

# F T M



FUTURE TECHNOLOGY MAGAZINE

ISSUE 1811

**Component Focus: Pages 3-6**

PRG series precision chip resistors from Susumu offer high power ratings in small case sizes

**Analog Corner: Pages 8-9**

New power monitoring IC from Microchip provides real-time log of AC and DC power supplies

**Application Spotlight: Pages 10-15**

ON Semiconductor introduces controllers and a protection switch for new USB Type-C™ designs

AMERICAS EDITION

Application Spotlight on:

# Connectivity

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## NXP launches its first MCU to feature Arm TrustZone security technology

The LPC5500 series of microcontrollers from NXP Semiconductors features the recently introduced Arm® Cortex®-M33 core, which supports the renowned TrustZone security technology used widely in Arm A-class processors. TrustZone technology is approved by the banking industry to support secure financial operations.

Other security features in the LPC5500 MCUs include SRAM physically unclonable function-based root of trust and provisioning, and real-time execution from encrypted images in internal Flash memory.

## New LoRaWAN expansion software for STM32 MCUs

I-CUBE-LRWAN software expansion  
Up-to-date, more secure



STMicroelectronics has released a new I-CUBE-LRWAN expansion software package which enables STM32 microcontrollers to support the LoRaWAN™ low-power wide-area networking protocol. The package consists of a set of libraries and application examples for STM32L0, STM32L1 and STM32L4 series MCUs acting as end nodes.

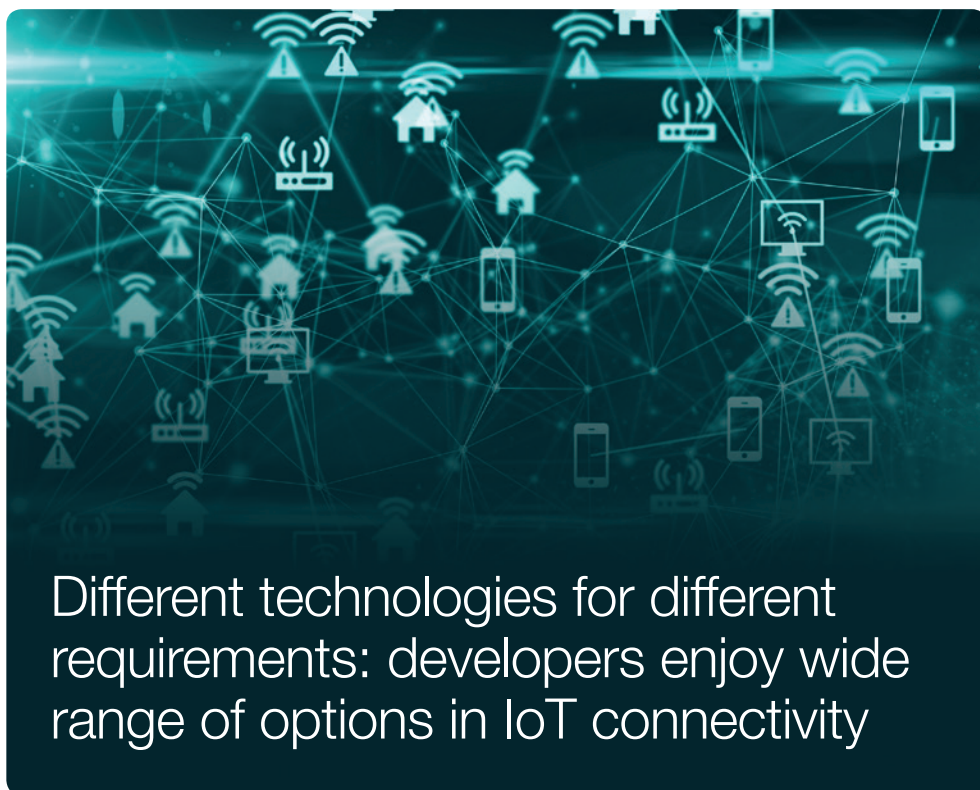
The ST software is compatible with various LoRa® radio expansion boards provided by Semtech.

## Bluetooth 5.0-compliant SoC from Microchip enables immersive audio

Microchip has introduced a fully certified System-on-Chip (SoC) which features Sony's LDAC audio codec technology and a Bluetooth® 5 radio, giving OEMs a means to provide high-resolution audio in mass-market Bluetooth wireless products. Microchip supplies the IS2064GM-0L3 SoC in an 8mm x 8mm LGA package. It is available in production volumes.

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Different technologies for different requirements: developers enjoy wide range of options in IoT connectivity

The story of the electronics industry's technology battles tends to end with a decisive victory for one side or the other. VHS won, and Betamax became extinct. In the mobile phone, Nokia's doomed Symbian was briefly the leading OS in smartphones, until the Android™ operating system became dominant.

It is looking, however, as though the market for IoT connectivity could buck this trend, simultaneously supporting multiple technology options. There is good reason for this: the term 'IoT' applies to an incredibly diverse range of applications, and their connectivity requirements can vary widely. Different technologies can co-exist if they are meeting different needs.

In industrial applications, robust wired connections continue to be made via proven fieldbus connections in many factories, using communications protocols such as EtherCAT and Profibus. Recent years have seen the emergence, however, of industrial variants of Ethernet, such as the Time-Sensitive Networking (TSN) protocol for real-time, high-availability communication. In this issue of FTM, designers of industrial Ethernet communications systems can learn about the WAGO 852-1411, 852-1417 and 852-1505 series of robust Ethernet switches, which provide features such as a rugged housing and redundant power supply suitable for use in high-reliability applications, as shown on page 11.

Ethernet is far from the only high-bandwidth wired communications option for today's system designers: USB adoption continues to grow and grow, and this trend is represented in FTM by ON Semiconductor's FUSB3xxx series, as shown on page 12.

These USB Type-C devices provide an integrated solution for designers who wish to take advantage of the new convenient connector design and the increased power and bandwidth capabilities of the USB-C technology.

The field of connectivity for the IoT is dynamic, seeing the frequent introduction of new technologies and capabilities, some of which are featured in this issue of FTM. If you would like advice on choosing the best option for your application, the engineers at Future Electronics are always ready to help.

For technical support in using these or any other components featured in FTM1811, please get in touch with your nearest branch, or call 1.800.FUTURE.1 for help.



**Amar Abid-Ali**  
Vertical Segment Director  
Future Electronics





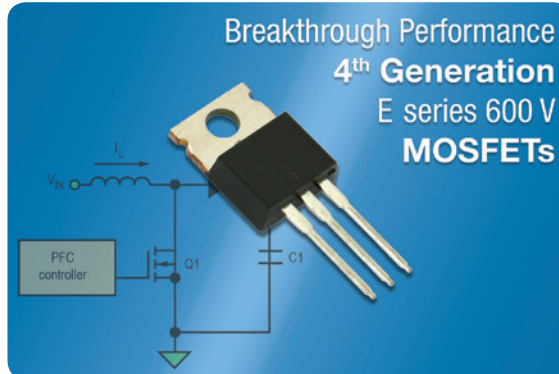
# 600V power MOSFET lowers conduction and switching losses

VISHAY

Vishay Intertechnology's SiHP065N60E N-channel MOSFET, part of its latest generation of 600V E series power MOSFETs, can help developers to achieve high energy efficiency in power factor correction circuits and hard-switched DC-DC converter topologies.

Built using Vishay's latest energy-efficient E series superjunction technology, the SiHP065N60E features low maximum on-resistance at a 10V gate-source voltage of 0.066Ω, some 30% lower than that of previous 600V E series MOSFETs. The new superjunction technology also produces a reduction in gate charge: at 49nC at 10V, it is 44% lower than in the earlier E series devices.

This means that the figure of merit of the SiHP065N60E, the product of the on-resistance and gate charge, is 25% lower than that of the closest competing MOSFET in the same class. The MOSFET is rated for a maximum continuous drain current of 25A at a case temperature of 100°C.



Vishay's SiHP065N60E: 44% lower gate charge than previous E series MOSFETs



### APPLICATIONS

- Telecoms equipment
- Enterprise power systems
- High-intensity discharge lighting
- Fluorescent ballast lighting
- Welding equipment
- Motor drives
- Battery chargers
- Solar inverters

### FEATURES

- Low effective output capacitances improve switching performance
- Withstands transient over-voltages in the avalanche mode with limits guaranteed through 100% UIS testing
- 5V maximum gate-source threshold voltage
- 0.5°C/W maximum junction-to-case thermal resistance
- 1.2V maximum drain-source body diode forward voltage

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# Precision chip resistors offer high power ratings

SUSUMU

The latest spin-off from Susumu's RG series of high-performance, reliable thin-film chip resistors, is the PRG series, which has a power rating almost five times higher than that of the RG series.

The PRG series resistors, which have terminals on their long sides, are offered in three sizes:
 

- the 1206 case size is rated at 1W
- the 2008 case size is rated at 2W
- the 2512 case size is rated at 3W

 These power ratings are as much as eight times higher than the ratings of competing chip

resistors of the same size. For example, most 1206 resistors are rated at 0.125W. A 1W rating is normally only available in the bigger 2512 case size.

The PRG series maintains all the thin-film characteristics of the RG series. These include:

- Precise absolute tolerance – in the PRG series this is ±0.1%
- A low temperature coefficient of resistance, just 25ppm/°C in the PRG devices
- Low noise
- Wide operating-temperature range of -55°C to 155°C

Likewise, the reliability of the PRG series is just as good as the RG series. The maximum drift for most standard reliability tests, such as short-time

overload, load life, temperature humidity bias, thermal shock and high-temperature exposure, is specified as 0.05-0.1%.

While the PRG series resistors are optimized for applications with high power requirements, the other members of the RG family have their own advantages: the original RG series devices are ideal for general-purpose applications, and the URG series are for designs which require ultra-high reliability.



### APPLICATIONS

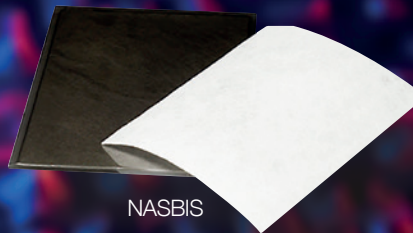
- Precision industrial and medical instrumentation
- Test and measurement equipment
- Telecoms equipment
- Automotive electronics
- Laboratory-grade scales
- Power supplies
- Power grid infrastructure

### FEATURES

- AEC-Q200 qualified
- Good sulfur resistance

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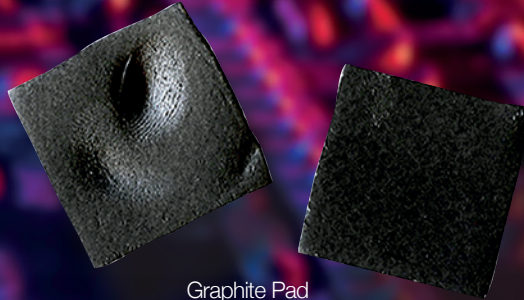
Type	Size (Inches)	Power Rating	Resistance Tolerance	TCR	Resistance Range (Ω) + E24 and E56 series R Value	Packaging
PRG3216	1206	1.0W	±0.1%(B)	±25ppm/°C(P)	47K to 100K	Tape and reel T5 = 5,000 pcs
			±0.5%(D)	±50ppm/°C(Q)	47K to 100K	
				±25ppm/°C(P)	10K to 100K	
PRG5020	2008	1.5W to 2.0W	±0.1%(B)	±25ppm/°C(P)	47K to 200K	Tape and reel T4 = 4,000 pcs
				±0.5%(D)	±50ppm/°C(Q)	
			±25ppm/°C(P)		10K to 200K	
PRG6432	2512	2.0W to 3.0W	±0.1%(B)	±25ppm/°C(P)	47K to 250K	Tape and reel T4 = 4,000 pcs
				±0.5%(D)	±50ppm/°C(Q)	
			±25ppm/°C(P)		10K to 250K	
				±50ppm/°C(Q)	2.5K to 250K	



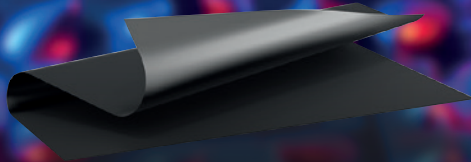
NASBIS



Soft PGS



Graphite Pad



PGS



PGS+SSM

# Portfolio of thermal management products supports wide range of application requirements

## PANASONIC

**Nano Silica Balloon Insulator Sheet or NASBIS** is a thin, flexible heat-insulating material composed of silica aerogel and a polyester fiber that has excellent thermal isolation properties. The thermal conductivity of NASBIS is comparable to that of air, making it an attractive material for heat insulation. NASBIS sheets protect thermally weak products from heat. It also helps maintain a uniform temperature throughout a device.

**Graphite-PAD** is a silicone resin-based pad composed of graphite flakes oriented in the vertical z-axis direction. Highly compressible, a Graphite-PAD can serve as a Thermal Interface Material (TIM) between a heat-sink and an IC.

**Pyrolytic Graphite Sheet, or PGS**, is a very thin TIM which offers high thermal conductivity. Made from graphite polymer film, it is ideal for thermal management in limited spaces. It can also be used to provide supplemental heat

Panasonic provides a portfolio of thermal management products which offer a range of characteristics and performance specifications to meet the requirements of different applications for thermal conductivity and mechanical properties.

dissipation in addition to a conventional heat-sink. The flexible material may be cut into custom shapes.

**Soft PGS** is an ideal TIM because of its combination of high thermal conductivity and high compressibility. When compressed, it reduces contact thermal resistance between rough surfaces in thin spaces.

Custom-cut to IGBT module footprints, Soft PGS contributes to the long life and high performance of power modules, since it provides high thermostability and reliability in thermally sensitive areas. Soft PGS is easy to install with a one- or two-step process that requires much less labor than the use of thermal grease entails.

**Semi-Sealing Material, or SSM**, is a silicone-free thermoplastic resin which absorbs heat, and which can conform to any rough or uneven surface with the right applied pressure. SSM material allows PGS to be used in areas in which the TIM needs to be compressed to avoid the risk of high thermal contact resistance.



### APPLICATIONS

- Mobile phones
- Displays
- Smart watches
- Medical devices
- Home appliances
- Drones
- Cameras
- Base transmitter stations

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# Fast 200V rectifiers increase power density, efficiency and system reliability

VISHAY

Vishay Intertechnology has introduced four new 200V FRED Pt<sup>®</sup> rectifiers offering very fast reverse recovery in the thermally-efficient FlatPAK™ 5mm x 6mm package with a low profile of <1mm.



FRED Pt rectifiers: FlatPAK package has standard MOSFET footprint

The commercial/industrial-grade VS-6DKH02-M3 and VS-8DKH02-M3 and the automotive-grade VS-6DKH02HM3 and VS-8DKH02HM3 enable developers of automotive or telecoms equipment to realise power-system designs featuring high power density and high efficiency.

Configured as dual-die rectifiers with separate cathode connections, the devices allow designers to simplify PCB layouts by using one package instead of two smaller packages. Vishay's FlatPAK design has a standard 5mm x 6mm QFN package's footprint, which is common in other component types such as MOSFETs, and thus supports the implementation of various circuit topologies.

Part Number	VS-6DKH02-M3	VS-6DKH02HM3	VS-8DKH02-M3	VS-8DKH02HM3
Forward Current	2 x 3A	2 x 3A	2 x 4A	2 x 4A
Forward Voltage	0.71V	0.71V	0.7V	0.7V
AEC-Q101 Qualified	No	Yes	No	Yes

The rectifiers' FRED Pt technology produces a very fast reverse-recovery time of 25ns as well as low reverse-recovery charge and soft recovery characteristics over the junction-temperature range of -55°C to 175°C.

The rectifiers' low forward voltage drop reduces power losses and improves conversion efficiency.



## APPLICATIONS

- Engine control units
- Anti-lock braking systems
- Automotive HID and LED lighting
- Telecoms power supplies

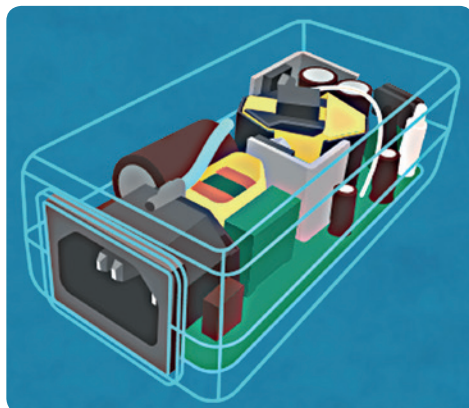
## FEATURES

- 200V maximum reverse voltage
- Reverse leakage-current range: 6µA to 7µA
- Junction-capacitance range: 10pF to 14pF
- High-temperature reverse bias tested for 2,000 hours

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# Custom power adapters allow OEMs to specify unique electrical and mechanical parameters

CUI INC



CUI power adapters: Custom design options

Alongside CUI's broad portfolio of off-the-shelf wall plug-in and desktop power adapters, the company also offers numerous modification options, providing users with a custom power adapter precisely specified to meet the requirements of an individual application.

Future Electronics together with CUI priorities being a flexible, collaborative partner which works with the customer from start to finish to create the ideal adapter solution. Potential modifications in a custom power adapter can be made to both the mechanical or the electrical design. CUI can also provide the customer with regulatory assistance to ease the regional or worldwide compliance process.



## COMMON MODIFICATIONS

- Case design and colours
- Labels and branding
- Cord lengths and cables
- Non-standard output voltages
- EMI filtering
- Extended temperature ranges
- Testing and certification management
- Country-specific agency marks

## APPLICATIONS

- Consumer
- Mobile devices
- IT and communications equipment
- Audio/visual equipment
- Medical, dental, and home healthcare equipment
- Communication systems
- Measurement equipment

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# Compact USB Type-C connector supports 10Gbits/s data-transfer

HIROSE

Hirose has introduced the CX series of surface-mount and through-hole USB Type-C™ connectors which offer a compact footprint to save board space.

The new CX series connector, which conforms to the specifications of the USB 3.1 Gen 2 standard, supports the 10Gbits/s transmission rate, enabling data transfers twice as fast as those of a conventional 5Gbits/s USB 3.0 connector. A high-current variant, the CX90M-16P, operates at the USB 2.0 data rate of 480Mbits/s, and is intended for use in fast battery chargers.

The receptacles feature a hybrid design and use both surface-mount and through-hole

soldering to improve mounting accuracy and to minimize the board mounting space needed. The design also facilitates automated optical inspection, and eases reworking of the solder terminal joints with a visible lead design. The slim plug is reversible, and the user-friendly receptacle features a symmetrical mating face to prevent incorrect insertion. A tactile click can be felt when mating the connectors to ensure correct engagement and prevent incomplete mating.



CX series receptacle: Symmetrical mating face



## APPLICATIONS

- Control systems
- Drones
- Medical devices
- Smart meters
- Point-of-sale equipment
- Imaging equipment
- Small portable devices

## FEATURES

- 24 contacts
- Pitch: 0.4mm surface-mount, 0.8mm DIP
- 1.25A maximum current rating
- 20V AC voltage rating
- 10,000 mating cycles

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Product	Type	ESR at -10°C (Ω/100kHz)	Ripple Current at 105°C (mA <sub>RMS</sub> /100kHz)
CX60-24S-UNIT	Plug (Unit)	Surface-mount, double-row	Slim type
CX60-SLDA	Plug (Plug shell)	-	Slim type
CX70M-24P1	Receptacle (Mid-mount)	Hybrid (surface-mount and DIP, 1 row each)	Space saving type, Depth: 8.35mm
CX70M-24P2	Receptacle (Mid-mount)	Hybrid (surface-mount and DIP, 1 row each)	Space saving type, Depth: 7.95mm
CX90B1-24P	Receptacle (Mid-mount)	Surface-mount, double-row	10Gbits/s data transfer, robust structure type
CX90M-16P	Receptacle (Mid-mount)	Surface-mount, double-row	Capable of carrying high current up to 6A for fast charging USB 2.0 data rate of 480Mbits/s
CX90MWD2-24P	Receptacle (Mid-mount)	Surface-mount, double-row	Waterproof (IPx8)

# Reflowable safety switch protects power semiconductors from risk of thermal run-away

SCHURTER

Schurter's RTS is a compact thermal switch which protects power semiconductors, safely interrupting the circuit in over-temperature conditions. It gives physical protection against the risk of thermal run-away, guaranteeing the circuit will shut down should software-based safety measures fail.

The RTS, or Reflowable Thermal Switch, protects power semiconductors such as MOSFETs, IGBTs, triacs and Silicon-Controlled Rectifiers (SCRs) from overheating. The RTS is a surface-mount device which may be assembled on a PCB using conventional reflow soldering techniques with temperature profiles up to 260°C before it is activated.



The RTS switch trips at 210°C

After the RTS is soldered to a PCB, mechanical activation arms the RTS for tripping at an over-temperature threshold of 210°C. The advantage of mechanical activation over the electrical activation required by other thermal switches is that the activation status is immediately visible to the installer. In addition, the RTS does not require the third contact required by devices that are activated electrically.

The RTS, which has a footprint of just 6.6mm x 8.8mm, can handle operating currents up to 100A at rated voltages of up to 60V DC. Variants of the RTS are available with an integrated shunt or an additional over-current fuse. Integrating these functions into the RTS extends the space-saving benefits of the device in high-power circuits.



## APPLICATIONS

- Anti-lock braking system
- Automotive fan
- Glow plug
- Fuel heater
- Battery protection
- Motor drives
- Lighting ballasts
- H-bridge circuits

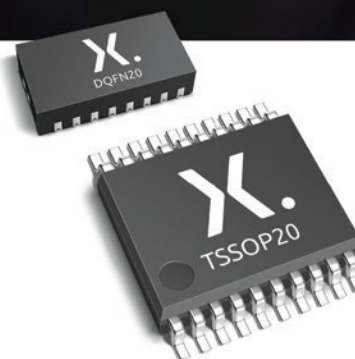
## FEATURES

- 95mΩ cold resistance
- AEC-Q200 qualified
- Compatible with MIL-STD specifications
- 50N maximum activation force
- 0.75g weight

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# Voltage-translating Shift Register for Modular Designs

Ideal for multiple I/O voltages, 74LVC8T595 performs voltage-level translation using an 8-stage shift register and an 8-bit storage register with 3-state outputs. The device operates in the 1.1 to 5.5 V range, enabling newer low-voltage controllers to interface with legacy solutions. 74LVC8T595 is suitable for SIPO (serial-in/parallel-out) shift register implementations.

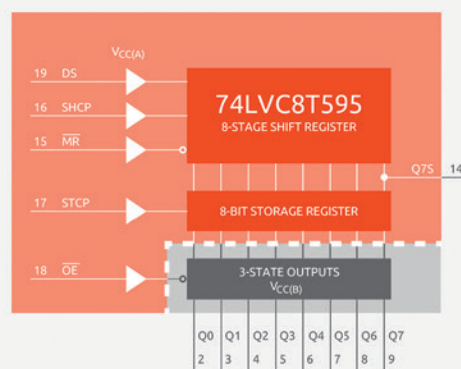


74LVC8T595 benefits from Nexperia's LVC family technology with  $I_{OFF}$  circuitry for partial power down-mode operation, which contributes to energy savings.

74LVC8T595's shift and storage register have separate clocks. Data is shifted on the positive edge of the SHCP input and data in the shift register is transferred to the storage register on a positive edge of the STCP input.

Part of our Standard Logic range, 74LVC8T595 is available in 20-pin TSSOP leaded and DQFN leadless packages. Both packages are specified for  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  and can be released in our Automotive (-Q100) portfolio.

Circuit Diagram



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## 500mW monaural speaker amplifier

NEW JAPAN RADIO CORP.

The NJU72060 is a 500mW-output audio power amplifier. It is suitable for various applications that require voice guidance, notification sound or alarm. The built-in BTL amplifier reduces output coupling capacitor. The voltage gain is set by the user-selected resistors ( $R_i$ ,  $R_f$ ). The NJU72060 has a shutdown function providing low current consumption at no input signals (mute). It also reduces pop noise turning active and shutdown mode.

- 2.7V to 5.5V operating voltage
- 3mA operating current
- 500mW output power with 8 $\Omega$  or 16 $\Omega$  load @5V
- 270mW output power with 8 $\Omega$  load @3.3V
- Pop noise suppression circuit
- Single-end input and differential input corresponds
- Thermal shutdown circuit
- MSOP8(VSP8), HSOP8-M1, DFN8-V1(ESON8-V1) packages



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## High-efficiency synchronous DC-DC buck-boost converter with 4.3A switches

DIODES INCORPORATED

The AP72200 employs Diodes Incorporated's proprietary buck/boost current-mode control technology to achieve excellent voltage regulation and a continuous output current of up to 2A. The design allows for seamless transition between buck and boost operation while the wide 2.3V to 5.5V input voltage range provides flexibility of supply and produces between 2.6V to 5.14V output voltage. The integrated H-bridge MOSFETs feature extremely low on-resistance of 25m $\Omega$  and a shutdown current of less than 1 $\mu$ A. Quiescent current is as low as 20 $\mu$ A when operating in non-switching mode and a typical of 29 $\mu$ A in PFM mode.

- 2.3V to 5.5V  $V_{IN}$
- 2.6V to 5.14V output voltage range
- 2A Continuous output current for  $V_{OUT} = 3.4V$  and  $V_{IN} > 2.9V$
- Up to 97% efficiency
- I<sup>2</sup>C interface
- Fully protected for over-current, short circuit, reverse current, over voltage and UVLO
- Selectable MODE PFM/PWM
- 2.5MHz switching frequency
- Ultrasonic operation programmable through I<sup>2</sup>C
- Power good indicator with 5M $\Omega$  internal pull-up
- Adjustable over-current limit
- 2.125mm x 1.750mm, 20 balls WLCSP package

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## Four-channel, fast, low-power, reinforced isolation 5kV<sub>RMS</sub> digital isolators

MAXIM INTEGRATED

The MAX22444 to MAX22446 are reinforced, fast, low-power 4-channel digital galvanic isolators using Maxim's proprietary process technology. These devices transfer digital signals between circuits with different power domains, using as little as 0.74mW per channel at 1Mbps (1.8V supply). The MAX22444 features four channels transferring digital signals in one direction for applications such as isolated digital I/O. The MAX22445 has three channels transmitting data in one direction and one channel transmitting in the opposite direction, making them ideal for applications such as isolated SPI and RS-485 communication. The MAX22446 provides further design flexibility with two channels in each direction for isolated RS-232 or other applications.

- Up to 200Mbps maximum data rate
- Withstands 5kV<sub>RMS</sub> for 60s (VISO)
- Withstands  $\pm 10$ kV surge between GNDA and GNDB with 1.2/50 $\mu$ s wave-form
- Active-high or Active-low enable inputs
- 2 fixed output default states (high/low) or pin-selectable
- 3 direction configurations
- Continuously withstands 1500V<sub>RMS</sub> (VIOWM)
- High CMTI (50kV/ $\mu$ s, typical)
- 6-pin wide-body SOIC package

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## Light-to-digital converter with I<sup>2</sup>C interface

AMS

The TSL2540 is a very high-sensitivity light-to-digital converter that approximates the human eye response to light intensity under varying lighting conditions and transforms this light intensity to a digital signal output capable through a 1.8V I<sup>2</sup>C interface. The Ambient Light Sensor (ALS) features 2 output channels, a visible channel and an IR channel. The visible channel has a photodiode with a photopic Interferometric UV and IR blocking filter and the IR channel has a photodiode with an IR pass filter. Each channel has a dedicated integrating data converter which converts photodiode current into a 16-bit digital output.

- Integrated on-chip photopic filter
- High sensitivity down to mLux levels
- 1M:1 dynamic range
- Automatic AUTO zero/dark count control
- 1.7V to 2.0V supply voltage
- 0.18 $\mu$ m process technology with 1.8V I<sup>2</sup>C
- QFN-10 package



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## 75V, 0.3A, high-efficiency, synchronous step-down power module with integrated inductor

### MONOLITHIC POWER SYSTEMS

The MPM3570E is a high-density, non-isolated DC-DC power module for space-sensitive applications. The module offers a very compact solution to achieve 0.3A output current over a 4.5V to 75V wide input supply range, and can provide an adjustable output voltage from 1.0V to 5.0V via an external FB resistor and a default 3.3V output. The MPM3570E integrates a switching controller, power switches, inductors, a modest amount of input and output capacitors and all support components with an advanced 10 × 10 × 4.2mm size. And it requires a minimal number of standard external components.

- Integrated inductor, switches, controller
- Wide 4.5V to 75V operating input range
- 1.0V to 5.0V adjustable output
- 0.3A output current
- 30µA quiescent current
- CISPR25 Class 5 compliant
- Ultra-fast transient response
- Internal fixed soft-start time
- Power OK indicator
- Non-latch OCP and UVLO
- Thermal shutdown protection
- Remote enable control



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## USB Type-C analog audio switch with protection

### ON SEMICONDUCTOR

The FSA4480 is a high-performance USB Type-C™ port multimedia switch that supports analog audio headsets allowing a common USB Type-C port to pass USB 2.0 signals, analog audio and analog microphone signals. The device, which supports an audio sense path, is a fully integrated and optimized solution that eases design-in and minimizes overall solution footprint. It includes integrated high voltage protection up to 20V DC, and offers pinout support for both OMTP and CTIA - sometimes known as American Headset Jack (AHJ) - smartphone headset standards. There is Over Voltage Protection (OVP) on the common node pins and the unplugging of any audio device is automatically detected.

- 2.7 V to 5.5 V power supply
- 3Ω typical USB high-speed  $R_{ON}$
- Audio switch THD+N = -110dB;  $1V_{RMS}, f = 20\text{Hz}-20\text{kHz}, 32\Omega$  Load
- 20V DC tolerance on connector side pins
- OMTP and CTIA pinout support
- 1Ω typical audio  $R_{ON}$
- USB high speed (480Mbps) SDD21 -3dB bandwidth: 950MHz
- -3V to 3V audio switch negative rail capability
- Over-voltage protection
- Supports audio sense path

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## Dual-mode power monitoring IC

### MICROCHIP

The MCP39F511A power monitoring IC is a highly integrated device that addresses the growing need for more accurate power measurements in high-performance de-signs. To simplify calibration procedures and support most accuracy requirements, two 24-bit delta-sigma Analog-to-Digital Converters (ADCs) with 94.5dB of Signal-to-Noise ratio plus Distortion (SINAD) performance and a 16-bit calculation engine are included. Suitable for a range of consumer, Internet of Things (IoT) and industrial applications, the MCP39F511A automatically senses power-supply types and switches between AC and DC modes, optimizing measurement results. The device also helps developers troubleshoot issues with an on-chip EEPROM that logs critical events, as well as an integrated low-drift voltage reference and internal oscillator to reduce implementation costs.

- Real-time measurement of input power for AC or DC supplies
- Automatic sensing and switching between AC and DC modes
- Dedicated Zero Crossing Detection (ZCD) pin
- Automatic event pin control through fast voltage surge detection
- Built-in active, reactive, apparent power calculations
- Up to 115.2kbps 2-wire UART
- 512bytes user-accessible EEPROM through page read/write commands
- Power monitoring accuracy capable of 0.1% error across 4000:1 dynamic range
- Dedicated PWM output pin
- Fast calibration routines
- 28-lead 5 × 5 QFN package

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## Gen III Triaxis rotary and linear position sensors

### MELEXIS

The MLX90371/372 is a family of monolithic magnetic position processor ICs. It consists of a Triaxis® Hall magnetic front end, an analog-to-digital signal conditioner, a DSP for advanced signal processing and an output stage driver. The MLX90371/372 is sensitive to the three components of the magnetic flux density applied to the IC (Bx, By and Bz). This allows the sensors with the correct magnetic circuit to decode the absolute position of any moving magnet such as rotary position from 0 to 360 degrees or linear displacement.

- Stray field immunity capability
- Programmable linearization algorithm: arbitrary points (8 points) or piece-wise-linear (32 points)
- 12-bit angular resolution
- 10-bit thermal accuracy
- On-chip diagnostics – ASIL-B (SEooC)
- -40°C to 160°C ambient temperature range
- Analog (ratio metric) and PWM selectable output mode
- Programmable measurement range
- Dual die (fully redundant) option available



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# Chip antennas are optimized for use in wireless LPWA networks

## YAGEO

Yageo supplies a comprehensive choice of chip antennas tailored for use in Low Power Wide Area (LPWA) radio networking equipment that complies with technologies such as the NB-IoT, LoRa® and Sigfox wireless communications protocols.

LPWA networks provide long-range communications at a low bit rate, while consuming little enough power that they can run for long periods from a battery power source. This makes LPWA networking technology ideal for IoT applications in market sectors such as smart cities, automotive, healthcare and industrial.

NB-IoT, LoRa and Sigfox, the most widely used technologies in LPWA wireless networking



Yageo antennas: High radiation efficiency

equipment, operate at various frequencies below 1GHz, as shown in the table. Yageo, which has applied professional design capabilities and high-quality manufacturing services to the antenna field for more than 15 years, can provide appropriate antenna designs to customers in chip, PCB and metal antenna formats.

LPWA	Working Frequency (MHz)	Region					
		Europe	N. America	China	Korea	Japan	India
NB-IoT	14 bands in the range 452 to 2,220MHz	Frequency depends on local licensing					
LoRa®	470-510MHz 865-869MHz 920-925MHz	867 to 869MHz	902 to 928MHz	470 to 510MHz	920 to 925MHz	920 to 925MHz	865 to 867MHz
Sigfox	868MHz, 902MHz	868MHz		902MHz		923/920MHz	

For LPWA applications, the chip antenna type provides the best characteristics:

- Compact size
- Surface-mount package
- Omni-directional radiation
- High reliability
- High radiation efficiency
- Antenna performance and characteristics may be adjusted via matching circuit



### APPLICATIONS

- Alarms
- Building automation
- Transportation
- Intelligent traffic management systems
- Fleet and asset tracking
- Remote health monitoring
- Assisted living equipment
- Access control
- Surveillance equipment
- Process monitoring and control

### FEATURES

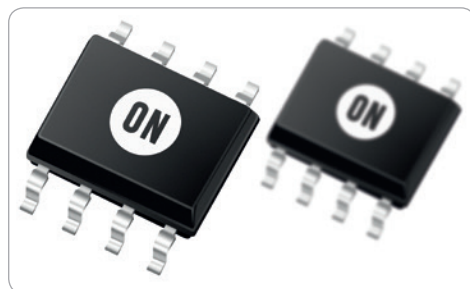
- Custom antenna design and manufacturing service available

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# EEPROM features NFC RF interface for contactless and batteryless data monitoring

## ON SEMICONDUCTOR

ON Semiconductor has released the N24RF family of NFC EEPROM products, providing a scalable design solution which combines conventional EEPROM functionality with an integrated NFC interface for contactless reading and writing of data.



N24RF: Range up to 1.5m

Like a conventional non-volatile EEPROM device, the N24RF includes a digital I<sup>2</sup>C interface. The NFC interface provides an additional option for contactless reading and writing via an NFC reader such as a smartphone equipped with an NFC radio. The device can communicate with a reader over a range of up to 1.5m.

The N24RF can power itself from the energy of the reader's RF field during communication, which enables the implementation of batteryless designs.

The N24RF is available in two package options: a SOIC-8 measuring 4mm x 5mm x 1.75mm, and a TSSOP-8, which is 3.1mm x 4.5mm x 1.2mm.

Density	Part Number, SOIC-8 Package Option	Part Number, TSSOP-8 Package Option
64kbits	N24RF64DW	N24RF64DT
16kbits	N24RF16DW	N24RF16DT
4kbits	N24RF04DW	N24RF04DT



### APPLICATIONS

- Predictive maintenance
- Contactless data monitoring
- Contactless firmware updating

### FEATURES

- 2,000,000 Program/Erase cycles
- 200 years' data retention
- Supply-voltage range: 1.8V to 5.5V
- Operating-temperature range: -40°C to 105°C
- ISO15693/ISO18000-3 Mode 1 compliant at 13.56MHz
- Anti-collision support

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# Industrial Ethernet switches support PoE and 24V DC power rails

## WAGO

**WAGO supplies a range of industrial Ethernet switches which offer the flexibility to transfer data at rates up to 1Gbit/s while supporting Power over Ethernet (PoE) operation on multiple ports simultaneously.**

The 852-1411 Industrial ECO Switch is a five-port Gigabit Ethernet switch. Four of the ports support PoE+ at 30W. These four PoE+ ports can be used simultaneously to provide a power supply. The integrated voltage transformer enables operation on the 24V DC power rail common in the control cabinet. This reduces the scale of the wiring operation, and eliminates the need for a separate power supply for the PoE circuit.

Like the 852-1411, the 852-1417 Industrial Ethernet Switch features five Gigabit Ethernet ports, with four supporting PoE+ at 30W.

The 852-1417 also offers two SFP-1000BASE-SX/LX ports; SFP modules are available as an option. This means that, while the switch is ideal for small and medium-sized networks, it can also be integrated into larger installations through the use of its SFP slots.

WAGO also supplies the configurable 852-1505 Industrial Ethernet Switch, which features eight 10/100/Gigabit Ethernet ports. All support PoE+ at 30W, and all can be operated simultaneously. Four SFP-1000BASE-SX/LX ports are available.



WAGO switches feature rugged housing and redundant power supply

The switch has a rugged housing, redundant power supply and function monitoring with a relay. It features web-based/SNMP management, and DIP switches to set alarm functions.

All three switches operate over an extended temperature range of -40°C to 70°C.



### APPLICATIONS

- Industrial Ethernet equipment

### FEATURES

- Front-panel diagnostic LEDs
- Supports Auto-MDI/MDI-X functions
- Full-/half-duplex transfer modes for each port
- Store-and-forward switching method
- Integrated address look-up table supports up to 8,000 MAC addresses
- Over-voltage protection
- IEEE 802.3x flow control in full-duplex mode
- For DIN-35 rail mounting

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# New low-cost USB Type-C connector supports high-power charging operations

## GCT

**GCT has introduced the USB4085, a USB Type-C™ connector which features a modified 16-pin configuration which provides the full 100W power-output capabilities of a conventional USB-C receptacle but with streamlined USB 2.0 functionality.**



USB4085: Four PCB retention and grounding posts

This modified connector design has enabled GCT to produce a high-performance USB-C connector for battery charging at a very competitive price.

The USB4085 is supplied in a through-hole mount package. Four PCB retention and grounding posts provide extra strength and stability for the connector once mounted on the board.

GCT supports developers using the USB4085 with an extensive set of resources. This includes 3D models, product drawings and PCB layout and footprint guidelines, making it easier and quicker for engineers to design the connector into new products.



### APPLICATIONS

- USB Type-C chargers
- USB docking stations
- Power adapters

### FEATURES

- 20V voltage rating
- 50mΩ maximum contact resistance
- 10,000 mating cycles
- Mating force: 5-20N
- Operating-temperature range: -40°C to 85°C

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## Renesas Synergy™ AE-CLOUD2 Kit

# ACCELERATE YOUR IoT DEVELOPMENT WITH CELLULAR AND CLOUD TECHNOLOGIES

The newly launched AE-CLOUD2 cloud connectivity kit quickly enables developers to create their next-generation IoT device using the latest cellular technology. With the AE-CLOUD2, developers can now choose between wired Ethernet, Wi-Fi, or CAT-M1/NB-IoT cellular technology to connect their device to the Internet and on to the cloud. AE-CLOUD2 provides maximum freedom in choosing how their device will connect.

### Expand Your Device Reach with Global Cellular Connectivity

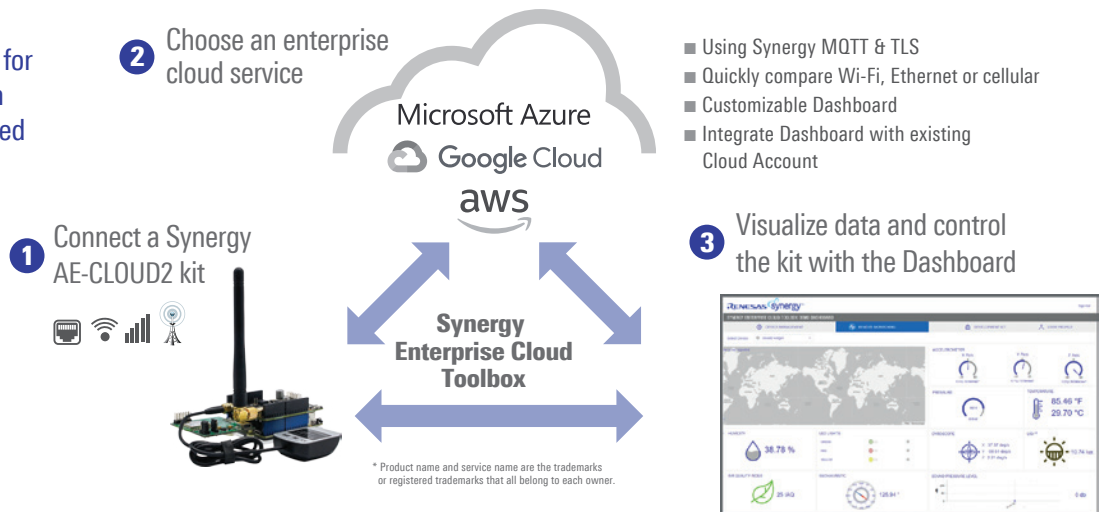
With the addition of an LTE CAT-M1 and NB-IoT cellular option for AE-CLOUD2, developers now have the flexibility to create devices that can be placed anywhere in the world where cellular coverage exists. Devices can now be truly mobile and wireless, enabling a whole new class of IoT devices. Low power, low data rates, and lower modem device costs are key for IoT and M2M devices to be successful. Unlike other LTE technologies, CAT-M1 and NB-IoT are specifically geared to tackle these

device and market challenges. AE-CLOUD2 and Renesas Synergy support this with a packaged solution using CAT-M1 and NB-IoT out-of-the-box.

### Create. Connect. Cloud.

Just like previous kits, AE-CLOUD2 quickly enables customers to connect to enterprise cloud service providers like Amazon Web Services, Google Cloud Platform, and Microsoft Azure, as well as connecting to a private cloud instance using Medium One. Developers can quickly demo and prototype on each platform to fit their needs. Coupled with the different connectivity options, there is now a vast array of options to get your IoT device communicating with the cloud quickly and easily. Get started on your development path with application projects for each of the aforementioned cloud providers, or just kick the tires with a cloud demo so you can see what your IoT device can be capable of doing!

A simple 3-step process for creating next-generation IoT devices with advanced cellular technology.



### Synergy AE-CLOUD2 Development Kit

The AE-CLOUD2 kit comes out-of-the-box with Ethernet, Wi-Fi, and cellular RF transceivers. Simply get a SIM card and data plan, install the SIM card, load up either the cloud demo application or any of the free cloud application projects, and you are off and running toward your next connected IoT design. Use the AE-CLOUD2 and included cloud connectivity software to jumpstart your next IoT design today!

For more information, visit <https://renessasynergy.com/ae-cloud2>  
Order your Development Kit from Future – Part No.: YSAECL002



# Fully compliant components ease implementation of USB Type-C connectivity

## ON SEMICONDUCTOR

ON Semiconductor has introduced new USB Type-C™ devices which are fully compliant with the latest specifications. The new devices include two controllers and a switch.

The **FUSB303** port controller can convert existing and new systems to a USB-C interface, supporting applications that are to operate in Source (SRC), Sink (SNK), or Dual Role Port (DRP) modes. The device offers autonomous detection, and requires minimal processor interaction and firmware support.

The low-power operation of the FUSB303 is particularly attractive to mobile and ultra-portable applications: in stand-by mode, it draws less than 10µA.

The controller is housed in a QFN package measuring 1.6mm x 1.6mm x 0.375mm which is thinner than standard CSP packaging, allowing use in the most space-constrained designs.

The **FSUSB242** is a USB-C compliant port protection switch which blocks high and surge voltages. As required by the USB-C standard, the switch allows for multiplexing of two USB sources on to the common DP/DM positive and negative data terminal pins, while maintaining signal integrity.

The device offers IEC 64000-4-5-compliant surge protection up to ±20V, without the use of an external transient voltage suppressor. The FSUSB242's low power consumption makes it suitable for mobile applications.

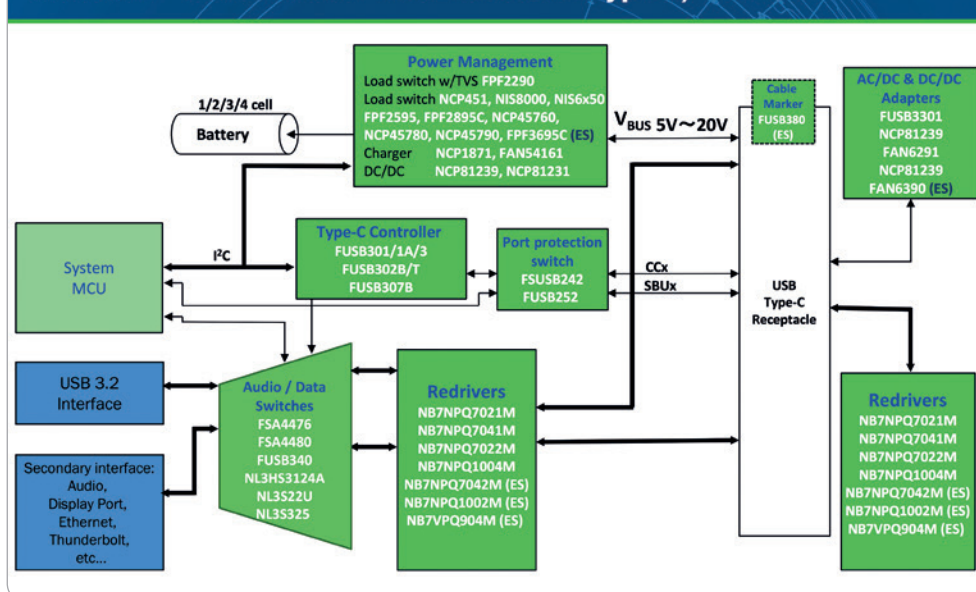
The **FUSB302BV** controller is intended for use in automotive USB Power Delivery (PD) applications. While other solutions are only for consumer applications, this device is AEC-Q100 qualified. It supports detection functions including attach and orientation, making it one of the most efficient and flexible products on the market.

Unlike other solutions, the FUSB302BV communicates via an I<sup>2</sup>C interface and does not integrate a microprocessor. This ensures the device meets the automotive requirements for minimal energy consumption and low levels of self-heating.

ON Semiconductor also supplies a portfolio of USB redrivers which reduce signal losses in long cable runs.

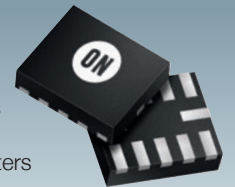
Redriver Part Number	Description	Channel	Package
NB7NPQ701M	3.3V 5Gbits/s and 10Gbits/s redriver	Single	2mm x 2mm WDFN8
NB7VPQ701M	1.8V, 5Gbits/s and 10Gbits/s redriver	Single	1.6mm x 1.6mm UQFN12
NB7NPQ702M	3.3V 5Gbits/s and 10Gbits/s redriver	Dual, bi-directional	3mm x 3mm UQFN16
NB7VPQ702M	1.8V, 5Gbits/s and 10Gbits/s redriver	Dual, bi-directional	3mm x 3mm UQFN16

## ON Semi – Solutions for the Entire USB Type-C/PD BOM



### APPLICATIONS

- Smartphones
- Tablets
- Laptop computers
- Wearable devices
- Multi-function printers
- Servers
- Games consoles
- Digital video recorders
- Industry 4.0 equipment
- Automotive audio and infotainment systems
- Power adapters



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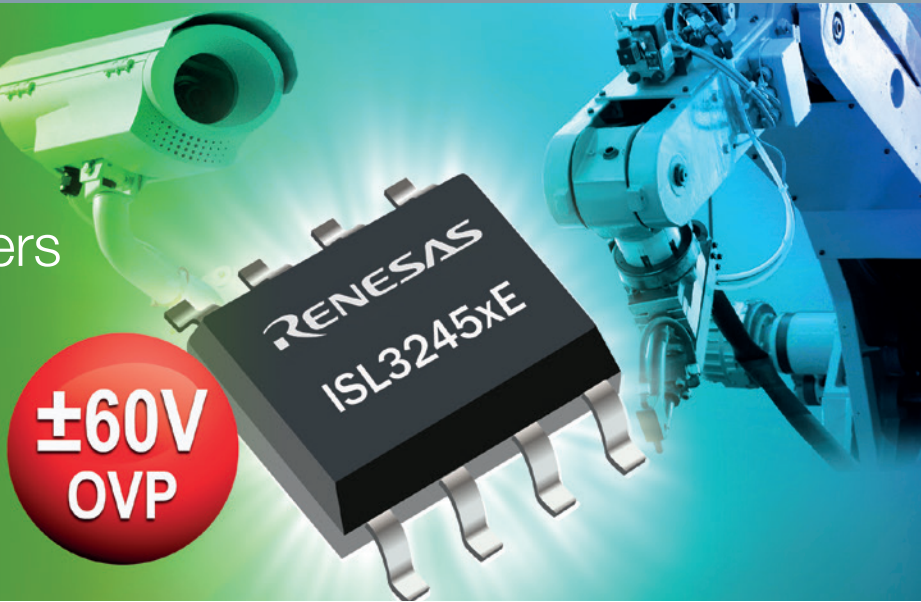
## FTM Boards

Orderable Part Number: FSUSB242GEVB

To buy development boards go to:  
[www.FutureElectronics.com/resources/ftm](http://www.FutureElectronics.com/resources/ftm)

# Latest RS-485 transceivers support high data rates and handle over-voltage events safely

RENESAS



The wired communication standards TIA/EIA-485 and TIA/EIA-422 (also known as RS-485 and RS-422), published by the Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA), specify a technology which uses differential signaling to enable data transmission over long distances and in noisy industrial environments.

The differential signaling method offers high immunity to common-mode noise; on the twisted-pair cable recommended for use in RS-485 and RS-422 networks, most received interference is common-mode. Long transmission distances increase the scope for ground potential differences, but the standards' wide Common-Mode Range (CMR) ensures that the network operates properly even in the presence of large common-mode voltages.

Renesas offers a wide range of RS-485 transceivers which not only meet the basic requirements for compliance with this RS-485 standard, but which also go far beyond them, offering attractive features such as integrated ESD protection, and support for high data rates.

### Enhanced ESD protection

Full-featured transceivers include improved ESD protection on the bus pins. Bus pins typically connect to an exposed port at the host equipment's housing. This exposure makes the port especially susceptible to ESD events. Connecting a charged interface cable can destroy an unprotected transceiver.

### Higher differential output voltage

Some bus protocols, such as Profibus DP, use an RS-485 network for the physical layer, but operating at a higher Transmit differential output voltage of 2.1V than the  $\pm 1.5V$  specified in the RS-485 standard. This provides for better drive performance and higher noise immunity.

Renesas' 5V ISL3150E family features a 2.4V minimum differential output voltage, which provides 900mV more noise immunity than standard RS-485 ICs. The 40Mbits/s ISL3159E offers a 2.1V minimum differential output voltage. These transceivers can drive more than the two terminations required by the RS-485 standard.

ISL315XE transmitters can drive the 1.5V differential output voltage specified for RS-485 into as many as eight terminations. This makes them ideal for networks with a star or other non-standard configuration.

### Over-voltage protection

Over-Voltage Protection (OVP) or fault-protected transceivers enable RS-485 bus pins to survive voltages much higher than those specified by the standard. The ISL3243XE and ISL3249XE offer OVP of up to  $\pm 60V$ , and a CMR up to twice as wide as that specified by the RS-485 standard.

### High data-rate transceivers

Near real-time applications, such as robotics, motor control and data acquisition, require high data rates of more than 25Mbits/s to minimize latency and to increase throughput. At these very high data rates, the transceiver must be characterized by low Transmit and Receive skews to minimize duty-cycle distortion. In addition, low part-to-part skews enable high-speed parallel applications such as SCSI Fast-20 and Fast-40.

High-speed devices from Renesas offer maximum Receive and Transmit skews of 1.5ns, and maximum part-to-part skew of 4ns.

The 3V ISL3179E and 5V ISL3159E support a maximum data rate of 40Mbits/s. The 5V ISL3259E operates at up to 100Mbits/s. All parts optionally support a maximum operating temperature of 125°C to handle the high temperatures encountered in motor-control applications. They are supplied in MSOP and DFN packages for space-constrained designs. They withstand ESD strikes of  $\pm 15kV$ .

Additionally, the ISL3159E and ISL3259E feature a Transmit differential output voltage of  $>2.1V$ , making them ideal for use in high-speed Profibus DP networks.

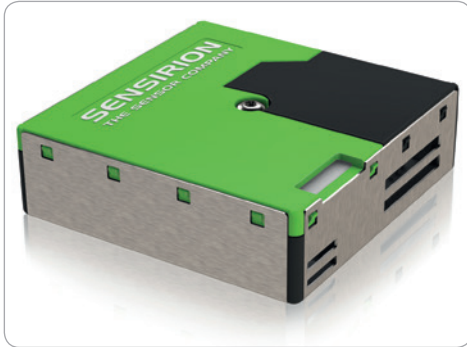
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Transceiver Family	Common-mode Range	Maximum Data Rates	Features
ISL3247XE $\pm 60V$ , basic 5V family	$\pm 15V$	250kbits/s, 1Mbit/s or 15Mbits/s	The ISL3247XE is an improved replacement for Over-Voltage Protection (OVP) devices without an extended CMR
ISL3249XE $\pm 60V$ , premium 5V family	$\pm 25V$	250kbits/s, 1Mbit/s or 15Mbits/s	The $\pm 25V$ CMR is the best of any OVP transceiver
ISL3248XE $\pm 60V$ , premium 5V family	$\pm 25V$	1Mbit/s	The ISL3248XE is similar to the ISL3249XE, but with an additional cable invert, or polarity reversal, function
ISL3243XE $\pm 40V$ , basic 3V-5V family	$\pm 15V$	250kbits/s or 1Mbit/s	Transmit differential output voltage of 1.35V at supply voltage of 3.3V does not comply with RS-485 specification
ISL3245XE $\pm 60V$ , premium 3V-5V family	$\pm 20V$	250kbits/s or 1Mbit/s	Transmit differential output voltage of 1.35V at supply voltage of 3.3V does not comply with RS-485 specification

# Stable, accurate new particulate matter sensor

## SENSIRION

The introduction by Sensirion of its new SPS30 particulate matter sensor marks a breakthrough in optical sensor technology, offering more stable performance and a longer operating lifetime thanks to greatly improved resistance to contamination.



SPS30: Laser scattering measurement method

The SPS30 uses a laser scattering method for measuring the concentration of particulates in the atmosphere. Comprised of high-quality and long-lasting components, the SPS30 provides accurate measurements from its first operation and throughout its lifetime of more than eight years of continuous operation.

In addition, Sensirion's advanced algorithms provide accurate measurement results for different types of particulates. Higher-resolution particle size binning enables new use cases and device-specific actions based on the detected particle composition of various types of environmental dust and other particles.

The SPS30 also benefits from Sensirion's proprietary contamination-resistance technology. Traditional optical particulate matter sensors suffer from contamination, which impairs the sensor's performance. Contamination results from dust and particle accumulation on the sensor's light source and photodetector. The SPS30's contamination resistance ensures long-term stability and high accuracy.

The SPS30 measures 41mm x 41mm x 12mm, which means that it is suitable for use in wall-mounted or compact air-quality devices.



### APPLICATIONS

- Air purifiers
- HVAC equipment
- Demand-controlled ventilation systems
- Air conditioners
- Air quality and environmental monitors
- Smart home and IoT devices

### FEATURES

- $\pm 10\%$  mass concentration accuracy
- Measures concentrations up to  $1,000\mu\text{g}/\text{m}^3$
- 1s minimum sampling interval in continuous mode
- UART and I<sup>2</sup>C interfaces

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## LIGHTING HIGHLIGHT



# LED in popular 2835 package achieves new high efficacy of >200lm/W

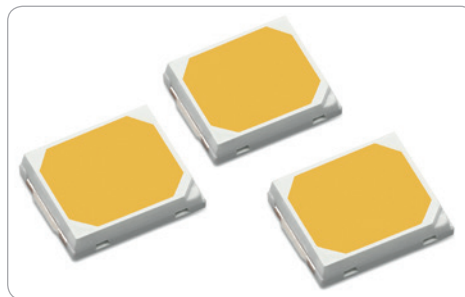
## LUMILEDS

Lumileds announces the introduction of the LUXEON 2835 HE, which sets a new standard for efficacy in the mid-power LED market: the 4000K/80CRI variant achieves 202lm/W when producing 36lm at a drive current of 65mA.

The new LED, which extends the successful LUXEON 2835 line, is optimized for high color consistency as well as high efficacy. Color variation at the LED light source is limited to just a two-step MacAdam ellipse over the full operating-temperature range.

Lumileds' high-reliability design also enables the LUXEON 2835 HE to be driven at high currents of up to 480mA, enabling lighting OEMs to produce a high light output from low-profile general lighting fixtures. At 480mA, the 4000K variant produces an output of 220lm.

Lumileds expects the LUXEON 2835 HE to be most popular in applications such as troffers and



Lumileds: 220lm output at 480mA drive current

downlights, in which high efficacy is important and LED count must be minimized.

Unlike many 2835 LED packages on the market, the LUXEON 2835 HE is lumen-maintenance tested on the TM-21 basis to 12,000 hours, indicating L70 lumen maintenance of 72,000 hours in the field.

The new 28mm x 35mm LED is available immediately as a drop-in replacement for standard 2835 LED packages. It can also replace 5630 or 3030 mid-power sockets that have similar optical requirements to those of a 2835 LED.



### APPLICATIONS

- Troffers
- High-bay fixtures
- Low-bay fixtures

### FEATURES

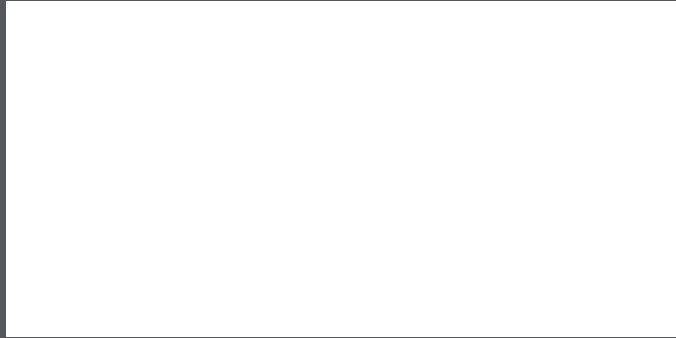
- Minimum 80 CRI
- CCT options: 2700K, 3000K, 3500K, 4000K, 5000K, 5700K, 6500K
- 2.71V forward voltage
- 13°C/W junction-to-solder pad thermal resistance

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Current and previous versions of the virtual FTMs are available at [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)



### Delight the Customer®

Future Electronics' New Product Introduction (NPI) program is an important part of our commitment to servicing all of our customers' needs from prototype to production.

Look for the NPI icon to learn about the latest products and technologies available, and buy what you need in engineering quantities.



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## Create, Secure, Connected Applications in a Single Click with Microchip's AC164160 AVR-IoT Development Board for Google Cloud



# MICROCHIP

Creating cloud-connected applications can require significant time and resources for embedded designers to develop necessary expertise in communications protocols, security and hardware compatibility. Developers often overcome these challenges with large software frameworks and Real Time Operating Systems (RTOS), which results in increased development time, effort, cost and security vulnerabilities.

The AVR-IoT Development Board gives developers the ability to add Google Cloud connectivity to new and existing projects with a single click using a free online portal at [www.AVR-IoT.com](http://www.AVR-IoT.com). Once connected, developers can use Microchip's rapid development tools, MPLAB® Code Configurator (MCC) and Atmel START, to develop and debug in the cloud. The board combines smart, connected and secure devices to enable designers to quickly connect IoT designs to the cloud.

The AVR-IoT Development Board enables developers to easily deploy IoT devices to Google Cloud IoT Core's artificial intelligence and machine learning infrastructure. The Internet of Things (IoT) rapid development board is part of an expanded partnership with Google Cloud, enabling designers to prototype connected devices within minutes.

The solution combines a powerful AVR® microcontroller (MCU), a Crypto-Authentication™ secure element IC and a fully certified Wi-Fi® network controller to provide a simple and effective way to connect embedded applications. Once connected, Google Cloud IoT Core makes it easy to collect, process and analyze data to inform decisions at scale.



To buy products or download data, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

### FEATURES

- **Powerful AVR microcontroller (MCU) with integrated peripherals:** The ATmega4808 8-bit MCU brings the processing power and simplicity of the AVR architecture with added advanced sensing and robust actuation features. With the latest Core Independent Peripherals (CIPs) that decrease power consumption, it provides cutting-edge performance in real-time sensing and control applications.
- **Secure element to protect the root of trust in hardware:** The ATECC608A CryptoAuthentication device provides a trusted and protected identity for each device that can be securely authenticated. ATECC608A devices come pre-registered on Google Cloud IoT Core and are ready for use with zero touch provisioning.
- **Wi-Fi connectivity to Google Cloud:** The ATWINC1510 is an industrial-grade, fully certified IEEE 802.11 b/g/n IoT network controller that provides an easy connection to an MCU of choice via a flexible SPI interface. The module relieves designers from needing expertise in networking protocols.

Among the benefits of connecting devices to Google Cloud IoT Core's infrastructure are the powerful data and analytics that enable designers to make better, smarter products. As part of the infrastructure, embedded designs can better take advantage of, and respond to, rapidly changing conditions across many sensor nodes.

### DEVELOPMENT TOOLS

AVR devices are now beta supported in the MPLAB X Integrated Development Environment (IDE), giving designers the option to choose between MCC or Atmel START when developing with the AVR-IoT Development Board. The board is compatible with more than 450 MikroElektronika Click boards™ that expand sensors and actuator options. Developers who purchase the kit will have access to an online portal for immediate visualization of their sensors' data being published.



## Taking Your IoT Idea to Proof-of-Concept is As Easy As 1-2-3 with the Rapid IoT Prototyping Kit



Earlier this year, NXP announced the Rapid IoT prototyping kit, a comprehensive, secure and power-optimized solution designed to simplify and accelerate development of IoT end nodes for consumer, commercial and industrial markets. Rapid IoT combines optimized hardware design and trusted security with pre-programmed applications that help get users up and running within minutes of opening the box. The kit is extendable through a docking station and the Mikro-Elektronika Click board™ range to create a virtually limitless number of applications.

Also available is Rapid IoT Studio, a complimentary drag-and-drop style online IDE which allows innovators to easily create their applications, even without embedded coding experience. Rapid IoT Studio allows simultaneous creation of firmware for the embedded device, a mobile app and cloud connectivity and comes with complimentary IoT Cloud services or the option to take source code to another cloud of choice. Automatic source code generation for NXP's MCUXpresso, a comprehensive and cohesive set of software development tools including an SDK, IDE, and Config Tools, further helps to provide a fast and easy transition for developers.



To buy products or download data, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

The Rapid IoT prototyping kit is in production now and available from US\$49.99. What will you build?

### APPLICATIONS

The Rapid IoT kit is used for a wide range of applications:

- Smart home/building
- Smart cities
- Industrial
- Smart appliances
- Unmanned vehicles (Rovers/ UAVs)
- Designs requiring a small form factor, low power and low cost
- .... and many applications yet to be discovered!

### FEATURES

- Kinetis® K64 MCU based on Arm® Cortex®-M4 Core
- KW41Z Wireless MCU (BLE, Thread, Zigbee)
- NT3H2211 NFC Forum Type 2 Tag
- A1006 Secure Authentication & anti-counterfeit IC
- Multiple sensors (Gyroscope, Acc/Mag., Barometer/Temp., Air Quality, Ambient light and capacitive touch)
- Complimentary Rapid IoT Studio IDE
- Automatic source code & project generation for MCUXpresso IDE/SDK
- iOS/Android mobile apps and IoT Cloud connect platforms
- Expandable to most IoT end-node use cases with 400+ Click boards™
- Compatible with NXP IoT Modular Gateway



# TINY BUT MIGHTY BY ABRACON<sup>®</sup> LIC

# NXP's Rapid IoT Prototyping Kit

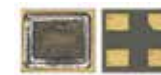


## SOLUTIONS FOR THE IoT'S MOST FOOTPRINT-CHALLENGED APPLICATIONS

## SUPPORTED BY ABRACON'S TIMING, RF AND CONNECTIVITY SOLUTIONS FOR KINETIS®-BASED KIT



Miniature 32kHz XO  
**ASAKMP**  
1.6 x 1.2mm footprint  
0.6mm profile



Miniature XTAL  
**ABM13W**  
1.2 x 1.0mm footprint  
0.33mm profile



Miniature 32kHz XTAL  
**ABS04W**  
1.2 x 1.0mm footprint  
0.35mm profile



Power Optimized MEMS XO  
**AMJM/AMPM/AMJD/AMPD**  
1.6 x 1.2mm footprint  
Low 0.85mm profile



MEMS 32kHz Oscillator  
**ASTMTXK**  
1.54 x 0.84mm footprint  
0.6mm profile



GPS/GLONASS/BEIDOU  
Chip Antenna  
**ACAR0301-SG3**  
3.05 x 1.6mm footprint  
0.55mm profile



Chip Antenna  
**ACAG0201-2450-T**  
2.0 x 1.25mm footprint  
0.6mm profile



Chip Inductor  
**ASMPL**  
1.6 x 0.8mm footprint  
0.5mm profile



Wireless Charging Coils  
**AWCCA-12R12H11-C01-B**  
12 x 12mm footprint  
1.1mm profile



Wireless Charging Coils  
**AWCCA-15N15H06-C01-B**  
Ø15.0 footprint  
0.6mm profile



### ADVANTAGES

- Minimize time to market
- Accelerate software and firmware development
- Reduce design effort
- Complete BOM available using Abracon's solutions

Abracon Part Number	Description	NXP Chipset
ABM11W-101-32.0000MHZ-T3	2.0x1.6mm low ESR 8pF crystal for IoT applications reducing power	MKW41Z512VHT4
ABM8G-106-12.000MHZ-T	3.2x2.5mm cost effective crystal	MK64FN1M0VMD12
ABS06-127-32.768kHz-T	2.0x1.2mm crystal solution	MKW41Z512VHT4
ABS07-166-32.768kHz-T	3.2x1.2mm crystal solution	PCF2123BS
AMCA31-101-2R450G-S1F-T3	Low profile 1.2mm chip antenna for BLE, WiFi, Zigbee	MKW41Z512VHT4
ANF-CA-101-2515-A02	Flexible 25x15mm NFC 13.56MHz NFC antenna	NT3H2211 NFC



Renesas Synergy™ AE-CLOUD2 Kit

# ACCELERATE YOUR IoT DEVELOPMENT WITH CELLULAR AND CLOUD TECHNOLOGIES

The newly launched AE-CLOUD2 cloud connectivity kit quickly enables developers to create their next-generation IoT device using the latest cellular technology. With the AE-CLOUD2, developers can now choose between wired Ethernet, Wi-Fi, or CAT-M1/NB-IoT cellular technology to connect their device to the Internet and on to the cloud. AE-CLOUD2 provides maximum freedom in choosing how your device will connect.

### Expand Your Device Reach with Global Cellular Connectivity

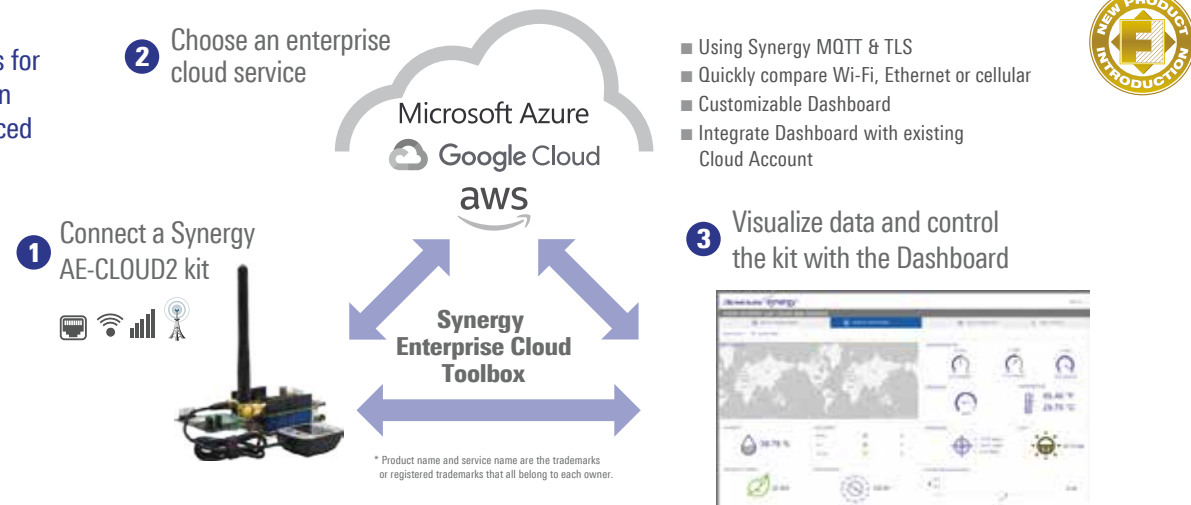
With the addition of an LTE CAT-M1 and NB-IoT cellular option for AE-CLOUD2, developers now have the flexibility to create devices that can be placed anywhere in the world where cellular coverage exists. Devices can now be truly mobile and wireless, enabling a whole new class of IoT devices. Low power, low data rates, and lower modem device costs are key for IoT and M2M devices to be successful. Unlike other LTE technologies, CAT-M1 and NB-IoT are specifically geared to tackle these

device and market challenges. AE-CLOUD2 and Renesas Synergy support this with a packaged solution using CAT-M1 and NB-IoT out-of-the-box.

### Create. Connect. Cloud.

Just like previous kits, AE-CLOUD2 quickly enables customers to connect to enterprise cloud service providers like Amazon Web Services, Google Cloud Platform, and Microsoft Azure, as well as connecting to a private cloud instance using Medium One. Developers can quickly demo and prototype on each platform to fit their needs. Coupled with the different connectivity options, there is now a vast array of options to get your IoT device communicating with the cloud quickly and easily. Get started on your development path with application projects for each of the aforementioned cloud providers, or just kick the tires with a cloud demo so you can see what your IoT device can be capable of doing!

A simple 3-step process for creating next-generation IoT devices with advanced cellular technology.



### Synergy AE-CLOUD2 Development Kit

The AE-CLOUD2 kit comes out-of-the-box with Ethernet, Wi-Fi, and cellular RF transceivers. Simply get a SIM card and data plan, install the SIM card, load up either the cloud demo application or any of the free cloud application projects, and you are off and running toward your next connected IoT design. Use the AE-CLOUD2 and included cloud connectivity software to jumpstart your next IoT design today!

For more information or to buy products, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)  
Order your Development Kit from Future – Part No.: YSAECL002

## Cypress' Wireless & Compute Portfolio: Powering Tomorrow's IoT Platforms



### PSoC® 6: Industry's Lowest-Power Microcontroller, Purpose-Built for the IoT

PSoC 6 is Cypress' ultra-low-power MCU built on a dual-core architecture integrating an Arm® Cortex®-M4 and Cortex-M0+ onto a single chip. A range of IoT designs requiring low power can benefit from PSoC 6's industry-leading low power consumption of 22 µA/MHz. In addition, PSoC 6 provides the critical security required by connected devices including a hardware-based root-of-trust and hardware-accelerated cryptography. PSoC 6 is in full production with silicon and Bluetooth/Wi-Fi Dev Kits available at Future Electronics.



### Cypress Provides Market-Proven Wi-Fi, Bluetooth & Combo Wireless Connectivity

Get to production faster with Cypress' ecosystem of certified IoT Partner Modules

#### Murata 1DX Module

Powered by the Cypress CYW4343W 802.11n Wi-Fi & Dual-Mode Bluetooth Combo chipset

Murata's 1DX certified module (LBEE5KL1DX) is powered by Cypress' CYW4343W chipset which provides developers with wireless connectivity to connect a range of IoT applications with proven 802.11b/g/n 2.4GHz Wi-Fi and dual-mode Bluetooth. The Murata 1DX is designed for space-constrained applications with a form factor smaller than a dime. Engineers can get started with the Murata 1DX by leveraging Future Electronics/Cypress' Nebula IoT Dev Kit.

Learn more at [www.futureelectronics.com/nebula](http://www.futureelectronics.com/nebula).



**muRata**  
INNOVATOR IN ELECTRONICS



**Laird**  
Smart Technology. Delivered.™

#### Laird Sterling-LWB Modules

Leveraging Cypress' combo and 802.11ac-enabled chipsets

Laird's certified Sterling-LWB Wi-Fi + Bluetooth Combo Module is available with 3 different antenna options and features Cypress' CYW4343W combo chipset. Two different Dev Board options are available – one in an SD Card form-factor as well as a full-on WICED® SDK compatible carrier board. In addition, the Sterling-LWB5 is a pin-compatible upgrade that adds 802.11ac Wi-Fi for higher bandwidth and increased range within IoT applications.

#### Inventek Wi-Fi Module

Powered by the Cypress CYW43903 802.11n SoC with integrated Arm Cortex-R4

The Inventek CYW43903-based Wi-Fi module (ISM43903-R48-L54-E/U) provides an integrated or optional external antenna with 1 MB of SRAM available for applications. In addition to WICED support, the module can also run with no operating system while leveraging an integrated TCP/IP stack that requires only a simple AT command set to establish connectivity within your wireless product.



**Inventek Systems**  
Embedding Connectivity Everywhere



MAX32660

Ultra-Low-Power Arm Cortex-M4 with FPU-Based Microcontroller for Wearable and IoT Sensors

DARWIN Generation U MCUs Are Perfect for Engineers Who Are Serious About Power and Performance

KEY FEATURES

- High-efficiency microcontroller for wearable devices
  - Internal oscillator operates up to 96MHz
  - 256KB Flash memory
  - 96KB SRAM, optionally preserved in lowest power backup mode
  - 16KB Instruction cache
  - Memory protection unit (MPU)
  - Low 1.1V V<sub>CORE</sub> supply voltage
  - 3.6V GPIO operating range
  - Internal LDO provides operation from single supply
  - Wide operating temperature: -40°C to +105°C
- Power management maximizes uptime for battery applications
  - 85µA/MHz active executing from flash
  - 2µA Full memory retention power in backup mode at V<sub>DD</sub> = 1.8V
  - 570nA Ultra-low power RTC at V<sub>DD</sub>=1.8V
  - Internal 8kHz ring oscillator
- Optimal peripheral mix provides platform scalability
  - Up to 14 general-purpose I/O pins
  - Up to two SPI master/slave
  - I<sup>2</sup>S master/slave



- Up to two UARTs
- Up to two I<sup>2</sup>C master/slave, 3.4Mbps high speed
- Four-channel standard DMA controller
- Three 32-bit timers
- Watchdog timer
- CMOS-Level 32.768kHz RTC Output

APPLICATIONS/USES

- Fitness monitors
- Industrial sensors
- IoT
- Optical modules: QSFP-DD, QSFP, 400G
- Portable medical devices
- Sports watches
- Wearable medical patches

MAX22445

Four-Channel, Fast, Low-Power, Reinforced Isolation 5kV<sub>RMS</sub> Digital Isolators

Industry's Fastest, Lowest Power Reinforced Digital Isolators

KEY FEATURES

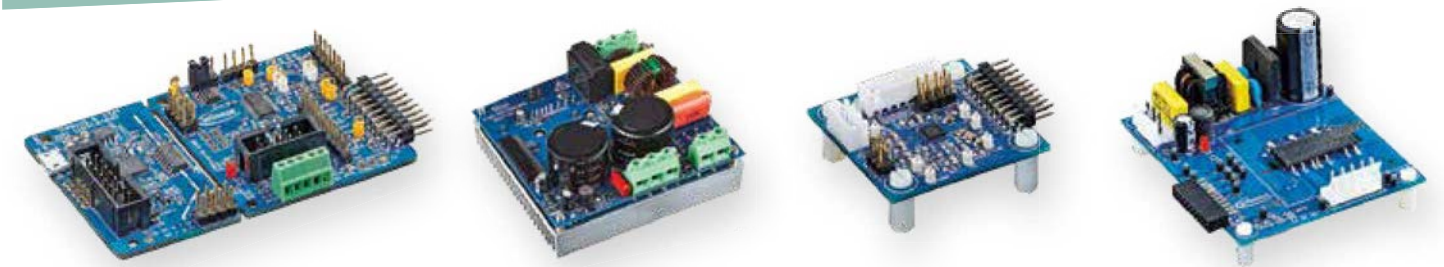
- Reinforced galvanic isolation for fast digital signals
  - Up to 200Mbps maximum data rate
  - Withstands 5kV<sub>RMS</sub> for 60s (VISO)
  - Continuously withstands 1500V<sub>RMS</sub> (VIOWM)
  - Withstands ±10kV surge between GNDA and GNDB with 1.2/50µs waveform
  - High CMTI (50kV/µs, typical)
- Low power consumption
  - 0.74mW per channel at 1Mbps with V<sub>DD</sub> = 1.8V
  - 1.4mW per channel at 1Mbps with V<sub>DD</sub> = 3.3V
  - 3.2mW per channel at 100Mbps with V<sub>DD</sub> = 1.8V
- Options to support a broad range of applications
  - 2 maximum data rates (200Mbps, 25Mbps)
  - 3 direction configurations
  - Active-high or active-low enable inputs
  - 2 Fixed output default states (high/low) or pin-selectable (M/N versions)

APPLICATIONS/USES

- Battery Management
- Fieldbus Communications for Industrial Automation
- Isolated RS-485/RS-422, CAN
- Isolated SPI Interface
- Medical Systems



For more information or to buy products, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)



iMOTION™ MADK Evaluation Platform  
Scalable System Solution for 3-Phase Motor Drives

Infineon Technologies' iMOTION Modular Application Design Kit (MADK) is a modular and scalable evaluation platform for testing different Infineon products targeting 3-phase PMSM/BLDC motor drives. The iMOTION™ MADK platform offers users system flexibility and scalability at multiple levels:

- Various controller options – iMOTION motor controller ICs or XMC1302 ARM® Cortex®-M0 MCU
- Inverter boards with maximum power ranging between 20W and 2kW
- Inverters with or without active PFC control
- Boost or totem pole PFC options
- Power stage maximum voltages ranging between 40V and 1200V
- Discrete or IPM-based power stages

The iMOTION MADK modular approach with standardized interfaces between different controller and power boards allows users to mix and match different control and power stage options for maximum flexibility and scalability during the evaluation and development phase at an affordable cost. This flexibility and scalability on the hardware level is complemented by state-of-the-art motor control algorithms delivered for both control board options:

- iMOTION ICs on control boards are pre-programmed with ready-to-use sensorless FOC motor control firmware which can be parametrized and tuned using iMOTION PC tools
- XMC1302 control board is delivered with matching FOC motor control library, supported by µC Probe-based GUI

Infineon will keep expanding the iMOTION MADK platform with new control and power board options for inverterized BLDC motor control, to enable users to test the latest Infineon products in their familiar evaluation environment.

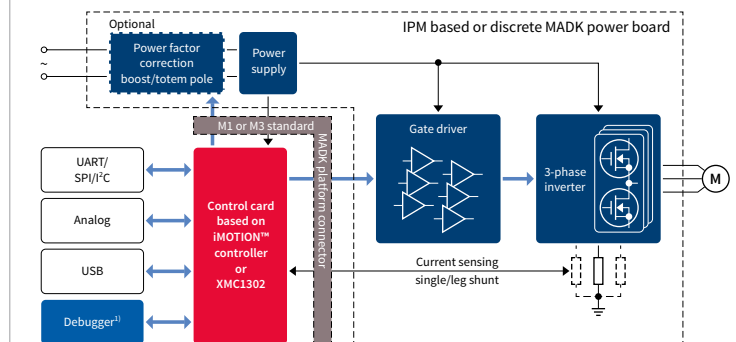
To buy products or download data, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

FEATURES

- Several control boards with iMOTION controllers using field-proven Motion Control Engine (MCE) to fit different use cases:
  - With or without additional MCU core for system control
  - With or without active PFC control
- XMC1302 MCU control board is supported by:
  - µC Probe-based GUI for motor parametrization and tuning
  - FOC motor control library
  - Free-of-charge DAVE™ IDE and other 3rd party ARM® IDEs
- A growing number of inverter boards offering flexibility and scalability:
  - Different CIPOS™ IPMs with various packages, switching elements (IGBT or FET), and power ratings
  - Power stages based on discrete components (IGBT/FETs + gate drivers)
  - Power stages without PFC, with boost PFC and with totem pole PFC options



iMOTION™ MADK evaluation platform  
Overview



1) External MCETOOLV2 debugger (sold separately) is required for some older iMOTION control boards

# ST Microelectronics Teseo-LIV3F GNSS Module

Integrated Flash and Superior Performance in a Tiny Package



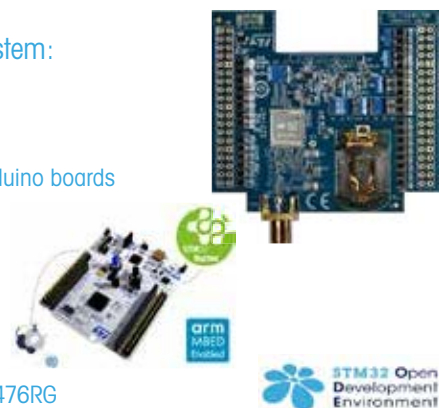
**X-Nucleo-GNSS1A1**  
Teseo-LIV3F and STM32 Nucleo Ecosystem:  
the perfect match.

For development on STM32-based design  
Compatible with STM32 Nucleo boards and Arduino boards

Protocols: NMEA

Interfaces: 1 UART, 1 DDC (I<sup>2</sup>C compliant),  
Digital I/O configurable time-pulse,  
1 EXTINT input for Wake-up.

Supported STM32 Nucleo boards:  
NUCLEO-F401RE, NUCLEO-L073RZ, NUCLEO-L476RG



**EVB-LIV3F**  
TESEO-LIV3F Evaluation starts here.  
Complete, fast and easy.

For evaluation of LIV3F GNSS solution  
Protocols: NMEA

Interfaces: 1 UART, 1 DDC (I<sup>2</sup>C compliant)



**TESEO SUITE**  
Free, Powerful, Easy PC-Windows SW Suite.

For evaluation, development and FW updates.  
View/Record/Playback: NMEA & DEBUG

View Graphics charts: Position / CNO /  
Sky view / Map view / Send Commands

Dedicated panels: Assisted GPS /  
FW configurator TEST plan

Embedded tools: FW Upgrade



## TESEO-LIV3F KEY FEATURES & BENEFITS

- Tiny (9.7 x 10.1 x 2.5mm LCC18 standard package) and easy-to-use standalone GNSS module with integrated 16Mb Flash and multi-constellation world-class GNSS receiver performance
- Integrated flash for data storage and SW execution enabling free FW upgrades, flexibility in configuration, performance improvement, longer lifetime
- Most Powerful ARM9 processor allowing concurrent functions
- High level of integration (GNSS receiver, power supply, flash, crystal oscillator, RTC) enabling cost-competitive solution and top performance with a minimal BOM
- Superior accuracy thanks to its embedded 26-MHz temperature-compensated crystal oscillator (TCXO) and a reduced Time To First Fix (TTFF) relying on its dedicated 32-kHz real-time clock (RTC)
- Pre-Certified RF Module (CE, FCC, IC) simplifies design and drastically reduces time to market and eliminates design risk, accommodating the typically very short IoT design schedules
- Pre-loaded applications: datalogging, geofencing, odometer, enabling several IoT and asset/fleet tracking applications



WHEN YOU'RE CREATING  
ENERGY EFFICIENT DEVICES THAT  
SENSE, CONNECT AND CONTROL

THINK ON



ON Semiconductor®

Our broad portfolio of IoT solutions can help your designs do what they need to do while using minimal power—from image to proximity sensors to battery-free wireless sensors that measure pressure, temperature, moisture, and more. Our market-leading technologies enable ultra-low-power and energy-harvesting applications. And for wireless data connections, we can equip your designs with Bluetooth® low-energy technology. When you think about all the energy efficient IoT possibilities, THINK ON.



## Gemalto Cinterion® Wireless IoT Modules

Secure, Highly Efficient Connectivity  
for Industrial IoT Applications

The booming Internet of Things is revolutionizing the way we work and live! To keep pace with growth and increasing demand for bandwidth, the industry is leveraging highly efficient, IoT-optimized LTE technologies to support billions of new connections.

Gemalto, the global leader in digital security and IoT technology, keeps IoT customers at the leading edge of innovation offering a broad portfolio of IoT connectivity solutions and services designed to meet the unique demands of industrial applications. Our award-winning LTE-M and LTE Cat. 1 Cinterion wireless modules are ideal for IoT applications where safe, reliable, efficient connectivity and longevity are paramount.

### Gemalto Cinterion EMS31 Wireless Module

Highly Efficient LTE-M Connectivity for the Internet of Things

Based on Low Power Wide Area Network (LPWAN) standards, Gemalto's Cinterion EMS31 CAT M1 wireless module optimizes LTE for IoT applications. It delivers highly efficient speeds of up to 300 kbps downlink and 375 kbps uplink plus extended in-building and in-ground coverage (up to 15 db) for smart metering, smart building and healthcare applications. Other features include:

- Optional eSIM integration allows remote subscription management and lifecycle management for improved TCO
- Flexible RF design enables global LTE-M connectivity
- Advanced power management system enabling extremely fast wake-up and extended battery life up to 10+ years
- Extended operating temperature range of -40°C to +85°C with innovative temperature management system
- Secure firmware updates over-the-air (FOTA)



Cinterion IoT Terminal



### Gemalto Cinterion PLS62-W Wireless Module

Global Connectivity with Multi Band LTE Cat 1 and 2G / 3G Fallback

Gemalto's Cinterion PLS62-W wireless module delivers highly efficient Multi Band Cat 1 LTE connectivity with seamless fallback to 3G and 2G for global IoT solutions. Offering extremely optimized speeds of 10Mbit/s downlink and 5Mbit/s uplink, it's ideal for global track and trace, smart metering, and fleet management solutions that require the longevity of LTE networks plus seamless coverage in regions where 4G is still emerging. The PLS62-W comes in three form factors to meet any industrial IoT need: IoT wireless module for bespoke solutions, and terminal or modem card for plug and play simplicity. Other features include:

- A powerful Java™ embedded system to simplify and speed up application development
- Seamless global connectivity with Multi Band LTE, Multi Band 3G HSPA/UMTS and Quad Band GSM
- IoT optimized power management system ensures reliability and advanced sleep mode to extend battery life for 10+ years
- Extended security concept with the latest TLS/SSL engine for secure and reliable TCP/IP connectivity.
- Secure firmware updates over-the-air (FOTA)

Both EMS31 and the PLS62-W come with a suite of Gemalto special features and services that have evolved over 20+ years of experience to help customers in all stages and aspects of implementation: from production, to network troubleshooting, to security and connectivity management. They will also be available in terminal and modem card form factors to quickly and easily add M2M connectivity to smart enterprise applications.

For more information or development kits, contact your local Future Electronics representative.



To buy products or download data, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

# Panasonic

## PAN1762 Series Bluetooth® 5.0 Low Energy RF Module



Introducing Panasonic's NEW PAN1762 Series RF Module!  
The PAN1762 Series is Panasonic's Bluetooth 5.0 Low Energy RF Module based on the Toshiba TC35680 single-chip controller.

The new Bluetooth 5.0 features with the NEW PAN1762 enable a higher symbol rate of 2 Mbps using the high-speed 2M PHY or a significantly longer range using the LE coded PHY at 500 kb/s or 125 kb/s. The new channel selection algorithm improves the performance in environments which are busy at 2.4 GHz. Furthermore, the new LE advertising extensions allow for much larger amounts of data to be broadcast in connectionless scenarios and are therefore favorable for beacon and mesh applications.

The Latest Panasonic's Bluetooth and Wi-Fi Modules



## PAN1760A Series



### PAN1760A Series RF Modules for Advanced Wireless Connectivity

The PAN1760A Series is a groundbreaking low power BLE device, offering years of operation using only a CR2032 Battery for simple, prompt and sound IoT designs. With an ample amount of RAM and embedded flash, as well as simple-to-use programming interface utilizing AT commands, designing the PAN1760A Series into any IoT device is an easy task, saving resources and time to market.

#### FEATURES AND BENEFITS

- Embedded 256kB flash memory and 192kB internal RAM (83kB RAM for user application)
- UART, SPI & I²C interface, PWM output, ADC (both external and internal), programmable I/O
- Standard SIG BLE GATT profiles and services as well as SPPoverBLE profile
- Plug-In for BT SIG Developer Studio
- AT command mode, host mode, or stand-alone mode
- Simultaneous GAP central and peripheral
- Support for over-the-air update
- Support for BT SIG Mesh V1.0

#### APPLICATIONS

- Wireless sensors
- Lighting solutions
- Telemedicine
- Industrial controllers

#### FEATURES AND BENEFITS

- Surface Mount Type Dimensions: 15.6 x 8.7 x 1.9 mm
- Host Mode, AT Command Mode or Stand-Alone Operation Mode
- 18 General Purpose IOs
- 2-SPI, 2-I²C, UART, PWM, Wake-Up Inputs, General Purpose ADC
- Bluetooth Stack In ROM, Flash Memory Available For Application
- 128 kB Flash Memory and 128 kB Internal RAM For Application Code and Data Patches
- Toshiba TC35680 Featuring ARM® Cortex®-M0 (Selectable 16 MHz or 32 MHz Operation Frequency) with SWD Interface

#### APPLICATIONS

- Gaming controls
- Medical
- Monitoring
- Door locks
- Wearable devices



## PAN9420 Series

### PAN9420 Series Fully Embedded Stand-Alone Wi-Fi Module

The PAN9420 is a 2.4GHz 802.11 b/g/n Embedded Wi-Fi Module with integrated stack and API that minimizes firmware development and includes a full security suite. Specifically designed for highly integrated and cost-effective applications, it includes a fully shielded case, integrated crystal oscillators and a chip antenna.

#### FEATURES AND BENEFITS

- Integrated webserver with AJAX/JSON for web applications
- No stack or software implementation needed on a host MCU
- Simultaneous support of access-point and infrastructure mode
- Fully automatic IP configuration
- DHCP server offers IP configuration in AP mode
- Integrated TCP/IP network stack: Ipv4, ARP, and AUTOIP
- Supports TLS/SSL, HTTPS, and WI-FI security (Wpa2) for secure data connection
- Two UART interfaces (command and transparent data)
- Programming via standard JTAG
- Wide temperature ranges of -40°C to +85°C
- Surface mount type (SMT) 29.0 x 13.5 x 2.66mm
- Marvell® 88MW300 MCU/WLAN system-on-chip (SOC) inside

#### APPLICATIONS

- White goods
- Home appliances
- Vending machines

## Connectivity Solutions for IoT Ecosystems



INNOVATOR IN ELECTRONICS

Today, we live in a world of connected devices - where every device, and increasingly everything, is connected. Gadgets around us are constantly collecting, transmitting, and analyzing data.

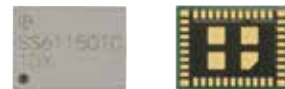
Wireless makes the Internet of Things (IoT) possible and Murata's wireless innovations help to make new IoT products a reality. We are at the forefront of wearable computing, intelligent homes, smart cars, digital health and fitness.

Murata offers a variety of connectivity solutions to meet your needs. Through our Wireless Connectivity Platforms, Murata is continuously innovating the ways to connect and network devices, equipment, and processes.

The Murata Wireless Connectivity Platforms uniquely assist OEM design engineers, applications developers, and/or systems integrators in accelerating development and delivery of public or private cloud networking solutions to consumer, commercial and industrial customers.

Murata's connectivity solutions for IoT are based on the Cypress WICED® architecture. Murata offers high quality, easy-to-use, certified and ultra-small wireless connectivity modules based on Cypress Semiconductor Corporation for minimizing development time and effort. Examples of Murata's Cypress based modules are found below:

**Type 1DX**  
Order Number  
LBEE5KL1DX



### FEATURES

- 2.4GHz WiFi + Bluetooth WiFi and Bluetooth
- Network Topology: AP and STA dual mode
- Chipset: Cypress (CYW4343W)
- Processor: No

The Murata Type 1DX Wi-Fi module, based on the Cypress 4343W chipset, has been incorporated into Future Electronics' recently launched Nebula IoT Development Kit. The board was designed for novices and expert developers looking to explore the vast opportunities in IoT applications such as asset tracking, energy management, fitness, lighting controls, HVAC, portable controls, security and building automation.

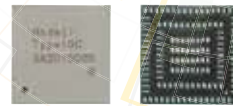
The kit is an IoT cloud-ready board that allows developers to quickly prototype and deploy their IoT ecosystems. Wireless connectivity is supported by the Murata 1DX module, which is powered by the Cypress CYW4343W Wi-Fi and BT/BLE combo SoC. The SoC includes a 2.4 GHz WLAN IEEE 802.11 b/g/n baseband/radio and Bluetooth 4.2 support. In addition, it integrates a high-performance power amplifier (PA), a low-noise amplifier (LNA) for best-in-class receiver sensitivity, and an internal transmit/receive (iTR) RF switch to reduce the overall solution cost and 1DX module size.

The Nebula board supports applications development through the Cypress WICED® (Wireless Internet Connectivity for Embedded Devices) Studio development platform.

It is also equipped with four interfaces to access the STM32F429 peripherals that enable developers to create any IoT application: Arduino™ compatible shield, mikroBUS™ socket, Pmod™ Connector/Interface and USB. In addition, the kit employs easy hardware expandability through a large number of standardized add-on boards. Each one focuses on a different application such as motor control and environmental sensors, including the wireless connectivity to enable IoT development.

Murata's 1DX Wi-Fi and Bluetooth combo module on the Nebula board is also a certified solution designed to fit into small spaces and utilizes minimal external circuitry. The end result allows engineers to overcome design challenges and launch the products that make IoT a reality.

**Type 1FX**  
Order Number  
LBWA1KL1FX



### FEATURES

- 2.4GHz Wi-Fi Module
- Network Topology: AP and STA dual mode
- Chipset: Cypress (CYW43364)
- Processor: No
- Modulation: DSSS / CCK / OFDM

Murata Type 1FX module is an ultra-small module that includes 2.4GHz WLAN functionality. Based on Cypress CYW43364, the module provides high-efficiency RF front end circuits. The module is designed to fit into small spaces and is smaller than a dime. Minimal external circuitry is required to complete a radio design; add an antenna, power source, clocks, processor, and associated interface hardware and the radio hardware design is complete. To ease Wi-Fi certification, the Type 1FX module complies with IEEE 802.11b/g/n. Software is available for Linux and Android.

**Type 1GC**  
Order Number  
LBWA1UZ1GC



### FEATURES

- 4GHz & 5GHz Wi-Fi / dual mode
- Chipset: Cypress (R4 CYW43907)
- Processor: ARM Cortex
- Modulation: DSSS / CCK / OFDM
- Ethernet WiFi and MCU
- Network Topology: AP and STA

Murata Type 1GC Wi-Fi module is an embedded network controller solution for consumer grade applications. It is enabled with Cypress Wireless Internet Connectivity for Embedded Devices (WICED) architecture. They host the Wi-Fi, TCP/IP network stack, security supplicant, and other network application features.

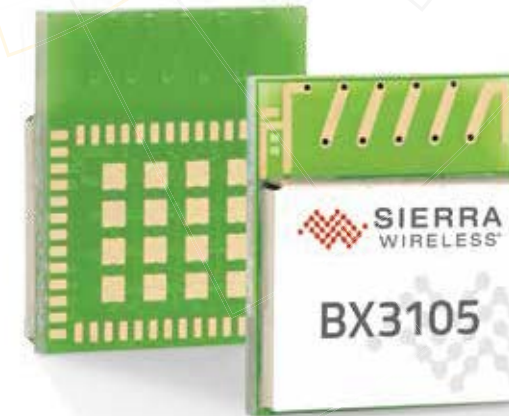


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## Sierra Wireless Embedded IoT Modules — LPWA, 4G LTE, 3G, 2G, Wi-Fi, Bluetooth & GNSS Technologies



### Wi-Fi and Bluetooth Combo Module — BX3105

**Secure, Certified Short Range Connectivity With Integrated Antenna**

The BX3105 Wi-Fi and Bluetooth 4.2 pre-certified module offers simple and fast integration with free unlimited FOTA and built-in cloud connectivity from AirVantage®, ideal for quickly and cost effectively adding wireless communication.

This module supports 802.11 b/g/n and dual-mode Bluetooth Classic and Bluetooth Low Energy (BLE), connecting industrial applications requiring a secure connection to Wi-Fi and Bluetooth on a single module.

Designed in an industrial-grade common flexible form factor (CF3®), BX3105 enables system integrators to build their devices on the most scalable module platform in the world.



### Low-Power Wide-Area (LPWA) Module — WP7700

**Offering LTE-M/NB-IoT Connectivity For Any Cellular Network in the World**

The WP7700 module for Cat-M1/NB1 worldwide networks is fully compliant with the 3GPP Release 13 standard, providing a new low-cost, low-power technology for low-bandwidth IoT applications with extended reach beyond traditional cellular.

Delivering up to 300Kbps download speed and 375Kbps upload speed, this module is ideal for real-time fixed or mobile applications such as consumer wearables, health monitoring devices, tracking devices, and smart home and smart city devices to name a few.

Design now with 4G LTE-M1/NB1 modules in the CF3® form factor and scale to 3G or 4G networks in the future as the application evolves.

For more information or to buy products, go to [www.FutureElectronics.com/m/sierra-wireless](http://www.FutureElectronics.com/m/sierra-wireless)





## Laird Connectivity, No Matter What

Laird Connectivity simplifies the enablement of wireless technologies with market-leading wireless modules and antennas, integrated sensor and gateway platforms, and customer-specific wireless solutions. Our best-in-class support and comprehensive engineering services help reduce risk and improve time-to-market. When you need unmatched wireless performance to connect electronics with security and confidence, Laird Connectivity delivers — no matter what.



### STERLING LWB

Laird's Sterling-LWB™ 2.4 GHz Wi-Fi® and Bluetooth® Smart Ready Multi-Standard Module provides your customers with more options, more certifications and a greater variety of antenna options.

#### PRACTICAL APPLICATIONS

- Security & building automation
- Internet of Things/M2M connectivity
- Smart gateways

#### FEATURES

- Delivers IEEE 802.11 b/g/n, BT 2.1+EDR, and BLE 4.2 wireless connectivity
- Based on next-generation silicon from Cypress (CYW4343W)
- Three configuration options available:
  - SiP Module (10 x 10 x 1.2mm)
  - Module with chip antenna (15.5 x 21 x 2mm)
  - Module with External U.FL antenna port (15.5 x 21 x 2mm)
- Sterling-LWB for WICED reference platform also available



### STERLING LWB-5

Laird's Sterling-LWB5 dual-band Wi-Fi, Bluetooth® Smart, and Bluetooth® Smart Ready module offers significant value to developers by providing an unmatched breadth of options, certifications, and antenna options.

#### PRACTICAL APPLICATIONS

- Security & building automation
- Internet of Things/M2M connectivity
- Telematics
- Smart gateways

#### FEATURES

- Delivers IEEE 802.11 ac/a/b/g/n, BT 2.1+EDR, and BLE 4.2 wireless connectivity
- Provides 802.11ac for high-speed data applications in the 5 GHz band
- Based on next-generation silicon from Cypress (CYW43353)
- Three configuration options available:
  - SiP Module (10 x 10 x 1.6mm)
  - Module with chip antenna (21 x 15.5 x 2.3mm)
  - Module with external U.FL antenna port (21 x 15.5 x 2.3mm)



### BT850-SA – INTEGRATED ANTENNA BT850-ST – EXTERNAL ANTENNA

The BT850 modules are ideal when designers need both performance and minimum size. For maximum flexibility in integration, they support a host USB interface, I2S and PCM audio interfaces, GPIO, and Cypress' GCI coexistence (2-Wire).

#### APPLICATIONS

- Bluetooth v4.2 – Dual Mode – BR / EDR / LE – Classic Bluetooth and Bluetooth Low Energy (BLE)
- Compact Footprint – As small as 8.5 x 12.85mm
- Class 1 Output – up to 8 dBm

#### FEATURES

- Support for Windows/Linux/Android via USB interface, plus external USB pluggable adapter variant
- Class I +8dBm output power in an 8.5 x 12.85mm package means no need to compromise one for the other
- Wide array of Operating System support, as well as embedded MCU support for Searan's flexible DotStack platform give you even more design choices
- Industry-recognized integration and support organization dedicated to reducing your time to market



### BT860-SA – INTEGRATED ANTENNA BT860-ST – EXTERNAL ANTENNA

The BT860 modules are ideal when designers need both performance and minimum size. For maximum flexibility in integration, they support a host UART interface, I2S and PCM audio interfaces, GPIO, and Cypress' GCI coexistence (2-Wire).

#### APPLICATIONS

- Bluetooth v4.2 – Dual Mode – BR / EDR / LE – Classic Bluetooth and Bluetooth Low Energy (BLE)
- Compact Footprint – As small as 8.5 x 12.85mm
- Class 1 Output – up to 8 dBm

#### FEATURES

- Class I +8dBm output power in an 8.5 x 12.85mm package means no need to compromise one for the other
- Wide array of Operating System support, as well as embedded MCU support for Searan's flexible Dot Stack platform give you even more design choices
- Certifications and approvals for FCC (USA), IC (Canada), ETSI (Europe), Giteki (Japan), RCM (AUS/NZ), Bluetooth SIG
- Industry-recognized integration and support organization dedicated to reducing your time to market



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## SX1261 Long Range Low Power LoRa® RF Transceiver +15dBm, Global Frequency Coverage



**SX1261, SX1262 and SX1268 sub-GHz radio transceivers are ideal for long range wireless applications. Both devices are designed for long battery life with just 4.2 mA of active receive current consumption. The SX1261 can transmit up to +15 dBm and the SX1262 and SX1268 can transmit up to +22 dBm with highly efficient integrated power amplifiers.**

These devices support LoRa modulation for LPWAN use cases and (G)FSK modulation for legacy use cases. The devices are highly configurable to meet different application requirements utilizing the global LoRaWAN™ standard or proprietary protocols.

The devices are designed to comply with the physical layer requirements of the LoRaWAN specification released by the LoRa Alliance™.

The radio is suitable for systems targeting compliance with radio regulations including but not limited to ETSI EN 300 220, FCC CFR 47 Part 15, China regulatory requirements and the Japanese ARIB T-108. Continuous frequency coverage from 150 MHz to 960 MHz allows the support of all major sub-GHz ISM bands around the world.

#### FEATURES

- LoRa and FSK modem
- 170dB maximum link budget (SX1262/68)
- +22 dBm or +15 dBm high efficiency PA
- Low RX current of 4.6mA
- Integrated DC/DC converter and LDO
- Programmable bit rate up to 62.5kbps LoRa and 300kbps FSK
- High sensitivity: down to -148dBm
- 88dB blocking immunity at 1MHz offset
- Co-channel rejection of 19dB in LoRa mode
- FSK, GFSK, MSK, GMSK and LoRa modulation
- Built-in bit synchronizer for clock recovery
- Automatic Channel Activity Detection (CAD) with ultra-fast AFC

#### APPLICATIONS

The level of integration and the low consumption within SX1261/2 enable a new generation of Internet of Things applications.

- Smart meters
- Supply chain and logistics
- Building automation
- Agricultural sensors
- Smart cities
- Retail store sensors
- Asset tracking street lights
- Parking sensors
- Environmental sensors
- Healthcare
- Safety and security sensors
- Remote control applications

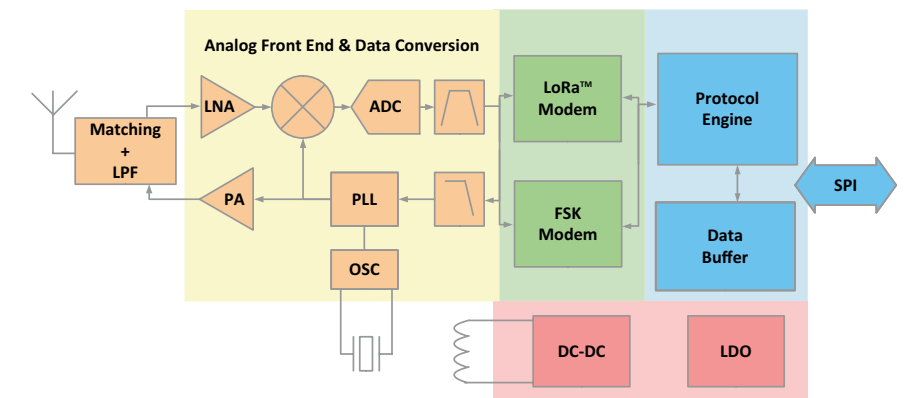


Figure A: SX1261/2 Block Diagram



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## Accurate Relative Humidity and Temperature Sensor IC Ideal for Space- and Power-Constrained Designs



**ams**

The ENS210 from ams is a single-die sensor IC providing extremely accurate, pre-calibrated measurements of relative humidity and ambient temperature.

The ENS210 provides a digital temperature output in Kelvin, accurate to a maximum  $\pm 0.2^\circ\text{C}$  over the range  $0^\circ\text{C}$  to  $70^\circ\text{C}$ . It also provides relative humidity measurements as a digital output accurate to a maximum  $\pm 3.5\%$ . Shipped to customers as a calibrated unit, the sensor requires no trimming on the production line. It provides its digital outputs over an I<sup>2</sup>C interface,

eliminating the need for signal processing by the host device's applications processor or microcontroller.

Housed in a moulded plastic surface-mount package measuring just 2 x 2 x 0.75mm, the ENS210 is small enough to be accommodated in mobile and wearable devices, such as fitness monitoring wristbands.

Drawing just 40nA in stand-by mode and 7.1 $\mu$ A in active measurement mode (sampling at 1Hz), the ENS210 drains very little energy from the battery in portable applications. It operates from a wide input-voltage range of 1.71V to 3.6V, which means that systems with a dual 1.8V/3.3V power supply need no additional level-shifting voltage regulator at the point of load.

In home and building automation systems, the ENS210 readings of relative humidity and temperature may be used in combination with ams CCS811 or CCS801 gas sensor for accurate assessment of the quality of the indoor environment. The ENS210 may also be combined with smart LED lighting solutions from ams, such as the AS7225 Smart Lighting Director, as part of an IoT sensor hub.

### FEATURES

- 4s response time for relative humidity measurements
- 1s response time for temperature measurements
- Excellent long-term stability
- May be combined with ams gas sensors for air-quality monitoring
- Optional sensor fusion software

### APPLICATIONS

- Mobile and wearable devices
- Thermostats
- Air conditioning systems and air purifiers
- Home appliances such as
  - Refrigerators
  - Clothes dryers
  - Microwave ovens
  - Kitchen air extractors
- Monitor of controlled industrial and medical environments
- Paediatric incubators
- Weather stations

## Sensor-Driven System-on-Chip to Speed Adoption of Variable-CCT and Daylight-Responsive LED Lighting

ams has introduced the AS7225 smart system-on-chip sensor for tunable white lighting, based on ams technology for closed-loop CCT tuning and daylight compensation.

Interfacing to an existing host microprocessor in a smart lighting design, the AS7225 enables lighting OEMs to benefit from higher precision, more flexible LED binning and lower system costs for tunable white lighting systems.

The AS7225 is equipped with an industry-first embedded tri-stimulus CIE XYZ color sensor to enable precise color sensing with direct mapping to the International Commission on Illumination (CIE) 1931 color space, which is recognized as the standard co-ordinate definition for human perception of color. CCT and daylighting tuning directives, or instructions, are communicated to the host processor via an industry-standard I<sup>2</sup>C interface.

The AS7225 is supplied in a 20-pin LGA package measuring 4.5 x 4.7 x 2.5mm. The package has an aperture offering a  $\pm 20.5^\circ$  field of view. It allows for flexible

integration into luminaires, light engines and larger replacement lamps, such as LED linear T-LED products.

Facing inward toward the light source, the device provides precise CCT tuning by balancing the output from configured warm and cool white LED strings in a luminaire. Facing outward, the AS7225 can be used in luminaire designs to provide precise daylight management. It can also provide combined CCT-tuning and daylighting directives with the addition of an ams TSL4531 ambient light sensor.

Also in the ams family of Cognitive Lighting products is the AS7221, a networking-enabled IoT Smart Lighting Manager with the same tri-stimulus color sensor. IoT luminaire control is performed through a network connection, or by direct connection to 0V to 10V dimmers, with control outputs that include a direct PWM channel to LED drivers, and analog 0V to 10V signals to dimming ballasts.

A simple text-based Smart Lighting Command Set and serial UART interface enable easy integration with standard network clients.



### FEATURES

- Comprehensive register-driven command set enabling complete sensor control plus management of precision tuning directives
- Readable registers for CIE 1931 and CIE 1975 color-point coordinates, CCT, du'v' and lux
- Simple register-based commands to control and configure key light-tuning supervisory functions
- Calibrated nano-optic silicon interference filters

### APPLICATIONS

- Tunable white LED lighting



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**Melexis**

INSPIRED ENGINEERING

MLX90632

SURFACE MOUNT

MINIATURE INFRARED (IR) THERMOMETER IC



Pit viper snakes have a cool heat sensing system to find prey in the dark. The pit is a special organ that senses body heat from animals and gives an infrared heat vision which accurately judges distance and size.

## ROBUST TEMPERATURE SENSING WHEN SIZE REALLY MATTERS

MLX90632

MLX90632 is a miniature SMD thermometer IC for accurate non-contact temperature measurement, especially in thermally dynamic environments and when available space is limited. Primary applications for this device can be found in server rooms, white and gray goods, room temperature monitoring in smart thermostats or integration into portable electronic devices such as tablets and smartphones.

### KEY FEATURES

- ✓ Accurate and stable operation in thermally challenging environments
- ✓ 3x3x1mm QFN package, eliminating the need for bulky TO-can packages
- ✓ Factory calibrated with I<sup>2</sup>C digital interface, 50° field of view
- ✓ Object temperatures between  $-20^\circ\text{C}$  and  $200^\circ\text{C}$  within  $-20^\circ\text{C}$  to  $85^\circ\text{C}$  operational temperature range can be measured
- ✓ Typical target object temperature accuracy of  $\pm 1^\circ\text{C}$  can be obtained



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# FUTURE ELECTRONICS

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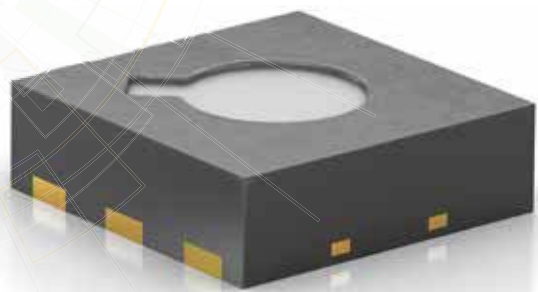
offering unparalleled  
flexibility and support

## COMPREHENSIVE DESIGN SUPPORT

leveraging factory-level  
engineers and Global  
Design Centers



## Air Quality Sensor: Sensirion SGP30



**SENSIRION**  
THE SENSOR COMPANY

The SGP30 air quality sensor offers a complete sensor system integrated into a very small 2.45 x 2.45 x 0.9mm<sup>3</sup> DFN package featuring an I<sup>2</sup>C interface and fully calibrated air quality output signals. Sensirion's MOXSens<sup>®</sup> Technology enables highly sensitive and reliable measurements of typical indoor chemical pollutants like volatile organic compounds (VOC's). Higher concentrations of these pollutants affect humans negatively causing irritation in skin, eyes and nose, headaches, reduced cognitive abilities and respiratory issues<sup>1,2</sup>.

The SGP further combines multiple metal-oxide (MOX) sensing elements on one chip to provide additional air quality signals such as equivalent CO<sub>2</sub> using the Hydrogen signal from the sensor<sup>3</sup>. The SGP30 enables easy and quick integration of the sensor with in-built digital signal processing, I<sup>2</sup>C interface and lowers total cost of implementation. Thanks to Sensirion's dynamic baseline compensation algorithms and on-chip calibration along with humidity compensation, the sensor is able to read out accurate air quality measurements (Figure 1).

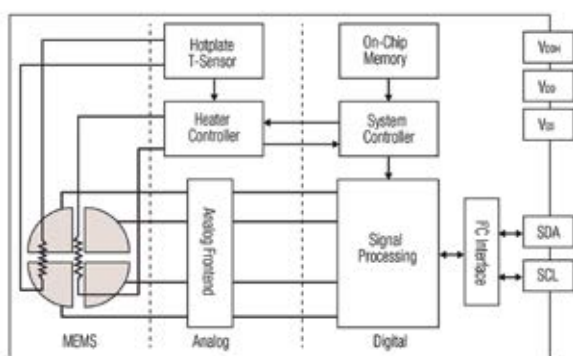


Figure 1: Block diagram of SGP30 (Source: Sensirion)

Traditional metal-oxide gas sensors suffer from poor long-term stability caused by irreversible contamination from siloxanes. This contamination results in significant loss of VOC sensitivity as well as a detrimental increase of response time. Sensirion's proprietary MOXSens<sup>®</sup> Technology provides the SGP30 with unmatched robustness against siloxanes, resulting in unique long-term stability and accuracy (Figure 2).

### FEATURES

- Multi-pixel air quality sensor
- Humidity compensation
- Outstanding long-term stability
- TVOC and CO<sub>2</sub>eq outputs
- Fully calibrated air quality signals



Figure 2: Testing long-term stability of MOX Sensors (Source: Sensirion)

### APPLICATIONS

- Smart home devices/thermostats
- Air purifiers
- Mobile phones
- Air conditioners
- Indoor air quality monitors
- Cold chain/dataloggers

More information about the SGP30: [www.sensirion.com/sgp](http://www.sensirion.com/sgp)

## Start Developing with Sensirion's Environmental Sensing Shield

The Environmental Sensing Shield (ESS) is a sensor shield that features Sensirion's SHTC1 humidity and temperature sensor along with the SGP30 air quality sensor. It uses the popular Arduino footprint, which has been adopted by many reference designs and development kits. Sensirion is offering sample code for a number of platforms, including Future Electronics' Nebula IoT reference design board.



<sup>1</sup> Allen et al., Environ. Health Perspect. 124, 805 (2015)  
<sup>2</sup> Kjaergaard et al. Atmosph. Environ. 25a, 1417 (1991)  
<sup>3</sup> Tadesse et al., J. Exp. Phys. 65, 85 (1980)

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# Sensing Solutions for a Connected World



Leveraging more than 20 years of industry expertise, IDT provides advanced sensing technologies that enable our customers to build best-in-class sensor solutions. With a broad portfolio of environmental and automotive sensor ICs, IDT delivers unique, differentiated sensor solutions – such as SensorShare<sup>™</sup> technology which connects IDT's array of environmental sensor solutions with a central hub designed to measure, monitor and sense smart home and industrial end applications.

### Sensor Portfolios and Tools

Sensor Product	Description
<b>FS2012, FS10xx Flow Sensors</b>	Liquid or gas mass flow sensor modules with calibrated or uncalibrated output options
<b>ZMOD4410 Gas Sensor</b>	Digital air quality sensor platform
<b>SGAS70x Gas Sensors</b>	Hydrogen, organic chemical and flammable gas detection sensors
<b>HS300x Relative Humidity Sensors</b>	High-performance relative humidity and temperature sensors with ±1.5% to ±3.8%RH accuracy options
<b>ZMID520x Position Sensors</b>	Contactless inductive position sensors with rotary, linear, and arc motion module options
<b>ZSC310x SSCs</b>	Resistive and capacitive Sensor Signal Conditioner ICs with multiple output options
<b>ZSC31x/41x Automotive SSCs</b>	AEC-Q100 Sensor Signal Conditioner ICs
<b>SDAWIRO3</b>	SensorShare <sup>™</sup> wireless flow rate, humidity and temperature sensing development kit
<b>ZMID5201STKIT</b>	Inductive position sensing starter kit with arc, rotary, and linear modules

For more information or to buy products, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

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# Opto Appleseed

**Optoelectronics**  
Bright Ideas, Stellar Products

When we bring out a new product we have targeted applications in mind. But, optoelectronic products find their way into applications we never imagined. Vishay's broad Opto portfolio allows you to explore applications that sense, protect, power, and measure. Here is a small sample of some Opto seeds. Plant your own. What grows is totally up to you.

## Lighting Control

Ambient Light Sensors

VEML6030 • VEML7700



## Industrial

PIN Photodiodes

VEMD5110X01 • VEMD6110X01



## Pulse Oximetry

LEDs and Photodiodes

VLMTG1400 • VEMD8080 



## Automotive

Turning Knobs

TCUT1350X01 • TCUT1630X01



## Consumer Goods

Object Detection

VCNL36687S • VCNL4030X01



## Motion Control

Gesture Sensor

VCNL4035X01 • VSMY2940RGX01



## Security Camera


Nighttime Illumination

VSMY98545DS • VSMY98545ADS



## Electric Vehicles

Creepage  $\geq 5$  mm

VOMA617A 



## Solenoid Valves

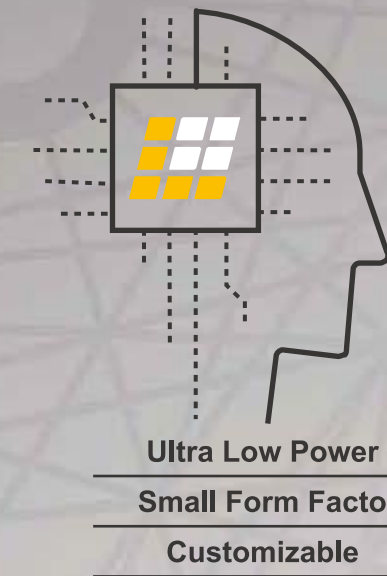
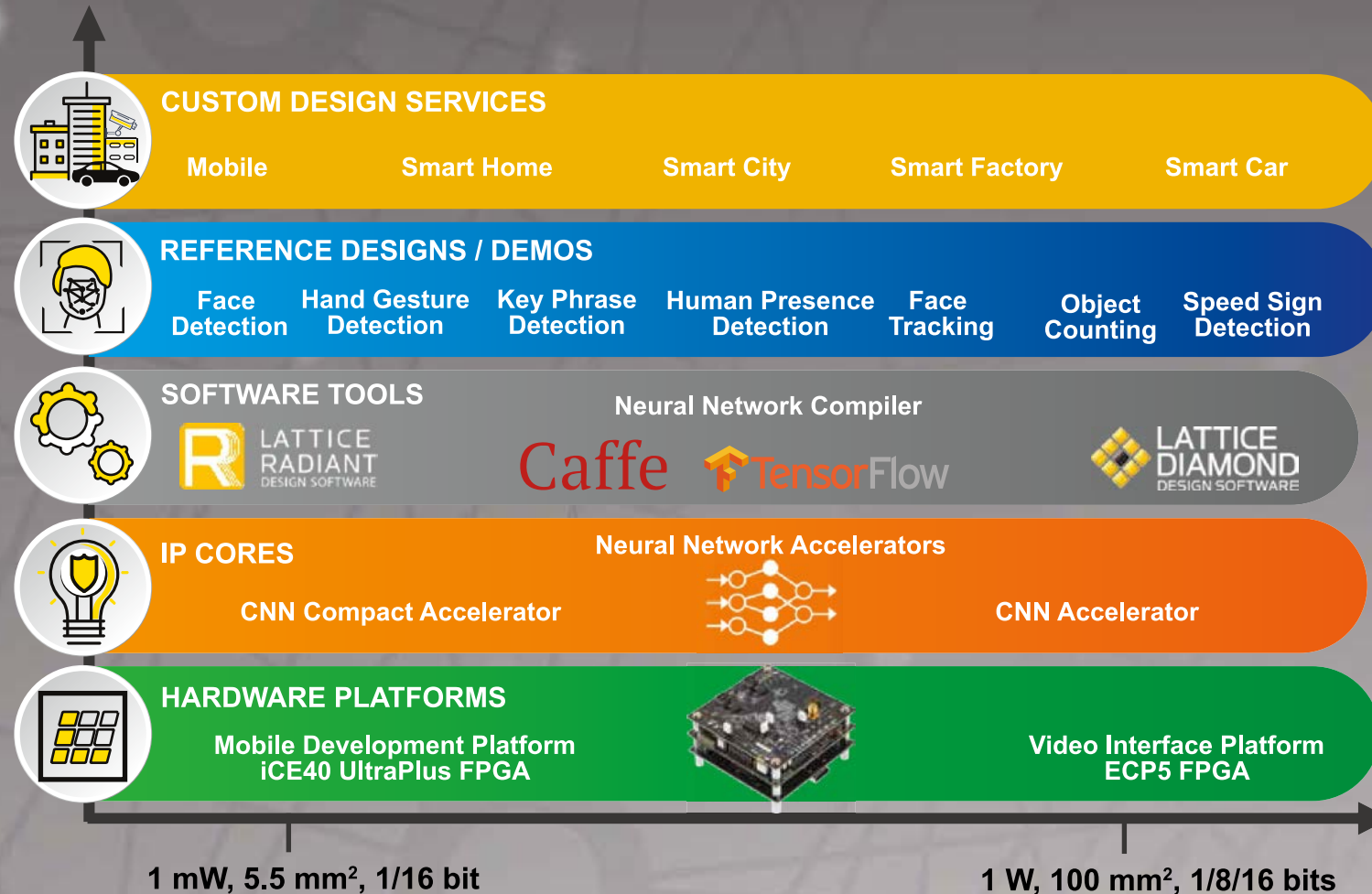
Isolation + Switching

IL4108 • VOM3052



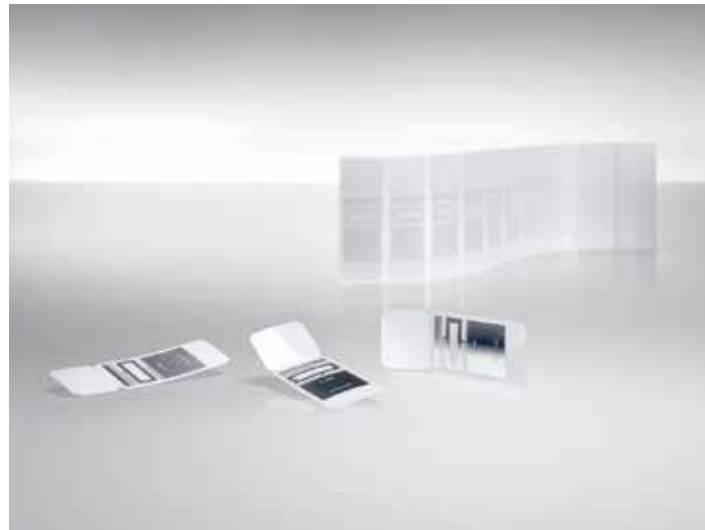
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# LATTICE sensAI™



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Smartrac Midas FlagTag



**Innovative Design for Best-in-Class Performance**

Midas FlagTag has a small form factor with a total size of 60 x 21mm when used as a standard flat paper tag. As a special feature, a flag can be created at the end of tag with a final paper tag size of 43 x 21mm after folding, and with an exposed area of 17 x 21 mm. The folded part of the tag sticks out of the metal resembling a flag, and the attached antenna part uses the metal surface as part of the antenna structure to increase the performance of the tag. Read distances of more than 10 meters can be achieved, depending on the geometry and size of the metal object. The tags are compatible with RFID printers for easy printing and encoding.

**A Smart Concept Turned Into a Convincing Product**

"Midas FlagTag is a bright example of what Smartrac's success is built upon: a smart concept turned into a truly innovative, convincing product that expands the scope of RFID technology. Working extremely well on metallic packaging and liquids containers, Midas FlagTag literally has the 'Midas Touch' and, moreover, fits perfectly into our IoT solutions portfolio. These aspects make us believe that Midas FlagTag will have considerable impact on the market", says Hal Hikita, SVP of Product Management Inlays & Tags at Smartrac.



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**SMARTRAC**  
connect things

**Cost-Efficient High-Performance Tag for Metallic Surfaces and Everyday Objects**

Smartrac's unique Midas FlagTag design uses the metallic surface as part of the antenna structure. This ensures superior performance in less demanding physical environments, while providing cost advantages compared to foam-based inlays and hard tags typically designed for use on surfaces in tougher industrial environments.

Until now, tagging metallic packaging and liquids has presented a challenge in many applications. Midas FlagTag can solve this issue in high-performance and cost-effective ways. It is the on-metal first choice solution for authentication of retail, pharma, healthcare or industrial items, as well as supply chain and asset management applications.



Midas FlagTag features an Impinj Monza R6 IC and utilizes RAIN RFID technology, based on the UHF RFID protocol standard developed by GS1 and ISO. Additionally, the tags are suitable for full IoT integration into Smartrac's enablement platform Smart Cosmos.

# ENABLING THE ELECTRONICS REVOLUTION

Amphenol ICC is a world leader providing interconnect solutions for the Information, Communications and Commercial electronics markets.



Industrial



Automotive



Mobile Networks



IT & Data Communications

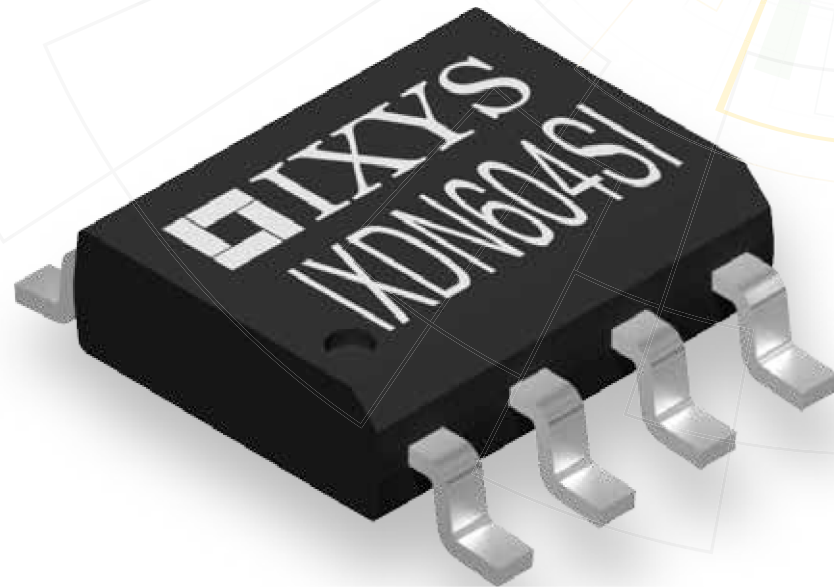


IOT & Electronics

**Amphenol ICC**

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IXYS IX Gate Driver ICs



Low-Side Gate Drivers Operate Over a Wide Input-Voltage Range

IXYS Integrated Circuits Division supplies a family of low-side gate drivers for MOSFETs and IGBTs which offers a mix of logic configurations, packaging and drive-current capabilities.

Handling input voltages up to 35V, the IX family devices are well suited to the gate-driver requirements of wide-bandgap silicon carbide (SiC) MOSFETs, which are becoming increasingly popular in applications that need very high efficiency, high switching speed or high-temperature capability.

The IX single-output and dual-output low-side driver ICs include selectable options for various logic combinations. The range of peak-current ratings extends up to 30A maximum. This is the highest peak drive current capability of any integrated driver on the market.

In all these driver devices, internal circuitry eliminates cross conduction and current shoot-through, and the driver is almost immune to latch up.

Some of the IXYS IX gate drivers are AEC-Q100 qualified for use in automotive applications. They are:

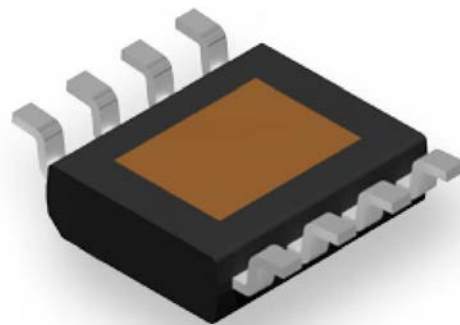
- IXDx604SI and IXDx604SIA 4A dual low-side gate drivers
- IXDx609SI 9A low-side gate driver
- IXDx614SI 14A low-side gate driver

FEATURES

- Operating-voltage range: 4.5V to 35V
- Operating temperature range: -40°C to 125°C
- Logic inputs withstand negative swing of up to 5V
- Low propagation delay time
- Low output impedance

APPLICATIONS

- Automotive systems
- Industrial equipment
- Home appliances



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# 3<sup>rd</sup> GENERATION SiC MOSFETS

ROHM, a pioneer in SiC development, was the first to successfully mass produce SiC MOSFETs in 2010 and continues to lead the industry in developing products that aim for further reductions in power loss. ROHM Semiconductor has now added 3<sup>rd</sup> Gen SiC MOSFETs, SiC Schottky Barrier Diodes (SBDs), and SiC modules to its market-proven SiC lineup. These new devices successfully address the needs of efficient power delivery and are key solutions for reducing loss during power conversion.

As the performance and characteristics of silicon approach their theoretical limits, ROHM from early on has focused on SiC as a viable successor to silicon as a semiconductor material due to its higher voltage resistance and lower loss (higher efficiency). ROHM's latest offering, a SiC MOSFET featuring a trench structure that maximizes SiC characteristics, represents a groundbreaking milestone with significant implications worldwide.

Optimum performance is achieved by combining exceedingly low loss with high-speed switching performance. As a result, efficiency during power conversion is

improved and waste eliminated during production, contributing to increased miniaturization, lighter weight, and greater energy savings in a variety of equipment.

Although adopting a trench construction in SiC MOSFETs has been attracting increased attention due to its effectiveness in reducing ON resistance, there is a need to establish a structure for mitigating the electric field generated in the trench gate portion in order to guarantee long-term reliability. ROHM was able to meet this need and successfully mass-produce the industry's first trench-type SiC MOSFETs by utilizing a proprietary structure. As a result, switching performance is improved (approx. 35% lower input capacitance) and ON resistance reduced by 50% over conventional planar-type SiC MOSFETs.

ROHM has also developed a full SiC power module that incorporates these latest trench-type SiC MOSFETs in a 2-in-1 circuit with integrated SiC SBDs. This 1200V/180A module features the same rated current as SiC IGBT modules while reducing switching loss by approximately 42% vs. planar-type SiC MOSFETs.

FEATURES

- Low ON resistance
- Fast switching speed
- No intrinsic body diode degradation
- Ultra-fast body diode
- Negative gate voltage not required to Turn OFF

APPLICATIONS

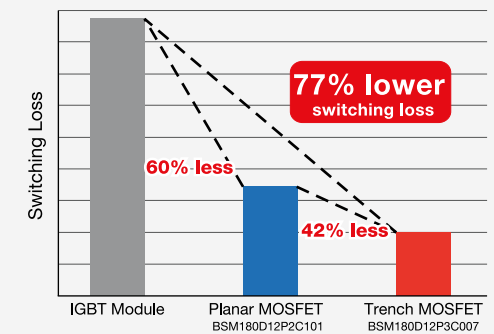
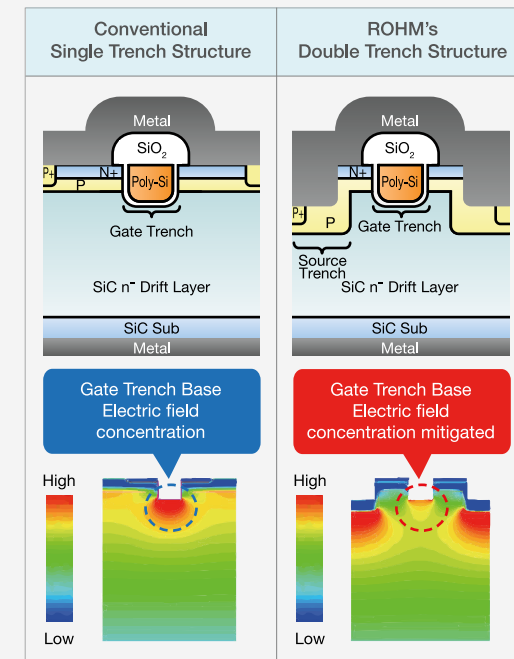
- Consumer PV and energy storage systems
- Industrial power supplies
- Inverters/converters
- Power conditioners
- EV chargers

ROHM 3<sup>rd</sup> Gen Trench-Type SiC MOSFET Lineup

Part Number	Description
SCT3022ALGC11	SiC Nch 650V 93A 22mΩ TrenchMOS
SCT3030ALGC11	SiC Nch 650V 70A 30mΩ TrenchMOS
SCT3030KLG11	SiC Nch 1200V 72A 30mΩ TrenchMOS
SCT3040KLG11	SiC Nch 1200V 55A 40mΩ TrenchMOS
SCT3060ALGC11	SiC Nch 650V 39A 60mΩ TrenchMOS
SCT3080ALGC11	SiC Nch 650V 30A 80mΩ TrenchMOS
SCT3080KLG11	SiC Nch 1200V 31A 80mΩ TrenchMOS
SCT3120ALGC11	SiC Nch 650V 21A 120mΩ TrenchMOS
SCT3160KLG11	SiC Nch 1200V 17A 160mΩ TrenchMOS



ROHM 3<sup>rd</sup> Gen Trench-Type SiC MOSFET Comparison

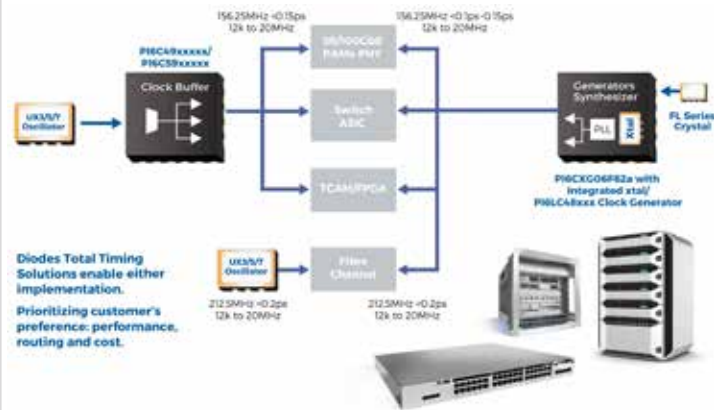


Device	2 <sup>nd</sup> Generation		3 <sup>rd</sup> Generation	
	SCT2080KE	SCT3040KL	SCT2080KE	SCT3040KL
Package	TO-247	TO-247		
T <sub>J</sub> MAX	175°C	175°C		
P <sub>D</sub> T <sub>c</sub> = 25°C	262W	262W		
I <sub>D</sub> T <sub>c</sub> = 25°C	40A	55A		
r <sub>DS(on)</sub>	T <sub>J</sub> = 25°C	80mΩ	40mΩ	
	T <sub>J</sub> = 125°C	125mΩ	62mΩ	
E <sub>ON</sub>	V <sub>DD</sub> = 800V	760μJ	550μJ	
E <sub>OFF</sub>	I <sub>D</sub> = 20A	120μJ	90μJ	
C <sub>ISS</sub> /C <sub>OSS</sub> /C <sub>RSS</sub>	2080/77/16 (pF)	1337/76/27 (pF)		
Q <sub>g</sub>	106nC	107nC		

Diodes' Timing Solutions: Total Timing for Latest Ethernet Systems



Diodes Incorporated's total timing portfolio enables optimized designs for your Ethernet designs. Our portfolio of crystals, oscillators, clock generators and clock buffers allows for customized combinations to achieve your design priorities.



Diodes Total Timing Solutions enable either implementation. Prioritizing customer's preference: performance, routing and cost.

Oscillators: A good clock source enables a much easier design.

OSCILLATOR FEATURES

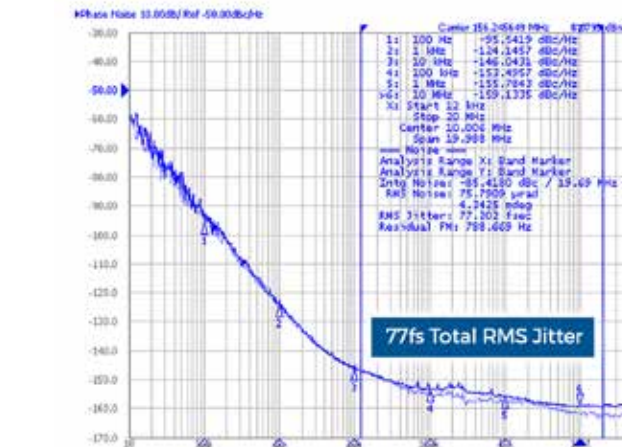
- Ultra low jitter ~0.1ps
- Industry-standard footprint for compatibility
- Extended temperature range support (up to +125°C)

MPN	Output Type	Jitter	Package Size
UX31F6201Z	LVC MOS	0.1ps	3.2x 2.5mm
UX31F6203Z	LVC MOS	0.15ps	3.2x 2.5mm
UX54F62001	HCSL	0.11ps	5.0 x 3.2mm
UX52F62008	LVPECL	0.15ps	5.0 x 3.2mm

Clock Buffers: Very low additive jitter to provide added design margin and improved system performance.

CLOCK BUFFER FEATURES

- Ultra low additive jitter ~10fs, total overall jitter <100fs: providing ample margins for your designs
- High frequency supported <3GHz: providing wide range of use cases
- Fast rise and fall times support latest chipset requirements



MPN	Output Type	# of Outputs
PI6C5912016ZDIEIX	LVPECL	16
PI6C49S1510AZDIEIX	Selectable	10
PI6C49S1506FAIEIX	Selectable	6
PI6C5913004ZHIEX	LVPECL	4
PI6C5922504ZHIEX	LVDS	4

Clock Generators:

CLOCK GENERATOR FEATURES

- Low source jitter <100fs: providing multiple copies of low jitter clocking to your system
- Multiple output frequency or output type selection: enabling design flexibility and wide ranging support

MPN	Output Type	# of Outputs
PI6CXG06F62AFBEIEX	Selectable	6
PI6LC48S25AZBBIEX	Selectable	11

A suggested crystal for use with clock generators.

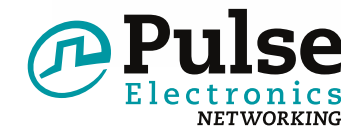
LARGE CRYSTAL PORTFOLIO FEATURES

- Wide range of frequencies
- Large selection of industry-standard footprint for compatibility
- Extended temperature range support (up to +125°C)

MPN	Frequency
FL2500316Z	25MHz



2.5GBase-T and 5GBase-T Ethernet – IEEE 802.3bz



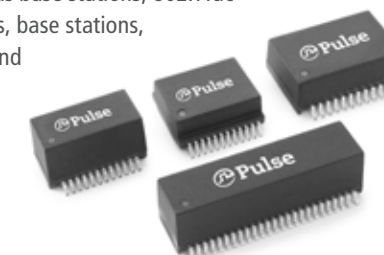
Pulse Electronics new line of 2.5GBASE-T and 5GBASE-T Ethernet connector modules and Ethernet magnetics are designed to support 4P PoE connections up to 100W for various Ethernet applications requiring increased bandwidth.

Pulse worked closely with the IEEE802.3bz committee and leading PHY suppliers to develop the standard for 2.5GBASE-T and 5GBASE-T Ethernet. Pulse offers a broad portfolio of 2.5G/5GBASE-T components and continues to expand the product offering.

The 2.5G/5GBASE-T Ethernet connector modules and Ethernet magnetics are produced to meet IEEE802.3bz standards for 2.5G/5GBase-T to increase speeds and reliability. These components are compatible with major PHY suppliers.

Pulse Electronics offers multiple packaging and extended temperature options.

These parts are suited for applications that require higher bandwidth and PoE++ functionality such as base stations, 802.11ac access points, routers, switches, base stations, security cameras, thin clients and video displays.



KEY FEATURES

Pulse Electronics Networking BU's 2.5G/5GBASE-T Ethernet connector modules and Ethernet magnetics were designed to meet a wide range of needs for various applications.

Some of the key features of our Ethernet connector modules and Ethernet magnetics:

- Designed to meet IEEE802.3bz for 2.5GBASE-T and 5GBASE-T
- Compatible with all Major PHYs
- 4P PoE up to 100W
- Available in -40°C to +85°C operating temperature
- Multiple package options available, including Single, Dual, Quad, 1x1, 1xN, & 2xN
- Tuned to maximize EMI performance
- Industry Standard Footprints
- Custom products available



APPLICATIONS

The 2.5GBASE-T and 5GBASE-T Ethernet connector modules and Ethernet magnetics are ideally suited for the following applications:

- Access points
- Routers
- Gateways
- Thin clients
- Switches
- Base stations
- Video displays
- Security cameras





DEUTSCH Connectors

TE Connectivity's DEUTSCH industrial environmentally sealed electrical connectors are heavy-duty connectors designed to withstand dirt, moisture, salt spray, and rough terrain.

DEUTSCH connectors are constructed of rugged thermoplastic or durable aluminum and feature silicone seals and grommets that help prevent contamination. The connectors are available in rectangular and cylindrical body shapes and accommodate wire gauges from 4AWG to 22AWG (25mm<sup>2</sup> - 0.35mm<sup>2</sup>).

DEUTSCH connectors are offered in cavity arrangements from 1 to 128 and with in-line, flange, and PCB mount options. The connectors utilize contacts that can be used interchangeably across several DEUTSCH connector product lines, which helps improve performance, reliability, and maintainability

by reducing changes in the assembly of the wire harness. Several accessory items are also available to meet specific design requirements, including boots, gaskets, backshells, wire routers, and mounting clips.

TE Connectivity's DEUTSCH industrial environmentally sealed electrical connectors are designed for harsh environments and critical applications where dirt, moisture, salt spray, and rough terrain can contaminate or damage electrical connections. DEUTSCH connectors feature environmental seals, multi-pin arrangements, a common contact system, quick disconnect coupling, and internal retention systems.



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Kingston Embedded and Design-In SSD Products

As the world's largest independent manufacturer of memory product, Kingston Technology offers a wide variety of memory products to industrial and embedded OEM customers of all sizes globally. Our reliable and exceptional customer service brings great value to our customers.

Embedded Products

Kingston® offers a variety of embedded memory products, including eMMC, eMCP, ePoP and DRAM components, to customers worldwide. These products are ideal memory and storage solutions and are widely used in many embedded applications such as IoT, smartphones, wearables, robotics, and smart home applications.

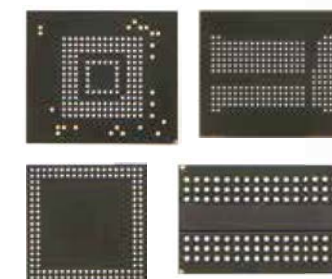
Kingston also offers I-temp eMMC and DRAM for outdoor and harsh environment applications.

Design-In SSDs

Kingston offers a line of Design-In SATA and NVMe solid-state drives created specifically for system designers and builders. With their needs in mind, our Design-In drives all come with locked BOM, PCN and direct engineering support.

The line includes:

- SATA 3: 2.5" 7mm, mSATA (Mini SATA), M.2 2242, M.2 2280
- PCIe Gen 3 NVMe 1.2: M.2 2280



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The Hirose Rugged IX Industrial I/O Connector Offers Transmission Speeds Up to 10Gbps for Next-Generation Industrial Modules Providing PCB Space Savings Up to 75% Compared to RJ45 Solutions

Hirose, a leader in the development of innovative connector solutions has developed a rugged I/O connector that combines a small robust design with high-speed data transmission capabilities that enables industrial equipment advancements in smart manufacturing. The IX Series connector reduces installation space by up to 75% compared to RJ45 solutions, and up to 28% compared to competing snap-in I/O connectors. Supporting CAT5e and CAT6a (10G) cabling, the IX Series I/O connector features an optimized EMI/ESD shielding design for safe and secure data transmission up to 10Gbps.

Available with two keying codes for Ethernet and non-Ethernet applications, the IX Series I/O connector is compliant with IEC PAS 61076-3-124. The IX Series can be used as a next generation standard connector in equipment such as factory automation controllers, industrial robotics, programmable logic controllers, security systems, servo amps, servers, robotics and more. Offered in upright right angle and horizontal right angle versions, the IX Series I/O has maximum dimensions of 22.9 x 8.4 x 14.3mm. The upright right angle connector receptacles can be mounted in parallel with a pitch distance of only 10mm. The narrow width of the receptacle is particularly beneficial when multiple connectors are positioned on a single PCB side-by-side. Featuring a rugged and reliable design, the snap-in I/O connector has a positive metal lock with a preload spring mechanism that provides a clear tactile click and ensures complete, secure mating. The preloaded springs are designed to prevent unintended cable removal, and to extend the operating life to more than 5000 mating/unmating cycles.

**FEATURES**

- Combines a small, robust design with high-speed data transmission capability up to 10Gbps
- Reduces installation space by up to 75% compared to RJ45 solutions, and up to 28% compared to competing snap-in I/O connectors
- Supports CAT5e and CAT6a (10G) cabling
- Features an optimized EMI/ESD shielding design for safe and secure data transmission
- Positive locking I/O connector delivers a rugged and reliable design with high PCB retention force
- The narrow width of the receptacle is particularly beneficial when multiple connectors are positioned on a single PCB side-by-side

**APPLICATIONS**

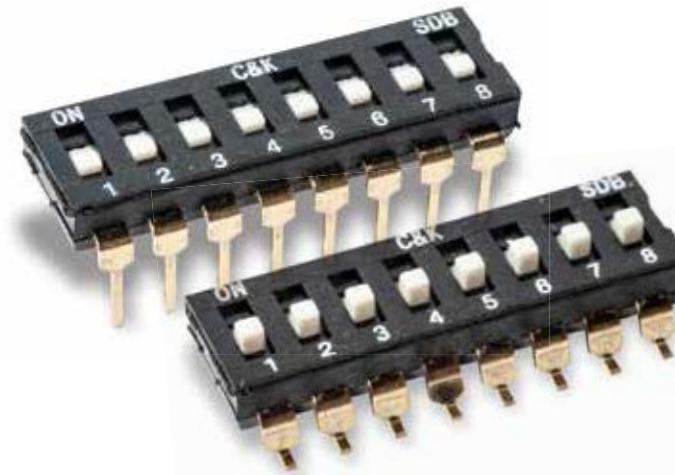
Ideal solution for any application that requires long reach, high speed and limited wiring space including factory automation controllers, industrial robotics, programmable logic controllers, security systems, servo amps, servers, robotics and more.



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**SDB DIP Series**



The new SDB DIP switch provides product designers with a cost-effective solution for applications that require a low-profile switch for space savings on PCB layouts. The SDB DIP switch has a high operating life cycle under load and comes in thru-hole or surface-mount models, with additional tape and reel packaging available.

The SDB DIP switch joins C&K's extensive family of DIP switches that includes surface mount half-pitch DIP switches, low-profile and standard-profile DIP switches, rotary and coded DIP switches, SIP switches and jumper switches with a variety of extended actuator and flush actuator styles.

**FEATURES**

- Number of positions 01-12
- Flush or extended actuator
- Contact rating: 25mA at 24V<sub>DC</sub> or 100mA at 50V<sub>DC</sub>
- Operating force: 8N max

**APPLICATIONS**

- Automation and control devices
- Servers, modems, routers
- ATMs and POS machines

**HDP Detect Series**



The HDP series are microminiature side-actuated detect switches with an ultra-low board-mounted profile. The HDP Series switches measure just 5.7 x 8.35mm in the "free" position and feature a very low profile height of 1.9mm off the board. With an operating life of 100,000 cycles, these robust switches are ideal for a variety of applications.

The HDP Series are halogen-free with two color-coded options to distinguish between the right- and left-hand actuation styles. The right-hand version features a black actuator body, and the left-hand version is gray.

**FEATURES**

- Contact rating: 1mA / 5V<sub>DC</sub>
- Contact resistance < 500mΩ
- Total travel distance: 1.3mm

**APPLICATIONS**

- Consumer electronics
- Medical devices
- Mobile communications
- ATCA and MicroTCA devices



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# HARTING ix Industrial® Really Big Miniaturisation. An overview of the advantages.



The HARTING ix Industrial® is the answer to the future challenges posed by Industry 4.0 and the IoT. Successful miniaturization is exemplified by its small size and outstanding robustness; this makes HARTING ix Industrial® a top performer. The ix Industrial® mating profile is standardized according to IEC 61076-3-124. It has been jointly developed by the technology partners HARTING and HIROSE.



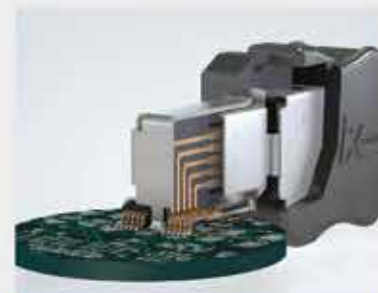
Robust receptacle with five THR shield contacts



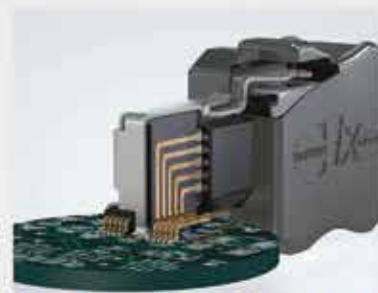
Cat 6A performance for 1/10 Gbit/s Ethernet



Resistant to shock and vibration, designed for 5000 mating cycles



Continuous shielding and robust cable attachment



Two snap-in metal hooks ensure that the receptacle and connector are safely connected



70% reduced size compared to RJ45

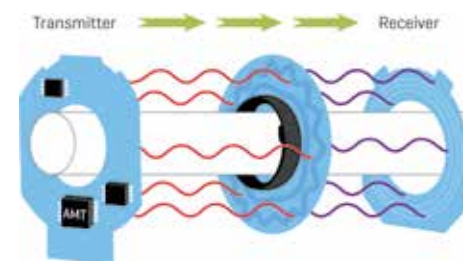
## Innovative AMT Encoders Deliver Durability and Precision Without Tradeoffs



CUI's incremental, absolute and commutation rotary encoders with capacitive sensing technology offer a combination of performance, reliability, and accuracy not available with traditional encoders. Featuring up to 22 programmable resolutions, an operating temperature range from -40°C up to +125°C and low current draw, AMT modular encoders provide a compelling solution for a range of applications.

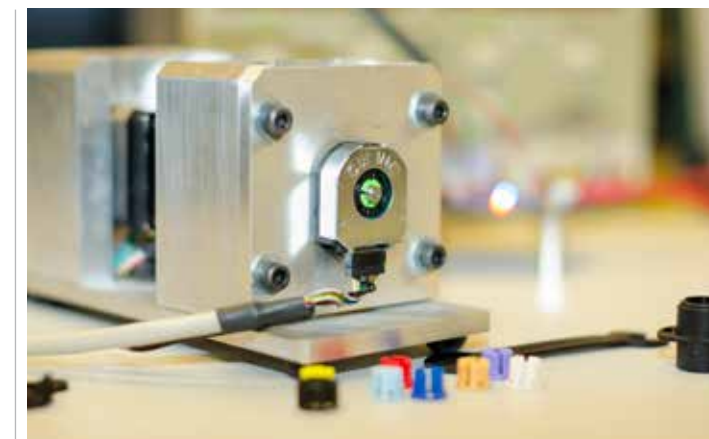
Rotary encoders provide critical information about the position of motor shafts and thus also their rotational direction, velocity, and acceleration. They are vital components in the motion-control feedback loop of industrial, robotic, aerospace, energy, and automation applications. In these installations, encoders are asked to provide long-term reliability, durability, and high performance despite often working in severe conditions that include dust, dirt, grease, fluctuating temperatures, and heavy vibration. The need for encoders has been increasing dramatically with the rise in applications requiring precise motion control. However, standard encoders—including optical and magnetic—result in unnecessary tradeoffs between durability and accuracy that can now be avoided by utilizing a capacitive-based encoder.

Capacitive sensing uses patterns of bars or lines, with one set on the fixed element and the other set on the moving element, to form a variable capacitor configured as a transmitter/receiver pairing (Figure 1). As the encoder rotates, an application specific integrated circuit (ASIC) counts the line changes and also interpolates to find the precise position of the encoder and direction of rotation.



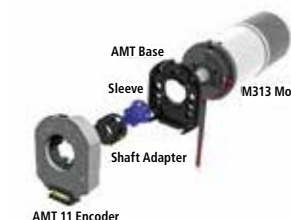
By design, the encoder ASIC's electrical output is 100% compatible with optical and magnetic encoders. This non-contact encoder implementation has several significant user benefits:

- It is not affected by dust, dirt, or oil, and so is inherently more reliable than the optical approach.
- It is less sensitive to heat and cold; thus more reliable and consistent.
- It is less susceptible to vibration than a glass disk.
- There is no LED to dim or burn out.
- The encoder needs only 6 to 10 mA of operating current, far less than the 20 to 50 mA of the optical units; making it an efficient component for mobile and battery-operated applications.



There is another benefit, although a less-obvious one, for designers fine tuning the proportional-integral-derivative (PID) control loop: the ability to adjust the encoder's ppr count to optimize performance without the need to change encoders. This ability to dynamically modify the resolution greatly simplifies the system optimization process, which is usually done via adjustments to the code, or by changing the encoder's line count (resolution). With an optical encoder, the latter process requires different encoders to be purchased and installed, increasing overall cost and lengthening the design cycle. With the capacitive-based encoder, the control engineer simply instructs a change in the line count parameter of the encoder until the desired control-loop result is obtained.

Even in installation and production, the capacitive encoder brings other benefits. Mechanically, its mounting holes are also matched to the other encoder types, making it a fit-and-function compatible unit (Figure 2). Thus, a single encoder can be fitted to different diameter shafts simply by using adapter sleeves, which reduces the number of SKUs in production and repair stock.



With the availability of field-tested encoders based on capacitive-sensing principles, there's no longer a need for the design engineer to make the difficult choice between the attributes that optical and magnetic encoders force: short and long-time reliability versus output accuracy. The capacitive encoder excels at both, and also brings additional benefits in mechanical mounting, inventory, ppr selection, readout zeroing, and power consumption, all with full compatibility to standard outputs.

### PARTS

- AMT10
- AMT11
- AMT20
- AMT21
- AMT23
- AMT31



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# Performance Passives from NIC Components

With a focus on the latest technologies, NIC continues to expand its offering of "Performance Passives". Each series uses cutting edge technology to provide you with the components you need for your designs.



## Design with NIC by Application

◇ NIC's application search provides the best series and associative NIC "Performance Passives" offering a full solution for your designs

## Design with NIC by Technology

◇ Over 300 Series of "Performance Passives"  
 ◇ With multiple product types under each category choosing a passive component has never been easier!

## NIC Goes Beyond The Components

◇ Industry Leading Parametric Search Tool  
 ◇ Dedicated Sample Stock  
 ◇ Global Design Support

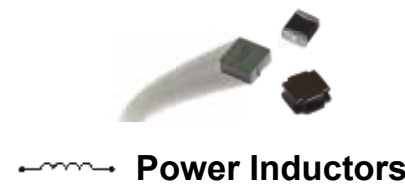


## Specialized Capacitors

**NSPE-x - Hybrid Electrolytic**  
 Temperature Range : -55°C ~ +135°C  
 Capacitance : 3.3uF ~ 1,000uF  
 Capacitance Tolerance :20%  
 Voltage Ratings : 6.3V ~ 125V  
 Ripple Current Ratings : up to 4.34A  
 Sizes: 5x6.1 ~ 10x12.8

**Interference Suppression Capacitors**  
 X1, X2 & Y2 Classifications Available  
 Capacitance : 3.3uF ~ 10uF  
 Voltage Ratings : 300Vac ~ 440Vac  
 Self-Healing Construction  
 UL, cUL, ENEC & CQC Ratings Available

**NMC - Specialty MLCC Families**  
 X7R, X6S, and X5R Dielectrics  
 Capacitance : 0.1pF ~ 220uF  
 Voltage Ratings : 4.0V ~ 100V  
 Sizes: 01005 ~ 2215 Case Codes  
 Automotive, Flexible Terminal, High Voltage, RF & Low ESL Options Available



## Power Inductors

**NFP, NFPS - Ferrite Multilayer Chip**  
 Inductance : 0.47uH ~ 10uH  
 Inductance Tolerance : ±20%, ±30%  
 Current Ratings up to 2.3A Isat  
 DC Resistance (DCR) as low as 40mΩ  
 0603 ~ 1008 Sizes, profiles as low as 0.5mm

**NPIS\_Lx - Ferrite Coil, Auto. Assembly**  
 Inductance : 0.47uH ~ 470uH  
 Inductance Tolerance : ±10% ~ ±30%  
 Current Ratings up to 13.8A Isat  
 DC Resistance (DCR) as low as 6.0mΩ  
 35+ Size Options from 2mm ~ 8mm  
 Automotive Grade Options Available

**NPMx, NPIMx - Metal Composite Coil**  
 Inductance : 0.22uH ~ 100uH  
 Inductance Tolerance : ±20%, ±30%  
 Current Ratings up to 110A Isat  
 DC Resistance (DCR) as low as 0.65mΩ  
 Chip Styles 0603 ~ 1210  
 Standard Style 4mm ~ 17mm sizes  
 Automotive Grade Options Available



## Current Sensing Resistors

**NCSS - High Power Metal Strip**  
 Resistance : 1.0mΩ ~ 50mΩ  
 Resistance Tolerance : ±1%, ±2%, ±5%  
 Power Ratings up to 2W  
 TCR as stable as ±75PPM  
 Case Sizes : 0805 ~ 2512  
 Thermal EMF Material Options Available

**NCLP - High Power Metal Strip**  
 Resistance : 1.0mΩ ~ 500mΩ  
 Resistance Tolerance : ±1%, ±2%, ±5%  
 Power Ratings up to 3W  
 TCR as stable as ±75PPM  
 2512 Case Size  
 Thermal EMF Material Options Available

**NCSW - Thin Film Chip**  
 Resistance : 100mΩ ~ 910mΩ  
 Resistance Tolerance : ±1%, ±2%, ±5%  
 Power Ratings up to 1W  
 TCR as stable as ±200PPM  
 Case Sizes : 0402 ~ 2512

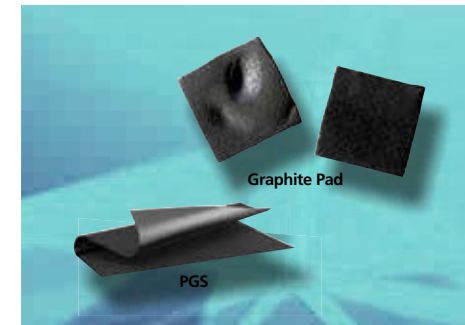
For more information or to buy products, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

THE TIME IS NOW

AEU 2018

## Panasonic

## Explore Panasonic's Thermal Offering to Effectively Manage Heat Generated by Circuit Boards



Panasonic provides a portfolio of **thermal management** products which offer a range of characteristics and performance specifications to meet the requirements of different applications for thermal conductivity and mechanical properties.

**Nano Silica Balloon Insulator Sheet or NASBIS** is a thin, flexible heat-insulating material composed of silica aerogel and a polyester fiber that has excellent thermal isolation properties. The thermal conductivity of NASBIS is comparable to that of air, making it an attractive material for heat insulation.

NASBIS sheets protect thermally weak products from heat. It also helps maintain a uniform temperature throughout a device.

**Soft PGS** is an ideal TIM because of its combination of high thermal conductivity and high compressibility. When compressed, it reduces contact thermal resistance between rough surfaces in thin spaces.

**Pyrolytic Graphite Sheet, or PGS**, is a very thin TIM which offers high thermal conductivity. Made from graphite polymer film, it is ideal for thermal management in limited spaces. It can also be used to provide supplemental heat dissipation in addition to a conventional heat-sink. The material is flexible and may be cut into custom shapes.

**Graphite-PAD** is a silicone resin-based pad composed of graphite flakes oriented in the vertical z-axis direction. Highly compressible, a Graphite-PAD can serve as a Thermal Interface Material (TIM) between a heat-sink and an IC.

**Semi-Sealing Material, or SSM**, is a silicone-free thermoplastic resin which absorbs heat, and which can conform to any rough or uneven surface with the right applied pressure. SSM material allows PGS to be used in areas in which the TIM needs to be compressed to avoid the risk of high thermal contact resistance.

Custom-cut to IGBT module footprints, soft PGS contributes to the long life and high performance of power modules, since it provides high thermostability and reliability in thermally sensitive areas. Soft PGS is easy to install with a one- or two-step process that requires much less labor than the use of thermal grease.

### APPLICATIONS

- Mobile phones
- Smart watches
- Home appliances
- Cameras
- Displays
- Medical devices
- Drones
- Base transmitter stations

## Solid State Relays with Capacitor-Coupled Isolation for High Temp and Small Size



Panasonic is pleased to introduce the extended **PhotoMOS CC TSON 1 Form A CxR Series** product line, the next generation of sub-miniature solid-state relay technology now available in 60V, 40V and 100V options! The AQY2C

PhotoMOS CC Series is a revolution in size and performance. The internal switching mechanism contains an oscillation circuit as well as a built-in Capacitor-Coupled Isolation driver IC. This differs from traditional PhotoMOS products which use an optical coupled isolation.

By replacing the LED circuit, the package size can be substantially decreased, while also lowering power consumption. For high-density mounting applications, the TSON package of the PhotoMOS CC Series requires 46% less board space than SON package types. The temperature performance also increases, with guaranteed performance up to +105°C for industrial applications. This robust performance is enhanced with a fast switching speed, which is afforded by a voltage-driven input circuit.

### FEATURES

- Sub-miniature TSON package (0.8 x 1.95 x 1.8 mm)
- Low current consumption of 0.2A Max
- High-temp performance, guaranteed up to +105°C
- Voltage-driven input circuit
- Saves space and facilitates density mounting
- Energy savings
- Robust performance in industrial applications
- Faster switching speeds

### APPLICATIONS

- Measuring equipment: IC tester, probe cards, board tester and other testing equipment
- Telecommunication equipment
- Electric and gas meters
- Cameras, fire alarms, smoke/heat detectors

For more information or to buy products, go to [www.FutureElectronics.com/FTM](http://www.FutureElectronics.com/FTM)

# System Design Center

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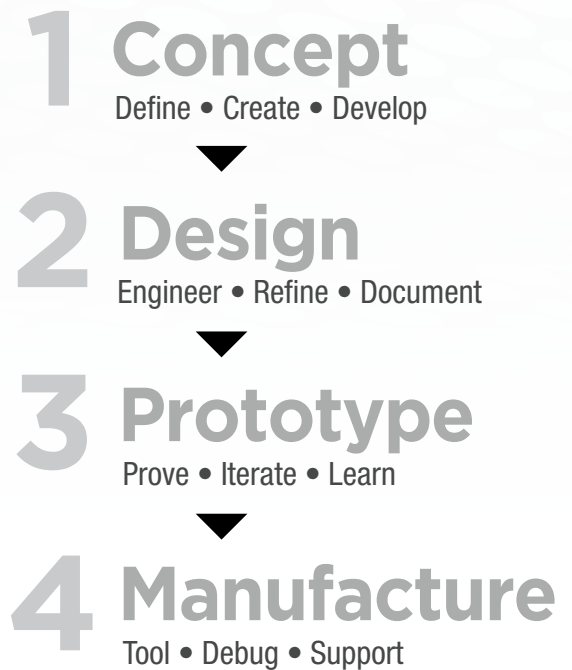
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## Partnership / Continuity

Develop a partnership with Future Electronics to ensure continuity and success

.....



Engineering Tomorrow's Ideas

