LTC2492/LTC2488/LTC2486
2-/4-Channel 24-/16-Bit ΔΣ ADC with Easy Drive Input Current Cancellation

DESCRIPTION

Demonstration circuit 1009A-A features the LTC®2492 2-/4-channel, 24-bit ΔΣADC with Easy Drive™ inputs. Key DC specifications include 2ppm INL, 1ppm offset, 25ppm full-scale error and 10nV/°C offset drift. In the 6.8Hz/600nV$_{RMS}$ mode, input normal mode rejection of 50Hz and 60Hz noise is better than 87dB. The LTC2492 also includes an internal temperature sensor that is accurate to 2°C over the operating temperature range.

Demonstration circuit 1009A-B features the LTC2488 2-/4-channel, 16-Bit ADC that is pinout and software compatible with the LTC2492.

Demonstration circuit 1009A-C features the LTC2486 2-/4-channel 16-Bit ADC that also includes a PGA with a gain range from 1 to 256 and the same temperature sensor as the LTC2492.

DC1009 is a member of Linear Technology's QuikEval™ family of demonstration boards. It is designed to allow easy evaluation of the LTC2492, LTC2488 or LTC2486. DC1009 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 at http://www.linear.com/demo

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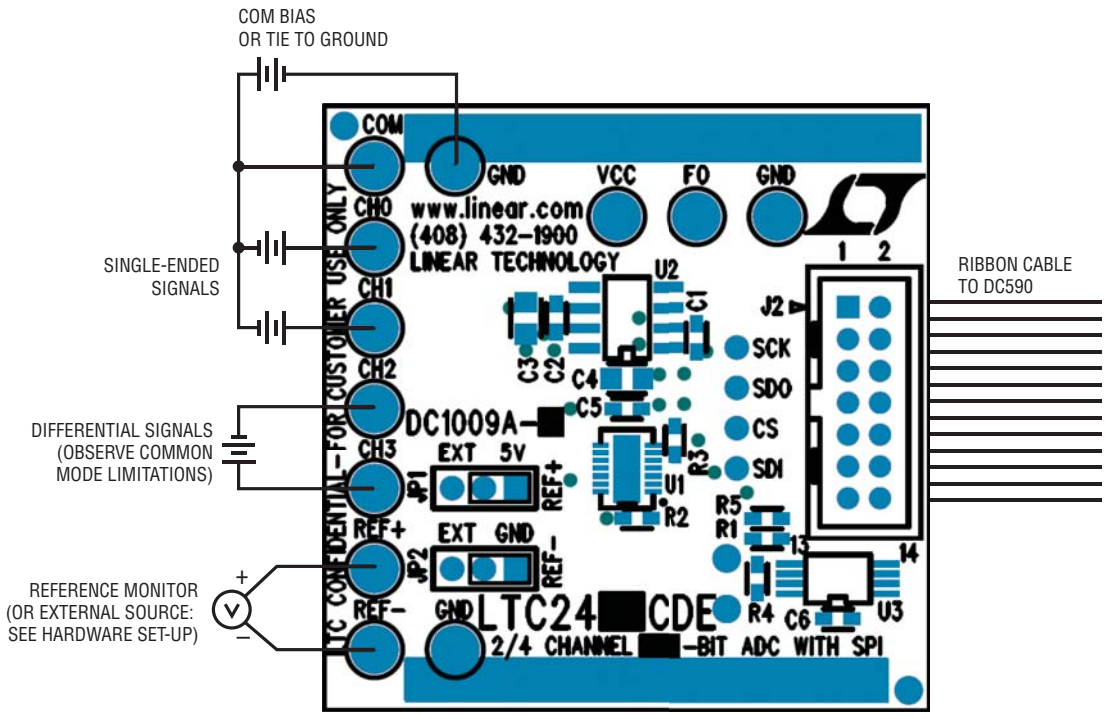
BOARD PHOTO



QUICK START PROCEDURE

Connect the DC1009 to a DC590 USB serial controller using the supplied 14 conductor ribbon cable. Connect DC590 to the host PC with a standard USB A/B cable. Run the evaluation software supplied with DC590 or downloaded from www.linear.com/software. The correct program will be loaded automatically. Click the collect button to start reading the input voltage. The software allows for selecting the input channel, single-ended or differential mode and 50Hz/60Hz rejection settings. Selecting 2x speed located at the bottom of the strip chart display will double the data output rate at the expense of offset accuracy (LTC2492 and LTC2486 only).

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.

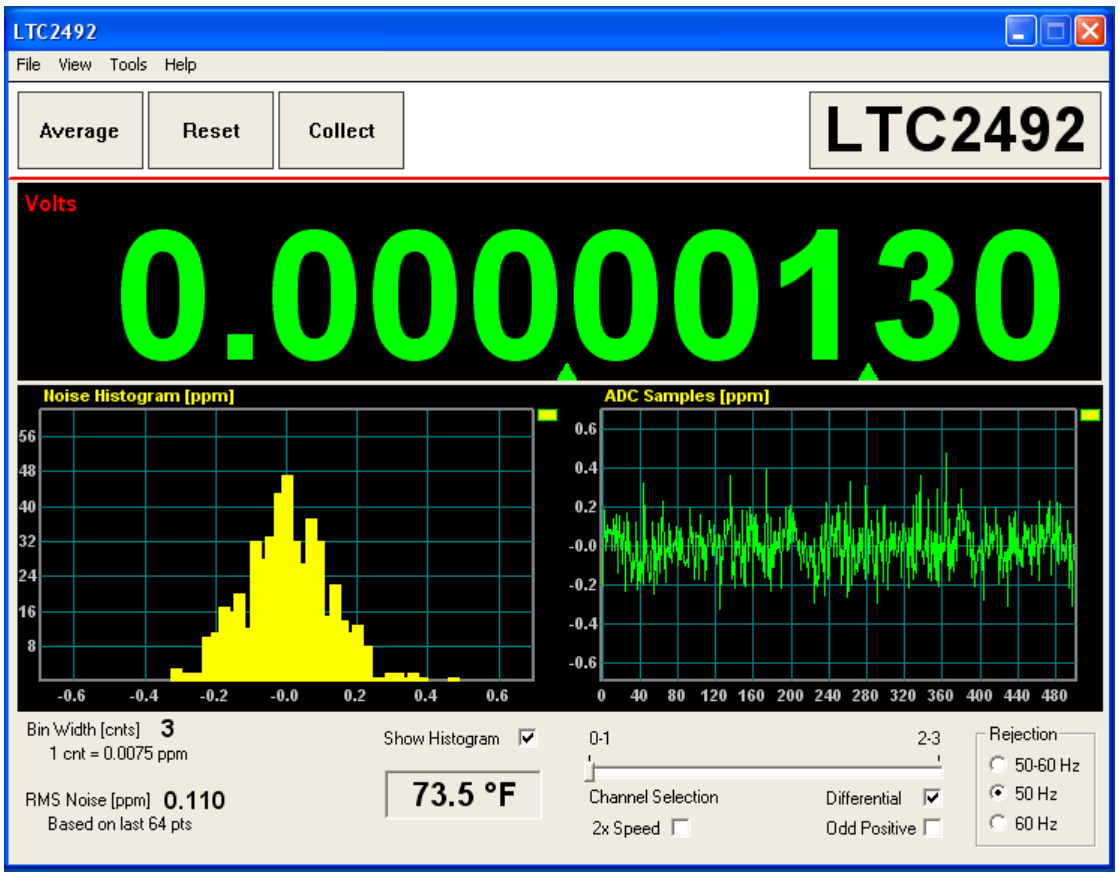


Figure 1.

HARDWARE SETUP

Jumpers

JP1, JP2: Select the source for REF+ and REF–, respectively. REF+ can be 5.00V from the onboard LT1236 reference (default) or supplied externally. REF– can be ground (0V, default) or supplied externally.

Connection To DC590 Serial Controller

J2 is the power and digital interface connector. Connect to a DC590 serial controller with the supplied 14-conductor ribbon cable. Digital signals are also connected to through-hole test points on the circuit board.

Analog Connections

Analog signal connections are made via the row of turret posts along the edge of the board.

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

V_{CC}: 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 V_{CC} supply on DC590. See the DC590 quick start guide for details.

REF+, REF–: These turrets are connected to the LTC2486/LTC2488/LTC2492 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 JP1 and JP2 are configured for external reference.

CH0-CH3: These are the differential inputs to the LTC2492/LTC2488/LTC2486. They may be configured as single–ended inputs with respect to the COM pin, or as differential inputs (CH0-CH1, CH2-CH3) with the polarity software selected.

EXPERIMENTS

Input Noise

Solder a short wire between the CH0 and CH1 turrets. Connect the inputs to ground through a short wire and start taking data. LTC2492 Noise should be approximately 0.12ppm of 5V (600nV$_{RMS}$.) The electrical noise of the LTC2488 is also 600nV$_{RMS}$, however this is masked by the 76.3µV quantization level. If the input is well between code transitions, the noise level will read zero. If the input is exactly between two codes such that the two adjacent output codes have equal probability, the noise level will be approximately 7.9ppm. The input noise of the LTC2486 is apparent at very high gain settings (128 or 256.) Note that with a 5V reference and gain set to 256, 1LSB is equal to 298nV which is lower than the 600nV$_{RMS}$ electrical noise of the input stage.

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 0.5µV due to the 140dB+ CMRR of the LTC2492. The LTC2488 will produce less than 1LSB difference.

Input Normal Mode Rejection

The LTC2492 and LTC2486 SINC4 digital filter can be software selected to reject 50Hz, 60Hz by 110dB, or both 50Hz and 60Hz by 87dB. The LTC2488's SINC4 filter is fixed at 50Hz/60Hz. To measure input normal mode rejection, connect COM to a 2.5V source such as an LT1790-2.5 reference or a power supply. Connect any other input (CH0-CH3) to the same supply through a 10k resistor. Apply a 10Hz, 2V peak-to-peak sine wave to the input through a 1µF capacitor.

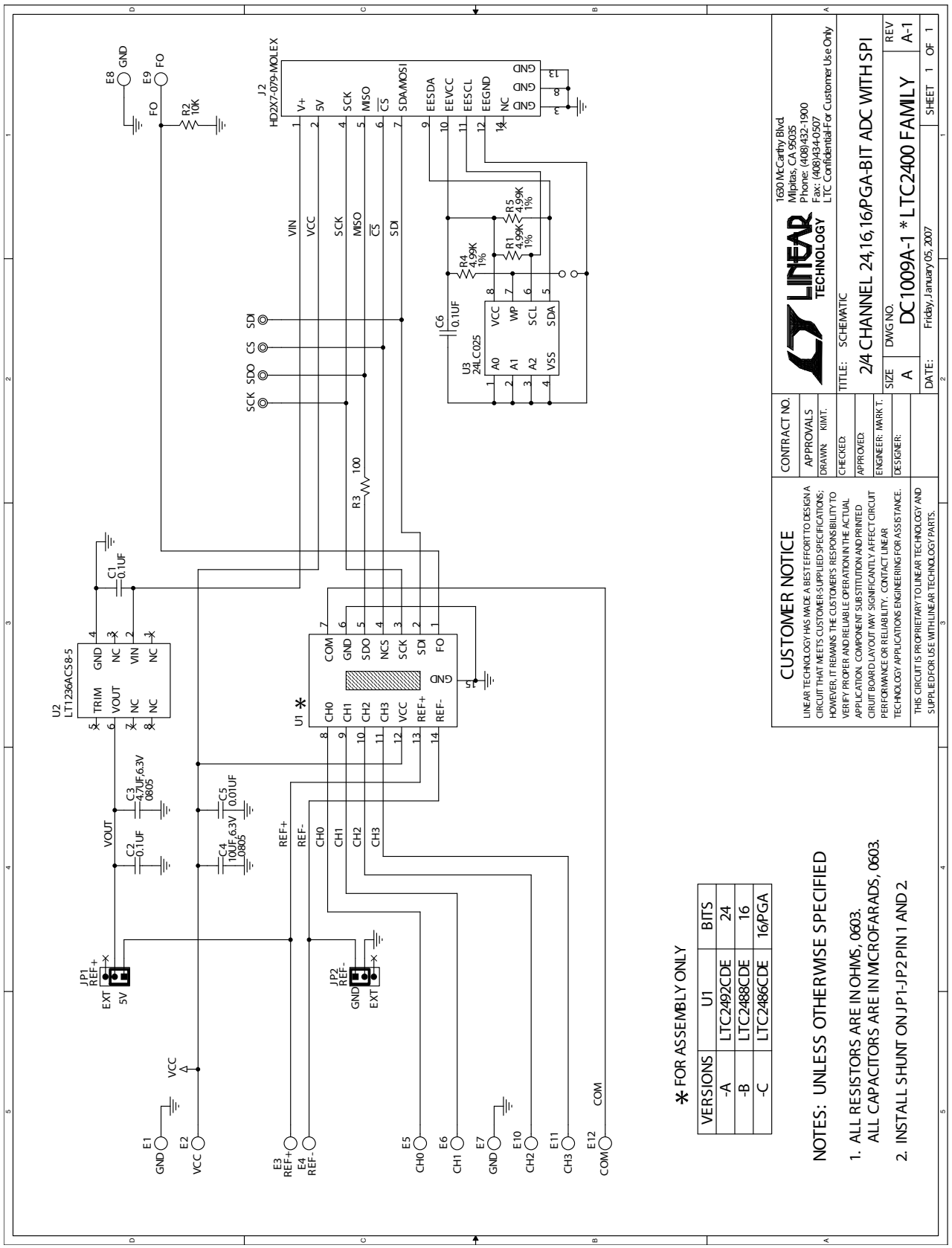
Set the rejection frequency to 55Hz (LTC2492 only) and start taking data. The input noise will be quite large, and the graph of output vs time should show large variations.

Next, slowly increase the frequency to 55Hz. The noise should be almost undetectable in the graph.

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	3	C1, C2, C6	CAP., X7R 0.1µF 16V, 0603	AVX, 0603YC104MAT1A
2	1	C3	CAP., X5R 4.7µF 6.3V, 20%, 0805	TAIYO YUDEN, JMK212BJ475MGT
3	1	C4	CAP., X5R, 10µF 6.3V, 20%, 0805	TDK, C2012X5R0J106M
4	1	C5	CAP., X7R 0.01µF 16V, 10%, 0603	AVX, 0603YC103KAT1A
5	12	E1-E12	TESTPOINT, TURRET, .064”	MILL-MAX, 2308-2
6	2	JP1, JP2	JMP, 3-PIN 1 ROW .079CC	SAMTEC, TMM-103-02-L-S
7	2	JP1-JP2 (Pin 1 & 2)	SHUNT, .079” CENTER	SAMTEC, 2SN-BK-G
8	1	J2	HEADER, 2 × 7-PIN, 0.079CC	MOLEX, 87831-1420
9	3	R1, R4, R5	RES., CHIP 4.99k 1/16W 1%, 0603	AAC, CR16-4991FM
10	1	R2	RES., CHIP 10k 1/16W 5%, 0603	AAC, CR16-103JM
11	1	R3	RES., CHIP 100Ω 1/16W 5%, 0603	AAC, CR16-101JM
12	1	U2	I.C., LT1236ACS8-5#PBF, SO8	LINEAR TECH., LT1236ACS8-5#PBF
13	1	U3	I.C., 24LC025, TSSOP8	MICROCHIP, 24LC025-I/ST
DC1009A-A				
14	1	U1	I.C., LTC2492CDE#PBF, DFN14DE	LINEAR TECH., LTC2492CDE#PBF
DC1009A-B				
14	1	U1	I.C., LTC2488CDE#PBF, DFN14DE	LINEAR TECH., LTC2488CDE#PBF
DC1009A-C				
14	1	U1	I.C., LTC2486CDE#PBF, DFN14DE	LINEAR TECH., LTC2486CDE#PBF

SCHEMATIC DIAGRAM



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