Brief Description

ZSC31050 is a CMOS integrated circuit for highly accurate amplification and sensor-specific correction of bridge sensor and temperature sensor signals. The device provides digital compensation of sensor offset, sensitivity, temperature drift, and nonlinearity via a 16-bit RISC microcontroller running a polynomial correction algorithm.

The ZSC31050 accommodates virtually any bridge sensor type (e.g., piezo-resistive, ceramic thick-film, or steel membrane based). In addition, it can interface to a separate temperature sensor. The bi-directional digital interfaces (I2C, SPI, and ZACwire™) can be used for a simple PC-controlled one-pass calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. A specific sensor and a ZSC31050 can be mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser. The ZACwire™ interface enables an end-of-line calibration of the sensor module.

Typical applications for the ZSC31050 include industrial, medical, and consumer products. It is specifically engineered for most resistive bridge sensors; e.g., sensors for measuring pressure, force, torque, acceleration, angle, position, and revolution.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and nonlinearity
- Accommodates nearly all resistive bridge sensor types (signal spans from 1mV/V up to 275mV/V)
- Digital one-pass calibration: quick and precise
- Selectable compensation temperature source: bridge, thermistor, or internal or external diode
- Output options: voltage (0 to 5V), current (4 to 20mA), PWM, I2C, SPI, ZACwire™ (one-wire interface), alarm
- Adjustable output resolution (up to 15 bits) versus sampling rate (up to 3.9kHz)
- Current consumption: 2.5mA (typical)
- Selectable bridge excitation: ratiometric voltage, constant voltage, or constant current
- Input channel for separate temperature sensor
- Sensor connection and common mode check (sensor aging detection)
- AEC-Q100 qualification (temperature grade 0)

Benefits

- No external trimming components required
- PC-controlled configuration and calibration via digital bus interface – simple, low cost
- High accuracy (±0.1% FSO @ −25 to 85°C; ±0.25% FSO @ −40 to 125°C) *

Available Support

- Evaluation kit available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

- Operation temperature -40°C to +125°C (-40°C to +150°C derated, depending on product version)
- Supply voltage: 2.7V to 5.5V; with external JFET: 5V to 48V
- Available in 16-SSOP package or as die

Basic Circuit Diagram
ZSC31050 Block Diagram

Typical Applications:
- Consumer Goods
  - Weight scales
  - Flow meters
  - Strain gauges
  - Load meters
  - HVAC
- Industrial Applications
  - 4-20mA transmitters
  - Intelligent sensor networks
  - Process automation
  - Factory automation
- Portable Devices
  - Altimeters
  - Blood pressure monitors
- Automotive Sensors *
  - Oil pressure
  - Temperature sensing
  - Strain gauges
  - AEC-Q100 qualified

Ordering Information (See section 8 in the data sheet for additional options.)

<table>
<thead>
<tr>
<th>Product Sales Code</th>
<th>Description</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZSC31050FEB</td>
<td>ZSC31050 Die — Temperature range: -40°C to +150°C</td>
<td>Unsawn on Wafer</td>
</tr>
<tr>
<td>ZSC31050FEC</td>
<td>ZSC31050 Die — Temperature range: -40°C to +150°C</td>
<td>Sawn on Wafer Frame</td>
</tr>
<tr>
<td>ZSC31050FEG1</td>
<td>ZSC31050 16-SSOP — Temperature range: -40°C to +150°C</td>
<td>Add “-T” for tube or “-R” for reel to sales code</td>
</tr>
<tr>
<td>ZSC31050KITV3P1</td>
<td>ZSC31050 SSC Evaluation Kit V3.1: ZSC31050 Evaluation Board, SSC Communication Board, SSC Sensor Replacement Board, five ZSC31050 16-SSOP samples. Software is downloadable.</td>
<td></td>
</tr>
<tr>
<td>ZSC31050MCSV1P1</td>
<td>Modular Mass Calibration System (MSC) V1.1 for ZSC31050: Four Mass Calibration Boards; SSC Communication Board; four ZSC31050 Mass Calibration Reference Boards, each with a ZSC31050 sample mounted; 30m 10-wire flat cable; 100 connectors. Software is downloadable.</td>
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