DEMO MANUAL DC2507A

DESCRIPTION

Demonstration circuit DC2507A is a resistive protection network designed to interface the LTC®2986 demonstration boards (DC2508 for LTC2986 or DC2618 for LTC2986-1). The LTC2986 is a pin and software compatible 10-channel version of the 20-channel LTC2983. The LTC2986 includes several new modes enabling external protection/filtering resistors for 2-/3-/4-wire RTDs, thermistors, and thermocouples. The DC2507A includes a universal input 4-input terminal block, front end protection/filtering resistors, and an interface for connecting to the DC2508/DC2618 demonstration circuit.

The 4-input terminal block (J1) can directly interface to a single 2-/3-/4-wire RTD, or a thermistor, or a thermocouple (with 4 options for cold junction compensation). A single hardware design is shared between all sensor types. Switching between sensors simply requires a change in software (channel assignment programming). All LTC2986 input channels are isolated from the terminal block by a 2.4kΩ, 1W protection resistor, while the complementing DC2508 contains 100pF filtering capacitors. As a reference, the DC2507A includes a top level hookup diagram for each sensor type, see Figure 1.

The DC2507A requires a DC2531 or DC2608 kit. These kits contain the LTC2986 motherboard (DC2508 or DC2618) and a Linduino® One (DC2026) USB interface board. Additionally, QuikEval™ software is used to program the LTC2986 channel assignment data and display the temperature results.

Design files for this circuit board are available at http://www.linear.com/demo/DC2507A

Figure 1. DC2507A Demonstration Board
Global Parameters Setup

In order to run the LTC2986 in the universally protected mode, all 3 kelvin mode global variables need to be set, see Figure 2. Note, these variables are not available with the LTC2983 and LTC2984. The LTC2986 will automatically determine the current mode based on the sensor type and/or the number of sensor wires.

![Global parameters setup](Figure 2. Setting Global Kelvin Mode)
**Sense Resistor Setup**

The DC2508 includes a precision 2kΩ sense resistor. This Sense resistor is assigned to CH2 for all RTDs and Thermistors (see Figure 3).

**Built-In Configurations**

The LTC2986 demonstration software includes stored configurations for each of the sensor type used for the DC2507A demonstration board. These can be loaded by selecting the menu function: Configuration > Demo Board > DC2507A. (see Figure 4). These configurations will automatically load all the channel assignment data and global variables for each sensor.

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![Figure 3. Sense Resistor Channel Assignment](image1)

![Figure 4. Loading Pre-Programmed Sensor Configurations](image2)
SETUP

2-Wire RTD
Connect the 2-wire RTD to between terminals 1 and 2 on terminal block J1, see Figure 5.

Figure 5. 2-Wire RTD Connection

The 2-wire RTD is assigned to CH4 (see Figure 6) and can be automatically loaded using the configuration file DC2507A_MULTI_SENSOR_BOARD_2_WIRE_RTD or manually entered using the LTC2986 demonstration software.

Figure 6. 2-Wire RTD Configuration
**SETUP**

3-Wire RTD

Connect the 3-wire RTD to between terminals 1, 2 and 3 on terminal block J1, see Figure 7.

The 3-wire RTD is assigned to CH6 (see Figure 8) and can be automatically loaded using the configuration file DC2507A_MULTI_SENSOR_BOARD_3_WIRE_RTD or manually entered using the LTC2986 demonstration software.

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**Figure 7. 3-Wire RTD Connection**

![3-Wire RTD Connection Diagram](image1)

**Figure 8. 3-Wire RTD Configuration**

![3-Wire RTD Configuration Image](image2)
SETUP

4-Wire RTD

Connect the 4-wire RTD to between terminals 1, 2, 3 and 4 on terminal block J1, see Figure 9.

The 4-wire RTD is assigned to CH6 (see Figure 10) and can be automatically loaded using the configuration file DC2507A_MULTI_SENSOR_BOARD_4_WIRE_RTD or manually entered using the LTC2986 demonstration software. In the universal protected mode, 4-wire RTDs have rotation and sharing turned off, the DC2507 includes a protected ground connection for the 4-wire RTD.

Figure 9. 4-Wire RTD Connection

Figure 10. 4-Wire RTD Configuration
**SETUP**

**Thermistor**

Connect the thermistor between terminals 1 and 2 on terminal block J1, see Figure 11.

![Thermistor Connection](image)

Figure 11. Thermistor Connection

The thermistor is assigned to CH4 (see Figure 12) and can be automatically loaded using the configuration file DC2507A_MULTI_SENSOR_BOARD_10K_THERMISTOR or manually entered using the LTC2986 demonstration software.

![Thermistor Configuration](image)

Figure 12. Thermistor Configuration
Thermocouple

Connect the thermocouple between terminals 3 and 4 on terminal block J1, see Figure 13. 1 of 4 sensors can be used for the cold junction compensation.

**CJ Option 1:** Active analog temperature sensor (U1) tied to CH10.

**CJ Option 2:** Diode (Q1) tied to CH9.

**CJ Option 3:** 2-wire RTD connected between terminals 1 and 2 on terminal block J1 and assigned to CH4.

**CJ Option 4:** Thermistor connected between terminals 1 and 2 on terminal block J1 and assigned to CH4.

See pages 63-65 in the LTC2986 data sheet for more information.

The thermocouple is assigned to CH6 (see Figure 14) and can be automatically loaded using the configuration file DC2507A_MULTI_SENSOR_BOARD_THERMOCOUPLE_THERMISTOR_CJ or DC2507A_MULTI_SENSOR_BOARD_THERMOCOUPLE_PT100_CJ or manually entered using the LTC2986 demonstration software.

![Figure 13. Thermocouple and Cold Junction Connection](image1)

![Figure 14. Thermocouple and Cold Junction Configuration](image2)
PCB LAYOUT

Top Silkscreen

[Diagram of PCB layout with annotations]

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PCB LAYOUT

Top Layer
Bottom Layer
**PARTS LIST**

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<th>ITEM</th>
<th>QTY</th>
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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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