ZMDI®

The Analog Mixed Signal Company

PINK IS THE NEW GREEN®

ENABLING ENERGY EFFICIENT SOLUTIONS

ZMDI Sensor Signal Conditioning

Multi-Market Sensing Platforms and Mobile Sensing by ZMDI

Over 50 Years of Proven Reliability Designing Semiconductor Solutions

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Energy Efficient Mixed Signal Solutions

Zentrum Mikroelektronik Dresden AG (ZMDI) is a global provider of high-performance, energy-efficient analog and mixed signal semiconductors and application-specific ICs. Innovation-driven and customer-focused, we enable IC solutions that reduce fuel consumption and CO_2 emissions to help protect the environment. Our products range from very low-power SSCs for mobile applications to rugged AEC-Q100-qualified ICs that expedite automotive product design by providing advanced sensor-signal conditioning and configurability while minimizing power consumption. Our sophisticated calibration and configuration techniques significantly reduce external component count and time to market for products that meet new emission-reduction standards.

For over 50 years, we have offered our customers high-quality products and services at great value. Our high performance products and excellent application support have earned us our customers' trust and built long-term partnerships with market leaders. ZMDI's solutions enable our customers to create the most energy-efficient products in sensors, power management, and lighting. Typical applications include measurement of pressure, temperature, strain, torque, proximity, displacement, angle, humidity, altitude, fluid level, flow, weight, and sensor aging.

ZMDI - Making a positive impact

As a result of ZMDI's leadership in energy-efficient solutions for automotive, industrial, and mobile applications, we have been honored with prestigious awards.

We have been selected as a finalist in the **EE Times and EDN Annual Creativity in Electronics (ACE) Awards 2014** for the category "Energy Technology Award" for our ZSSC1956 Intelligent Battery Monitoring Solution, as well as for the "Marketing Team" for our marketing campaigns. In 2012 as well as 2013, we received the **Green Apple Award** for products that contribute to "passive" energy savings. ZMDI was honored with the "**Best Company for Innovation and Sustainability Award**" (regional) by the International Alternative Investment Review (IAIR) for 2013. In 2012, we received the "**Innovative Enterprise of the Year 2012**" presented by the president of Bulgaria. Frost & Sullivan have recognized us with the 2012 **Europe Frost & Sullivan New Product Innovation Award** for our innovative battery-monitoring device.

Visit **www.zmdi.com**
for more detailed information

Easy-to-Use Sensor Signal Conditioner ICs from ZMDI

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. ZMDI 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.

ZMDI Sensor Signal Conditioner ICs are all-in-one, energy-efficient products that are easy to use and are supported by advanced software and expert technical support staff with extensive sensor system design experience. A distinct advantage of our correction algorithms is that they are calibrated and programmed in an efficient "single-pass" operation that lowers costs by reducing test time and loading of production test equipment without sacrificing precision. ZMDI Sensor Signal Conditioner ICs also lower total system costs by simplifying sensor design with our excellent support tools, reducing external components, minimizing board space, and providing a faster migration to production.

ZMDI Sensor Signal Conditioning ICs enable you to get it right – on the first pass!

ZMDI is a leading-edge global technology company with over 50 years of success designing semiconductor solutions that enable our customers to create energy-efficient products

Sensor Interface IC Solutions
Products available at ZMDI On-Line Store

	Product Name	Adjustable Analog Gain Values	ADC Resolution	Sample Rate	Temperature Compensation / Ext.Temperature Sensor	Interface Options (Note: I²C™ is a trademark of NXP)
Resistive	**ZSC31010**	6 / 12 / 24 / 48	14 Bit	Up to 1.0kHz	✓/ -	Ratiometric Voltage Absolute Voltage 0 to 1V or 5V ZACwire™
	ZSC31014	1.5 / 3 / 6 / 12 / 24 / 48 / 96 / 192	14 Bit	Up to 2.0kHz	✓/✓	I²C™ & SPI
	ZSC31015	6 / 24 / 48 / 96	14 Bit	Up to 1.0kHz	✓/ ✓	Ratiometric Voltage Absolute Voltage 0 to 1V or 5V ZACwire™ (12-Bit DAC)
	ZSC31050	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	9 to 15 Bit	Up to 3.9kHz	✓/ ✓	Ratiometric or Absolute Voltage; 4mA to 20mA Two PWMs; Two Alarms; I²C™ & SPI & ZACwire™ (11-Bit DAC)
	ZSSC3016	13.2 to 72	16 Bit	Up to 175Hz	✓/ -	I²C™ & SPI
	ZSSC3026	13.2 to 72	16 Bit	Up to 175Hz	✓/ -	I²C™ & SPI
	ZSSC3027	13.2 to 72	16 Bit	Up to 175Hz	✓/ -	I²C™ & SPI
	ZSSC3036	13.2 to 72	16 Bit	Up to 325Hz	✓/ -	I²C™ & SPI
Resistive Automotive AEC Q-100 Qualified	**ZSC31150**	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	13 to 16 Bit	Up to 7.8kHz	✓/ ✓	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)
	ZSSC3015	6 / 24 / 48 / 96	14 Bit	Up to 1.0kHz	✓/ ✓	Ratiometric Voltage Absolute Voltage 0 to 1V or 5V ZACwire™ (12-Bit DAC)
	ZSSC3131	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105	13 to 14 Bit	Up to 200Hz	✓/ -	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)
	ZSSC3135	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105	13 to 14 Bit	Up to 200Hz	✓/ ✓	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)
	ZSSC3136	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105	13 to 14 Bit	Up to 200Hz	✓/ ✓	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)
	ZSSC3138	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	13 to 16 Bit	Up to 7.8kHz	✓/ -	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)
	ZSSC3154	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	14 Bit	Up to 2.0kHz	✓/ ✓	Dual Analog Out Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)
	ZSSC3170	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	13 to 14 Bit	Up to 430Hz	✓/ ✓	PWM (12-Bit) LIN (1.3 / 2.0 / 2.1)
Capacitive		Input Capacitance Ranges in pF				
	ZSSC3122	2 to 10	8 to 14 Bit	Up to 1.0kHz	✓/ -	I²C™ & SPI (only MISO) PDM (ratiometric analog output possible - RC filter) Two Alarms
	ZSSC3123	2 to 8 8 to 32 32 to 130 130 to 260	8 to 14 Bit	Up to 1.0kHz	✓/ -	I²C™ & SPI (only MISO) PDM (ratiometric analog output possible - RC filter) Two Alarms

See page 46 for details about the ZOPT3100, our unique, leading-edge optical sensor IC.

Operation Temperature Range in °C	Supply Voltage in V DC	Current Consumption (see data sheet for conditions)	Package Options
-50 to +150	2.7 to 5.5 (>5.5V with ext. JFET)	0.25mA	SOP8 / Die
-40 to +125	2.7 to 5.5	70µA (2µA Sleep Mode)	SOP8 / Die
-50 to +150	2.7 to 5.5 (>5.5V with ext. JFET)	250µA	SOP8 / Die
-40 to +150 (depends on part number; see data sheet)	2.7 to 5.5 (>5.5V with ext. JFET)	2.5mA	SSOP16 / Die
-40 to +85	1.8 to 3.6	900µA (40nA Sleep Mode at 25°C)	Die
-40 to +110	1.8 to 3.6	900µA (50nA Sleep Mode at <85°C)	PQFN24 / Die
-40 to +85	1.7 to 3.6	930µA (20nA Sleep Mode)	Die
-40 to +110	1.8 to 3.6	900µA (20nA Sleep Mode at ≤85°C)	Die
-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / DFN14
-50 to +150	2.7 to 5.5 (>5.5V with ext. JFET)	300µA	SOP8 / Die
-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
-40 to +140	4.5 to 5.5	10mA	QFN32 / Die
-40 to +150	7 to 18	7mA (40µA Sleep Mode)	SSOP20/ Die
-40 to +125	1.8 to 5.5	60µA (1µA Sleep Mode)	TSSOP14 / Die
-40 to +125	2.3 to 5.5	60µA (1µA Sleep Mode)	TSSOP14 / Die

ZSSC/ZSC Selection Guide

Sensor Signal Conditioner Product Family

ZMDI's Sensor Signal Conditioner (SSC) 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.

ZMDI's 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).

Brief Description

The ZSC31010 is a sensor signal conditioner integrated circuit, which enables easy and precise calibration of resistive bridge sensors via EEPROM. When mated to a resistive bridge sensor, it will digitally correct offset and gain with the option to correct offset and gain coefficients and linearity over temperature. A second-order compensation can be enabled for temperature coefficients of gain or offset or bridge linearity. The ZSC31010 communicates via ZMDI's ZACwire™ serial interface to the host computer and is easily mass calibrated in a Windows® environment. Once calibrated, the output pin Sig™ can provide selectable 0 to 1 V, rail-to-rail ratiometric analog output, or digital serial output of bridge data with optional temperature data.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Accommodates differential sensor signal spans, from 3 mV/V to 105 mV/V
- ZACwire™ One-Wire Interface (OWI)
- Internal temperature compensation and detection via bandgap PTAT (proportional to absolute temperature)
- Output options: rail-to-rail analog output voltage, absolute analog voltage, digital ZACwire™ One-Wire Interface (OWI)
- Optional sequential output of both temperature and bridge readings on ZACwire™ digital output
- Fast response time, 1 ms (typical)
- High voltage protection up to 30 V with external JFET
- Chopper-stabilized true differential ADC
- Buffered and chopper-stabilized output DAC

Benefits

- No external trimming components required
- Simple PC-controlled configuration and calibration via ZACwire™ One-Wire Interface
- High accuracy (±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -50 to 150°C)
- Single pass calibration – quick and precise
- Suitable for battery-powered applications
- Small SOP8 package

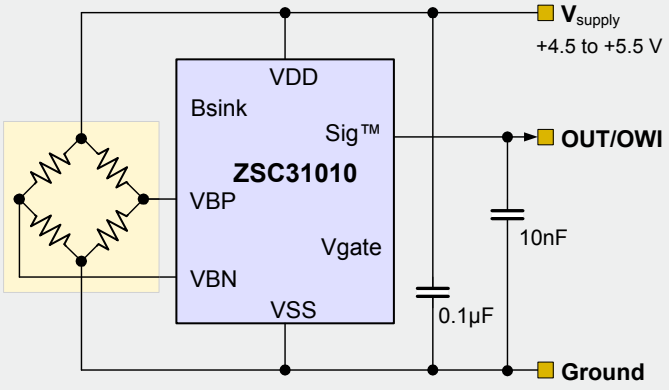
Available Support

- Development Kit available
- Mass Calibration Kit available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

- Supply voltage 2.7 to 5.5 V, with external JFET 5.5V to 30 V
- Current consumption depending on adjusted sample rate: 0.25 mA to 1 mA
- Wide operational temperature: –50 to +150°C

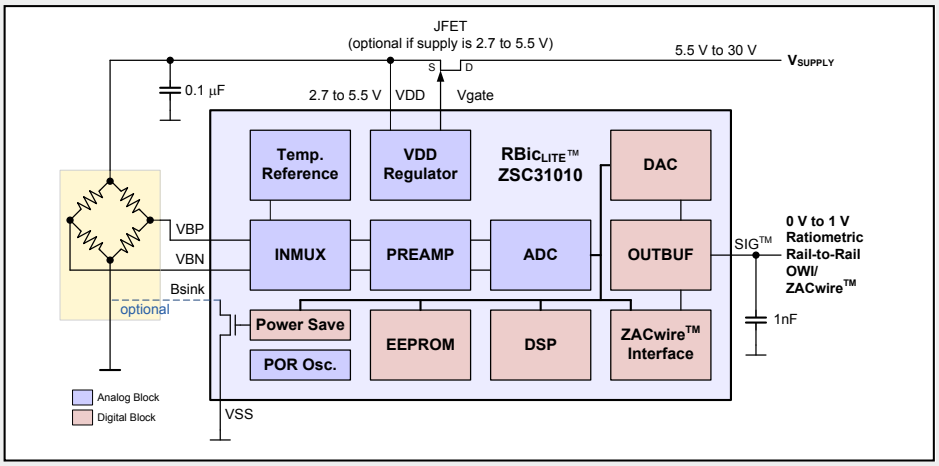
ZSC31010 Application Circuit – Digital Output



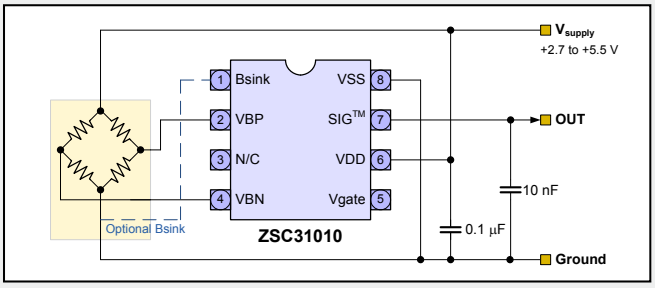
ZSC31010 Block Diagram

Highly Versatile Applications in Many Markets Including

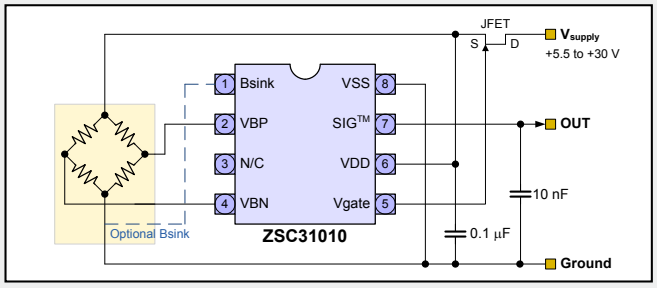
- ***Industrial***
- ***Building Automation***
- ***Office Automation***
- ***White Goods***
- ***Automotive***
- ***Portable Devices***
- ***Your Innovative Designs***



Rail-to-Rail Ratiometric Voltage Output Applications



Absolute Analog Voltage Output Applications



Ordering Examples *(Please see section 11 in the data sheet for additional options.)*

Sales Code	Description	Package
ZSC31010CEB	ZSC31010 Die — Temperature range: -50°C to +150°C	Unsawn on Wafer
ZSC31010CEC	ZSC31010 Die — Temperature range: -50°C to +150°C	Sawn on Wafer Frame
ZSC31010CEG1	ZSC31010 SOP8 (150 mil) — Temperature range: -50°C to +150°C	Tube: add "-T" to sales code Reel: add "-R"
ZSC31010KIT	ZSC31010 ZACwire™ SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, USB Cable, 5 IC Samples	Kit

Brief Description

The ZSC31014 is a CMOS integrated circuit for highly accurate amplification and analog-to-digital conversion of differential and half-bridge input signals. The ZSC31014 can compensate the measured signal for offset, 1st and 2nd order span, and 1st and 2nd order temperature (Tco and Tcg). It is well suited for sensor-specific correction of bridge sensors. Digital compensation of signal offset, sensitivity, temperature drift, and non-linearity is accomplished via an internal digital signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM.

The ZSC31014 is adjustable to nearly all piezo-resistive bridge sensors. Measured and corrected bridge values are provided at digital output pins, which can be configured as I²C™* or SPI. The digital I²C™ interface can be used for a simple PC-controlled calibration procedure to program calibration coefficients into an on-chip EEPROM. The calibrated ZSC31014 and a specific sensor are mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser trimming.

The ZSC31014's integrated diagnostics functions are well suited for safety-critical applications.

Features

- High accuracy (±0.1% FSO @ -25 to +85°C; ±0.25% FSO @ -40 to +125°C)
- 2nd order charge-balancing analog-to-digital converter provides low noise, 14-bit data at sample rates exceeding 2kHz
- Fast power-up to data output response: 3ms at 4MHz
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Eight programmable analog gain settings combine with a digital gain term; accommodates bridges with spans <1mV/V and high offset
- Internal temperature compensation for sensor correction and for corrected temperature output
- 48-bit customer ID field for module traceability

* I²C™ is a trademark of NXP.

Benefits

- Simple PC-controlled configuration and single-pass digital calibration via I²C™ interface – quick and precise; SPI option for measurement mode
- Eliminates need for external trimming components
- On-chip diagnostic features add safety to the application (e.g., EEPROM signature, bridge connection checks, bridge short detection).
- Low-power Sleep Mode lengthens battery life
- Enables multiple sensor networks

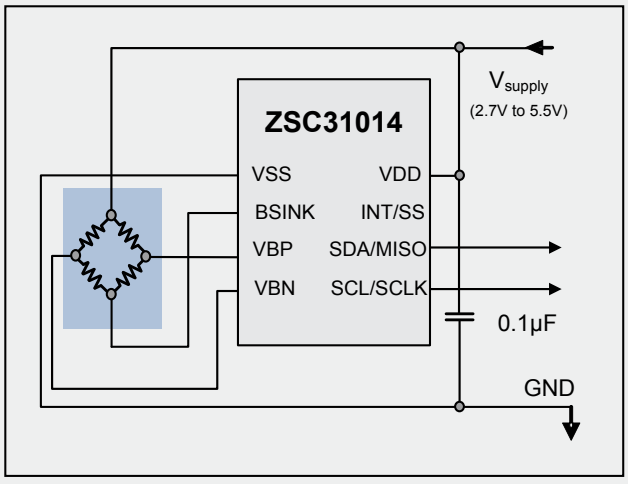
Available Support

- Evaluation Kit
- Application Notes
- Mass Calibration Solution

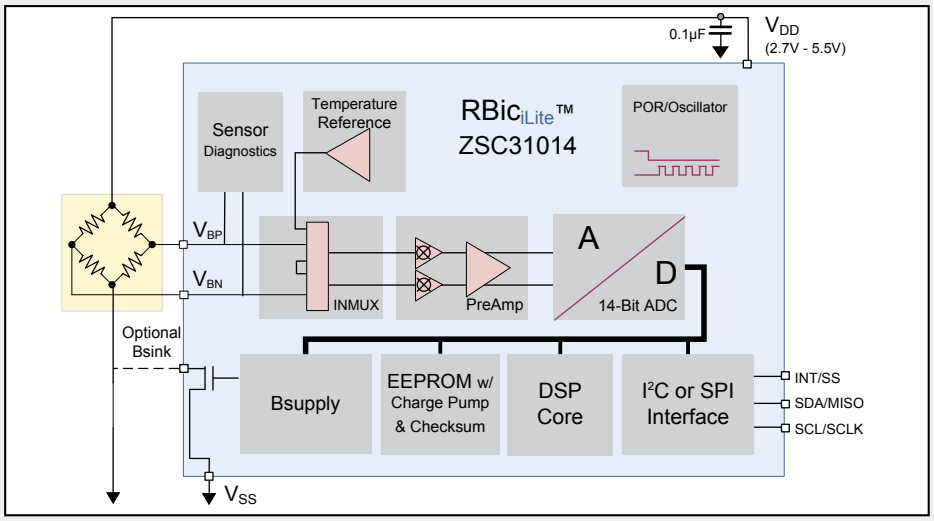
Physical Characteristics

- Wide supply voltage capability: 2.7V to 5.5V
- Current consumption as low as 70µA depending on programmed sample rate
- Low-power Sleep Mode (<2µA @ 25°C)
- Operation temperature: -40°C to +125°C
- Small SOP8 package

ZSC31014 Application: I²C™ Interface, Low-Power Bsink Option, Internal Temperature Correction



ZSC31014 Block Diagram



Applications:

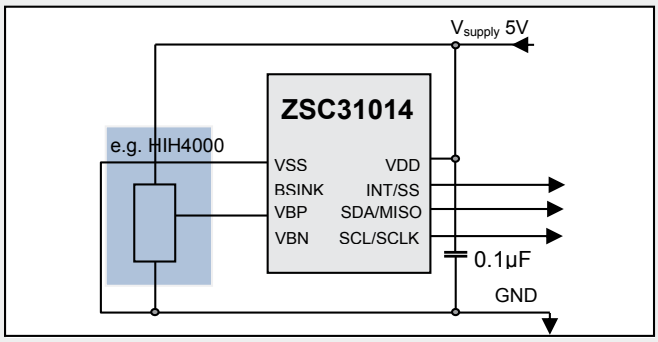
Industrial: building automation, data loggers, pressure meters, leak detection monitoring

Medical: infusion pumps, blood pressure meters, air mattresses, apnea monitors

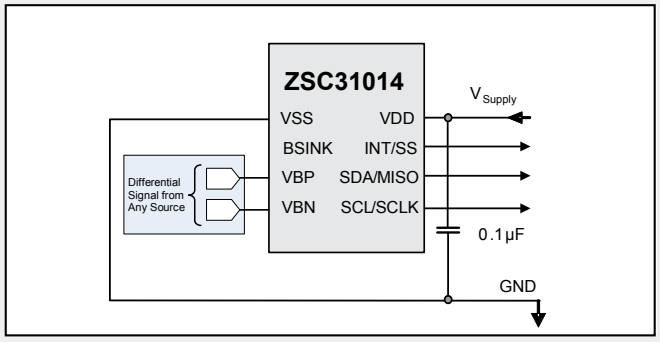
White Goods / Appliances: fluid level, refrigerant

Consumer: body monitors, portable monitors, desktop weather stations, bathroom scales, toys/games

Application: *Half-Bridge Voltage Measurement*



Application: *Generic Differential A2D Converter*



Ordering Examples *(Refer to section 10 in the data sheet for additional options.)*

Sales Code	Description	Package
ZSC31014EAB	ZSC31014 Die — Temperature range: -40°C to +125°C	Unsawn on Wafer
ZSC31014EAC	ZSC31014 Die — Temperature range: -40°C to +125°C	Sawn on Wafer Frame
ZSC31014EAG1	ZSC31014 SOP8 (150 mil) — Temperature range: -40° to +125°C	Tube: add "-T" to sales code / Reel: add "-R"
ZSC31014KIT	ZSC31014 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, USB Cable, 5 IC Samples (software can downloaded on www.zmdi.com/zsc31014)	Kit

Brief Description

The ZSC31015 is adjustable to nearly all piezo-resistive bridge sensors. Measured and corrected bridge values are provided at the SIG™ pin, which can be configured as an analog voltage output or as a one-wire serial digital output.

The digital one-wire interface (OWI) can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSC31015 and a specific sensor are mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser. Integrated diagnostics functions make the ZSC31015 particularly well suited for automotive applications.*

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Programmable analog gain and digital gain; accommodates bridges with spans < 1mV/V and high offset
- Many diagnostic features on chip (e.g., EEPROM signature, bridge connection checks, bridge short detection, power loss detection)
- Independently programmable high and low clipping levels
- 24-bit customer ID field for module traceability
- Internal temperature compensation reference (no external components)
- Option for external temperature compensation with addition of single diode
- Output options: rail-to-rail ratiometric analog voltage (12-bit resolution), absolute analog voltage, digital one-wire interface
- Fast power-up to data out response; output available 5ms after power-up
- Current consumption depends on programmed sample rate: 1mA down to 250µA (typical)
- Fast response time: 1ms (typical)
- High voltage protection up to 30V with external JFET

Benefits

- No external trimming components required
- Simple PC-controlled configuration and calibration via one-wire interface
- High accuracy: ±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -50 to 150°C
- Single-pass calibration – quick and precise

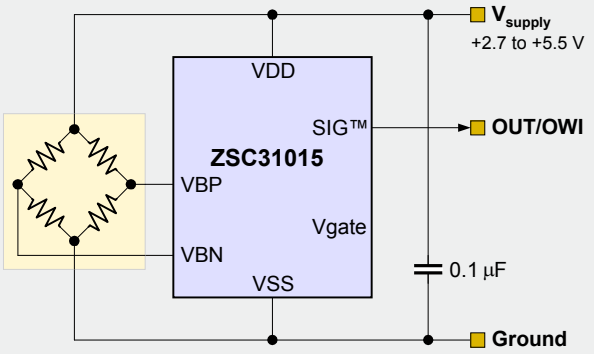
Available Support

- Evaluation Kit available
- Mass Calibration System available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

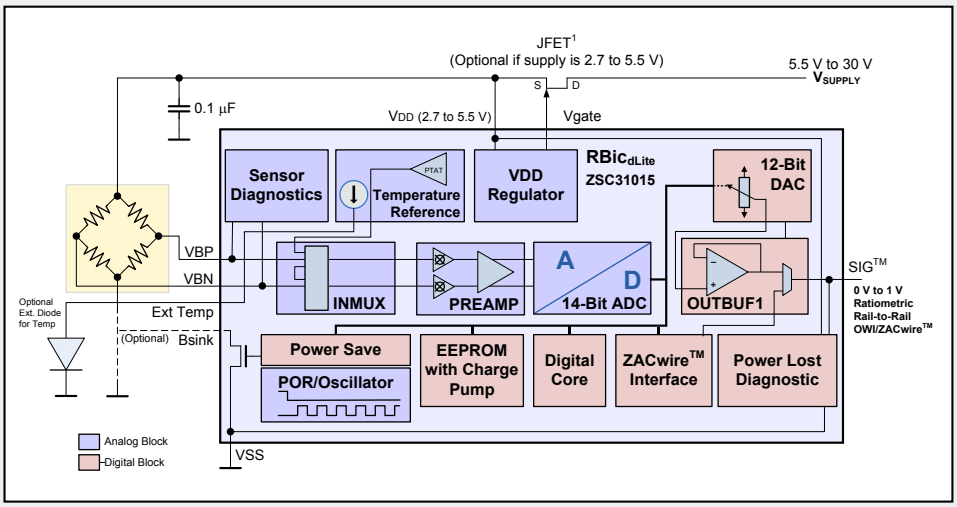
- Wide operation temperature: –50°C to +150°C
- Supply voltage 2.7 to 5.5V; with external JFET, 5.5 to 30V
- Small SOP8 package

ZSC31015 Application Circuit



* Not AEC-Q100-qualified.

ZSC31015 Block Diagram



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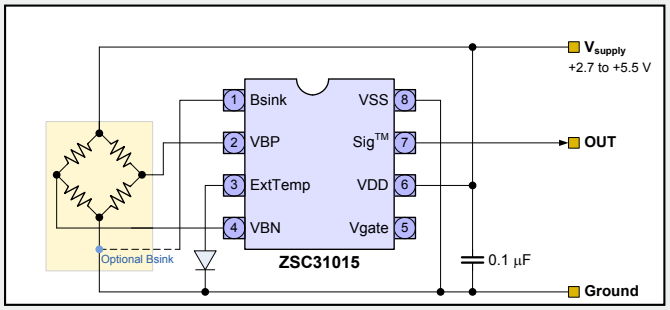
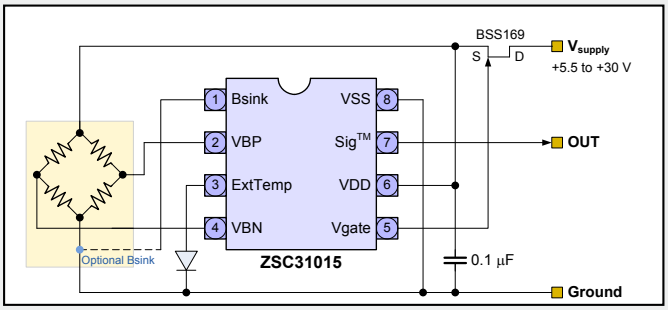
- ***Office Automation***
- ***White Goods***
- ***Automotive ****
- ***Portable Devices***
- ***Your Innovative Designs***

* Not AEC-Q100-qualified.

Rail-to-Rail Ratiometric Voltage Output Applications



Absolute Analog Voltage Output Applications



Ordering Examples *(See section 11 of the data sheet for additional temperature range options.)*

Sales Code	Description	Package
ZSC31015EEB	ZSC31015 Die — Temperature range: -50°C to +150°C	Unsawn on Wafer
ZSC31015EEC	ZSC31015 Die — Temperature range: -50°C to +150°C	Sawn on Wafer Frame
ZSC31015EEG1	ZSC31015 SOP8 (150 mil) — Temperature range: -50°C to +150°C	Tube: add “-T” to sales code. Reel: add “-R”
ZSC31015KIT	ZSC31015 ZACwire™ SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, USB Cable, 5 IC Samples (SOP8 150mil) (ZACwire™ SSC Evaluation Software can be downloaded from www.zmdi.com/zsc31015)	Kit

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 non-linearity 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 (I^2C™*, 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.

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

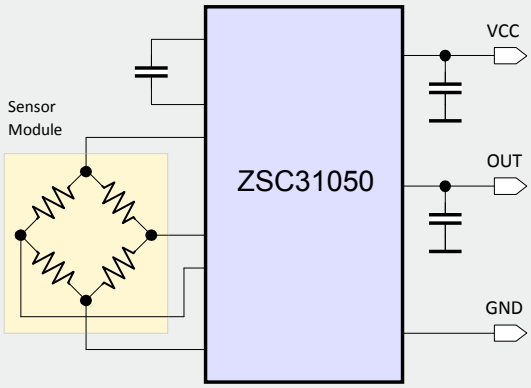
Features

- 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, I^2C™, 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)

Physical Characteristics

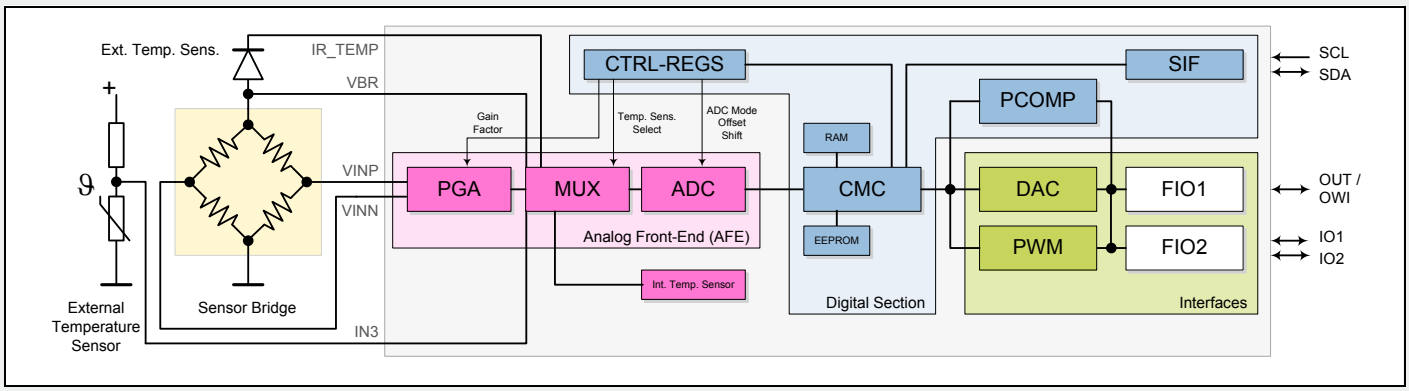
- Operation temperature -40 to +125°C (-40 to +150°C de-rated, depending on product version)
- Supply voltage: 2.7 to 5.5 V; with external JFET: 5 to 40 V
- Available in SSOP16 package or as die

ZSC31050 Overview



* I^2C™ is a trademark of NXP.
† Digital output signal.

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

* Non-AEC-Q100

Ordering Information *(Please refer to section 8 in the data sheet for additional options.)*

Product Sales Code	Description	Package
ZSC31050FEB	ZSC31050 Die — Temperature range: -40°C to +150°C	Unsawn on Wafer
ZSC31050FEC	ZSC31050 Die — Temperature range: -40°C to +150°C	Sawn on Wafer Frame
ZSC31050FEG1	ZSC31050 SSOP-16 — Temperature range: -40°C to +150°C	Tube: add “-T” to sales code Reel: add “-R”
ZSC31050KIT Evaluation Kit V3.0	Modular ZSC31050 SSC Evaluation Kit: three interconnecting boards, five ZSC31050 SSOP-16 samples	Kit
ZSC31050 Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSC31050: MCS boards, cable, connectors	Kit

Brief Description

The ZSC31150 is a CMOS integrated circuit for highly accurate amplification and sensor-specific correction of bridge sensor signals. Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity is accomplished via an internal 16-bit RISC microcontroller running a correction algorithm, with calibration coefficients stored in an EEPROM.

The ZSC31150 is adjustable to nearly all bridge sensor types. Measured values are provided at the analog voltage output or at the digital ZACwire™ and I²C™* interface. The digital interface can be used for a simple PC-controlled calibration procedure in order to program a set of calibration coefficients into an on-chip EEPROM. A specific sensor and a ZSC31150 can be mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or a laser.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Adjustable to nearly all bridge sensor types
- Analog gain of up to 420, overall gain up to 2000
- Output options: ratiometric analog voltage output (5% to 95% maximum, 12.4-bit resolution) or ZACwire™ (digital one-wire-interface)
- Temperature compensation: internal or external diode, bridge resistance, thermistor
- Sensor biasing by voltage or constant current
- Sample rate: up to 7.8kHz
- High voltage protection up to 33V
- Supply current: max. 5.5mA
- Reverse polarity and short-circuit protection
- Wide operation temperature depending on part number: up to -40 to +150°C
- Traceability by user-defined EEPROM entries
- Safety and diagnostic functions

* I²C™ is a trademark of NXP.

Benefits

- No external trimming components required
- Only a few external protection devices needed
- PC-controlled configuration and single pass calibration via I²C™ or ZACwire™ interface: simple, cost efficient, quick, and precise
- End-of-line calibration via I²C™ or ZACwire™ interface
- High accuracy (0.25% FSO @ -25 to 85°C; 0.5% FSO @ -40 to 125°C)
- The ZSC31150 is optimized for automotive environments by its special protection circuitry and excellent electromagnetic compatibility

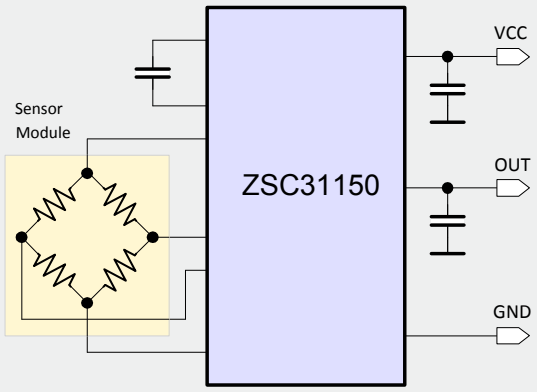
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

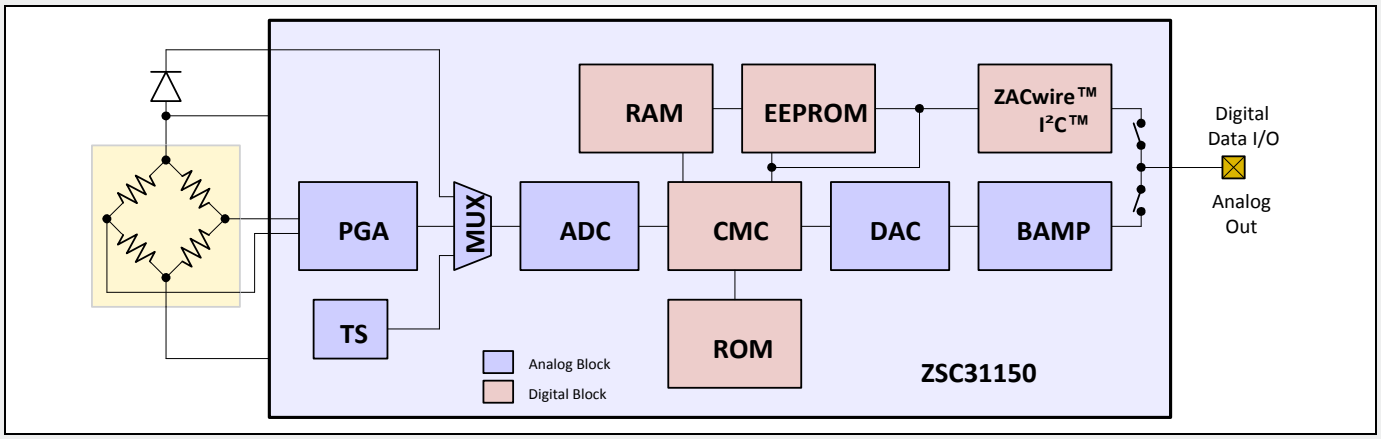
Physical Characteristics

- Supply voltage: 4.5 to 5.5 V
- Operation temperature: -40°C to 125°C (-40°C to +150°C de-rated, depending on product version)
- Available as DFN14 (5mmx4mm) or SSOP14

ZSC31150 Application Circuit



ZSC31150 Block Diagram



Ordering Information *(Refer to section 8 in the data sheet for additional options.)*

Product Sales Code	Description	Package
ZSC31150GAG2-R	ZSC31150 DFN14, 5mmx4mm—Temperature range: -40°C to 125°C	Tape & Reel
ZSC31150GEG2-R	ZSC31150 DFN14, 5mmx4mm—Temperature range: -40°C to 150°C	Tape & Reel
ZSC31150GAG1	ZSC31150 SSOP14—Temperature range: -40°C to +125°C	Tube: add “-T” to sales code Reel: add “-R”
ZSC31150GEG1	ZSC31150 SSOP14—Temperature range: -40°C to +150°C	Tube: add “-T” to sales code Reel: add “-R”
ZSC31150GLG1	ZSC31150 SSOP14—Temperature range: -40°C to +150°C (Long life: 5000h @150°C)	Tube: add “-T” to sales code Reel: add “-R”
ZSC31150KIT Evaluation Kit V1.0	ZSC31150 SSC Evaluation Kit: 3 interconnecting boards, 5 ZSC31150 SSOP14 samples, USB cable (software can be downloaded from product page at www.zmdi.com/zsc31150)	Kit
ZSC31150 Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSC31150: MCS boards, cable, connectors (software can be downloaded from product page)	Kit

Brief Description

The ZSSC3015 sensor signal conditioner is adjustable to nearly all piezo-resistive bridge sensors. Measured and corrected bridge values are provided at the Sig™ pin, which can be configured as an analog voltage output or as a one-wire serial digital output.

The ZACwire™ digital one-wire interface (OWI) can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSSC3015 and a specific sensor are mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser. Integrated diagnostics functions make the ZSSC3015 IC particularly well suited for automotive applications.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and nonlinearity
- Programmable analog gain and digital gain; accommodates bridges with spans < 1mV/V and high offset
- Many diagnostic features on chip (e.g., EEPROM signature, bridge connection checks, bridge short detection, power loss detection)
- Independently programmable high and low clipping levels
- 24-bit customer ID field for module traceability
- Internal temperature compensation reference (no external components)
- Option for external temperature compensation with addition of single diode
- Output options: rail-to-rail ratiometric analog voltage (12-bit resolution), absolute analog voltage, ZACwire™ digital one-wire interface
- Fast power-up to data out response; output available 5ms after power-up
- Current consumption depends on programmed sample rate and mode: 1mA down to 300µA (typ.)
- Fast response time: 1.4ms typical
- High voltage protection: ≤ 30V with external JFET
- AEC-Q100 qualified

Benefits

- No external trimming components required
- PC-controlled configuration and calibration via ZACwire™ one-wire interface – simple, low cost
- High accuracy (as high as ±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -50 to 150°C)
- Single-pass calibration – quick and precise

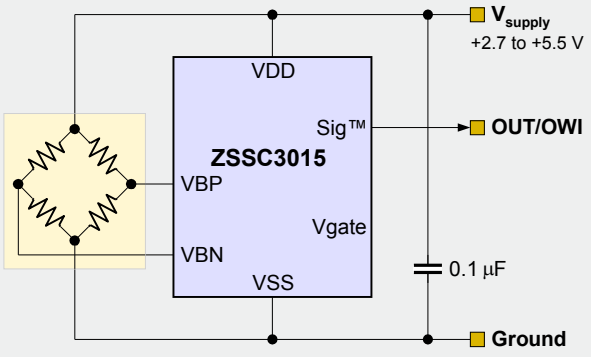
Available Support

- Evaluation Kit available
- Mass Calibration System available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

- Wide operation temperature: –50°C to +150°C
- Supply voltage 2.7 to 5.5V; with external JFET, 5.5 to 30V
- Small SOP8 package

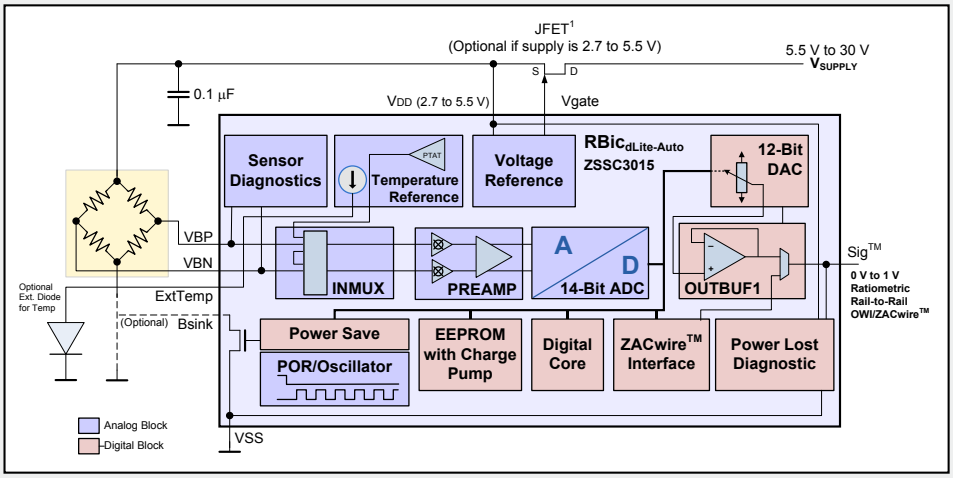
ZSSC3015 Application Circuit



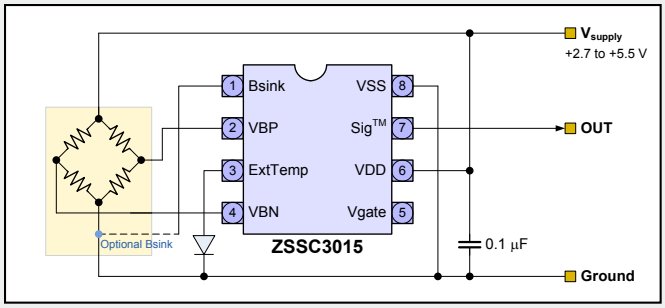
ZSSC3015 Block Diagram

Highly Versatile Applications in Many Markets Including

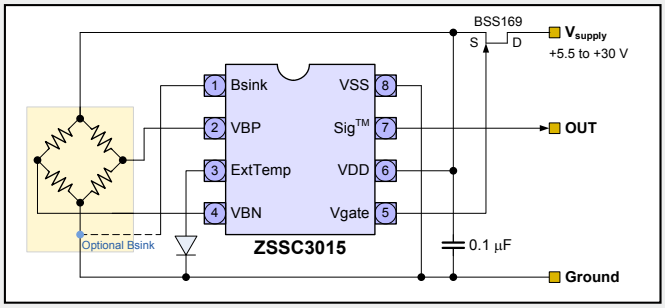
- ***Industrial***
- ***Building Automation***
- ***Office Automation***
- ***White Goods***
- ***Automotive***
- ***Portable Devices***
- ***Your Innovative Designs***



Rail-to-Rail Ratiometric Voltage Output Applications



Absolute Analog Voltage Output Applications



Part Ordering Examples *(See section 11 in the data sheet for additional options.)*

Sales Code	Description	Package
ZSSC3015NE1B	ZSSC3015 Die — Temperature range: -50°C to +150°C	Unsawn on Wafer
ZSSC3015NE1C	ZSSC3015 Die — Temperature range: -50°C to +150°C	Sawn on Wafer Frame
ZSSC3015NE2T(R)	ZSSC3015 SOP8 (150 mil) — Temperature range: -50°C to +150°C	Tube: add "-T" to sales code. Reel: add "-R"
ZSSC3015KIT	ZSSC3015 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, USB cable, 5 IC samples, instructions for downloading SSC Evaluation Software	Kit

Brief Description

The ZSSC3131 is a member of the ZSSC313x product family of CMOS integrated circuits designed for automotive/ industrial sensor applications. All family members are well suited for highly-accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure in an on-chip EEPROM.

The ZSSC3131 is optimized for simple switch and cost-sensitive sensor applications. The integrated adjustable digital filter enables building fast-switching real-time applications as well as stabilized applications for switching input signals that are unstable or disrupted.

Features

- Adjustable to nearly all resistive bridge sensor types: maximum analog gain of 105; maximum overall gain of 420
- Sample rate up to 200 Hz
- ADC resolution 13/14 bit
- Internal temperature compensation
- Integrated adjustable digital filter
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: Max. 5.5mA
- Reverse polarity and short circuit protection
- Wide operation temperature range: -40 to +150°C
- Traceability by user-defined EEPROM entries

* Note: I²C™ is a trademark of NXP.
** FSO = Full Scale Output.

Benefits

- Family approach offers the best fitting IC selection to build cost-optimized applications
- No external trimming components required
- Low number of external components needed
- PC-controlled configuration and One-Pass/ end-of-line calibration via I²C™* or ZACwire™ interface: Simple, cost-efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/industrial environments due to robust protection circuitries, excellent electromagnetic compatibility, and AEC-Q100 qualification

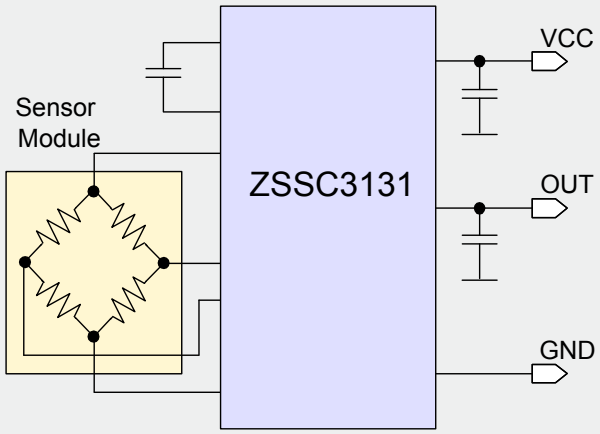
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

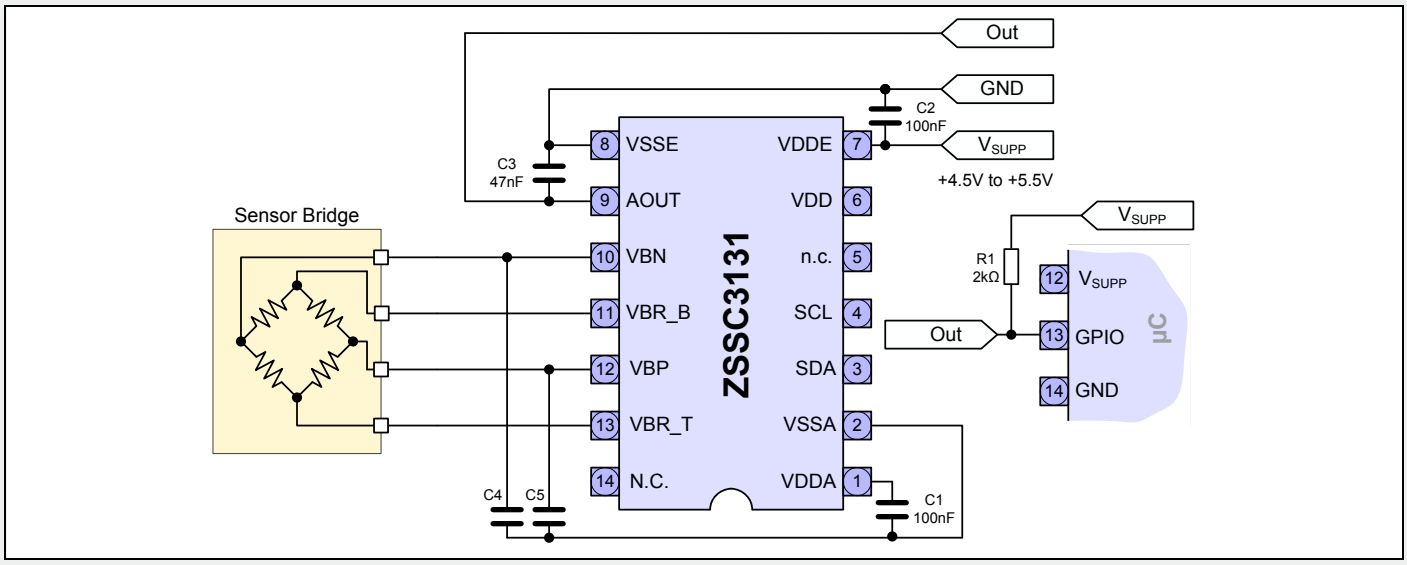
Physical Characteristics

- Supply voltage 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoHS-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3131 Minimum Application Requirements



ZSSC3131 Switch Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3131BA2T	ZSSC3131 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3131BA2R	ZSSC3131 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3131BE2T	ZSSC3131 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3131BE2R	ZSSC3131 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors	Kit

Brief Description

The ZSSC3135 is a member of the ZSSC313x family of CMOS integrated circuits designed for automotive/industrial sensor applications. All family members are well suited for highly accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure in an on-chip EEPROM.

The ZSSC3135 is specially designed for piezoresistive bridge sensor elements. The amplification stage with an analog gain of 105 in combination with optional temperature compensation via an external temperature sensor meets or exceeds the requirements of piezoresistive sensor applications.

Features

- Adjustable to nearly all resistive bridge sensor types: analog gain of up to 105, maximum overall gain of 420
- Sample rate up to 200 Hz
- ADC resolution 13/14 bit
- Safety functionality sensor connection
- External temperature sensor
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: max. 5.5mA
- Reverse polarity and short circuit protection
- Wide operation temperature range: -40 to +150°C
- Traceability by user-defined EEPROM entries

* Note: I²C™ is a trademark of NXP.
** FSO = Full Scale Output.

Benefits

- Family approach offers the best fitting IC selection to build cost-optimized applications
- No external trimming components required
- Low number of external components needed
- PC-controlled configuration and one-pass/ end-of-line calibration via I²C™* or ZACwire™ interface: simple, cost-efficient, quick, and precise
- High accuracy: 0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C
- Optimized for automotive/industrial environments due to robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification

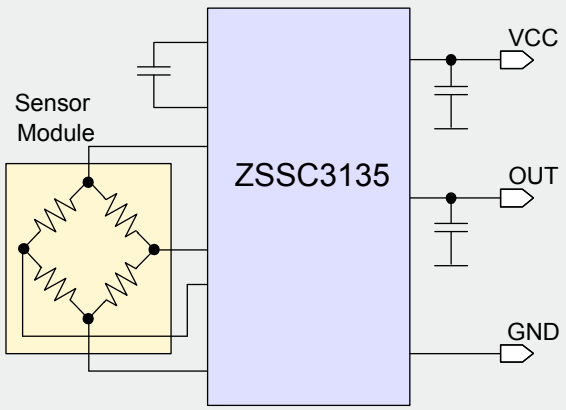
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

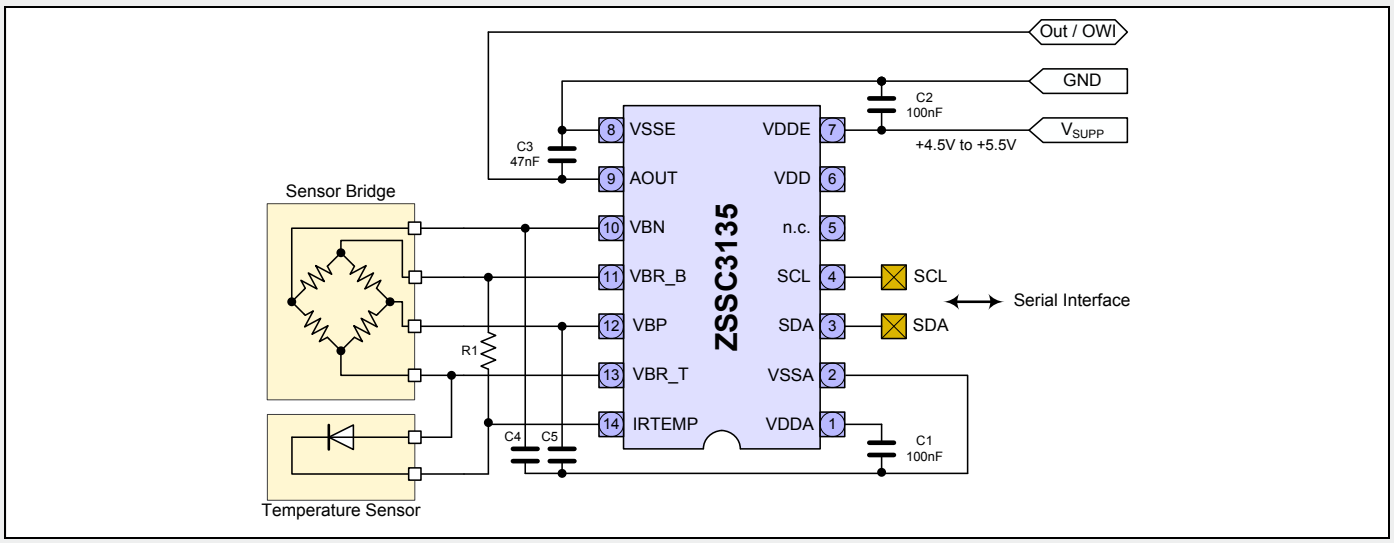
Physical Characteristics

- Supply voltage: 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoHS-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3135 Minimum Application Requirements



ZSSC3135 Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3135BA2T	ZSSC3135 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3135BA2R	ZSSC3135 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3135BE2T	ZSSC3135 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3135BE2R	ZSSC3135 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors	Kit

Brief Description

The ZSSC3136 is a member of the ZSSC313x family of CMOS integrated circuits for automotive/ industrial sensor applications. All family members are well suited for highly accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure in an on-chip EEPROM.

The ZSSC3136 is optimized for SIL (Safety Integrity Level) rated switch applications. The integrated adjustable digital filter offers the possibility of setting up fast switching real-time applications as well as stabilized switching applications in the case of disturbed or unstable input signals.

In addition to the general features for switch applications, the ZSSC3136 offers the capability to set up safety-relevant SIL2 rated switches due to its extended safety functionalities.

Features

- Analog gain of 105, maximum overall gain of 420
- Sample rate: 200 Hz maximum
- ADC resolution: 13/14 bit
- External temperature sensor
- Safety functionalities: Calibration microcontroller, sensor connection, analog front-end
- Adjustable to nearly all resistive bridge sensor types
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% in maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: max. 5.5mA
- Reverse polarity and short circuit protection
- Wide operation temperature: -40 to +150°C
- Traceability by user-defined EEPROM entries

Benefits

- Capability for setting up SIL level 2 applications
- Application-focused feature set
- No external trimming components required
- Only a few external protection devices needed
- PC-controlled configuration and one-pass/ end-of-line calibration via I²C™* or ZACwire™ interface: simple, cost-efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/ industrial environment due to robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification

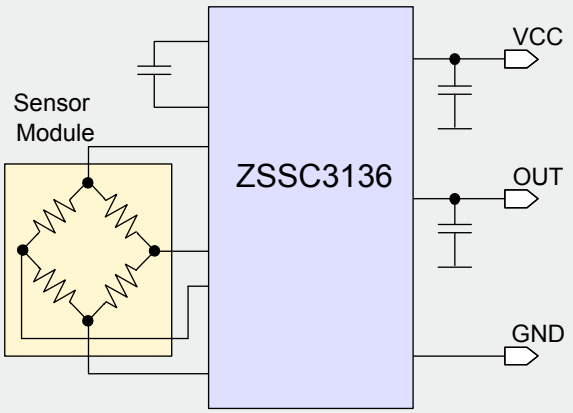
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

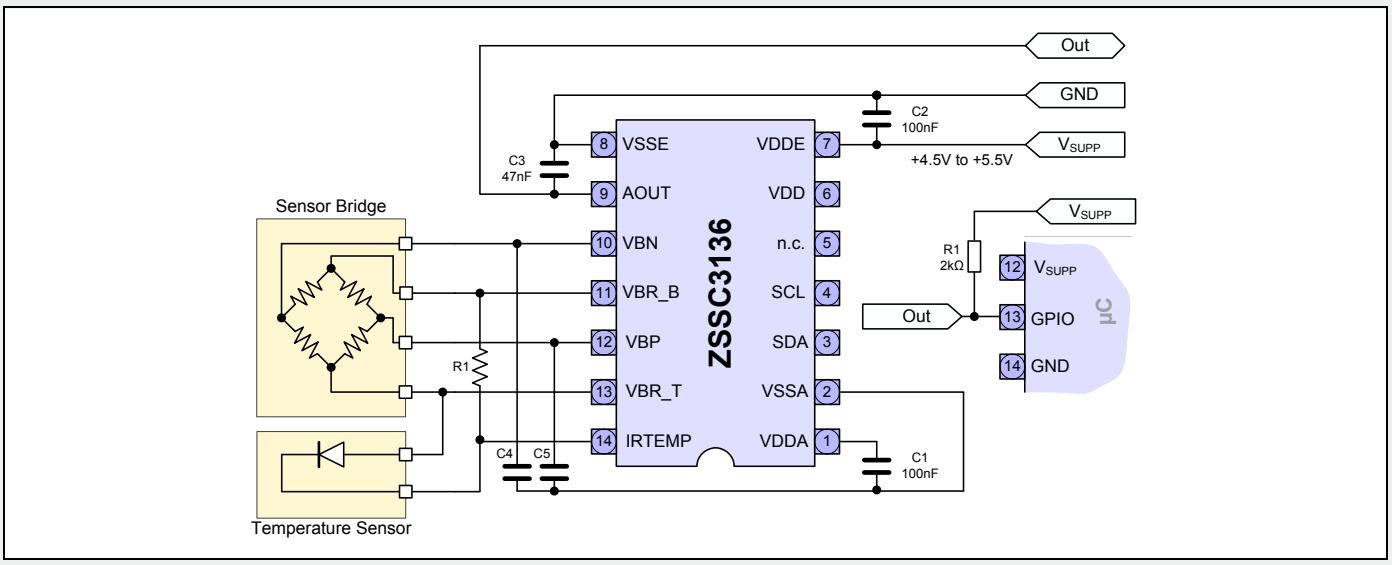
Physical Characteristics

- Supply voltage 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoHS-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3136 Minimum Application Requirements



ZSSC3136 Switch Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3136BA2T	ZSSC3136 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3136BA2R	ZSSC3136 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3136BE2T	ZSSC3136 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3136BE2R	ZSSC3136 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors	Kit

* Note: I²C™ is a trademark of NXP.
** FSO = Full Scale Output.

Brief Description

The ZSSC3138 is a member of the ZSSC313x product family of CMOS integrated circuits designed for automotive/ industrial sensor applications. All family members are well suited for highly accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure on chip (EEPROM).

The ZSSC3138 offers a maximum analog gain of 420 and two offset compensation features. These fit perfectly with the requirements of ceramic thick-film-based sensor elements as well as strain gauges. The high amplification in combination with the offset compensation offers the capability to set up ceramic thick-film-based sensor applications without laser trimming, which leads to better long-term stability.

Features

- Adjustable to nearly all resistive bridge sensor types, analog gain of 420, maximum overall gain of 1680
- Enhanced sample rate: 7.8 kHz maximum
- High ADC resolution 15/16 bit
- Safety functionality sensor connection
- Internal temperature compensation
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: 5.5mA maximum
- Reverse polarity and short circuit protection
- Wide operation temperature range between -40 to +150°C
- Traceability by user-defined EEPROM entries

* Note: I²C™ is a trademark of NXP.
** FSO = Full Scale Output.

Benefits

- Family approach offers the best fitting IC selection to build cost-optimized applications
- No external trimming components required
- Low number of external components needed
- PC-controlled configuration and one-pass/ end-of-line calibration via I²C™* or ZACwire™ interface: simple, cost efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/industrial environments due to robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification

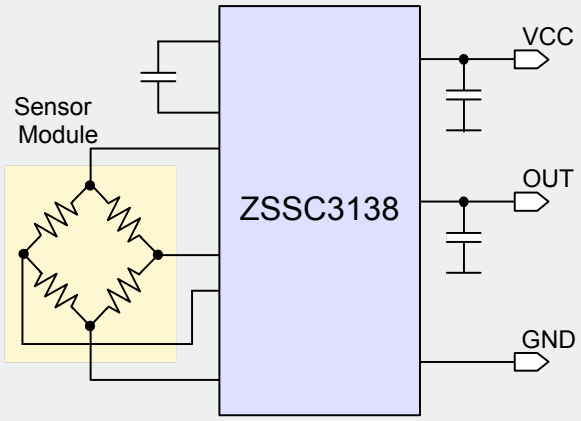
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

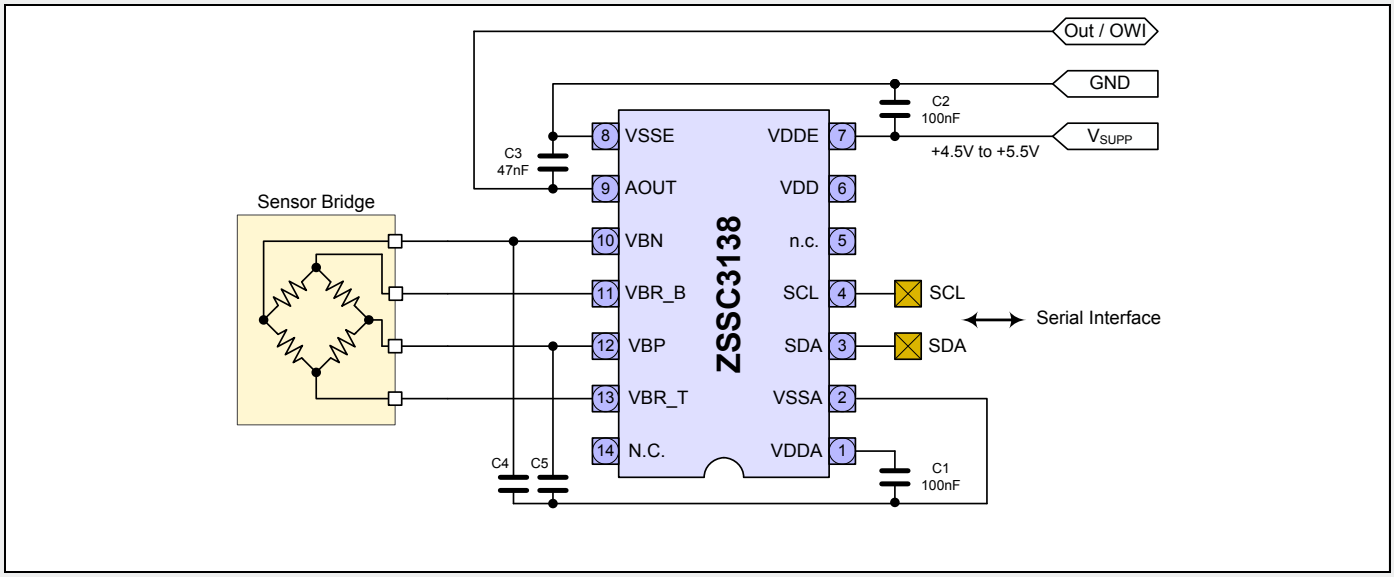
Physical Characteristics

- Supply voltage 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoSH-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3138 Minimum Application Requirements



ZSSC3138 Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3138AA2T	ZSSC3138 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3138AA2R	ZSSC3138 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3138AE2T	ZSSC3138 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3138AE2R	ZSSC3138 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors	Kit

Brief Description

The ZSSC3154 is an integrated circuit for highly accurate amplification and sensor-specific correction of a bridge sensor signal. Up to two temperature sensors can also be read in parallel.

The circuitry provides different configurations of the analog outputs to show two measurement results simultaneously. This also allows generating a complementary bridge sensor signal, which is often a requirement in safety-relevant applications.

The ZSSC3154 can measure and process two external temperature sensors to compensate the temperature drift of the bridge sensor signal and to output a separate temperature signal.

An integrated calibration microcontroller with an on-chip EEPROM performs the digital compensation of the sensor offset, the sensitivity, the temperature drift, and the nonlinearity of a sensor signal.

The single-pass, digital end-of-line calibration combined with the integrated broken-chip detection supports automatic and highly efficient mass production.

Features

- Differential bridge sensor input
- Half-bridge sensor or temperature sensor input
- Digital compensation of offset, gain, nonlinearity, and temperature dependency
- Two analog outputs; behavior programmable by EEPROM configuration
- Sequential analog output mode provides two measurement values at one output pin
- On-chip diagnostic and safety features including sensor connection diagnostic and broken-chip detection
- 2 EEPROM words for arbitrary user data
- Multiple configurable output options

Benefits

- Bridge sensor signal validation for safety applications via two antivalent analog outputs or via half-bridge sensor measurement output
- Simultaneous measurement of sensor signals, including temperature signal for compensation and for temperature output
- Efficient use of non-calibrated elements for bridge sensors and temperature sensors without external trimming components
- Single-pass end-of-line calibration algorithm minimizes production costs
- Excellent EMC/ESD robustness and AEC-Q100 qualification

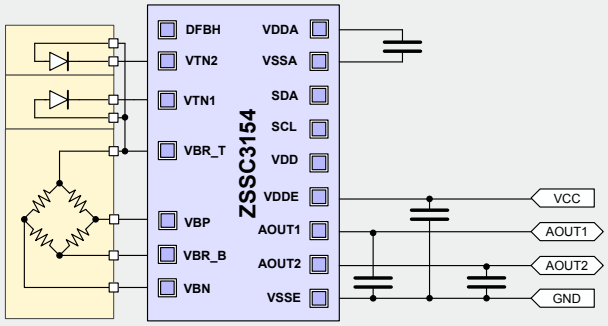
Available Support

- Evaluation Kit
- Application Notes
- Calculation Tools

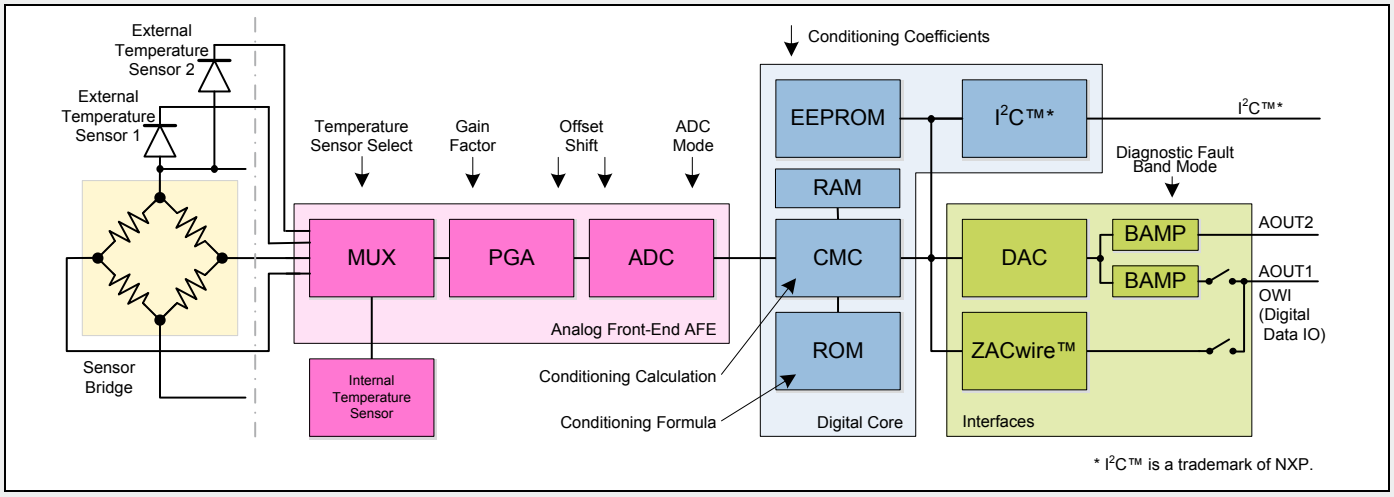
Physical Characteristics

- Supply voltage: 4.5 to 5.5V
- Maximum supply voltage: 7.7V
- Input span: 1.8 to 267mV/V
- ADC resolution: 14 bit
- Output resolution: > 12 bit from 10% to 90%
- Operating temperature range: -40°C to 140°C
- Package: QFN32 5x5mm or die

ZSSC3154 Basic Circuit



ZSSC3154 Block Diagram



Ordering Information

Product Sales Code	Description	Package
ZSSC3154BA1B	ZSSC3154 Die - Temperature Range -40 to 125°C	Wafer
ZSSC3154BA1C	ZSSC3154 Die - Temperature Range -40 to 125°C	Sawn on frame
ZSSC3154BA3R	ZSSC3154 QFN32 5x5 mm - Temperature Range -40 to 125 °C	Reel
ZSSC3154BE3R	ZSSC3154 QFN32 5x5 mm - Temperature Range -40 to 140 °C	Reel
ZSSC3154KIT	ZSSC3154 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement, 5 QFN32 5x5 Samples (software can be downloaded from the product page www.zmdi.com/zssc3154)	Kit

Brief Description

The ZSSC3170 is a CMOS integrated circuit for highly accurate amplification and sensor specific correction of bridge sensor signals. Featuring a maximum analog gain of 420, as well as extended offset compensation capabilities, the ZSSC3170 is adjustable to nearly all resistive bridge sensor types.

Digital compensation of offset, sensitivity, temperature drift, and nonlinearity is accomplished via a 16-bit RISC microcontroller. Conditioning coefficients are stored in an EEPROM certified for automotive applications.

Measured values are provided by one of the digital LIN or PWM interfaces. Each interface can support end-of-line calibration using the sensor output. Noise sensitivity is greatly reduced because the calibration equipment and the ZSSC3170 are mated digitally.

For quick and easy evaluation and support for calibrating prototypes, ZMDI offers the ZSSC3170 SSC Evaluation Kit, which includes evaluation hardware, SSOP20 samples, and software.

Features

- Complies with LIN specifications 1.3 / 2.0 / 2.1
- Configurable LIN publisher frame content
- Data conversion rate of up to 430Hz fully utilizes the maximum LIN channel capacity of 20kbit/s
- PWM high-side and low-side switches, support for LIN communication for end-of-line calibration
- Digital compensation of offset, gain, temperature effects up to 2nd order, and nonlinearity up to 3rd order. Compensation of temperature sensor offset, gain, and nonlinearity up to 2nd order.
- Internal or external temperature reference
- Media temperature sensing by diode or RTD
- Load dump protection of the LIN pin up to ±40V
- Accuracy ±0.25% FSO @ -20 to 85°C
  ±0.50% FSO @ -40 to 125°C
  ±1.00% FSO @ -40 to 150°C
- 3 EEPROM words available for optional user data

Benefits

- Measurand and temperature signal available via one output pin
- Compatible with nearly all resistive bridge inputs
- No external trimming components required
- Single-pass calibration minimizes calibration costs
- End-of-line calibration using sensor output
- Optimized for automotive environments with special protection circuitry, excellent electro-magnetic compatibility, and numerous diagnostic features

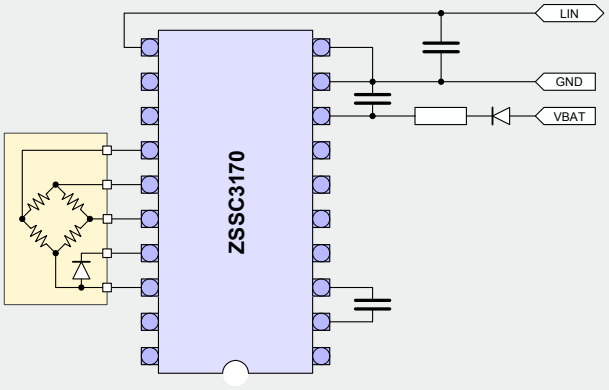
Available Support

- Evaluation Kit
- Application Notes
- Calculation Tools

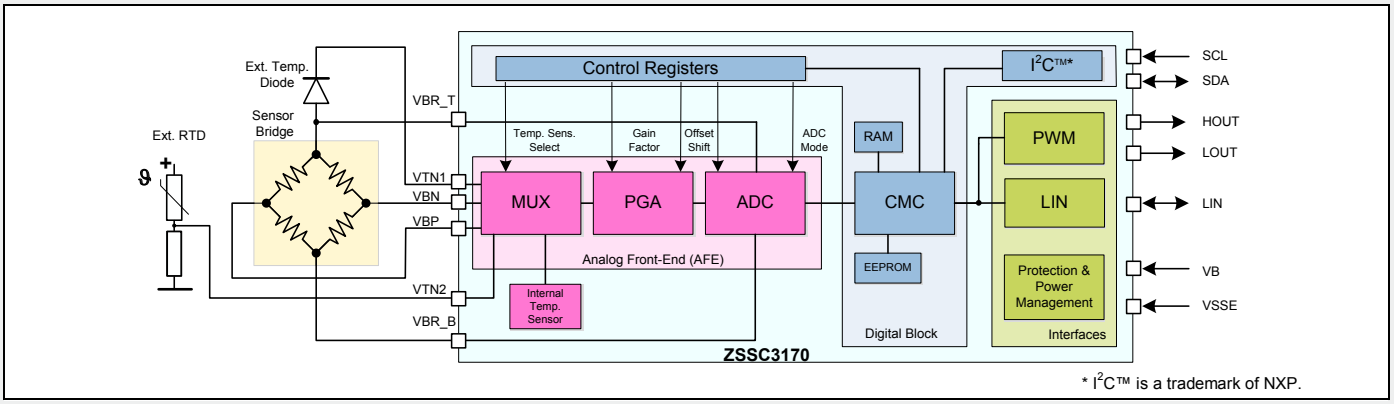
Physical Characteristics

- Supply voltage: 7 to 18 V
- Current consumption in Sleep Mode: ≤ 100µA
- Input span: 1.8 to 267 mV/V
- ADC resolution: 13 to 14 bit
- Output resolution: up to 12-bit (LIN and PWM)
- Operating temperature range: -40 to 125°C
- Extended operating temperature range: ≤150°C
- Package: SSOP20 or die

ZSSC3170 Basic Circuit



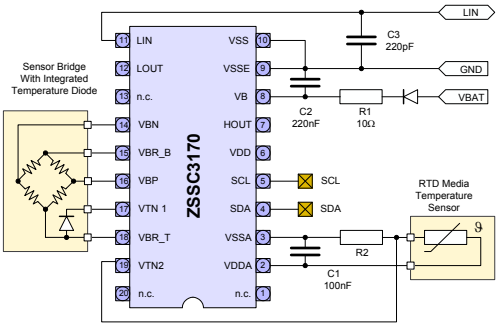
ZSSC3170 Block Diagram



Applications

LOCAL INTERCONNECT NETWORK

LIN Pressure Sensor with Temperature Sensor



Ordering Information *(See section 7 of the data sheet for additional options.)*

Product Sales Code	Description	Package
ZSSC3170EE1B	ZSSC3170 Die — Temperature range: -40°C to +150°C	Unsawn on Wafer, 2450 pcs.
ZSSC3170EE1C	ZSSC3170 Die — Temperature range: -40°C to +150°C	Sawn on Wafer Frame, 2450 pcs.
ZSSC3170EE2	ZSSC3170— SSOP20 — Temperature range: -40°C to +150°C	Add R for 13" reel, 2000 pcs. Add T for tube, 660 pcs.
ZSSC3170EA1B	ZSSC3170 Die — Temperature range: -40°C to +125°C	Unsawn on Wafer, 2450 pcs.
ZSSC3170EA1C	ZSSC3170 Die — Temperature range: -40°C to +125°C	Sawn on Wafer Frame, 2450 pcs.
ZSSC3170KIT	ZSSC3170 Evaluation Kit and 5 SSOP20 samples	Kit

Brief Description

The ZSSC3122 is a CMOS integrated circuit for accurate capacitance-to-digital conversion and sensor-specific correction of capacitive sensor signals. Digital compensation of sensor offset, sensitivity, and temperature drift is accomplished via an internal digital signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM.

The ZSSC3122 is configurable for capacitive sensors with capacitances up to 10pF and a sensitivity of 125aF/LSB. It is compatible with both single capacitive sensors (both terminals must be accessible) and differential capacitive sensors. Measured and corrected sensor values can be output as I²C™ *, SPI, PDM, or alarms.

The I²C™ interface can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSSC3122 and a specific sensor are mated digitally: fast, precise, and without the cost overhead of trimming by external devices or laser.

Features

- Maximum Target input capacitance: 10pF
- Sampling rates as fast as 0.7ms at 8-bit resolution; 1.6ms at 10-bit; 5.0ms at 12-bit; 18.5ms at14-bit
- Digital compensation of sensor: piece-wise 1st and 2nd order sensor compensation or up to 3rd order single-region sensor compensation
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Internal temperature compensation reference (no external components)
- Programmable capacitance span and offset
- Layout customized for die-die bonding with sensor for low-cost, high-density chip-on-board assembly
- Accuracy † as high as
  ±0.25% FSO@ -40 to 125°C, 3V, 5V, Vsupply ±10%

Benefits

- Minimized calibration costs: no laser trimming, one-pass calibration using a digital interface
- Excellent for low-power battery applications

Interfaces

- I²C™ or SPI interface—easy connection to a µC
- PDM outputs (Filtered Analog Ratiometric) for both capacitance and temperature
- Up to two alarms that can act as full push-pull or open-drain switches

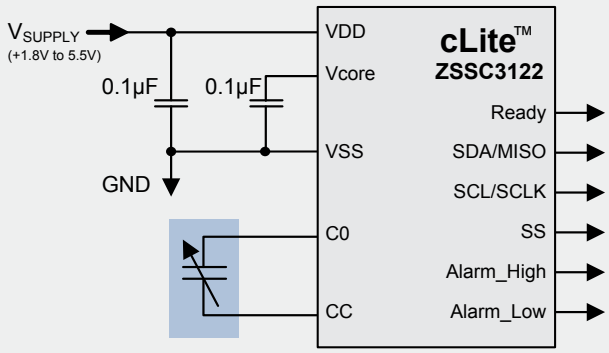
Physical Characteristics

- Supply voltage: 1.8 to 5.5V
- Typical current consumption 650µA down to 60µA depending on configuration
- Typical Sleep Mode current: ≤ 1µA at 85°C
- Operation temperature: –40°C to +125°C
- Die or TSSOP14 package

Available Support

- ZSSC3122 SSC Evaluation Kit available: SSC Evaluation Board, samples, software, documentation.
- Support for industrial mass calibration available.
- Quick circuit customization option for large production volumes.

Application: Digital Output, Alarms

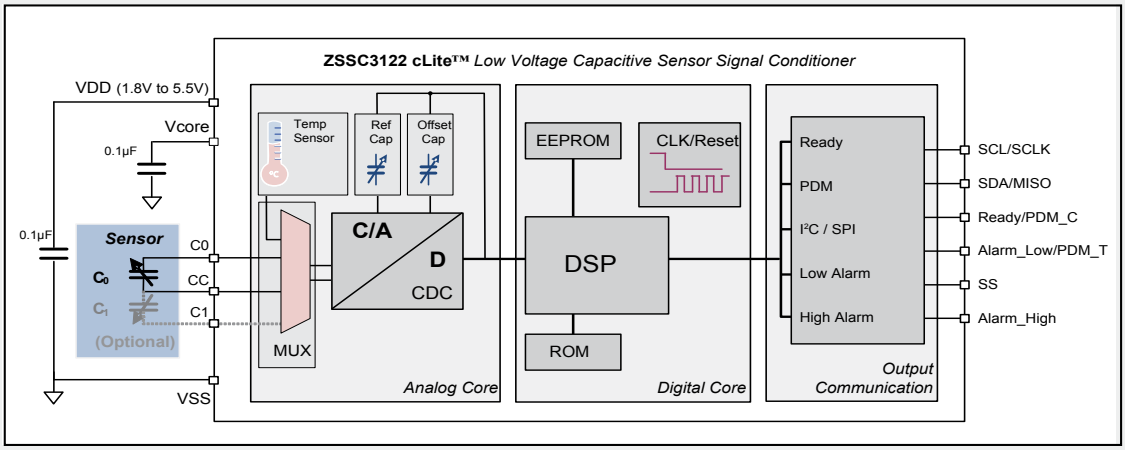


* I²C™ is a registered trademark of NXP.

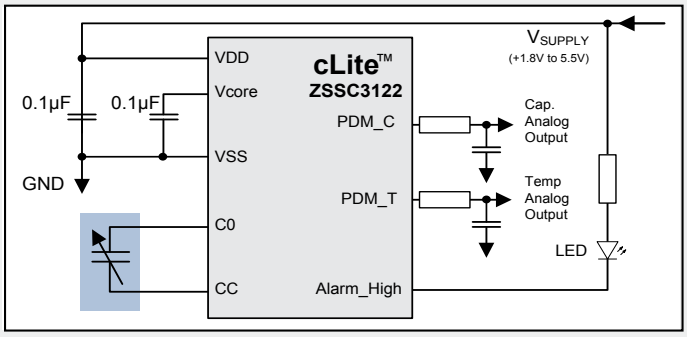
† See data sheet section 1.3 for restrictions.

ZSSC3122

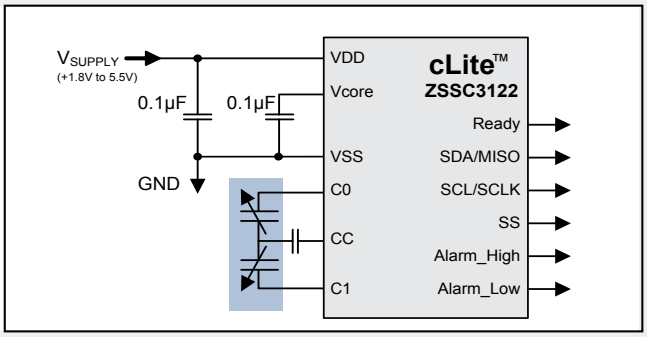
Block Diagram



Application: *Analog Output*



Application: *Differential Capacitance Input*



Ordering Codes

Sales Code	Description	Package
ZSSC3122AA1B	ZSSC3122 die — Temperature range: -40°C to +125°C	*Tested dice on un-sawn wafer*
ZSSC3122AI1B	ZSSC3122 die — Temperature range: -40°C to +85°C	*Tested dice on un-sawn wafer*
ZSSC3122AA1C	ZSSC3122 die — Temperature range: -40°C to +125°C	*Tested dice on frame*
ZSSC3122AI1C	ZSSC3122 die — Temperature range: -40°C to +85°C	*Tested dice on frame*
ZSSC3122AA2	ZSSC3122 TSSOP14 — Temperature range: -40°C to +125°C – Lead-free package	Tube: add “T” to code; reel: add “R”
ZSSC3122AI2	ZSSC3122 TSSOP14 — Temperature range: -40°C to +85°C – Lead-free package	Tube: add “T” to code; reel: add “R”
ZSSC3122KIT	ZSSC3122 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, USB Cable, 5 IC Samples (software can be downloaded from www.zmdi.com/zssc3122)	Kit

Brief Description

The ZSSC3123 is a CMOS integrated circuit for accurate capacitance-to-digital conversion and sensor-specific correction of capacitive sensor signals. Digital compensation of sensor offset, sensitivity, and temperature drift is accomplished via an internal digital signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM.

The ZSSC3123 is configurable for capacitive sensors with capacitances up to 260pF and a sensitivity of 125aF/LSB to 1pF/LSB depending on resolution, speed, and range settings. It is compatible with both single capacitive sensors (both terminals must be accessible) and differential capacitive sensors. Measured and corrected sensor values can be output as I²C™*, SPI, PDM, or alarms.

The I²C™ interface can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSSC3123 and a specific sensor are mated digitally: fast, precise, and without the cost overhead of trimming by external devices or laser.

Features

- Maximum Target input capacitance: 260pF
- Sampling rates as fast as 0.7ms at 8-bit resolution; 1.6ms at 10-bit; 5.0ms at 12-bit; 18.5ms at 14-bit
- Digital compensation of sensor: piece-wise 1st and 2nd order sensor compensation or up to 3rd order single-region sensor compensation
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Internal temperature compensation reference (no external components)
- Programmable capacitance span and offset
- Layout customized for die-die bonding with sensor for low-cost, high-density chip-on-board assembly
- Accuracy † as high as
  ±0.25% FSO@ -40 to 125°C, 3V, 5V, Vsupply ±10%

Benefits

- Minimized calibration costs: no laser trimming, one-pass calibration using a digital interface
- Wide capacitance range to support a broad portfolio of different sensor elements
- Excellent for low-power battery applications

Interfaces

- I²C™ or SPI interface—easy connection to a µC
- PDM outputs (Filtered Analog Ratiometric) for both capacitance and temperature
- Up to two alarms that can act as full push-pull or open-drain switches

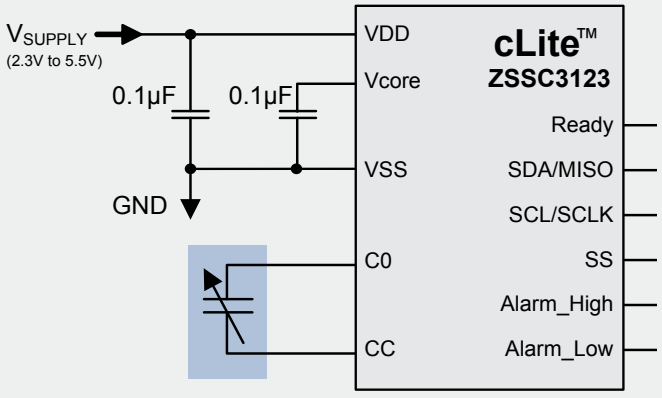
Physical Characteristics

- Supply voltage: 2.3V to 5.5V
- Typical current consumption 650µA down to 60µA depending on configuration
- Typical Sleep Mode current: ≤ 1µA at 85°C
- Operation temperature: –40°C to +125°C
- Die or TSSOP14 package

Available Support

- ZSSC3123 SSC Evaluation Kit available: SSC Evaluation Board, samples, software, documentation.
- Support for industrial mass calibration available.
- Quick circuit customization option for large production volumes.

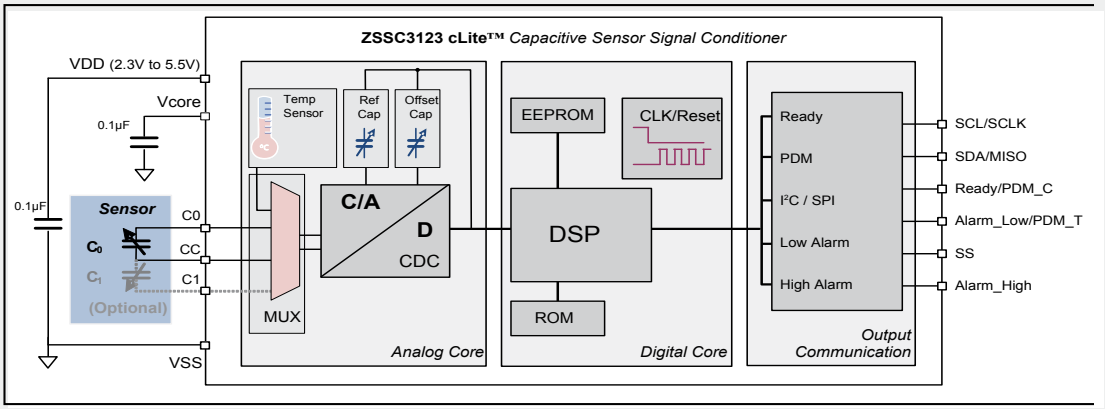
Application: Digital Output, Alarms



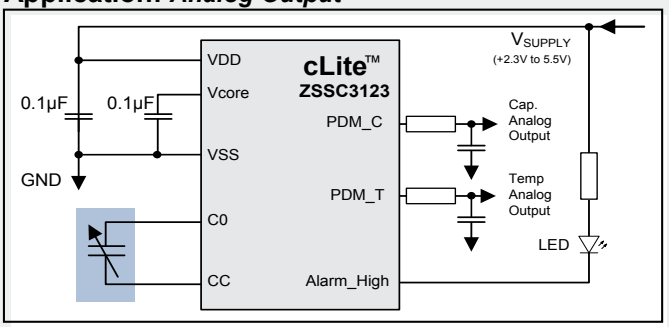
* I²C™ is a registered trademark of NXP.
† See data sheet section 1.3 for restrictions.

ZSSC3123

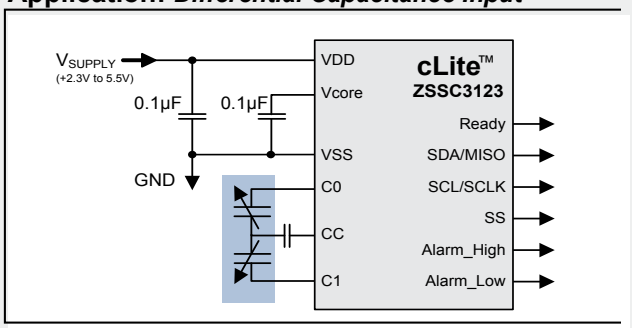
Block Diagram



Application: *Analog Output*



Application: *Differential Capacitance Input*



Ordering Codes

Sales Code	Description	Package
ZSSC3123AA1B	ZSSC3123 die — Temperature range: -40°C to +125°C	*Tested dice on un-sawn wafer*
ZSSC3123AI1B	ZSSC3123 die — Temperature range: -40°C to +85°C	*Tested dice on un-sawn wafer*
ZSSC3123AA1C	ZSSC3123 die — Temperature range: -40°C to +125°C	*Tested dice on frame*
ZSSC3123AI1C	ZSSC3123 die — Temperature range: -40°C to +85°C	*Tested dice on frame*
ZSSC3123AA2	ZSSC3123 TSSOP14 — Temperature range: -40°C to +125°C – Lead-free package	Tube: add “T” to code; reel: add “R”
ZSSC3123AI2	ZSSC3123 TSSOP14 — Temperature range: -40°C to +85°C – Lead-free package	Tube: add “T” to code; reel: add “R”
ZSSC3123KIT	ZSSC3123 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, USB Cable, 5 IC Samples (software can be downloaded from www.zmdi.com/zssc3123)	Kit

Basic Application Overview
ZMDI's Sensor Signal Conditioners

Sensor Measurand	Typical Resistive Sensor Type	Resistive SSC Sensitivity						
		> 20mV/V						
		> 10mV/V						
		>5mV/V						
		> 2mV/V						
		Analog Output	Digital Output	Analog Output	Digital Output	Analog Output	Digital Output	Analog Output
Pressure Temperature Flow Level	Ceramic Thick Film Bridge Metal Thin-Film Bridge Strain Gauge Bridge	ZSC31050 **ZSSC3138** **ZSC31150** **ZSSC3154**	ZSC31050 **ZSSC3170**	**ZSSC3138**	ZSC31014	ZSC31015 **ZSSC3015** **ZSSC3131** **ZSSC3135** **ZSSC3136**	ZSSC3016 ZSSC3026 ZSSC3036 ZSSC3027	ZSC31010
Position	Magneto-resistive							
Altitude	Resistive Bridge						ZSSC3016 ZSSC3026 ZSSC3036 ZSSC3027	

Sensor Measurand	Typical Sensor Type	Maximum Input Capacitance			
		2 - 10pF		2-260pF	
		Analog Output	Digital Output	Analog Output	Digital Output
Humidity	Capacitive	ZSSC3122	ZSSC3122	ZSSC3123	ZSSC3123

NOTE: PINK FONT INDICATES AUTOMOTIVE QUALIFIED PRODUCTS

Supply Voltage Range Resistive SSC	Supply Voltage Range Automotive Resistive SSC	Supply Voltage Range Capacitive SSC
ZSSC3027: 1.7 to 3.6 V	**ZSSC3015**: 2.7 to 5.5 V *	ZSSC3122: 1.8 to 5.5 V
ZSSC3016: 1.8 to 3.6 V	**ZSC31150**: 4.5 to 5.5 V	ZSSC3123: 2.3 to 5.5 V
ZSSC3026: 1.8 to 3.6 V	**ZSSC3131**: 4.5 to 5.5 V	
ZSSC3036: 1.8 to 3.6 V	**ZSSC3135**: 4.5 to 5.5 V	
ZSC31010: 2.7 to 5.5 V *	**ZSSC3136**: 4.5 to 5.5 V	
ZSC31014: 2.7 to 5.5 V	**ZSSC3138**: 4.5 to 5.5 V	
ZSC31015: 2.7 to 5.5 V *	**ZSSC3154**: 4.5 to 5.5 V	* 5.5 to 30 V with external JFET
ZSC31050: 2.7 to 5.5 V **	**ZSSC3170**: 7 to 18 V	** 5 to 40 V with external JFET

Application Overview
ZMDI's Optical Sensor IC ZOPT3100

Altitude
- Unique, all-in-one optical sensor IC
- Low-power – ideal for mobile applications including consumer devices, cell phones, notebooks
- Integrated ambient light sensor, color sensor, proximity sensor, and IR LED
- Supply voltage: 2.4 to 3.6 VDC

Physical Characteristics
- Integrated ambient light sensor, color sensor, proximity sensor, and IR LED
- Maximum temperature range: -40 to +90°C
- Supply voltage: 2.4 to 3.6 VDC
- Current consumption: 200µA (LED driver excluded); standby mode current: 2µA (see data sheet for conditions)
- Available as die

Proximity Sensor
- High ambient light suppression
- Built-in LED driver and detector
- Detection of movement (in/out)
- Cancelation of cross-talk (lowest PS value is stored and subtracted from output value to memorize the reflection quantity)
- Programmable pulsed LED driver: up to 125mA output current
- 11-bit resolution

Ambient Light Sensor
- Dynamic range: 0.006 lux to 32,000 lux
- ALS measurement uses CS green filtered values
- Temperature compensation
- CS/ALS output resolution: 14 to 18 bits
- 50ms conversion rate @ 14-bits
- Linear output code
- 50Hz/60Hz light flicker immunity
- Fluorescent light flicker immunity

Color Sensor
- Temperature compensation
- CS/ALS output resolution: 14 to 18 bits
- Linear output code
- 50ms conversion rate for 14-bit resolution
- 50Hz/60Hz light flicker immunity
- Fluorescent light flicker immunity

Visit **www.zmdi.com**
for more detailed information

Mobile Sensing
Smart and Mobile

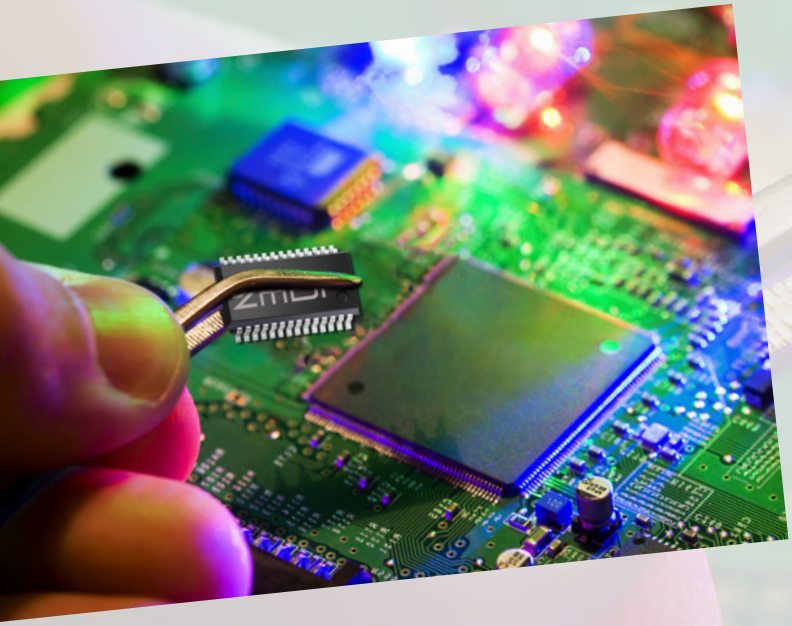
PINK IS THE NEW GREEN®
ENABLING ENERGY EFFICIENT SOLUTIONS

Mobile Sensing from ZMDI

ZSSC3016, ZSSC3026, ZSSC3027, ZSSC3036, ZOPT3100

Types of ZMDI'S Mobile Sensing ICs

ZMDI's Mobile Sensor Signal Conditioner (SSC) Family ICs interface with three main sensor types: capacitive, resistive, and optical sensors. Our energy-efficient, battery optimized SSCs enable diverse mobile applications, with current consumption as low as 930µA in operating mode or 20nA in sleep mode. ZMDI's mobile SSC ICs offer digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity in operational temperature ranges as wide as -40°C to +125°C (maximum range).



Mobile Sensing ICs from ZMDI

Industry leaders are predicting double-digit growth for the global market for mobile sensors, which is expected to expand to over 22 billion dollars by 2018. ZMDI's next generation sensing technology can shorten critical time-to-market essential to meeting the increasing demands for smaller mobile products with more sophisticated features.

Given ZMDI's focus on designing best-in-class energy efficient solutions that reduce the demand for energy consumption, it is clear why market leaders build long-term relationships with ZMDI.

With new solutions rapidly emerging in the market for mobile sensing systems and higher levels of integration driving new development, ZMDI is well placed to offer solutions that advance opportunities in this high-growth market. With highly integrated products providing advanced signal conditioning and sensing capabilities, ZMDI is positioned to be a true partner to tier-one suppliers, emerging market suppliers, MEMS suppliers, and reference design houses. For example, our recently released ZOPT3100 includes an ambient light sensor (ALS), a color sensor (CS), a proximity sensor (PS), and an integrated IR LED driver on a single chip.

Key Features for ZMDI Mobile Sensor ICs

- High accuracy and resolution for precise sensor signal conditioning
- Best-in-class power consumption, accuracy, and resolution
- Small package size and flexible delivery forms
- Minimal number of external components
- Single-pass calibration

Applications for ZMDI Mobile Sensor ICs

Innovative mobile sensing solutions based on diverse sensor technologies for various high-volume applications in mobile sensing:

- Altimeter/barometric
- Proximity sensing
- Ambient light/color sensing
- Temperature sensing
- Vital parameter sensing
- Humidity sensing

Visit **www.zmdi.com**
for more detailed information

ZMDI – Focused on Energy Efficiency

HUMMINGBIRDS are the fastest and most agile birds, yet they are also the most energy efficient. As an "intelligent consumer" of energy, the hummingbird best represents ZMDI's ICs for mobile sensing.

ZMDI – Mobile Sensing Strengths

- Core expertise: over 50 years of technical expertise in sensor signal conditioning
- Provider of highly integrated sensor ICs optimized for mobile sensing solutions
- Innovative partner for next generation platforms and emerging technology
- Strategic alliances with partners that manufacture modules enabled by ZMDI's advanced IC solutions

ZMDI Sensor Signal Conditioner ICs are highly integrated energy-efficient products that are easy to use as they are supported by sophisticated evaluation software and experienced technical staff

Sensor Interface IC Solutions
Products available at ZMDI On-Line Store

Brief Description

The ZSSC3016 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high resolution altimeter module applications, the ZSSC3016 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3016 is simple via the serial interface and the PC-controlled calibration software provided in the ZMDI Development Kit. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The digital mating is fast and precise, eliminating the overhead normally associated with trimming external components and multi-pass calibration routines.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Intelligent power management unit
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO @ -40 to 85 °C

* I²C is a registered trademark of NXP.

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Minimize calibration costs through the one-pass calibration concept
- No external trimming components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications

Physical Characteristics

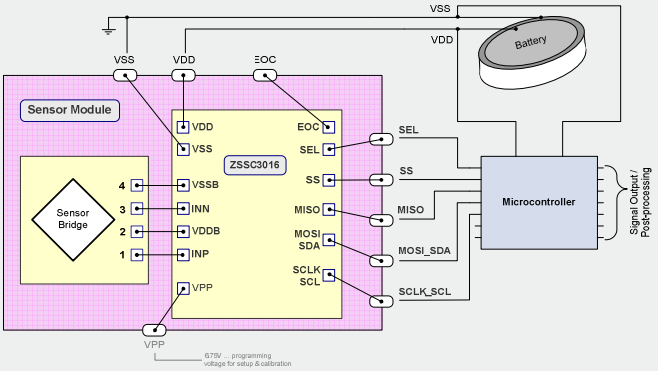
- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current <250nA (25°C)
- Temperature resolution: <0.003K/LSB
- Operation temperature: –40°C to +85 °C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding

Typical Applications

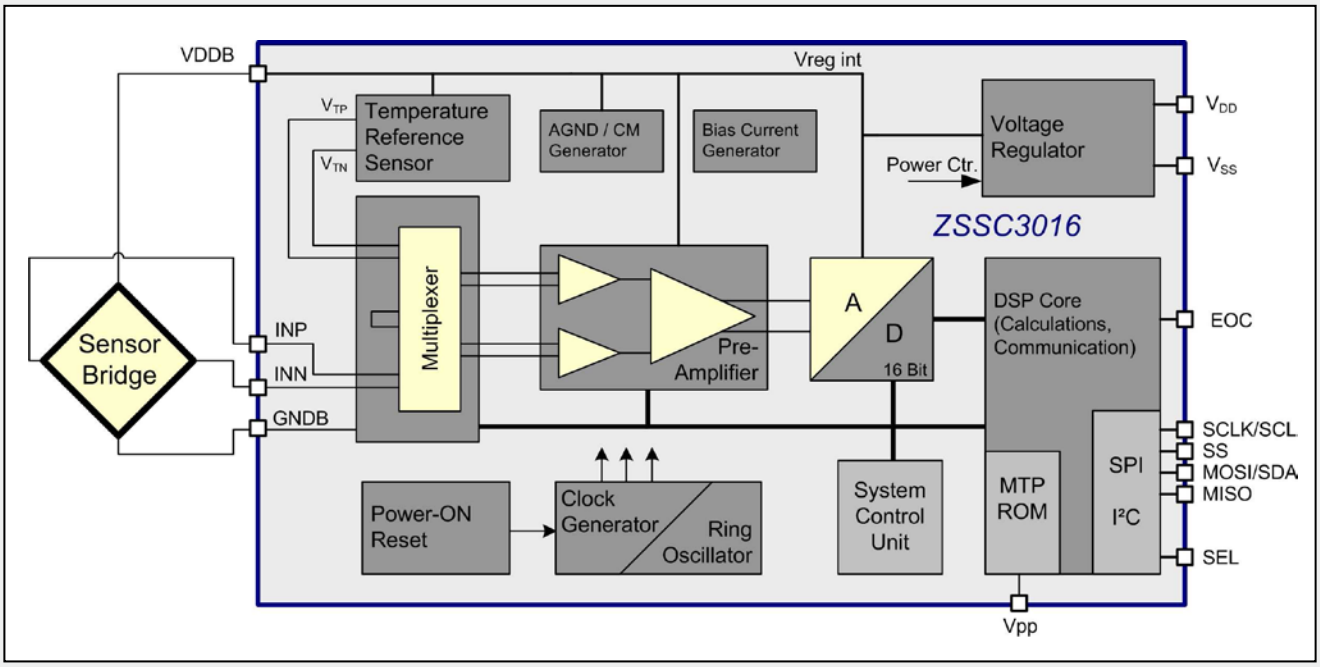
The ZSSC3016 is designed for operation in calibrated resistive (pressure) sensor modules:

- Barometric altitude measurement for portable navigation
- Altitude measurement for emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast
- Fan control

ZSSC3016 Application Example.



ZSSC3016 Block Diagram



Ordering Information

Ordering Examples *	Description	Package
ZSSC3016CC1B	Temperature range: –40°C to +85 °C, Consumer-Level: Parameter according Data Sheet	Wafer (304um) unsawn
ZSSC3016CI1B	Temperature range: –40°C to +85 °C, Industrial-Level: 10 years MTP-Data Retention; 20FIT	Wafer (304um) unsawn
ZSSC3016CI1D ES	Engineering Samples, Temperature range: –40°C to +85 °C	Dice in Waffle Pack
ZSSC3016KIT	ZSSC3016 Evaluation Kit, including sample, modular evaluation board, and evaluation software.	Kit

* Please contact ZMDI Sales for additional options.

Brief Description

The ZSSC3026 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high resolution altimeter module applications, the ZSSC3026 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3026 is simple via the serial interface. The IC-internal charge pump provides the MTP programming voltage. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The digital mating is fast and precise, eliminating the overhead normally associated with trimming external components and multi-pass calibration routines.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Intelligent power management unit
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO @ -40 to 110°C

* I²C is a registered trademark of NXP.

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Minimize calibration costs through the one-pass calibration concept
- No external trimming components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications

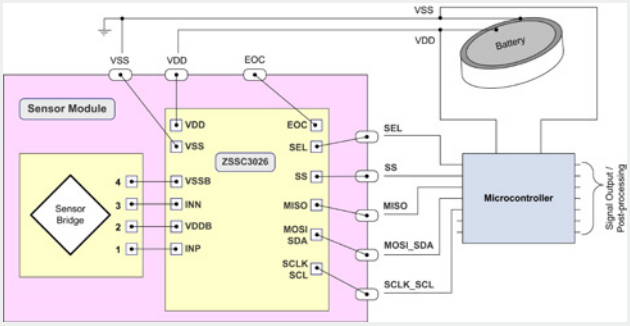
Physical Characteristics

- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current: 50nA (typical)
- Temperature resolution: <0.003K/LSB
- Operation temperatures: –40°C to +85°C
  –40°C to +110°C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding, bumped die for Flip Chip, PQFN24

Typical Applications

The ZSSC3026 is designed for operation in calibrated resistive (pressure) sensor modules:

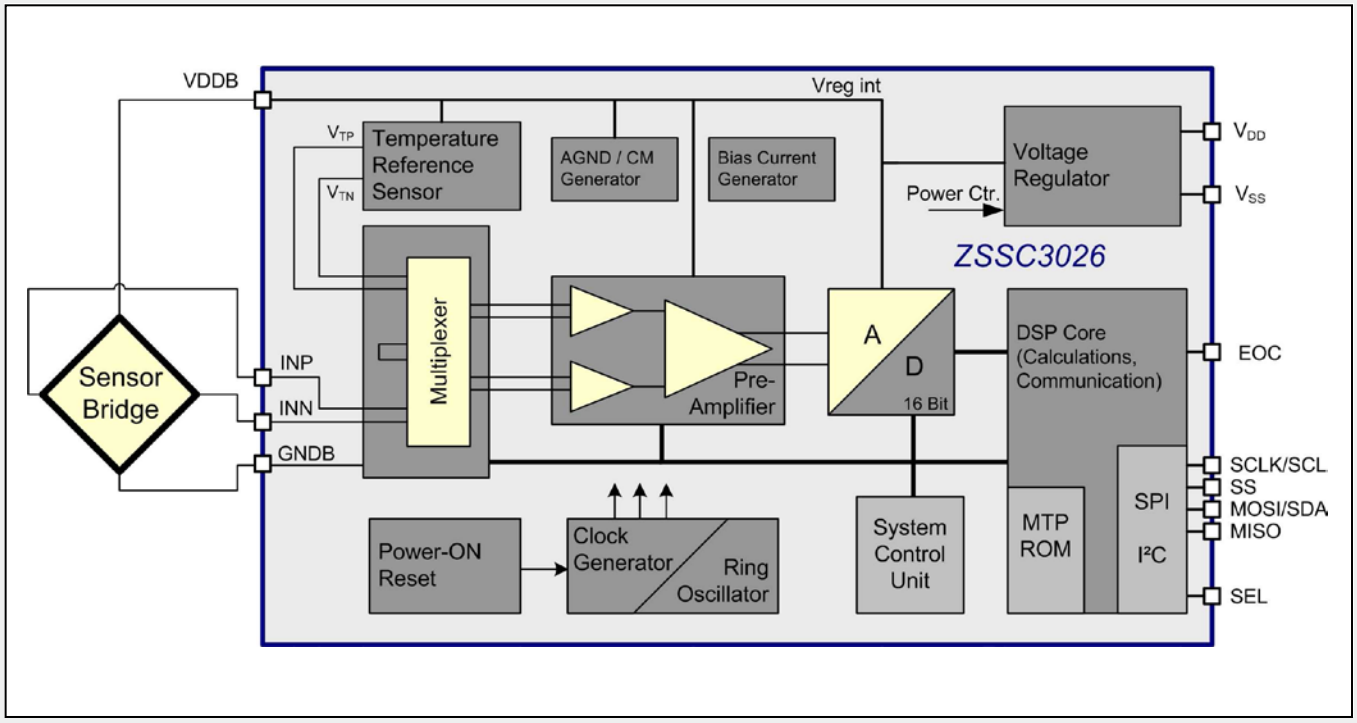
- Barometric altitude measurement for portable navigation
- Altitude measurement for emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast



- Fan control

ZSSC3026 Application Example.

ZSSC3026 Block Diagram



Ordering Information

Ordering Examples *	Description	Package
ZSSC3026CC1B	Temperature range: –40°C to +85 °C, Consumer-Level: Parameter according Data Sheet	Chips, Wafer (304um) unsawn, tested
ZSSC3026CI1B	Temperature range: –40°C to +85 °C, Industrial-Level: 10 years MTP-Data Retention	Chips, Wafer (304um) unsawn, tested
ZSSC3026CI4	Temperature range: –40°C to +110 °C, Industrial	PQFN24 4x4, tested
ZSSC30x6KIT	Evaluation Kit for ZSSC30x6 Product Family	Boards, cable, software-CD, 1 sample

* Please contact ZMDI Sales for additional options.

Brief Description

The ZSSC3027 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high-resolution altimeter module applications, the ZSSC3027 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C™* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3027 is simple via the serial interface. The IC-internal charge pump provides the MTP programming voltage. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory.

The ZSSC3027 provides accelerated signal processing in order to support high-speed control, safety, and real-time sensing applications. It complements ZMDI's ZSSC30x6 products.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain as well as of 1st and 2nd order temperature gain and offset drift
- Layout optimized for stacked-die bonding for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of better than ±0.10% FSO** @ -40 to 85°C

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- One-pass calibration minimizes calibration costs
- No external trimming, filter, or buffering components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications
- Optimized for operation in calibrated resistive sensor modules

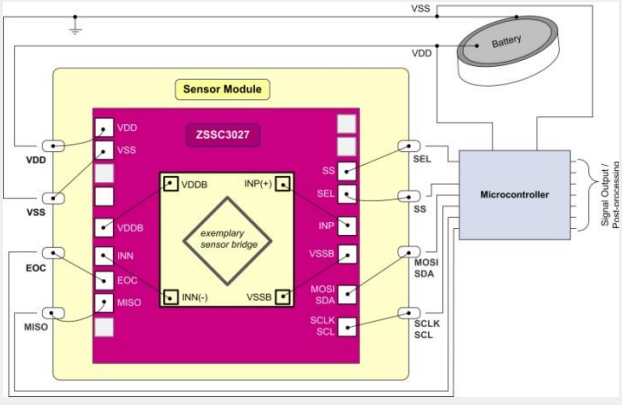
Physical Characteristics

- Supply voltage range: 1.7 to 3.6V
- Operating mode current consumption: 930mA (typical)
- Sleep State current: 20nA (typical)
- Temperature resolution: <0.003K/LSB
- Operation temperatures: –40°C to +85°C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding

Available Support

- ZSSC3026 Evaluation Kit can be used to evaluate ZSSC3027 capabilities
- Support Documentation

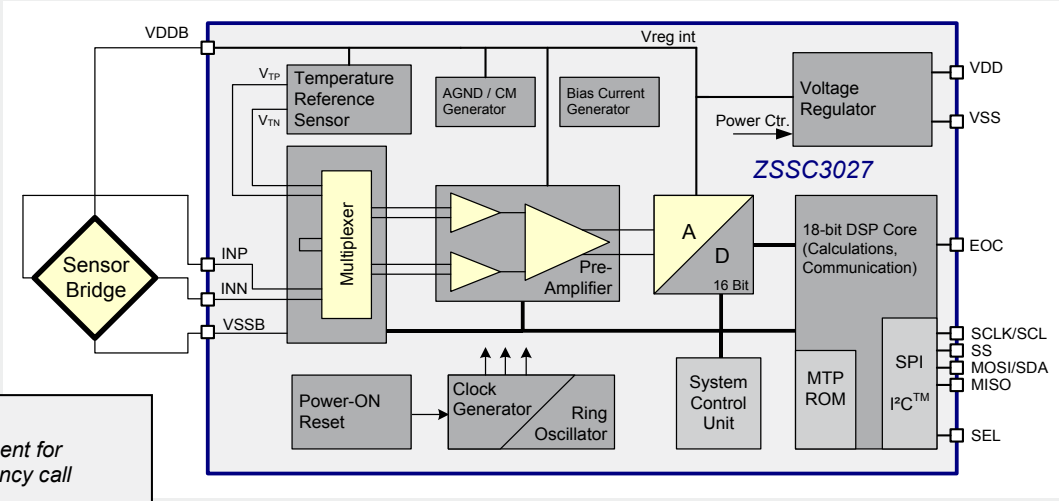
ZSSC3027 Application Example



* I²C™ is a trademark of NXP.

** FSO = Full Scale Output.

ZSSC3027 Block Diagram



Applications

- *Barometric altitude measurement for portable navigation or emergency call systems*
- *Altitude measurement for car navigation*
- *Inside hard disk pressure measurement*
- *Weather forecast*
- *Fan control*
- *Industrial, pneumatic, and liquid pressure*
- *High-resolution temperature measurements*

Ordering Information *(See section 6 in the data sheet for additional options for delivery)*

Sales Code	Description	Delivery Package
ZSSC3027AC1B	Die—temperature range: –40°C to +85 °C	Wafer (304µm) unsawn, tested
ZSSC3027AC6B	Die—temperature range: –40°C to +85 °C	Wafer (725µm) unsawn, tested
ZSSC3027AC7C	Die—temperature range: –40°C to +85°C	Wafer (200µm) unsawn, tested
ZSSC3027AI1D	Engineering samples, die—temperature range: –40°C to +85°C	Dice in waffle pack (304µm)
ZSSC3026-KIT	Evaluation Kit for ZSSC3026, including boards, cable, software, and 1 ZSSC3026 PQFN24 sample (equivalent to ZSSC3027—kit is recommended for evaluation of the capabilities of the ZSSC3027)	

Brief Description

The ZSSC3036 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high-resolution altimeter module applications, the ZSSC3036 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C™* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3036 is simple via the serial interface. The IC-internal charge pump provides the MTP programming voltage. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The ZSSC3036 provides accelerated signal processing in order to support high-speed control, safety, and real-time sensing applications. It complements ZMDI's additional ZSSC30x6 products.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain as well as of 1st and 2nd order temperature gain and offset drift
- Fast sensing: 16-bit conditioned sensor signal measurement rate at more than 200s^{-1}
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO** @ -40 to 110°C

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- One-pass calibration minimizes calibration costs
- No external trimming, filter, or buffering components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications
- Optimized for operation in calibrated resistive sensor modules

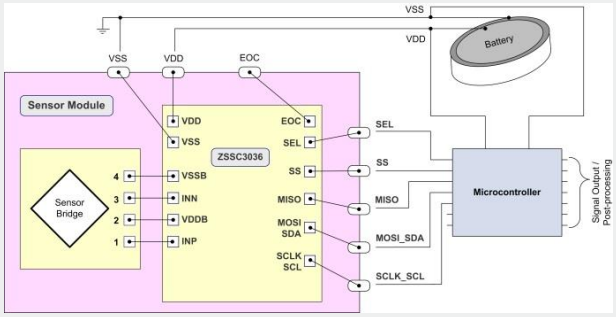
Physical Characteristics

- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current: 50nA (typical)
- Temperature resolution: <0.003K/LSB
- Operation temperatures: –40°C to +85°C
  –40°C to +110°C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding

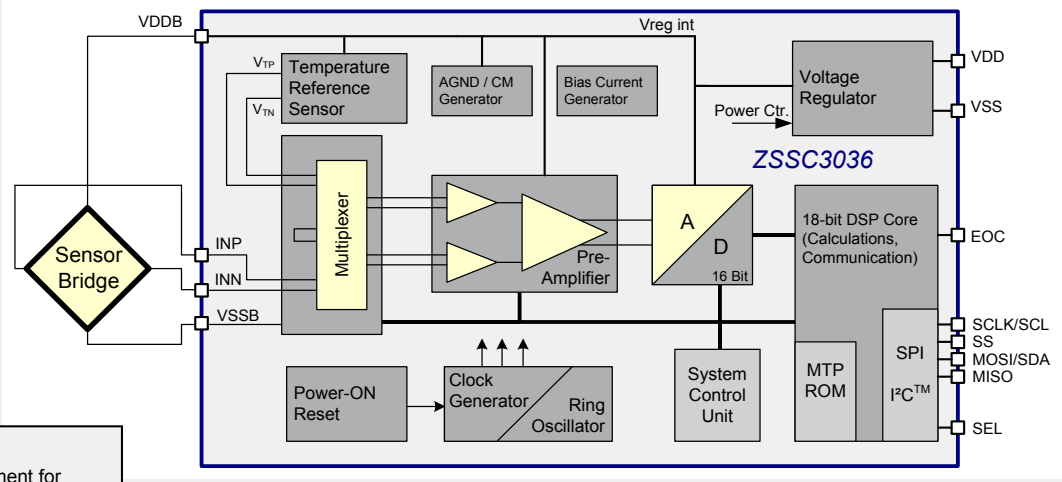
* I²C™ is a trademark of NXP.

** FSO = Full Scale Output.

ZSSC3036 Application Example



ZSSC3036 Block Diagram



Applications

- Barometric altitude measurement for portable navigation or emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast
- Fan control
- Industrial, pneumatic, and liquid pressure

Ordering Information *(See section 6 in the data sheet for additional options for delivery package and wafer thickness of 725µm.)*

Sales Code	Description	Delivery Package
ZSSC3036CC1B	Die—temperature range: –40°C to +85 °C	Wafer (304µm) unsawn, tested
ZSSC3036CI1B	Die—temperature range: –40°C to +85 °C, extended qualification	Wafer (304µm) unsawn, tested
ZSSC3036CC1C	Die—temperature range: –40°C to +85°C	Dice on frame (304µm), tested
ZSSC3036CI1BH	Die—temperature range: –40°C to +110 °C, extended qualification	Wafer (304µm) unsawn, tested
ZSSC3036CI1CH	Die—temperature range: –40°C to +110 °C, extended qualification	Dice on frame (304µm), tested
ZSSC30x6-KIT	Evaluation Kit for ZSSC30x6 Product Family, including boards, cable, software, and 1 sample	

Brief Description

The ZOPT3100 Sensor IC integrates an ambient light sensor (ALS), a color sensor (CS), and a proximity sensor (PS), as well as an LED driver on a single chip. The device is connected by an I²C™* interface to a microcontroller. Other I²C™ or SMBus devices can be connected to the same interface. The device has a programmable interrupt with hysteresis to respond to events and reduce the microcontroller tasks.

The device allows adjusting the brightness as well as the color of the display panel. This device can also measure distance in parallel with ALS and CS measurements in order to deactivate the touch screen during phone calls.

Features

- 5 integrated photodiodes (1 proximity diode and 4 diodes for white, green, blue, and red channels)
- 5 analog-to-digital converters (ADCs) to measure PS in parallel to ALS/CS
- I²C™ capable of standard mode (100kHz) or fast mode (400kHz) communication; 1.8V logic compatible
- Programmable interrupt function for ALS (green channel) and PS with upper and lower thresholds
- PS measurement parallel to ALS/CS measurements
- Many measurement modes: PS+ALS+CS, ALS+CS, PS+ALS, PS only, ALS only, CS only

PS Features

- High ambient light suppression
- Built-in LED driver and detector
- Detection of movement (in/out)
- Cancelation of crosstalk (lowest PS value is stored and subtracted from output value to memorize the reflection quantity)
- Programmable pulsed LED driver: up to 125mA output current
- 11-bit resolution

ALS Features

- Dynamic range : 0.006 lux to 32,000 lux
- ALS measurement uses CS green filtered values
- Temperature compensation
- CS/ALS output resolution: 14 to 18 bits
- Linear output code
- 50ms conversion rate for 14-bit resolution
- 50Hz/60Hz light flicker immunity
- Fluorescent light flicker immunity

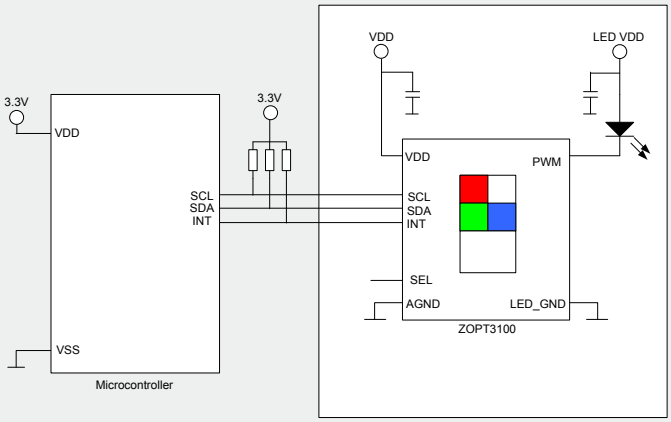
CS Features

- Temperature compensation
- CS/ALS output resolution: 14 to 18 bits
- Linear output code
- 50ms conversion rate for 14-bit resolution
- 50Hz/60Hz light flicker immunity
- Fluorescent light flicker immunity

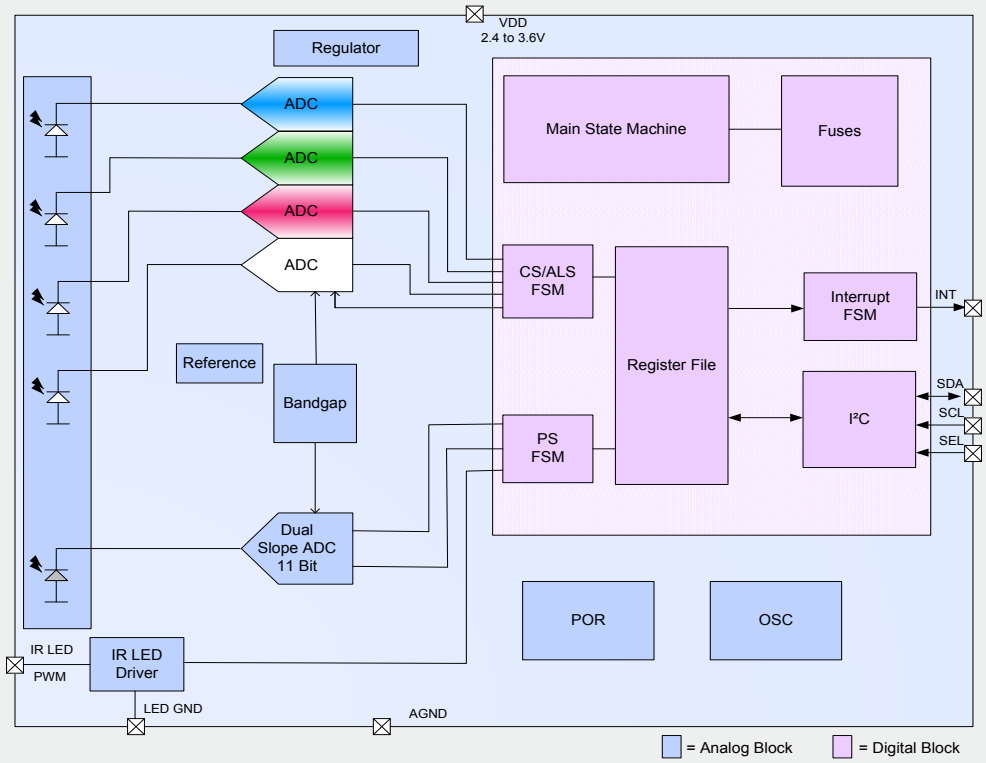
Physical Characteristics

- Wide operation temperature: -40 to +90 °C
- Wide supply voltage: 2.4 to 3.6 V
- Low supply current: < 200μA (LED driver excluded)
- Low standby current: < 2μA

ZOPT3100 Application Circuit



ZOPT3100
Block Diagram



Applications

- *Cellular phones*
- *Notebooks*
- *Consumer devices*

Ordering Information

Product Sales Code	Description	Package
ZOPT3100AC6B	ZOPT3100 die — Temperature Range: -40 to +90 °C	Unsawn wafer
ZOPT3100 KIT	ZOPT3100 Evaluation Kit, including Evaluation Board, cable, and 1 IC sample	Kit

The Analog Mixed Signal Company

Contact Name: _____

E-Mail Address: _____

Phone Number: ___(_____)_____

Distributor/Rep. Firm: _____

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ENABLING ENERGY EFFICIENT SOLUTIONS

Battery Management from ZMDI

Our Award-Winning Solutions Enable Energy-Efficient Usage

ZMDI – Battery Management

ZMDI offers power solutions for your battery powered applications. These devices include under-voltage load switch and linear regulators (both with 100pA of standby power) to highly efficient chargers for Lithium Ion and Supercapacitor charge storage devices.

ZMDI's pink power technology provides a simple and cost-effective solution to meet you energy efficient portable power demands

...

Brief Description

The ZSSC1856 is a dual-channel ADC with an embedded microcontroller for battery sensing/management in automotive, industrial, and medical systems.

One of the two input channels measures the battery current I_{BAT} via the voltage drop at the external shunt resistor. The second channel measures the battery voltage V_{BAT} and the temperature. An integrated flash memory is provided for customer-specific software; e.g., dedicated algorithms for calculating the battery state.

During Sleep Mode (e.g., engine off), the system makes periodic measurements to monitor the discharge of the battery. Measurement cycles are controlled by the software and include various wake-up conditions. The ZSSC1856 is optimized for ultra-low power consumption and draws only 100µA or less in this mode.

Features

- High-precision 18-bit sigma-delta ADC with on-chip voltage reference (5ppm/K)
- Current channel
  - I_{BAT} offset error: ≤ 10mA
  - I_{BAT} resolution: ≤ 1mA
  - Programmable gain: 4 to 512
  - Sampling rate: 1Hz to 16kHz
- Voltage channel
  - Input range: 4 to 28.8V
  - Voltage accuracy: ± 2mV
- Temperature channel
  - Internal temperature sensor: ± 2℃
  - External temperature sensor (NTC)
- On-chip precision oscillator (1%)
- On-chip low-power oscillator
- ARM® Cortex™-M0* microcontroller: 32-bit core, 10MHz to 20MHz
- 96kB Flash/EE Memory with ECC, 8kB SRAM
- LIN2.1 / SAE J2602-1 Transceiver
- Directly connected to 12V battery supply
- Current consumption
  - Normal Mode: 10mA to 20mA
  - Low-Power Mode: ≤ 100µA

* The ARM®, Cortex™, and Thumb®-2 trademarks are owned by ARM, Ltd. The I²C™ trademark is owned by NXP.

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EUROPEAN BATTERY SENSOR INTEGRATED CIRCUITS NEW PRODUCT INNOVATION AWARD

Benefits

- Precision measurement solution for accurate prediction of battery state of health (SOH), state of charge (SOC) or state of function (SOF)
- Flexible wake-up modes allow minimum power consumption without sacrificing performance
- No temperature calibration or external trimming components required
- Optimized code density through small instruction set architecture Thumb®-2 *
- Robust POR concept for harsh automotive environments
- Industry's smallest footprint allows minimal module size and cost
- AEC-Q100 qualified solution

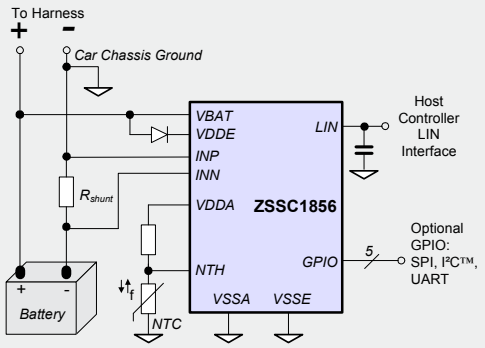
Available Support

- Evaluation Kit & Application Notes

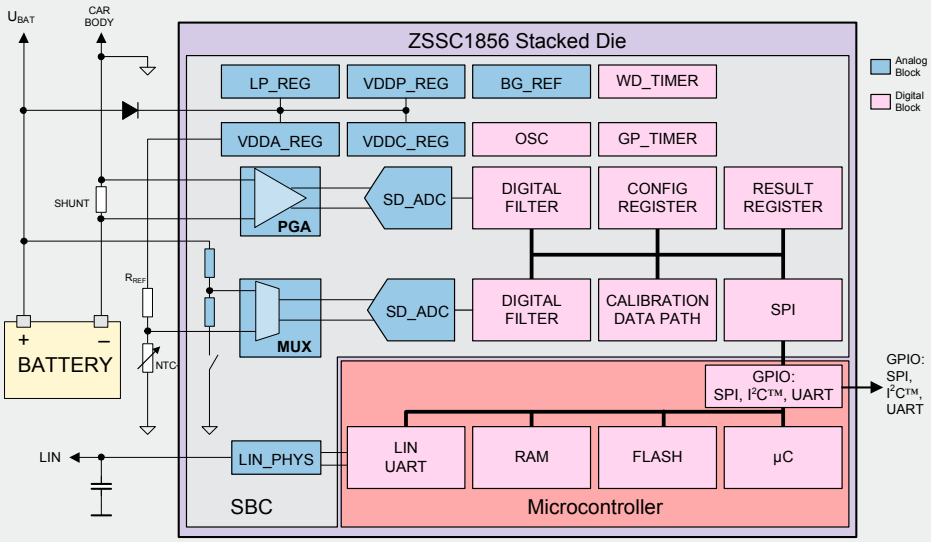
Physical Characteristics

- Wide operation temperature: -40℃ to +125℃
- Supply voltage: 3.5 to 18 V
- Small footprint package: PQFN32 5x5 mm

Basic ZSSC1856 Application Circuit



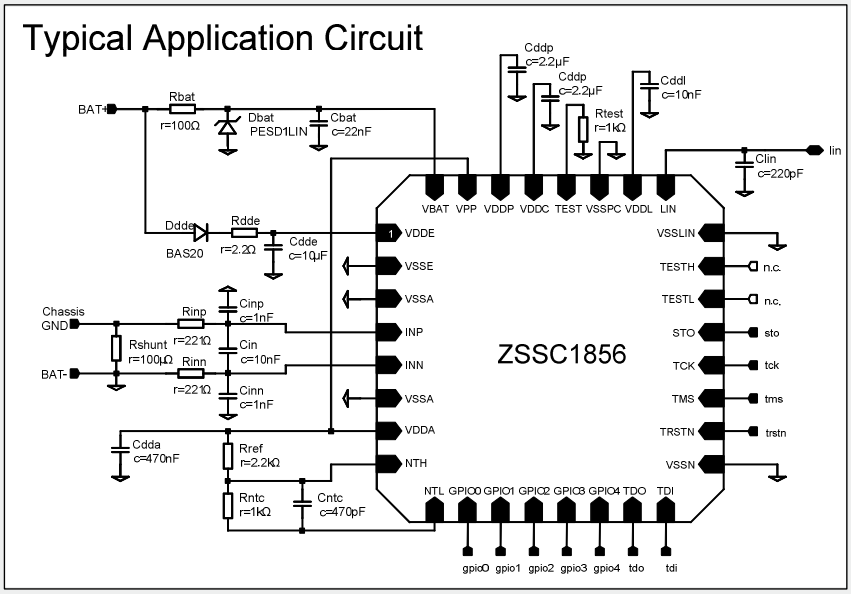
ZSSC1856 Block Diagram



Applications

- Intelligent battery sensing for automotive applications; e.g., start/stop systems, e-bikes, scooters, and e-carts
- Industrial and medical applications requiring precise battery SOC, SOH and SOF monitoring; e.g., emergency lighting, uninterruptable power supplies, hospital equipment, alarm systems, and more

Typical Application Circuit



Ordering Information

Product Sales Code	Description	Package
ZSSC1856CA6R	ZSSC1856 battery sensing IC – temperature range -40℃ to +125℃	PQFN32 5x5 mm (reel)
ZSSC1856KIT V1.0	Modular evaluation and development board for ZSSC1856	Kit boards, IC samples, USB cable, DVD with software and documentation