Sensing Technologies and Sensor Solutions

With more than 20 years of industry experience, IDT is an expert in providing sensor technologies that enable our customers to build best-in-class sensor solutions. As we expand the breadth of our sensor technologies, IDT will create unique, differentiated sensor solutions.

- **SensorShare™ Technology**
  Connects IDT's array of environmental sensor solutions with a central hub designed to measure, monitor and sense smart home and industrial end applications

- **Breadth of Experience**
  Bringing decades of knowledge, know-how and data from our technologies today into our solutions of the future

- **Trusted, Reliable Partner**
  A proven supplier that has shipped millions of parts into major consumer and automotive manufacturers

- **Best-in-Class Performance**
  Featuring low-power, high-accuracy solutions with highly integrated operations and support for ISO 26262 requirements and Automotive EMC and reliability

Flow Sensors

Humidity Sensors

Gas Sensors

Position Sensors

Sensor Signal Conditioners
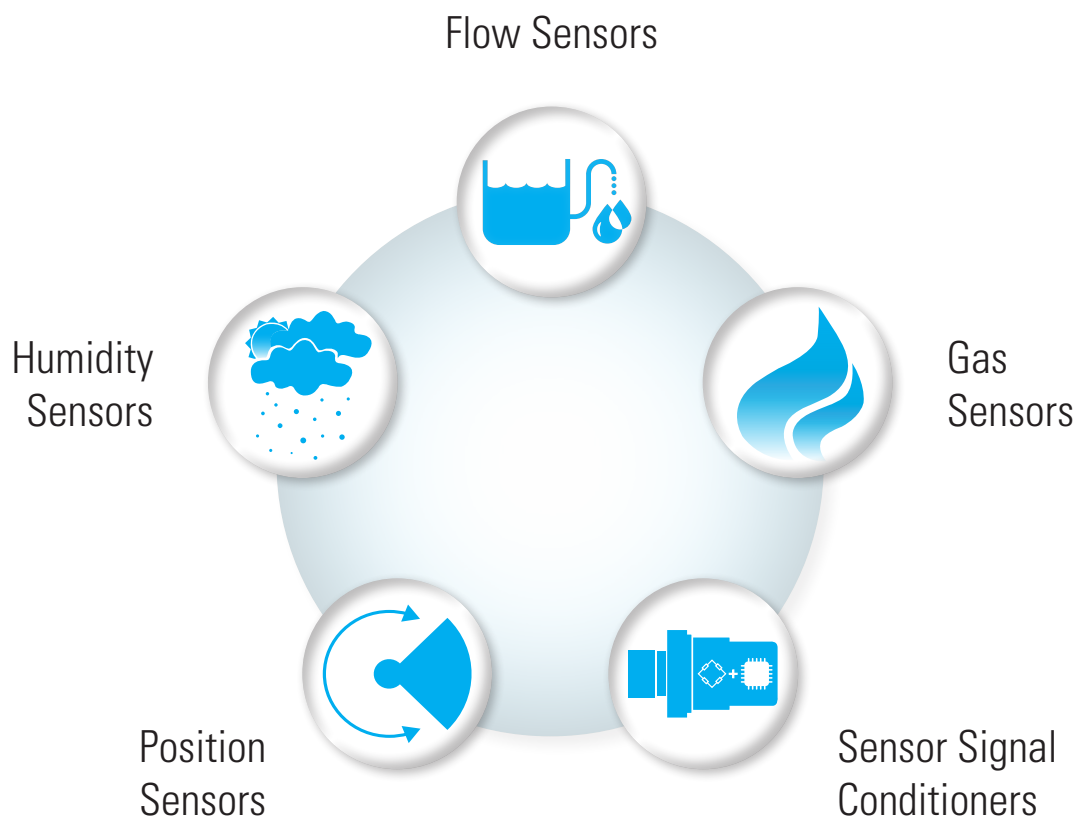
High-Performance MEMS Flow Sensor Module Family

Our mass flow sensors are ideal for use in the industrial process, healthcare and medical, and automotive markets

FEATURES AND BENEFITS

- Gas or liquid flow
- MEMS thermopile sensing
- Silicon-carbide coating over MEMS flow sensor
- Robust solid isolation technology
- No cavity in MEMS element to cause clogging
- Resistant to vibration and pressure shock
- High accuracy
- High sensitivity
- Food-grade compatible version
- Easy cleaning and sterilization
- 3 to 5 V DC supply, (5V for FS2012)

IDT mass flow sensor modules measure gas or liquid flow across a sensing surface using the thermo-transfer (calorimetric) principle. The flow sensor utilizes a series of MEMS thermocouples which provides excellent signal-to-noise ratio. The solid thermal isolation of the active MEMS sensing element along with the silicon-carbide film coating offers excellent abrasive wear resistance and long-term reliability.

IDT offers an uncalibrated millivolt output version (FS1012), uncalibrated with amplification circuit (FS102x) and fully-calibrated and linearized (FS2012) modules for either gas or liquid with typical accuracy down to 2% of reading.

Typical Applications

Industrial Process	Healthcare and Medical	Automotive
Process controls and monitoring	Medical infusion pumps	Mass air flow module
Oil and gas leak detection	CPAP and respiratory devices	Diesel fuel flow
HVAC and air-control systems	Breathalyzer	Brake fluid flow
Liquid dispensing and metering systems	Oxygen concentrators	Cabin air quality control

FLOW SENSORS PRODUCT DETAILS

Part Number	FS1012 (Millivolt Output)	FS102x (Uncalibrated, Amplified Output)	FS2012 (Fully-Calibrated)
Supply Voltage	3 to 5 V DC (Heater)	5V DC	5V DC
Gas Flow Range	0 to 2 Liter/Min (FS1012-1020-NG) 0 to 10 Liter/Min (FS1012-1100-NG)	—	0 to 2 Liter/Min (FS2012-1020-NG) 0 to 10 Liter/Min (FS2012-1100-NG)
Liquid Flow Range	0 to 0.5 Liter/Min (FS1012-1001-LQ) 0 to 1 Liter/Min (FS1012-1002-LQ)	0 to 3 Liter/Min (FS1023) 0 to 7 Liter/Min (FS1025) 0 to 10 Liter/Min (FS1027)	0 to 0.5 Liter/Min (FS2012-1001-LQ) 0 to 1 Liter/Min (FS2012-1002-LQ)
Flow Accuracy	–	—	±2% (Typical)
Output	Analog (millivolts)	Analog (0 to 5 V DC)	Digital I^2C and Analog (0 to 5 V DC)
Current Consumption	10mA at 3V DC (Heater Current)	11mA	30mA at 5V DC
Module Size	53.35 × 24.0 mm, 6-pin header	25 × 58 mm, 6-pin connector	53.35 × 24.0 mm, 6-pin header

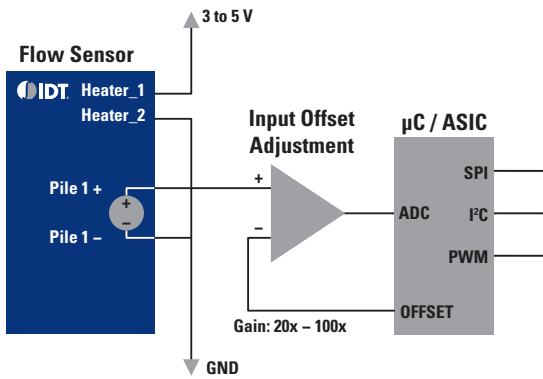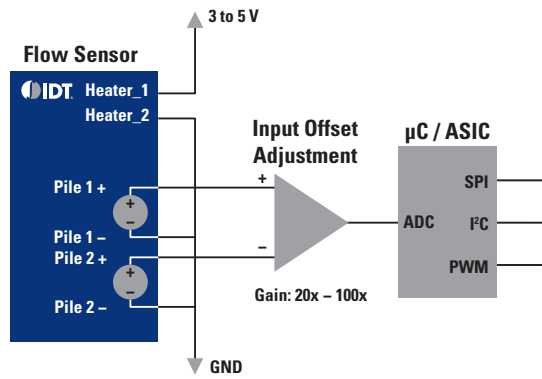**Figure 1:** FS1012 Single-Ended Application Circuit Diagram

Figure 2: FS1012 Differential Application Circuit Diagram

SDAWIR Complete Environmental Sensor Evaluation Kit

Real-time, low-power wireless sensor measurements for connected and monitoring applications

SensorShare
By Integrated Device Technology

To request samples, download documentation or learn more visit: **idt.com/flow**

ZMOD4410 Metal Oxide Gas Sensor for Indoor Air Quality

FEATURES

- Environmentally compensated heater driver control

- Dual output - detects wide range of TVOC from ppb to ppm concentrations and provides eCO$_2$ reading

- I^{2}C interface: up to 400kHz

- Adjustable ADC resolution for optimal speed vs. resolution: 16-bit maximum

- Configurable alarm/interrupt output

BENEFITS

- Proven MOx material with 12 years of reliability data

- Each sensor module is electrically and chemically tested and calibrated

- IDT offers downloadable source files and compiled code, enabling a product road map of indoor air measurement innovation

- Only sensor provider to utilize third-party validation of IAQ rating to help assess levels of clean air and recommend actions

IDT's ZMOD4410 gas sensor platform provides best-in-class stability and sensitivity and is designed to identify trace gases in various locations within indoor environments.

These air quality sensors feature a miniature package, integrated ASIC, and MEMS sensing element that is comprised of a controlled heater and proven metal oxide (MOx) material. Constant temperature operation or a very precisely regulated variation of the heater temperature allows the detection of a wide range of indoor air contaminants by accurately measuring the sensor conductivity and resistance.

This flexibility makes the sensors in the ZMOD4410 platform capable of providing a variety of measurement options by varying the method of operation or changing the firmware used to interpret the resistance measurements. Downloadable libraries and source code provided by IDT make upgrades straightforward to implement. All sensors are electrically and chemically (gas) tested with calibration data stored in the built-in nonvolatile memory (NVM).

The ZMOD4410 platform focuses on detection, control and rating of Indoor Air Quality (IAQ). The indoor air quality rating is based on TVOC concentrations defined by the German Environment Agency (UBA) as the main source for unpleasant air in an indoor environment. By detecting TVOC and rating the IAQ, the ZMOD4410 helps systems address clean air in the ambient environment. Additional downloadable algorithms are available to estimate levels of CO$_2$ and control ventilation systems.

RECOMMENDED APPLICATIONS

- Monitor home, office and personal environment for healthy conditions and comfort

- Smart appliances that control or monitor indoor air quality

- Automation based on indoor ambient air quality

PRODUCT SUPPORT

- Evaluation kits

- Manuals, videos, application notes and programming examples

- Third-party certification for compliance with standard defined by the German Environment Agency (UBA)

- Engineering support for sensor implementation

PHYSICAL CHARACTERISTICS

- Power consumption <14 mW in continuous operation

- −40°C to +65°C operating temperature range

- 1.7 to 3.6 V supply voltage

- 3.0 x 3.0 x 0.7 mm 12-LGA package

The ZMOD4410 uses the German Environment Agency (UBA) study as a basis to define clean air. Sensors are calibrated to this definition to ensure customer satisfaction.

Indoor Air Quality Ratings

IDT IAQ Rating	Reference Level*	Air Information	TVOC (mg/m³)	Air Quality
≤ 1.99	Level 1	Clean Hygienic Air (Target Value)	< 0.3	Very Good
2.00 - 2.99	Level 2	Good Air Quality (if no threshold is exceeded)	0.3 - 1.0	Good
3.00 - 3.99	Level 3	Noticeable Comfort Concerns (Not recommended for exposure > 12 months)	1.0 - 3.0	Medium
4.00 - 4.99	Level 4	Significant Comfort Issues (Not recommended for exposure > 1 months)	3.0 - 10.0	Poor
≥ 5.00	Level 5	Unacceptable conditions (Not recommended)	> 10.0	Bad

* Based on a study by the German Environment Agency (UBA).

ZMOD4410 Firmware

IAQ Firmware	Application
ZMOD4410-UBA	UBA standard
ZMOD4410-LP†	Low power battery
ZMOD4410-Bathroom†	Bathroom odors
ZMOD4410-Bedroom	Bedroom odors, eCO₂ and TVOC
ZMOD4410-Office	HVAC control, eCO₂

† Contact IDT

To request samples, download documentation or learn more visit: **idt.com/ZMOD4410**

High-Performance Gas Sensor Family

Leveraging more than 10 years of development and use, IDT's gas sensors are reliable and proven

FEATURES AND BENEFITS

- Reliable gas detection
- High sensitivity to a wide range of gases
- Long lifetime:
  - SGAS707: 3 to 5 years
  - SGAS701/SGAS711: 5+ years
- Minimal response to relative humidity (RH)
- Over a decade of gas sensing experience
- Reduced frequency of calibrations
- Reduced maintenance and overall system
- TVOC <1 to 1000 ppm (SGAS707)

IDT offers innovative, high-performance gas sensors ideal for industrial leak detection and air quality applications. Our industry-leading sensors are based upon a highly reliable ceramic substrate, coupled with advanced nanostructured materials tailored for individual applications.

The SGAS family of gas sensors are capable of accurately detecting a range of gases, including hydrogen, flammable gases (methane, propane, natural gas) and volatile organic compounds (includes TVOC, alcohols, aldehydes, ketones and more).

Typical Applications

Building/ Industrial Air Quality	Leak Detection	Process Control
• Measure VOC in offices, light industrial settings, schools and hospitals • Measure efficacy of filtration/purification systems • Control ventilation systems based on real-time air quality	PPM range leak measurement of hydrogen, methane, propane, LPG, natural gas and other flammable gases	Measure hydrogen leaks to test seals and product integrity

SGAS SENSORS PRODUCT DETAILS

Part Number	Sensor Function	Package Code	Package Type	Temperature Range
SGAS701	Hydrogen			−20 to +50°C
SGAS707	Industrial Organic Chemical	TO4	TO-39	0 to +40°C
SGAS711	Flammable Gas			−20 to +50°C

SGAS707 Gases Detected

VOC (Volatile Organic Compounds)
TVOC (Total Volatile Organic Compounds)
Alcohols – ethanol, isopropanol   } 1 to 1000 ppm
Ketones – methyl ethyl ketone (MEK)
Aldehydes – formaldehyde
Aromatics – toluene, xylene

SGAS711 Gases Detected

Hydrogen
Methane
Propane   } 10 to 1000 ppm
LPG
Natural Gas
Freons

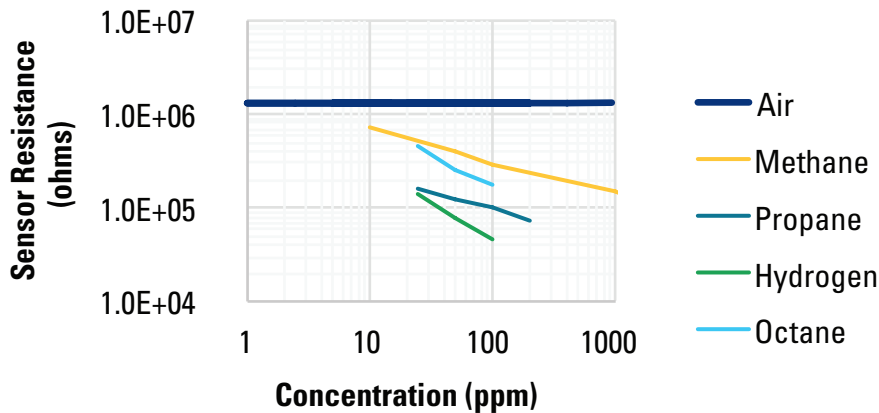## SGAS701 Gases Detected

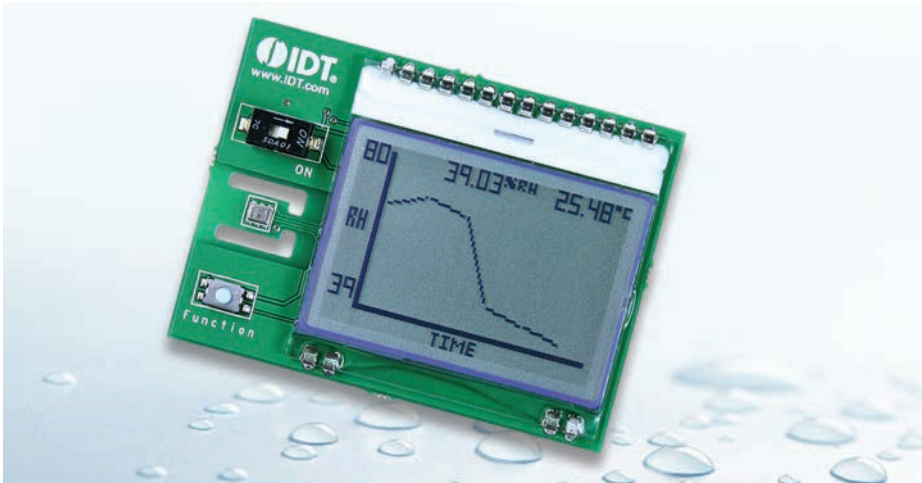Hydrogen   1 to 1000 ppm

SGAS711 Response

To request samples, download documentation or learn more visit: **idt.com/gas**

Relative Humidity Sensor Family

Relative humidity sensors provide industry-leading accuracy and response times to improve system performance

FEATURES

- Silicon carbide structure

- ±1.5%RH accuracy (HS3001)

- Fast RH response time
  (typical 6 seconds)

- 0.1%RH per year drift

- 14-bit resolution: 0.01%RH (typical)

- Low power consumption: 1.0µA
  average

- Digital/Analog output

- Extended supply voltage:
  2.3 to 5.5 V

IDT's humidity sensors offer high accuracy with the fastest measurement response time of comparable devices currently on the market.

The HS300x family of relative humidity sensors feature a ±1.5% RH accuracy and six-second response time (rated 20% to 80% RH range in still air and does not require airflow). Since humidity sensors consume the most power when they are taking a measurement, the fast response time to a stable measurement reduces the amount of sampling needed. This is especially important for battery-powered applications where lower power consumption equates to longer battery life. In addition to high-accuracy and fast response times, the HS300x family features excellent long term stability of 0.1% RH per year as a result of a robust silicon carbide construction and an innovative design. This improves useful lifetime and lowers effective cost.

| Typical Applications |
|---|
| Measurement of water vapor content in medical oxygen |
| Humidity measurement in home appliances |
| Monitor humidity in the air in industrial processes, climate control systems (HVAC), weather stations and portable personal health devices |

BENEFITS

- Integrated temperature and humidity sensing solution

- Small form factor solution with lower system cost

- Low power consumption saves battery

- 14-bit high resolution provides extremely tight accuracy

- Insensitive to environmental contaminants like dirt and dust

- Small solution size saves space and BOM for compact designs

- On board calibration reduces time to market

- Wide supply voltage range eliminates the need for LDO/DC-DC

- Fast RH response time (typical 6 seconds)

High-Performance Relative Humidity and Temperature Sensors

Part Number	Relative Humidity Accuracy Typ (±%RH)
HS3001	1.5
HS3002	1.8
HS3003	2.8
HS3004	3.8

High Relative Humidity Accuracy and Long Term Stability You Can Depend On
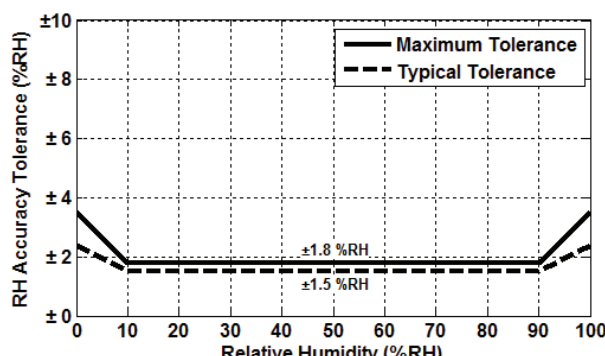
HS3001 RH Accuracy Tolerance at 25°C

SDAWIR Complete Environmental Sensor Evaluation Kit

Real-time, low-power wireless sensor measurements for connected and monitoring applications
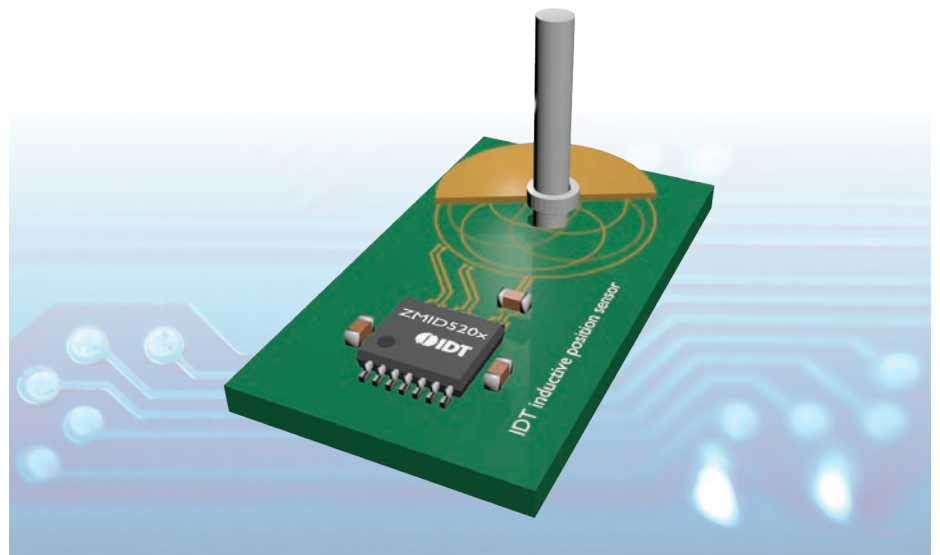
SensorShare
By Integrated Device Technology

To request samples, download documentation or learn more visit: **idt.com/humidity**

Inductive Position Sensor Family

Contactless
absolute position
sensors for linear
and angular position

FEATURES AND BENEFITS

- No magnet required
  - Simple metallic target immune to magnetic stray fields (ISO 11452-8)
- Flexible; same IC for a variety of position sensing applications
- Fully AEC-Q100-qualified
- Replaces potentiometer, Hall-effect and magneto-resistive technology
- Very thin assembly height
- Tolerant to target misalignment in any direction

SPECIFICATIONS

- Analog, PWM and SENT output versions
- Only 3 wires: +5V, Ground, Output
- Non-volatile memory, programmable through output pin
- −14 to +18 V overvoltage and reverse polarity protection
- −40°C to +150°C ambient temperature range
- Coil temperature can be >150°C
- Suitable for safety-related systems compliant to ISO 26262 up to ASIL-B
- TSSOP-14 package

The ZMID5201, ZMID5202 and ZMID5203 family of inductive position sensors are designed for absolute position sensing in automotive, industrial and consumer applications.

This family utilizes the physical principles of induction in a wire loop and eddy currents to detect the position of a metallic target that is sliding or rotating above a set of coils consisting of one transmitter coil and two receiver coils. The three coils are typically printed as copper traces on a printed circuit board and are used to detect the metallic target's position over the coils. After demodulating and processing the secondary voltages from the receiver coils, a signal representative of the metallic target's position over the coils is obtained.

The ZMID520x family is fully qualified to automotive standard AEC-Q100, grade 0 up to 150°C ambient temperature.

Typical Applications
Automobiles and other vehicles
Robotics and unmanned aerial vehicles (UAVs)
Automation
Home Appliances

POSITION SENSORS PRODUCT DETAILS

PERFORMANCE

- Accuracy down to ±0.2% full scale
- Resolution up to 4096 steps full scale
- Scalable accuracy and resolution
- Up to 10kHz output update rate
- 2.2 to 5.6 MHz oscillation frequency

PROGRAMMING OPTIONS

- 9-point linearization
- Input signal offset
- Input signal gain
- Slope of transfer function
- Analog clamping voltages
- PWM clamping duty cycles
- PWM base frequency
- SENT data format
- Various diagnostic diagrams
  - Oscillator failure
  - Coil failure
  - Supply voltage out of range
  - Missing target

| Part Number	Description
ZMID5201	Inductive position sensor IC with analog output
ZMID5202	Inductive position sensor IC with PWM output
ZMID5203	Inductive position sensor IC with SENT output
ZMID5201STKIT	Inductive position sensing starter kit with arc, rotary, and linear modules

The same chip can be used for rotary, linear or other position sensing types by simply adapting the shape of the coils and the target. Additionally, the coil design can be scaled to smaller angles while maintaining the full resolution and accuracy within the mechanical borders of the design. The moving target can be any solid metallic structure with a minimum thickness of a few micrometers.
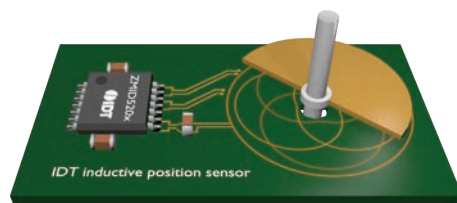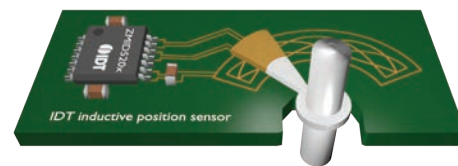
Linear position (any length)
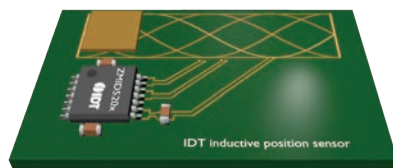
Side shaft off-axis rotation
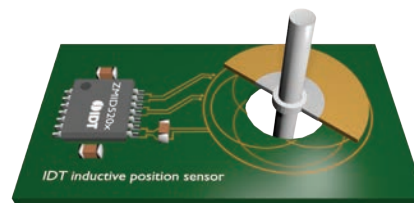
End of shaft on-axis rotation

Narrow angles

To request samples, download documentation or learn more visit: **idt.com/position**

Sensor Signal Conditioner ICs

SSCs provide performance, test and calibration process advantages for our customers' sensor modules

FEATURES AND BENEFITS

- Analog and one-wire interface
- Digital I^{2}C & SPI output
- Resistive and capacitive sensor interface
- High analog gain for sophisticated sensors
- Automotive, industrial and consumer applications
- Low-power and battery-powered applications
- Single-pass calibration
- High ADC resolution up to 24 bit
- Wafer and packaged delivery forms

Designing sensor interfaces can be quite challenging and time consuming, and producing them in volume is often expensive due to long test cycles on costly production test equipment. IDT Sensor Signal Conditioner (SSC) ICs facilitate both design and production of sensor interfaces by providing programmable, highly accurate, wide gain and quantization functions combined with powerful, high-order digital correction and linearization algorithms.

IDT is a trusted partner in the sensing market with more than twenty years of experience developing leading-edge core technologies for sensor signal conditioning devices.
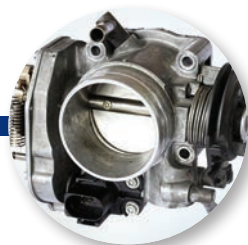
IDT's SSC ICs are all-in-one, energy efficient products that are easy-to-use and are supported by advanced software and expert technical support staff.

Our portfolio offers a broad range of resistive and capacitive SSC ICs. IDT's highly accurate single-pass calibration operation enables the design of cost-effective, accurate sensing systems.

Infotainment   **Chassis**   **Body**   **Safety**   **Powertrain**

Single-bridge Automotive Sensor Signal Conditioners

Part Number	Description	Supply Voltage (V)	Interface	Adjustable Analog Gain	Resolution (Bits)	Sample Rate Max (kHz)
ZSSC3015	Resistive Sensor Signal Conditioner with Diagnostics – AEC-Q100 qualified	2.7 to 5.5	Ratiometric Voltage, Absolute Voltage, ZACwire™	6, 24, 48, 96	14	1
ZSC31150	Automotive Sensor Signal Conditioner	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C	3, 7, 9, 14, 26, 35, 52, 70, 105, 140, 210, 280, 420	16	7.8
ZSSC3131	Capacitive Sensor Signal Conditioner with Digital Output	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C	3, 7, 9, 14, 26, 35, 52, 70, 105	14	0.2
ZSSC3135	Sensor Signal Conditioner for Piezoresistive Bridge Sensors	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C	3, 7, 9, 14, 26, 35, 52, 70, 105	14	0.2
ZSSC3136	Automotive Sensor Signal Conditioner for Safety Switch Applications	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C	3, 7, 9, 14, 26, 35, 52, 70, 105	14	0.2
ZSSC3138	Automotive Sensor Signal Conditioner for Ceramic Sensor Applications	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C	3, 7, 9, 14, 26, 35, 52, 70, 105, 140, 210, 280, 420	16	7.8
ZSSC3154	Automotive Sensor Signal Conditioner with Dual Analog Output	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C, Dual Analog Output	3, 7, 9, 14, 26, 35, 52, 70, 105, 140, 210, 280, 420	14	2
ZSSC3170	Automotive Sensor Signal Conditioner with LIN and PWM Interface	7 to 18	PWM, LIN	3, 7, 9, 14, 26, 35, 52, 70, 105, 140, 210, 280, 420	14	0.43
ZSSC4151	Automotive Sensor Signal Conditioner with Analog Output	4.5 to 5.5	Ratiometric Voltage, ZACwire, I²C	1 to 200	18	1.56
ZSSC4162	Automotive Sensor Signal Conditioner Dual Bridge SENT Output	4.75 to 5.25	SENT 3.0, I²C	1 to 200	18	1.56
ZSSC4169	Automotive-grade Resistive Sensor Signal Conditioner with SENT Output & ASIL-C	4.5 to 5.5	SENT, I²C	1 to 200	18	1.56

Oil Pressure and Temperature Sensor **Pressure Sensing in Consumer Electronics** **Industrial Pressure Sensor** **Sensors for White Goods**

Single-bridge Industrial Sensor Signal Conditioners

Part Number	Type	Voltage	Output	ADC	Package	Typical Application/Features
ZSC31010	Resistive	2.7 to 30 V	Analog/Digital	14 bit	SOIC, Wafer	Industrial/Analog Sensors
ZSC31014	Resistive	2.7 to 5.5 V	Digital	14 bit	SOIC, Wafer	Industrial/I²C Sensors
ZSC31015	Resistive	2.7 to 30 V	Analog/Digital	14 bit	SOIC, Wafer	Industrial/Analog Sensors
ZSC31050	Resistive	2.7 to 40 V	Analog/Digital	15 bit	SSOP, Wafer	Industrial/Current Loop
ZSSC3026	Resistive	1.8 to 3.6 V	Digital	16 bit	Wafer	Consumer, White Goods
ZSSC3036	Resistive	1.8 to 3.6 V	Digital	16 bit	Wafer	Industrial
ZSSC3027	Resistive	1.7 to 3.6 V	Digital	16 bit	Wafer	Stacked Die Assemblies
ZSSC3018	Resistive	1.68 to 3.6 V	Digital	18 bit	QFPN, Wafer	Industrial/White Goods
ZSSC3218	Resistive	1.68 to 3.6 V	Digital	18 bit	QFPN, Wafer	Consumer/White Goods
ZSSC3224	Resistive	1.68 to 3.6 V	Digital	24 bit	QFPN, Wafer	Industrial/Consumer
ZSSC3122	Capacitive	1.8 to 5.5 V	Digital, PDM	14 bit	TSSOP, Wafer	Consumer/White Goods
ZSSC3123	Capacitive	2.3 to 5.5 V	Digital, PDM	14 bit	TSSOP, Wafer	Industrial

Why Choose IDT SSCs?

Decades of sensor design experience **Excellent evaluation and support tools** **Unmatched technical support** **Continued investment** **Reduced time to market**
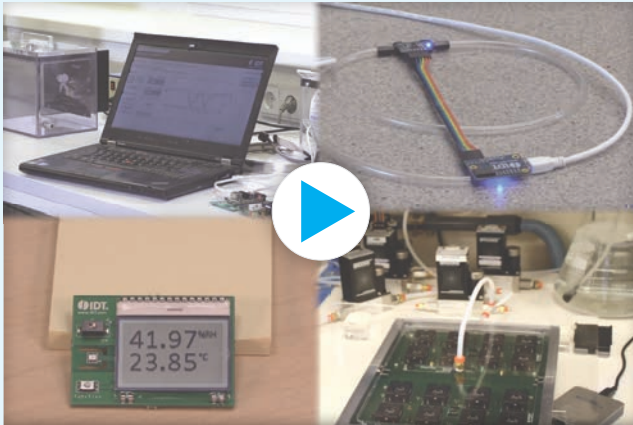
To request samples, download documentation or learn more visit: **idt.com/ssc**

Sensor Resources

Find the tools and resources you need to start your sensor design today.

VIDEOS

BLOGS

idt.com/blogs

COLLATERAL

TOOLS

idt.com/sensors

IDT
Integrated Device Technology