

PGA900, PGA300 and PGA305 Use Case for the Pressure Transmitter Applications



Introduction

The resistive bridge sensors are used in a variety of end-equipment like Pressure Transmitters or Transducers, Flow Meters, HVAC, and Weight Scales. The pressure transmitter or transducer is one of the major applications for the resistive bridge.

Pressure Transmitter

Figure 1 shows the pressure transmitter mechanism. The pressure transmitter measures and monitors the pressure from outside, and sends this information to the controller. The sensor element to measure the pressure value is normally the resistive bridge.

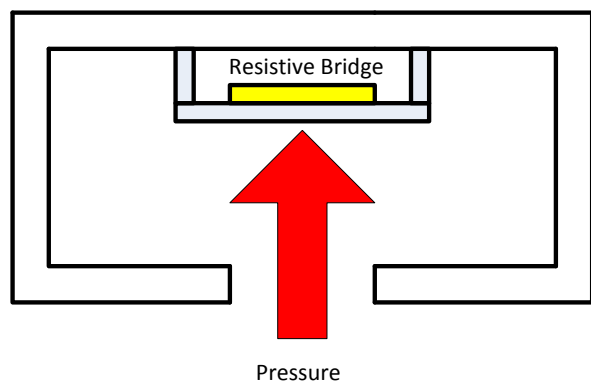


Figure 1. Pressure Transmitter System

Resistive Bridge

Figure 2 shows the resistive bridge. Ideally, the signal from the resistive bridge would be linear with the change of pressure, but that is not always the case. Furthermore, each individual resistance is not equal to the others, so a voltage offset is observed. This particularly comes to effect when no pressure is applied to the resistive bridge. Finally, the output is temperature-dependent, meaning the signal from the resistive bridge must be temperature-compensated in the system. This requires that the typical system connected to a load cell sensor is capable of linearization and temperature dependency cancellation for accurate measurements across pressure and temperature.

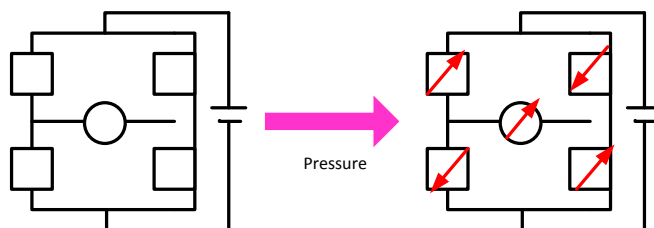


Figure 2. Resistive Bridge

Important System Factors

The pressure transmitter needs to measure precisely, so consider the following spec in signal conditioning device:

- High resolution
- High accuracy
- Temperature compensation and linearization
- Output interface : voltage of 4 to 20 mA or I2C

PGA900

Figure 3 shows the PGA900 Functional Diagram. The device has two high-resolution ADCs (24-bit) with an integrated ARM M0 MCU that allows the development of application-specific compensation linearization algorithms. The PGA900 supports multiple output choices, including the analog voltage (0 – 5, 0 – 10 V), the current output (4 – 20 mA), and the digital I2C, UART, PWM, and One Wire interface.

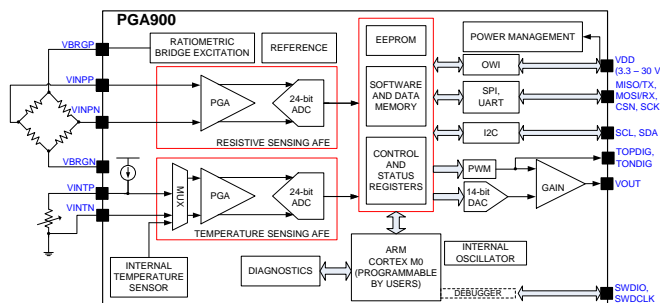


Figure 3. PGA900 Block Diagram

PGA300

Figure 4 shows the PGA300 Block Diagram. The PGA300 integrates two 16-bit ADCs while a 3rd-order compensation algorithm is employed for sensor linearization. The system accuracy achieved can be <math><0.1\%FS</math> over temperature. PGA300 supports the analog voltage, the current output (4 – 20 mA), and the One Wire interface.

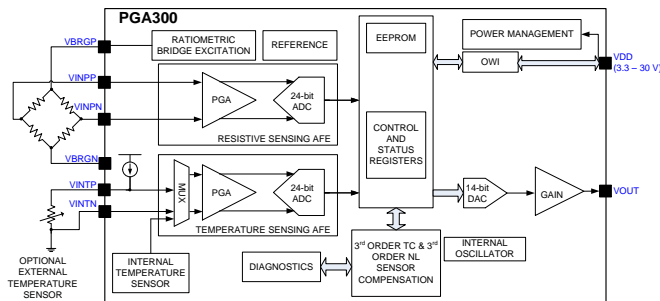


Figure 4. PGA300 Block Diagram

PGA305

Figure 5 shows the PGA305 Block Diagram. This device integrates a dual-channel, 24-bit ADC, followed by a 3rd-order digital linearity compensation algorithm. The system accuracy achieved can be <math><0.1\%FS</math> over temperature. The PGA305 supports the analog voltage and the current output (4 – 20 mA), along with the I2C output and the One Wire Interface.

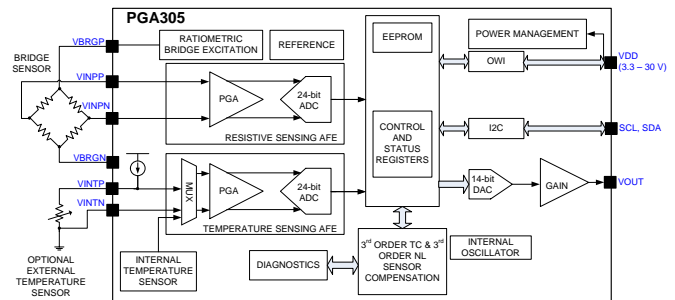


Figure 5. PGA305 Block Diagram

Table 1. Alternative Device Recommendations

Device	Optimized Parameters	Performance Trade-Off
PGA308	High Gain Setting, Automotive AECQ100 available	High current consumption
PGA309	High Gain Setting	High current consumption

Table 2. Adjacent Tech Notes

SLYA025	PGA900/300/305 Use Case for the HVAC Application
SLYA026	PGA900/300/305 Use Case for the Pressure Transmitter Application

IMPORTANT NOTICE FOR TI DESIGN INFORMATION AND RESOURCES

Texas Instruments Incorporated ("TI") technical, application or other design advice, services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using any particular TI Resource in any way, you (individually or, if you are acting on behalf of a company, your company) agree to use it solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources.

You understand and agree that you remain responsible for using your independent analysis, evaluation and judgment in designing your applications and that you have full and exclusive responsibility to assure the safety of your applications and compliance of your applications (and of all TI products used in or for your applications) with all applicable regulations, laws and other applicable requirements. You represent that, with respect to your applications, you have all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. You agree that prior to using or distributing any applications that include TI products, you will thoroughly test such applications and the functionality of such TI products as used in such applications. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

You are authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING TI RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY YOU AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You agree to fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of your non-compliance with the terms and provisions of this Notice.

This Notice applies to TI Resources. Additional terms apply to the use and purchase of certain types of materials, TI products and services. These include; without limitation, TI's standard terms for semiconductor products (<http://www.ti.com/sc/docs/stdterms.htm>), [evaluation modules](#), and [samples](http://www.ti.com/sc/docs/sampterm.htm) (<http://www.ti.com/sc/docs/sampterm.htm>).

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2017, Texas Instruments Incorporated