

**NPIs, DESIGN
AND TECHNOLOGY NEWS**



24-iv Motor Control

32-bit MCU provides high-performance control for BLDC and other motor types

The STMicroelectronics STM32G4 series of microcontrollers features a 32-bit RISC core which runs the DSP and floating point unit instructions for motor-control applications, with a rich set of software and development resources.



The STM32G4 series of 32-bit microcontrollers from STMicroelectronics, based on the high-performance Arm® Cortex®-M4 32-bit RISC core, provides the peripherals, processing capabilities and memory resources required for high-performance motor-control applications.

Operating at a frequency of 170 MHz, these MCUs include 16-bit PWM timers dedicated to motor control. The MCUs are suitable for the control of three-phase, low-voltage and low-current brushless dc (BLDC) or permanent magnet motors. Developers using the STM32G4 MCUs can draw on the resources available at the online STM32 ecosystem for motor control, which includes development boards, the X-CUBE-MCSDK software development kit, and embedded software, as well as training resources and documentation.

The STM32G4 MCU processor core series implements a full set of digital signal-processing instructions and a memory protection unit. The MCUs also embed several protection mechanisms for embedded Flash memory and SRAM, including:

- Read-out protection
- Write protection
- Secure memory area
- Proprietary code read-out protection

The core also features a floating-point unit which supports all the Arm single-precision data-processing instructions and all the data types.

The STM32G4 MCUs embed up to 512 kbytes of high-speed Flash memory, and up to 128 kbytes of SRAM. These MCUs also offer an extensive range of enhanced I/Os and peripherals. Analog provision includes up to five fast 12-bit ADCs, up to seven ultra-fast comparators, up to six operational amplifiers, and four internal DAC channels. An option for three external DAC channels is available for a total of seven DAC channels.

The MCUs feature maximum operating-temperature ratings of up to 125°C, and run from a 1.7 V to 3.6 V power supply. A comprehensive set of power-saving modes allows the design of low-power applications.



FEATURES

- FMAC and CORDIC math accelerators
- ART Accelerator™ hardware module
- Error correction code on Flash memory
- Quad SPI memory interface
- USB 2.0 Full-Speed interface

APPLICATIONS

- Home appliances
- E-bikes
- Air-conditioning units
- Industrial equipment
- Rechargeable devices
- Drones
- Toys
- Servers
- Telecoms equipment
- Electric vehicle charging stations
- Instrumentation and measurement equipment

FREE DEV BOARD

Motor-control board based on STM32G473 MCU

Orderable Part Number
B-G473E-ZEST1S

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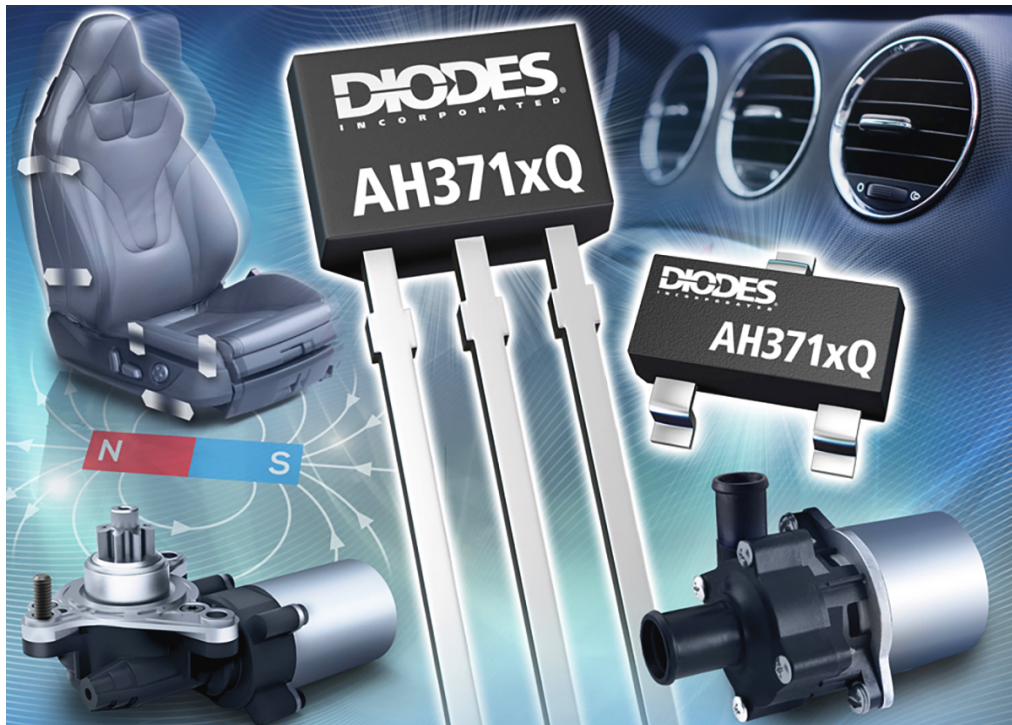
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 [SAMPLES](#)



Automotive-grade Hall-effect latches give superior resistance to physical stress

The AH371xQ series magnetic switches from Diodes Incorporated handle the electrical and magnetic stresses experienced by in-cabin and engine management applications in vehicles, while providing useful options for design flexibility.



The new AH371xQ series of high-voltage Hall-effect latches from Diodes Incorporated provide stable and predictable performance in automotive applications that are exposed to magnetic interference.

Qualified to AEC-Q100 Grade 0, the AH371xQ bipolar magnetic latch switches operate over a voltage range of 3 V to 27 V, with 40 V load dump protection, for use in circuits powered by a 12 V automotive battery. Supporting numerous in-vehicle comfort and engine management applications, these Diodes latches may be used for brushless dc (BLDC) motor control, valve operation, linear and incremental rotary encoders, and position sensing functions.

The superior performance of the AH371xQ latch switches is due to a proprietary Hall sensor plate and a chopper-stabilized design which mitigate the effects of thermal variation and provide excellent immunity to interference from stray magnetic fields.

Specified for operation with magnets rated from 25 gauss to 140 gauss, the series is available in a selection of six sensitivity options. Featuring tight operating windows and low temperature coefficients for switch points, the AH371xQ latches give engineers scope to specify the right magnetic operating and release values to fit the application's sensing distance and magnet strength.

Protection features integrated into the latch switches include a reverse blocking diode, over-current protection, and over-voltage clamp.



FEATURES

- 13 μ s power-on time
- Single, open-drain or internal pull-up output options
- Good RF noise immunity
- Manufactured in IATF 16949 certified facilities
- Supports PPAP documentation
- 8 kV ESD protection on the human body model
- Operating-temperature range: -40°C to 125°C

APPLICATIONS

- Automotive systems:
 - Electric power window lifts
 - Sunroof motor
 - Tailgate opening/closing mechanism
 - Seat adjustment motors
 - Cooling fans
 - Water/oil pumps
 - Speed measurement
- Home appliances
- Office equipment
- Industrial equipment

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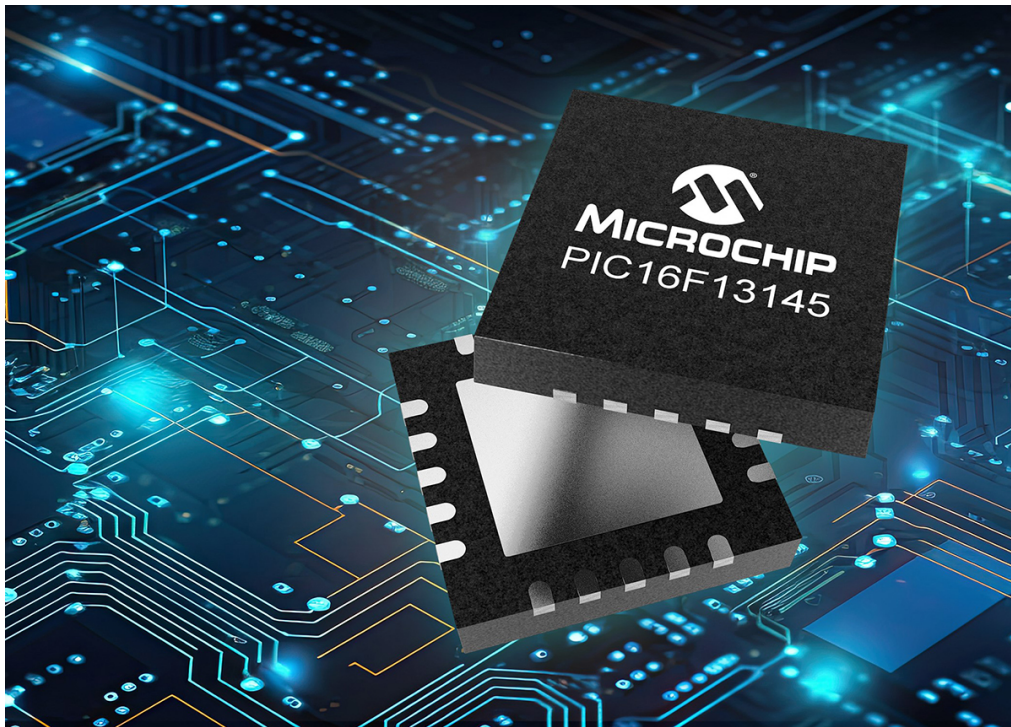
CONSUMER



TELECOMS

Highly configurable 8-bit MCU offers integrated alternative to PLDs

The PIC16F13145 microcontroller from Microchip features a new configurable logic block (CLB) module alongside common MCU peripherals, including an ADC, DAC, PWMs and timers as well as serial communications interfaces.



FEATURES

- Adjustable internal oscillator up to 32 MHz
- Four configurable logic cells
- Up to 300 k samples/s 10-bit ADC
- 8-bit DAC
- Two fast comparators
- Two 10-bit PWMs
- Two capture, compare PWM units
- One 8-bit timer
- One 16-bit timer
- I2C and SPI serial communication modules

APPLICATIONS

- Industrial equipment
- Automotive systems

Microchip is offering a new, tailored hardware solution with the launch of its PIC16F13145 family of configurable 8-bit microcontrollers. The CLB module in this new family enables the MCU to be used in applications that are typically the domain of stand-alone programmable logic devices (PLDs).

With the CLB module, the PIC16F13145 can be configured to perform hardware-based, custom combinational logic functions directly within the MCU. The CLB allows designers to optimize the speed and response time of embedded control systems, eliminating the need for external logic components and reducing bill-of-materials cost and power consumption.

The development of tailored hardware is further simplified by the provision of a graphical interface tool, which helps designers to synthesize custom logic designs using the CLB. The PIC16F13145 family is ideal for applications that use custom protocols, or perform task sequencing or I/O control to manage real-time control systems in the industrial and automotive sectors.

Since the CLB operation is not dependent on the CPU clock speed, it improves the system's latency and helps to reduce power consumption. The CLB can also be used to make logic decisions while the CPU is in sleep mode, further reducing power consumption and reliance on software code.

The PIC16F13145 family is available in various packages from 8 up to 20 pins. It is supported by the MPLAB[®] Code Configurator, a free software plug-in within the MPLAB X integrated development environment which provides an easy GUI-based interface to configure the MCU and on-board peripherals, including the CLB.

FREE DEV BOARD

PIC16F13145 Curiosity Nano evaluation kit

**Orderable Part Number
EV06M52A**

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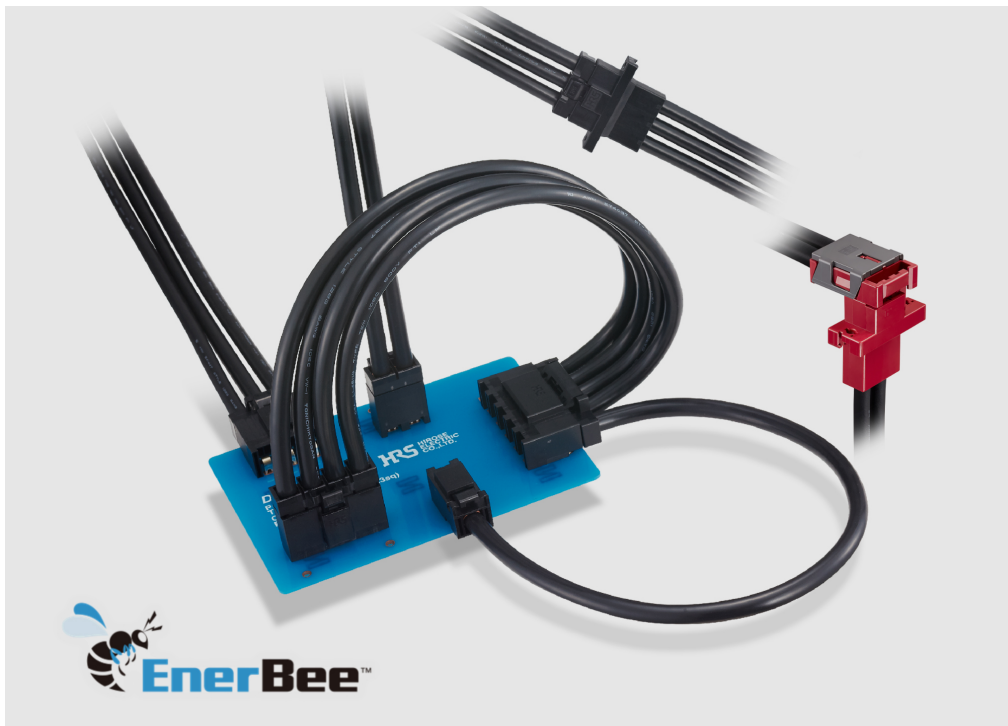
CONSUMER



TELECOMS

Reliable connectors offer high current capability for use in industrial equipment

Hirose supplies the DF60 series of connectors in configurations for board or panel mounting. Compatible with 8 to 12 AWG wire, the DF60 connectors offer robust locking for secure connections.



HRS HIROSE
ELECTRIC
EUROPE B.V.

FEATURES

- 10.16 mm contact pitch
- 1 to 6 contact positions
- Cable sizes: AWG 8 to AWG 12
- 30 mating cycles
- 1,000 V ac voltage rating
- UL, C-UL and TÜV certified
- Operating-temperature range: -55°C to 105°C

APPLICATIONS

- Robots
- Automotive devices
- Medical equipment
- Servers
- Industrial equipment
- Motors
- Telecoms equipment

Hirose supplies the DF60, a series of robust, high-power wire-to-board and wire-to-wire connectors which offer the high level of reliability needed for use in industrial equipment.

The DF60 range consists of cable-mount female crimp sockets and board-mount vertical, right-angle and panel-mount in-line male headers. The connectors can handle currents of up to 65 A.

The low-profile plug and receptacle housings have a mated height of only 30 mm when using the vertical header.

The robust lock provides a positive tactile sensation and an audible click when mated. This confirms that the connector is fully engaged, guaranteeing complete electrical and mechanical connection. The lock is on the center of the housing to avoid uneven locking and cable entanglement, a common problem with side locks.

In addition, multiple connectors can be mounted closer together side-by-side. The cable-mount female socket housing uses crimp contacts which provide five independent points of contact. Two of the contact points are fixed in the upper section. The other three in the lower section are spring-based, allowing movement to follow the flat structure of the male contact during the mating operation. This provides high contact reliability, secure connection and strong resistance to vibration.

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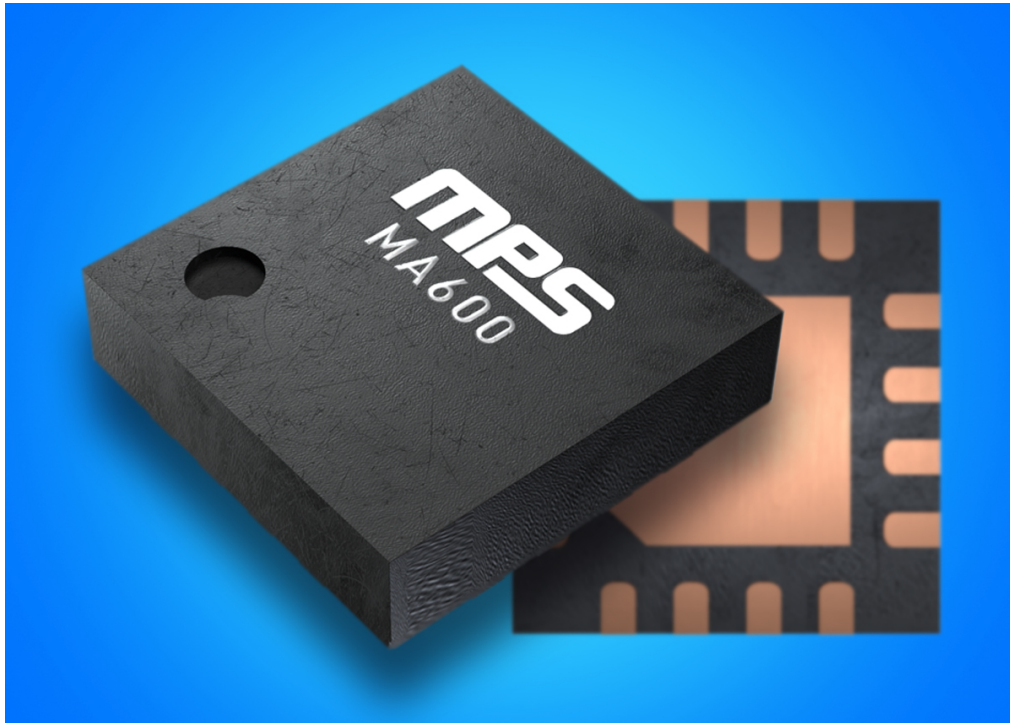
CONSUMER



TELECOMS

Magnetic angle sensor produces very low error over high bandwidth

The high-resolution MA600 angle sensor from Monolithic Power Systems features a broad set of configuration options which give designers flexibility in spatial, electrical and magnetic settings.



The MA600 from Monolithic Power Systems is a high-bandwidth digital magnetic angle sensor which provides accurate inputs for position-control systems in products such as robots and user interfaces.

The MA600 detects the absolute angular position of a permanent magnet mounted on a rotating shaft. The system designer can configure the sensor to operate at between 11.5 bits and 14.5 bits of resolution. At 11.5 bits of resolution, the MA600 offers 21 kHz bandwidth.

Factory calibration enables the MA600 to achieve intrinsic non-linearity below 0.6° across the entire operating-temperature range of -40°C to 125°C. An additional final system calibration may be performed by using a 32-point, user-configurable correction table. The resulting intrinsic non-linearity can be less than 0.1°.

The MA600 supports a wide range of magnetic field strengths and spatial configurations. The sensor supports end-of-shaft and off-axis, or side-shaft mounting, configurations.

An on-chip non-volatile memory provides storage capacity for configuration parameters, including the reference zero-angle position, and settings for common encoder interfaces including incremental ABZ, incremental UVW, and PWM absolute output. The incremental ABZ quadrature encoder interface supports from one to 2,048 programmable pulses per turn.

MPS

FEATURES

- Zero latency
- Serial interfaces:
 - Serial peripheral interface for digital angle readout and chip configuration
 - Synchronous serial interface for digital angle readout
- Multi-turn or speed output options
- 3.3 V power supply
- 7 mA quiescent current
- 3 mm x 3 mm QFN-16 package

APPLICATIONS

- Robots
- Multi-turn encoders
- Position control
- Speed control

FREE DEV BOARD

Test board for MA600 magnetic angle sensor

Orderable Part Number
TBMA600-Q-LT-00A

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CONSUMER



TELECOMS

How advanced electronics technologies will help manufacturers profit from the opportunities in decarbonization

Future Electronics is forecasting strong growth in demand for electronic components that support device-level energy harvesting, residential and commercial energy storage systems, and dc metering of systems such as electric vehicle chargers.

By Riccardo Collura
Vertical Segment Manager Power (EMEA), Future Electronics



FREE DEV BOARD

Infineon 11 kW SiC bi-directional dc-dc converter board for EV charging and ESS applications

Orderable Part Number
REF-DAB11KIZSICSYS

APPLY HERE NOW

FREE DEV BOARD

STMicroelectronics three-phase full shunt electricity meter evaluation board based on STPM52, ST150621 and STM32F413RH

Orderable Part Number
EVALSTPM-3PHISO

APPLY HERE NOW

At a national and global level, policies for decarbonization and ending the world's dependence on fossil fuel energy are focused on a small number of very high-impact technologies:

- The installation of multi-gigawatt wind farms and solar farms
- The expansion of nuclear fission generation and continued investment in nuclear fusion
- The replacement of combustion engine propulsion by battery electric vehicles, as well as electrically-powered aircraft

The production of the energy infrastructure and new technologies to support these systems is dominated by a small number of global manufacturers.

But the achievement of the goal of net zero requires decarbonization and electrification across nearly every type of power-consuming application, large and small, with few exceptions. And this has interesting implications for Europe's many thousands of small and medium-sized manufacturers of electronics products. Opportunity for innovation in the design of smaller scale equipment abounds, and large global OEMs are often ill-equipped to fill the gaps in markets that are emerging out of the trend to decarbonize.

Smaller product manufacturers, on the other hand, can profit from these new opportunities. In many cases, they can do so by taking advantage of features and capabilities in the latest electronic components.

Opportunities in decarbonization at less than grid-scale

As a broadline electronic component distributor serving a diverse customer base of industrial, communications and consumer product manufacturers, Future Electronics has a bird's eye view of the trends in applications and system design across the continent of Europe. It is clear to us that the drive towards decarbonization, driven by governments, enterprises and consumers, is creating new opportunities in three areas in particular.

The first is in **solar energy harvesting**. This is in part driven by geopolitics: the Western world has decided to 'de-risk' its relationship with China, and this is going to involve a considerable amount of reshoring of the production of key technologies, including photovoltaic energy generation. So solar panel manufacturing, which today is almost entirely located in giant Chinese factories, is likely to return in part to Europe and North America. This creates opportunities for European manufacturers to gain an unexpected share of a previously closed market.

At the micro-scale, growth in solar energy harvesting is being driven by innovation in electronic technology that supports new use cases. In particular, solar energy harvesting is enabling a new architecture for sensing systems. When autonomous, batteryless wireless sensors and actuators can be entirely decoupled from grid power and have no need for battery charging or replacement for the whole of their lifetime, it becomes possible to completely rethink the way they are sited and used. Improvement in the technology for converting and using harvested solar energy is making this change possible.

The second arena of change driven by decarbonization is in **energy storage systems (ESS)**. At national and regional levels, electricity infrastructure operators are hoping to use various sources of stored energy to balance out the fluctuations in the energy generated by wind and solar power sources. One way or another, financial incentives will be used to encourage householders and companies to deploy ESS, and to allow the two-way exchange of electrical power to balance the grid. Design innovation is still required to make it viable for systems such as repurposed electric vehicle (EV) batteries to be used in residential and commercial ESS, and to enable on-demand bidirectional energy exchange. Here the implementation of new semiconductor technology, wide bandgap semiconductors made of silicon carbide (SiC) material, is becoming essential to achieve higher conversion efficiency than is possible with silicon semiconductors.

The third opportunity is in **metering**, and particularly in dc metering at the point-of-load. For the adoption of ESS to become widespread, the owners of ESS equipment will need to feel confident that they are being correctly paid for the energy that they supply to the grid, and correctly billed for consumption: this requires dedicated meters.

Another example is in public EV charging infrastructure. EV batteries are mainly charged with direct current, but utility-grade meters used in public charging stations typically measure the mains ac power consumed by the charging equipment. EV drivers, or the regulators which represent them, will eventually object to being charged for an ac input when the value to them comes from the dc output supplied to the car's battery. Ac metering rewards charging station operators for installing chargers that have a cheap but inefficient ac-dc conversion stage, and penalizes the EV driver. Before long, the EV market will likely demand the use of accurate dc meters at the point-of-load to measure the energy that is actually supplied to the car's battery.

Such regulatory requirements, if they materialize, are likely to open the metering market to new, innovative companies that will fragment the market, in much the same way as has happened in the market for solar inverters.

Component innovation generates new opportunities

The opportunities are clearly visible, then. But the race to profit from them will depend in large part on the extent to which manufacturers successfully deploy new technology that confers a performance or cost advantage.

In small-scale solar energy harvesting for wireless sensors, the crucial function is ultra-efficient conversion of the harvested power input to a useful, regulated output to drive the sensor circuit. Component technology continues to provide improved efficiency and integration: this is reflected in the specifications of the NEH2000BY from Nexperia, a dedicated power management IC (PMIC) for solar energy harvesting shown in Figure 1. This PMIC provides a high-efficiency dc-dc converter which can operate with harvested power inputs as low as 35 µW. Crucially, the PMIC implements an integrated maximum power point tracking (MPPT) algorithm, which continually optimizes circuit operation to maximize the power supplied to the load.



Fig. 1: The NEH2000BY energy-harvesting PMIC from Nexperia is supplied in a 16-terminal QFN package with a footprint of 3 mm x 3 mm

Advanced technology is also transforming prospects in the energy storage arena: wide bandgap SiC semiconductors are enabling storage units to perform power conversion more efficiently, with lower power losses, than traditional silicon MOSFETs or IGBTs.

The migration from silicon-based power switches to the use of SiC MOSFETs calls for a different design approach: the superior thermal performance and higher switching frequencies enabled by SiC technology mean that manufacturers can rethink the thermal and magnetic components that are used. According to Infineon, a change from superjunction MOSFETs to CoolSiC™ MOSFETs can provide around a 2% increase in energy capacity without increasing battery size.

An excellent starting point for a design team developing a new ESS product is a reference design supplied by a leading SiC MOSFET manufacturer such as Infineon, onsemi or STMicroelectronics. For instance, Infineon's REF-DAB11KIZSICSYS is a CLLC resonant dc-dc converter board which can supply a load of up to 11 kW at an output voltage of 800 V, as shown in Figure 2. With its highly efficient bidirectional power flow capability and soft-switching characteristics, it is the ideal building block for fast prototyping of any ESS design, and is also suitable for use in EV charging stations. The board is based on the 1,200 V IMZ120R30M1H CoolSiC™ MOSFET in a TO-247 package, driven by a 1EDC20I12AH gate driver IC.

Also useful in three-phase EV chargers rated for up to 11 kW is the STMicroelectronics TN4050HA-12GY, a 40 A/1,200 V automotive-grade silicon-controlled rectifier thyristor. Featuring a 400 A/10 ms surge-current rating, this robust thyristor enables the designer to implement a compact inrush-current limiter in a vehicle on-board charger, or the phasing switch of a solar power inverter rated for up to 440 V ac and 11 kW.

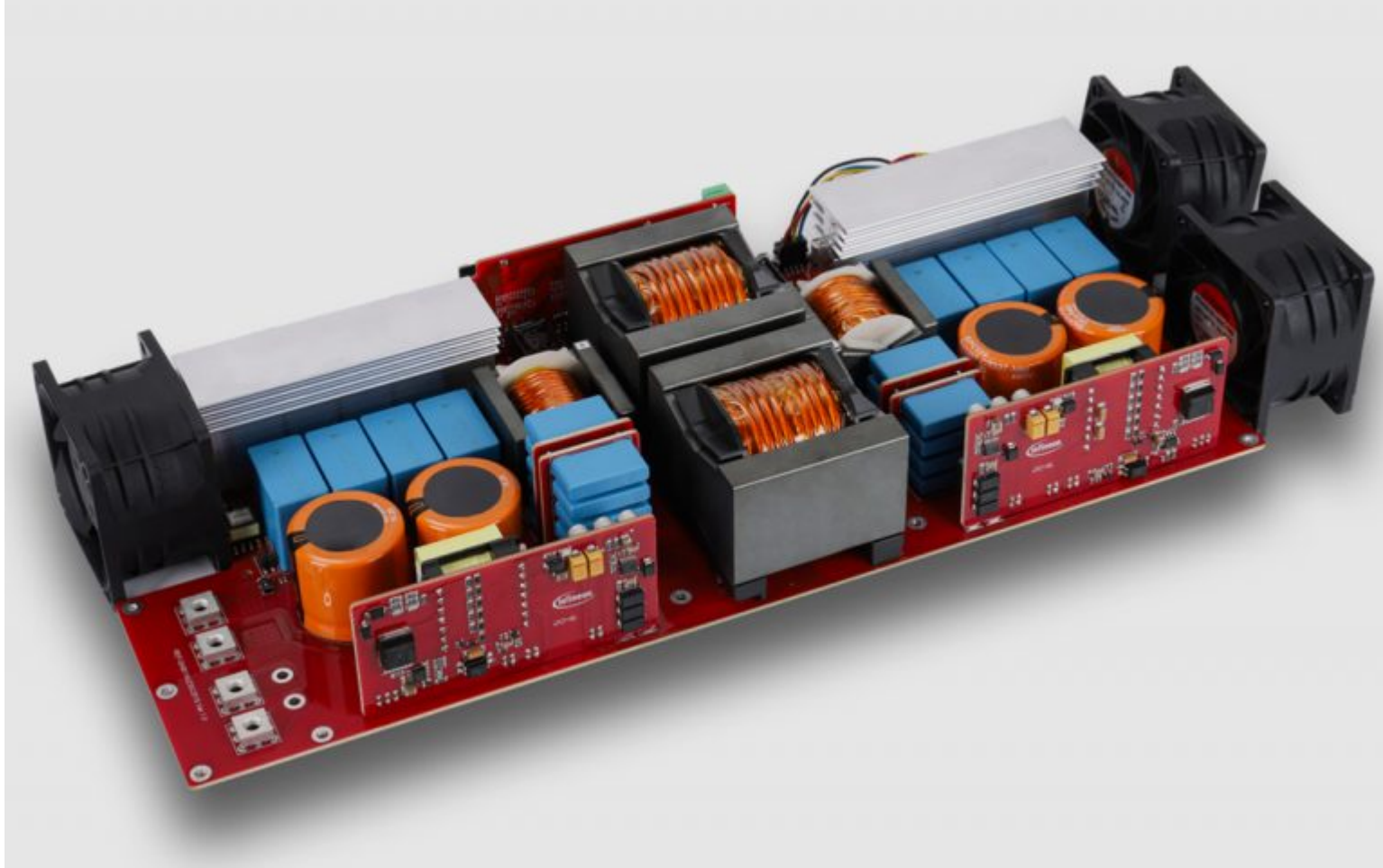


Fig. 2: The REF-DAB11KIZSICSYS reference design board from Infineon is small and light, making for easier integration into ESS designs

The third area in which component technology helps small and medium-sized manufacturers exploit new opportunities is in dc metering. The design of accurate, utility-grade ac electricity meters with regulators. In dc metering, however, there is scope for more innovation. Across various functional domains, the latest technology will:

- Perform accurate energy measurement
- Reduce the size, weight and cost of the meter
- Provide more reliable and convenient wireless connectivity and a user-friendly interface

A useful starting point for a new dc meter design is the EVALSTPM-3PHISO energy meter evaluation board from STMicroelectronics, shown in Figure 3. Based on the STPM52, a dual-channel, 24-bit sigma-delta modulator, the board measures voltage and current for each of three ac phases through a voltage divider and a shunt current sensor. A selectable high-pass filter allows for measurement of dc current and voltage.

The sensing circuitry and PCB layout maximize the signal-to-noise ratio to give the best possible measurement accuracy.

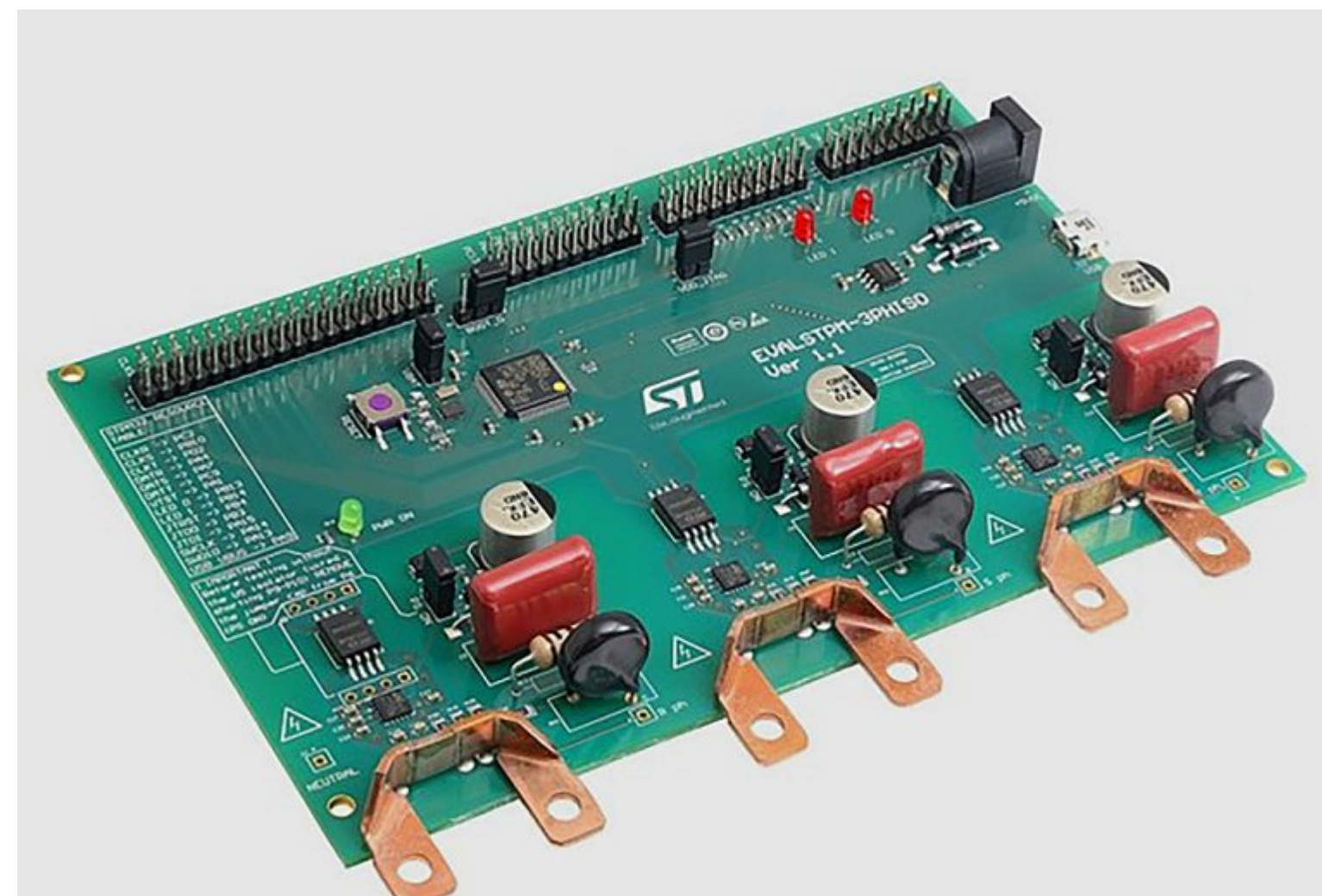


Fig. 3: The EVALSTPM-3PHISO evaluation board implements a complete three-phase energy meter with low-cost shunt current sensors

Expert support for use of new components

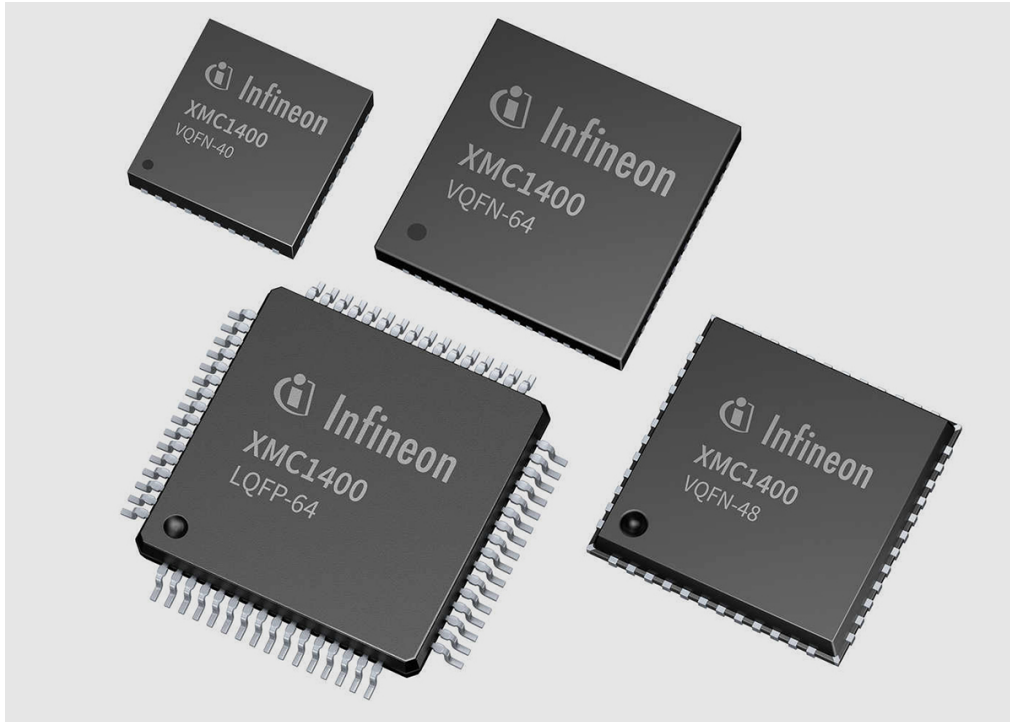
In all of these applications and use cases, the use of new component technology can be facilitated by drawing on the expertise of the Advanced Engineering Group at Future Electronics. This group includes regional specialists in domains such as power management, sensing, and embedded systems. The group is backed by the hands-on design engineering expertise of the Centre of Excellence, which develops sophisticated reference designs for various power-conversion functions.

The combination of advanced component technology, specialist advice, and the innovation and engineering skills of Europe's small and medium-sized electronics OEMs provides a sure foundation for the exploitation of the new opportunities presented by the continent's moves towards decarbonization.

BUY NOW

32-bit MCUs include special features for motor-control applications

The XMC™ 1300 and XMC1400 microcontrollers from Infineon provide high-performance control for motor drives due to features including a CCU8 PWM timer unit, easy inverter design, a POSIF interface, and adjustable ADC.



The XMC1300 and XMC1400 series of microcontrollers from Infineon integrates all the control and analog interface functions required for sensorless field-oriented control schemes, and for brushless dc (BLDC), brushed dc and permanent magnet synchronous motors (PMSM).

Part of the XMC1000 family of MCUs based on an Arm® Cortex®-M0 core, the XMC1300 and XMC1400 perform well in low-cost embedded control applications, not only in motor drives but also in multi-channel LED lighting, industrial I/O systems, and human-machine interfaces.

Features of the XMC1300 and XMC1400 that are especially well suited to motor control include:

- Easy 3-phase inverter implementation with a single CCU8 PWM unit, offering shadow register transfer, external input for fault control, binary and floating pre-scaler, and 16- to 64-bit width
- POSIF interface to directly connect Hall sensors or an incremental encoder
- 12-bit ADC with on-chip adjustable gain of x1, x3, x6, or x12



FEATURES

XMC1300

- One CCU8 PWM timer unit
- Memory:
 - From 8 kbytes to 200 kbytes of Flash
 - 16 kbytes of RAM
- 8 x 16-bit special-purpose timers with dead-time generation
- 12-channel, 12-bit ADC with 2 x parallel sampling
- Up to three comparators
- DALI or DMX communication capability
- Temperature sensor
- Math co-processor
- Operating-temperature range: -40°C to 105°C

XMC1400

- Two CCU8 PWM timer units
- 48 MHz core operating frequency
- Memory:
 - From 32 kbytes to 200 kbytes of Flash
 - 16 kbytes of RAM
- 8 x 16-bit special-purpose timers with dead-time generation
- 12-channel, 12-bit ADC with 2 x parallel sampling
- Two CAN communications interfaces
- Up to four comparators
- Real-time clock
- Watchdog timer
- Temperature sensor
- Operating-temperature range: -40°C to 85°C or 105°C

FREE DEV BOARD

Motor-drive card for development with the XMC1300 MCU

Orderable Part Number
KIT_XMC1300_DC_V1

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 **SAMPLES**



Integrated three-phase motor controller includes 32-bit Arm Cortex-M4-based MCU

The STSPIN32G4 from STMicroelectronics combines a 32-bit microcontroller with a triple half-bridge gate driver in a single package, is capable of implementing advanced motor-control schemes, and running two independent BLDC motors.



The STSPIN32G4 from STMicroelectronics is a flexible, integrated motor controller for driving three-phase brushless dc (BLDC) motors. This system-in-package (SiP) motor controller includes a powerful microcontroller, a triple half-bridge gate driver able to drive power MOSFETs with a current capability of 1 A, three bootstrap diodes, and a complete power management system to supply these components.

The high level of integration in the STSPIN32G4 helps motor-system designers to reduce the size and complexity of the control board, and to reduce system cost.

The SiP's integrated STM32G431VBx3 MCU is based on a 32-bit Arm[®] Cortex[®]-M4 core which operates at a frequency up to 170 MHz. The SiP features a single-precision floating-point unit, a full set of DSP instructions, and a memory protection unit which enhances application security.

The range of MCU peripheral features is ideally suited to sophisticated BLDC motor-control applications. This includes two fast 12-bit ADCs, four comparators, three operational amplifiers, four DAC channels, and an internal voltage reference buffer. Multiple timers include two 16-bit PWM timers dedicated to motor control.

This feature-rich MCU is capable of running high-performance motor-control algorithms. Designers can program the STSPIN32G4 to run sensorless or sensed field-oriented control algorithms with one, two, or three shunts. The MCU can also run more advanced position or torque control algorithms, as well as implementing traditional six-step control.

With an additional external three-phase motor driver, such as the STDRIVE101, the STSPIN32G4 is capable of running two independent, three-phase BLDC motors, reducing bill-of-materials cost and simplifying the design.

Motor-control system designers benefit from the wide range of protection functions implemented in the STSPIN32G4. An interlocking function prevents the high- and low-side switches of the same half-bridge from being simultaneously driven high. Hardware drain-source voltage monitoring checks each of the six external MOSFETs. If the STSPIN32G4 detects an over-voltage across one of them, it switches off all the gate driver outputs.

The STSPIN32G4 is fully self-supplied via a flexible power management structure which can generate all the internal supplies from a single external motor-supply voltage source.



FEATURES

- Motor supply-voltage range: 5.5 V to 75 V
- Flexible power management
- Circuit protection features:
 - Thermal shut-down
 - Short-circuit
 - Overload
 - Under-voltage lockout
- Standby mode for reduced power consumption
- On-chip debug support
- Operating-temperature range: -40°C to 125°C

APPLICATIONS

- Industrial automation
- Home automation
- Home appliances
- Servo drives
- E-bikes
- Robots
- Power and garden tools
- Pumps and fans
- Drones

FREE DEV BOARD

Demo board for STSPIN32G4 integrated motor and drive controller

Orderable Part Number
EVSPIN32G4

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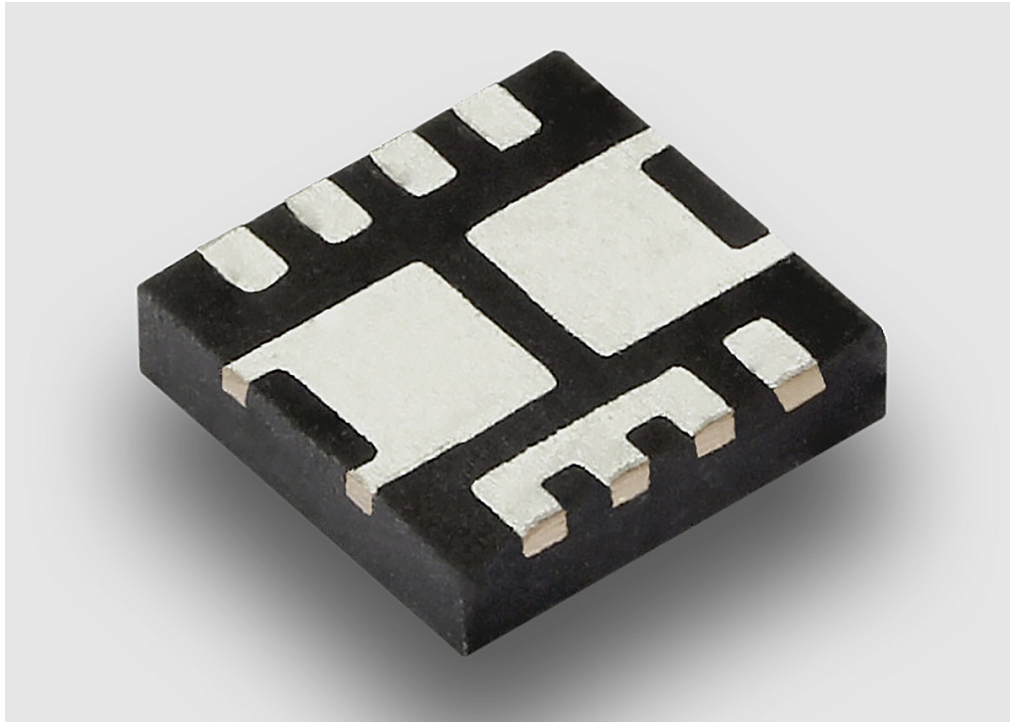
 **DATASHEET**

 **SAMPLES**



80 V MOSFET saves space and power in dc-dc converters

The SiZF4800LDT from Vishay, in a thermally efficient 3.3 mm x 3.3 mm PowerPAIR[®] package, features the fourth generation of the TrenchFET[®] MOSFET technology, for high efficiency when switching at high frequency.



FEATURES

- 2 V maximum gate-source threshold voltage
- 2.2°C/W maximum junction-to-case thermal resistance
- ±100 nA maximum gate-source leakage current
- Operating-temperature range: -55°C to 150°C

APPLICATIONS

- Computer and server peripherals
- Point-of-load power supplies
- Telecoms power supplies

The SiZF4800LDT 80 V dual N-channel MOSFET from Vishay offers high efficiency in high-frequency switching power converters in a synchronous buck topology. The MOSFET is suitable for operation in half-bridge circuits and in point-of-load power supplies.

The SiZF4800LDT is based on Vishay's TrenchFET Gen IV technology. The combination of high- and low-side MOSFETs in the SiZF4800LDT is suitable for operation in a 50% duty cycle. Thanks to low on-resistance and low gate charge, the MOSFET enables designers to achieve high efficiency when switching at high frequency.

The MOSFET is housed in a 3.3 mm x 3.3 mm PowerPAIR package. Based on flip-chip technology, this package offers excellent thermal performance.

The SiZF4800LDT features maximum on-resistance of 19 mΩ at 10 V, gate charge of 7.1 nC, and can handle a maximum drain current of 36 A.

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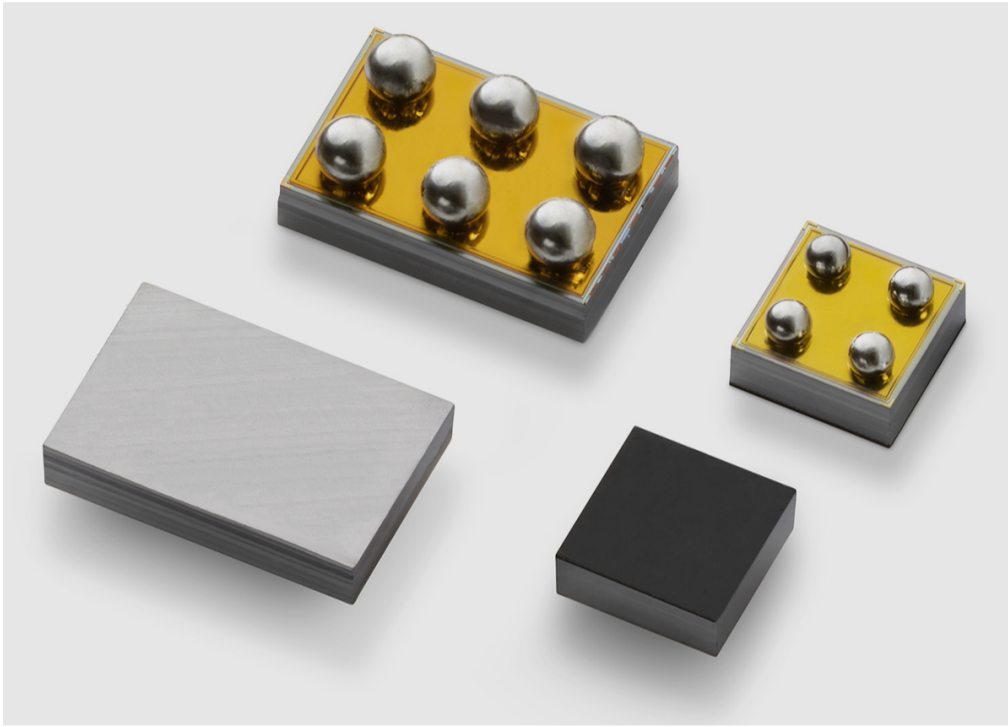
CONSUMER



TELECOMS

Ultra low-power load switch ICs extend battery life with nA-rated leakage current

The Low Quiescent (LQ) series of load switch ICs from Littelfuse features reduced parasitic leakage current and low on-resistance. Several compact package options offer a high level of integration.



Expertise Applied | Answers Delivered

FEATURES

- Ultra low-power consumption
- 14 mΩ minimum on-resistance
- 1 nA minimum quiescent current
- Quick output discharge

APPLICATIONS

- Wearable devices
- Handheld devices
- Computing equipment
- SSDs
- Building automation
- IoT devices
- Smart tags
- Smart meters
- Point-of-sale terminals

The Littelfuse LQ series load switch ICs provide industry-leading low on-resistance and leakage current measured in nanoamps to reduce power consumption, resulting in higher system efficiency and extended battery life.

Suitable for use in space-constrained applications, the LQ switches feature a highly integrated design: the switches take passives, transistors, and reverse current blocking diodes that are often mounted externally, and integrate them in the IC package to give substantial space and bill-of-materials cost savings. This high level of integration also results in on-resistance that is some two-thirds lower than that of discrete solutions.

These load switches support a voltage range from 1.1 V to 5.5 V. Two maximum current options are available: the 0.77 mm x 0.77 mm x 0.46 mm CSP4 package is rated for current up to 2 A. The 0.97 mm x 1.47 mm x 0.55 mm CSP6 package option has a 4 A rating.

An additional 0.97 mm x 0.97 mm x 0.55 mm CSP4 package option for the 2 A device gives more opportunity for drop-in replacement of other components, to accelerate time-to-market.

The LQ series load switches also offer several features to protect a circuit from damage caused by transient currents. Slew-rate control and soft-start protects the system from inrush currents. Input and output voltage detection enables reverse-current blocking. Quick output discharge prevents unpredictable behavior in downstream circuitry.

[Introduction to LQ series](#)

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TELECOMS

Power MOSFET offers >90% efficiency for high-end power conversion at 500 kHz switching frequency

The STL120N10F8 100 V power MOSFET from STMicroelectronics features reduced conduction and switching losses and low EMI, enabling engineers to realize efficient designs for power supplies and power converters.



FEATURES

- Continuous drain current up to 125 A at 25°C
- Pulse drain current up to 500 A
- 4.6 mΩ maximum on-resistance
- Low capacitance and gate charge
- Operating-temperature range: -55°C to 175°C
- 100% avalanche tested

APPLICATIONS

- Motor drives
- Switching applications
- Synchronous buck-boost dc-dc converters
- Industrial automation
- Data centers and cloud servers
- Battery-operated devices

The STL120N10F8 N-channel enhancement-mode power MOSFET from STMicroelectronics is a robust device which provides high system efficiency in fast-switching circuit topologies. The MOSFET is available in a compact 5 mm x 6 mm x 1 mm package.

The key innovation behind the STL120N10F8 high levels of efficiency is the STMicroelectronics STripFET F8 technology. This enables several performance benefits, including:

- Faster switching speeds
- Higher power density
- Reduced switching and conduction losses
- Reduced electromagnetic noise

The performance efficiency is a minimum 90% at a 500 kHz switching frequency across all load conditions. This increases to over 95% for medium-load conditions at a 300 kHz switching frequency.

This 100 V power MOSFET features a maximum on-resistance of 4.6 mΩ and supports a continuous drain current of up to 125 A at 25°C. This is reduced to 88 A at 100°C. A maximum current of 500 A can be pulsed for up to 10 μs. A single-pulse avalanche current of 60 A is also possible, with the pulse length limited by the maximum junction current of 175°C.

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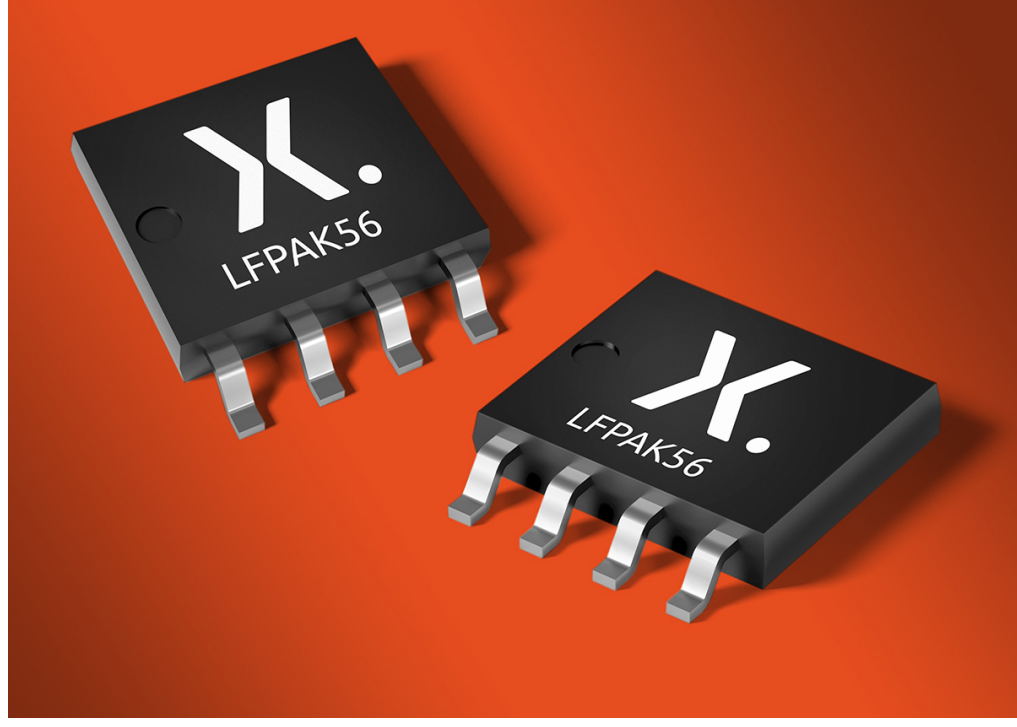
CONSUMER



TELECOMS

How noise-optimized MOSFETs ease EMC compliance in industrial and telecoms applications

A range of MOSFETs from Nexperia, supplied in an LPAK56 package which has a standard footprint, reveals marked reductions in EMI peaks and in average noise when tested against competing products.



nexperia

Industrial motor drives that switch large currents through MOSFETs are prone to high levels of electromagnetic emissions. The MOSFETs used in these applications will affect EMI differently, depending on several factors such as the speed of turn-on/turn-off, and the ability of the output network to limit spiking and to damp harmonic content.

Now a range of products from Nexperia balance the dynamic characteristics of the MOSFET and increase damping to ensure that EMC performance is improved. This makes it easier to design the MOSFETs into new or existing designs and to tolerate imperfect board layouts. Nexperia EMC-optimized MOSFETs help OEMs to meet EMC requirements, and give designers confidence that the product will pass, reducing time to market and lowering development costs.

Alternative methods of meeting EMC test specifications are available to designers:

- Use more expensive MOSFETs that have low on-resistance
- Slow down switching and absorb any ringing

But these techniques increase bill-of-materials cost and impair system performance. Nexperia's EMC-optimized MOSFETs improve EMC performance without over-engineering or adding cost.

Additionally, some designers will fit an external snubber across each MOSFET, adding to power losses, to improve EMC performance. This snubber usually needs to be matched to a specific MOSFET, and is not normally effective for a different MOSFET. The Nexperia optimized MOSFETs provide a similar outcome without the need to design a snubber circuit, with the benefit of higher overall efficiency and lower system costs.

Applications that can benefit from the use of EMC-optimized Nexperia MOSFETs include:

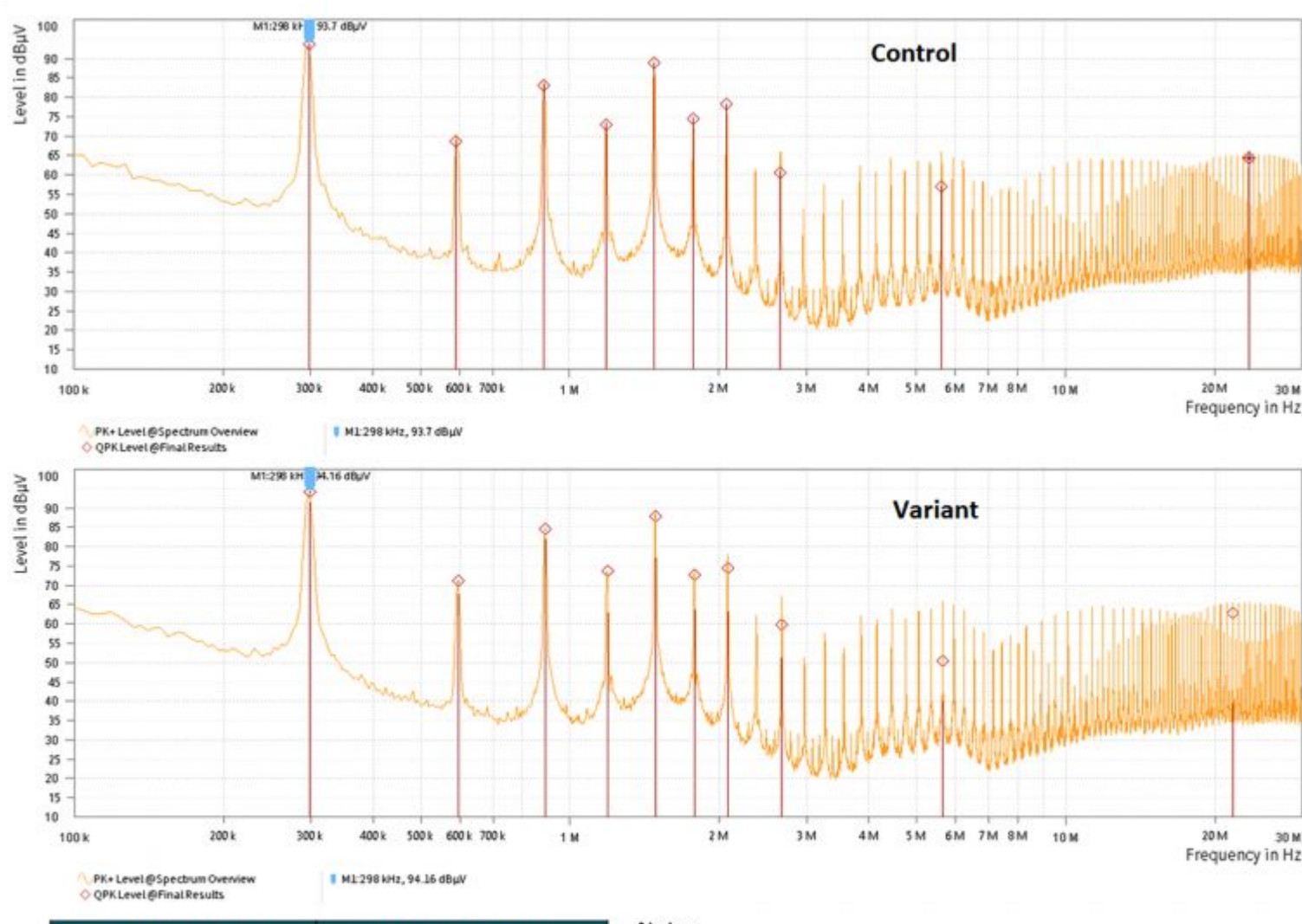
- Motor drives in industrial applications including battery-powered tools
- Synchronous rectification in power supplies, including in telecoms equipment and industrial PCs
- Condition monitoring
- Instrumentation and control
- Automation, robots and cobots

PSMN3R5-40YSB vs Control



Fig. 1: Comparison of radiated emission on motor-drive board using close field probe

Figure 1 shows the results from testing performed on Nexperia's Trinity motor-control board, comparing the EMC performance of an optimized Nexperia device, the PSMN3R5-40YSB, with that of a competing product. The average noise floor is raised by between 6 dB and 8 dB in the frequency range 125 MHz to 150 MHz. Individual peaks improve by as much as 12 dB.



Note:
 • 1.53dBuV difference at ~110-116MHz range
 • 1.65dBuV difference at ~90MHz range

Fig. 2: Comparison of conducted emissions on power-supply evaluation board

Figure 2 shows a plot of conducted emissions, again comparing a Nexperia EMC-optimized MOSFET with a standard MOSFET. The MOSFETs were fitted to a readily available step-down dc-dc converter evaluation board that produces a 12 V/10 A output. The snubber was removed from the board for the purpose of testing. The board layout itself minimizes EMI. This gives heightened significance to the 1.65 dB reduction in emissions attributable to the EMC-optimized MOSFET.

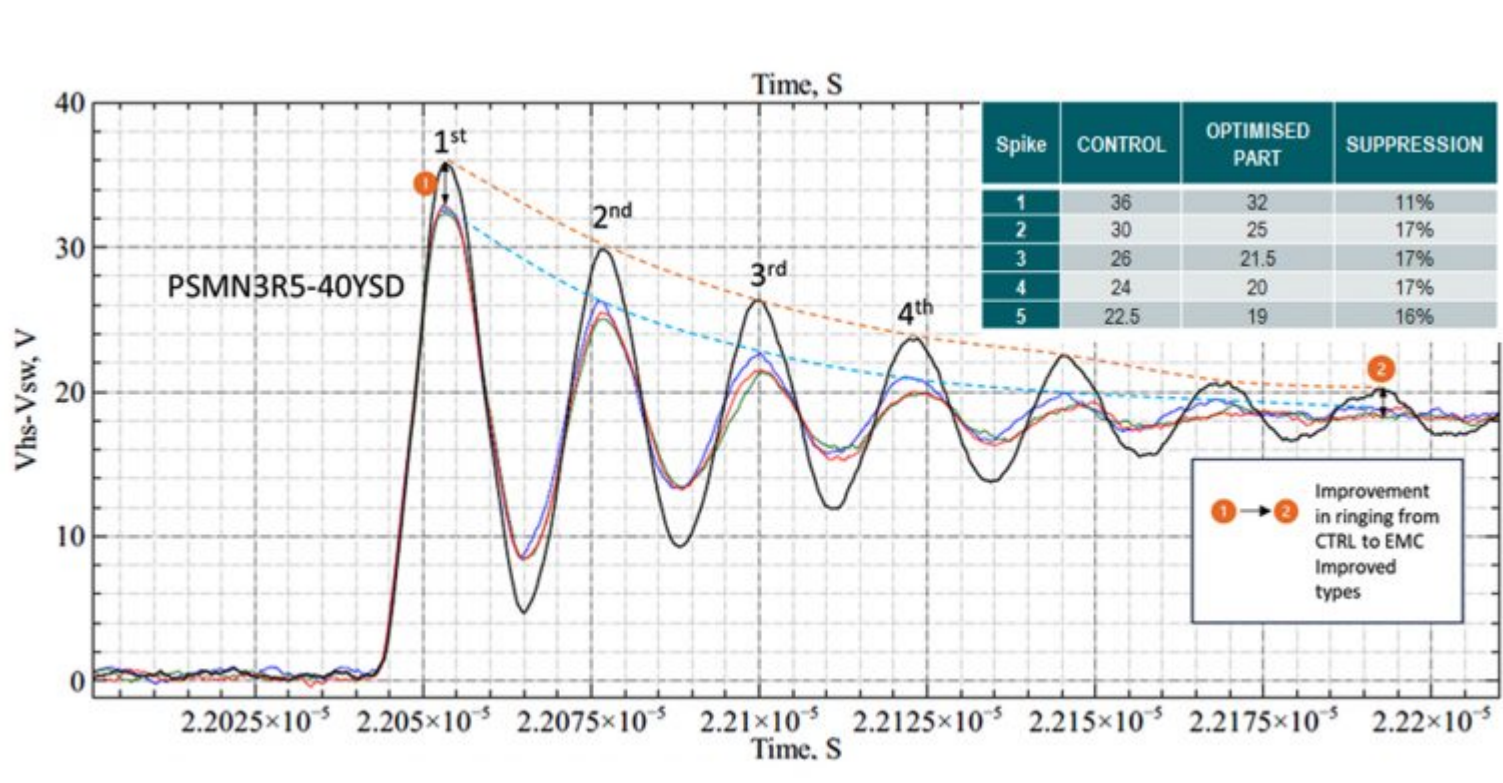


Fig. 3: Measurements performed on HCDP test gear show that Nexperia EMC-optimized MOSFETs provide better damping and spike suppression than a competing standard MOSFET

Figure 3 shows how the optimized MOSFET tested on high-current double-pulse (HCDP) test gear provides damping and spike suppression up to 17% better than the control. This will produce improved EMC performance in application designs.

Conclusion

EMC performance is dependent on several factors, and it is impossible to solve all EMC problems by replacing the MOSFET. The EMC-optimized MOSFET portfolio from Nexperia, however, is a valuable option for designers dealing with circuits in which EMC compliance is proving difficult.

The Nexperia EMC-optimized MOSFETs are supplied in a 100% clip-bonded LPAK56 package. This package is robust, offers high board-level reliability and provides excellent thermal performance. The LPAK56 is footprint-compatible with all widely used DFN56 packages.

Part Number	Maximum Drain-source Voltage	Maximum On-resistance at a Gate-source Voltage of 10 V	Maximum On-resistance at a Gate-source Voltage of 4.5 V	Maximum Drain Current
PSMN1R7-40YL B	40 V	1.8 mΩ	2.3 mΩ	200 A
PSMN1R9-40YSB	40 V	1.9 mΩ		200 A
PSMN2R0-40YL B	40 V	2.1 mΩ	2.7 mΩ	180 A
PSMN2R2-40YSB	40 V	2.2 mΩ		180 A
PSMN2R5-40YL B	40 V	2.6 mΩ	3.3 mΩ	160 A
PSMN2R8-40YSB	40 V	2.8 mΩ		160 A
PSMN3R2-40YL B	40 V	3.3 mΩ	4.2 mΩ	120 A
PSMN3R5-40YSB	40 V	3.5 mΩ		120 A

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TELECOMS

Full-bridge driver IC provides flexible control for brushed dc motors

The STSPIN958 full-bridge driver from STMicroelectronics offers a highly versatile, scalable solution for the control of brushed dc motors, with output current up to 5 A and standby consumption of 3 μ A.



The STMicroelectronics STSPIN958 is a highly integrated motor driver supporting an operating voltage of up to 58 V. The driver IC enables high-frequency PWM control of brushed dc motors with a precisely regulated duty cycle.

Seven drive modes are offered by the STSPIN958, which are selectable via three Mode pins. A high signal on all three Mode pins results in no mode being selected, and the drive mode cannot be changed during operation.

These drive modes with the respective current limiter modes are:

1. Dual half-bridge with fixed Off time
2. Single full-bridge with fixed Off time
3. Single half-bridge, parallel mode, with fixed Off time
4. Single full-bridge, mixed decay, with fixed Off time
5. Dual half-bridge with PWM trimming
6. Single full-bridge with PWM trimming
7. Single half-bridge, parallel mode, with PWM trimming

The STSPIN958 supports an adjustable power MOSFET slew rate for a maximum slew rate of 300 ns. This is selected via an external resistor and enables engineers to optimize the design for drive and EMI performance.

This motor driver IC also offers current sensing via an external shunt resistor, and a current limiter with adjustable threshold and Off time, and corresponding decay. Standard protections are present for under-voltage, over-current, and over-temperature, with under-voltage lockout and thermal shutdown at 150°C.



FEATURES

- Operating voltage up to 58 V
- 5 Arms maximum output current
- Integrated amplifiers with precise current control
- 0.33 Ω on-resistance
- Protection functions:
 - Under-voltage
 - Over-current
 - Thermal shutdown

APPLICATIONS

- Factory automation
- Textile machines
- ATM and cash machines
- Vending machines
- Home appliances
- Robotics
- Stage lighting
- Antenna control

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UNO-pinout-compatible motor shield based on the STSPIN958 full-driver

Orderable Part Number
EVSPIN958

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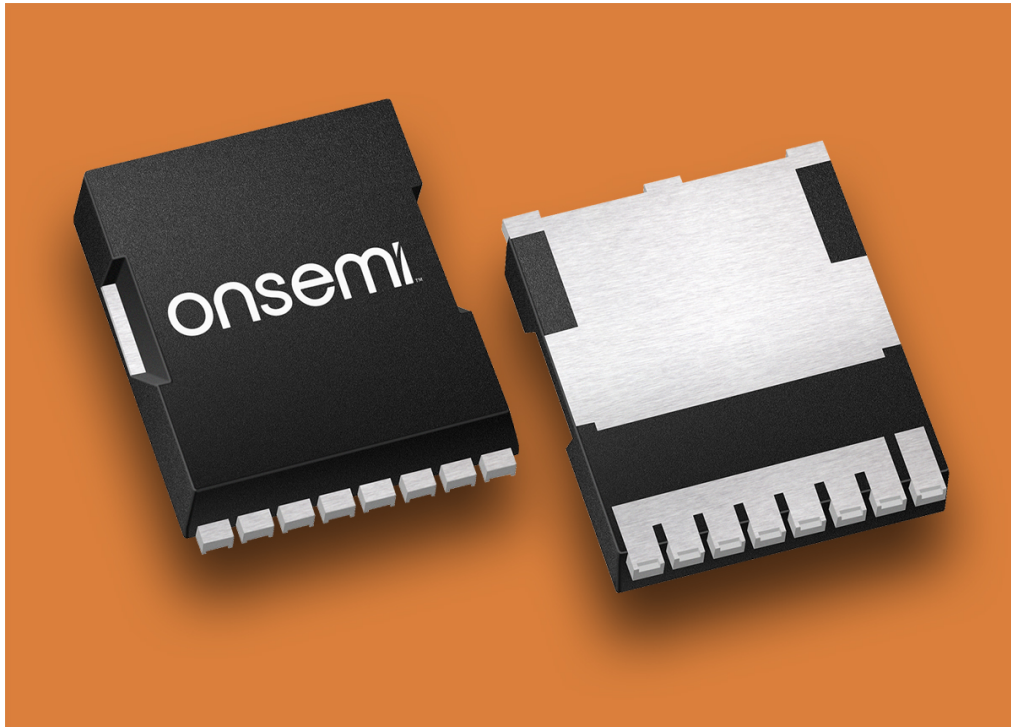
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Robust 80 V MOSFETs improve efficiency with lower switching losses and softer recovery diode

The new 80 V T10 single N-channel MOSFETs from onsemi feature a softer recovery diode and low reverse-recovery charge and gate charge to minimize driver and conduction losses in motor-drive and voltage-conversion applications.



onsemi

FEATURES

- High power density
- 3.6 V maximum gate-threshold voltage
- 100 nA maximum leakage current
- 174 nC total gate charge at 10 V
- Operating-temperature range: -55°C to 175°C

APPLICATIONS

- Motor drives
- Industrial automation
- Synchronous rectification in dc-dc and ac-dc converters
- Isolated dc-dc converters
- ORing circuits
- Solar optimizers and PV converters
- Data center server power supplies
- Telecoms power supplies
- Cloud computing
- Battery-powered equipment

The new T10 family of 80 V MOSFETs from onsemi benefit from the latest circuit fabrication technology to produce improved performance across many parameters of interest to MOSFET users. The NTBLS0D8N08 and NTMFWS1D5N08 MOSFETs in particular offer low on-resistance and high continuous drain-current capability.

The NTBLS0D8N08, supplied in a TOLL package, has a maximum on-resistance of 0.79 mΩ at 10 V. The maximum continuous drain current is 457 A at 25°C and 323 A at 100°C. At 25°C the current can be pulsed at up to 1,629 A for 100 μs.

The NTMFWS1D5N08 is supplied in an SO8FL package with a maximum on-resistance of 1.43 mΩ at 10 V. The maximum continuous drain current is 253 A at 25°C and 179 A at 100°C. At 25°C the current can be pulsed at up to 1,071 A.

The performance of the MOSFETs has been improved to provide additional avalanche robustness in fast-switching applications. A softer recovery diode and lower reverse-recovery charge also reduce ringing, overshoot, and system noise while increasing application efficiency.

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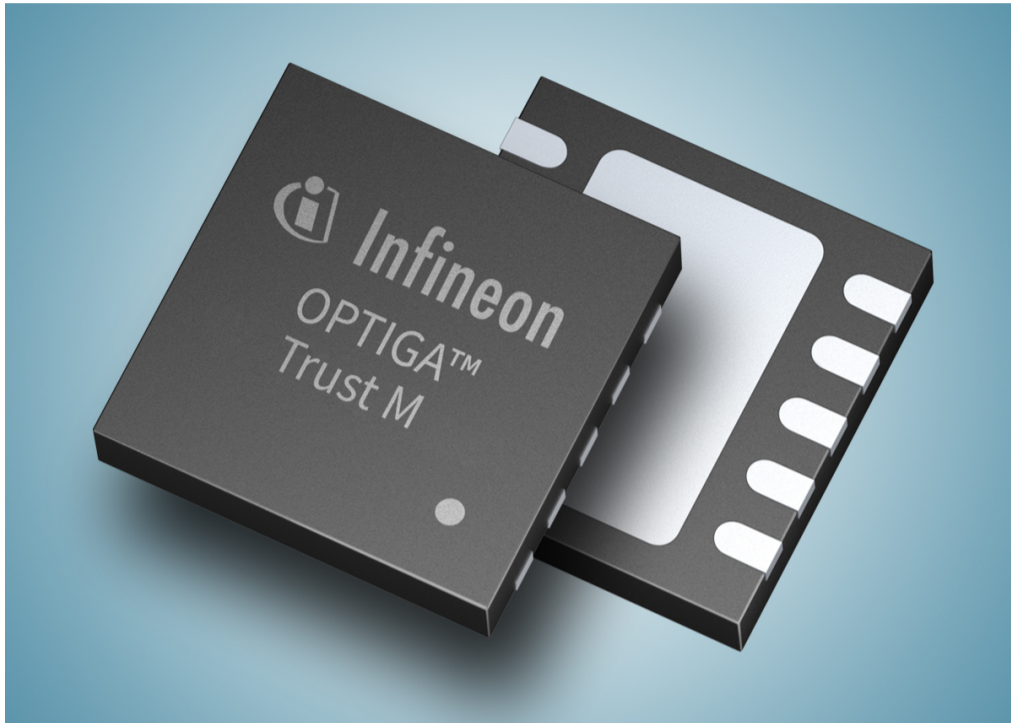
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TELECOMS

Complete cloud security solution protects IoT devices from cyber-attack

The OPTIGA™ Trust M tamper-resistant security solution from Infineon is Common Criteria EAL6+ certified. The secure element can be used with any MCU or application processor to enhance the security of IoT designs.



The OPTIGA Trust M from Infineon is a high-end security solution which provides an anchor of trust for connecting IoT devices to the cloud, giving every IoT device its own unique identity. This individual, turnkey solution offers secure, zero-touch onboarding and the high performance needed for quick cloud access.

The OPTIGA Trust M chips and supporting software offer a wide range of security features. In particular, they support common asymmetric cryptography algorithms including:

- RSA® up to 2048
- AES key up to 256, HMAC up to SHA512
- TLS v1.2 PRF and HKDF up to SHA512

The turnkey set-up with full system integration minimizes the design, integration and deployment effort required of product manufacturers. The OPTIGA Trust M development process is certified according to the security standard IEC 62443-4-1 for industrial automation and control systems, acting as an enabler to achieve component-level certification according to IEC 62443-4-2.

The OPTIGA Trust M security solution is specified in two operating-temperature ranges:

- SLS32AIA010MK at a standard temperature range of -25°C to 85°C for most commercial implementations
- SLS32AIA010ML at an extended temperature range of -40°C to 105°C for harsh industrial environments

The OPTIGA Trust M chip is supplied in a USON-10 package that has a footprint of 3 mm x 3 mm.



FEATURES

- High-end CC EAL6+ certified security controller
- ECC: NIST curves up to P-521, Brainpool r1 curve up to 512
- Hibernate mode for zero power consumption
- Open-source host code available on GitHub under MIT license
- Up to 10 kbytes of memory
 - Protected updates
 - Usage counters
 - Dynamic object locking
- Configurable device security monitor
- 20-years lifetime for industrial and infrastructure applications

APPLICATIONS

- Smart lightning
- Smart home
- Building automation
- Industrial robotics
- Programmable logic controllers
- Motor drives
- Drones

FREE DEV BOARD

OPTIGA Trust M IoT security development kit

Orderable Part Number
TRUSTMIOTSDKTOB1

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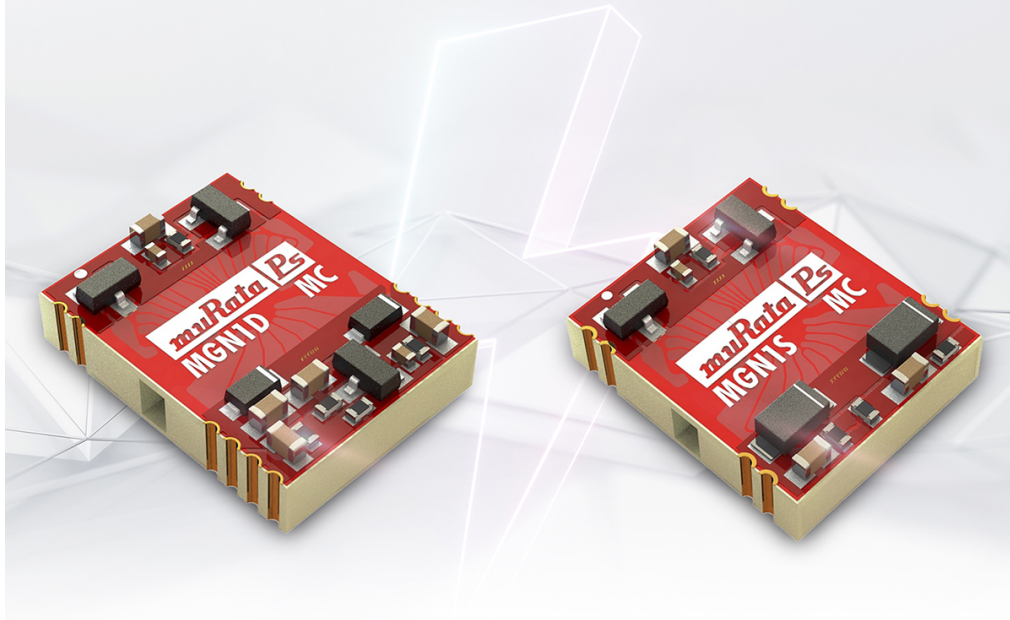
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New dc-dc converters meet fast-switching requirements of GaN-based systems

The MGN1 converter modules from Murata provide the ideal isolated power supply solution for the gate drivers required by GaN power switches. Compact dimensions ensure the modules suit tightly-packed board layouts.



muRata
INNOVATOR IN ELECTRONICS

FEATURES

- 6.5 mm creepage and clearance
- 3 kV ac isolation voltage
- Operating-temperature range: -40°C to 105°C
- Reverse-polarity protection
- Short-circuit protection
- 68.5% efficiency

APPLICATIONS

- EV fast charging stations
- Battery energy storage systems
- Smart grid equipment
- Solar inverters
- Computing equipment
- Data centers
- Wind turbines
- Motor drives

Murata has introduced compact new 1 W dc-dc converters, the MGN1 series, which supply the voltages needed by the gate drivers of wide bandgap gallium nitride (GaN) power switches. The regulated output-voltage options are +8 V, +12 V, and +6/-3 V from a 12 V nominal input voltage.

Lightweight, and measuring 12.0 mm x 16.0 mm x 4.25 mm or 12.0 mm x 14.5 mm x 4.25 mm, these surface-mount modules can easily be integrated into space-constrained designs.

One of the key attributes of the MGN1 series converters is the ultra-low isolation capacitance of 2.5 pF. This minimizes the coupling of transients across the isolation barrier, preventing signal distortion, and alleviating system EMI problems.

Common-mode transient immunity of more than 200 kV/μs makes the MGN1 modules ideal for GaN-based systems that switch at high frequency. Thanks to the partial discharge performance, reliable operation is maintained in high-voltage conditions.

The dc-dc converters in Murata's MGN1 series support a continuous isolation barrier withstand voltage of 1.1 kV.

Part Number	Input Voltage	Output Voltage	Line Regulation	Load Regulation	Number of Outputs
MGN1D050603MC	5 V	6 V	±0.2%	1%	2
MGN1D120603MC	12 V	6 V	±0.2%	1%	2
MGN1S0508MC	5 V	8 V	±1.2%	4%	1
MGN1S0512MC	5 V	12 V	±1.2%	4%	1
MGN1S1208MC	12 V	8 V	±1.25%	4%	1

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Zener-protected power MOSFET offers reduced ringing and higher circuit efficiency

The 600 V STD7N60DM2 power MOSFET from STMicroelectronics features a fast recovery diode, and offers low reverse-recovery charge and time for higher efficiency in demanding converter topologies.



FEATURES

- Fast-recovery body diode
- 100% avalanche tested
- High dV/dt ruggedness: 0.5 V/ns

APPLICATIONS

- Switch-mode power supplies
- Bridge converters
- ZVS phase-shift converters
- Home and professional appliances
- HVAC and climate control

The STMicroelectronics STD7N60DM2 is a 600 V, N-channel power MOSFET with a typical on-resistance of 0.78 Ω . It is well suited to high-efficiency switching applications thanks to the extremely low gate charge and input capacitance.

As part of the STMicroelectronics MDmesh DM2 fast recovery diode series of power MOSFETs, the STD7N60DM2 offers shorter reverse-recovery time for increased efficiency, and higher dV/dt ruggedness for improved system reliability.

The STD7N60DM2 can carry a continuous drain current of up to 6 A at 25°C. At 100°C this is reduced to 3.8 A. The maximum pulsed drain current is 24 A for a total power dissipation of up to 60 W at 25°C. The full operating junction temperature range is -55°C to 150°C.

This power MOSFET is 100% avalanche tested and offers Zener diode protection for increased reliability in demanding applications. The package is a 6.40 mm x 9.35 mm x 2.20 mm DPAK.

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TELECOMS

Compact magnetic connectors with 30,000 mating cycles for reliable charging of consumer devices

The EDAC magnetic pogo connectors feature a robust magnetic design for easy, reliable alignment, with linear or circular housing options and contacts rated at up to 2 A.



EDAC

FEATURES

- Magnetic design for reliable, polarized connection
- 2 A maximum current per contact, higher amperage available
- 60 mΩ maximum contact resistance after initial mating
- Operating-temperature range: -30°C to 85°C
- Design solutions for bespoke requirements

APPLICATIONS

- Consumer electronics
 - Smart watches
 - Mobile phones
 - Tablet PCs
 - Wearable devices
- Toys and games

The magnetic pogo connectors from EDAC are available in two options. Both provide robust operation with 30,000 mating cycles to support reliable connection for the full lifetime of a consumer product. The tear-away magnetic design prevents mechanical damage caused by unintended disconnection.

The 685C02212021C1E connector features a circular design with a diameter of 8.3 mm and a concentric ring contact rated at up to 5 V. This contact is made from brass with a gold-over-nickel plating, and an outer diameter of 2.3 mm. The contact housing is made from PA46 black thermoplastic. The insulation resistance is specified at a minimum of 100 MΩ.

The 685E0321350120E has a black thermoplastic construction, in a 4.1 mm x 21.5 mm linear form factor with three spring-loaded contacts rated at up to 12 V each. This pin assembly is located in the central 8 mm of the connector length, with north- and south-polarized magnets on either side to ensure correct alignment.

The EDAC magnetic pogo connectors are tested for a maximum contact resistance of 60 mΩ after initial mating.



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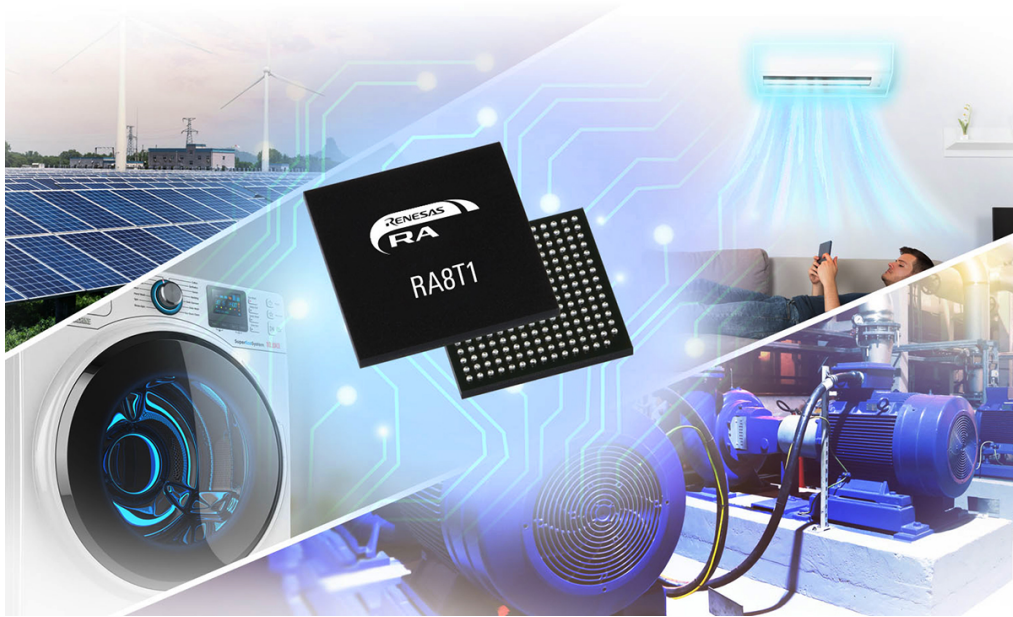
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TELECOMS

480 MHz Cortex-M85-based MCU offers high performance and abundant features for motor control

The RA8T1 series of 32-bit microcontrollers from Renesas features Arm's AI-capable, highest-performance M-class core with Helium™ and TrustZone® technology for secure, advanced motor control designs.



The new RA8T1 microcontrollers from Renesas are built with a wide set of features that are optimized for real-time motor control tasks in a wide range of industrial automation and consumer applications.

Based on an Arm® Cortex®-M85 core running at up to 480 MHz, these MCUs are capable of advanced calculations for the most complex movements. This architecture is supported by 1 Mbyte or 2 Mbytes of code Flash memory with dual-bank capability, 12 kbytes of data Flash, and 1 Mbyte of SRAM.

Arm Helium technology enhances the capabilities of these MCUs to give lower power consumption as well as additional functionality. This includes high-level AI at the edge or digital signal processing, with four times the machine learning performance when compared to existing Cortex-M7 devices. This functionality is supported by an additional 128 kbytes of memory with error correction code and 32 kbytes of I/D cache.

To serve as a basis for a complete motor control system, the RA8T1 devices have 14 channel PWM timers operating at 120 MHz, two 21-channel ADCs with 3-channel sample and hold, and two DACs. These have been engineered to support the low overall power consumption of the RA8T1 device. In addition to standard interfaces, these MCUs also support I3C, Ethernet MAC, CAN FD, and USB 2.0 Full-speed communications.

The RA8T1 MCUs also feature numerous safety and security features in addition to Arm's TrustZone technology. The safety features include a memory protection unit, SRAM parity check, Flash area protection, clock-frequency accuracy measurement, and ADC self test. Key security measures include secure debug, true random number generator, immutable storage, RSIP-E51A cryptographic engine, and protection against side-channel attacks.

To support different application requirements, Renesas produces the RA8T1 MCUs in the following package options: LQFP100, LQFP144, LQFP176, and BGA224.

RENESAS

FEATURES

- Armv8.1-M architecture profile
- Armv8-M security extension
- Memory Protection Unit
 - Protected memory system architecture
 - Secure MPU with eight regions
 - Non-secure MPU with eight regions
- SysTick timer
 - Embeds two SysTick timers: secure and non-secure instances
 - Driven by CPUCLK or MOCO divided by 8
- CoreSight™ ETM-M85
- Security functions
 - Secure boot
 - Up to three tamper-resistant pins
 - Device lifecycle management

APPLICATIONS

- Industrial automation
 - Ac drives
 - Line conveyors
 - Power supplies
- Building automation
 - Solar inverters
 - HVAC and air conditioning
- White goods
- Induction hob cookers
- Vacuum cleaners
- Power tools
- Lawnmowers

FREE DEV BOARD

Evaluation kit for BLDC motor control using Renesas RA8T1 series MCUs

**Orderable Part Number
MCK-RA8T1**

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TELECOMS

Low-loss IGBT enables safer paralleling with tighter parameter distribution

The STMicroelectronics STGD6M65DF2 M-series 650 V IGBT features an optimal balance between inverter system performance and efficiency, with a maximum junction temperature of 175°C.



FEATURES

- 2.6 V maximum forward voltage
- 6 V gate threshold voltage
- 21.2 nC total gate charge
- Operating-temperature range: -55°C to 175°C

APPLICATIONS

- Industrial motor control
 - Induction motor control
 - PMSM/BLDC motor control
 - Stepper motor control
 - Switched reluctance motor control
- Industrial tools and equipment
- Industrial fans
- PFC converters
- Uninterruptible power supplies

The STGD6M65DF2 IGBT from STMicroelectronics features an advanced proprietary trench-gate field-stop structure which provides low-loss operation for higher system efficiency. This is supported by low thermal resistance.

The advanced trench-gate field-stop structure also ensures good short-circuit functionality. The STGD6M65DF2 is capable of withstanding short-circuit operation for a minimum of 6 μ s.

This IGBT features a soft, ultra-fast recovery antiparallel diode to protect the STGD6M65DF2. Additionally, the positive collector-emitter saturation voltage-to-temperature coefficient and tight parameter distribution enable safer operation when paralleling multiple STGD6M65DF2.

The continuous collector current, or forward current, is up to 12 A at 25°C. This is reduced to 6 A at 100°C and increases to 24 A during pulsed operation. The rated maximum total power dissipation of the device is 88 W at 25°C.

The STGD6M65DF2 is supplied in a 6.40 mm x 9.35 mm x 2.20 mm DPAK package.

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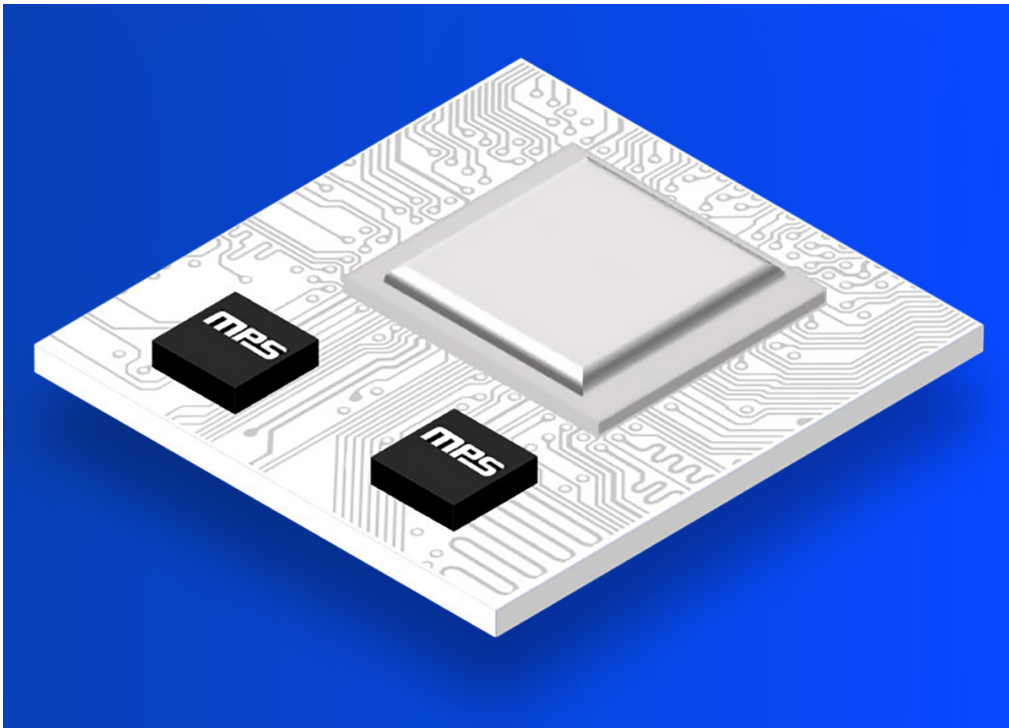
CONSUMER



TELECOMS

Reference designs for Lattice FPGAs ease design of power circuits

Monolithic Power Systems provides a set of ready-made circuit designs for Lattice Semiconductor FPGAs that can be optimized for low bill-of-materials cost or small system size.



Monolithic Power Systems (MPS) offers an extensive portfolio of power solutions for Lattice Semiconductor FPGAs, simplifying the design of power circuits for designers using Lattice FPGAs, and helping OEMs to shorten time-to-market for new products.

The reference designs for Lattice FPGAs feature various MPS power devices. These range from highly flexible and easy-to-use PWM regulators to fully integrated power modules. MPS has developed an innovative, proprietary process technology that produces high efficiency, ultra-fast transient response, small size, and low system cost.

Reference designs are available for various Lattice FPGAs:

- ECP5-5G
- MachX05
- CrossLink-NX
- Avant-E
- CertusPro-NX

For the ECP5-5G FPGA, MPS offers three reference designs: two options minimize bill-of-materials cost, and a third keeps the system board footprint to a minimum. This last design features two MPM3606 and four MPM3620 modules.

The MPM3606 is a synchronous step-down converter with integrated inductor. It provides a maximum current output of 0.6 A from a supply with an input voltage of up to 21 V. The MPM3620 is also a synchronous step-down converter with integrated inductor. The current rating is 2 A, and the converter handles a maximum input voltage of 24 V.

Reference designs with options to minimize cost or board footprint are also available for the MachX05, Avant-E, and CertusPro-NX FPGAs. The CrossLink-NX reference design, featuring the MPM54304 quad-output power module, has a small board footprint.

All the reference designs are optimized for low EMI to provide for compliance with the requirements of the EN 55022 standard.

MPS

FEATURES

MPM54304

- Input-voltage range: 4 V to 16 V
- Output-voltage range: 0.6 V to 7 V
- Configurable parameters:
 - Paralleling channel 1 and 2
 - Paralleling channel 3 and 4
 - Switching frequency
 - Output voltage
 - Over-current and over-voltage protection threshold
 - Power-on and power-off sequencing
 - Forced PWM or auto-PWM/PFM
- Maximum continuous current
 - 3 A on channels 1 and 2
 - 2 A on channels 3 and 4
- Interleaved operation
- Configurable, multi-functional GPIO pin

APPLICATIONS

- Industrial equipment
- Consumer devices
- Telecoms equipment

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Application-certified dc film capacitors for rating consistency throughout product lifetime

The Panasonic Industry EZPV series of dc film capacitors uses a new fabrication process that greatly improves the capacitance stability over time, offering standard, industrial, and automotive-compliant film capacitors.



Panasonic INDUSTRY

FEATURES

- Low ESR
- AEC-Q200-qualified options
- Operating-temperature range: -40°C to 105°C

APPLICATIONS

- Industrial power supplies
- Home appliances
- Solar inverters
- Wind power generation
- Automotive:
 - On-board chargers
 - Ac-dc and dc-dc converters

The EZPV series of dc film capacitors from Panasonic Industry are durable and offer stable capacitance over a wide operating-temperature range. The capacitors are ideal for functions including dc filtering and link circuits.

Unlike competing alternatives, the EZPV capacitors feature an improved fabrication process which avoids introducing unwanted air bubbles into the structure of the device. This results in additional resilience against changes in humidity and prevents internal corrosion, resulting in a longer operating life.

The EZPV devices are available with a nominal capacitance from 3 μF to 110 μF , and a rated voltage range from 600 V to 1,100 V dc. The packaging is made from a flame-retardant plastic and non-combustible resin to meet safety requirements for UL regulation and RoHS compliance.



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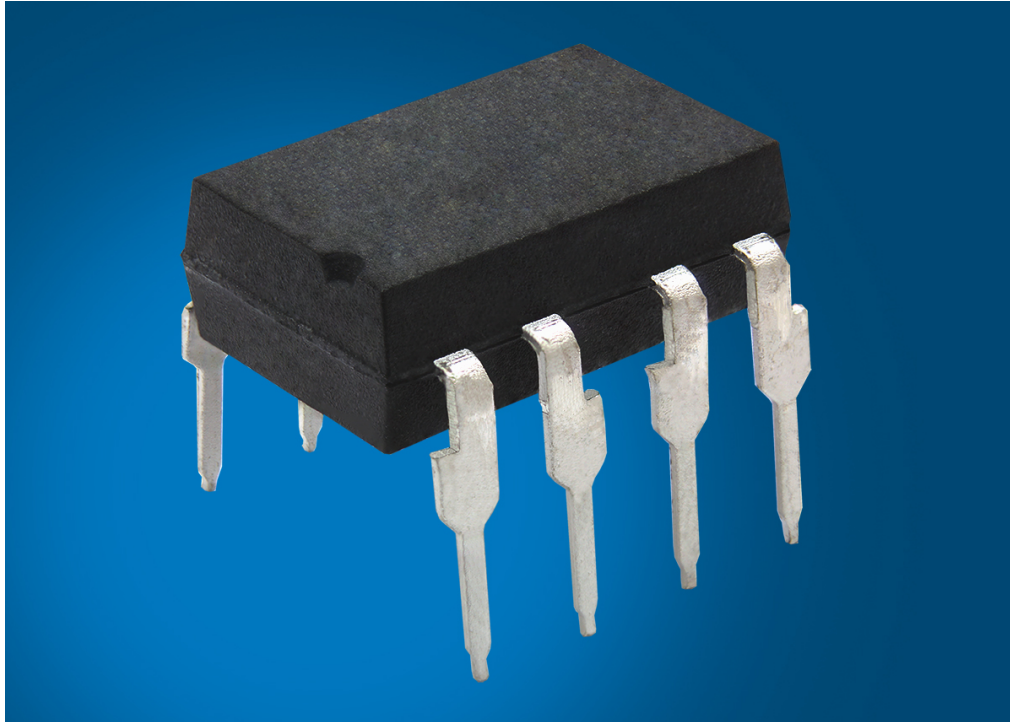
CONSUMER



TELECOMS

10 MBd optocouplers save energy in industrial applications

The latest high-speed optocouplers from Vishay feature a wide supply range of 2.7 V to 5.5 V and an open collector output. Single- and dual-channel configurations are available.



FEATURES

- Supply-voltage range: 2.7 V to 5.5 V
- Open collector output
- DIP-8, SMD-8, and SOIC-8 packages

APPLICATIONS

- Motor drives
- High-voltage safety in automation
- Ground loop elimination
- Digital bus systems isolation
- High-speed ADCs or DACs
- Level shifting
- Data communications
- Tools
- Low-voltage microcontroller-based systems

The VOH260A, VOIH060A, VOWH260A, VOH263A and VOIH063A 10 MBaud optocouplers from Vishay offer a low maximum supply current of 5 mA per channel to reduce energy usage in industrial applications.

The low typical turn-on threshold current of 2 mA also enables use of these optocouplers in low-voltage microcontroller applications, and in systems controlled via an I2C or serial peripheral interface. This is possible because the low-power specifications eliminate the requirement for additional driver stages between the MCU and optocoupler.

These optocouplers also feature an internal shield to provide a minimum common-mode transient immunity (CMTI) of 15 kV/μs. This makes the optocouplers an ideal solution for noise isolation and ground loop elimination.

The high isolation voltage supports applications with working voltages exceeding 1 kV, increasing safety and system reliability.

Part Number	VOH260A	VOIH060A	VOWH260A	VOH263A	VOIH063A
Channels	Single	Single	Single	Dual	Dual
Isolation Voltage (Vrms)	5,000	3,750	5,000	5,000	3,750
Isolation Distance (mm)	7 or 8	5	10	7 or 8	5



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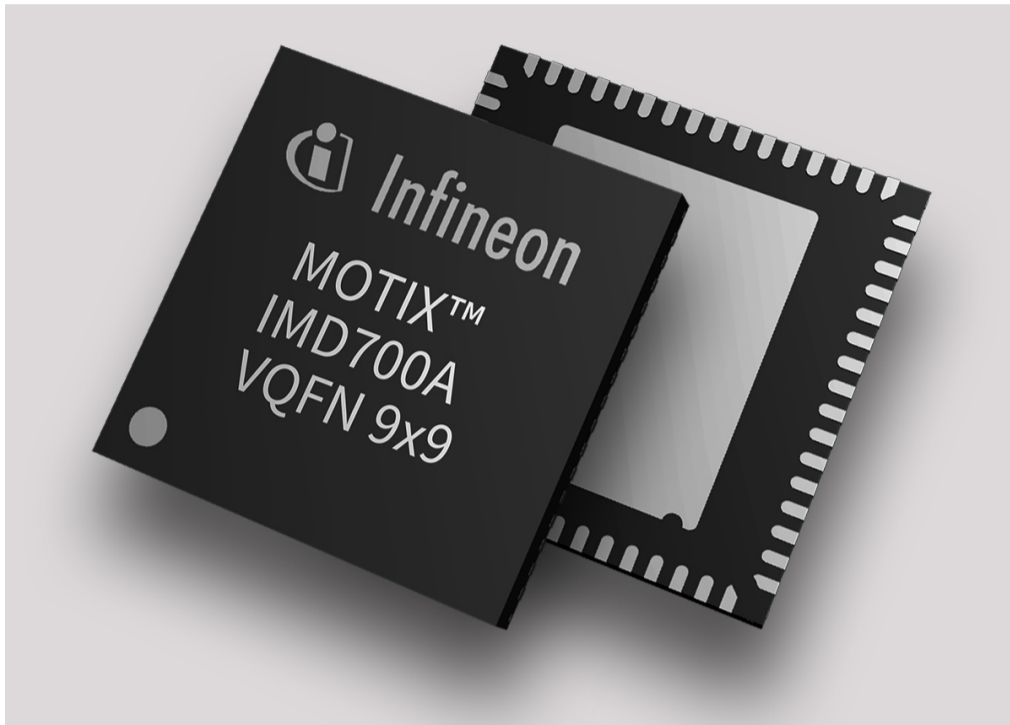
CONSUMER



TELECOMS

Fully programmable motor controller combines MCU with gate driver IC in a single package

The MOTIX™ IMD700A/701A motor controller from Infineon enables designers to implement compact BLDC motor or PMSM control systems with fewer components, and supporting operation from a battery power supply.



The MOTIX IMD700A/IMD701A from Infineon is a fully programmable motor controller which combines an XMC1404 32-bit microcontroller and a 6EDL7141 three-phase, half-bridge gate driver and supporting components into a single, compact package. The integration of control, MOSFET driving, current-sensing, protection and power-supply functions into one package enables designers to implement designs that are smaller, with fewer components and a simpler board layout than systems based on multiple discrete components.

The IMD70xA is ideal for compact, battery-powered motor-control systems that use a brushless dc (BLDC) motor or permanent magnet synchronous motor (PMSM).

The XMC1404 MCU, based on an Arm® Cortex®-M0 processor core, provides dedicated features for motor control. A hardware math co-processor operating at 96 MHz accelerates calculations that are commonly used in the field-oriented control of a PMSM, such as arctan and other division and trigonometric functions. Useful peripherals include PWM timers, a POSIF position-sensor interface, and serial communication modules supporting protocols including CAN.

The motor controller's 6EDL7141 MOSFET gate driver features sink and source currents that are configurable up to 1.5 A for driving a wide range of MOSFETs efficiently. It offers adjustable gate driver supply-voltage settings of 7 V, 10 V, 12 V or 15 V which are available even when the battery power supply is at a low voltage, thanks to built-in high- and low-side charge pumps.

The 6EDL7141 also has adjustable gate driver parameters to enable control of the slew rate, for minimizing system EMI. All of the 6EDL7141 settings can be quickly changed with an easy-to-use PC-based GUI supplied by Infineon.



FEATURES

- Three shunt amplifiers for current sensing
- Protection functions:
 - Over-current protection
 - Under-voltage lockout
 - Over-temperature protection
 - Locked rotor detection

APPLICATIONS

- Professional cordless power tools
- Drones
- Power tools for gardening
- E-bikes
- Automated guided vehicles
- Portable oxygen concentrators
- Fans

FREE DEV BOARD

Fully integrated BLDC motor-drive solution based on the MOTIX™ IMD701A

Orderable Part Number
EVAL_IMD700A_FOC_3SH

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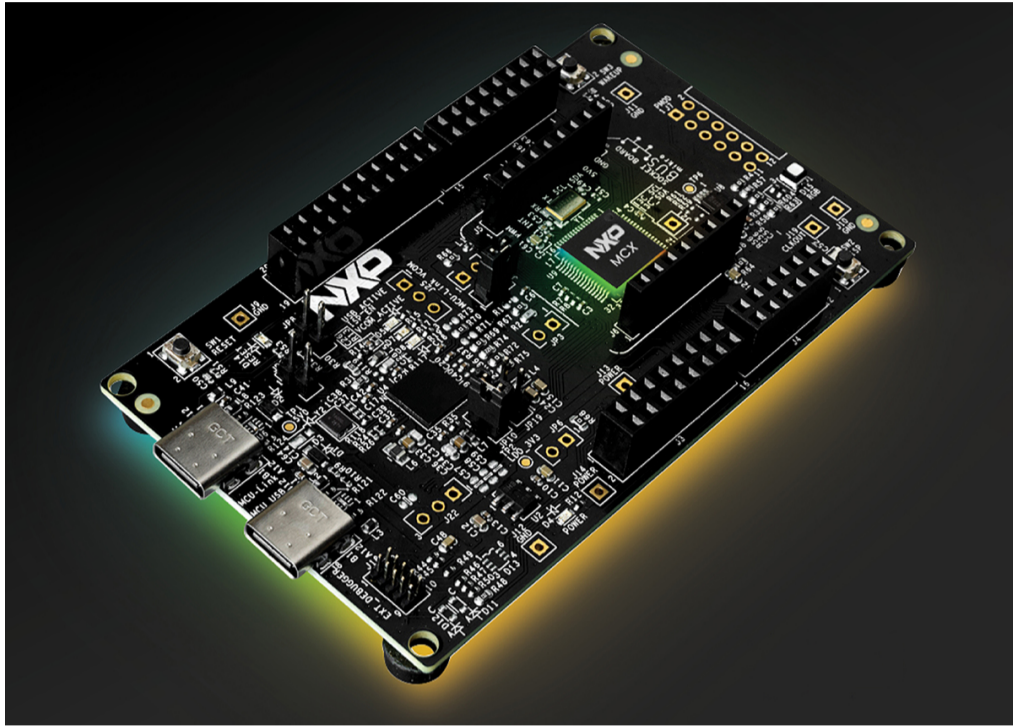
CONSUMER



TELECOMS

New 32-bit MCUs provide ideal platform for control of BLDC, PMSM and other motors

The new NXP Semiconductors MCX A series microcontrollers feature high-performance mixed-signal circuitry and a motor-control sub-system, backed by a rich set of software resources in the NXP App Code Hub.



The MCX A series of 32-bit microcontrollers from NXP Semiconductors includes a set of features that support the high-performance operation of electric motors. The performance of the MCX A series can be evaluated easily with the FRDM-MCXA153 development board for MCXA14x and MCXA15x MCUs.

The MCX A series, based on an Arm Cortex-M33 core, supports the key functions for a broad range of applications in which cost constraints, advanced analog capabilities such as high-precision data converters, and fast time-to-market are key considerations

The features of the MCX A series that are particularly well suited to motor-control include:

- 4 Msamples/s ADC
- High-speed comparators backed by an 8-bit reference DAC
- Motor control sub-system. The FlexPWM peripheral includes motor control PWM pairs, quadrature decoders and a hardware event generation function

These features make the MCX A series ideal for applications such as:

- Brushless dc (BLDC) motors
- Permanent magnet synchronous (PMSM) motors
- AC induction motors (ACIM)
- Field-oriented control
- Precision servo systems and positioning
- Distributed battery management systems

The MCX portfolio is supported by the MCUXpresso Developer Experience. This includes a suite of software, tools and hardware prototyping platforms:

- Integrated development environments:
 - MCUXpresso for VS Code
 - MCUXpresso integrated development environment
 - IAR Embedded Workbench
 - Arm KEIL
- MCUXpresso software development kit (SDK)
 - Extensive suite of robust peripheral drivers, stacks, and middleware
 - Includes software examples demonstrating the use of peripheral drivers and middleware
- MCUXpresso config tools
 - Includes pins, clocks, and peripheral tools for generation of MCUXpresso SDK code

The NXP GitHub also provides access to application examples including motor control, which can be accessed using the Application Code Hub (ACH) portal. The MCUXpresso IDE from version 11.9.0 and MCUXpresso for VS Code have ACH built-in, so developers can easily browse available examples, and filter by device, application technology or peripheral/feature before loading the project directly for use.



FEATURES

FRDM-MCXA153

- MCXA15x with up to 128 kbytes of Flash and up to 32 kbytes of RAM
- Connectivity
 - Full-Speed USB ports with USB Type-C connector for host or device functionality
 - High-Speed USB Type-C connectors
 - SPI/I2C/UART connector
 - Wi-Fi connector
- On-board MCU-Link debugger
- JTAG/SWD connector
- P3T1755DPJ temperature sensor
- Expansion options
 - Arduino header
 - FRDM header which connects to NXP's BLDC or PMSM FRDM driver shield
 - Pmod™ header
 - mikroBUS™ interface
- User interface
 - RGB user LED
 - Reset, ISP and wake-up buttons

APPLICATIONS

- Industrial
 - Factory automation
 - Power and energy systems
 - Building control
 - Medical equipment
- Smart home
 - Control and security
 - Smart appliances
 - Home entertainment
 - Health and fitness
- General embedded
 - Industrial/consumer HMIs
 - Handheld devices
 - Power tools
 - General-purpose embedded control

FREE DEV BOARD

Low-cost and scalable FRDM development board for general-purpose Arm Cortex-M33-based MCUs

Orderable Part Number
FRDM-MCXA153

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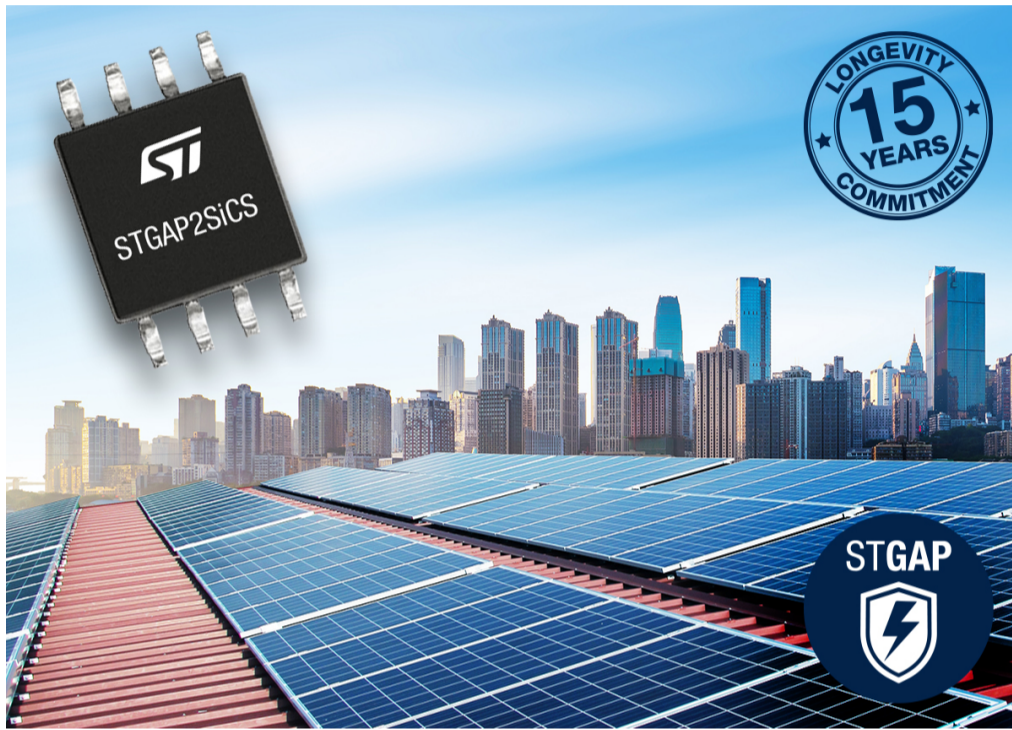
CONSUMER



TELECOMS

Isolated gate driver for SiC MOSFETs offers robust performance

The STGAP2SiCS from STMicroelectronics offers high immunity to transient voltages, and maintains stable operation when used in hard-switching topologies. Low propagation delay enables power-system designs to support high switching frequencies.



The STMicroelectronics STGAP2SiCS is a specialized single-channel gate driver for controlling silicon carbide (SiC) MOSFETs. Supplied in a space-saving, narrow-body SO-8 package, it offers robust operation and supports high-frequency switching.

Providing galvanic isolation between the gate-driving channel and the low-voltage control signal, the STGAP2SiCS operates at voltages up to 1,200 V on the high-voltage rail. Input-to-output propagation time of less than 75 ns provides for accurate operation of PWM-controlled switching.

High common-mode transient immunity of ± 100 V/ns over the entire operating-temperature range helps the power-system designer to maintain highly reliable operation.

Two optional configurations are available, giving a choice of separate outputs which allow turn-on and turn-off times to be independently optimized using an external resistor, or a single output with active Miller clamp function. The single-output configuration enhances stability in high-frequency hard-switching applications, taking advantage of the Miller clamp to prevent excessive oscillation of the power switch gate voltage.

The STGAP2SiCS inputs are compatible with CMOS/TTL logic down to 3.3 V, simplifying connection to a host microcontroller or DSP.

The driver can sink and source up to 4 A at a gate-driving voltage up to 26 V. An integrated bootstrap diode simplifies design and enhances reliability. A shut-down mode with a dedicated Input pin helps to minimize system power consumption.



FEATURES

- Under-voltage lockout protection optimized for SiC MOSFETs
- Interlocking function to eliminate cross-conduction
- Thermal shut-down

APPLICATIONS

- EV charging systems
- Switch-mode power supplies
- High-voltage power factor correction
- Dc-dc converters
- Uninterruptible power supplies
- Solar power
- Motor drives
- Fans
- Factory automation
- Home appliances
- Induction heating

FREE DEV BOARD

Demonstration board for isolated 4 A SiC MOSFET gate driver

Orderable Part Number
EVALSTGAP2SiCS

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TELECOMS

Miniature omnipolar TMR sensors draw low current in flange-mounted applications

The 54100 and 54140 omnipolar tunnel magnetoresistance (TMR) sensors from Littelfuse feature digital switching at up to 1 kHz, handling a maximum load of 3 mA at 5.5 V dc. The IP67-rated housing is available in two mounting options.



Expertise Applied | Answers Delivered

FEATURES

- Omnipolar operation
- 1.5 μ A operating current
- Built-in temperature compensation
- Operating-temperature range: -40°C to 100°C

APPLICATIONS

- Position and limit sensing
- Motor speed measurement
- Flow metering
- Brushless dc motor commutation
- Magnetic encoders
- Angle sensing
- Tamper detection

The Littelfuse 54100 and 54140 sensors give designers a low-power, low-profile solution for reliable magnetic position sensing in demanding applications. Rated for 20 billion switching operations, the 54100 and 54140 offer long lifetime and reliable performance.

These sensors also feature an IP67-rated housing that is specified to withstand vibration of a maximum 50 g and shock of up to 150 g.

The 54100 can be mounted using two screws on either side of the sensor. The thickness of the mounting structures is 1.5 mm, and the footprint is 11.0 mm x 25.5 mm.

The 54140 places both mounting holes on one side of the sensor, which is encapsulated in a housing which measures 23.0 mm x 7.5 mm x 5.9 mm. The mounting structure thickness is 2.9 mm.

Both sensors feature a three-wire design with push-pull output. They can operate in static or dynamic magnetic field environments with north or south polarity. The supply voltage is 1.8 V to 5.5 V dc with protection for up to 7 V dc.

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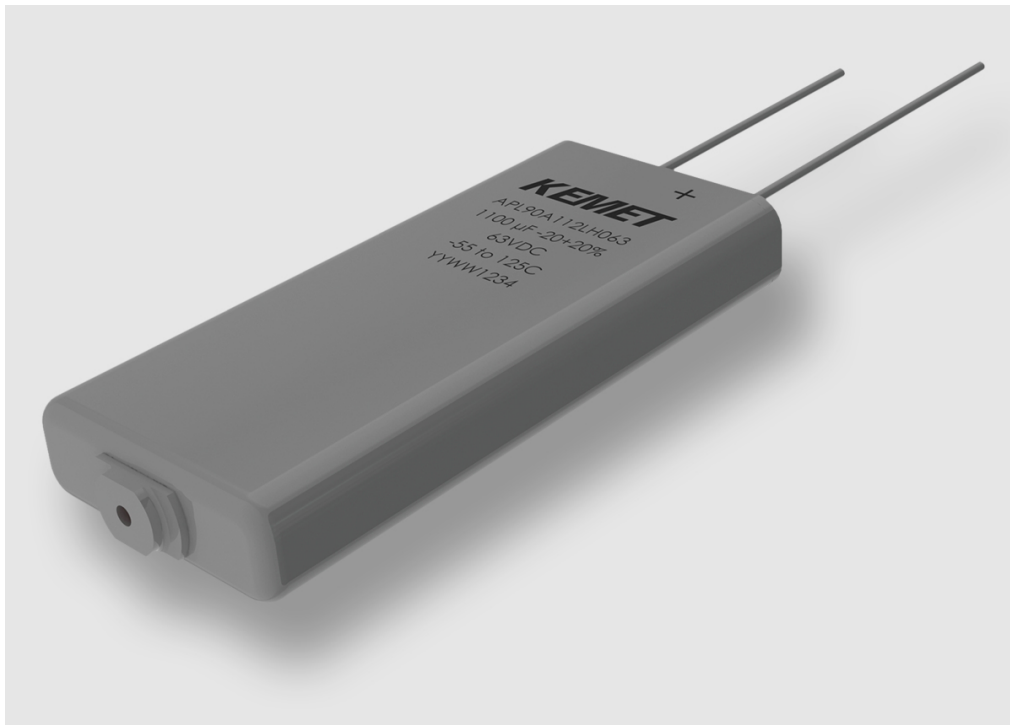
CONSUMER



TELECOMS

Automotive-grade polymer capacitors are low-profile and rectangular for easy integration

The KEMET APL90 aluminum polymer capacitors are available in a low-profile package that eases stacking and effective heat-sink integration in 48 V automotive applications.



YAGEO

FEATURES

- AEC-Q200 qualified
- Operating-temperature range: -55°C to 125°C

APPLICATIONS

- Automotive 48 V DC-link inverters
 - MHEV
 - Motor drives
 - Water pumps
 - Power steering
 - Cooling fans
- E-bike 48 V DC-link inverters
- Electrical flight 48 V DC-link inverters
- Data center power supplies

The APL90 from KEMET is a robust, automotive-grade capacitor rated at 63 V dc, and offering capacitance of 1,100 µF. The 53.9 mm x 24.0 mm x 8.0 mm package provides for greater efficiency of design integration.

The compact, rectangular form factor allows for multiple units to be vertically or horizontally stacked in narrow spaces. The large surface area of the metal casing also supports effective heat-sink integration, enabling designs to maintain the optimum operating temperature. Lifetime is 2,000 hours at 125°C when power is applied.

The APL90 capacitors can handle ripple currents of up to 26 A and are tolerant against high levels of vibration or shock up to 20 g. This makes the APL90 extremely reliable, giving long product lifetimes in mechanically unstable environments.

This is the first range of rectangular polymer capacitors and additional voltages can be available on request to support new design platforms.

Typical applications are automotive, such as DC-link on 48 V inverters for MHEV, DC-link on 48 V system motor drives as water pumps, power steering or cooling fans, as well as input capacitors for 48 V system power supplies in data centers



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TELECOMS

Robust relays with 5 mm width offer high packing density for space-constrained applications

The PF and PA-N relays from Panasonic Industry present engineers with a versatile, highly compact solution for load switching without compromising safe thermal and electrical operation.



Panasonic INDUSTRY

FEATURES

- 5 mm slimline form factor for high-density mounting
- Contact-to-coil surge breakdown voltage up to 6 kV
- Gold-nickel contacts with gold plating
- UL/C-UL and VDE safety approved
- Sealed, RTIII construction

APPLICATIONS

- Industrial
 - Automation
 - Equipment
 - Timers and counters
 - Temperature controllers
- Robots
- Office equipment
- Test and measurement equipment
- Home appliances
- Printers
- IoT devices
- Smart plugs
- Security equipment
- I/O boards
- PLCs

The PF relay can support load switching up to 6 A at 250 V ac and has nominal size of 28 mm x 15 mm x 5 mm. The relay is also available in a bent-pin option for horizontal mounting in low-profile designs. The wide coil voltage range of 4.5 V to 60 V dc enables the PF relay to be used in many applications, with a nominal power consumption from 170 mW to 217 mW, depending on the coil voltage applied.

The PA-N relay is the smallest 5-A ATEX relay at 20 mm x 12.5mm x 5 mm. This power relay supports load switching up to 5 A at 250 V ac or 5 A at 30 V dc. A low nominal operating power of 110 mW enables high-density mounting, using a coil voltage from 3 V to 24 V dc. The relay is available with either a normally open or normally closed contact.

The PF relay is compliant with EN 60335-1, Clause 30 for resistance to heat and fire up to 85°C. The relay is capable of withstanding 4 kV breakdown voltage, with a minimum creepage distance of 8.0 mm between the contact and the coil terminal, and a minimum clearance distance of 6.0 mm.

For harsh, hazardous or potentially explosive environments, the PA-N relay is ATEX-certified to switch currents up to 5 A, and can be operated at temperatures up to 110°C. It also features reinforced insulation according to IEC 61010-2 standards.

Both relays are suitable for use in relay interface modules, extension boards for power relays or programmable logic controllers, in which the relays provide safe switching and isolation between the signal and load circuits. The PF and PA-N relays can handle a wide variety of load behaviors, including the high inductive loads of valves or motors.



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