

16:1 and 8:1 Sensor Interface AFEs Simplify Sensor Conditioning

OVERVIEW

Integrated Features	16:1/8:1 Diff MUX, INA, LDO, DAC
Offset Correction Range	±560mV
Gain Range V/V	2V/V to 760V/V (8 gains)
V _{CC} Range	2.7V to 5.25V
V _{DD} Range	1.7V to 5.25V
Operating Temperature Range	-40°C to 85°C

PERFORMANCE

V _{IO} Max (XR10910)	1mV
V _{IO} Max (XR18910)	3mV
I _B Max	100pA
Peak-to-Peak Noise	2μV _{P-P}
Input Voltage Noise	35nV/√Hz
Supply Current	457μA
Disable Supply Current	45μA
Gain Error (%)	±0.5%

FEATURES

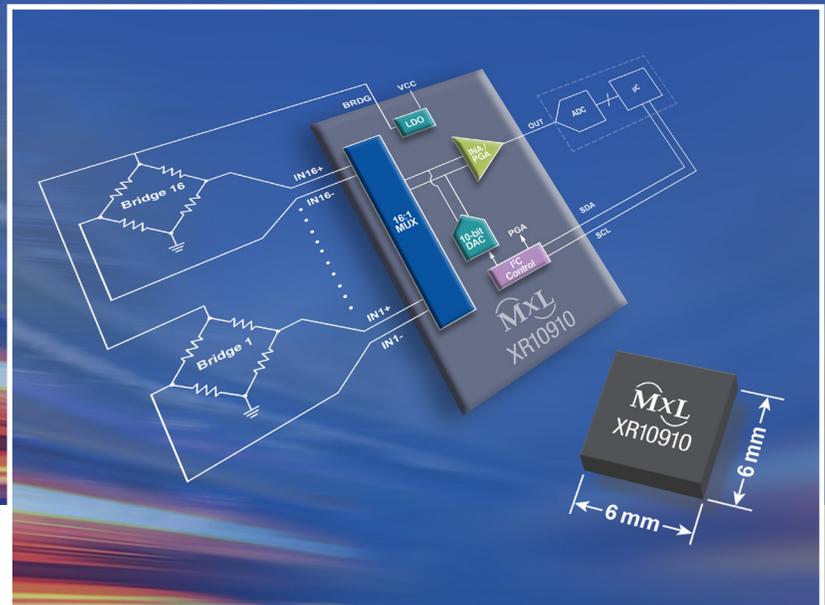
- Easy to use
- Integrated MUX, DAC, INA/PGA and LDO simplifies sensor conditioning applications
- Connect multiple sensors to an MCU or FPGA
- Small footprint:
 - 6mm x 6mm QFN – XR10910
 - 3mm x 3mm QFN – XR18910

BENEFITS

- Allows more flexibility than more integrated solutions
- Lower power than more integrated solutions and same or lower power than discrete solutions
- Simple, easy-to-use I²C interface
- Small footprint
- High channel count simplifies board layout and saves real estate

APPLICATIONS

- Bridge sensor interface
- Pressure and temperature sensor interface
- Strain gauge amplifier
- Industrial and process control
- Weigh scale



The **XR10910** and **XR18910** are highly integrated sensor interface Analog Front Ends (AFE) that provide calibration and signal conditioning of analog sensor outputs. The XR10910/XR18910 offer onboard 16:1/8:1 differential multiplexer, offset correction DAC, programmable gain instrumentation amplifier and voltage reference. These devices provide 14-bit signal path linearity and are designed to connect multiple bridge sensors to a Microcontroller (MCU) or Field Programmable Gate Array (FPGA) with an embedded ADC.

These devices integrate a host of features to simplify sensor conditioning applications. The integrated DAC provides offset calibration for any offset voltage generated by the sensors, improving overall system sensitivity and accuracy. An independent offset value can be set for each differential input. Both AFEs offer eight, I²C selectable, fixed-gain settings from 2V/V to 760V/V to ensure the amplified sensor signal falls within the optimum input range of the downstream ADC. The integrated LDO provides a regulated voltage to power the sensors and is selectable between 3V and 2.65V for lower voltage compatibility. An I²C interface provides an easy way to control the many functions of the XR10910 and XR18910.

The XR10910 and XR18910 integrate high channel count and functionality in a tiny footprint and are lower power than competing devices. They fill the gap between less feature rich discrete solutions and single-chip sensor interface devices that include their own processing capability. Their unique feature set makes them well suited for industrial applications using multiple analog sensors.

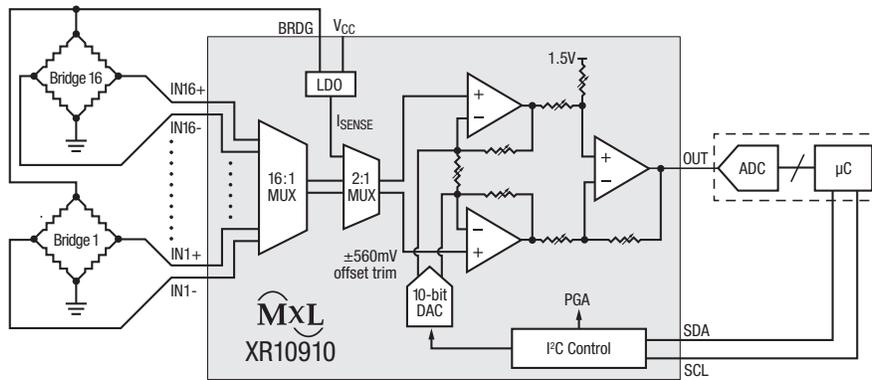
Typical Application – 16:1 Bridge Sensor Interface

Many force and pressure sensors utilize a strain gauge or Wheatstone bridge circuit. The resistive elements in the bridge change resistance in response to mechanical strain. Bridge sensors have a differential output signal (V_{O+} and V_{O-}). Ideally, the unloaded bridge output is zero (V_{O+} and V_{O-} are identical). However, inexact resistive values result in a difference between V_{O+} and V_{O-} . This bridge offset voltage can be substantial and vary between sensors causing decreased system accuracy. The XR10910 provides the ability to calibrate the bridge offset on each of the 16 bridge sensors using the onboard DAC. The

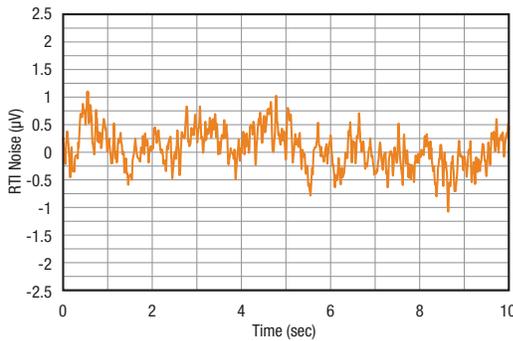
XR10910 is an easy-to-use sensor conditioning interface between multiple bridge sensors and an ADC/MCU or FPGA. It consumes only 457 μ A of supply current and only 36mm² of board real estate, making it the industry's smallest, lowest power interface for 16 bridge sensors.

<16-Bit Noise Floor Performance

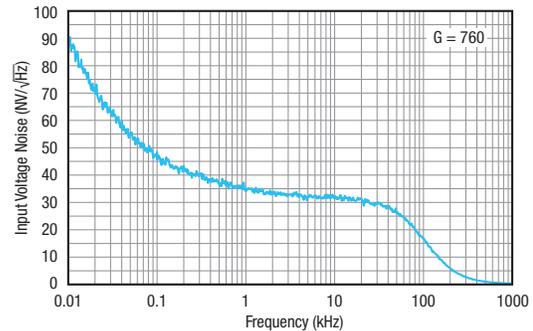
The XR10910 and XR18910 provide 14-bit signal path linearity and offers low peak-to-peak noise (2 μ V_{P.P} at G=760) and low input voltage noise (35nV/ $\sqrt{\text{Hz}}$ at G=760). The low noise performance of these AFEs combined with low bias current capability (100pA maximum) allows the XR10910 and XR18910 to interface with a wide range of sensors and they pair nicely with 3V to 5V 16-bit ADCs.



Low Power Sensor Interface Solution for 16 Bridge Sensors



0.1Hz to 10Hz RTI Voltage Noise



Input Voltage Noise Performance



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