System Board 6661

MAXREFDES1154: CONFIGURABLE 4-CHANNEL RTD/TC MEASUREMENT SYSTEM USING THE MAX11410

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OVERVIEW

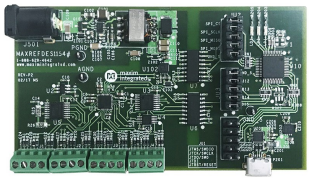
The MAXREFDES1154 is a configurable 4-channel RTD/ TC measurement system. Each channel can be configured as either RTD input or TC input using RTD for cold junction compensation. The RTD can either be PT100 or PT1000 connected in 2-wire or 3-wire configuration. The same configuration can also be used to measure resistance. MAXREFDES1154 also supports all types of thermocouples, using RTD for cold junction compensation, which can be PT100 or PT1000, but it needs to be configured as a 2-wire connection.

The MAXREFDES1154 provides a complete system solution for highly accurate temperature measurement in industrial applications. Analog front end includes two 8:1 multiplexer MAX4617 and one 4:1 multiplexer MAX4704 for RTD/TC input selection, and one 24-bit, 10-channel ADC MAX11410.

The microcontroller on board is used to communicate with the MAX11410 ADC, control the multiplexers, and process the ADC conversion results. The 24V field input power supply is isolated from both the analog front end and the microcontroller, which is powered using a USB. Isolation enhances system robustness, an important consideration in harsh industrial applications.

The MAXREFDES1154 design integrates two 8:1 multiplexer (MAX4617) and one 4:1 multiplexer (MAX4704), a 24-bit 10-channel ADC with internal PGA buffers (MAX11410), a high-precision 1.250V voltage reference (MAX6071), 2.75kVRMS digital isolator (MAX14930 and MAX14931), a STM32F1 microcontroller, a µP supervisor (MAX6730), a FTDI USB-UART bridge, a high-efficiency Iso-Buck DC-DC converter (MAX17681), and an isolated/regulated +3.3V power rail (MAX16910). The entire system typically consumes less than 300mW and fits onto a 5cm x 9cm board. It is targeted for industrial PLC applications.

MAXREFDES1154 Hardware



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This board is not available for purchase.

Key Features

- Highly accurate measurement
- Four channels
- Each channel can be configured as either RTD or TC input
- Supports 2-wire and 3-wire RTD
- Supports all types of thermocouple
- Thermocouple with RTD for cold junction compensation
- Sensor open detection
- 24V input protection

- Isolated power and data
- Board-level calibration

Designed, Built, Tested

Describing both hardware and firmware, this document details system design, particularly how the analog front end is achieved. This reference design has been built and tested, details of which follow later in the document.

Design Resources