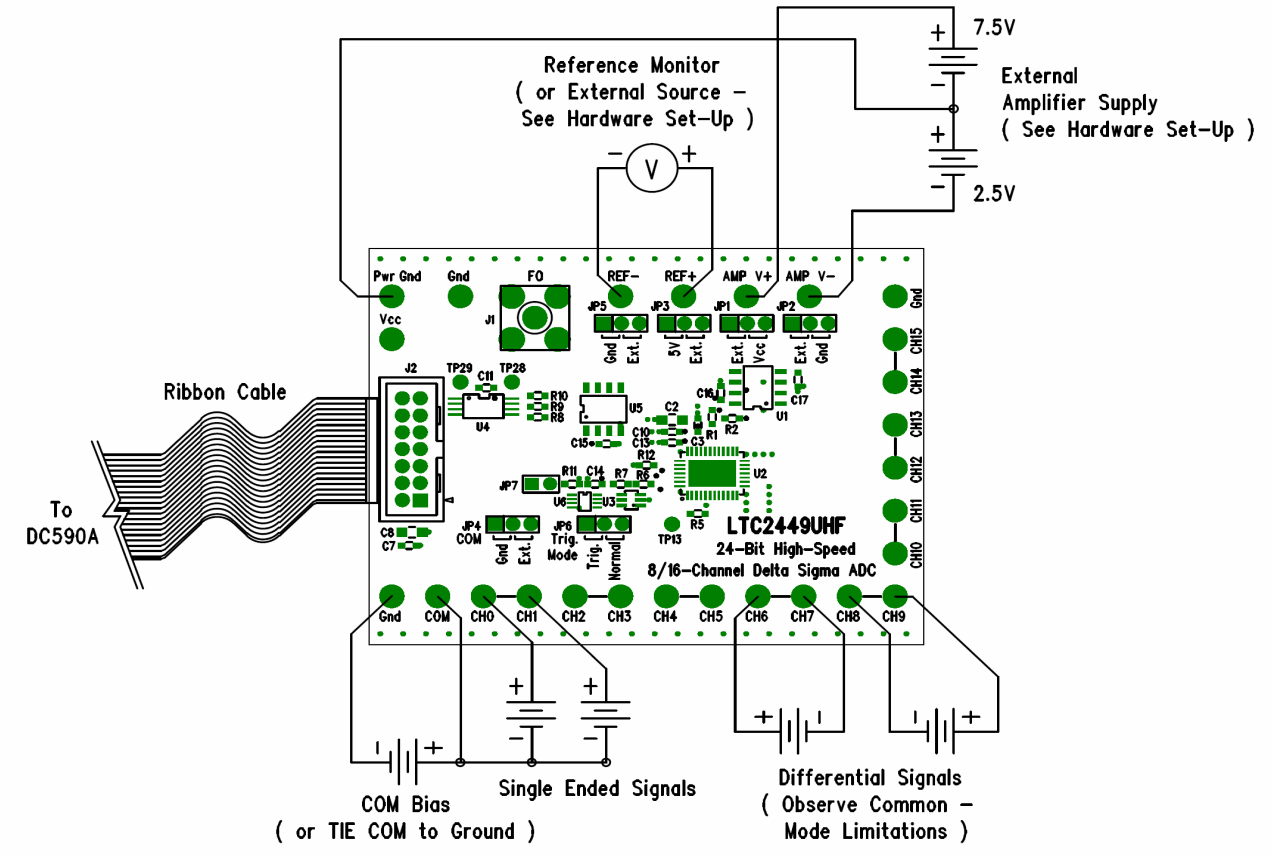
DESCRIPTION

The LTC®2449 is an 8/16 channel, high speed, 24-bit ΔΣ ADC with ten selectable speed / resolution modes from 6.9Hz/200nV$_{RMS}$ to 3.5 kHz/25μV$_{RMS}$. Key DC specifications include 5ppm INL, 5μV offset, 10ppm full-scale error and 20nV/°C offset drift. In the 6.9Hz/200nV$_{RMS}$ mode, input normal mode rejection of 50Hz and 60Hz noise is better than 87dB. The accuracy (offset, full-scale, linearity, drift) and power dissipation are independent of the speed selected. The LTC2449 performs autozeroing of the ADC by reversing the inputs through the multiplexer output / ADC input connections. This allows an external dual buffer amplifier to isolate the signal inputs from the sampling current of the ADC.

DC742 is a member of Linear Technology's QuickEval™ family of demonstration boards. It is designed to allow easy evaluation of the LTC2449 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. The exposed ground planes allow proper grounding to prototype circuitry. 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.

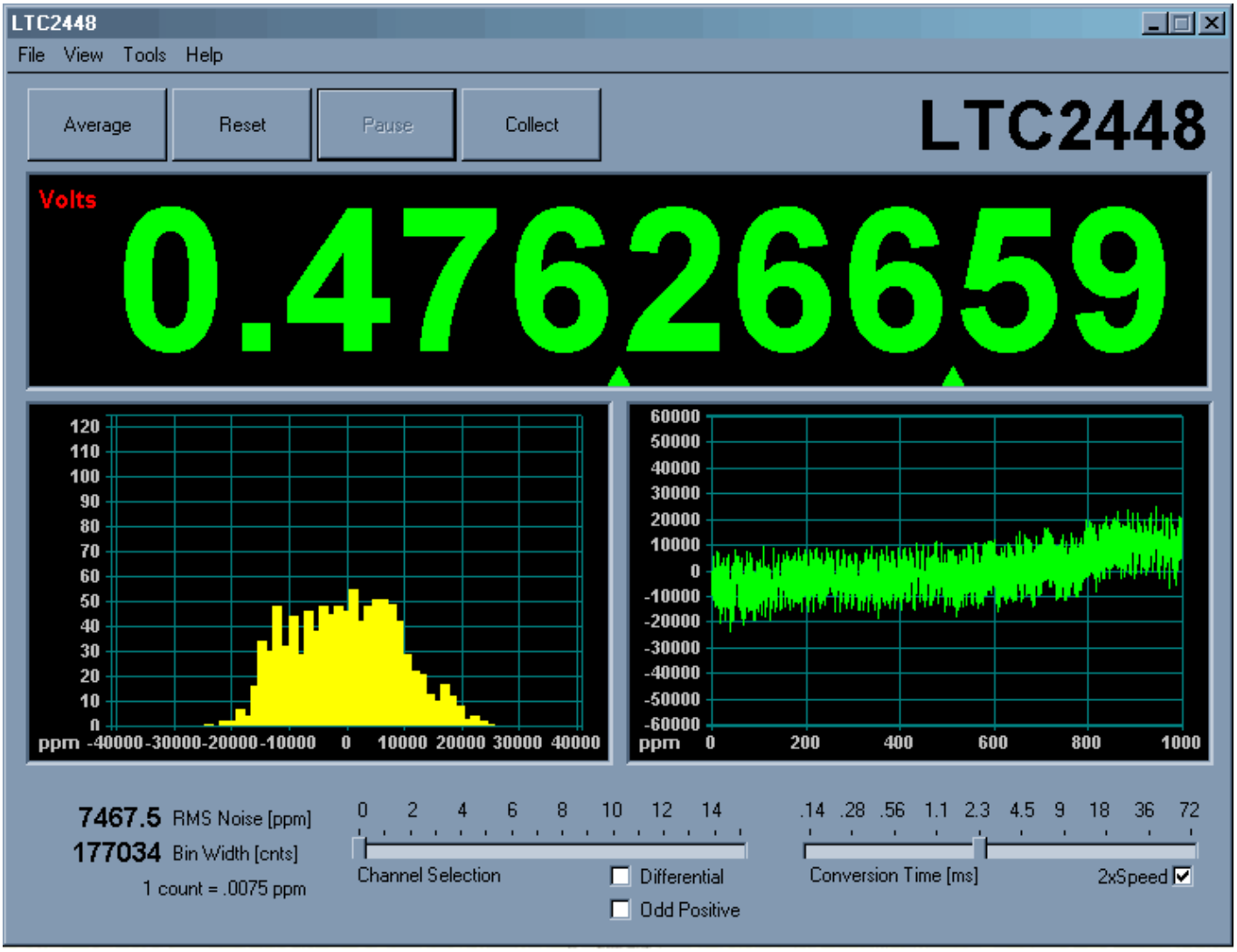
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QUICK START PROCEDURE

Connect DC742 to a 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. 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 oversample ratio (OSR) which will in turn change the data output rate.

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, JP2 – Select the positive and negative supply voltages for the onboard amplifier. Supplies can be GND and Vcc or supplied externally.

JP3, JP5 – Select the source for REF+ and REF-, respectively. REF+ can be 5.00 volts from the onboard LT1236 reference (default) or supplied externally. REF- can be Ground (0 volts, default) or supplied externally.

JP4 – Select source for analog COM input, either tied to ground or supplied externally to the COM turret post.

JP6 – Trigger mode, either normal (default) or externally triggered.

JP7 – Trigger input signal. Pin 1 is a 5-volt logic signal, pin 2 is ground. When triggered mode is selected on JP3, a rising edge starts a new conversion. Note that since a conversion cannot be terminated once started, this signal can only be used to slow down the conversion rate.

CONNECTION TO DC590 SERIAL CONTROLLER

J2 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 row of turret posts along the edge of the board. Also, if you are connecting the board to an existing circuit, the exposed ground planes along the edges of the board may be used to form a solid connection between grounds.

GND – Ground turrets are connected directly to the internal analog ground plane.

PWR GND – Power ground, connected to the power return trace.

VCC – This is the supply for the ADC. Do not draw any power from this point. External power may be applied to this point after disabling the switching supply on DC590. If the DC590 serial controller is being used, the voltage must be regulated 5 volts only, as the isolation circuitry will also be powered from this supply. See the DC590 quick start guide for details.

REF+, REF- - These turrets are connected to the LTC2449 REF+ and REF- pins. If the onboard reference is being used, the reference voltage may be monitored from this point. An external reference may be connected to these terminals if JP3 and JP5 are configured for external reference.

Note: The REF+ and REF- terminals are decoupled to ground with 0.1µF and 10 µF capacitors in parallel. Thus any source connected to these terminals must be able to drive a capacitive load and have very low impedance at DC. Examples are series references that require an output capacitor and C-load stable op amps such as the LT1219 and LT1368.

CH0 – CH15 – These are the differential inputs to the LTC2449. They may be configured either as single –ended inputs with respect to the COM pin, or adjacent pairs may be configured as differential inputs (CH0-1, CH2-3, etc.)

EXPERIMENTS

INPUT NOISE

Solder a short wire from the CH0 to CH1. Ensure that the buffer amplifiers are in their active region of operation by either biasing the inputs to mid – supply with a 10kΩ-10kΩ divider when the buffer amplifier is powered from Vcc and ground, or tie the inputs to ground and connect an external +7.5V / -2.5V supply to the AMPV- turret (JP1 and JP2 must be set to EXT.)

Set the demo software to OSR32768 (6.8 samples per second.) and check the 2X box. Noise should be approximately 0.04ppm of Vref (200nV.) Next, select different oversample ratios. Measured noise for each oversample ratio should be close to values given in the LTC2449 Data Sheet.

COMMON MODE REJECTION

Tie the two inputs (still connected together from previous experiment) to ground through a short wire and note the indicated voltage. Tie the inputs to REF+; the difference should be less than 5 μV due to the 120 dB CMRR of the LTC2449.

This experiment requires an external power supply to the buffer amplifier.

If the common mode voltage is limited to GND+0.25V to Vcc-0.25V, this test may be performed with the amplifier supplies set to ground and Vcc.

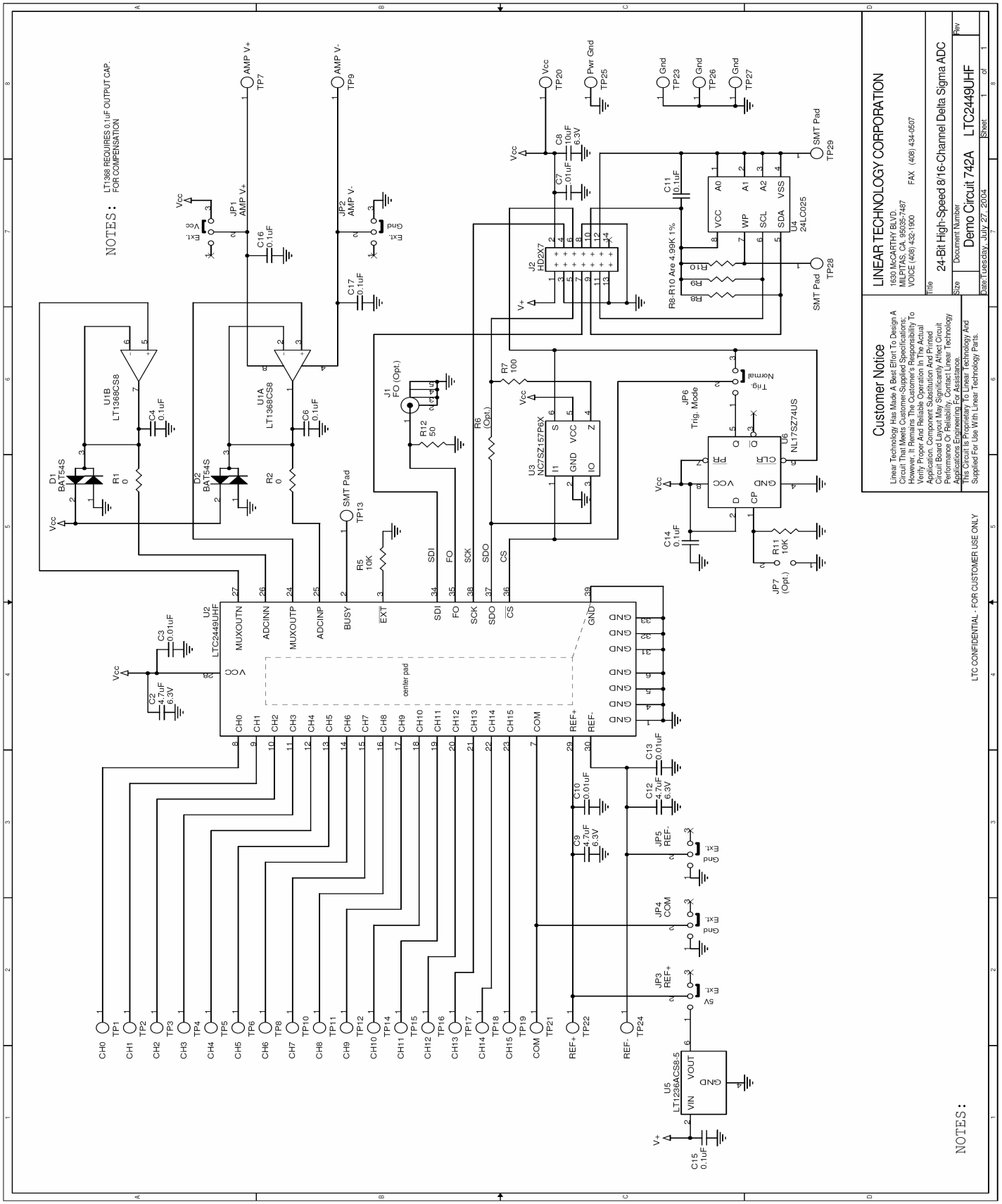
INPUT NORMAL MODE REJECTION

The LTC2440's SINC4 digital filter is trimmed to strongly reject both 50 and 60 Hz line noise when operated with the internal conversion clock and oversample ratio 32768 (6.8 samples per second.) To measure input normal mode rejection, connect COM to a 2.5 volt source such as an LT1790-2.5 reference or a power supply. Connect any other input (CH0 – CH15) to the same supply through a 10kΩ resistor. Apply a 10 Hz, 2V peak-to-peak sine wave to the input through a 1uF capacitor.

Select OSR32768 (6.8 samples per second) and 2X mode in the demo software and start taking data. The input noise will be quite large, and the graph of output vs. time should show large variations.

Next, slowly increase the frequency to 55 Hz. The noise should be almost undetectable in the graph. Note that the indicated noise in ppm may still be above that of the datasheet specification because the inputs are not connected to a DC source.

Change the OSR to 16384 (13.75 samples per second;) the noise will increase substantially, as the first notch at this OSR is at 110 Hz. Increase the signal generator frequency to 110 Hz, the noise will drop again.


NOTES:
LT1368 REQUIRES 0.1uF OUTPUT CAP. FOR COMPENSATION
U2 LTC2449UHF
U1A LT1368CS8
U1B LT1368CS8
U3 NC7SZ157P6X
U4 24LC025
U5 LT1236ACS8-5
U6 NL17SZ74US
J1 FO (Opt.)
J2 HD2X7
JP1 AMP V+
JP2 AMP V-
JP3 REF+
JP4 COM
JP5 REF-
JP6 Trig. Mode
JP7 (Opt.)
R8-R10 Are 4.99K 1%
Customer Notice
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.
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24-Bit High-Speed 8/16-Channel Delta Sigma ADC
Size
Document Number
Demo Circuit 742A LTC2449UHF
Rev
Date: Tuesday, July 27, 2004
Sheet 1 of 1
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NOTES: