# Automotive Sensor Signal Conditioner for Thermocouples with SENT Output



## Description

The ZSSC4175D-01 is a member of Renesas' family of CMOS integrated circuits for highly accurate amplification and sensor-specific correction of two signals from thermocouple elements.

Digital compensation of offset, sensitivity, temperature drift, and nonlinearity is accomplished via a 16-bit RISC microcontroller. Calibration coefficients and configuration data are stored in the ZSSC4175D-01 nonvolatile memory (NVM), which is reliable in automotive applications.

Measured values are provided via a digital SENT interface. The SENT interface enables transmission of conditioned thermocouple data via its Fast Channel as well as transmission of supplementary data via its Serial Data Message (SDM) Channel (also referred to as the "slow" channel) using only one output pin. End-of-line calibration is also supported through this output pin via a One-Wire Interface (OWI). The ZSSC4175D-01 and the calibration equipment communicate digitally, so the noise sensitivity is greatly reduced. Digital calibration helps keep assembly cost low as no trimming by external devices or lasers is needed.

The ZSSC4175D-01 is optimized for automotive environments by over-voltage and reverse-polarity protection circuitry, excellent electromagnetic compatibility, and multiple diagnostic features.

## Typical Applications

- Exhaust Systems

## Available Support

- Evaluation Kit
- Application Notes
- Calculation Tools

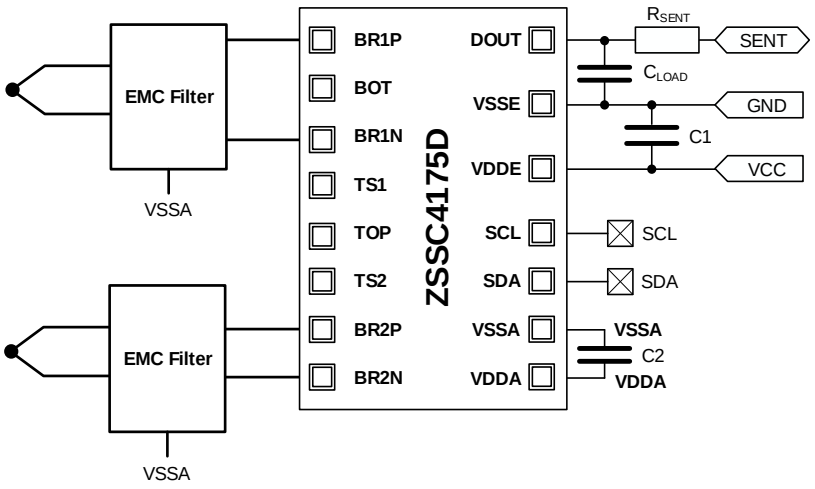
## Features

- Two differential thermocouple element inputs and an on-chip temperature sensor, available for cold-junction compensation and temperature output
- Operating temperature range: -40°C to 150°C
- Accuracy: up to 5K at 1000°C hot junction
- Supports N-type thermocouples
- NVM memory for configuration, calibration data, and configurable measurement and conditioning functionality
- SENT output compliant to SAE J2716 JAN2010 (SENT Rev. 3) and APR2016 (SENT Rev. 4) standard
- Supports output of one or more thermocouple signals and product identification via a single SENT interface connection
- End-of-line calibration process minimizes production costs
- No external trimming or components required
- Qualified according to AEC-Q100 Grade 0
- Enhanced diagnostic features for sensor module

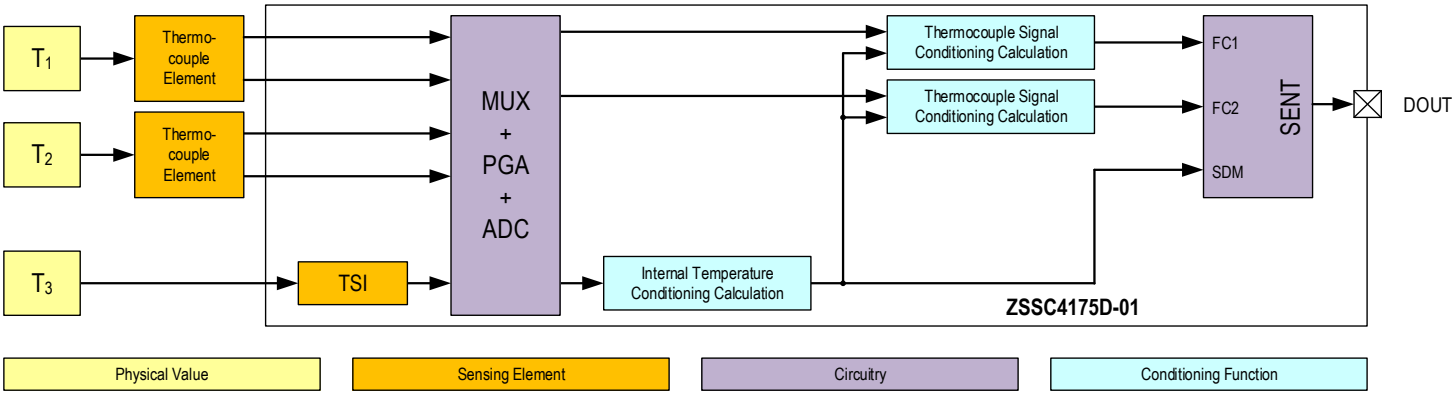
## Physical Characteristics

- Supply voltage: 4.5V to 5.5V
- Over-voltage and reverse-polarity protection up to ±18V
- Input span: -5mV to 60mV thermocouple voltage range
- ADC resolution: 14-bit
- Output resolution: 12-bit via SENT interface
- Package: 24-QFN (4 × 4 mm; wettable flanks)

## ZSSC4175D-01 Basic Circuit




## Signal Path




## Ordering Information

| Part Number | Description and Package | MSL Rating | Shipping Packaging | Temperature |
|---|---|---|---|---|
| *ZSSC4175DE4R* | Dual Thermocouple input, SENT output, internal temperature measurement, 4 × 4 mm 24-QFN, wettable flanks | MSL1 | 13” Reel | -40°C to 150°C |
| *ZSSC4175KIT* | ZSSC4175 SSC Evaluation Kit: Communication Board, ZSSC415x/6x/7x Evaluation Board, USB Cable, ZSSC4175D Test PCB, Tweezer, 5 Samples. | | | |

Contact Renesas for additional options.

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