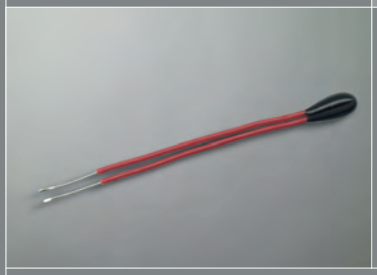
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Sensors Application Guide





TTI, Inc., - A Berkshire Hathaway Company

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The Specialist in Electronic Component Distribution

Why Choose TTI?

Why Buy from TTI?
Founded in 1971, TTI has steadily grown to become a world leading specialist distributor of electronic components. The company was founded on the premise that passive component purchasing could be made more efficient by offering product specialisation, customer-driven service and proprietary supply chain solutions.

Product Knowledgeable Experts
Our unique specialisation enables us to provide significantly better product knowledge to support manufacturing from design chain to supply chain. TTI's commitment to this specialty and our customers is as dedicated today as always.

Broader and Deeper Inventories
TTI maintains extensive inventories, stocking more than 2M part numbers globally – that's more connector, passive, electromechanical, discrete, sensor and power supply inventory available than from any other source.

Leading Edge Technology Products
TTI partners with manufacturers that lead the industry in new component technologies and can help solve any design challenge. We ensure the very latest and most technologically-advanced products are readily available from stock.

Supply Chain Excellence
From technical application advice to customised logistical solutions; TTI can add value throughout the supply chain by reducing acquisition costs, improving material flow through forecast analysis, provide safety stock and reduce receipt handling through consolidated shipments. We provide the BOM coverage necessary to deploy comprehensive supply chain solutions that reduce total cost of ownership and mitigate line down risk.

Global Distribution Centres
Our European headquarters is located just outside of Munich, Germany in Maisach-Gernlinden. In total, we have more than 35,000m² of dedicated warehouse space and local sales and technical support in over 40 locations across Europe.

TTI has more than 120,000m² of automated warehousing in North America, Europe and Asia. All are linked into a global warehouse management system that provides superior customer service and overall business efficiencies. Wherever you are in the world, TTI can support you.

Quality and Reliability
TTI is the first distributor to have all global warehouse locations ISO registered and certified to ISO 9001 and ISO 14001 Standards. TTI Europe is also certified to EN9120/EN9100, IECQ-CECC and ISO/IEC 27001 Standards. Additionally, all of our European sales branches are ISO 9001 certified. TTI has one global documentation system that ensures that every TTI branch and warehouse in the world follows the same processes.

Year after year, customers rate our inventory availability, on-time delivery and accuracy among the very best in the industry – contact us today to find out what a true specialist has to offer.





Global Distribution Centres with more than **120,000m²** of automated warehousing in North America, Europe and Asia.

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Finding the Right Sensor for your Design

From pressure to position, temperature to humidity – if your application calls for a sensor, TTI is committed to providing the options and inventory you need.

Our engineers welcome the opportunity to work with you to help develop your sensor solution to meet your individual needs.

To view TTI's full line of sensor products, go to www.ttieurope.com/sensors

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Sensors Line Card

Sensors

Sensors	ALPS	Amphenol Advanced Sensors	AVX	Bourns	Honeywell	Littelfuse	Molex	Murata	Omron	Panasonic	Sensata – BEI Sensors	Sensata and Kavlico	Standex Meder	TDK EPCOS	TE Connectivity	TT Electronics	Vishay
Motion, Speed and Position																	
Accelerometer	■							■		■					■		■
Gyroscope								■							■		■
Inclinometer/Tilt								■	■		■				■		■
Shock/Vibration	■				■			■	■						■		
Inertial Measurement Unit					■										■		
Encoder/Rotary – Board Mount	■			■		■		■		■					■	■	■
Encoder/Rotary – Industrial	■			■							■				■		■
Face Recognition Sensors (HVC – Human Vision Component)									■								
Proximity – Inductive					■					■							
Proximity – MagnetoResistive					■	■		■					■		■		
Proximity – Optical					■				■	■					■	■	■
Speed Sensor					■	■						■		■	■		
Hall Effect/GeoMagnetic Sensors	■				■	■		■			■						■
Resolver					■										■		
Ultrasonic								■									
Optical																	
Ambient Light								■	■	■							■
Fibre Optic										■						■	
PIR/Infrared		■						■	■	■		■			■	■	■
Matrix Sensors									■	■							
Laser										■							
Proximity – Optical									■	■					■	■	■
Solar		■				■								■			■
Ultra Violet																	■
Colour Sensors																	■
Pressure																	
Board Mount Pressure	■	■		■	■				■	■		■		■	■		
Disposable Medical Pressure Sensors	■	■							■						■		
Dies		■												■			
Altimeter/Barometric	■	■						■	■					■	■		
Combination MEMS		■							■						■		
Industrial Pressure	■			■	■							■			■		
Pressure Switches					■							■					
Air Quality																	
CO_2		■			■												
VOC (COV)		■			■												
Gas		■			■												
Dust		■			■					■							
Ionizer								■									
Force																	
Force	■				■							■			■		
Load Cell/Load Pin					■										■		
Torque					■										■		
Flow																	
Air Flow					■				■						■		
Liquid Flow	■														■		
Flow Switch															■		
Fluid Property Sensors						■									■		
Turbidity		■															
Temperature and Humidity																	
Combination MEMS, Digital Temperature Sensors	■	■		■	■				■			■			■		
Humidity	■	■		■	■				■						■		
NTC Thermistor – Leaded		■	■		■	■		■		■				■	■		■
NTC Thermistor – SMT		■	■		■	■		■		■				■	■		■
Probes and Assemblies		■			■	■								■	■		■
PTC Thermistors		■						■						■			■
RTD/PTC Thermistors – Customised – Platinum		■			■	■						■			■		
PTC Thermistors – Customised – Ceramic Heating		■						■						■			
Heaters – Copper Customised		■			■									■	■		
Thermocouples															■		
Thermopiles/Human Presence Detection – Solutions		■							■	■							
Thermopiles/Human Presence Detection – Component		■													■		
Thermostats					■							■					
Level Sensors																	
Liquid Level						■	■						■	■	■	■	
Urea, Water (WIF/WIF+WDS/WS), Diesel					■	■									■		
Powder Level Sensors														■			
Hydra-static Pressure Cells												■			■		
Other																	
Current Sensors	■				■	■								■	■		
Capacitive Touch	■						■							■			
Inductive Sensors – Factory Automation									■	■							
Light Curtain Safety – Factory Automation									■	■							
Magnets						■							■				
Medical Sensor Cable Assemblies/Pulse Oximetry Probes							■								■		
Sensor Development Boards	■	■			■				■	■					■		■

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Smart Building



Smart Building



ALPS

Air purifiers, refrigerators, air-conditioning systems and other major home appliances on the market today are increasingly equipped with functions for sensing a wide range of environmental parameters, such as temperature, humidity, air pressure and ambient light, to enhancing comfort and convenience for users and improving the energy-saving performance of the equipment.



Sensors used in these appliances in the past have predominantly provided analog output, but there has been a rising need in recent years for integration of sensors with digital output. Sensors must also be installed in an optimal location inside the appliance to be able to perform more accurate measurement. In many cases, that is away from the main circuit board and the sensor should be mounted to a separate PCB board.

HSHCL Series Digital Capacitive Humidity and Temperature Sensor



Features

- Outstanding performance: measures from 0 to 100% relative humidity (dew point)
- Humidity measurement accuracy is 0+/-0.5%. Temperature measurement accuracy is 0+/-0.5°C
- Can be installed in an optimal location enabling accurate measurement
- Ensuring reliability, the module is covered in moisture-proof film
- I2C interface support and built-in connector allow easy wiring to the main board
- The MEMS sensor has its own in-built ASIC for temperature characteristic compensation
- Low current consumption 200uA (at 10Hz sampling)
- Compact size and low profile (dimensions: 24mm x 16mm x 6.5mm)

Note: Sensor is also available as separate item (HSHCAL001B)



Smart Building – Room Air Quality

Amphenol Advanced Sensors

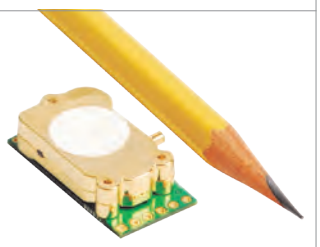
Amphenol
Advanced Sensors

Telaire Air Quality Sensors

Telaire, a product line of Amphenol Advanced Sensors, is the world's first and leading manufacturer of low cost NDIR Carbon Dioxide (CO_2) Sensors. In more recent years, the Telaire product line has expanded into other air quality sensors, including Dust (PM 2.5 and PM 10) and Relative Humidity Sensors. Telaire products are used in commercial and residential building ventilation applications and, increasingly, in consumer air quality devices for the home.

Telaire T6700 Series – Miniature CO_2 Sensor Modules

The Telaire T6700 Series consists of miniature NDIR CO_2 sensors that have the accuracy and reliability of many larger sensors.



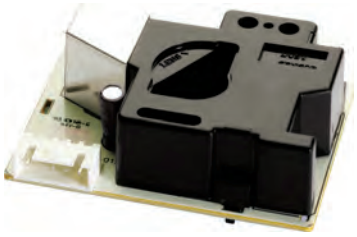
The small size allows OEM's to integrate in to smaller enclosures and equipment and uses significantly less power than many other devices on the market.

The Telaire T6703 CO_2 Module is configured for applications where CO_2 levels are less critical but an assessment of indoor air quality is required, for example in residential applications.

The Telaire T6713 CO_2 Module is ideal for applications where accurate CO_2 levels need to be measured and controlled for indoor air quality and energy saving applications such as demand control ventilation.

Telaire SM-PWM-01C – SMART Dust Sensor

The Telaire SM-PWM-01C SMART Dust Sensor detects dust particle concentration in air by using an optical sensing method.



An infrared light emitting diode (IR LED) and a photo-sensor are optically arranged in the device. The photosensor detects the reflected IR LED light by dust particles in air. The dust sensor can detect the small particles, such as cigarette smoke. It can also distinguish small particles, such as smoke from large house dust, by the pulse pattern of the signal output.

Telaire AAS-AQS-UNO – Air Quality Evaluation Board

The Telaire AAS-AQS-UNO Air Quality Evaluation Board is used to evaluate Telaire air quality sensors for the rapid development of air quality sensor acquisition systems, intelligent apparel devices and low-power-consumption IOT-based Bluetooth modules.



The Board can support T9602 temperature and humidity sensors, T6713 carbon dioxide sensors, SM-PWM-01C dust sensors and other sensors from the Amphenol range. Moreover, the OLED display and Bluetooth output can be supported at the same time. This evaluation board is designed to speed up evaluation and development of the relevant sensors. The serial output can be configured to send sensor data to a PC over the USB connection for recording and analysis in 3rd party software.

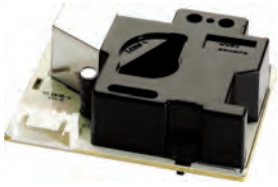
Smart Building – Room Air Quality



Amphenol Advanced Sensors

Amphenol
Advanced Sensors

Telaire Air Quality Sensors







Telaire T9602 – Humidity and Temperature Sensor

The sensor is designed for OEM installations, fully calibrated and temperature compensated. Uniquely, this sensor cover is water resistant and rated IP67 for protection in demanding environments.



Telaire T9602 offers the most advanced and cost effective humidity and temperature sensing solution for virtually any type of application. Based on our own capacitive polymer sensor chip and a CMOS integrated circuit with EEPROM are integrated into an easy mount OEM package.

Telaire MiCS-VZ-89TE – Integrated VOC Sensor Module

The Telaire MiCS-VZ-89TE Integrated Sensor Module combines state-of-the-art MOS sensor technology with intelligent detection algorithms.



It monitors VOCs and CO_2 equivalent variations in confined spaces. The dual signal output can be used to control ventilation on-demand, saving energy and reducing cost-of-ownership.

The device also has very low power consumption making it ideal for battery applications.

Telaire ChipCap 2 – Humidity and Temperature Sensor

The Telaire ChipCap 2 offers the most advanced and cost effective humidity and temperature sensing solution for virtually any type of application.



A capacitive polymer sensor chip and a CMOS integrated circuit with EEPROM are integrated into one embedded system in a reflow solderable SMD package. Individually calibrated and tested, ChipCap 2 performs at ±2% from 20% to 80% RH (±3% over entire humidity range), and is simple and ready to use without further calibration or temperature compensation.



Smart Building – Room Air Quality

Honeywell

Honeywell
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Particle Sensor – HPM Series Particle Sensor

Particle sensors play a critical role in measuring and managing the quality of the air we breathe to help protect our health.



Honeywell's HPM series particle sensor is designed to work in heating, ventilation and air conditioning (HVAC) systems and consumer products such air purifiers to measure air quality in homes, buildings and public spaces. The sensor uses laser technology to accurately and cost-effectively monitor for fine inhalable particles that are 2.5 micrometers in diameter or smaller.

For reference, the average human hair is nearly 30 times larger at 70 micrometers in diameter. The laser-based sensor uses a light-scattering method to accurately detect and count particles in the concentration range of 0 micrograms-per-cubic-meter-of-air (µg/m3) to 1,000µg/m3 in a given environment. The sensor then analyses the particulate size and concentration in real time to enable systems to provide alerts and allow operators to take remediation actions.

With its heavy industrial level electromagnetic compatibility, the HPM series sensor performs accurately in harsh, challenging environments. Building operators benefit from the sensor's industry-leading long life of 20,000 hours, which allows for stable operations and continuous use. The new sensor can be used in a range of consumer products such as air purifiers, automotive air systems and mobile air quality detectors.

Features

- Detect range: PM2.5, PM10
- Concentration range (max) : 0ug – 1000 ug/m3
- Accuracy: Max (± 15ug/m3, ±15%) : (T=20°C)
- Self-calibration: Factory calibrated
- Response time: < 6sSupply voltage: 5V ± 0.2V
- Standby current: < 20mA
- Supply current: 120mA
- Operating temperature: -10~50°C
- Operating humidity: 0~80% RH
- Storage temperature and humidity: -30 ~ 65°C, 0~95% RH
- Output data: PM2.5 (default) (defined string) PM10 (optional)
- Output protocol: UART(default) I2C (option)
- Operate life: 20,000 hours continuous or 60,000+ based on duty cycle
- Dimensions: 43 x 36 x 23.7mm

Applications

- Air quality monitoring
- Indoor air filtering
- Environmental monitoring
- Air conditioners
- Air cleaners
- Hand held air quality detectors
- In vehicle air cleaners

Smart Building - Presence Detection



Omron

MEMS IR Sensor – D6T

High Sensitivity Enables Detection of Stationary Human Presence



From individual consumers to manufacturing companies and governments, everyone recognises the importance of reducing energy wastage and cutting costs.

Simply by detecting body heat, Omron's D6T heat-detecting sensor is making a huge contribution to energy-saving efforts. This super-sensitive infrared D6T temperature sensor can detect human presence in a room, even if the person isn't moving.

That information can be used in homes and offices to switch lights, heating and air conditioning on and off as needed. The sensor can also be used to count people, helping to optimise control in smart energy systems and offering reliable intruder detection.

The D6T is available in three main configurations: 1x1, 1x8 and 4x4 array.

- Omron's unique MEMS and ASIC technology achieve a high SNR.
- Superior noise immunity with a digital output.
- High-precision area temperature detection with low cross-talk field of view characteristics.

Structure of D6T

Product	Description
Silicon lens	Gather radiated infared on the theropile
MEMS thermopile array	Transduce infared light into electrical signal
ASIC	Low noise amplification and detection of chip temperature
MCU	Convert sensor signal to digital temperature output

Features

- Measure the surface temperature of the material by detecting intensity of the infrared radiation.
- Best fit for human detection and non-contact temperature measurement.

Technology

Incorporate state-of-the-art MEMS thermopile, custom designed sensor ASIC and signal processing micro processor and algorithm into tiny package.

- Small 12.0x11.6mm (D6T-8L-09 / D6T-1A)
- Digital temperature output I2C
- High sensitivity and low noise *NETD=0.14°C

*NETD: Noise Equivalent Temperature Difference



Smart Building – Motion Detection

Panasonic

Panasonic

PaPIRs – High Density Long Distance PIR Motion Sensor



Panasonic's new passive infrared sensor convinces through the unbelievable small optic and a specified installation height up to 17m. A special lens design with an additional lip allows fast integration into IP-rated applications by using a standard o-ring for example.

The pyroelectric sensor complements the PaPIRs families EKMC and EKMB. The EKMC sensors have a standby current consumption of 170µA and are available as digital as well as analog output sensors. The EKMB family is especially designed for battery operated devices with a very low standby current consumption of 1µA, 2µA and 6µA (digital output only).

The quad sensor based design, with a very high detection zone density of 128, guarantees reliable response, even at huge distances. The detection area is circular and symmetrical which simplifies sensor integration because of the independence of sensor orientation within the final product.

Samples and specifications are available.

Features

- Detection distance up to 17m
- Detection area: at 12m ≈ 16m and at 17m ≈ 23.5m
- Lens diameter: min. 19.3mm
- Output: digital (open- collector output) and analogue (op-amplifier output)
- Available lens colours: white, pearl white and black

Applications

- Passive infrared motion sensors for lighting controls
- High-bay motion sensors and luminaires for warehouses, public and industrial buildings
- Street lights
- Security cameras

EKMB series for battery-operated devices EKMC series for battery-free devices								
Product name			Standard and Slight Motion	Slight Motion	Standard	Horizontally Wide	Wall Installation	Long Distance	High Density Long Distance
Appearance			Ø 14.9mm	Ø 14.6mm	Ø 9.5mm	12 x 26mm	Ø 20.7mm	Ø 20.7mm	Ø 19.3mm
									
Standby current consumption	Output type	Sensitivity							
1µA	Digital (open collector)	Standard sensitivity type	EKMB119311□	EKMB119111□	EKMB110111□	EKMB110511 □	EKMB110411□	EKMB110311□	EKMB110611 □
2µA			EKMB129311□	EKMB129111□	EKMB120111□	EKMB120511□	EKMB120411□	EKMB120311□	EKMB120611 □
6µA			EKMB139311□K	EKMB139111□K	EKMB130111□K	EKMB130511□K	EKMB130411□K	EKMB130311□K	EKMB130611□K
170µA	Digital (open collector)	Standard sensitivity type	EKMC169311□	EKMC169111□	EKMC160111□	EKMC160511□	EKMC160411□	EKMC160311□	EKMC160611□
		High sensitivity type	EKMC469311□K	EKMC469111□K	EKMC460111□K	EKMC460511□K	EKMC460411□K	EKMC460311□K	EKMC460611□K
	Analogue (op amp)	Adjustable	EKMC269311□K	EKMC269111□K	EKMC260111□K	EKMC260511□K	EKMC260411□K	EKMC260311□K	EKMC260611□K
Lens colour			Placeholder □: White = 1, black = 2, pearl white = 3						
Typical installation height (ceiling) / detection distance (wall / corner)	Standard sensitivity type		3m	3m	3m	5m	up to 12m	7m	12m
	High sensitivity type		4m	4m	4m	7m	up to 17m	10m	17m
	Analogue		Adjustable						
Maximum field of view (horizontal x vertical)			91° x 91°	104° x 104°	106° x 97°	150° x 35°	112° x 56°	108° x 99°	69° x 69°
Usable ambient temperature			Standard sensitivity and analogue type: -20°C to +60°C High sensitivity type: -20°C to +55°C						

Smart Building – Utility Meters



Standex-Meder

Reed Sensor Solutions – Custom Engineered Solutions for Tomorrow



Standex-Meder Electronics is a worldwide market leader in the design, development and manufacture of standard and custom electro-magnetic components.

Our reed switch-based solutions include MEDER, KENT and KOFU brand reed switches, as well as a complete portfolio of reed relays, and a comprehensive array of fluid level, proximity, motion, water flow, HVAC condensate, hydraulic pressure differential, capacitive, conductive and inductive sensors.



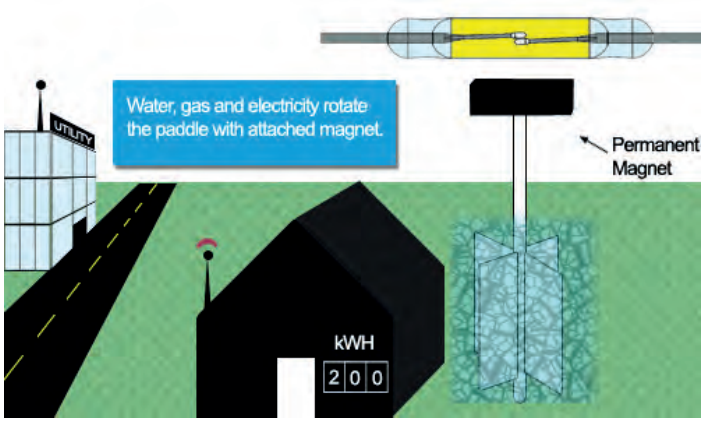
Specification

Surface Mount (SMD) Reed Sensors

Surface mount reed sensor products are an SMT design used in switching and sensing applications. Choose from bare glass or rugged thermoset over-molded versions in SPST-NO, SPST-NC or SPDT changeover contacts. Choose from 9 different switch models from 7mm and up, ranging from 0-100W and switch voltages up to 1,000 VDC, as well as 5 different surface mount lead designs. They are typically supplied in tape and reel and are ideal for automatic pick and place.

Features

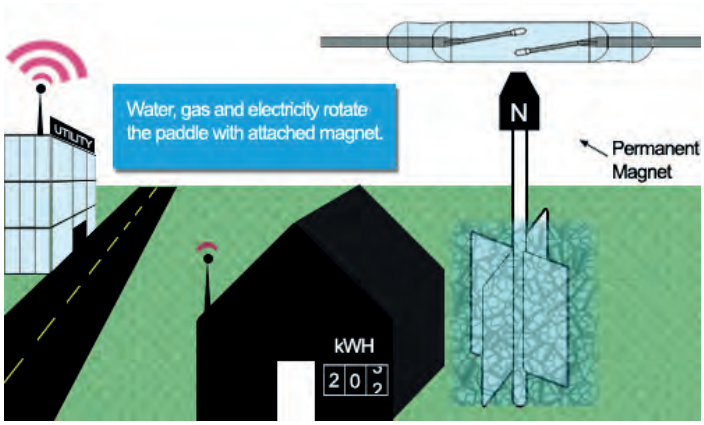
- Ideal for on/off control switch, proximity, motion and position detection
- Supplied in tape and reel
- Excellent for low power operations
- UL approval
- Different lead designs
- Suitable for applications with minimal space availability
- Bare glass or rugged thermoset over-molded versions
- Over-molded version for harsh environment, shock protected
- Ideal for automatic pick and place



Utility Meters Use SMD Reed Sensors To Measure Water Flow, Gas and Electricity

Most households and businesses have meters reading and recording the volume of water used, the volume of gas used and/or the amount of electricity being used. Most of these meters used reed sensors to count and measure the usage for each household. This is done in a power efficient and tamper proof way using reed sensors.

Most of the utility meters convert the flow of water, gas, and/or electricity to the movement of a rotating disk. Each rotation is directly equated to a given volume of water or gas. In the case of electricity, each rotation directly equates to a given amount of kilowatt hours usage. Usually a magnet is mounted on this rotating disk. Whenever the disk completes a revolution the reed sensor, which is conveniently mounted on a PCB, is so positioned to sense each revolution of the magnet.





Smart Building

TE Connectivity

AUTHORIZED DISTRIBUTOR

AmbiMate Sensor Module MS4



TE Connectivity's (TE) AmbiMate sensor module MS4 series provides an application specific set of sensors on a ready to attach PCB assembly for easy integration into a host product.

Design resources are freed and time to market accelerated by integrating the MS4 series pre-engineered, four core sensor solution for Motion/Light/Temperature/Humidity into your next product.

TE's AmbiMate sensor module MS4 series integrates a set of sensors suitable for Building Automation and Connected Home applications onto a PCB assembly. The pre-engineered multi-sensor modules are easily integrated onto a host product.

Features

Multi-sensor modules

- Design resources are freed and time to market is accelerated
- Simplicity of popular I2C communication protocol
- Space saving compact design
- Multiple attach methods to accommodate your application need
- One footprint allows multiple sensor configurations and flexibility in design

Applications

- Indoor lighting
- Building automation
- Connected home
- Air quality
- Energy management
- Work space comfort
- Zonal environmental controls

MS4 series sensor modules include VOC (Volatile Organic Compound), eCO2 and sound detection. Add the capability to monitor air quality through the capture of VOC concentrations. All MS4 series sensor modules offer the flexibility of sharing a common seven position connection. This allows the designer to layout a single PCB footprint accommodating all the available sensor configurations at production.



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SMART Appliances





SMART Appliances

Honeywell

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High Sensitive MR-Sensors Nano Power Series (SM351T and SM353T)



Honeywell's Magnetoresistive Sensor ICs Nanopower Series are ultra-sensitive devices designed to accommodate a wide range of applications with large air gaps, small magnetic fields and low power requirements.

However, designers should consider the extra precautions that will need to be taken when handling reed switches on the manufacturing line and when handled by the end users.

Reed switch OEMs themselves highlight the numerous precautions that are required when handling reed switches, resulting into a higher cost of ownership for customers (including warranty costs). Unlike reed switches, Honeywell MR sensors better withstand shocks and vibrations, and may be dropped without the risk of severe damages. No need to cut and bend leads on an MR SOT-23 sensor, and therefore no risk of altering the component characteristics. Soldering an MR sensor does not require special preheating in order to prevent heat stress damage. Any ultrasonic welding, sealing or cleaning process will not affect the MR sensor, therefore no additional exhaustive testing would be required.

Mounting a reed switch on a PCB often requires manual operations to either elevate the reed switch above the board using an additional holder, or to drill a hole in the board to avoid direct contact with the board, when surface mount SOT-23 components are designed for automatic insertion on a PCB. Using an MR solution not only saves on costs for OEMs, but also brings comfort of use and long term reliability and durability for the end users.

Features

- Similar or higher sensitivity than reed switches (7 or 14 Gauss typical)
- Smaller than equivalent reed switches with the surface mount SOT-23 housing
- More stable magnetic characteristics over the entire operating temperature range (-40°C to +85°C)
- More durable as solid state technology and does not wear out over time
- More robust with it's plastic moulded housing in comparison with glass bulbs widely used for reed switches
- Ten times lower in consumption than next best alternative micropower Hall effect sensors (down to 310nA)
- Supply voltage range: 1.65V to 5.5V

Applications

- **White goods and power tools**
  - Door/lid position
  - Liquid level/flow monitoring for white goods
  - Selector switch on battery operated devices
  - Refrigerators
  - Microwaves
  - Dishwashers
  - Battery operated tools
- **Flow sensing including smart utility meters**
  - Counting mechanism
  - Anti-tamper switch
  - Solenoid valves with embedded flow meter for appliance



SMART Appliances



TE Connectivity

AUTHORIZED DISTRIBUTOR

Digital High Accuracy RH/T Sensor – HTU21D(F)



Today's energy efficient home appliance products, like washing machines and dryers, cookers and refrigerators, require optimal system performance to meet environmental and end user expectations.

TE Connectivity's (TE) engineering and 20+ years of experience provides humidity and temperature combination sensors with leading response time, precision in measurement and sustained performance even when exposed to extreme changes and conditions. TE's HTU2x senses the true relative humidity and temperature to provide best in class performance and superior value to competitive solutions.

Applications
- Refrigeration and freezers
- Dryers
- Dishwashers

Key Benefits
- Enable optimal system performance and precise engineering with a strict linear response curve through humidity (0-100%) and temperature (-40 to 125°C)
- Support reliable, consistent system performance even in the most demanding conditions driven by properties of TE's specific polymer combined with calibration slope and offset skills
- Support fast response times (t63% in 2 sec) with TE's humidity die structure
- Enable precise environment measurement even after high humidity exposure or condensation events with TE's specific die and IP67 rated sealing with filter options

Thermopile Infrared (IR) Sensor



Thermopiles are mainly used for contactless temperature measurement in many applications. Their function is to transfer the heat radiation emitted from the objects into a voltage output.

Thermopile infrared (IR) non-contact temperature measurement sensors are available with various lens, and filters allowing use in multiple applications. Depending on the sensors, the output signal can be the standard resistance output, or packaged with analog or digital signals.

Features
- Ambient temperature range: -20 – 85°C [-4 – 185 °F]
- Resistance: 25°C
- Dimensions: Ø9.15mm x 4.4mm (Body)
- Output signal can be the standard resistance output, or packaged with analog or digital output signals.



SMART Appliances

Vishay

Proximity Sensing and Gesture Control – VCNL Series

Vishay has a wide range of proximity and ambient light sensors ideal for presence detection to switch on SMART appliance displays for example for SMART refrigeration, or for gesture recognition for cooking or home lighting control, or for collision avoidance for robotic vacuum cleaners in the home.

The VCNL series combines a high-power IR emitter, photo detectors for proximity and ambient light, a signal processing IC, and a 16-bit ADC into a compact 8mm by 3mm by 1.8mm surface-mount package. The device's small outline saves space and gives design engineers greater flexibility where and how they locate the sensor.

The sensors can detect from 10cm up to 1.5m. They also have a programmable interrupt function with high and low thresholds that allows the sensor to wake up an application from a low-power mode, reducing the overall power consumption of an application, and support I2C bus communication interface for smart home applications.

The VCNL4200 provides presence detection for display activation for home appliances, collision avoidance for new robotic vacuum cleaners, lighting control in and around the home, garage door control and activation for water faucets/taps.

Containing the circuitry needed for these applications in one device, the sensor eliminates the need for additional light barriers and optical alignment of the IR emitter and photo diode. The device's small outline saves space and gives design engineers greater flexibility where and how they locate the sensor.

Series	Product	Description
VCNL4030X01		Best performance
VCNL4035X01 No integrated infrared emitter (IRED), drives up to 3 external IREDs / LEDs		Highest design flexibility
VCNL4040		Smallest package available
VCNL4200		Up to 1.5m detection range

Features VCNL4200

- Ambient Light Function
  - Fluorescent light flicker immunity
  - Selectable maximum detection range (197/393/786/1573) lux with highest sensitivity 0.003 lux/step
  - Spectrum close to real human eye responses
- Proximity Function
  - Intelligent background light cancellation
  - Immunity to red glow (940nm IRED)
  - Proximity distance up to 1.5m
  - Smart persistence scheme to reduce PS response time
- Interrupt
  - Programmable interrupt function for ALS and PS with upper and lower thresholds
  - Adjustable persistence to prevent false triggers for ALS and PS

Benefits

- Filtron™ technology adoption for robust background light cancellation
- Supports low transmittance (dark) lens design
- Long life cycle as automotive qualified
- Lowest noise for ALS and proximity path
- High 16 bit proximity pesolution
- Distance range up to 1.5m
- Flexible design with external LEDs
- Low power consumption I2C (SMBus compatible) interface
- Compact size
- -40°C to +85°C temperature compensation

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Heating/Water Pumps, Compressors and Refrigeration





Heating/Water Pumps, Compressors and Refrigeration

Honeywell

Honeywell
THE POWER OF CONNECTED

Heavy Duty Pressure Transducers – PX3 Series

Honeywell's PX3 Series Pressure Transducers use piezoresistive sensing technology with ASIC (Application Specific Integrated Circuit) signal conditioning in a brass housing and Metri-Pack 150 electrical connector.



The Honeywell PX3 is a durable heavy duty pressure sensor for an economical choice for design implementation. The series offers multiple configuration possibilities and broad medis compatibility for reliable performance in tough environments to support overall system reliability and warranty.

With the capability freeze/thaw resistance, the device operates even with exposure to frost, commonly found in refrigeration systems.

Insulation resistance and dielectric strength ensures performance in high over-voltage situations.

Enhanced EMC rediated immunity allows for use in the presence of electro-magnetic fields, such as near wireless signals, RF communication and electrical devices.

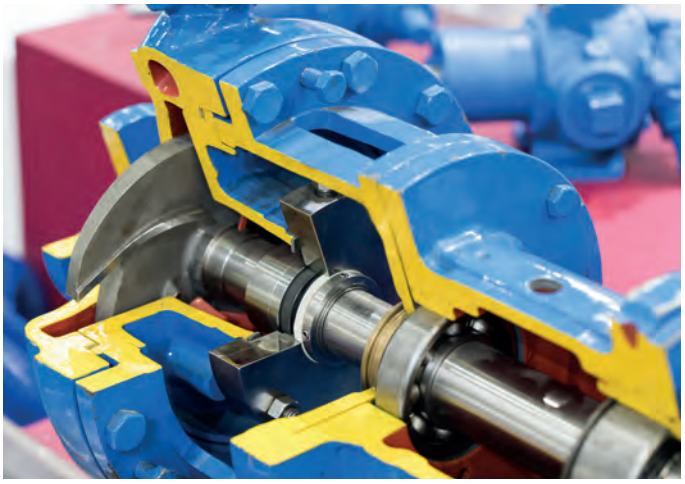
Low current consumption (3.5 mA max.) helps reduce energy costs and enhances product life if used in battery driven systems.

Features

- Pressure range: 1 bar to 46 bar
- Total error band: ±1.0%FSS from -20°C to 85°C
- External freeze/thaw resistance: 6 cycles from -30°C to 50°C
- Low current consumption: 3.5mA max
- EMC radiated immunity: 200V/m per ISO 11452-2
- Response time: <2MS
- RoHS, REACH and CE compliant

Applications

- Refrigerant pressure monitoring in HVAC/R Systems
- Air compressor system pressure
- Air system monitoring
- Hydraulic oil pressure monitoring





Heating/Water Pumps, Compressors and Refrigeration



Littelfuse

Tank Level Sensing MDSM-10

Reed switches and sensors are highly effective solutions for flow sensing applications that can be used for detecting the presence of fluid flow in a system or even measure the rate of fluid flow.



The MDSM-10 Reed Switch is a sub-miniature, surface mounting, normally open switch with a 10.16mm long x 1.80mm diameter (0.400" x 0.071") glass envelope, capable of switching 200Vdc at 10W. This reed switch is a surface mount version of the MDSR-10. It has high insulation resistance of 10^{12} ohms minimum and low contact resistance of less than 120milli-ohms.

Tankless water heaters are becoming a widely popular solution for water heating needs. The availability of hot water on demand and the perceived limitless supply of hot water make these types of water heaters much more attractive than traditional tank water heaters. These water heaters also provide long-term energy savings since energy is used only when there is a demand for hot water. In order to effectively heat the water when there is a demand, a sensor is needed to detect the flow of water.

Solution

Flow Switches

A flow switch is used to detect the presence of water flow and turns on the system to heat the water. Whenever there is a hot water demand, a reed sensor within the tankless water heater identifies the demand and initiates the heating process. This sensor monitors the presence of water flow while two other sensors measure the incoming and outgoing water temperature. This information is transmitted continually to a microprocessor controller which determines the precise amount of power to send to the heating elements to heat the water to the desired temperature.

Flow Sensors

A flow sensor performs the same function but provides the added benefit of measuring the rate of water flow. Flow sensors are also used in tankless water heaters. In Europe and other regions, pressure pump showers with flow sensor-based utility metering technology are widely used. The pressure pump creates pressure for the shower when water flow is sensed, which helps conserve water.

Many multi-unit apartment buildings are equipped with water submetering systems that employ flow sensors to measure water usage in individual apartments. Even in some individual homes, submetering systems with flow sensors are being installed to monitor water usage at various locations throughout the home. The lowering costs of wireless communication technology helps to make these systems more economically feasible.

Features

- No physical contact is required to operate the switch or sensor
- Wide operating temperature range adequate for use in cold and hot temperatures
- Electrical contacts are within a hermetically sealed capsule and are thus immune to moisture, dust and dirt
- Over-molded sensors provide additional protection against mechanical stresses
- Reliable switching for millions of open/close operations
- Low cost alternative to mechanical switches



Heating/Water Pumps, Compressors and Refrigeration

Sensata

Sensata Technologies

116CP Water Pressure Sensor



Utilising Sensata's industry leading ceramic capacitive technology, the 116CP is housed in a small and innovative plastic package ideal for boilers, pumps and other light industrial applications.

Central heating boiler applications

Central heating boilers are a very common way of heating the house or the office. In a case where a combi boiler is used, the domestic hot water is created in the same boiler. For example, wall hung boilers are an energy and space efficient way of heating rooms. Heat transfer is done by means of a hydronic liquid system that transfers heat to the radiator panels in separate rooms. One important variable in the hydronic system is the liquid (usual water or water with glycol) pressure. If the pressure is too low, there is a risk of damage or leakage to the hydronic system. If the pressure is too high, there is a risk of damaging the heat exchanger inside the boiler. An unreliable system will lead to higher costs (efficiency loss and maintenance/repair), poor customer satisfaction and poor brand recognition in a competitive market.

Solution

Sensata now offers a cost-efficient pressure sensor (116CP/117CP) family, which is developed according to 'automotive' standards to measure the pressure in the hydronics loop of the central heating boiler. The sensor design is patented according to US9857260B2 2018-01-02. The pressure sensor converts the pressure signal into an electronic (voltage) value which can be acquired by the control unit of the boiler. The sensor measurement pressure value is usually presented on a display or thermostat in the living room (typically wireless). With developing trends, customers and installers are able to be notified of the actual pressure reading by means of an application on a tablet or mobile device with a push notification. This push message notifies the end user to check the boiler application and refill if needed. This will prevent unexpected failures in the heating of the house or office.

The 116CP is offered in a wide range of configurations including various pressure ports, electrical outs and pressure ranges from 0-3 to 0-16 bar.

Features

- Multiple port and connector options
- High accuracy +/-1.5%FS
- Small and compact size
- 100% automated calibration
- REACH/RoHS compliant

Applications

- Boilers
- Heat pumps
- Residential booster pumps
- Lawn and pool pumps
- Circulator pumps
- Pump controllers
- Food and beverage equipment



Heating/Water Pumps, Compressors and Refrigeration



TDK

NTC Thermistor Probes for Boilers and Water Tanks

TDK offers sensors over-molded with plastic or encapsulated with specific materials for reliable use in adverse environments for a large range of temperatures. They can be delivered in numerous shapes and with a wide variety of cable and connector geometries.

T120 Series

Temperature measurement of fluids in pipes



Pipe mounted sensor for temperature measurement of fluids in pipes of heating appliances:

Features & Benefits
- Metal clip for fast and easy mounting/replacement
- Short response time
- For pipe diameters from 13.5 to 22 mm
- Temperature compensation

K301 Series

Ideally suitable for corrosive environments



Connector-bound immersion probe for temperature measurement in fluids, e.g. boilers

Features & Benefits
- Compact design
- NTC thermistor potted in a nickel plated brass housing
- Fast and easy mounting
- Screw-in sensor

Z81 Series

Temperature measurement in heating or used water



Ideally suited for heating systems or water boilers

Features & Benefits
- Short response time
- Sealing with O-ring

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Renewable Energy



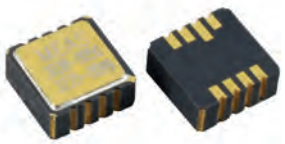
Renewable Energy



TE Connectivity

AUTHORIZED DISTRIBUTOR

Vibration Sensors – Featuring Accelerometer Model 3038



Designed for application durability in extreme temperature, vibration and shock environments, TE Connectivity's (TE) Model 3038 accelerometer delivers the performance you need for wind turbine applications.

The Model 3038 helps improve sensing confidence and allows for simple installation with a hermetically sealed SMD design. It incorporates a gas damped piezo-resistive MEMS sensing element providing outstanding long-term stability. With a millivolt output signal and mechanical overload stops that provide shock protection to loads greater than 10,000g, this sensor offers excellent value for performance.

Features

- Deliver reliable performance at higher altitudes and demanding temperature ranges from -55° to 125°C
- Provide extended battery life with low power consumption and 4,000 ohm bridge resistance
- Survive up to 10,000g shock loads while providing precision measurements up to ±1.0% with a piezoresistive MEMS sensor with mechanical over-range stops
- Offers excellent value for performance with availability of ranges from 50g to 6,000g

Benefits

- ±50g to ±6,000g Dynamic ranges
- Board mountable Accelerometer
- Low power consumption
- Hermetic LCC package
- DC response, gas damping
- 5,000Hz Bandwidth

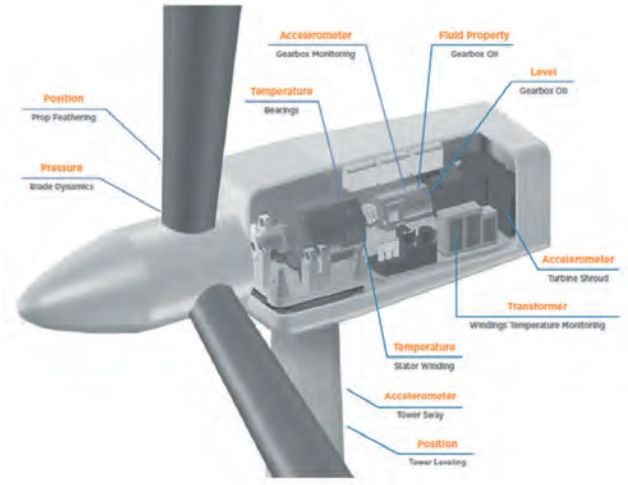
Applications

- Harsh environments
- Vibration and shock monitoring
- Impact testing
- Safe and arming
- Munitions testing
- Automotive safety testing
- Drop testing
- Bio-mechanics testing
- Pile driving
- Embedded applications
- Instrumentation
- Machinery

Specifications	
Product type features	• Accelerometer type – MEMS DC • Sensor type – DC Response Embedded accelerometers
Electrical characteristics	• Full Scale Output Voltage (VDC) – ±.1 • Excitation Voltage (VDC) – 2 – 10 • Zero Acceleration Output (mV) – ±25
Signal characteristics	• Frequency Response (Hz) – 0-100 to 0-5000
Body features	• Number of Axes – 1 • Material – Ceramic • Weight (g) – .6
Mechanical attachment	• Mounting Type – Solder
Usage conditions	• Operating Temperature Range – -55 – 125°C [-67 – 257°F]
Other	• Acceleration Range (±) (g) – 50, 100, 200, 500, 2000, 6000 • Overall Acceleration Range (±) (g) – 50 – 6000 • Sensitivity (mV/g) – .1, .16, .4, .8, 1, 2 • Sensitivity Range (mV/g) – .1 – 2 • Nonlinearity (%FSO) – ±1

Wind turbine application solutions

TE Connectivity is a global designer and manufacturer of sensors and sensor-based systems, providing support to wind engineers in both the development and operation of wind turbines. Offering a broad range of sensing technologies to manufacturers, system integrators, wind farm operators, R&D labs and universities. They include vibration sensors for gear box monitoring, oil level sensors, tilt sensors for tower installation and accelerometers for tower sway and blade monitoring. There is significant interest in our miniature pressure sensors for blade monitoring and our LVDTs for facilitating emergency prop feathering and shutdown. Our vibration sensors, speed sensors and temperature sensors provide a variety of real-time and precise inspection data with their superior performance and reliability, enabling engineers to perform efficient equipment monitoring and maintenance and maximise the use of wind turbines.



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Robotics/Cobots/ Factory Automation



Robotics/Cobots/Factory Automation



ALPS

HSFPAR Series

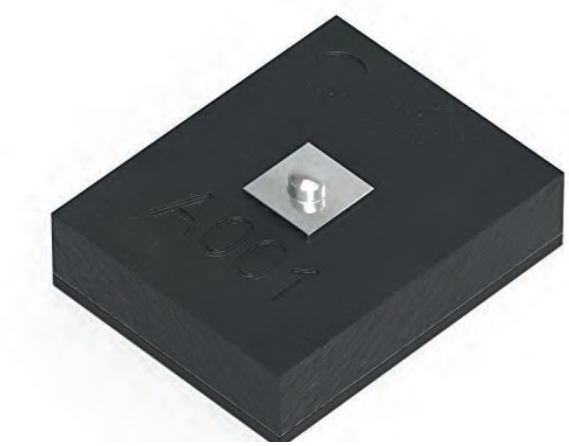


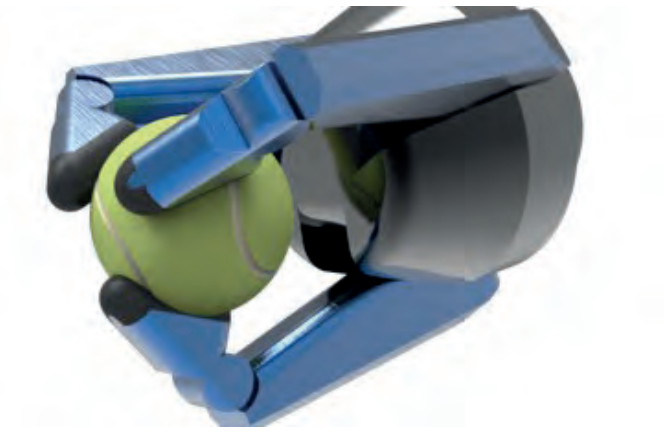
ALPS has developed the “HSFPAR Series” force sensor, for sensing force in input devices and posture control in industrial equipment and robots, using MEMS technology to achieve the industry’s smallest size.

The robotics markets has driven up demand for compact, sensitive force sensors for applications like load detection on touch or contact, and load balance and grip strength control is expected to rise. Force sensors today are generally either semiconductor or metallic strain gauge types, and both have their issues, the first being too big and the other sacrificing sensitivity for scale.

The HSFPAR series has a small footprint and a low profile and can detect stress as low as 0.01N, enabling sensing of, for example, minor variations in pen pressure and load shift in robots. The device senses force using the effect of piezo resistive bridge circuit formed on a silicon diaphragm, the piezo resistance is changed according to the strain by applying a force to the diaphragm. This yields high sensitivity and a good linearity, and the device can precisely detect micro forces less than 0.01 N. The HSFPAR series has high durability with no characteristics changing after 1 million cycles. It is also available as a unit type with a FPC (flexible printed circuit) included for easy integration into end products.

Specifications		
Model	HSFPAR Series	
	SMD type	Shock resistant unit type
Dimensions (WxDxH)	2.00mm x 1.60mm x 0.66mm	4.00mm x 2.70mm x 2.06mm
Measurement range	8N	7N
Sensitivity	3.7mV/V/N	3.7mV/V/N
Linearity	<3%FS	<3%FS
Operating life	1 million cycles (at 8N)	1 million cycles (at 8N)
Supply voltage	1.5 - 3.6V	1.5 – 3.6V
Impact resistance	50N	200N







Robotics/Cobots/Factory Automation

Omron

OMRON

HVC-P2



Omron's face recognition HVC module handles all the complexity of seeing and recognising faces, bodies and gestures, allowing a developer of robots and factory automation systems to read the data output and programme a response without the need to understand the algorithms or optical design.

Based on the Omron OKAO Vision software, a proven set of image recognition algorithms used in over 500 million digital cameras, mobile phones and surveillance robots around the world, HVC includes a camera and a processor, and a USB or UART interface to control the module and read data.

Features

- Camera module angle of view
  - 2 models (50 deg. and 90 deg.) available
- Multiple functions (10 functions)
  - Body detection
  - Face detection
  - Hand detection
  - Face direction estimation
  - Gaze estimation
  - Blink estimation
  - Age estimation
  - Gender estimation
  - Expression estimation
  - Face recognition
- User friendly
  - Easy implementation through UART or USB

Specifications	
Horizontal detection area (angle of view)	• 50 deg: 54°±3°; 90 deg: 94°±5°
Vertical detection area (angle of view)	• 50 deg: 41°±3°, 90 deg: 76°±5°
Detection distance (differs per function)	• 3.2-16.7m (HVC-P2 50 deg), 1.6-8.6m (HVC-P2 90 deg)
Dimensions (WxLxH)	• 45 x 45 x 8.2mm (main board for both types), • 25 x 25 x 8.7mm (camera board 50deg type), • 25 x 25 x 15.7mm (camera board 90deg type)

Function	Results
Face detection Body detection Hand detection	• Result count (max:35) Center coordinates (X and Y) Detection size (pixel) • Degree of confidence
Face direction estimation	• Yaw degree • Pitch degree • Roll degree • Degree of confidence
Gaze estimation	• Yaw degree • Pitch degree
Blink estimation	• Blink degree (left-side eye/right-side eye)
Age estimation	• Age • Degree of confidence
Gender estimation	• Gender • Degree of confidence
Expression estimation	• 5 expressions: "neutral", "happiness", "surprise", "anger", "sadness" and their respective score, • Expression degree (positive/negative)
Face recognition	• Individual recognition result • Score
Image output	• Choose one: none, 160×120pixels, 320×240pixels • Image format: 8-bit Y data

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Material Handling Vehicles





Material Handling Vehicles

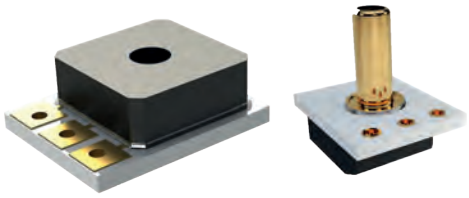
Bourns

Bourns® Precision Sensors (BPS) are designed for demanding applications in the Industrial, Transportation, Medical Device* (low/medium risk) and Consumer markets. Quality, performance and reliability are the core values of this product family of environmental sensors.

Bourns® Pressure Sensors are based on innovative MEMS technology which provides extremely accurate measurements in a miniature package size.

Bourns® Model BPS130 Harsh Environment Pressure Sensor

The Bourns® Model BPS130 pressure sensor is a fully calibrated, compensated and amplified output silicon pressure sensor.



It is designed for liquid and gas harsh media compatibility over a broad temperature range from -40°C to +150°C with a total error band of less than 2.5%.

The unique media compatibility and temperature range, compared to other silicon-based pressure sensors on the market, allows utilisation in transportation applications** such as:

Benefits

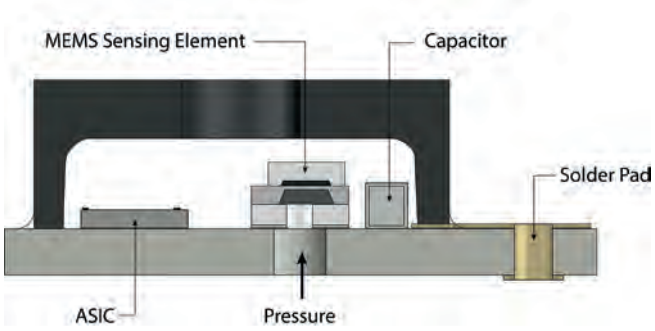
- Transmission fluid pressure
- Fuel, oil, cooling system pressure
- EGR and DPF system pressure
- Manifold absolute pressure
- Fuel rail system pressure

Features

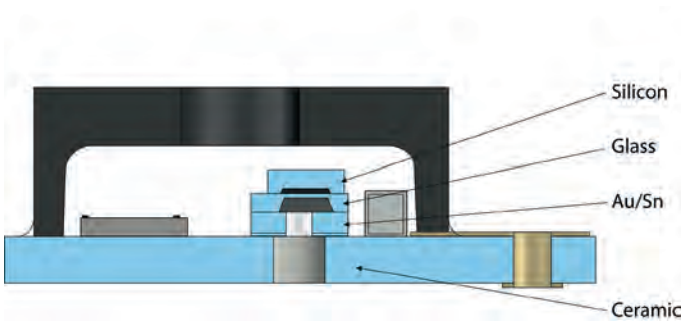
- Operating temperature range -40°C to +150°C
- Pressure range: 15 PSI to 500 PSI
- Gauge and absolute calibration
- Amplified analog output
- Wetted materials: ceramic, glass, silicon, Au/Sn (face seal option)

As with other sensors and controls products, our BPS models can be modified to fit the customer's specific application. Ask our FAEs for additional information regarding customization.

Components



"Wetted" Materials*



* Bourns® products have not been designed for and are not intended for use in "lifesaving," "life-critical" or "life-sustaining" applications nor any other applications where failure or malfunction of the Bourns® product may result in personal injury or death. See Legal Disclaimer Notice http://www.bourns.com/docs/legal/disclaimer.pdf.

**Custom engineered solutions. Check with factory for details.

Material Handling Vehicles



Murata

SCA3300 Accelerometers

3-axis Accelerometer with digital SPI interface. Industry proven technology with significantly improved performance



Murata's 3-axis accelerometers MEMS sensors offer ideal solutions for weighing angle compensation for material handling vehicles. Weighing apparatus can give inaccurate readings due to the angle between the earth's gravitational vector and the measurement device, this error can be caused by movement of the device or positioning on an uneven surface. To achieve an accurate reading this angle needs to be balanced or compensated for.

Features

- Size 7.6 x 8.6 x 3.3 mm3 (w x l x h)
- 3-axis high performance accelerometer with ±1.5 to ±6g user selectable measurement range
- Extensive self-diagnostics features
- Ground breaking bias stability, low noise level and good vibration robustness
- SPI digital interface
- Unique mechanical over damping
- -40°C…+125°C operating range
- 3.0V…3.6V supply voltage with 1mA current consumption
- Proven capacitive 3D-MEMS technology

MEMS accelerometers and inclinometers have excellent stability, resolution and linearity to measure smallest possible angles and can be used to get accurate angle reading and a dynamic environment gyroscope can be used to achieve reliable measurement readings while the vehicle or machine is moving.

Benefits

- Excellent bias stability, low noise level and linearity
- Robust MEMS designs and high performance in harsh environment
- Good performance under mechanical vibrations
- Good mechanical shock endurance

Applications

- SCA3300-D01 is targeted at applications demanding high stability with tough environmental requirements
- Professional leveling
- Angle measurement and control
- Tilt compensation
- Inertial measurement units (IMUs) for heavy machine and automotive (ADAS)
- Motion analysis and control
- Navigation system

Series Lineup

Part number	Axis	Maximum Range	Amplitude Response	Offset Temp. Characteristic	Operating Temp.	Output Type
SCA3300-D01	3	±1.5g ±3g ±gg	10/88Hz	±15mg	-40–125°C	Digital/ SPI





Material Handling Vehicles

Sensata/BEI Sensors

Sensata Technologies

SIL3/PLe Functional Safety incremental encoders

Material handling equipments need encoders for a highly accurate control of speed and direction; in some cases like autonomous vehicles these components need to comply with the highest safety standard levels.



BEI Sensors specialises in speed and position sensors for extreme applications. With an extensive product offering including optical and magnetic encoders, Hall effect sensors, and potentiometers, Sensata offers standard configurations to completely customised solutions. Through uncompromising quality, performance and reliability, Sensata upholds a standard of excellence in its products, customer service experience and commitment to being a global leader in sensor technology.

The new range of incremental encoders: up to SIL3/PLe Cat. 4

In response to customer demand for functional safety, Sensata/BEI Sensors, a leading manufacturer of encoders and position sensors, has developed a range of functional safety encoders to suit a wide variety of industrial applications. This new range of encoders can be used in safety applications involving speed control with or without rotation detection as well as position counting applications. The associated drive safety functions are: SLS, SSM, SLA, SAR, SDI, SS1/SS2, SOS, SLP, SEL, SLI, SCA.

Standards

IEC/EN 61508 (2010)
This standard, specific to control systems, incorporates safety regulations, technical specifications and the training of personnel, taking into account the life cycle applied to safety. It has replaced standard EN 954 since November 2009.

IEC/EN 62061 (2013)
This standard derived from standard EN 61508 is applied to machinery. It defines requirements and gives recommendations for the design, integration and validation of safety-related electrical, electronic and electronically programmable control systems for machinery.

EN ISO 13849-1 (2009)
This standard covers the electrical safety of control systems (hydraulic, pneumatic, mechanical).
Standard EN 62061 supplements standard EN ISO 13849-1.

Specifications

Model		Characteristics	Shaft type	Shaft diameter	Resolution	Max. speed	Termination
DSM5H		58mm Aluminium IP65	Shafted	6, 10mm and 3/8”	250, 256, 360, 500, 512, 1000, 1024, 2048, 2500	6000 RPM	Cable or M23 Connector Axial or Radial
DSM5X		58mm Stainless steel IP69K	Shafted	10mm	250, 256, 360, 500, 512, 1000, 1024, 2048, 2500	3000 RPM	Cable Axial
DSO5H		58mm Aluminium IP65	Through shaft	14mm	250, 256, 360, 500, 512, 1000, 1024, 2048, 2500	4000 RPM	Cable or M23 Connector Radial
DSM9H		90mm Aluminium IP65	Shafted	11, 12mm	1024, 2048	6000 RPM	Cable or M23 Connector Axial or Radial
DSM9X		90mm Stainless steel IP66	Shafted	11, 12mm	1024, 2048	6000 RPM	Cable or M23 Connector Axial or Radial
DSU9H		90mm Aluminium IP65	Through shaft	20, 25, 30mm and 1”	1024, 2048	3000 RPM	Cable or M23 Connector Radial
DSU9X		90mm Stainless steel IP66	Through shaft	20, 25, 30mm and 1”	1024, 2048	1500 RPM	Cable or M23 Connector Radial

Shafted Through shaft

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EV/HEV Battery Management/ Automotive Applications





EV/HEV Battery Management/ Automotive Applications

Amphenol Advanced Sensors

Amphenol
Advanced Sensors

Thermometrics EV/HEV Coolant System Temperature Sensors

Coolant temperature sensors monitor the temperature of the coolant that is used to cool the battery module of EV/PHEVs. In turn, the coolant temperature information is relayed to the battery management system (BMS). The vehicle system will use this information to control the battery charging and cooling to prevent damage to the battery. Various sensor designs are available including inline, clip-on and screw in.

Thermometrics GE Series Inline Flow-Through Fluid Temperature Sensor



The Thermometrics GE series Inline Flow-Through Temperature Sensors monitors the temperature of a fluid that passes through it. A system control module receives this temperature reading and uses a control loop to control the overall system temperature. These versatile sensors are ideal for EV/HEV battery coolant systems and similar applications where flexible hoses are used.

Thermometrics JS8741 Integrated Pipe Clip Surface Temperature Sensor



The Thermometrics JS8741 Integrated Pipe Clip Surface Temperature Sensor is a clip-on temperature sensor that monitors the temperature of a fluid or gas that passes through a pipe or tubing circulation system. A system control module receives this temperature reading and uses a control loop to control the overall system temperature. These versatile sensors are ideal for EV/HEV battery coolant systems and similar applications where metal pipework is used.

Thermometrics WTF Series Coolant Temperature Sensor



Thermometrics Coolant Temperature Sensor (CTS) monitors the temperature of the coolant that is being pumped around the battery to cool the battery module of EV/PHEVs. If the battery module starts to overheat, the Coolant Temperature Sensor relays a signal to the Battery Management System (BMS). The BMS uses this information to prevent battery packs from any damage and maximise the performance.

EV/HEV Battery Management/ Automotive Applications



Amphenol Advanced Sensors

Amphenol
Advanced Sensors

Bus-Bar Integrated Temperature Sensor



The Bus-bar Integrated Temperature Sensor is used in Battery (BEV), Plug-in Hybrid (PHEV) and Hybrid (HEV) Electric Vehicles power battery packs to monitor the temperature of the battery cell.

The Battery Management System (BMS) uses the sensor's output to monitor and control the battery's State of Function (SOF), which is critical to the battery pack's thermal management and State of Health (SOH).

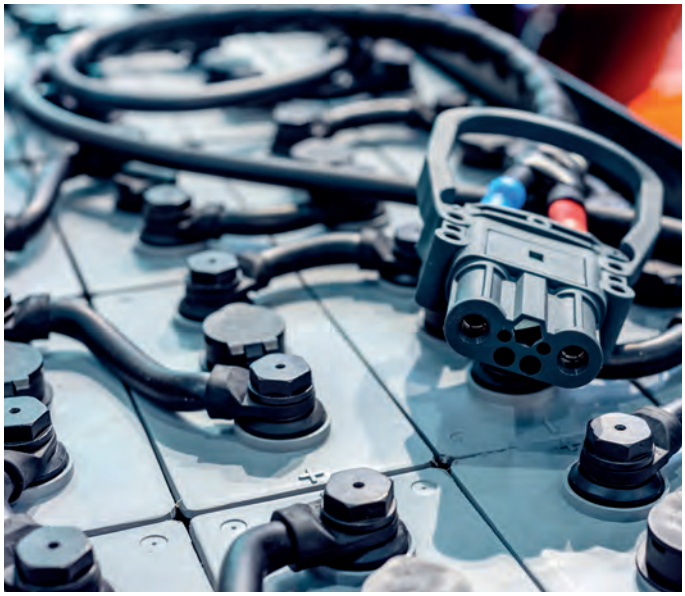
Applications

- BEV/PHEV/HEV – Power battery packs of passenger and commercial vehicles
- Energy storage battery packs

Features

- Operating temperature range: -40°C ~ 125°C
- Resistance (R) at 25°C: 10KΩ±1.46% of R
- Beta (25/85): 3977K±1.0%
- Field proven bus-bar integrated design – no welding process, more reliable connection to the bus-bar
- Designed for compact space applications
- Designed for press-fit and laser welding electrical connection to BMS, for the voltage sensor
- Fast response time: T63 < 5.5 seconds (25°C~85°C in water)
- Compliance with RoHS, VW91101, GB/T30512
- Alternate RvT curves available upon request







EV/HEV Battery Management/ Automotive Applications

TDK

NTC Thermistor Probes for EV/HEV Battery Management

All kinds of our sensors are over-molded with plastic or encapsulated in specific materials for reliable use in adverse environments for a large range of temperatures.

High-temperature surface mounted sensors with high accuracy
K560 and K1560 Series



Typical applications for the K560/ K1560 series of temperature sensors are household appliances such as cookers. The glass-encapsulated NTC thermistor is potted into an aluminium (K560) or ceramic (K1560) case for high temperature resistance up to 250°C. The leaded sensors are designed for fast temperature measurement especially for fast thermal reactions in the air stream. The fast thermal response in air stream of the K560 is approx. 15 s and of the K1560 approx. 20s. The flange housing enables good thermal coupling to hot surfaces. The housing of the K1560 sensors does not impair the transfer of electromagnetic energy in induction cookers.

Medium resistant sensor with high accuracy
K504 Series



Cable-bound sensors for fast temperature measurement in water boilers
- NTC thermistor potted into a medium-resistant stainless steel case
- Short thermal response time
- Temperature range: -20°C to +150°C

High temperature immersion sensors
K514 / K524 Series



The K514/ K524 series has a metal case with cable outlet and is designed to measure the temperature of hot flowing air and can be integrated in steam generators.

The K514/ K524 has a stainless steel case. The heat-resistance of the leads of the K514/ K524 series reaches up to 200°C. The temperature range of the K514 is from -10 to +200°C and of the K524 from -10 to +300°C at the sensor head.

The customisable design of the K514/ K524 series ensures fast and easy installation.

The K514/ K524 series is developed for the installation in clothes dryers, in order to determine the temperature of the hot air flowing into the drum. A temperature sensor can be integrated in the steam generator to optimise anti-wrinkling treatment of laundry.

High temperature resistant screw-on case sensor with cable outlet
M703 and M1703 Series



Temperature sensors ideally suited for industrial and small appliances with fast and simple screw-on installation
- NTC thermistor encapsulated in metal tag case (M703) or brass metal tag case (M1703)
- Good thermal coupling through metal tag / brass metal tag
- Temperature range: M703: -55°C to +125°C; M1703: -10°C to +200°C, upto 300°C at the sensor head

EV/HEV Battery Management/ Automotive Applications



TDK

Screw-in case sensor with cable outlet
K45 Series



Temperature sensors ideally suited for small appliances with fast and simple screw-in installation
- NTC thermistor potted into a screw-in aluminium case
- Good thermal coupling through screw-in case (M3 thread)

Minisensors with Bendable Wires
S861, S863, S864, S867, S869 Series



Applications:
- Automotive motor management
- Automotive outside-temperature sensor
- Heating systems
- General temperature measurement in industrial and household electronic

Leaded NTC Thermistors
S871, S875, S881, S891, K164, M891 Series



Applications:
- Automotive motor management
- Temperature measurement in industrial and household electronics
- Heating applications
- Temperature compensation

NTC Chip Thermistors - Rated Temperature up to 150°C
S860 Series



Applications:
- Embedded power semiconductor modules used in the power train
- Wafer-based NTC chip thermistor
- For precise and accurate temperature monitoring
- For high temperatures up to 150°C, higher on request
- Tight tolerance near the junction temperature of 100°C

NTC Element for Measuring Temperatures up to 650°C
H650 Series



Applications:
- Regulation of exhaust gas recirculation
- The control of printer chambers in 3D printers or household appliances like catalytical cleaning
- Very high operating temperature of up to 650°C
- Cost attractive solution (glass encapsulated construction)
- High resolution and very robust construction
- Excellent aging behaviour
- AEC-Q200 qualified

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Medical



Medical



Honeywell

Honeywell
THE POWER OF CONNECTED

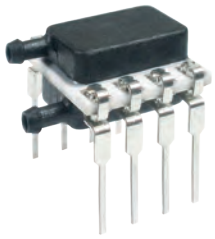
Honeywell's sensors, switches, scan engines and barcode decoding software are designed to provide enhanced accuracy, stability and reliability for the most stringent medical requirements while being easy to design-in.

- Accuracy is often critically important at a zero and low flow conditions
- Stability is often essential to minimise long term drift, reduce the need for recalibration and improve ease of use for medical equipment operators
- Reliability enhances patient safety in life-critical applications, reduces downtime and improves test throughput in applications such as clinical diagnostics
- Ease of use and easy to design-in are important to design engineers, so Honeywell's customisation and built-in calibration/amplification capabilities are strong benefits.

Whether it's ventilation solutions, diagnostics and dialysis equipment, portable infusion pumps, or even anaesthesia and apnea monitors, an innovative solution from Honeywell SIoT can provide longer product life and greater accuracy.

Trustability RSC Digit Pressure Sensor

Industry-leading accuracy and long-term stability, enhancing equipment performance and reliability, whilst reducing equipment downtime and service costs.







Accuracies of 0.25% FS are attainable over a -40°C to 85°C temperature range. It utilises a 24-bit ADC and provides an digital output at a programmable rate of between 20 and 2000 readings per second.

Features

- 24 bit ADC-40 to 85°C compensated temperature range160Pa to 10bar pressure ranges
- Accuracy 0.75% (0.25% with autozero)
- High sensitivity with high burst and over pressure
- IPC/JEDEC J-STD-020D.1 Moisture Sensitivity Level 1Configurable pressure range, supply voltage, package and number of ports
- REACH and RoHS compliant
- Power consumption: less than 10mW, typ.
- Size: miniature 10mm x 12.5mm
- 20 and 2000 samples per second over an SPI interface
- Industry-leading long-term stability
- High burst pressures (1 bar for 160Pa sensor)

Applications

- Airflow monitors
- Anesthesia machines
- Blood analysis machines
- Gas chromatography
- Gas analysers
- Hospital room air pressure
- Kidney dialysis machines
- Nebulisers
- Pneumatic controls
- Respiratory machines
- Sleep apnea equipment
- Spirometers
- Ventilators
- Flow calibrators
- HVAC clogged filter detection
- VAV (Variable Air Volume) control



Medical

Murata

Contactless Bed Sensor – SCA10H/11H

This integrated solution opens new possibilities in patient monitoring and elderly care in hospitals, assisted living and domestic homes.



The system offers a solution from simple bed monitoring to more complex embedded heart and respiration rate and beat-to-beat time signal processing for patient condition analysis.

The new bed sensor technology is based on the Ballistocardiographic (BCG) principle. When the heart pumps blood there is a recoil effect in the opposite direction. When a patient is lying on a bed, the entire bed will be subject to micro movements due to the blood flow; we use an ultra-sensitive Murata accelerometer to capture this signal and a microcontroller processes algorithms to extract heart rate and other vital signs from the signal.

The BCG module/node outputs can monitor:
- Heart rate bpm (once per second)
- Respiration rate (once per minute)
- Heart rate variability (correlates to stress level)
- Relative stroke volume (how much blood the heart pumps – A.U)
- Bed status indicator (is the bed empty, is patient in bed, is patient moving in bed)
- Other information such as a data log of timestamp and the signal strength – A.U

The BCG technology is available in 2 different formats/products:
- SCA11H node: A complete BCG-based sensing component that comprises of the sensor, microcontroller and a Wi-Fi transceiver, providing a software solution for service providers and OEM system integrators.
- SCA10H module: Solder able PCB module component comprising the sensor and microcontroller

Ideal for equipment manufacturers.

The devices offer WiFi connectivity with cloud interface support software for ease of integration, along with 'sleep analysis algorithms' developed for use with SCA10/11H data.

FTN Series NTC Thermistors

This low profile flexible film temperature sensor is highly responsive to skin temperature sensing and burning of calories.



This range of surface-mounted NTC temperature sensors is packaged on a flexible printed circuit (FPC) film and measures 50.00x3.17x0.55mm in size. With an FPC thickness of approximately 100µm, they can be easily routed inside complex designs and tight spaces. Owing to its low heat capacity, the sensor's thermal responsiveness is excellent. The FTN series is stronger for mechanical stress due to resin mould and hence offers good endurance.

The film temperature sensor has been granted four patents, including one basic patent and three peripheral patents.

Features
- Low profile
- Easy to adhere to the product design – flip chip mounting or wire bonding technology available
- Excellent quick response time
- Customisable length
- ROHS compliant

Applications
- Medical and patient (home care) monitoring
- Smart glucose monitoring
- Smart insulin pumps
- Smart wound care
- Smart pills
- Controlling skin infections
- Implantable hearing aids

Medical



TE Connectivity

AUTHORIZED DISTRIBUTOR

PT1000 Temperature Sensors







TE Connectivity's (TE) platinum temperature sensors enable precision in extreme temperature environments. Because accurate monitoring, diagnosis and treatment counts, today's medical devices rely on our high-performance sensor technologies to meet exacting specifications, including ISO 13485 certification and FDA registration. We are a leading provider of sensor solutions to the medical device market. Our sensors meet the rigorous demands of a wide range of medical and healthcare applications.

Designed for precise, stable measurement for harsh appliance, industrial and medical applications, these sensors offer a greater value through proven design, ease-of-use and reliable performance. The nearly linear output characteristics minimise correction and intervention, enabling improved engineering efficiency. With one of the largest, most advanced temperature sensor portfolios in the industry, TE is a global leader in sensor innovation with over 20 years of experience.

Key Benefits

- Deliver precision in extreme temperature environments from -200 to +600°C
- Help enable greater engineering efficiency with nearly linear output
- Enable design flexibility with multiple form factors (typ. 1.2mm x 1.6mm to 2.9mm x 10.0mm)
- Design to meet international industrial standards (IEC 60751:2008)
- Provide comprehensive sensor solutions with 20 years of temperature sensor innovation

Applications

- Test and measurement lab equipment
- Dialysis
- Cryogenics

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Wearables



Wearables



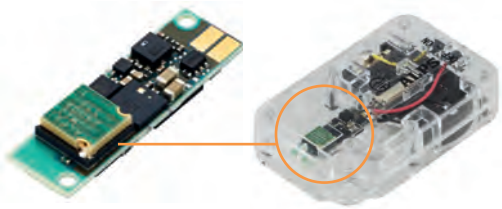
ALPS

ALPS Sensor Network Module



Low power consumption with Bluetooth® SMART.
MCU utilised to realise efficient power management.
Tiny package realised using original mounting technology.
Multiple sensors in a tiny package: Pressure Sensor, Humidity/Temp Sensor, UV/Light Sensor, 6 DOF Sensor (Accel and Geomag).

This module measures geomagnetic and acceleration (6 axis), temperature, humidity, air pressure and ambient light and sends the information using integrated Bluetooth® SMART technology, all in a single package. The PCBqs board is small enough to embed in a watch or pair of glasses. This means it ideal for wearable market with the ability to sense all conditions in the surrounding environment easy.



Substrate size
18.5mm x 5.6mm x 3.4mm

Sensor	Series	Product	Features	Specification	Application
Waterproof Pressure Sensor	HSPPAD143A (with new ASIC and new sensor die)		• Waterproof pressure sensor • SMD type • 17 bit digital output • Supply voltage 1.7 to 3.6V • 300 to 2100 hPa (+9000m in altitude and 10m in depth)	• Size – 3,1 x 3,1 x 2,60mm • Current consumption – 1.8uA at low power setting • RMS noise – 2.6Pa (0.22m) at high resolution setting • Pressure range – 300 ~2100hPa • Pressure resolution – 2Pa/LSB • Accuracy – +/- 2hPa	• Watch • Lifelog • Weather forecast • Water depth meter
Geomagnetic Sensor	HSCDTD008A		• Smallest LGA package. • Low noise (σ=0.3μT) • Low current consumption (60μA at 10Hz)	• Dynamic range – +/-2.4mT • Resolution – 0.15 μT/LSB • Current consumption – 2.5mA 60μA(ODRat10Hz) • Supply voltage – AVDD=1.7-3.6V DVDD=1.65-AVDD • Interface – I2C(SS/FS/FS+/HS)	• E-Compass • Motion sensing

Geomagnetic Sensors – Specification

Product	Supply voltage	Operating temperature	I/F	Measurement range	Resolution	Peak current	Average current(1Hz)	Standby current	TCO	Package size	RMS noise	FIFO
HSCDTD008A Current	1.8~3.6V	-40~85°C	I2C	±2.4mT	0.15μT/lsb	Max peak 3.0mA	Max 15μA	10μA(typ)	Max 0.15 μT/°C	1.6x0.8t	0.3μT	16



Wearables

TE Connectivity

AUTHORIZED DISTRIBUTOR

TE Connectivity have a wide range of sensors for a host of wearable applications

Altimeter Watches
- Humidity sensors monitor local relative humidity
- Pressure sensors monitor altitude
- Temperature sensors measure local air temperature

Multi-Mode Watches
- Pressure sensors monitor altitude changes
- Temperature sensors measure local air temperature or skin temperature
- Humidity sensors monitor local relative humidity or skin moisture (sweat)
- Photo optic sensors measure heart rate and SpO2 level

Diving Watches/Computer
- Pressure sensors monitor altitude
- Pressure sensors monitor dive depth
- Temperature sensors measure water temperature

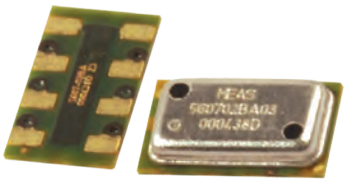
Martial Arts Vests
- Piezo cable determines impact location and intensity

Fitness Bands
- Pressure sensors monitor altitude changes
- Temperature sensors measure local air temperature or skin temperature
- Humidity sensors monitor local relative humidity or skin moisture (sweat)
- Piezo film sensors monitor user motion and general activity level

- **Ski Goggles**
- Pressure sensors monitor altitude changes for heads-up display data
- Humidity and temperature sensors help control goggle defogging fan

Altimeter Sensor – Digital Barometric Pressure Sensor MS5607-02BA03

Barometric Pressure Sensor, with stainless steel cap



The MS5607-02BA is a new generation of high resolution altimeter sensors from MEAS Switzerland with SPI and I2C bus interface. This barometric pressure sensor is optimised for altimeters and variometers with an altitude resolution of 20cm. The sensor module includes a high linearity pressure sensor and an ultra low power 24 bit ΔΣ ADC with internal factory calibrated coefficients. It provides a precise digital 24 bit pressure and temperature value and different operation modes that allow the user to optimise for conversion speed and current consumption. A high resolution temperature output allows the implementation of an altimeter/thermometer function without any additional sensor. The MS5607-02BA can be interfaced to virtually any microcontroller. The communication protocol is simple, without the need of programming internal registers in the device. Small dimensions of only 5.0mm x 3.0mm and a height of only 1.0mm allow for integration in mobile devices. This new sensor module generation is based on leading MEMS technology and latest benefits from MEAS Switzerland proven experience and knowhow in high volume manufacturing of altimeter modules, which have been widely used for over a decade. The sensing principle employed leads to very low hysteresis and high stability of both pressure and temperature signal.

Specifications
- High resolution module, 20cm
- Fast conversion down to 1ms
- Low power, 1µA (standby < 0.15µA)
- QFN package 5.0 x 3.0 x 1.0mm3
- Supply voltage 1.8 to 3.6V
- Integrated digital pressure sensor (24 bit ΔΣ ADC)
- Operating range: 10 to 1200mbar, -40 to +85°C
- I2C and SPI interface up to 20MHz
- No external components (internal oscillator)
- Excellent long term stability

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Drones/Aviation/Ground Vehicles





Drones/Aviation/Ground Vehicles

ALPS

HSPPAD042A

ALPS HSPPAD042A barometric piezo resistive type Pressure Sensor, is used in drones to detect the drone's flight height from the ground.



The pressure sensor has a relative accuracy of +/-0.05hPa and temperature compensation, this contributes to achieve an accurate detection of flight height.

The HSPPAD042A Sensor also features low current consumption and low noise making it ideal for this application.

HSCDTD008A

ALPS Geomagnetic Sensor HSCDTD008A is used as e-compass and motion sensing in drones.



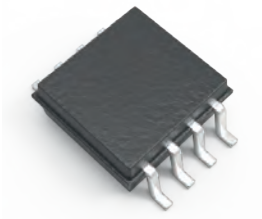
The small, 3 axis, terrestrial magnetic sensor has the following key features:

- Resolution: 0.15uT/lsb
- Output noise: 0.3µT
- Current consumption: 2.5mA
- Temperature range: -40°C to +85°C

As further option this sensor is available with accelerometer in one package (HSCDHD005A).

HGARAP001A

ALPS Magnetic Sensor HGARAP001A offer a good solution for angle detection, for example the camera position attached to the drone.



The sensor with its analog output allow position detection and high accuracy absolute angle detection.

Specifications

Parameter	Symbol	Values		
		Minimum	Type	Maximum
Operating temperature	Top	-40°C	-	105°C
Magnetic field strength	Hext*	20mT	-	60mT
		16kA/m	-	40kA/m

Drones/Aviation/Ground Vehicles



Vishay

MCB Rotational Absolute Magnetic Kits



Vishay MCB and Vishay Sfernice are the partners of choice for position sensing in the aerospace, defense and space markets.

Thanks to experience acquired in these markets and its involvement in major programs, Vishay MCB has developed a unique know-how to customise its potentiometer technology and its magnetic absolute encoders to meet the cutting-edge technology requirements for harsh environments.

The Vishay MCB RAMK Serie (Rotational AbsoluteMagnetic Kit) has increased accuracy compared to the conventional technologies. Its performance and long-term reliability is superior thanks to its insensitivity to humidity, vibration and shock.

Features

RAMK027 S
- Hall effect principle
- Especially dedicated to harsh conditions (vibrations, shocks, CEM)
- Not sensitive to external magnetic fields and temperature
- Not sensitive to moisture and pollution
- Plug and play
- Small error due to misalignment
- High Precision (HP)
- Protected design, patent EP 2711663

RAMK040 HP
- Especially dedicated to hard conditions (vibrations, shocks, CEM)
- Not sensitive to external magnetic fields and temperature
- Not sensitive to moisture and pollution
- Plug and play
- Small error due to misalignment
- Hall effect principle
- High precision (HP): accuracy 13 bits and resolution 17 bits
- Protected design, patent EP 2711663

RAMK090
- Hall effect principle
- Especially dedicated to hard conditions (vibrations, shocks, CEM)
- Not sensitive to external magnetic fields and temperature
- Not sensitive to moisture and pollution
- Plug and play
- Small error due to misalignment
- Very high precision (VHP): accuracy 16 bits and resolution up to 20 bits
- Protected design, patent EP 2711663

Applications
- Missiles gimbal
- Missiles guidance
- Optronic device
- Robotics
- Side stick unit, incidence probe

Notes

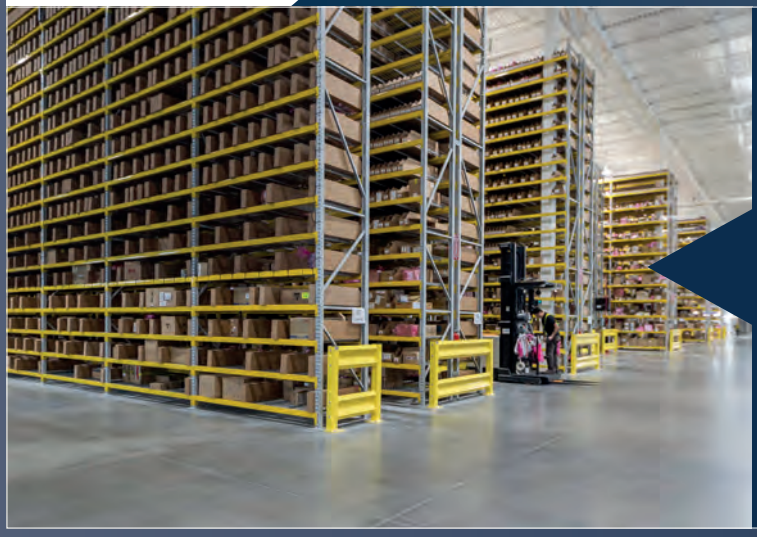
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