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# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 790

## 8-CHANNEL DIFFERENTIAL 16-BIT ADC

### LTC2439-1

## DESCRIPTION

The LTC2439-1 is a high resolution 16-bit  $\Delta\Sigma$  ADC with 5ppm INL and 5 $\mu$ V offset. Channel selection is programmed through a simple serial interface. Since there is no latency, each conversion is valid, even after a change in input channel.

Demonstration circuit 790 is a member of Linear Technology's QuickEval™ family of demonstration boards.

It is designed to allow easy evaluation of the LTC2439-1 and may be connected directly to the target application's analog signals while using the

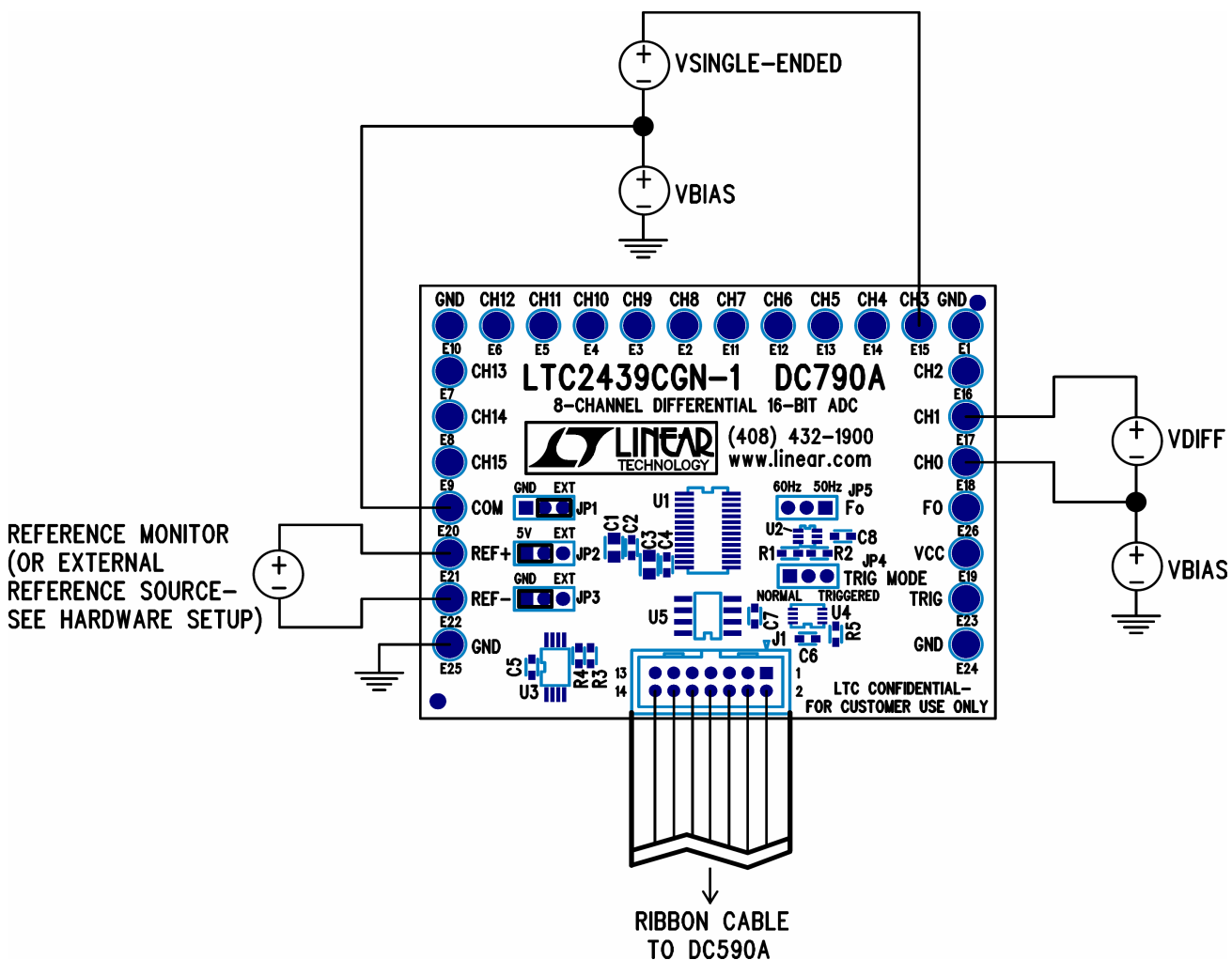
DC590 USB Serial Controller board and supplied software to measure performance.

After evaluating with LTC's software, the digital signals can be connected to the application's processor / controller for development of the serial interface.

**Design files for this circuit board are available. Call the LTC factory.**

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Figure 1. Proper Measurement Equipment Setup

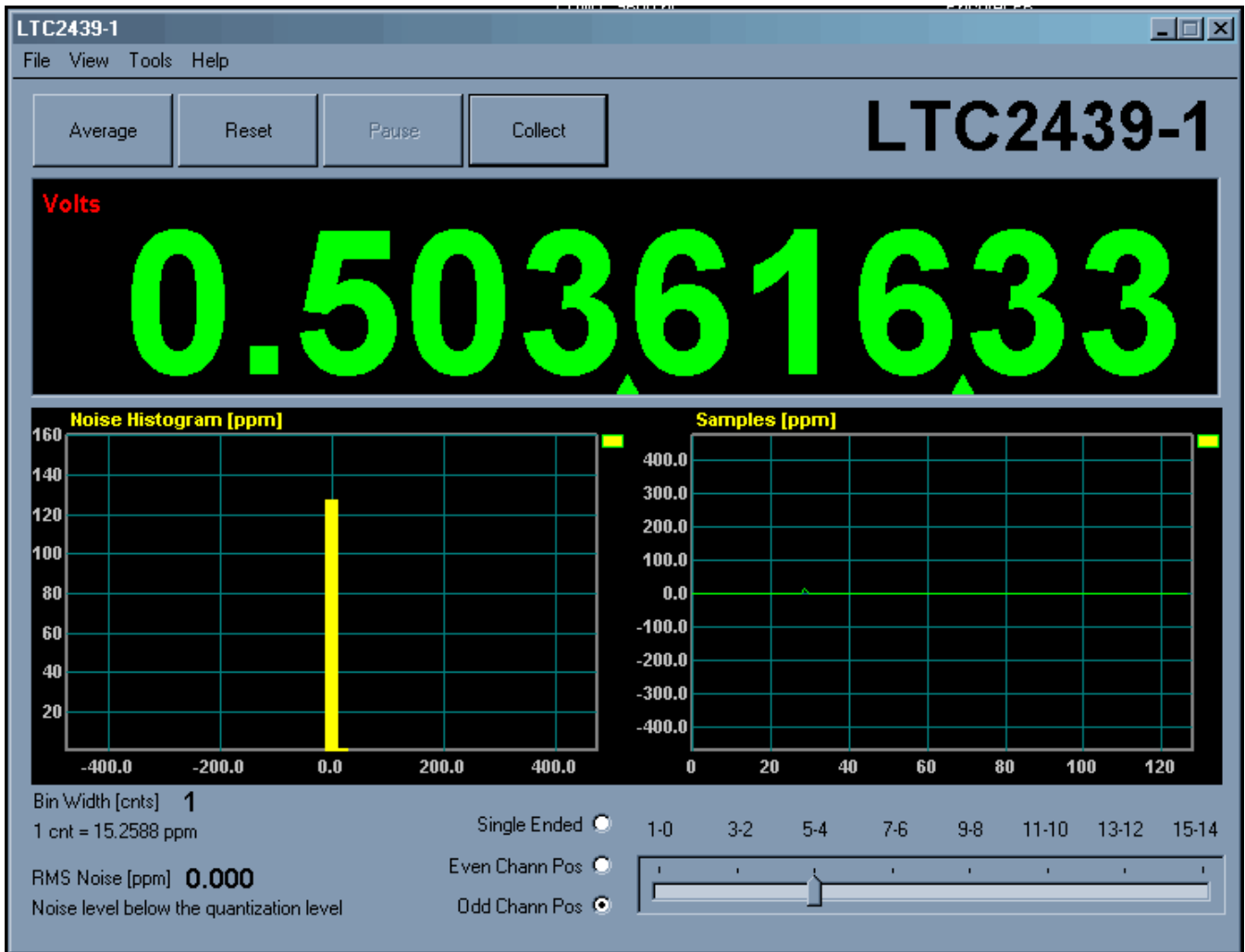


## QUICK START PROCEDURE

Connect DC790 to DC590 USB Serial Controller using the supplied 14 conductor ribbon cable. Connect DC590 to host PC with a standard USB A/B cable. Run the evaluation software supplied with DC590 or downloaded from [www.linear.com](http://www.linear.com). The correct program will be loaded automatically. Click the COLLECT button to start reading the input voltage. Click the slider at the bottom of the strip-chart display to change the input channel being displayed. For differential measurements, Even Channel Pos and Odd

Channel Pos correspond to even channels being positive inputs and odd channels being positive inputs, respectively. See the LTC2439-1 data sheet for details of channel selection.

Tools are available for logging data, changing reference voltage, changing the number of points in the strip chart and histogram, and changing the number of points averaged for the DVM display.



## HARDWARE SET-UP

### JUMPERS

JP1 – Select the connection for the common pin, either ground or external connection. Single ended measurements are taken with respect to this pin.

JP2, 3 – Select source for differential reference. Selecting 5V and GND will use the onboard 5 volt reference. Select EXT to use an external reference.

JP5 – Select notch frequency, 60Hz or 50Hz. Alternatively, this jumper may be removed and an external conversion clock applied to the center pin of JP5.

### CONNECTION TO DC590 SERIAL CONTROLLER

J1 is the power and digital interface connector. Connect to DC590 serial controller with supplied 14 conductor ribbon cable.

### ANALOG CONNECTIONS

Analog signal connections are made via the turret posts along the edge of the board (CH0 to CH15.) Also, if you are connecting the board to an existing circuit make full use of the four ground connections at the corners of the board.

When using the onboard reference, the voltage can be measured across the REF- and REF+ turrets.

## EXPERIMENTS

Figure 2 shows a number of applications for the LTC2439-1.

### CH0, CH1, CH2

Channels 0 and 1 measure the differential output of an Intersema MS5401 absolute pressure sensor. The 6.8k resistor performs a first order temperature compensation of the bridge output. CH2 measures the bridge voltage, which provides a convenient temperature measurement. This can also be used to perform further temperature compensation in software.

### CH3

CH3 measures the output of a thermistor in a half bridge circuit. Many thermistors will work, the constraints are that the bridge output must have an impedance of less than 20k and the voltage must not go above  $V_{REF}/2$ .

### CH4

CH4 measures the output of a type J thermocouple. The circuit shown for channel 3 can be used for cold junction compensation. The cold junction sensor should be close to the connections of the thermocouple to the board. A 5 volt reference gives a resolution of about 1.5°C. A 1.25V reference will give a 0.38°C resolution.

### CH5

CH5 measures the output of an Omega OS36-01 infrared thermocouple. This can be used for remote temperature measurement.

### CH6

CH6 measures the photocurrent of a Hamamatsu S1336-5BK photodiode.

### CH7

Channel 7 measures the output of a resistive attenuator.

### CH8,9

Channels 8 and 9 measure the drop across a Deltec SWE-3000-50 current shunt. Full scale is 3000 amps with a resolution of 60mA when a 100mV reference is used. With careful grounding, both positive and negative currents can be measured. Care must be taken to ensure that both inputs stay more positive than  $GND - 0.3$  volts.

### CH10

CH10 is buffered with an LT1793 FET input amplifier suitable very high source impedance measurements.

### CH11

CH11 measures the output of a precision rectifier.

### CH12,13

Channels 12 and 13 measure a 3-wire RTD. The differential voltage is the output, and CH12 single ended reading is the ground lead compensation.

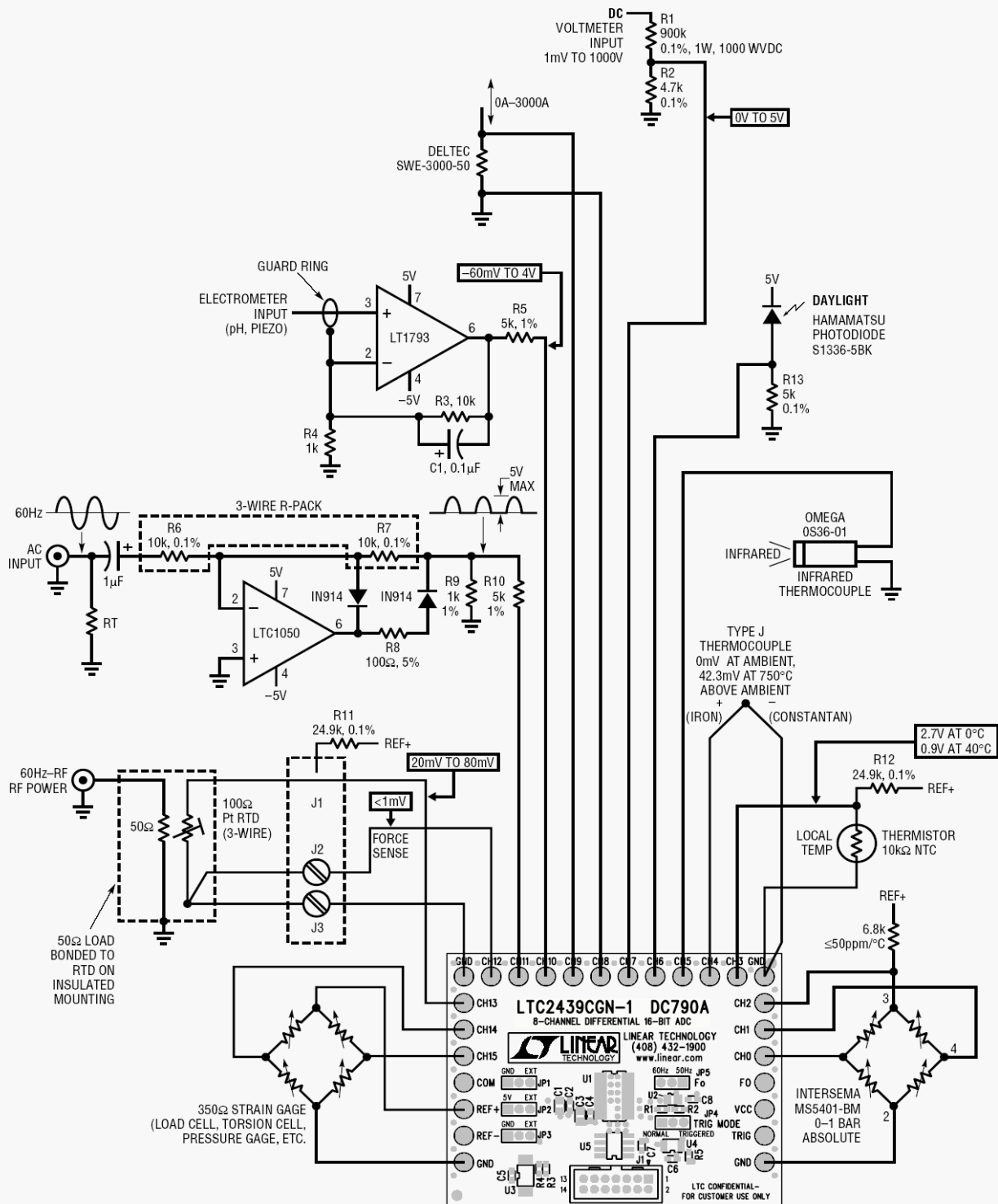
### CH14,15

Channels 14 and 15 measure the output of a 350 ohm bridge. This is standard for a wide variety of sensors. Typically the full scale output voltage is only 10 mV. However, with a 100mV reference the LTC2439-1 still gives 13 effective bits of resolution with no amplification.

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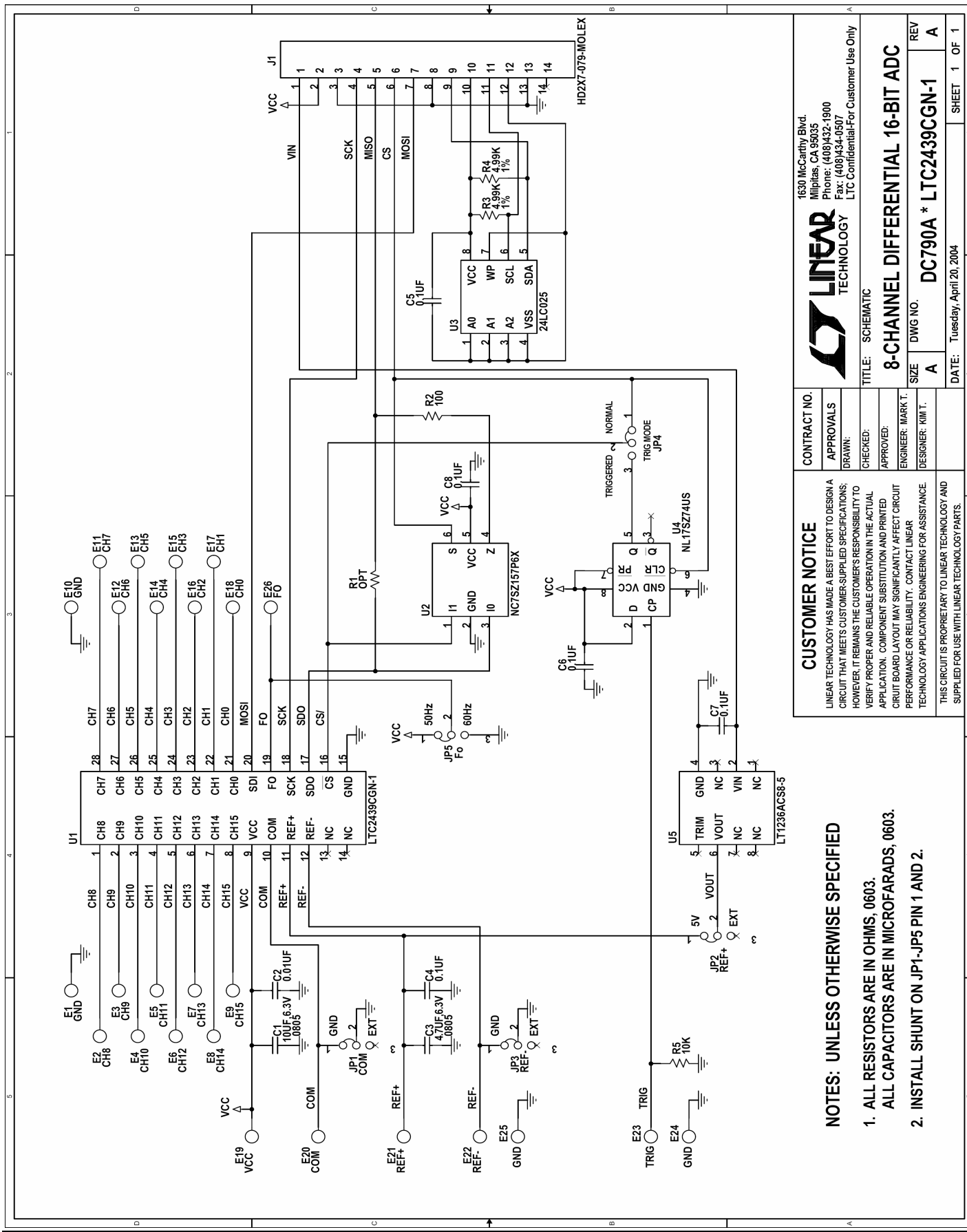
## 8-CHANNEL DIFFERENTIAL 16-BIT ADC

Figure 2. Applications for LTC2439-1



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## 8-CHANNEL DIFFERENTIAL 16-BIT ADC



<b>CUSTOMER NOTICE</b>		CONTRACT NO.	
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.		APPROVALS	1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408)432-1900 Fax: (408)434-0507 LTC Confidential-For Customer Use Only
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.		DRAWN:	<b>LINEAR TECHNOLOGY</b> <b>8-CHANNEL DIFFERENTIAL 16-BIT ADC</b> TITLE: SCHEMATIC SIZE: A DWG NO.: DC790A * LTC2439CGN-1 REV: A DATE: Tuesday, April 20, 2004 SHEET 1 OF 1
		CHECKED:	
		APPROVED:	
		ENGINEER: MARK T. DESIGNER: KIM T.	

- NOTES: UNLESS OTHERWISE SPECIFIED**
- ALL RESISTORS ARE IN OHMS, 0603.
  - ALL CAPACITORS ARE IN MICROFARADS, 0603.
  - INSTALL SHUNT ON JP1-JP5 PIN 1 AND 2.

