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Evaluation Board for the LTM2985 Isolated High Accuracy Digital Temperature Measurement System with EEPROM

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Description

The DC2872A is an evaluation board for demonstrating the performance and ease of use of the LTM2985, an isolated 10-channel temperature measurement system on a chip, software compatible with the LTC2986-1. It provides 5kV isolated power and SPI interface to the precision temperature-to-bits converter.

The LTM2985 datasheet provides additional information and should be consulted when using the evaluation board.

The DC2872A is designed to allow easy evaluation of the LTM2985 and may be connected to any one of the sensor daughter boards.

- Universal Temperature Measurement Board – DC2211
- Thermocouple Board – DC2212
- Dedicated RTD Board – DC2213
- Dedicated Thermistor Board – DC2214
- Experimenter Board - DC2210 (only comes with LTC2983/LTC2984/LTC2986/LTC2986-1 starter kits)

These daughter boards allow evaluation of the various sensors the LTM2985 supports. For the serial digital interface, the DC2872A may be connected to the DC2026 Linduino® One.

Evaluation Kit Contents

- DC2872A Evaluation Board

Equipment Needed

- PC running Windows®
- USB 2.0 port and USB 2.0 Cable A-B Male
- DC2026C Linduino One controller board (commonly referred to as DC2026C or Linduino)

Additional Documents

- LTM2985 Datasheet
- LTC2986-LTM2985 Demo Software Manual

Software Required

- LTM2985 Demo Software

Test Points

Reference Designator	Quantity	Description	Comments
VCC	1	Isolated Precision Power Supply	Installed
GND	3	Circuit Ground	1 installed, 2 DNI
CS_N	1	Serial SPI Chip Select	DNI
SCK	1	Serial SPI Clock Input	DNI
SDI	1	Serial SPI Data Input	DNI
SDO	1	Serial SPI Digital Output	DNI
DOUT	1	Digital Output	DNI
VCC2	1	5V Nominal Isolated Supply Voltage	Installed
GND2	2	Isolated Ground	1 installed, 1 DNI
VREF	1	Reference output pin	Installed
INT	1	Interrupt	DNI
DIN	1	Digital Input	DNI
P1	1	2-pin header for shorting INT and DIN	Installed

Quick Start Procedure

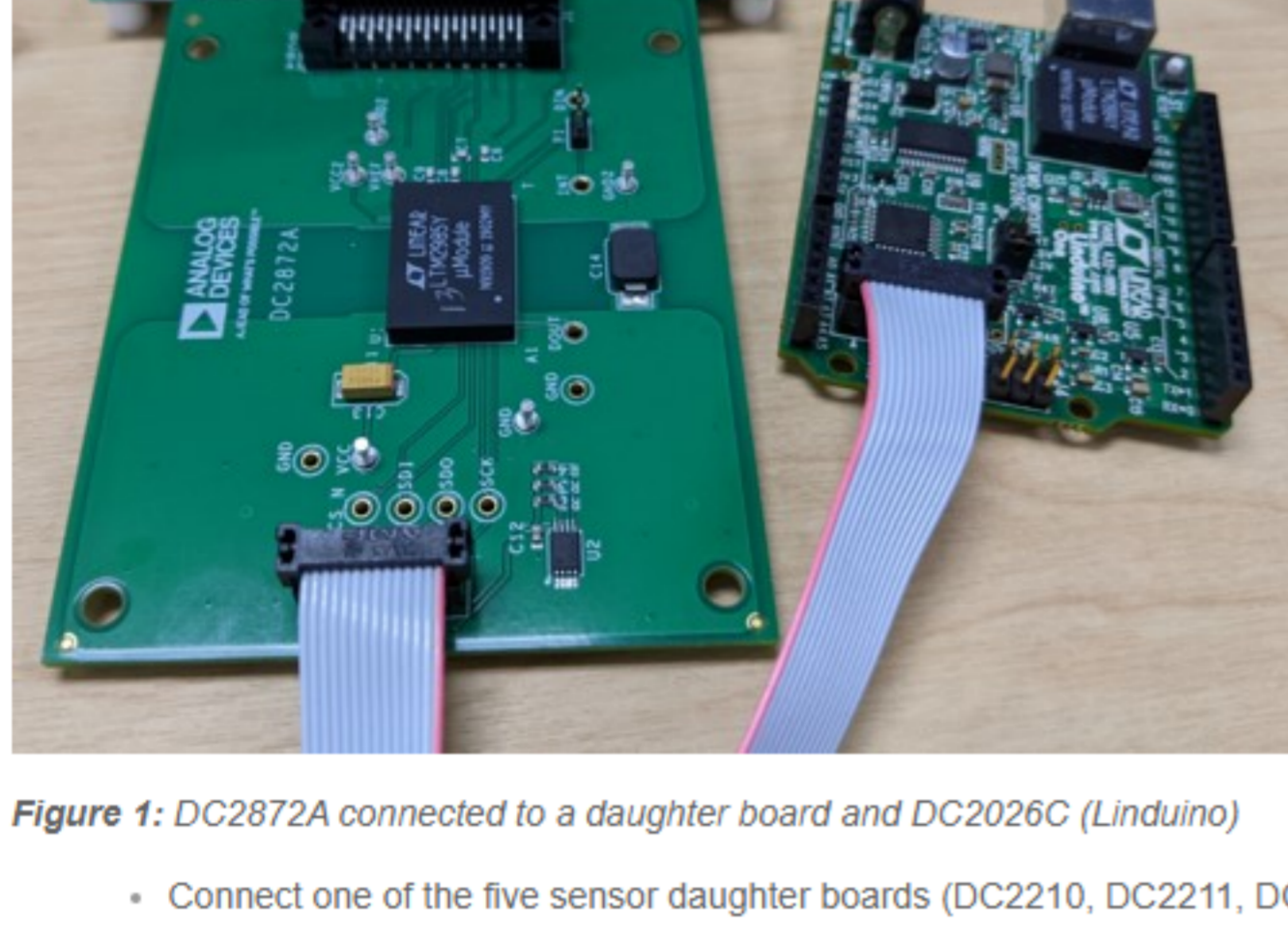


Figure 1: DC2872A connected to a daughter board and DC2026C (Linduino)

- Connect one of the five sensor daughter boards (DC2210, DC2211, DC2212, DC2213 or DC2214) to the DC2872A demo board.
- Connect the DC2872A to a DC2026C using the supplied 14-conductor ribbon cable.
- Connect the DC2026C to the PC using a standard USB A/B cable.
- Run the DC2872A demo software downloaded from its product page.

The demo software helps program and run the LTM2985. It can configure, check and save the configuration, run the LTM2985, output the results into a file, and even create Linduino ready C code based on the configuration. Refer to software manual LTC2986-LTM2985DSM for more detailed information.

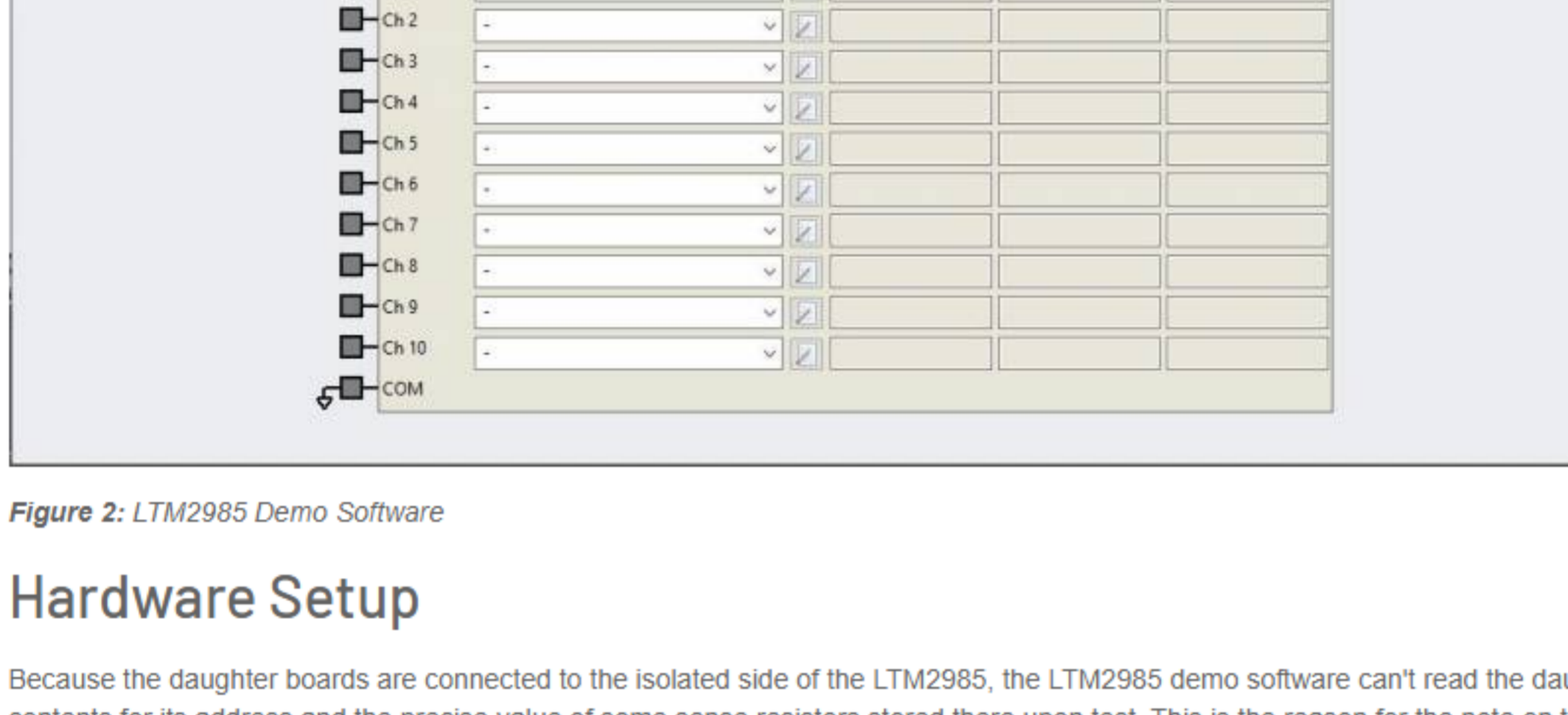


Figure 2: LTM2985 Demo Software

Hardware Setup

Because the daughter boards are connected to the isolated side of the LTM2985, the LTM2985 demo software can't read the daughter board's EEPROM contents for its address and the precise value of some sense resistors stored there upon test. This is the reason for the note on the LTC2986-LTM2985DSM saying that the section on Loading The Configuration from a Daughter Board only applies to the LTC2986 and LTC2986-1.

DC2211 Universal Temperature Measurement Board

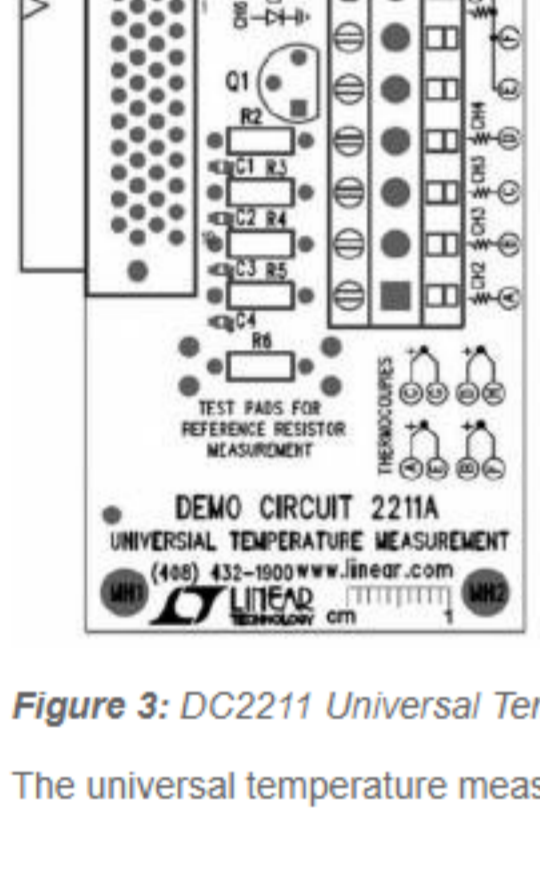


Figure 3: DC2211 Universal Temperature Measurement Board

The universal temperature measurement board allows the user to connect any of the LTM2985 supported sensors to the DC2872A demo board.

It has a built-in sense resistor for RTD applications as well as a cold junction sensor diode for thermocouple applications. The sense resistor is a 2kΩ ±0.1% 10ppm/°C sense resistor on channels 1 and 2 which may be used with any of the supported RTD sensor types.

The external interface on the universal temperature measurement board is an 8-position screw-terminal block with the flowing pinout.

DC2211 Terminal Connector Pinout

Position	Connection
Position A	LTM2985 CH2 as well as the low side of the on-board 2k sense resistor
Position B	LTM2985 CH3
Position C	LTM2985 CH4
Position D	LTM2985 CH5
Position E	Common/Ground Connection
Position F	Common/Ground Connection
Position G	Common/Ground Connection
Position H	Common/Ground Connection

DC2211 Schematics and Design Files

DC2212 Thermocouple Daughter Board

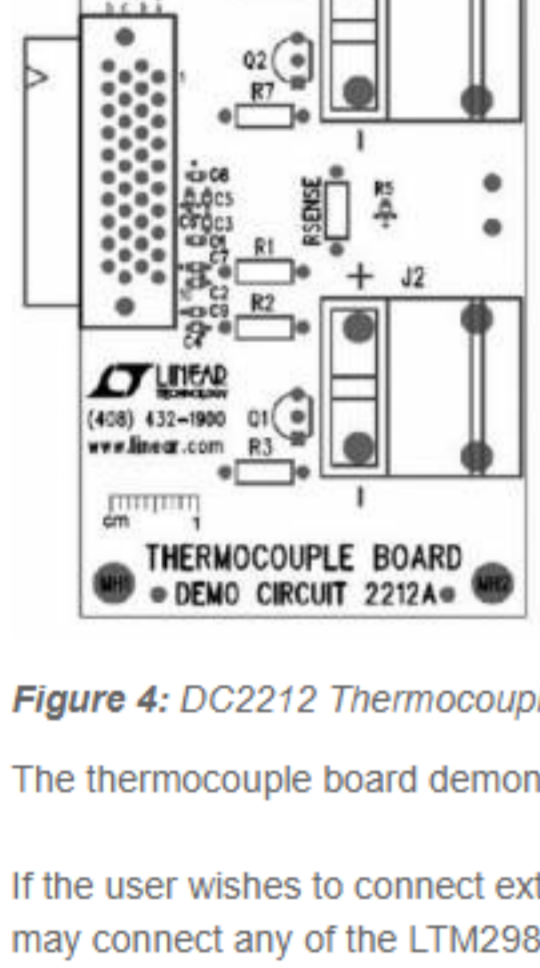


Figure 4: DC2212 Thermocouple Daughter Board

The thermocouple board demonstrates the flexibility, accuracy, and low noise features of the LTM2985 thermocouple modes.

If the user wishes to connect external sensors to the thermocouple board, two universal-type thermocouples (J2 and J3) are available. The user may connect any of the LTM2985 supported thermocouples (B, E, J, K, N, R, S, or T) as well as custom thermocouples through these jacks.

To demonstrate the flexibility of the LTM2985, the thermocouple board includes cold junction diodes (Q1 and Q2) embedded in each thermocouple socket. Alternatively, a 4-wire PT100 RTD (R5) can be used as the cold junction sensor for either or both thermocouples.

To demonstrate the low system noise and offset of the LTM2985, the thermocouple board provides a short to ground on channel 5.

To demonstrate the accuracy of the LTM2985, the thermocouple board allows the user to connect a thermocouple calibrator or an external voltage source to CH10 of the LTM2985 through a pair of banana jacks (J4 and J5).

DC2212 Schematics and Design Files

DC2213 Dedicated RTD Board

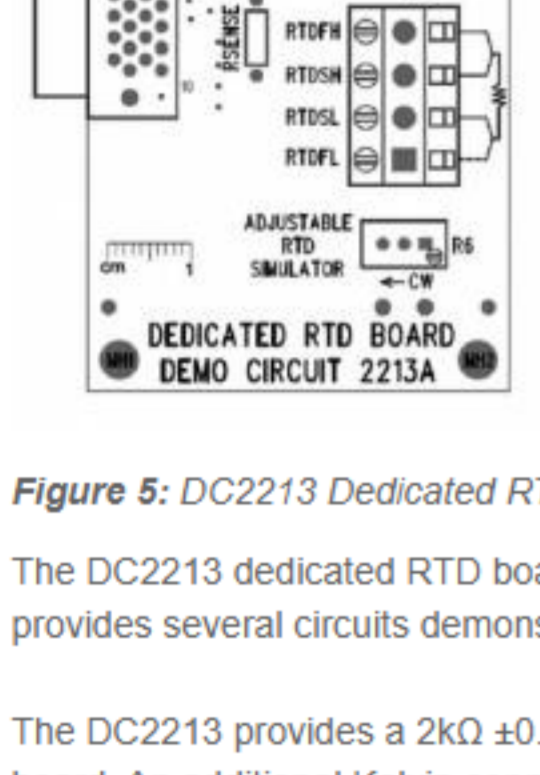


Figure 5: DC2213 Dedicated RTD Board

The DC2213 dedicated RTD board demonstrates the flexibility, accuracy, and low noise features of the LTM2985 RTD sensor modes. The DC2213 provides several circuits demonstrating the features of the LTM2985.

The DC2213 provides a 2kΩ ±0.1% 10ppm/°C sense resistor on channels 2 and 3 which may be used with any of the RTD sensor circuits on this board. An additional Kelvin connection is also provided to this sense resistor on channel 1.

To demonstrate the low system noise of the LTM2985, the dedicated RTD board provides a 0°C PT100 simulator (100Ω ±0.01% 10ppm/°C) on channels 3 to 6 configured as a 4-wire sensor. In addition to this the user may use this circuit to demonstrate how the rotated mode eliminates measurement error introduced by parasitic thermocouples. To facilitate this measurement, the DC2213 provides an external thermocouple interface which acts as a parasitic thermocouple.

To see the effects of parasitic thermocouples on non-rotated measurement modes, first measure the on-board 0°C PT100 simulator in a non-rotated configuration and see the measurement error as the thermocouple's temperature changes. To see the benefit of the rotated measurement mode, switch from the no rotation/sharing to the rotation/ sharing configuration and see the errors introduced by the parasitic thermocouple minimized.

If the user wishes to connect an external RTD to the sensor board, a 4-position terminal block is provided. The user may connect any of the LTM2985 supported RTDs as well as custom RTDs to the DC2872A demo board through this interface. The interface may be configured for 3 or 4 wire sensors. To demonstrate the accuracy of the LTM2985, the user may also connect an RTD calibrator or precision resistors to this interface.

DC2213 Schematics and Design Files

DC2214 Dedicated Thermistor Board

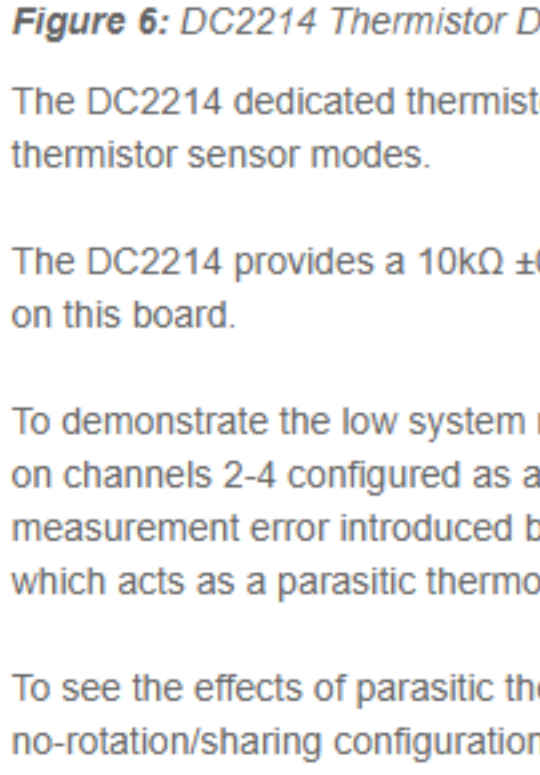


Figure 6: DC2214 Thermistor Daughter Board

The DC2214 dedicated thermistor board includes several circuits to demonstrate the flexibility, accuracy, and low noise features of the LTM2985 thermistor sensor modes.

The DC2214 provides a 10kΩ ±0.1% 15ppm/°C sense resistor on channels 1 and 2 which is shared with all of the thermistor sensor circuits on this board.

To demonstrate the low system noise of the LTM2985 the dedicated thermistor board provides a 25°C 10k thermistor simulator (10kΩ ±0.1% 15ppm/°C) on channels 2-4 configured as a differential sensor. In addition to this user may use this circuit to demonstrate how the rotated mode eliminates measurement error introduced by parasitic thermocouples. To facilitate this demonstration the DC2214 provides an external thermocouple interface which acts as a parasitic thermocouple.

To see the effects of parasitic thermocouples on non-rotated measurement modes, first measure the on-board 25°C 10k thermistor simulator in a no-rotation/sharing configuration and see the measurement error as the thermocouple's temperature changes. To see the benefit of the rotated measurement mode, switch to the rotation/ sharing configuration and see the errors introduced by the parasitic thermocouple disappear (the effects are more significant with lower excitation current).

The DC2214 also includes a 499kΩ (0.1% 15ppm/°C) thermistor simulator on channels 9 and 10. Ideally, this resistor simulates -30.59°C for a 44008 (30k) thermistor and -51.94°C for a 44006 (10k) thermistor. Note, the 10k thermistor reports the temperature, but also indicates a soft fault since the temperature is below the thermistor's specified minimum temperature. In addition to the fixed value thermistor simulators, there is a variable resistor thermistor simulator as well. This circuit can be used to demonstrate the range of the various LTM2985 thermistor sensor modes as well as demonstrate the fault detection capabilities of the LTM2985.

If the user wishes to connect an external thermistor to the daughter board, a 2-position terminal block is provided. The user may connect any of the LTM2985 supported thermistors as well as custom thermistors to the DC2872A demo board through this interface. To demonstrate the accuracy of the LTM2985, the user may connect external resistance standards to this interface.

DC2214 Schematics and Design Files

DC2210 Experimenter Board

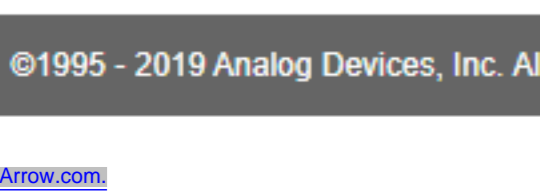


Figure 7: DC2210 Experimenter Board

The DC2210 experimenter board brings all LTM2985 channels plus the COM connection out to a proto area and a 24-position terminal block. The user may connect any of the supported sensors and sense resistors to any of the LTM2985 inputs in this area. Please note that only CH1 to CH10 are valid on the DC2210 when used in conjunction with the DC2872A.

DC2210 Schematics and Design Files (part of LTC2986-1 Kit, cannot be bought standalone)

resources/eval/dc2872a.txt · Last modified: 28 Oct 2021 05:39 by karen nueva ecija