

**Brief Description**

The ZSSC3218 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential or pseudo-differential input signal. Designed for high-resolution sensor module applications, the ZSSC3218 can perform offset, span, and 1<sup>st</sup> and 2<sup>nd</sup> order temperature compensation of the measured signal. Developed for correction of resistive bridge or absolute voltage sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected sensor values are provided at the digital output pins, which can be configured as I<sup>2</sup>C™\* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via a 26-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 ZSSC3218 is simple via the serial interface. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The ZSSC3218 provides accelerated signal processing, increased resolution, and improved noise immunity in order to support high-speed control, safety, and real-time sensing applications with the highest requirements for energy efficiency.

**Features**

- Flexible, programmable analog front-end design; up to 18-bit analog-to-digital converter (ADC)
- Fully programmable gain amplifier for optimizing sensor signals: gain range 6.6 to 216 (linear)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1<sup>st</sup> and 2<sup>nd</sup> order digital compensation of sensor gain as well as 1<sup>st</sup> and 2<sup>nd</sup> order temperature gain and offset drift
- Programmable interrupt operation
- High-speed sensing: e.g. 16-bit conditioned sensor signal measurement rate >500s<sup>-1</sup>
- Typical sensor elements can achieve an accuracy of better than ±0.10% FSO\*\* at -40 to 85°C

**Benefits**

- Integrated 26-bit calibration math digital signal processor (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
- Integrated reprogrammable non-volatile memory
- Excellent for low-voltage and low-power battery applications
- Optimized for operation in calibrated resistive (e.g., pressure) sensor or calibrated absolute voltage (e.g., thermopile) sensor modules

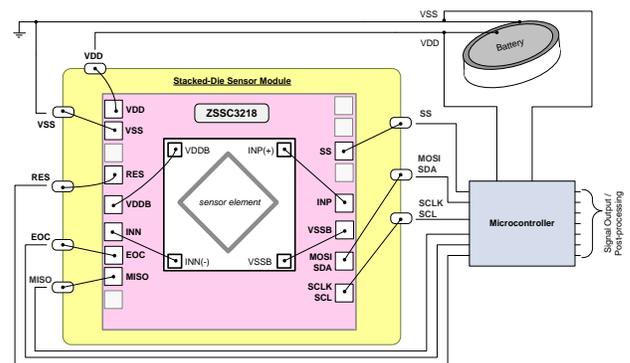
**Physical Characteristics**

- Supply voltage range: 1.68V to 3.6V
- Current consumption: 1.0mA (operating mode)
- Sleep State current: 20nA (typical)
- Temperature resolution: <0.003K/LSB
- Best-in-class energy-efficiency:
  - with 16-bit resolution: <140pJ/step
  - with 18-bit resolution: <50pJ/step
- Operation temperature: -40°C to +85°C
- Small die size
- Delivery options: die for wafer bonding

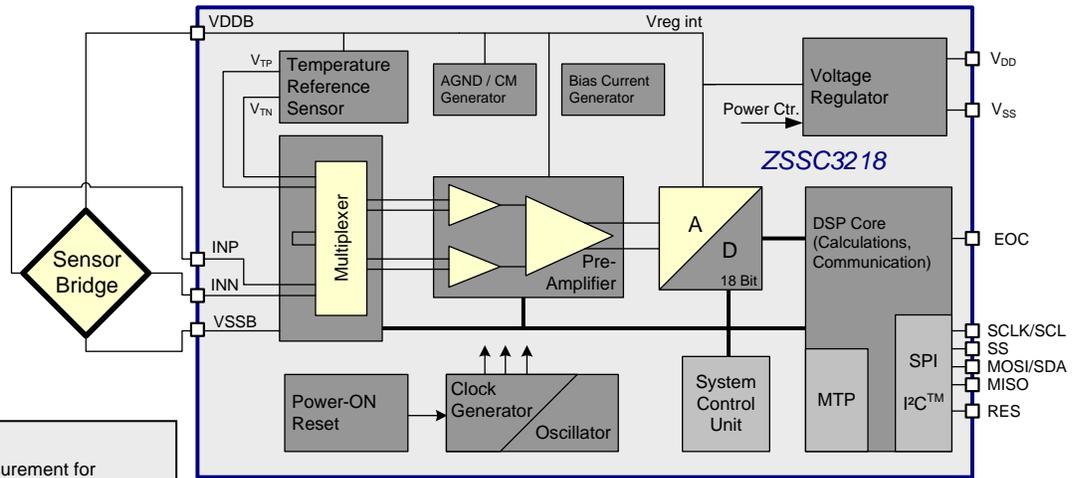
\* I<sup>2</sup>C™ is a trademark of NXP.

\*\* FSO = Full Scale Output.

**ZSSC3218 Application Example**



**ZSSC3218  
Block Diagram**



- Applications**
- ❖ Barometric altitude measurement for portable navigation or emergency call systems
  - ❖ Altitude measurement for car navigation
  - ❖ Weather forecast
  - ❖ Fan control
  - ❖ Industrial, pneumatic, and liquid pressure
  - ❖ High-resolution temperature measurements
  - ❖ Object-temperature radiation (via thermopile)

Sales Code	Description	Package
ZSSC3218BI1B	Die—temperature range: -40°C to +85 °C; thickness 304µm	Unsawn wafer
ZSSC3218BI2B	Die—temperature range: -40°C to +85 °C; thickness 725µm (w/o backlapping)	Unsawn wafer
ZSSC3218BI3R ES	PQFN24—temperature range: -40°C to +85 °C; <i>engineering samples</i>	Packaged die

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01 Jan 2024)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).