acal bfi

IoT and Wireless Technology solutions

Developing an enhanced technological future together

acalbfi.com

Contents

Our purpose

Is to enable innovators to turn ideas and designs into exceptional products.

Throughout Europe, we're committed to working with customers to develop 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 expertise

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

Technology Centres

Working in conjunction with our field engineers, our Technology Centres provide dedicated technical excellence and support across all project stages and technologies.

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 the full package, from design and prototyping to testing, pre-production, and manufacturing – all under one roof, guided by seasoned engineering experts, to ensure a speedy journey to success.

Inside these facilities, our engineers are ready to support and consult on everything from choosing components to tackling the trickiest project challenges. Providing access to a large range of services and capabilities across our technologies, develop the perfect solution for even the most complex designs.

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

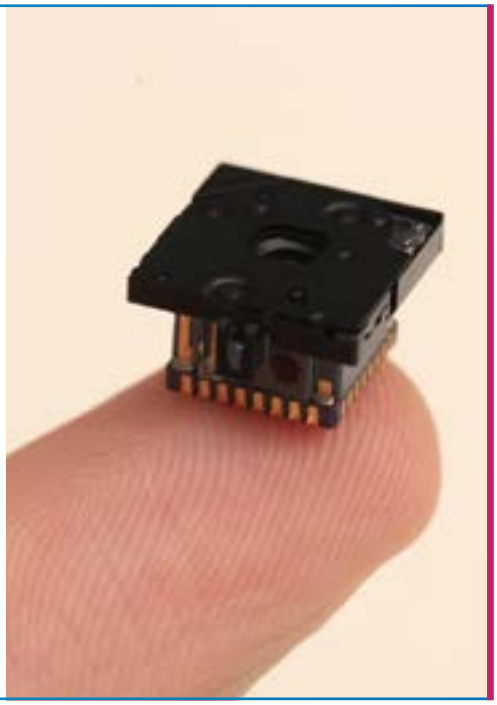
- Long-term stability in harsh environments
- Wide temperature range from -40 to 175˚C
- Lowest noise and non-linearity
- High stability under shock and vibration
- No recalibration or maintenance required

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

L1 / L5 GNSS module solutions

Acal's comprehensive portfolio consists of single-band (L1) and multi-band (L1/L5) low power GNSS chips and modules.

GNSS and GPS

Acal partner with a leading supplier of GNSS receivers to the IoT sector, aftermarket telematics, consumer and industrial applications. Pioneering the use of dual-band receivers for industrial applications. With a comprehensive portfolio, Acal can address the needs of mass market applications where performance, low power, small size and cost efficiency are equally important.

Modules come in an industry standard pinout and formfactor, which makes it very straightforward to integrate and test those modules in existing designs without a total redesign of the PCB.

The product ranges include:

- Meter-level and submeter-level GNSS solutions
- Industry standard pinout in 10.1mm x 9.7mm and 12.2mm x 16.0mm
- On-chip flash enables ultra-fast both cold and warm starts
- Easy migration to TAU120x for submeter accuracy
- Submeter accuracy thanks to dual-band reception
- High sensitivity at a minimal power consumption
- Free of charge Evaluation Software
- Evaluation Board small size: only 48 mm x 23mm

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.

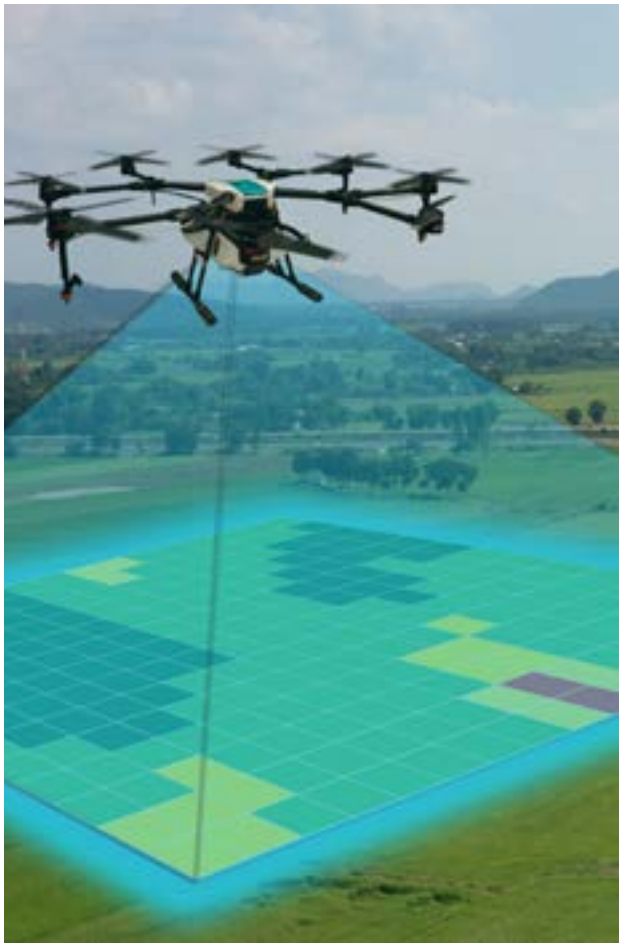
Antenna modules

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 partners Almosic, Insight SiP and IoT747, 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 a 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

The worlds most energy efficient IoT solutions: Introducing Atmosic

Our collaboration with Atmosic marks a strategic move to expand our technological offerings, integrating cutting-edge innovations that prioritise sustainability and efficiency. Atmosic's expertise in ultra-low-power Bluetooth SoCs has revolutionised IoT devices, introducing features like On-demand Wake-up and Managed Energy Harvesting. These advancements enable developers to create products with extended battery life or even operate without batteries, catering to a wide range of applications from smart homes to industrial sensors while significantly reducing power consumption.

Wireless energy harvesting (WEH) techniques, a cornerstone of Atmosic's modules, unlock the potential for nearly perpetual communications by extracting energy from external sources such as photovoltaic, thermal, or mechanical/kinetic harvesting and RF signals. This approach not only extends the lifespan of energy-constrained wireless networks but also enhances reliability across various domains such as wireless sensor networks and the Internet of things

ATM2 Series

Atmosic's ATM2 Series solutions adhere to the Bluetooth® 5 standard and incorporate the Lowest Power Radio and On-demand Wake Up technologies, ensuring unparalleled energy efficiency when compared to alternative Bluetooth products.

The ATM2 Series offers versatility with various memory and package configurations and can be tailored to meet the specific requirements of different applications, making it a flexible and high-performance choice in the realm of Bluetooth enabled devices.

ATM3 Series

The Atmosic ATM3 Series introduces advanced features for managing energy harvesting, storage and power distribution, offering substantial extension of battery life or facilitating bat- tery-free operation across various applications.

The ATM3 is customisable with diverse memory and package configurations, allowing it to seamlessly adapt to the specific needs of various applications.

ATM33 Series

Introducing the latest Bluetooth 5.3 generation architecture, the ATM33 series delivers elevated performance. Boasting feature enhancements such as a 64-MHz ARM® Cortex®-M33, a +10dBm RF transmit power, and advanced AES-256 encryption with ARM® TrustZone® enabled security features, the ATM33 is poised to empower the next wave of IoT device solutions.

With these upgrades, the ATM33 series sets a new standard for high-performance capabilities, ensuring robust support for cutting-edge applications in the realm of Internet of Things devices.

For more information on these modules please visit our website acalbfi.com/uk/partners/atmosic

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.

LoRaWAN

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

LoRaWAN™ facilitates communication for low-power devices, like battery-powered sensors, at regional, national, and global levels. It offers secure, bi-directional communication between end devices and gateways via multicast. With various frequency channels and data rates, you can optimize data rate, distance, and power consumption.

The LoRaWAN network server ensures efficient battery life and network capacity with adaptive data rate (ADR). Acal BFi offers comprehensive support for LoRaWAN integration, from end-node modules to indoor/outdoor gateways, enabling rapid market entry for LoRaWAN-enabled devices.

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.

LoRaWAN modules 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.

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 SparkLAN, USI and Lantronix.

Our product range in a nutshell

Key features

- Plug and play modules for Windows, Linux and Android operating systems
- 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
- Complete device server application with full IP stack and webserver
- Modules for embedded micro-controller applications

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. We 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 options, single or dual band, with or without Bluetooth
- Advanced security: WEP 64/128, WPA, TKIP, AES, CCX
- Functions include client, Wi-Fi direct, and soft AP
- Serial interfaces: SPI, UART, USB
- RF certification: FCC, CE, with metal-lid shielding
- Soldering onto PCB, suitable for shock and vibration applications
- Ultra-slim form factor for space optimization
- Highly project-oriented, tailored for volume, long-term cost advantages

Industrial and professional grade cards with driver support

Our extensive selection of Wi-Fi cards features robust, industrial-grade solutions from leading manufacturers, available in commonly used form factors.

Our professional-grade options offer similar advantages at a more affordable price for less demanding environments. Partnering with chip manufacturers, we facilitate global certification and provide access to dedicated software teams for custom driver development, including support for open-source drivers.

Our modules are easy to integrate, enabling seamless addition of Wi-Fi capabilities without prior wireless technology expertise.

Plan for Wi-Fi 7 now to capitalise on its advancements.

With the adoption of 6GHz spectrum and wider channel widths, Wi-Fi 7 promises unparalleled performance.

It introduces multi-link operation across 2.4, 5, and 6 GHz channels, while supporting up to 16x16 MU-MIMO and multi-RUs bonding for enhanced efficiency.

Wi-Fi 7 represents the pinnacle of wireless evolution, offering optimal user experience with proper planning starting today.

Our experienced Field Application Engineers assist in aligning your Wi-Fi generation choice with project requirements, including form factor, interface, price/performance balance, Bluetooth integration, and product lifecycle needs.

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.

Industrial Networks Management/solutions

Introduction

Introducing Teltonika Networks industrial management solutions, a key component of our portfolio. Offering robust and innovative solutions tailored for industrial environments, providing comprehensive management capabilities for critical infrastructure and networks. Optimise operations and drive productivity with reliable, secure, and efficient management tools that offer seamless integration and unparalleled industrial management capabilities.

Modems

Teltonika Networks' modems offer you reliable cellular connectivity solutions, ideal for applications requiring remote data transmission. These modems ensure seamless communication in challenging environments, with support for multiple backup scenarios and a range of connectivity options, such as 4G LTE and 3G.

Gateways

These secure gateways are designed to meet the complex requirements of IoT projects. These devices ensure secure and efficient data transmission between IoT devices and the cloud, with features like protocol translation, security measures, and compatibility with various IoT ecosystems, making them invaluable tools for design engineers in IoT deployments.

Routers

These routers are essential for design engineers seeking robust, secure, and easy-to-use connectivity solutions. These routers offer reliable 4G LTE and Ethernet connectivity with dual SIM support, advanced security features, and remote management through the Teltonika RMS platform.

Switches

Teltonika Networks' switches provide design engineers with versatile, industrial-grade networking solutions. Offering Layer 2 and Layer 3 capabilities, these switches enable efficient network design and management, with options for PoE support, advanced security features, and scalability for various network sizes.

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.

Semtech (Formerly Sierra Wireless) GL – Series
These modems offer immediate connectivity to IoT systems via serial or USB interfaces, providing 4G LTE and LPWA LTE CAT-M1/NB2 with fallback options. The compact, industrial-grade design supports Semtech's AirVantageTM Device Management platform, simplifying device deployment and management in the field. Pre-certified and easily integrated with 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
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.

Semtech FX30
The smallest LTE-M and LTE CAT-1 cellular gateway in the industry integrates the Legato® Open-Source Linux Platform. It supports Semtech's IoT Connector hardware expansion, facilitating swift, scalable, and global IoT application deployments for any connected machine or infrastructure. Based on the WP series modules running Linux with the Legato framework, the FX30 is suitable for initial deployments or market trials before developing your own device.

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 section (page 13) 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 Semtech, 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.

5G enhances everyday interactions and IoT expansion by improving infrastructure. It enables new applications like high-definition streaming, robotics, AR, VR, and real-time communication for autonomous vehicles. Unlike previous standards, 5G coexists with 4G, facilitating seamless feature updates and leveraging existing investments.

We offer a broad range of 5G modules from our partners Semtech 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 Semtech 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.

A cost-effective method to integrate wireless connectivity into designs is through embedded cellular modules.

We collaborate with leading providers Semtech and Fibocom, offering a range of high-performance 4G modules. From CAT20 M.2 modules to cost-optimised CAT1 and CAT4 options in M.2, miniPCIe, and LGA solder-down formats, we provide diverse LTE solutions tailored to your design needs.

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 Semtech 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 Semtech 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%.

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.

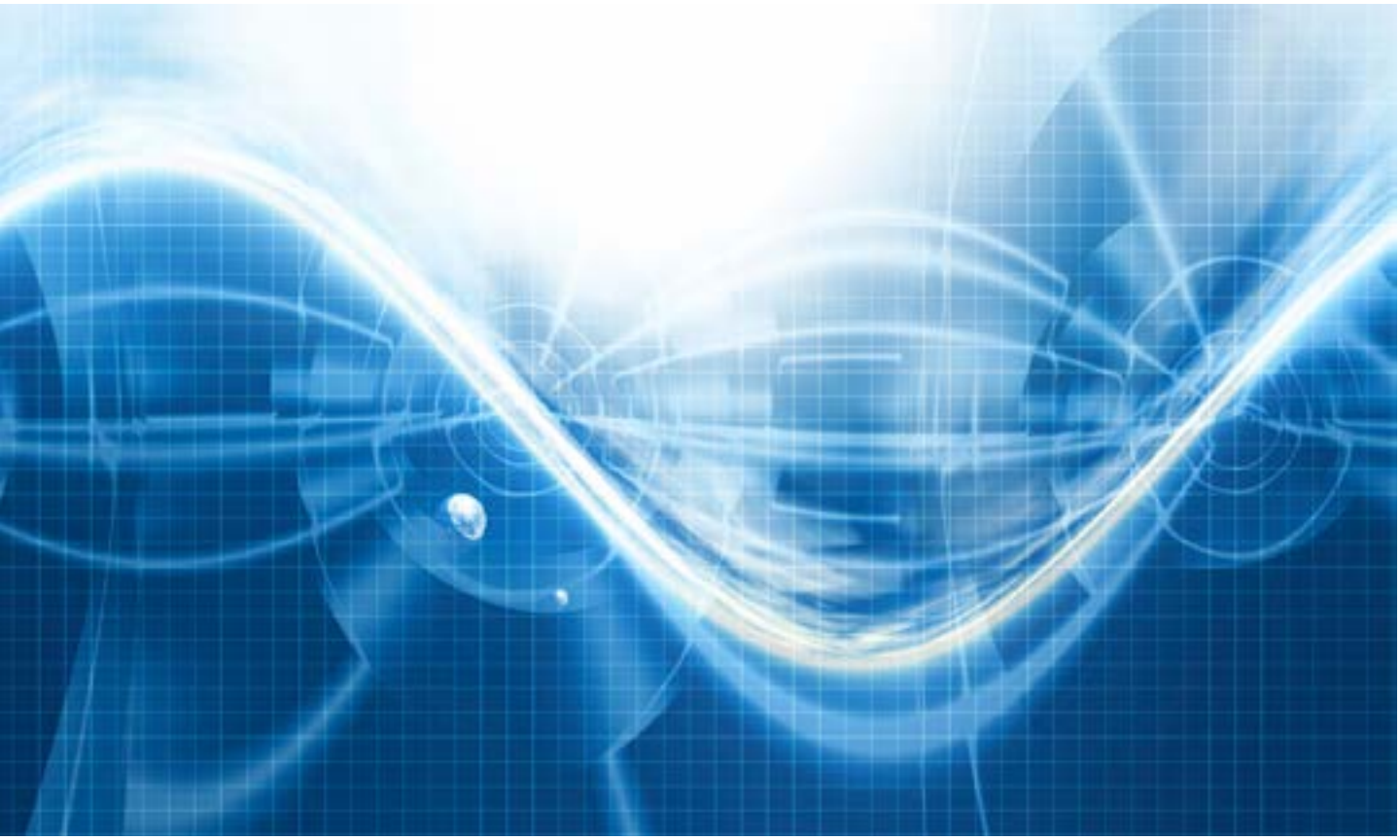
IoT applications often require highly reliable, low-power, cost-effective frequency solutions in small form factors. We offer a leading range of timing device solutions from global leading suppliers – including ACT, Taitien and Tai-Saw – with the engineering expertise to find and integrate the most suitable 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, offers lightweight, low-power DC/DC converters starting from 0.25W, ideal for IoT and remote-device designs, including handheld, mobile, and wearable devices.

The R-series portfolio includes various packaging options, providing cost-competitive solutions with minimal power outputs. These efficient converters generate little heat, allowing for compact designs and sealed products suitable for harsh environments and remote deployments.

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

Comprehensive solutions for industrial power supply design challenges

At our Power Supply Technology Centre we combine expertise and cutting-edge technology to bring tomorrow's solutions to life. Led by seasoned engineering experts, we offer a full package of services, from design and prototyping to testing and manufacturing – all under one roof.

Our highly trained engineers thrive on challenges, crafting tailored solutions for even the most complex designs. Whether it's adapting existing solutions or innovating bespoke products, we're committed to meeting your unique requirements every step of the way.

Our comprehensive services include custom design, power assembly, thorough testing, lifecycle management, and technology integrations, ensuring your journey to success is swift and seamless.

For more information please visit our website.

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

Our extensive filter range features top manufacturers like Tai-Saw, Johanson Technology, and Sangshin Elecom, ensuring precise signals and minimal noise. It includes band pass, high pass, low pass, SAW filters, and duplexers for IoT applications, prioritising easy RF integration for low-insertion, high-attenuation levels without sacrificing performance or cost.

High performance at extreme temperatures

Thermally compensated SAW filters offer high performance across extreme temperatures, crucial for automotive and industrial sectors. With reduced temperature sensitivity and enhanced insertion loss, they support LTE, GNSS, and digital radio.

Excellent performance across an extensive range

We offer over 700 designs covering narrow to ultra-wide bandwidths from 500MHz to over 6GHz. Our solutions boast short lead times, competitive pricing, and customisation options to meet precise RF requirements. Many solutions undergo AEC-Q200 automotive qualification.

Power and low-noise amplifiers

We provide a diverse range of amplifiers, including power amplifiers (PAs) and low-noise amplifiers (LNAs), sourced from leading supplier Skyworks. Leveraging their expertise, we tailor amplifier solutions to your specific requirements across various sectors like automotive, smart home, industrial, mobile, M2M, medical, and smart energy.

Our range includes low-noise, power, linear, driver, and variable-gain amplifiers, all packaged in a cost-effective, compact form, supported by comprehensive application notes and design expertise from Acal BFi.

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

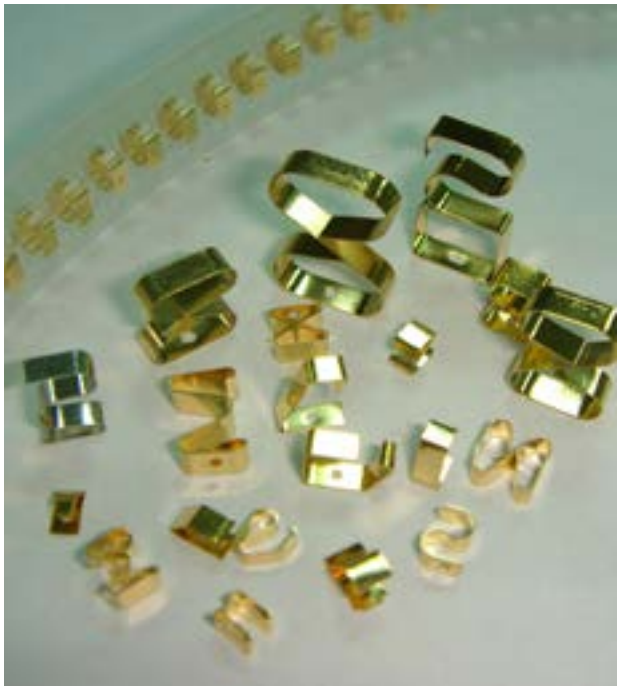
MTC (Micro Tech Components GmbH) are a leading manufacturer of high-quality products for electromagnetic shielding and heat dissipation.

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

The GT8230-NL evaluation kit by Fibocom aids 4G and LPWA module development, comprising the GT8230-NL, RF cable, antenna, and micro-USB cable, with adapter board and MiniPCIe interfaces. Completing the platform, the MA510 adapter board, with the MA510 module, enables CAT-M1 and NB2 connectivity, streamlining evaluation and design phases.

Semtech 5G EM9291

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

The Semtech M.2 Development Kit aids in application development with AirPrime® EM9/EM76 series modules like EM9190, EM9191, and EM7690. It features an evaluation board with an M.2 interface, antennas, and a power supply. The kit also offers SIM sockets, debugging ports, and system interfaces for enhanced functionality.

Skyworks LPWA SiP

World's smallest IoT solution

Introducing the world's tiniest pre-certified cellular IoT device in an 11.3mm x 8.8mm package. Covers 18 bands from 700MHz to 2.2GHz, incorporates low-power GNSS and Position over LTE (PoLTE) capabilities. Offers power options up to 20/23dBm in an Ag-Free shielded package, significantly reducing eBOM costs.

Atmosic ATM3325 SoC

Development / evaluation kit

The kit is designed to provide developers with the hardware and software to evaluate the performance of and develop applications for the non-Energy Harvesting ATM3325. Atmosic offers several kits to support product developers through the various stages in their product design when using the Atmosic family of Energy-Harvesting and non-Energy-Harvesting Wireless Connectivity SoCs and modules.

Our evaluation kits streamline testing and evaluation of technology and design concepts, eliminating the need for costly and time-consuming custom PCB development at the initial stage, offering cost advantages at mid to high volumes, and often operating via standard ports like USB or UART for easy configuration and programming.

Lantronix: xPico 240 evaluation kit

Connect and control via Wi-Fi

The xPico 240 evaluation kit comprises the evaluation board, two u.fl to RP-SMA adapter cables, antennas, and power adapters. It facilitates swift connection to the xPico 240 module for data sharing via dual-band Wi-Fi/ethernet. The board features a 10/100 ethernet port, USB port, peripheral I/O header, 3.3V header, and DB9 RS232 serial port for diverse design interfaces.

Allystar: TAU1202 evaluation board

Evaluate ALLYSTAR GNSS modules with TINY-EVK

The TINY-EVK is a straightforward demo kit for assessing Allystar GNSS modules. It features a Micro-USB interface for power and PC communication, with an SMA connector for passive or active antennas. Connect the EVK to a PC via USB, install Satrack for Windows, and begin evaluating GNSS functionalities and features.

SparkLAN: AP6281 evaluation board

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

The AP6281 evaluation board showcases the capabilities of the SparkLAN SiP module, offering Wi-Fi and Bluetooth functions for separate testing. It supports an SDIO interface to connect to the host on the target platform, with options for SD Card Slot or Micro SD card slot, facilitating straightforward evaluation.

Insight SiP: ISP2053-AX-EB board

Dual-core Bluetooth 5.2 BLE Module

The ISP2053-AX development tool includes an interface board, a test board with the ISP2053-AX module, and all required cables. Simply connect the components, download the tools and SDK, and commence application development. Easily create applications for Bluetooth LE 5.2, BT 5.2 LE Audio, Direction Finding, 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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