Easy-to-Use Sensor Signal Conditioner ICs

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.
Sensor Signal Conditioning Basics

**Sensor Signal**
- Physical measure
  - pressure
  - torque
  - temperature
  - force
  - weight / load
  - and more

**Signal Conditioning**
- Signal transducing
- Signal amplification
- Signal conditioning (compensation of offset, non-linearity and temperature dependency)

**Conditioned Output**
- Linear analog ratiometric voltage, current loop
- Digital PWM, I²C, and OWI output

Typical SSC Block Diagram
IDT’s Sensor Signal Conditioner ICs typically interface with two main sensor types: resistive bridges and differential capacitors. For each sensor type, further specialization allows selecting the optimal balance between price and performance for the required operating voltage and temperature range, gain, resolution, input/output format, and qualification level.

Our SSC ICs offer digital compensation of sensor offset, sensitivity, temperature drift, and nonlinearity in wide operational temperature ranges: −50°C to +150°C (maximum range).

<table>
<thead>
<tr>
<th>Generation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Resistive</td>
<td>Capacitive</td>
<td>Resistive</td>
<td>Resistive</td>
</tr>
<tr>
<td><strong>Part Numbers</strong></td>
<td>ZSC31010, ZSC31014, ZSC31015, ZSC31050</td>
<td>ZSSC3122, ZSSC3123</td>
<td>ZSSC3026, ZSSC3027, ZSSC3036</td>
<td>ZSSC3018, ZSSC3218, ZSSC3224</td>
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<tr>
<td><strong>Resolution</strong></td>
<td>up to 15 bit ADC resolution</td>
<td>up to 14 bit ADC resolution</td>
<td>up to 16 bit ADC resolution</td>
<td>up to 24 bit ADC resolution</td>
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<tr>
<td><strong>Output</strong></td>
<td>Analog and Digital</td>
<td>Digital</td>
<td>Digital</td>
<td>Digital</td>
</tr>
<tr>
<td><strong>Market</strong></td>
<td>Industrial</td>
<td>Consumer and Industrial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sensor Application Reference Designs

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

IDT SSC ICs Enable Easy Sensor Platform Development

- Analog and One-Wire interface
- Digital I²C & SPI output
- Resistive and capacitive sensor interface
- High analog gain for sophisticated sensors
- 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
Highest Accuracy by Integrated Sensor Signal Conditioning

Before Calibration: ±4500 counts Error

Figure 1 illustrates Absolute error [counts] from ideal linear bridge and temperature characteristic.

After Calibration: ±60 counts Error

Figure 2 illustrates Absolute error with typical sensor after calibration: ±0.1% (±60 counts)
Lowest Total System Cost with IDT SSCs

IDT Sensor Signal Conditioners

IDT SSC’s provide an advantage to our customers sensor modules both in performance as well as in the test and calibration process.

High Accuracy
Real resolution – not inflated claims

Integrated Solutions
No external trimming and single-pass calibration

Breadth of Product
Resistive and capacitive solutions with a variety of output options
Industrial and Consumer SSC Portfolio

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Type</th>
<th>Voltage</th>
<th>Output</th>
<th>ADC</th>
<th>Package</th>
<th>Typical Application/Features</th>
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</thead>
<tbody>
<tr>
<td>ZSC31010</td>
<td>Resistive</td>
<td>2.7 to 30 V</td>
<td>Analog/Digital</td>
<td>14 bit</td>
<td>SOIC, Wafer</td>
<td>Industrial/Analog Sensors</td>
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<tr>
<td>ZSC31014</td>
<td>Resistive</td>
<td>2.7 to 5.5 V</td>
<td>Digital</td>
<td>14 bit</td>
<td>SOIC, Wafer</td>
<td>Industrial/PC Sensors</td>
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<tr>
<td>ZSC31015</td>
<td>Resistive</td>
<td>2.7 to 30 V</td>
<td>Analog/Digital</td>
<td>14 bit</td>
<td>SOIC, Wafer</td>
<td>Industrial/Analog Sensors</td>
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<tr>
<td>ZSC31050</td>
<td>Resistive</td>
<td>2.7 to 40 V</td>
<td>Analog/Digital</td>
<td>15 bit</td>
<td>SSOP, Wafer</td>
<td>Industrial/Current Loop</td>
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<tr>
<td>ZSSC3026</td>
<td>Resistive</td>
<td>1.8 to 3.8 V</td>
<td>Digital</td>
<td>16 bit</td>
<td>Wafer</td>
<td>Consumer, White Good</td>
</tr>
<tr>
<td>ZSSC3036</td>
<td>Resistive</td>
<td>1.8 to 3.6 V</td>
<td>Digital</td>
<td>16 bit</td>
<td>Wafer</td>
<td>Industrial</td>
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<tr>
<td>ZSSC3027</td>
<td>Resistive</td>
<td>1.7 to 3.6 V</td>
<td>Digital</td>
<td>16 bit</td>
<td>Wafer</td>
<td>Stacked Die Assemblies</td>
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<tr>
<td>ZSSC3018</td>
<td>Resistive</td>
<td>1.68 to 3.6 V</td>
<td>Digital</td>
<td>18 bit</td>
<td>QFPN, Wafer</td>
<td>Industrial/White Good</td>
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<tr>
<td>ZSSC3218</td>
<td>Resistive</td>
<td>1.68 to 3.6 V</td>
<td>Digital</td>
<td>18 bit</td>
<td>QFPN, Wafer</td>
<td>Consumer/White Good</td>
</tr>
<tr>
<td>ZSSC3224</td>
<td>Resistive</td>
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<td>Digital</td>
<td>24 bit</td>
<td>QFPN, Wafer</td>
<td>Industrial/Consumer</td>
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<td>ZSSC3122</td>
<td>Capacitive</td>
<td>1.8 to 5.5 V</td>
<td>Digital, PDM</td>
<td>14 bit</td>
<td>TSSOP, Wafer</td>
<td>Consumer/White Good</td>
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<tr>
<td>ZSSC3123</td>
<td>Capacitive</td>
<td>2.3 to 5.5 V</td>
<td>Digital, PDM</td>
<td>14 bit</td>
<td>TSSOP, Wafer</td>
<td>Industrial</td>
</tr>
</tbody>
</table>

Why Choose IDT SSCs?

IDT 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.

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/go/SSCs