.” These channels wouldn’t overlap with each other, which will help reduce congestion, particularly in areas where lots of networks are operating.

These compact modules are a total solution developed especially for applications such as IP cameras, smart TVs, setup boxes, tablets, smartphones, doorbells and portable devices.

Acal BFi’s experienced Field Application Engineers can recommend the most appropriate solution based on your specific project requirements, from preferred Bluetooth release to price/performance balance.

Industrial and professional grade cards with driver support

Our wide range of Wi-Fi cards include rugged, industrial-grade solutions from world-leading manufacturers in the most commonly used form factors. Our professional-grade solutions offer all the advantages of our industrial range in a more cost-effective package for less extreme environments.

Our modules are simple to integrate, allowing you to add Wi-Fi capabilities without any prior knowledge of wireless technologies.

Our partner relationships with chip manufacturers can help you gain certification for any global location and can provide you with access to dedicated software teams who can develop special drivers and support open-source drivers.

LoRaWAN

LoRaWAN - Low power, long range, wide area network solutions.

LoRaWAN™ is designed to enable very low-power devices, such as battery-powered sensor modules, to easily communicate at regional, national and global levels. LoRaWAN provides secure, bi-directional, multicast communication between end devices and gateways connected to the network server.

End devices and gateways communicate across different frequency channels and data rates, allowing you to find the right balance of data rate, distance and power consumption within your design. To maximise both the battery life of the end devices and the overall network capacity, the LoRaWAN network server manages each end device individually by means of an adaptive data rate (ADR) scheme.

From end-node LoRaWAN modules to indoor and outdoor LoRaWAN gateways, Acal BFi supports all levels of integration for you to bring LoRaWAN enabled devices to market quickly and effectively.

LoRaWAN gateways

A central element of all LoRaWAN network, gateways manage high volumes of LoRaWAN enabled end devices and transfer information from your private or public LoRaWAN network to the Cloud via either wired or wireless interfaces.

Acal BFi's range of gateways are available in different form factors and with up to IP67-rated enclosures for outdoor usage. The modules can be preloaded with firmware to your requirements/configurations.

Our gateways offer network connectivity via a number of wired and wireless interfaces, such as ethernet (incl. PoE), 4G cellular interface and GNSS functionality.

Modules for LoRaWAN end-note applications

Most end devices in LoRaWAN networks are located remotely, with only a battery source for power. Their situation often requires data to be transferred over a long distance for extended periods of time – sometimes years or even decades.

Our range of compact, low-power solutions include modules, for quick and easy deployment and SiPs, to give designers an even more compact, volume-cost effective solution.

Combined technologies

Reduce board space and design complexity whilst improving time-to-market.

Wi-Fi and Bluetooth

As two of the most innovative wireless technologies in the world, it is often common for designers to integrate both Bluetooth and Wi-Fi into their design. We offer a wide range of solutions for you to be able to integrate multiple Wi-Fi and Bluetooth standards into your design.

Modules offer the quickest and easiest solution of adding these complementary wireless technologies to your design, whilst volume applications could benefit from a SiP solution from USI. Components from Sparklan combines the latest technology of both worlds - Bluetooth 5.2 and Wi-Fi 6/6E in various form factors, such as SiP, Mini PCIe and M.2.

Bluetooth and LoRa

Our partner Insight SiP offers a unique combination of two leading IoT radio technologies in one class-leading miniaturised package. With integrated BLE and LoRa connectivity, this module offers the long-range capability of LoRa for data transmission over distance.

Combined with the high throughput flexible service of BLE for a more local connection that can be used to carry out configuration, commissioning and update via smartphone or tablet applications.

Smart modules/SoMs

System-on-Module “SoM” solutions offer a highly integrated hardware and software platform designed for rapid development and time-to-market, as well as a full suite of tools and resources for design scalability and easy maintenance.

Acal BFi’s solutions supports a variety of long-distance communication modes and short-distance 2.4GHz and 5GHz wireless transmission technologies like Wi-Fi/ Bluetooth.

With built-in LNA, it supports GNSS wireless positioning technology. It is based on an open Android operating system with rich extension interfaces such as MIPI/ USB/ UART/ SPI/ I2C, which is the preferred solution for the core system of wireless intelligent products.

SoMs help accelerate development schedules and reduce costs by eliminating the complexity of the computing architecture, allowing developers to focus on solution innovation.

Cellular – external and network solutions

Modems (GL - Series)

Modems use an existing serial or USB port to connect to your design and provide direct access to the Cloud in minutes. For products with an ethernet port or Wi-Fi connectivity, gateways provide the same easy access with even greater design flexibility.

Sierra Wireless GL – Series These modems can immediately connect to any IoT system via a serial or USB high-speed interface to provide 4G LTE and LPWA LTE CAT-M1/NB2 connectivity with integrated fallback options. The industrial-grade, compact design supports the Sierra Wireless Device Management platform called AirVantage™, which will simplify logistics to deploy and manage your devices in the field. A pre-certified product, it is easy to integrate with your existing products.

Gateways and routers (FX30 and G520)

Cellular routers and gateways manage all communication for connected devices. Gateways provide translation between different protocols, and typically offer a data path to the Internet or a local network. Our routers are designed for customers who demand the best for mission-critical applications in extremely harsh vehicle, indoor and outdoor applications.

The Lantronix G520 - Series are the next generation IoT Cellular Gateways, designed for Industry 4.0, security and transport applications, providing state-of-the-art LTE CAT-4 or even 5G connectivity. It supports a wide range of interfaces, such as RS232/485, USB, ethernet and Digital I/O's.

Sierra Wireless FX30 - The industry's smallest, rugged LTE-M and LTE CAT-1 cellular gateway integrates the Legato® Open-Source Linux Platform and supports Sierra Wireless' flexible IoT Connector hardware expansion approach, enabling swift, scalable and global deployments of IoT applications for any connected machine or infrastructure. Based on the WP series modules, running Linux with the Legato application framework, the FX30 can be used as a basis for initial deployments or market trials prior to developing your own device.

Modems, routers and gateways are the quickest, most convenient way of enabling wireless capabilities with your device, providing remote configuration, deployment, monitoring and management.

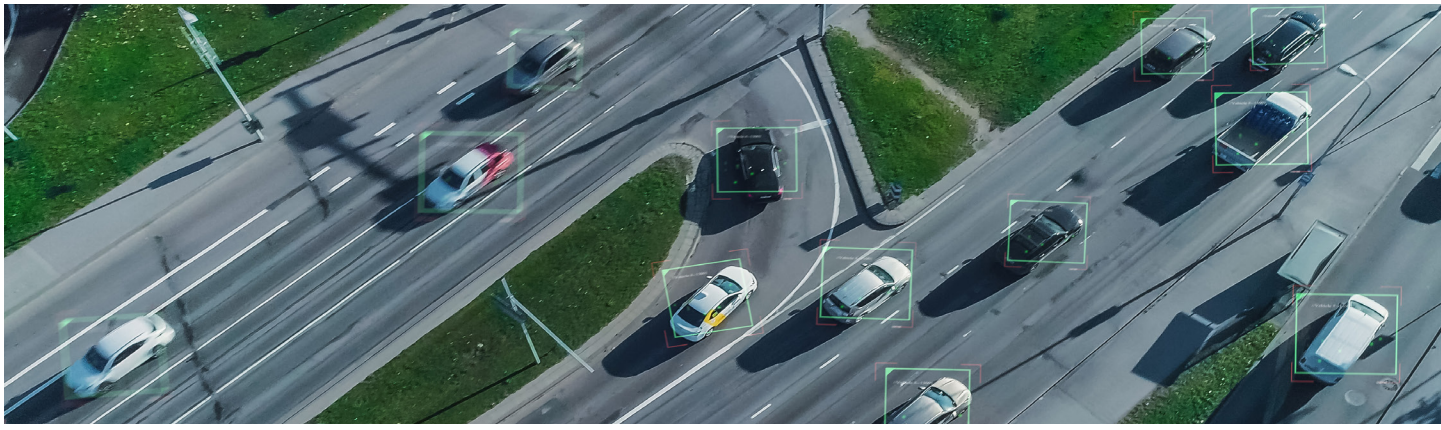
Telematic Gateways (Bolero and Fox3)

Vehicle Tracking Systems have been around for some time now, but over the last few years they are finally taking off and becoming a standard feature within the industry. These systems mainly utilise one of the GNSS systems to capture the position, an integrated cellular module to transmit the data and a back-end server, also called tracking platform, to keep track of the location of each vehicle in a fleet.

With the Lantronix telematic portfolio, Acal BFi can support you with a wide range of telematic systems.

FOX3 - Series is a vehicle tracking device that lets you monitor your assets. It is a highly customisable vehicle telematics device and offers a variety of inputs and outputs to satisfy the most demanding requirements. The FOX3 is an all-in-one device, combining cellular 4G and LPWA with the latest GNSS technology. The unit can send periodical reports or trigger alerts back to the cloud. All data transitions are fully encrypted.

Bolero40 is a ruggedised IP68 rated vehicle tracking solution for those people who need a micro-tracker especially designed to match the environmental, mechanical and electrical requirements of the vehicle tracking market. Available in 2G, LTE-M1 and 3G. The units can easily be connected to any vehicle electronic system and comes in an IP68 water and dust proven enclosure. Bolero40 can be customised via it's embedded scripting language to almost all operational scenarios.



Cellular for low-power applications

A brand new category of wireless technology for remote device deployment.

LPWA Network (LPWAN) technologies strengthen the business case for IoT solutions, offering a cost and power-efficient wireless option that leverages existing networks, global reach, and strong built-in security.

Created specifically for M2M and IoT devices, Low Power Wide Area technology is defined by its name - it enables low power consumption and long-range wireless connectivity.

There are essentially two different segments of LPWA technologies available:

- The standard-based LPWA, which includes LTE-M and NB-IoT
- The proprietary ones, such as LoRa/LoRaWAN

The following summarises the LTE-M and NB-IoT technologies. For the proprietary technologies, please refer to the LoRaWAN page of this brochure.

LPWA technology supports data transfer in small intermittent data packets ranging in size from 10 to 1000 bytes. This allows improved efficiency and optimised data speed ranging from:

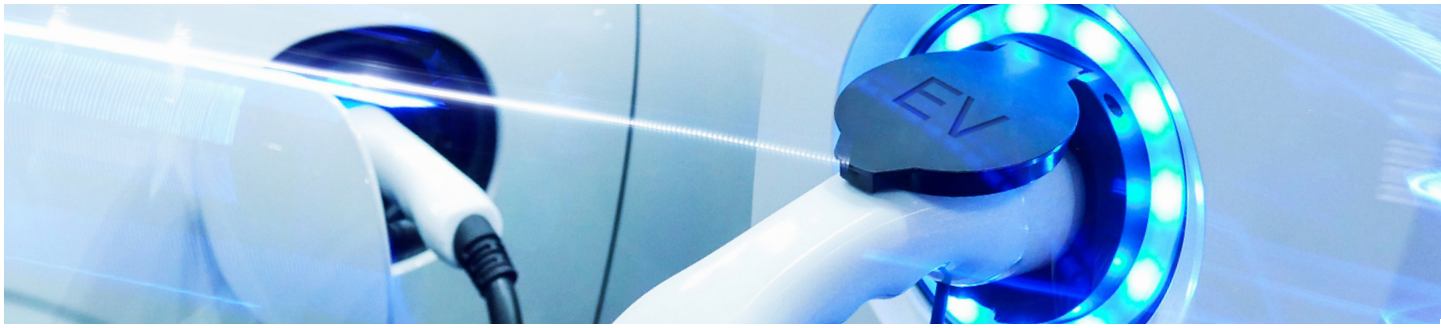
- Upload: from CAT-M 590 kbps to 127kbps for CAT-NB2
- Download: from CAT-M 1100 kbps to 158kbps for CAT-NB2

Working closely with our partner Sierra Wireless, we offer a wide range of LPWA cellular modules, such as the dual-mode (LTE-M and NB-IoT) HL78 and WP77 families, or the solutions from Fibocom, such as the MA510 and MC905A-GL as a single mode NB-IoT module only.

HL7810/12 (incl. 2G fallback), the MA510-GL and MC905A-GL are fully compliant with the 3GPP release 14, supporting CAT-M1 and CAT-NB2 technologies, while the WP7700/02 supports the release 13 with CAT-M1/NB1.

Cellular – LTE and 5G solutions

Offering higher speed, higher capacity and lower latency, 5G promises to enable many exciting applications.



For end users, 5G will deliver a better experience during everyday interactions, and in the Internet-of-Things (IoT), 5G will drive expansion by enhancing the current infrastructure. Over time, new applications, such as high-definition streaming, robotics, augmented reality (AR), virtual reality (VR), and even real-time communication for autonomous vehicles will be made possible by 5G.

5G is also unique in that it is the first cellular standard designed to co-exist with its predecessor (4G), so there are more ways to introduce new features whilst maintaining existing investments and continuing to use in-place deployments.

Acal BFi offers a broad range of 5G modules from our partners Sierra Wireless and Fibocom. Depending on your project requirements, we can offer high-end solutions for worldwide deployments as well as cost-optimised modules for regional use in EMEA and other regions, such as North America and Asia.

Typical data speed

- Peak download rate 3.5Gbps up to 4.9 Gbps*
- Peak upload rate up to 660Mbps up to 900Mbps*

*Data speeds strongly depend on your network and many other circumstances.

Modules are all fully compliant with the latest 3GPP release 16 and are available in an M.2 formfactor. The Sierra Wireless EM9291 is available as M.2 whilst we also offer the Fibocom FM/FG160 family as solder-down.

4G/LTE broadband modules

Integrate cellular 4G broadband LTE into your design.

One of the most cost-effective and user-friendly ways of adding wireless connectivity to your design is through an embedded cellular module. Acal BFi has partnered with two of the leading providers of high performance 4G modules – Sierra Wireless and Fibocom.

From high data rate M.2 form factor CAT20 modules, down to cost-optimised CAT1 and CAT4 modules in both M.2, miniPCIe and LGA solder-down versions, Acal BFi can offer an extensive range of LTE solutions with a view to integrating the best solution into your design.

Cloud services

Regardless of technology, your data needs to be securely stored and analysed. Cloud-based services are a popular choice, providing the benefit of anywhere, anytime access.

We are proud to offer several Cloud-based and Edge services. These purpose-built, high-performance platforms provide you with the tools and development community to get your service to market faster, enabling you to focus on your customer experience without worrying about your IoT and M2M infrastructure, and eventually lowering the total cost of ownership.

Uniquely providing all the services needed to create, deploy and manage several devices remotely from one secure cloud-based management application, connecting smart devices via cellular networks. Track, monitor, and manage the movement of high-value assets in near real-time, enabling quick and decisive action should problems occur.

AirVantage and R2C

The AirVantage™ connectivity management interface is the single place to order, track and manage all of your Sierra Wireless SIM cards and connectivity subscriptions. Because of our long history of working with all the global operators, AirVantage is also able to manage SIM cards from most of the other operators you may work with.

With a tightly integrated, secure data stream from the device to the cloud, our Ready-to-Connect (R2C) modules, gateways and routers simplify your IoT journey by providing instant access to Sierra Wireless Smart Connectivity. Embedded SIMs (eSIMs) pre-integrated inside Ready-to-Connect devices can be activated over-the-air anytime, anywhere, to eliminate individual device provisioning and reduce your total cost of ownership by up to 40%.

Octave

Octave™ is an Edge-to-Cloud connectivity platform designed specifically to shorten your time to market. With Octave, you can securely extract, orchestrate and act on your Internet-of-Things data. It is possible to connect Octave with your existing cloud platforms like Amazon AWS and Microsoft Azure. Moreover, all these features result in quick and easy scalability of the application.

Octave works out of the box with Ready-to-Connect devices like Embedded Modules, Gateways, and Development Boards from Sierra Wireless.

ConsoleFlow

ConsoleFlow™ is an on-premise and in-the-cloud management software that provides centralised and automated monitoring of deployed Lantronix products. It acts as a centralised IT Asset Directory and provides Real-Time network performance monitoring.

It uses REST APIs to aggregate and monitor data and provides customisable dashboards to visualise it. The ConsoleFlow software platform provides True Zero-Touch automation by provisioning remotely deployed Lantronix devices without user intervention. Utilising a full stack approach, from data collection through control, empowering our customers to get to market quickly with complete solutions.

Analytics, insights, predictions, and automation enable our customers to focus on business logic, and operational efficiency to drive successful outcomes.

Frequency control

Discover our leading range of quartz-based timing-device solutions.

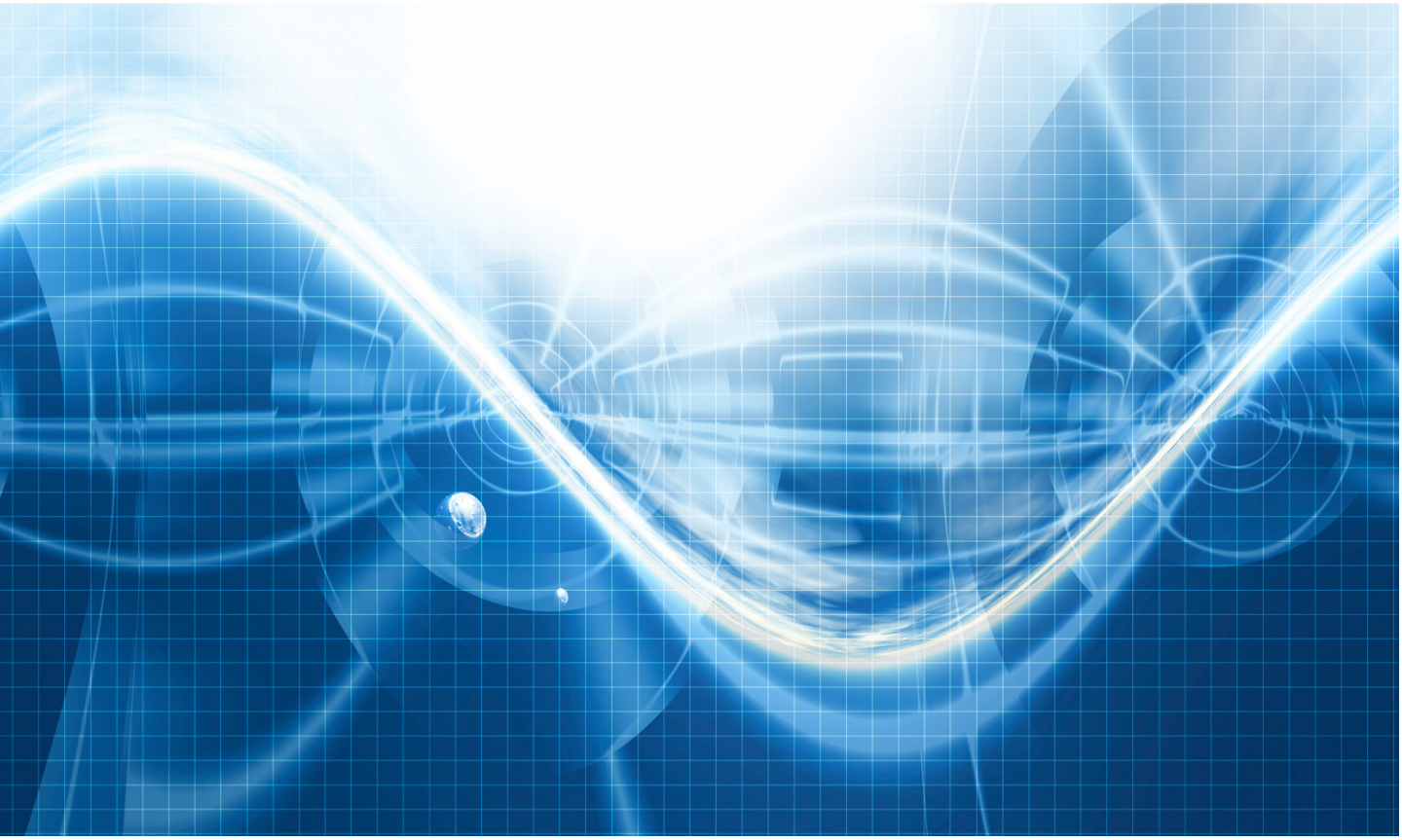
IoT applications often require highly reliable, low-power, cost-effective frequency solutions in small form factors. We offer a leading range of timing device solutions from global leading suppliers – including ACT, Taitien and Tai-Saw – with the engineering expertise to find and integrate the most suitable solution for your application.

Wide operating temperature, from -40 to 125°C

Our portfolio includes leading-edge solutions from Tai-Saw, which operate across an extended temperature range from -40 to 125°C. Ideal for demanding applications, these ultra-small, ultra-low-power, surface-mount crystal oscillators can be optimised for industrial applications and the special requirements of the automotive industry (AEC-Q200).

Our range covers

- 32.768kHz crystals and oscillators
- MHz crystals
- Clock oscillators
- VCXOs/TCXOs/OCXOs
- Real-time clocks
- SAW filters and resonators
- VCO/PLL



Power

Highly efficient, compact power supplies – perfect for small IoT applications.

Critical to an IoT device is power, and RSG, an Acal BFi brand, offer a broad range of lightweight, low-power, compact DC/DC converters from just 0.25W. These are ideally suited for IoT and remote-device designs, even those with the most stringent needs, such as handheld, mobile and wearable devices or peak-load demanding applications such as GSM/UMTS transceivers.

The R-series portfolio includes all packaging options, and provides a cost-competitive DC/DC converter and Point-of-Load (PoL) solution at the lowest range of power outputs. These compact components offer very low losses and are therefore highly efficient, conserving power within your design.

Thanks to their efficiency, these converters generate almost no heat, enabling you to further condense the overall size of your design and create sealed products for harsh or remote environment deployment.

Key features

- Broad power rating – from 0.25 to 60W
- All footprints – SIL3 to SIL12, DIL8 to DIL24, 1x1 to 2x1 inches, THT and SMT
- Various outputs – single, dual, dual-separate, dual-split and triple
- Various load regulations – regulated, semi-regulated and unregulated
- Broad isolation voltages – from 1,000 to 6,000VDC
- Non-isolated, step-down regulators for PoL applications
- CE, UL and other approvals

Wireless charging modules for rechargeable IoT applications from Laird

Wireless charging technology efficiency is critical to the performance of the devices using it. In order to keep this under control, ferrite materials need to be carefully developed and selected.

This range from Laird is characterised by a high Q factor which creates maximum wireless power charging efficiency while minimising Electromagnetic Interference (EMI). They use Wireless Power Consortium (WPC) ferrite material and the coil module design is WPC Qi specification compliant. Standard power transmitter design provides up to 15W and even higher power designs are available upon request.

Laird can integrate multifunctional materials into a single design to achieve high quality, reliability, and performance. That is why Laird wireless charging modules are automotive standard AECQ-200 (reliability specification) approved and widely selected by strategic automotive partners.

RF components

A comprehensive range of discreet components including switches, filters, amplifiers, FEMs, antennas and shielding – from the world's leading suppliers.

We offer a comprehensive portfolio of RF components with a complete range of solutions from world-leading suppliers. From high-performance switches, custom filters, powerful amplifiers and innovative FEMs, we will help you find the right solution from our complete portfolio, ensuring you get the very best from your wireless design.

To transmit your signals, we provide a total range of antenna solutions, including single and multiband, internal and external, standard and custom solutions, on page 28.

Finally, we can help you protect your design from other unwanted interference, or stop your solution impacting its surrounding environment with our shielding solutions on page 29.

Switches

We offer a broad portfolio of switches for IoT designs, with every option delivering the must-have attributes of any component in a demanding application – value, reliability and performance – three areas where our switch solutions really excel.

Our comprehensive range includes every type of switch you may need, from simple SPST to multi-port SP16T. Standard options are readily available to sample or ship from stock with rapid delivery.

- Standard and custom designs
- Low insertions loss
- High linearity and low distortion
- Low bias and control-logic voltage
- SPDT, SP2T, SP3T, SP4T, DPDT and up to SP16T
- High isolation
- Broad frequency range – 20MHz to 8GHz
- Low-current operation

All SoI (Silicon on Insulator), GaAs (Gallium Arsenide), pHEMT (pseudomorphic high-electron mobility transistor) and PIN diode-based switches are broadband by design and can be used throughout IoT applications.

Filters

We offer a huge range of filters from the world's leading manufacturers – including Tai-Saw, Johanson Technology and Sangshin Elecom – ensuring your signals are clean and precise, and noise is reduced to a minimum.

Our range includes band pass, high pass, low pass, SAW filters and duplexers for all types of IoT applications. These compact solutions are developed with easy RF design integration in mind to provide low-insertion and high-attenuation levels without compromising performance or cost.

High performance at extreme temperatures

Our thermally compensated SAW filters are proven to be highly effective and reliable over extended operating temperature ranges, an indispensable requirement for automotive and industrial applications. Exceptional performance is achieved through drastically reducing temperature sensitivity and improving insertion loss, providing total support for demanding applications – including LTE, GNSS and digital radio.

Excellent performance across an extensive range

Our range includes more than 700 designs for narrow and ultra-wide bandwidths, covering a frequency range from 500MHz to more than 6GHz. Our solutions are available with extremely short sample and production lead times, are competitively priced and can be fully customised to meet your exact RF product requirements. AEC-Q200 automotive qualification is also available across many of our solutions.

Power and low-noise amplifiers

We offer a wide selection of amplifiers, including power amplifiers (PAs) and low-noise amplifiers (LNAs), from our market-leading supplier Skyworks.

Leveraging their extensive design knowledge, technical leadership, superior quality and manufacturing expertise, we have an amplifier solution ready to meet your exact needs.

Demanding applications in multiple sectors – including automotive, smart home, industrial, mobile, M2M, medical and smart energy – have all been realised and gained superior performance from our design support and Skyworks' amplifiers. The range includes low-noise, power, linear, driver and variable-gain amplifiers.

All amplifiers benefit from a low-cost, small-footprint package, and are supported by comprehensive application notes and design-in expertise from Acal BFi, enabling you to achieve superior performance from a cost-effective, small form factor design.

Front-End Modules

Increasing the performance of every wireless standard.

We support all of the common wireless standards – including Wi-Fi, Bluetooth, LoRaWAN and other ISM frequencies – from major chip manufacturers with a range of integrated FEMs to help you get the most from your design.

A single FEM can efficiently increase the total performance of your wireless design, enabling you to reduce the power consumption, increase the efficiency or further the range of your design from an easy-to-integrate, cost-effective, compact solution.

Supporting SoCs from all major manufacturers

We offer Skyworks' leading range of FEMs, with a solution offered for most SoCs produced today, whether it is one from our leading portfolio of wireless solutions or sourced from another manufacturer or supplier.

Enhancing wireless standards with a single, cost-effective component

Regardless of the wireless standard you are using, Skyworks support almost every wireless standard with a dedicated FEM solution – available for every category and standard.

Key features

- Multiband/multi-mode power amplifiers
- High-linearity TX/RX switches
- Single, multi-chip module design
- Reduced design time
- Ease of manufacturing
- Consistency/reliability

FEMs boost the performance of your chosen SoC and can deliver stronger wireless signals, greater range, more efficiency, lower power consumption and a better user experience.

FEMs do more than just increase the range of your wireless technology

Many engineers understand that FEMs can increase the range of a wireless SoC solution, but they can also bring a host of other benefits to your entire design.

- **Lower power consumption**

  By adding a FEM to your design, the SoC can operate more efficiently within nominal tasks or deliver more performance with the power provided.
- **Increased battery life**

  Increased efficiency means less power is consumed. For battery-powered devices, this means your solution can operate for longer periods on a single charge and will use fewer batteries over its life cycle.
- **Cost saving and simpler designs**

  FEMs are multi-chip modules and can be used in place of multiple components, reducing your overall BOM and simplifying your design.
- **Faster time to market**

  FEMs include multiple discrete components, therefore do not require external matching components, further accelerating your time to market.

The performance benefits of a FEM mean you may also be able to use a more cost-effective SoC in your design. Post-production, the cost savings continue, with a more reliable, efficient design, reducing the amount of power consumed.

Enhancing the performance of your design

- Increased Tx efficiency
- Increased Rx sensitivity
- Improved efficiency
- Longer battery life
- Stronger signals
- Greater range
- One-for-three component replacement
- Technology agnostic – FEMs are available for all wireless standards

What is a FEM?

Skyworks' FEMs combine the company's industry-leading PAs, LNAs and switch functions into a single, low-cost, laminate-based, multi-chip module.

Manufactured using their proprietary heterojunction bipolar transistor (HBT) power amplifier process and low-loss pseudomorphic high-electron mobility transistor (pHEMT) switch technologies, their FEMs deliver superior performance to multiple applications, including automotive, smart home, industrial, M2M, medical, smart energy and wearables.

Antennas

Having the right antenna can make or break your design.

Working with our carefully selected antenna partners, we provide the most appropriate antenna solution for your application and frequency, ensuring you get the best range with the lowest power consumption.

Our Field Application Engineers offer complete support, finding the right options for your application, advising which is best for your design and working with you to match the RF input/output. Our range includes:

- Single and multiband antennas
- External connectorised antennas
- Internal chip, patch, PIFA and PCB antennas
- Customised antennas

Antennas for all technologies

Reducing RF inference has enabled multiple wireless technologies to co-exist within a few millimetres of one another, therefore antenna efficiency, RF isolation and antenna selectivity are all critical considerations. We offer a wide range of antennas specifically developed for every wireless technology standard.

- Cellular (2G, 3G, 4G LTE)
- Wi-Fi, Bluetooth
- ISM bands including LoRaWAN, SIGFOX and Zigbee
- GNSS (including BeiDou, Galileo, GLONASS and GPS)
- NB-IoT – Band 8 (880 to 960MHz) and Band 20 (791 to 862MHz)
- Custom designs for non-standard frequencies

We can also support you with your design. Your RF design can be tested and refined in an anechoic chamber to get the best possible results from your solution, whether it features a standard, modified or fully customised solution.

Intelligent antenna design can overcome the challenges of embedded and miniaturised antennas

In many data-gathering and wearable IoT applications, compact designs mandate the use of an on-board antenna. These antennas can be chip, patch or PIFA antennas, or embedded into the PCB itself.

Many factors affect the performance of these types of antenna including ground planes, position of other components, orientation of the unit, materials used in the outer casing, and proximity to the outer casing.

A poorly optimised or tuned antenna will have an adverse effect on the wireless range and power consumption.

With Acal BFi, you have access to the latest RF antenna modelling tools, to help you determine the optimum antenna for your system.

EMC protection and shielding

Enhance the performance of your design with EMC shielding.

Wireless solutions use radio frequencies to communicate and transfer data, however these frequencies can interfere and impede the performance of other components within your design. Similarly, other components can generate heat or unwanted frequencies, impacting the overall effectiveness.

No matter how big or small your design, managing radiation, heat and other radio magnetic frequencies is essential to the overall performance of your final product.

Protection against high-frequency electromagnetic interference and thermal influences

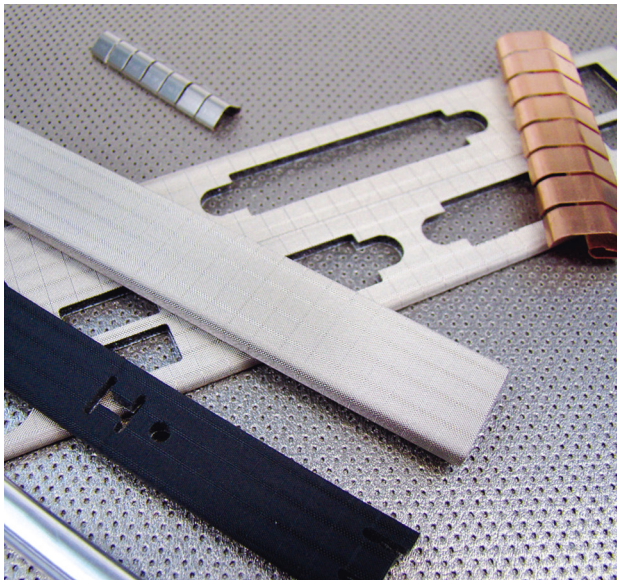
MTC (Micro Tech Components GmbH) are a leading manufacturer of high-quality products for electromagnetic shielding and heat dissipation.

MTC provide customers with individual services and support, including consulting on projects, development and production of individual solutions.

Whether you are looking to manage heat within your design at the initial concept stage, or need to stop unwanted frequencies entering your design before entering production, MTC can offer solutions for any size or scale of project.

Protection for your design

- Fabric-over-foam gaskets
- Conductive foams, elastomers and tapes
- Metal contact strips for chassis shielding
- Board-level shields
- SMD contacts
- Shielding clips
- Thermal conduction solutions
- Custom solutions

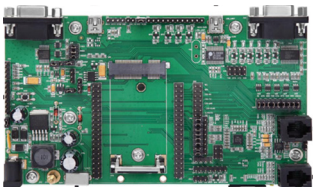


Evaluation kits

Our solutions are supported by a range of development kits to kick-start your design.

Fibocom LPWA MA510

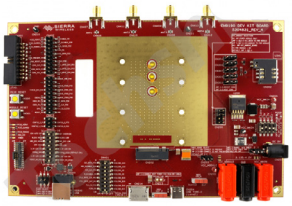
One EVK base board for multiple cellular standards



GT8230-NL is the evaluation kit for Fibocom's 4G and LPWA modules, which consists of the GT8230-NL, an RF cable, antenna, and micro-USB cable. It includes the adapter board and MiniPCIe interfaces, as well as the power input interface, power input switch and interfaces. To have a full working development platform, an additional MA510 adapter board is required. This ADP-MA510-GL comes with the MA510 module to supports your design with CAT-M1 and NB2 connectivity for a quick, efficient and successful evaluation phase.

Sierra Wireless 5G EM9291

All-in-one 5G M.2 development kit



Sierra Wireless M.2 Development Kit for EM9/EM76 series is used to help users to create and define applications when using the AirPrime® EM9/EM76 series embedded modules, such as Sierra AirPrime EM9190, AirPrime EM9191 and AirPrime EM7690.

The EM9 / EM76 Development kit includes the evaluation board with M.2 interface, antennas and power supply. The board provides additional interfaces, such as SIM sockets, debugging ports or system interfaces.

Skyworks LPWA SiP

World's smallest IoT solution

Offering the world's smallest pre-certified cellular IoT device in an 11.3mm x 8.8mm package. Covering 18 bands from 700MHz – 2.2GHz, with low power GNSS implemented and Position over LTE (PoLTE). Power options to 20/23dBm. Ag-Free shielded package. Extremely reduced eBOM.

OriginIoT

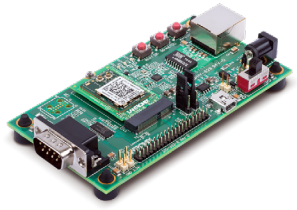
Miniature Cellular IoT Systems

These cellular IoT systems expedite the device development program with minimal required expertise in electrical engineering, RF and embedded programming. The combination of high-quality GNSS, cellular communications with a wide variety of interfaces provides you with a strong hardware platform to develop low-power, high-performance IoT products.

Not all solutions can be used straight out of the box. These types of solutions provide you with cost advantages at mid to high volumes; however, every design starts with an initial concept, and developing a custom PCB at this stage is costly and time consuming. Our evaluation kits reduce the time, energy and effort of testing and evaluating both the technology and your design concept, without needing to create a custom mounting. Most operate over a standard port, such as USB, or UART or can be configured/programmed via laptop or tablet.

Lantronix: xPico 240 evaluation kit

Connect and control via Wi-Fi

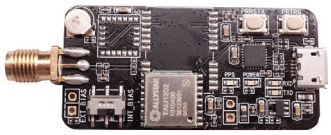


The xPico 240 evaluation kit includes the evaluation board, two u.fl to RP-SMA adapter cables, antennas and power adapters. With the kit, you can quickly connect to the xPico 240 module to share data via the module's dual-band Wi-Fi (802.11 a/b/g/n) / ethernet connection.

The board includes a 10/100 ethernet port, USB port for host/device, peripheral I/O header. 3.3V header and a DB9 RS232 serial port, to support multiple designs and interfaces.

Allystar: TAU1202 evaluation board

Evaluate ALLYSTAR GNSS modules with TINY-EVK

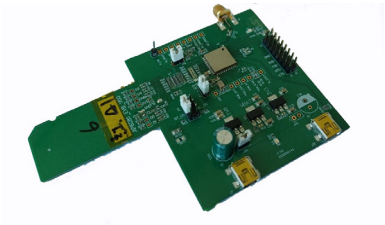


The TINY-EVK is a simple, user-friendly demo kit for evaluating the Allystar GNSS modules. It integrates a Micro-USB interface to power the board and to communicate with a PC. Passive or active antennas can be added to an SMA type RF connector.

The EVK needs to be connected to a PC using the USB interface. Install the latest version of Satrack for Windows on the PC and start evaluating the GNSS functionalities and features.

SparkLAN: AP6281 evaluation board

Evaluate the Wi-Fi 6+BT 5.2 Combo SiP Module

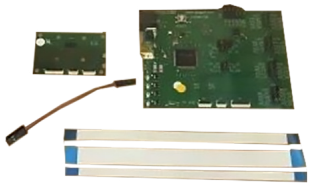


The AP6281 evaluation board is a universal development tool to highlight the capabilities of the AP6281 module.

The SparkLAN SiP module provides both Wi-Fi and Bluetooth functions and both functions can be tested separately. The EVK supports a SDIO interface to connect to the SDIO host on the target platform. The possible SDIO types on the target side are the SD Card Slot or the Micro SD card slot for easy evaluation.

Insight SiP: ISP2053-AX-EB board

Dual-core Bluetooth 5.2 BLE Module



The ISP2053-AX development tool contains an interface board, a test board with the ISP2053- AX module and all necessary cables. Connect it together, download the tools and SDK and start developing and running your application. It is quick and easy to create your own application; just add sensors and firmware.

You can develop applications for Bluetooth LE 5.2, BT 5.2 LE Audio, Direction Finding and Long Range, BT Mesh, Thread, Matter, Zigbee, 802.15.4, ANT and NFC.

Developing an enhanced technological future together

> To benefit from our expertise and in-house capabilities, it's important that you contact us at the earliest stage possible within your project to ensure you don't needlessly spend or use resources, as well as identifying all hidden improvement potential from the start.

You can connect with our experts immediately online or face-to-face when initial project details are available. Design proposals, budget quotes and prototypes are available within a few days.

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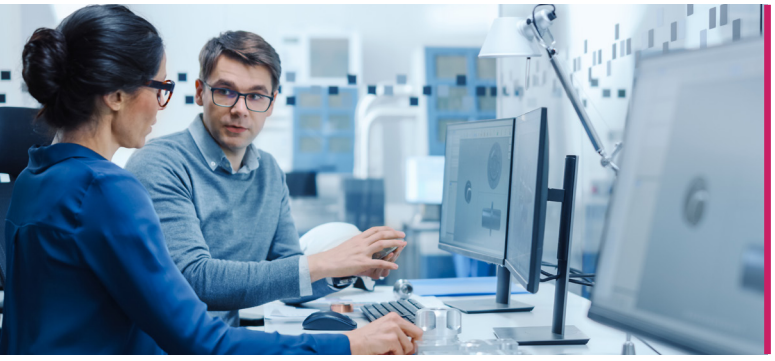

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