

# MIP

Marketing Innovative Products

2018/04

ART OF  
INTELLIGENCE  
SECURITY  
DRIVES  
INNOVATION  
QUANTUM  
COMPUTING  
SAFE  
DATA



**EBV**Elektronik  
| An Avnet Company |



## Sparks are flying in the microchip industry

According to the market researchers at IHS Markit, 125 billion networked appliances, machines and gadgets are already anticipated to be in use in 2030; in 2018, that figure still stood at something in the region of 31 billion. Concurrent with this development, the volume of data transferred is continuing to increase: IHS Markit expects the current annual growth rate of 20 to 25 per cent to increase to 50 per cent annually within the next 15 years.

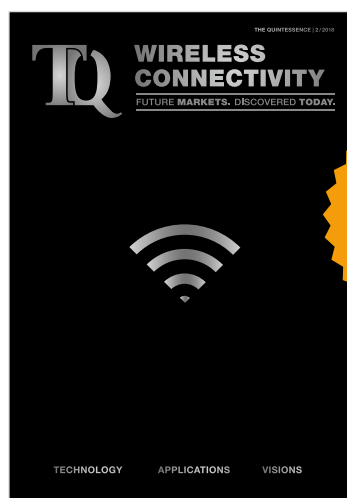
In the process, an ever increasing proportion of such data is transferred with the help of wireless technologies. There are networked cars, to name just one example: 125 million passenger cars with integrated connectivity are forecast to be sold between 2018 and 2022 according to market research institute Counterpoint. One of the drivers for this is the development of autonomous cars.

The healthcare industry is another important market for wireless technologies. As revealed by a market survey conducted by P&S Market Research, the IoT healthcare market is expected to reach a volume of USD 267.6 billion by the year 2023.

Indeed, without wireless technologies, Industry 4.0 would also be entirely infeasible. Consultancy firm Accenture estimates that the Industrial Internet of Things will generate an additional USD 14 trillion for the global economy in the run-up to 2030.

According to IHS Markit, semiconductor manufacturers saw revenues of USD 131 billion from wireless applications in 2017, in comparison to a total revenue of USD 428.9 billion. So, there you have it: wireless connectivity is a varied and rapidly growing market for the semiconductor industry and developers and manufacturers of networked devices alike.

**Read more about Wireless Connectivity  
in the latest issue of our TQ magazine**



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# SiP32431

## Ultralow Quiescent and Leakage



Vishay have seen a strong growth for the design in of ultra-low quiescent smart load switches in remote wireless sensors, IoT, and medical applications.

The SiP32431 is a part optimized for the above mentioned applications and has superior low IQ vs competition. SiP32431 maximum IQ is 50% lower, and the typical value is over 99% lower.

Used in market applications such as wireless sensor network, smart meters, wearable, internet of things, healthcare devices, security systems, PMP, GPS, DSC.

- Ultra-low leakage and quiescent current
- No bias power rail required

- Soft switching to minimize turn on in rush current
- Reverse blocking at switch off state

### FEATURES

- 1.5 V to 5.5 V input voltage range
- $V_{IN}$  quiescent current = 0.01 nA
- $V_{IN}$  shutdown leakage = 0.20 nA
- Guaranteed 100 nA max over temperature at 3.3V  $V_{IN}$
- Low on-resistance  $R_{DS(ON)}$ :
- Typically 105 mΩ at 5 V and 135 mΩ at 3 V. for TDFN4 1.2 mm x 1.6 mm package.
- Typical 147 mΩ at 5 V and 178 mΩ at 3 V for SC70-6 package
- Slew rate controlled turn-on time: 100 μs
- SC70-6 and TDFN4 1.2 mm x 1.6 mm packages

### KEY APPLICATIONS

- Wireless sensor network
- Smart meters
- Wearable
- Internet of things
- Healthcare Devices
- Security systems
- PMP, GPS, DSC

### MARKET SEGMENT

- Healthcare & Wearables
- Smart Consumer & Building
- Industrial

### SUB MARKET

- Personal Health, Sport & Fitness
- Portable Personal Electronics & Wearables
- Factory Automation (PLCs, I/O, Sensors & Actuators)
- Power Supplies (AC/DC, DC/DC)
- Home Appliances
- Home & Building Security (Alarms, Access Control)
- Toys, games and entertainment

### TECHNOLOGY SEGMENT

- Analog & Power



## BlueNRG-2

### Bluetooth® low energy wireless system-on-chip



Product Image

The BlueNRG-2 is a very low power Bluetooth low energy (BLE) single-mode system-on-chip, compliant with Bluetooth specification V4.2. It includes 256 KB of programming Flash memory, 24 KB of static RAM memory with retention (two 12 KB banks) and SPI, UART, I<sup>2</sup>C standard communication interface peripherals. It also features multifunction timers, watchdog, RTC and DMA controller. An ADC is available for interfacing with analog sensors, and for reading the measurement of the integrated battery monitor. A digital filter is available for processing a PDM stream.

- **Bluetooth low energy single mode system-on-chip**
- **Bluetooth 4.2 compliant, LE Data Packet Length Extension**
- **Operating temperature range: -40 °C to 105 °C**
- **ARM® Cortex®-M0 32-bit core with 256 KB Flash**

#### FEATURES

- Master, slave and multiple simultaneous roles
- Operating supply voltage: from 1.7 to 3.6 V
- Integrated linear regulator and DC-DC step-down converter
- 24 KB RAM with retention (two 12 KB banks)
- 1 x UART interface
- 1 x SPI interface
- 2 x I<sup>2</sup>C interface
- 14, 15 or 26 GPIOs
- 2 x multifunction timer
- 10-bit ADC
- Watchdog & RTC
- DMA controller
- PDM stream processor
- 16 or 32 MHz crystal oscillator
- 32 kHz crystal oscillator
- 32 kHz ring oscillator
- Battery voltage monitor and temperature sensor
- Up to +8 dBm available output power (at antenna connector)

- Excellent RF link budget (up to 96 dB)
- Accurate RSSI to allow power control
- 8.3 mA TX current (@ -2 dBm, 3.0 V)
- Down to 1 µA current consumption with active BLE stack (sleep mode)
- Suitable for building applications compliant with the following radio frequency regulations: ETSI EN 300 328, EN 300 440, FCC CFR47 Part 15, ARIB STD-T66
- Pre-programmed bootloader via UART
- QFN32, QFN48 and WCSP34 package options

#### KEY APPLICATIONS

- Fitness, wellness and sports
- Consumer medical
- Security/proximity
- Remote control
- Home and industrial automation
- Assisted living
- Mobile phone peripherals
- Lighting
- PC peripherals

#### MARKET SEGMENT

- Healthcare & Wearables
- Industrial
- Lighting
- Smart Consumer & Building

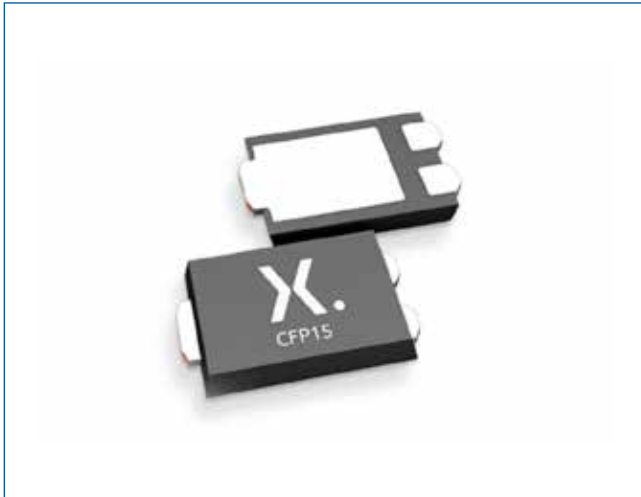
#### SUB MARKET

- Personal Health, Sport & Fitness
- Home Appliances
- Home & Building Security (Alarms, Access Control)
- Home & Building Control and Automation
- Audio and Video
- Lighting Drivers and Electronic Control Gears
- Surveillance, Parking & Traffic Control
- Robotics
- Professional Gaming, Amusement & Casino Machines
- Point of Sales and Vending machines
- Instrumentation, Test and Measurement
- Information Kiosk & Advertising Panels
- Human Machine Interface



## Trench Schottky rectifier

Trench Schottky rectifiers offer a  $T_{J(MAX)}$  of 175 °C and are AEC-Q101 qualified



CFP15

Nexperia releases a wide range of Trench Schottky rectifiers in CFP packaging for power applications including automotive, industrial and consumer.

These high-performance parts built on Nexperia's existing extensive portfolio of planar types, offer the combination of low reverse current and low forward voltage. This increases the thermal stability and reduces the risk of thermal runaway. The Trench Schottky rectifiers offer a  $T_{J(MAX)}$  of 175 °C and are AEC-Q101 qualified.

- **Average forward current:**  $I_{F(AV)}$  of 3 / 5 / 15 A
- **High power capability**  
due to clip-bonding technology

- **Reverse voltage:**  $V_R \leq 40 - 60$  V
- **Low forward voltage**

### FEATURES

- Low leakage current due to Trench MEGA Schottky technology
- Small and flat lead SMD plastic package
- Capable for reflow and wave soldering
- AEC-Q101 qualified

### KEY APPLICATIONS

- DC/DC converter with high efficiency

### MARKET SEGMENT

- Automotive
- Communication & Infrastructure
- Industrial
- Lighting
- Smart Consumer & Building
- Healthcare & Wearables

### SUB MARKET

- ADAS, Automotive Infotainment & Cluster
- Home Appliances
- Power Supplies (AC/DC, DC/DC)
- Lighting Drivers and Electronic Control Gears
- Robotics
- Instrumentation, Test and Measurement
- Embedded Computing & Storage
- Portable Personal Electronics & Wearables
- Personal Health, Sport & Fitness
- Medical Instruments
- Medical Imaging
- Wireless Infrastructure
- Telecom and Networking
- Broadcast
- Connected Car, Body Electronics and Automotive Lighting
- Home & Building Control and Automation

### TECHNOLOGY SEGMENT

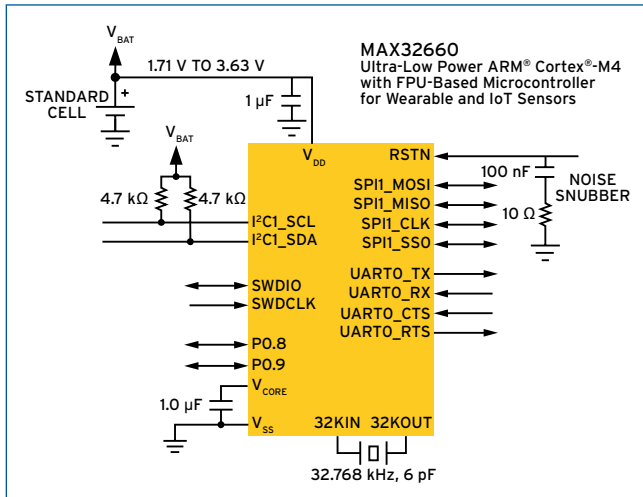
- Analog & Power

Portfolio	Voltage	Current	Package
PMEG40Txx	40 V	Up to 5 A	CFP3, CFP5
PMEG045T0xx	45 V	Up to 15 A	CFP3, CFP5, CFP15
PMEG60Txx	60 V	Up to 5 A	CFP3, CFP5



# MAX32660

## Low Power, Low Cost ARM® Cortex®-M4 MCU



Typical Application Circuit

The MAX32660 is an ultra-low-power, cost-effective, highly-integrated microcontroller designed for battery-powered devices and wireless sensors. It combines a flexible and versatile power management unit with the powerful ARM® Cortex®-M4 with floating point unit (FPU).

The MAX32660 enables designs with complex sensor processing without compromising battery life. It also offers legacy designs an easy and cost optimal upgrade path from 8- or 16-bit microcontrollers.

- **1.8 mW retention power w/ all SRAM maintained**
- **ARM® Cortex-M4F core with DSP and floating point acceleration**
- **60 mW/MHz executing from flash**
- **Up to 256 KB flash and 96 KB SRAM**

### FEATURES

- High-Efficiency Microcontroller for Wearable Devices
- Internal Oscillator Operates Up to 96 MHz
- 256 KB Flash Memory
- 96 KB SRAM, Optionally Preserved in Lowest Power Backup Mode
- 16 KB Instruction Cache
- Memory Protection Unit (MPU)
- Low 1.1 V V<sub>CORE</sub> Supply Voltage
- 3.6 V 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
- 85 μA/MHz Active Executing from Flash
- 2 μA Full Memory Retention Power in Backup Mode at V<sub>DD</sub> = 1.8 V
- 570 nA Ultra-Low Power RTC at V<sub>DD</sub> = 1.8 V
- Internal 8 kHz Ring Oscillator

- Optimal Peripheral Mix Provides Platform Scalability
- Up to 14 General-Purpose I/O Pins
- Up to Two SPI Master/Slave
- I²S Master/Slave
- Up to Two UARTs
- Up to Two I²C Master/Slave, 3.4 Mbps High Speed
- Four-Channel Standard DMA Controller
- Three 32-Bit Timers
- Watchdog Timer
- CMOS-Level 32.768 kHz RTC Output

### KEY APPLICATIONS

- Wearables

### MARKET SEGMENT

- Healthcare & Wearables
- Industrial

### SUB MARKET

- Medical Diagnostic and Therapy
- Instrumentation, Test and Measurement
- Information Kiosk & Advertising Panels
- Human Machine Interface
- Factory Automation (PLCs, I/O, Sensors & Actuators)
- Embedded Vision
- Elevators, Escalators, Moving Walkways
- Embedded Computing & Storage
- Portable Personal Electronics & Wearables
- Personal Health, Sport & Fitness
- Medical Instruments
- Motion Control, Servo Drives

### TECHNOLOGY SEGMENT

- High End Processing





## SAM L10 / L11 Series

**Industry's 1st 32-bit MCU with ARM TrustZone for Secured IoT Endpoints**



**SAM L10-L11-TQFP-32**

Industry's first ARM® Cortex®-M23, SAM L10 & L11 MCU series, with extremely low power consumption and water-tolerant, noise-immune capacitive touch.

With the booming growth of Internet of Things (IoT) endpoints, security is sometimes an afterthought for many designers, increasing the risk of exposing intellectual property (IP) and sensitive information. The new SAM L10/ SAM L11 MCU families are built by Microchip Technology Inc. to address the growing need for security Crypto accelerators and Trust memories are protected against several side channel attacks and therefore provide a superior level of security against various attack scenarios.

- **Embedded Security with TrustZone**
- **Ultra Low Power**

- **Enhanced Peripheral Touch Controller (PTC)**
- **Hardware touch**

### FEATURES

#### **Best-in-Class Low Power Consumption**

Microchip states, both SAM L10/L11 MCU families offer the industry's lowest power consumption. When benchmarked for power consumption the SAM L10 received a ULPMark™ score of 405.

#### **MCU Security Solutions for Authentication and Integrity**

In addition to TrustZone technology, the SAM L11 security features include an on-board cryptographic module supporting Advanced Encryption Standard (AES), Galois Counter Mode (GCM) and Secure Hash Algorithm (SHA). The secure boot incl. secure bootloader and secure key storage with tamper detection capabilities establish a hardware root of trust.

Microchip has partnered with Trustonic, to offer a comprehensive security solution framework that simplifies implementation of security and enables customers to introduce end products faster. Microchip has also

partnered with Secure Thingz and Data I/O Corporation to offer secure provisioning services for SAM L11 customers.

#### **Water-Tolerant, Noise-Immune Capacitive Touch**

Both MCU families offer Microchip's latest generation Peripheral Touch Controller (PTC) for capacitive touch capabilities. It features Driven Shield Plus that provides superior water tolerance and Parallel Acquisition that makes it 4x faster than the previous generation of PTC. Designers can easily add touch interfaces that provide an efficient user experience in the presence of moisture and noise while maintaining low power consumption. The touch interface makes the devices ideal for a myriad of automotive, appliance, medical and consumer HMI applications.

### KEY APPLICATIONS

- IoT & Security applications
- Smart Cities
- Home Automation

- Smart Agriculture
- Medical Devices
- Accessories Authentication

### MARKET SEGMENT

- Smart Consumer & Building
- Industrial
- Healthcare & Wearables
- Communication & Infrastructure

### SUB MARKET

- Toys, games and entertainment
- Home Appliances
- Home & Building Security
- Home & Building Control and Automation
- Asset Tracking
- Surveillance, Parking & Traffic Control
- Personal Health, Sport & Fitness
- Portables & Wearables
- Human Machine Interface (HMI)
- Professional Gaming

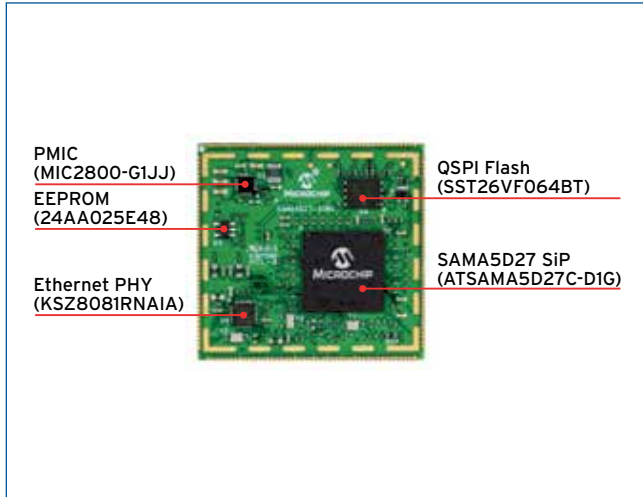
### TECHNOLOGY SEGMENT

- High End Processing



## SAMA5D2 System On Module

### Simplify Industrial-Grade Linux Designs



**SAMA5D2 SOM Detailed**

SAMA5D2 SOM integrates the basic components for an MPU-based system with an SAMA5D27-D1G System-in-Package (SiP) MPU into a single module. Starting with the System on Module as a design base greatly simplifies the MPU design effort. With its integrated DDR2 SDRAM, the SiP eliminates the board layout and design risk of interfacing high-speed SDRAM signals and also reduces EMI concerns. Besides shrinking board dimensions, the SOM can reduce the number of PCB layers, significantly lowering the system cost. The SOM makes it easy for you to get product to market faster with lower design risk.

- **Simplified board design**
- **Rapid prototyping**
- **Plug and play Linux®**
- **Lifetime commitment**

#### FEATURES

- The SOM includes the most commonly used system components, simplifying baseboard design. Design and manufacturing files (Gerbers, schematics, etc.) can be downloaded free of charge from [www.microchip.com/mpu](http://www.microchip.com/mpu)
- A single 3.3-volt power supply and a single-sided PCB with hand-solderable 0.8 mm pad spacing enables rapid prototyping.
- Download the SD card image for the ATSAMA5D27-SOM1-EK1 from [www.Linux4sam.org](http://www.Linux4sam.org) and be running Linux in no time. Access the Linux environment from your console.
- Microchip's customer-driven obsolescence policy allows you to design a SOM without worry.

#### KEY APPLICATIONS

- Industrial applications requiring -40 to +85 C
- Control panels and gateways

- Power Distribution Units
- Home and building automation
- Telematics and asset tracking
- Medical monitoring
- Smart HMI/control panels (white goods, alarm systems, etc.)

#### MARKET SEGMENT

- Healthcare & Wearables
- Industrial
- Smart Grid
- Smart Consumer & Building

#### SUB MARKET

- Elevators, Escalators, Moving Walkways
- Embedded Computing & Storage
- Embedded Vision
- Human Machine Interface
- Information Kiosk & Advertising Panels
- Motion Control, Servo Drives
- Instrumentation, Test and Measurement
- Point of Sales and Vending machines
- Professional Gaming, Amusement & Casino Machines

- Robotics
- Surveillance, Parking & Traffic Control
- Asset Tracking
- Audio and Video
- Heating, Ventilation and Air Conditioning
- Home & Building Control and Automation
- Home & Building Security (Alarms, Access Control)
- Home Appliances
- Toys, games and entertainment
- Metering (Electricity, Flow, Heat)
- Power Conversion (Inverters, Welding, Converters)
- Renewable Energy Generation
- Smart Grid Protection and Control
- Medical Instruments
- Portable Personal Electronics & Wearables
- Medical Diagnostic and Therapy

#### TECHNOLOGY SEGMENT

- High End Processing



€ 1.40

100-up price  
LPC51U68JBD48E

€ 32.00

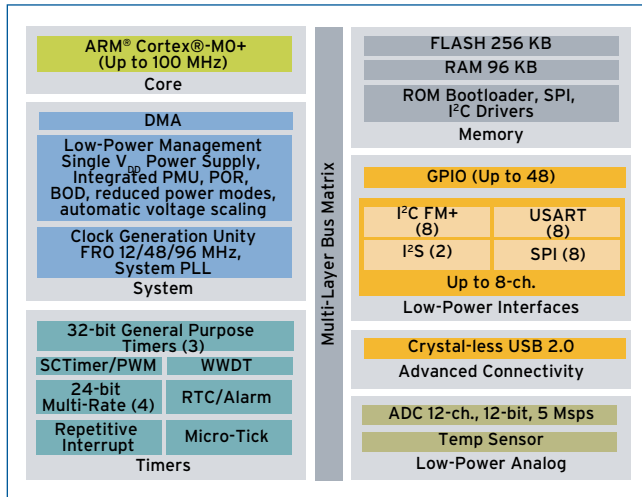
1-up price  
OM40005UL

€ 1.57

100-up price  
LPC51U68JBD64QL

## LPC51U68

High-performance, power-efficient and cost sensitive ARM® Cortex®-M0+ MCUs



LPC51U68 MCU Family Block Diagram

- Fast wake-up with up to 100 MHz performance
- Drop-in compatible ARM® Cortex®-M0+ to the LPC5411x Family

- 256 K flash and 96 KB total SRAM
- Crystal-less FS USB and 8 Flexcomm (SPI, I²S)

### FEATURES

- 100 MHz ARM® Cortex®-M0+
- 256 KB Flash, 96 KB SRAM
- FlexComm: 8 SPI, 8 I2C, 8 UART, 2 I²S
- Crystal-less FS USB
- Power-efficient 5.0 Msps, 12-bit ADC: full-spec performance (1.62 to 3.6 V, -40 to 105 °C)
- 12/48/96 MHz FRO, 100 kHz-1.5 MHz WDOG OSC, 32 Xtal OSC, external clock input
- Basic & advanced timers including SCTimer/PWM
- Asynchronous peripheral bus
- LQFP64 (10 x 10 mm)
- LQFP48 (7 x 7 mm)
- Operating voltage: 1.62 to 3.6 V
- Temperature range: -40 to 105 °C

### KEY APPLICATIONS

- Metering devices

### MARKET SEGMENT

- Industrial
- Smart Consumer & Building

### SUB MARKET

- Toys, games and entertainment
- Professional Gaming, Amusement & Casino Machines
- Instrumentation, Test and Measurement
- Embedded Computing & Storage
- Home & Building Security (Alarms, Access Control)
- Asset Tracking
- Home & Building Control and Automation
- Home Appliances

### TECHNOLOGY SEGMENT

- High End Processing



## STM32H750

**High-performance , ARM® Cortex®-M7 MCU with  
128 Kbytes of Flash memory, 1 MB RAM, 400 MHz CPU**



High-performance and DSP with DP-FPU, ARM® Cortex®-M7 MCU with 128 Kbytes of Flash memory, 1 MB RAM, 400 MHz CPU, L1 cache, external memory interface, JPEG codec, HW crypto, large set of peripherals

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MICROCONTROLLERS

- **High Performance**
- **Graphics with free of charge ecosystem**
- **CAN FD**
- **ECC on RAM and Flash**

### FEATURES

- 128 Kbytes of Flash memory
- 1 Mbyte of RAM: 192 Kbytes of TCM RAM (inc. 64 Kbytes of ITCM RAM + 128 Kbytes of DTCM RAM for time critical routines), 864 Kbytes of user SRAM, and 4 Kbytes of SRAM in Backup domain
- Dual mode Quad-SPI memory interface running up to 133 MHz
- Flexible external memory controller with up to 32-bit data bus:SRAM, PSRAM, NOR Flash memory clocked up to 133 MHz in synchronous mode
- SDRAM/LPDDR SDRAM
- 8/16-bit NAND Flash memories
- CRC calculation unit
- SecurityROP, PC-ROP, active tamper, secure firmware upgrade support, Secure access mode
- 4x SAIs (serial audio interface)
- SPDIFRX interface
- SWPMI single-wire protocol master I/F
- MDIO Slave interface
- 2x SD/SDIO/MMC interfaces (up to 125 MHz)
- 2x CAN controllers: 2 with CAN FD, 1 with time-triggered CAN (TT-CAN)
- 2x USB OTG interfaces (1FS, 1HS/FS) crystal-less solution with LPM and BCD
- Ethernet MAC interface with DMA controller8- to 14-bit camera interface (up to 80 MHz)
- 11 analog peripherals
- 3x ADCs with 16-bit max. resolution (up to 36 channels, 4.5 MSPS at 12 bits) 2x 12-bit D/A converters (1 MHz)
- 2x ultra-low-power comparators1x digital filters for sigma delta modulator (DFSDM) with 8 channels/4 filters
- Graphics LCD-TFT controller up to XGA resolution
- Chrom-ART graphical hardware Accelerator™ (DMA2D) to reduce CPU load
- Hardware JPEG Codec

### KEY APPLICATIONS

- Graphics
- Industrial
- Audio
- Safety

### MARKET SEGMENT

- Communication & Infrastructure
- Healthcare & Wearables
- Industrial
- Smart Consumer & Building

### SUB MARKET

- Wireless Infrastructure
- Personal Health, Sport & Fitness
- Human Machine Interface
- Home Appliances
- Audio and Video

### TECHNOLOGY SEGMENT

- High End Processing



# ACPL-M61M Digital Optocoupler

2.5 V / 3.3 V 125 °C Low Power 10 MBd  
Digital Optocoupler



ACPL-M61M

The ACPL-M61M optocoupler combines LED and integrated high gain photo detector to address low power consumption and high operating temperature needs. It supports 2.5 V / 3.3 V supply voltage with guaranteed AC and DC operational parameters at full industrial temperature range  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . The high operating temperature helps minimize thermal runaway and reduce temperature related design margins. The optocoupler consumes low power LED driving current from 1.6 mA and is able to reduce external driving buffer. It addresses market trends of energy saving efficiency and withstand harsh industrial operating conditions.

- Operating Temperature:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- 2.5 V / 3.3 V CMOS compatible

- Low Power  $I_{DD}$ : 1.5 mA max
- Propagation delay (tp): 90 ns max

## FEATURES

- 2.5 V / 3.3 V CMOS compatible
- Operating temperature up to  $125^{\circ}\text{C}$  to minimize thermal runaway
- Package: SO5
- Low Power  $I_{DD}$ : 1.5 mA max
- Low LED driving current  $I_F$ : 1.6 mA min
- Data rate: 10 MBd min
- Propagation delay (tp): 90 ns max
- Pulse width distortion (PWD): 45 ns max
- Common-mode transient immunity (CMR): 20 kV/ $\mu\text{s}$  min @  $V_{CM}$  1000 V
- IEC 60747-5-5 Working Voltage for Reinforced Insulation: 567 V<sub>PK</sub>
- UL 1577 Isolation Voltage: 3750 V<sub>RMS</sub>

## KEY APPLICATIONS

- Digital isolation for A/D, D/A conversion
- ASIC, MCU system interface (PLCs, DCs, I/O module)
- Communication interface: RS485, RS232

## MARKET SEGMENT

- Industrial
- Smart Grid

## SUB MARKET

- Elevators, Escalators, Moving Walkways
- Factory Automation (PLCs, I/O, Sensors & Actuators)
- Motion Control, Servo Drives
- Robotics
- Metering (Electricity, Flow, Heat)

## TECHNOLOGY SEGMENT

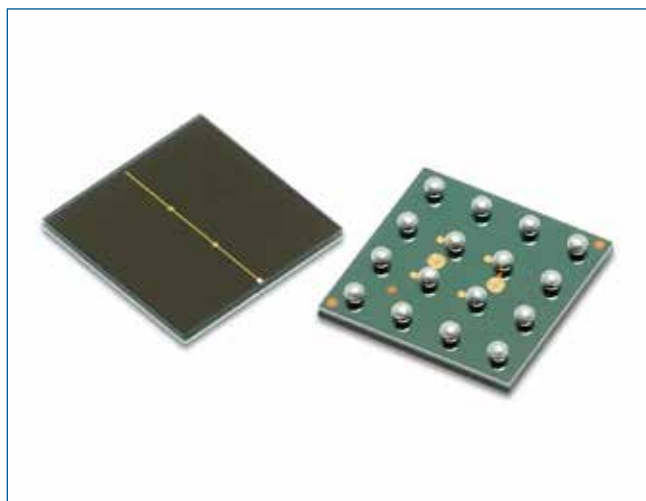
- Analog & Power





# AFBR-S4N44C013

## NUV-HD Single Silicon Photo Multiplier



AFBR-S4N44C013

The AFBR-S4N44C013 is a single silicon photo multiplier (SiPM) used for ultra-sensitive precision measurement of single photons. High packing density of the single chips is achieved using trough-silicon-via (TSV) technology. Larger areas can be covered by tiling multiple AFBR-S4N44C013 arrays. The passivation layer is made of a glass highly transparent down to UV wavelengths, resulting in a high sensitivity in the visible plus the blue- and near-UV light spectrum. The array is best suited for the detection of low-level pulsed light sources, especially for detection of Cherenkov or scintillation light from the most common organic (plastic) and inorganic scintillator materials.

- High photo-detection efficiency (PDE)
- Four-side tileable
- Highly transparent glass protection layer
- Operating temperature range from -20°C to +50°C.

### FEATURES

- High PDE
- Active Area 3,72 x 3.72 mm<sup>2</sup>
- Four-side tileable almost without any edge losses
- Highly transparent glass protection layer
- Examples for scintillator materials: LSO, LYSO, BGO, NaI, CsI, BaF, LaBr
- Operating temperature range from -20 °C to +50 °C.
- RoHS compliant

### KEY APPLICATIONS

- X-ray and gamma ray detection
- Nuclear medicine
- Positron emission tomography
- Time correlated single photon counting
- Physics experiments
- Evaluation and prototyping
- Safety and Security

### MARKET SEGMENT

- Healthcare & Wearables

### SUB MARKET

- Medical Diagnostic and Therapy
- Medical Imaging
- Medical Instruments

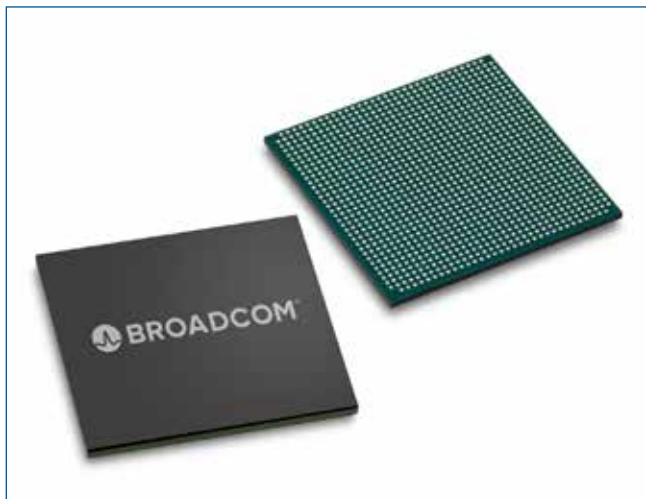
### TECHNOLOGY SEGMENT

- Analog & Power



# BCM53154 Ultra Low Power

## 5-Port GbE Time Sensitive Networking Switch



BCM53154

The Broadcom® BCM53154 is a next-generation ultra-low-power five-port GbE switch. The BCM53154 is based on the new 28-nm RoboSwitch™ 2 architecture and focuses on power-sensitive applications up to five ports – specifically daisy-chain and star topologies in industrial environments as well as low port count unmanaged and web-managed SMB switches. The BCM53154 supports four 10/100/1000BASE-T ports with integrated GPHYs, a single 1GbE/2.5GbE SGMII port, and a single RGMII 1GbE port.

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OPTOELECTRONICS

- **Time-Sensitive Networking (TSN) support**
- **Switch cascading for double port-count**

- **2.5GE SGMII support for new ind apps**
- **ARM® Cortex®-M7 for Robo-OS for web SMB apps**

### FEATURES

- 4 × 10/100/1000Base-T ports with integrated ultra-low-power GPHYs.
- 1 × 1GbE/2.5GE SGMII port
- 1 × RGMII
- Time-Sensitive Networking (TSN) support (802.1Qav, 802.1Qbv, 802.1Qci, IEEE 802.1AS, Cut-through)
- IEEE 1588 and SyncE support, including 802.1ASrev
- Cut-Through mode support
- Embedded ARM Cortex-M7, 400 MHz, CPU
- Switch cascading for double port-count
- 16 K entry MAC address table
- 1 K multicast group support
- 1 MB packet buffer
- srTCM and trTCM meters (support color aware and color blind modes)
- Eight CoS queues per port with priority flow-control

- IEEE 802.1p, MAC, and DSCP packet classification
- Per-queue and per port shaper
- 4 K VLANs (IEEE 802.1Q) with Virtual Switching Instance (VSI) support
- 1 K CFP rules support (up to 192b key)
- Mirroring and sFlow sampling
- Loop detection
- 1 K packets and bytes counters
- 16 LAG trunks (32 supported across cascaded switches)
- VLAN mapping and translation
- Protection and security mechanisms: port authentication (802.1x), isolation groups, BUM traffic metering, DOS filtering
- IEEE802.3az Energy Efficient Ethernet (EEE)
- 802.1BR standards-based port extender
- Jumbo frame: up to 10K bytes
- 19 × 19mm FBGA package
- Supports industrial temperature range (–40°C to +85°C)

### KEY APPLICATIONS

- Industrial Ethernet standalone switches
- Integrated industrial switches in PLCs
- Unmanaged/web-managed/fully-managed standalone SMB switches
- Port extension solutions per 802.1BR

### MARKET SEGMENT

- Industrial

### SUB MARKET

- Embedded Computing & Storage
- Factory Automation (PLCs, I/O, Sensors & Actuators)
- Human Machine Interface

### TECHNOLOGY SEGMENT

- Analog & Power



# Qmini AFBR-S20M2XX

## Compact USB Spectrometer



AFBR-S2M2xx Qmini Spectrometer

The Qmini is a miniature USB spectrometer featuring comprehensive on board electronics and several interfaces for mobile and industrial applications.

Part number	Wavelength range in nm (6 configurations)	Spectral resolution in nm (FWHM)
AFBR-S20M2UV	220 – 400	0.3
AFBR-S20M2VI	370 – 750	0.7
AFBR-S20M2NI	730 – 1080	0.7
AFBR-S20M2VN	480 – 1100	1.5
AFBR-S20M2WU	225 – 1000 (sensitivity max. at 300 nm)	1.5
AFBR-S20M2WV	225 – 1000 (sensitivity max. at 500 nm)	1.5

The small and sophisticated modular design of the Qmini spectrometer enables tight integration to suit a large number of OEM requirements.

- High spectral resolution
- Miniature size
- Powerful on-board electronics and evaluation
- Spectra acquired and processed on the device electronic
- Rugged design with no moving parts
- High thermal stability

### FEATURES

- Dynamic range 1300:1
- Numerical aperture: 0.1
- Sophisticated application software and SDK
- Linear CCD sensor with 2500 pixels
- Factory calibration stored and processed on the device (wavelength, sensitivity, non-linearity and multiple dark spectra)
- Various digital interfaces: USB, SPI, UART
- Dimensions: 64.0 x 42.0 x 14.5 mm
- Operating temperature: -25 °C to 60 °C

### KEY APPLICATIONS

- Process control and monitoring
- Light Analysis
- Handheld solutions
- Biomedical analysis
- Chemical research
- Forensic analysis
- System integration
- Environmental analysis

### MARKET SEGMENT

- Automotive
- Healthcare
- Industrial
- Test & Measurement
- Lighting

### SUB MARKET

- Agricultural vehicles
- Medical Imaging
- Medical Diagnostic and Therapy
- Medical Instruments
- Factory Automation and Instrumentation
- Lighting Drivers and Electronic Control Gears

### TECHNOLOGY SEGMENT

- Analog & Power



# Qwave AFBR-S20W1XX

## Compact USB Spectrometer



AFBR-S20W1xx QWave Spectrometer

The Qwave is a compact USB spectrometer with high resolution, dynamic range and numerical aperture for applications that require high performance in a compact design.

Available in 3 configurations:

Part number	Wavelength range in nm	Spectral resolution in nm (FWHM)
AFBR-S20W1UV	200 – 400	0.2
AFBR-S20W1VI	350 – 880	0.5
AFBR-S20W1NI	700 – 1040	0.4

Combined with the application software Waves, the Qwave is the ideal instrument setup for demanding spectral light analysis for industrial and research purposes.

- High spectral resolution
- High sensitivity
- Integrated electronics

- Exceptional thermal stability
- Rugged design with no moving parts

### FEATURES

- Dynamic range: 1500:1
- Numerical aperture: 0.1
- Sophisticated application software and SDK
- Linear CCD sensor with 3648 pixels
- Factory calibration stored on the device (wavelength, sensitivity, non-linearity and multiple dark spectra)
- Digital interfaces: USB, UART
- Dimensions: 89.5 x 68.0 x 19.5 mm
- Operating temperature: -25 °C to 60 °C

### KEY APPLICATIONS

- Light Analysis
- Biomedical analysis
- Process control and monitoring
- Chemical research
- Forensic analysis
- System integration
- Environmental analysis

### MARKET SEGMENT

- Automotive
- Healthcare
- Industrial
- Test & Measurement
- Lighting

### SUB MARKET

- Agricultural vehicles
- Medical Imaging
- Medical Diagnostic and Therapy
- Medical Instruments
- Factory Automation and Instrumentation
- Lighting Drivers and Electronic Control Gears

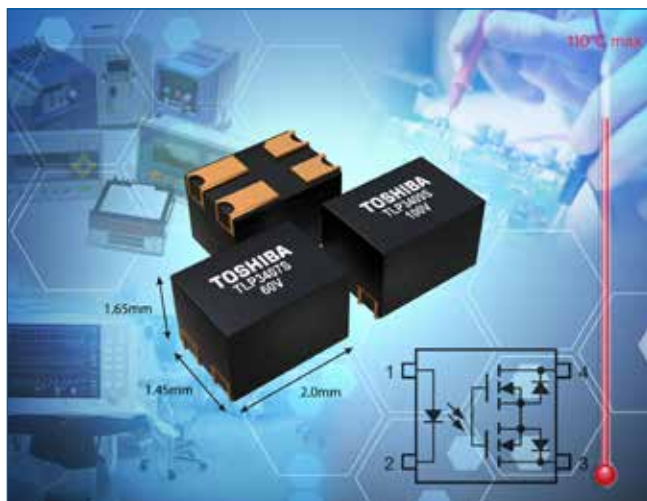
### TECHNOLOGY SEGMENT

- Analog & Power



## TLP3407S / TLP3409S

### High Current Photorelays 60 V and 100 V



Toshiba\_TLP3407S and TLP3409S

Toshiba Electronics Europe launched two additions to their line-up of photorelays; the 60V TLP3407S and the 100 V TLP3409S.

These devices are packaged in S-VSON4, the 2.00 mm x 1.45 mm package with one of the smallest mounting areas in the industry. The S-VSON4 package has a 22.5% smaller mounting area than the 2.45 mm x 1.45 mm VSON4 package.

This series also pushes operating temperature to a new high, from 85 °C to 110 °C. It contributes to improved design efficiency by reducing the size of the tester board, increasing the number of relay circuits, and further improving integration density.

- **S-VSON4:** height = 1.75 mm (max.), area = 1.45 mm x 2.0 mm (typ.)
- **Operation temp.** from -40 °C to +110 °C

- **Small mounting area**
- **Isolation voltage:** 500 V<sub>RMS</sub>

#### FEATURES

- Normally opened (1-Form-A)
- OFF-state output terminal voltage: 60 V (min) (TLP3407S) / 100 V (min) (TLP3409S)
- ON-state current: 1.0 A (max) (TLP3407S) / 0.65 A (max) (TLP3409S)
- ON-state resistance: 0.3 Ω (max) (TLP3407S) / 0.6 Ω (max) (TLP3409S)
- Trigger LED current: 3.0 mA (max)
- Isolation voltage: 500 V<sub>RMS</sub> (min)
- Halogen-free

#### KEY APPLICATIONS

- Probe cards
- ATE (Automatic Test Equipment)
- Measuring Instruments
- High-speed logic IC testers
- High-speed memory testers

#### MARKET SEGMENT

- Industrial

#### SUB MARKET

- Instrumentation, Test and Measurement

#### TECHNOLOGY SEGMENT

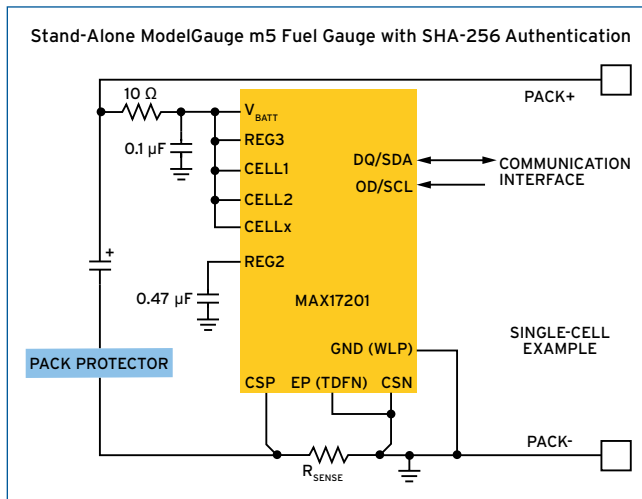
- Analog & Power





# MAX1720x / MAX1721x

## Stand-Alone ModelGauge m5 Fuel Gauge with SHA-256 Authentication



Typical Application Circuit

The MAX1720x/MAX1721x are ultra-low power stand-alone fuel gauge ICs that implement the Maxim ModelGauge™ m5 algorithm without requiring host interaction for configuration. This feature makes the MAX1720x/MAX1721x excellent pack-side fuel gauges. The MAX17201/MAX17211 monitor a single cell pack. MAX17205/MAX17215 monitor and balance a 2S or 3S pack or monitor a multiple-series cell pack. To prevent battery pack cloning, the ICs integrate SHA-256 authentication with a 160-bit secret key. Each IC incorporates a unique 64-bit ID.

- Fuel Gauge IC
- SHA-256 authentication

- automatical compensation for cell aging
- accurate estimation of time-to-empty and time-to-full

### FEATURES

- ModelGauge m5 Algorithm
  - Eliminates Error when Approaching Empty Voltage
  - Eliminates Coulomb-Counter Drift
  - Current, Temperature, and Age Compensated
  - Does Not Require Empty, Full, or Idle States
  - No Characterization Required for EZ Performance (See the ModelGauge m5 EZ Performance Section)
  - Cycle+ Age Forecasting Observes Lifespan
- Nonvolatile Memory for Stand-Alone Operation
  - Learned Parameters and History Logging
  - Up to 75 Words Available for User Data
- Precision Measurement System
  - No Calibration Required
- Time-to-Empty and Time-to-Full Estimation

- Temperature Measurement
  - Die Temperature
  - Up to Two External Thermistors
- Multiple Series Cell Pack Operation
- Low Quiescent Current
  - MAX172x1: 18 μA Active, 9 μA Hibernate
  - MAX172x5: 25 μA Active, 12 μA Hibernate
- Alert Indicator for Voltage, SOC, Temperature, Current, and 1 % SOC Change
- High-Speed Overcurrent Comparators
- Predicts Remaining Capacity Under Theoretical Load
- SHA-256 Authentication
- Maxim 1-Wire or 2-Wire (I<sup>2</sup>C) Interface
- SBS 1.1 Compatible Register Set

### KEY APPLICATIONS

- Handheld devices

### MARKET SEGMENT

- Healthcare & Wearables
- Industrial
- Smart Consumer & Building

### SUB MARKET

- Medical Instruments
- Medical Diagnostic and Therapy
- Personal Health, Sport & Fitness
- Portable Personal Electronics & Wearables
- Point of Sales and Vending machines
- Professional Gaming, Amusement & Casino Machines
- Surveillance, Parking & Traffic Control
- Heating, Ventilation and Air Conditioning
- Home & Building Control and Automation
- Home & Building Security (Alarms, Access Control)
- Home Appliances
- Power Supplies (AC/DC, DC/DC)
- Toys, games and entertainment

### TECHNOLOGY SEGMENT

- Analog & Power


**€ 1.41**

1000-up price  
MAX77752BETL+T

**€ 1.41**

100-up price  
MAX77752BETL+

**€ 1.41**

1000-up price  
MAX77752AETL+T

**€ 1.41**

100-up price  
MAX77752AETL+

# MAX77752

## Multichannel Integrated Power Management IC

Powering Next-Generation Consumer Devices with  
High-Performance PMICs  
MAX77714/MAX77752



**MAX77752 Application Message**

The MAX77752 is a highly integrated power management for computationally intensive platforms. Included are three step-down converters, a low-dropout linear regulator, two external regulators enable outputs, two dedicated load switch controllers, and an inrush-current limiter which can be configured as a third load switch controller using OTP.

It provides a combination of high-performance power management components, high-accuracy monitoring, and a customized top-level controller that results in an efficient, size optimized solution.

- **3 Step-Down Converters**
- **1 LDO**

- **2 Load Switch Controllers**
- **OTP Variants**

### FEATURES

- Highly Integrated
  - Three Buck Regulators
    - Integrated High-Accuracy Brownout Comparators
  - One Low-Dropout Linear Regulator
    - Low-Input Voltage
  - Two Dedicated Load Switch Controllers
  - One Inrush-Current Limiter, Configurable to be Load Switch 3 Controller Using OTP
  - Two External Regulator Enable Outputs
  - Voltage Monitor for Backup Power Control
- Highly Flexible and Configurable
  - I<sup>2</sup>C-Compatible Interface
  - Factory OTP Options Available
  - Flexible Power Sequencer
  - Configurable Sleep-State Control
- Small Size
  - 40-Pin, 5 mm x 5 mm x 0.8 mm, 0.4 mm Pitch TQFN
  - 70 mm<sup>2</sup> Total Solution Size

### KEY APPLICATIONS

- Computation Platforms

### MARKET SEGMENT

- Smart Consumer & Building

### SUB MARKET

- Audio and Video
- Home & Building Control and Automation
- Home Appliances
- Toys, games and entertainment

### TECHNOLOGY SEGMENT

- Analog & Power



## STSPIN8x

### Compact, Low Power & Versatile Motor Drivers



Nucleo Board

STMicroelectronics promotes STSPIN8x as the smallest 45V motor drivers in the world, such an ideal solution for portable, battery operated applications.

- High efficiency in a wide Voltage range
- ST's advanced algorithms keep the torque ripples under control
- Silent and highly precise motion
- Lowest consumption in idle state (45uA)
- Supporting stepper, BLDC and DC motors with dedicated part numbers: STSPIN820, STSPIN830, STSPIN840

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POWER MANAGEMENT

- Industrial operating voltage range ( from 7V to 45V )
- Standby mode to minimize power consumption in idle state
- Output current up to 1.5 A RMS and 2.5 A peak
- Implements an advanced current control

#### FEATURES

- Highly reliable thanks to a full set of protections
- Flexible driving methodology supporting different architectures (1 shunt, 3 shunt, ...)

#### KEY APPLICATIONS

- Industrial robots
- Medical & Health care
- Home Appliance
- Robotics
- POS & ATM
- 3D printers
- Small pumps and fans

#### MARKET SEGMENT

- Healthcare & Wearables
- Smart Consumer & Building
- Industrial

#### SUB MARKET

- Instrumentation, Test and Measurement
- Motion Control, Servo Drives
- Robotics
- Point of Sales and Vending machines
- Professional Gaming, Amusement & Casino Machines
- Surveillance, Parking & Traffic Control
- Heating, Ventilation and Air Conditioning
- Home & Building Control and Automation
- Home Appliances
- Information Kiosk & Advertising Panels
- Human Machine Interface

- Factory Automation End Points (PLCs, I/O, Sensors & Actuators)
- Medical Diagnostic and Therapy
- Medical Imaging
- Medical Instruments
- Personal Health, Sport & Fitness
- Portable Personal Electronics & Wearables
- Embedded Vision
- Home & Building Security (Alarms, Access Control)

#### TECHNOLOGY SEGMENT

- Analog & Power



# VNHD7008AY

## H-bridge motor driver for automotive DC motor driving



Product Image

The VNHD7008AY is a DC motor driver for automotive applications. It integrates a full protected dual high-side driver and the drivers and protections for the two external power MOSFETs in low-side configuration. The device is housed in a PowerSSO-36 exposed pad package to optimize the dissipation performances. It can directly interface the microcontroller to select the motor direction and the brake conditions. The MultiSense pin allows to monitor the motor current, provides a voltage proportional to the battery value and the information on the temperature of the chip.

- Dual fully protected HSD with MultiSense feedback
- MultiSense diagnostic functions
- Cross current protection
- Load current limitation

### FEATURES

- AEC-Q100 qualified
- Output current: 51 A
- 3 V CMOS compatible inputs
- Undervoltage shutdown
- Overvoltage clamp
- Thermal shutdown
- Self-limiting of fast thermal transients (Power Limitation)
- Shoot through protection
- Loss of ground and loss of VCC
- Electrostatic discharge protection
- Drain and source voltage monitoring of the external power MOSFETs
- PWM operation up to 20 kHz for external LSDs
- Analog motor current feedback
- Chip temperature monitoring
- Battery voltage monitoring
- Standby mode
- Half bridge operation
- Charge pump output for reverse battery protection

### KEY APPLICATIONS

- DC motor drives

### MARKET SEGMENT

- Automotive
- Industrial

### SUB MARKET

- Automotive Power Train and Chassis
- Connected Car, Body Electronics and Automotive Lighting
- Factory Automation (PLCs, I/O, Sensors & Actuators)
- Motion Control, Servo Drives
- Robotics

### TECHNOLOGY SEGMENT

- Analog & Power



## TC78H621FNG, TC78H611FNG

### Brushed DC and Stepper Motors Drivers including Dual H-Bridges



Toshiba\_TC78H6xxx

Toshiba's new H-bridge driver ICs for DC brushed motors are suitable for driving bipolar stepping motors with full-step controllability on 3 ports (TC78H621FNG only) or half-step on 4 ports. The devices have a low on-resistance of 0.8 Ω.

The new devices have two H-bridges with 1.1A ratings, and can drive two DC brushed motors, while the TC78H611FNG also supports short brake mode. The TC78H621FNG has Phase/Enable-Inputs, whereas the TC78H611FNG uses IN1/IN2-Input coding.

They require a logic power supply in the range of 2.7 to 5.5 V and can accept motor drive voltages in the range 2.5 to 15 V.

- Power supply voltage for motor:  $V_M = 18 \text{ V(Max)}$
- Power supply voltage for control:  $V_{CC} = 6 \text{ V(Max)}$

- Output current:  $I_{OUT} = 1.1 \text{ A(Max)}$
- Output ON resistance:  $R_{ON}(\text{upper and lower sum}) = 0.8 \Omega(\text{Typ.})$

#### FEATURES

- Internal pull-down resistors on inputs: 200 kΩ(Typ.)
- Built-in over current detection (ISD)
- Thermal shutdown (TSD) circuit
- Under voltage lockout (UVLO) circuit.
- Built-in cross conduction protection circuit.
- Short Brake mode (TC78H611FNG only)
- Current consumption in standby mode approx. 1 μA (max.)
- Small package : P-TSSOP16-0505-0.65-001

#### KEY APPLICATIONS

- Home appliances
- Point-of-sales
- White goods
- Housing and facility equipment
- Ventilation
- Water supply valves
- Electronic lock
- Smart meter

#### MARKET SEGMENT

- Communication & Infrastructure
- Smart Consumer & Building

#### SUB MARKET

- Broadcast
- Telecom and Networking
- Home & Building Security (Alarms, Access Control)
- Heating, Ventilation and Air Conditioning
- Audio and Video

#### TECHNOLOGY SEGMENT

- Analog & Power





# ZMOD4410

## Indoor Air Quality Sensor

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SENSORS AND TRANSDUCERS



Exceptionally high stability and sensitivity for indoor air quality applications

The ZMOD4410 gas sensor module is a firmware configurable platform that addresses air quality requirements in a wide range of IAQ applications such as smart homes and buildings, including thermostats, air purifiers, building controls, smart fans and smart HVAC equipment.

The ZMOD4410 gas sensor offers a library of downloadable firmware to address specific applications.

- Proven MOx material
- Power consumption of <14 mW in continuous operation
- Calibration with gas
- Flexible architecture

### FEATURES

- Correlates German committee on indoor air quality guidelines (UBA study)
- Miniature package 3 x 3 x 0.7 mm
- Power consumption of <14 mW in continuous operation
- Digital (I<sup>2</sup>C) output
- Chemical and electrical calibration
- Recognized indoor air quality definitions from the German Environment Agency (UBA)
- A flexible interface that enables software configurable indoor air quality sensing solutions for sensing VOCs and targeting applications in homes and offices

### KEY APPLICATIONS

- Smart thermostats

### MARKET SEGMENT

- Industrial
- Smart Consumer & Building

### SUB MARKET

- Heating, Ventilation and Air Conditioning
- Home & Building Control and Automation

### TECHNOLOGY SEGMENT

- Smart Sensing & Connectivity



# AR0144CS

## CMOS Digital Image Sensor with Global Shutter, 1/4-Inch, 1.0 Mp



AR0144CS image sensor

The AR0144 is a 1/4-inch 1.0 Mp CMOS digital image sensor with an active-pixel array of 1280H x 800V. It incorporates an innovative global shutter pixel design optimized for accurate and fast capture of moving scenes. The sensor produces clear, low noise images in both low-light and bright scenes. It includes sophisticated camera functions and is programmable through a simple two-wire serial interface. The AR0144 produces extraordinarily clear, sharp digital pictures, and its ability to capture both continuous video and single frames makes it the perfect choice for a wide range of applications.

- **Extreme High Shutter Efficiency**
- **Low Dark Current/Hot Pixels**

- **High Linear Full Well**
- **Low Operational Power**

### FEATURES

- Small Form Factor

### KEY APPLICATIONS

- Barcode Scanner
- Head Mounted Displays
- Biometric Scanners
- Virtual Reality/Augmented Reality Glasses
- Drones

### MARKET SEGMENT

- Healthcare & Wearables
- Smart Consumer & Building
- Industrial

### SUB MARKET

- Personal Health, Sport & Fitness
- Portable Personal Electronics & Wearables
- Embedded Vision
- Robotics
- Surveillance, Parking & Traffic Control
- Audio and Video
- Home & Building Security (Alarms, Access Control)
- Toys, games and entertainment

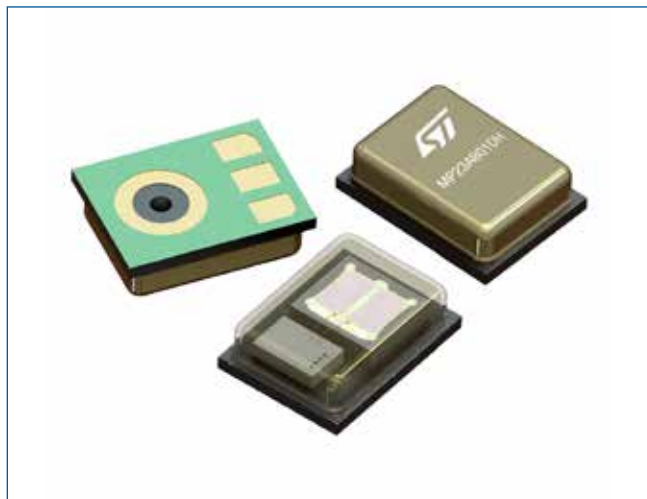
### TECHNOLOGY SEGMENT

- Smart Sensing & Connectivity



# MP23AB01DH

## High-performance MEMS audio sensor: Fully differential analog bottom-port microphone



MP23AB01DH MEMS audio sensor

The MP23AB01DH is a compact, low-power microphone built with a capacitive sensing element and an IC interface. It has a sensitivity of 38 dB  $\pm$ 1 dB, an acoustic overload point of 135 dBSPL with minimum 65 dB signal-to-noise ratio and fully differential output in order to minimize common mode noise. The MP23AB01DH is available in a package compliant with reflow soldering and is guaranteed to operate over an extended temperature range from -40 °C to +85 °C.

- High signal-to-noise ratio
- Fully differential output
- High bandwidth
- Package compliant with reflow soldering

### FEATURES

- Single supply voltage operation
- Omnidirectional sensitivity
- High RF immunity

### KEY APPLICATIONS

- All devices requiring a microphone

### MARKET SEGMENT

- Healthcare & Wearables
- Industrial
- Smart Consumer & Building

### SUB MARKET

- Medical Diagnostic and Therapy
- Medical Instruments
- Personal Health, Sport & Fitness
- Portable Personal Electronics & Wearables
- Factory Automation (PLCs, I/O, Sensors & Actuators)
- Human Machine Interface
- Information Kiosk & Advertising Panels
- Point of Sales and Vending machines
- Professional Gaming, Amusement & Casino Machines
- Robotics
- Audio and Video
- Home & Building Control and Automation
- Home Appliances
- Home & Building Security (Alarms, Access Control)
- Toys, games and entertainment

### TECHNOLOGY SEGMENT

- Smart Sensing & Connectivity

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