LTC2308
500ksps, 8-Channel, 12-Bit ADC

DESCRIPTION

Demonstration circuit 1186A features the LTC®2308 500ksps, 8-channel, 12-bit ADC. The LTC2308 has an SPI-compatible serial interface that can be used to select channel, unipolar/bipolar and power-down settings. DC1186A demonstrates the DC and AC performance of the LTC2308.

Use DC590 controller with QuikEval™ software to demonstrate DC performance such as peak-to-peak noise and DC linearity. Use DC890 controller with PScope™ software if precise sampling rates are required or to demonstrate AC performance such as SNR, THD, SINAD and SFDR. Alternatively, by connecting DC1186A into a customer application, the performance of the LTC2308 can be evaluated directly in that circuit.

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

BOARD PHOTO

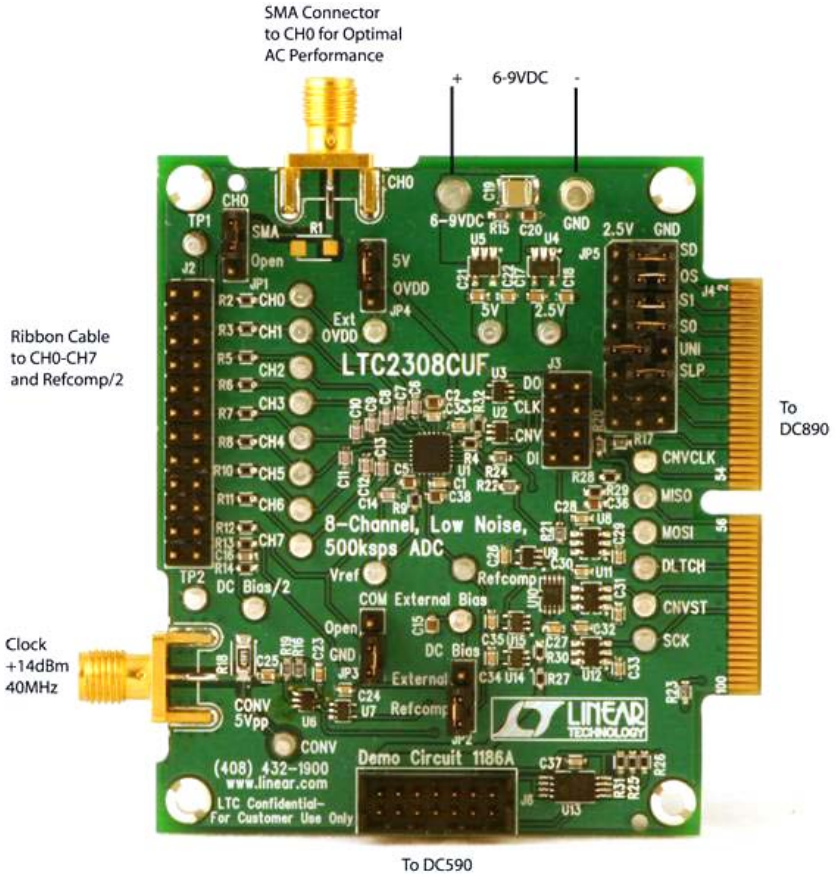

Figure 1. DC1186A Connection Diagram

DC890 QUICK START PROCEDURE

- Connect the DC1186A to a DC890 USB high speed data collection board via connector J4.
- Connect the DC890 to a host PC with a standard USB A/B cable.
- Apply $6V_{DC}$ to $9V_{DC}$ to the 6-9VDC and GND terminals.
- Apply a low jitter signal source to CH0 through CH7 on connectors J1 or J2, as determined by jumper block JP5.
- As a clock source, apply a low jitter 40MHz 14dBm sine wave or square wave to connector J5. Note that J5 has a 50Ω termination resistor to ground, which will prevent most logic from driving this pin directly.
- Run the PScope software (Pscope.exe version K49 or later) supplied with the DC890, or download it from www.linear.com/software. Complete software documentation is available from the Help menu. Updates can be downloaded from the Tools menu. Check for updates periodically as new features may be added.

PSCOPE SOFTWARE CONFIGURATION

The PScope software will recognize the DC1186A and configure itself automatically. The default configuration is for CH0 with respect to COM in unipolar mode.

- Make sure that the jumpers are set as shown in Figure 2. If bipolar mode is desired, it will be necessary to change the PScope user configure setting.
- Select ADC Configuration from the Configure menu.
- Select Configure Manually, 12-Bits, Alignment 12, S2308, 1-Channel and do not check Positive_Edge Clk. Check Bipolar if the JP5 UNI jumper is set to GND. An example of the user configure menu is shown in Figure 3.
- Click the Collect button (see Figure 4) to begin acquiring data. Depending on which board was previously used by PScope, it may be necessary to press Collect a second time. The Collect button then changes to Pause, which can be used to pause data acquisition.

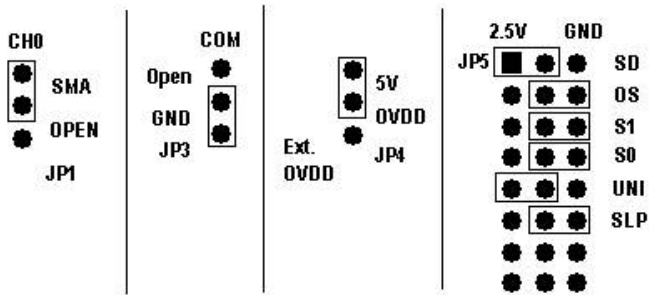

Figure 2. DC1186A Jumpers

PSCOPE SOFTWARE CONFIGURATION

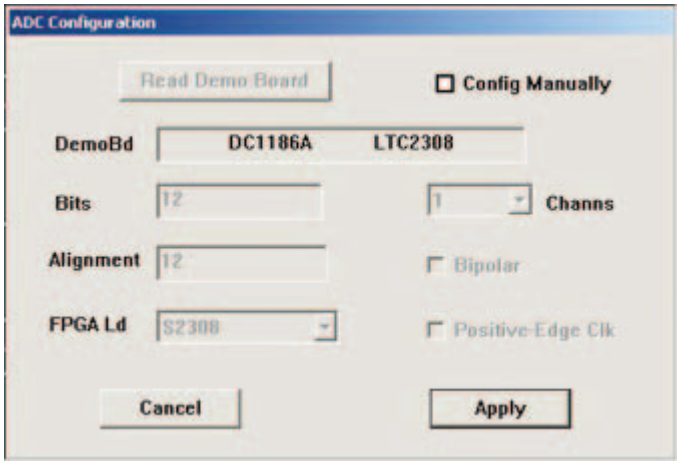

Figure 3. User Configure Menu

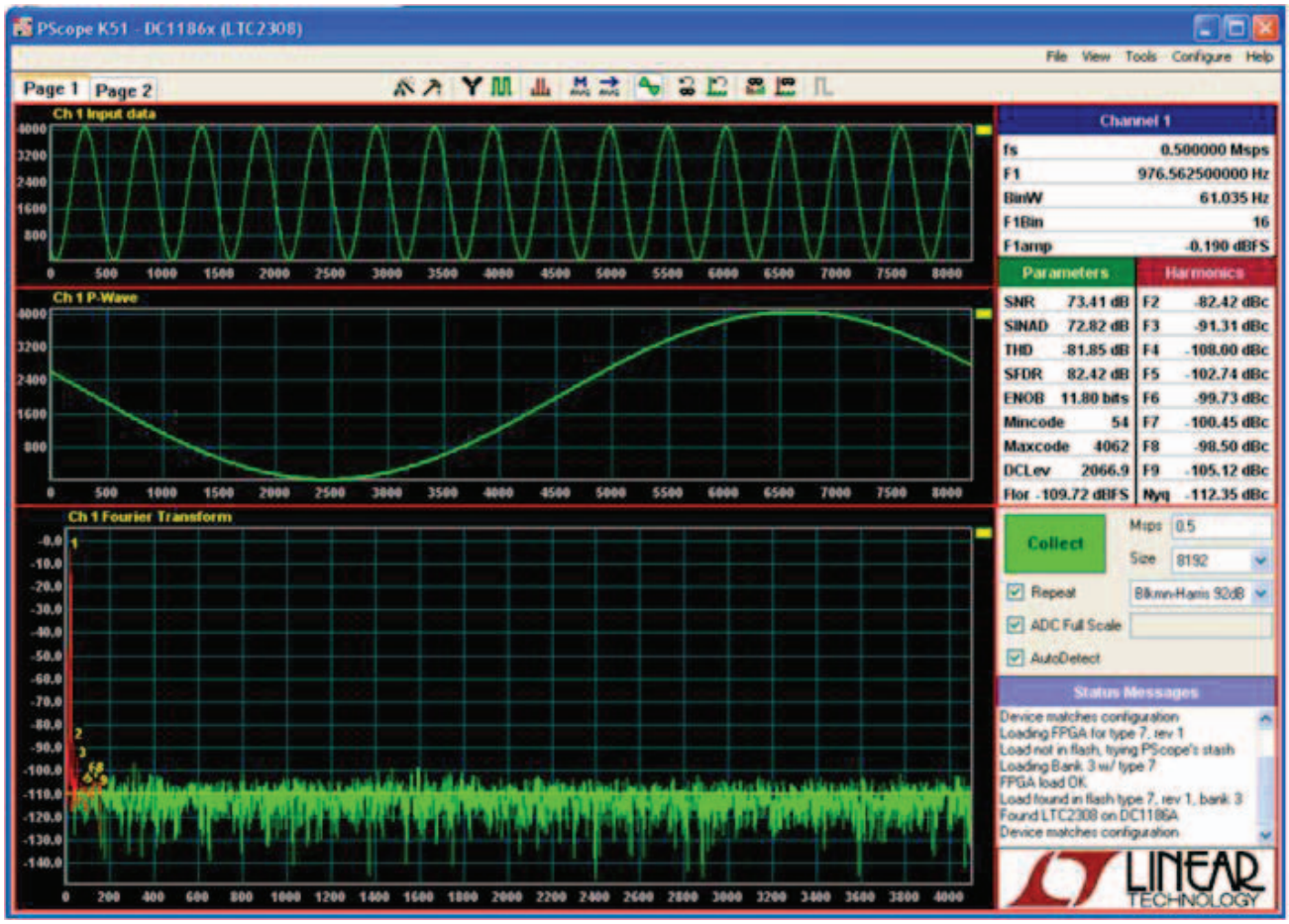

Figure 4. DC1186A PScope Screenshot

DC590 QUICK START PROCEDURE

- Connect DC1186A to a DC590 USB serial controller via the supplied 14-conductor ribbon cable.
- Connect DC590 to a host PC via a standard USB A/B cable.
- Run the evaluation software supplied with DC590, or download it from www.linear.com/software. The correct control panel will be loaded automatically.
- Click the COLLECT button to begin reading the ADC.
- Change the channel and range by right clicking over the channel or range indicator in the display, as shown in Figure 5.

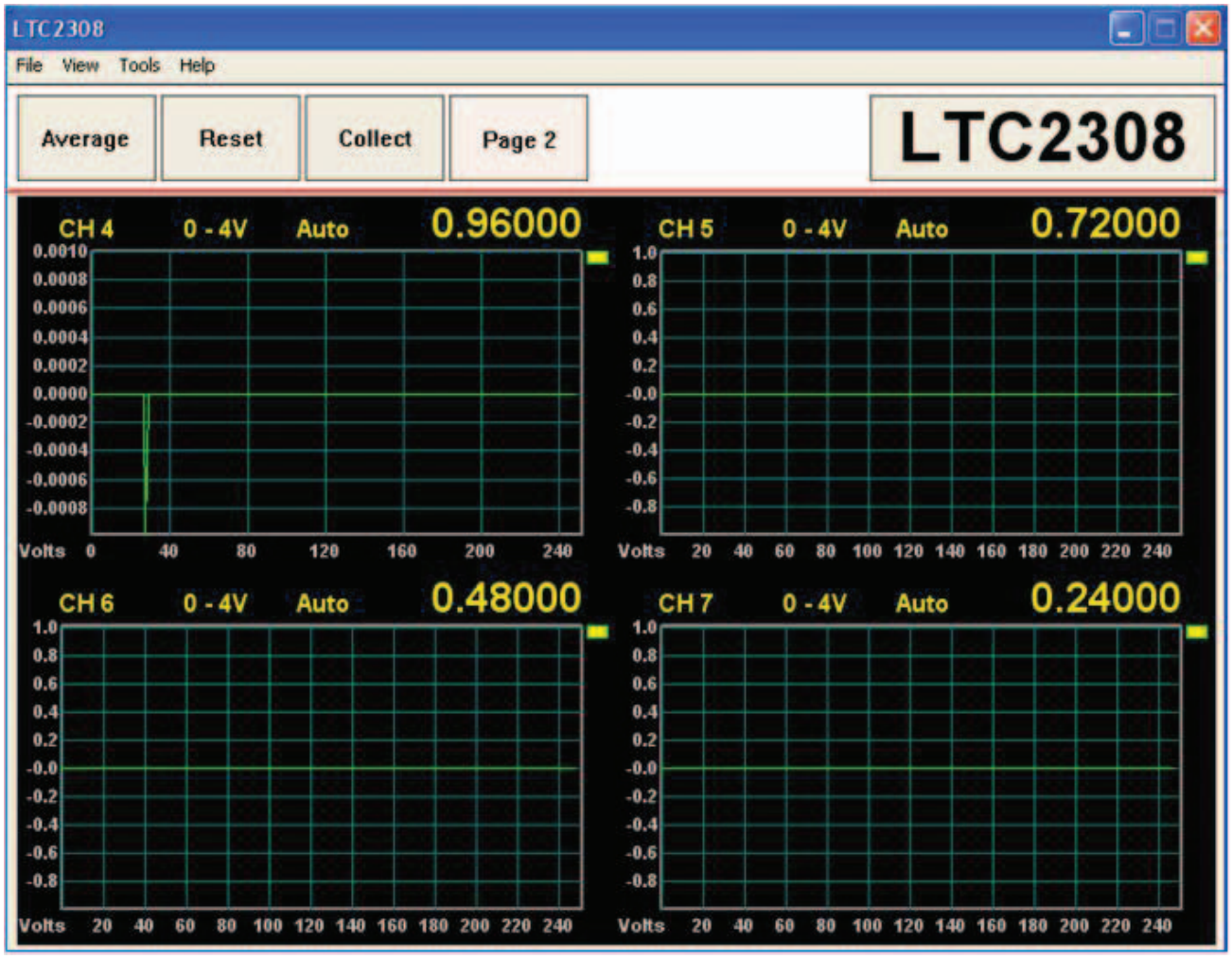

Figure 5. DC1186A QuikEval Screenshot

HARDWARE SETUP

SIGNAL CONNECTIONS

J1-J2: SMA and Header Connectors for CH0-CH7, COM and DC Bias. Limits input voltage swings to 0V to 5V. For optimum performance, the input should be band limited to the frequencies of interest. See Figure 6 for details.

J3: Contains CONV, SDI, SCK and a buffered SDO signal. This connector is intended to monitor these signals. For those who want to drive the ADC directly, use J6.

J4: Interface to the DC890. Do not use J6 at the same time.

J5: Conversion Clock Input. This input has a 50Ω termination resistor, and is intended to be driven by a 14dBm sine or square wave. To achieve the full AC performance of this part, the clock jitter should be kept under 20ps. This input is capacitively coupled to a clock buffer so that level shifting is not required. To run at maximum conversion rate, apply a 40MHz signal to this connector. J5 is used only for the DC890. DC590 generates its own clock signal.

J6: Interface to DC590. Do not use J4 at the same time. This connector can also be used to drive the ADC directly. See Figure 7 for details.

JUMPERS

JP1 (CH0): Selects whether the SMA connector, J1, is connected to CH0 of the ADC, or floating.

JP2 (DC Bias): Selects Refcomp, or an external bias voltage to be divided by 2, which can then be used as a bias point for the minus input of the ADC in bipolar mode.

JP3 (COM): Selects whether the COM pin of the ADC is to be cleanly grounded near the ADC or driven by header J2.

JP4 (OVDD): Connects the OVDD pin of the ADC to 5V or to an external voltage. The SDO pin swings from ground to OV_{DD}.

JP5 (DIN Word): Selects the channel configuration, unipolar/bipolar and power-down settings of the ADC. See Table 1 for details. JP5 is used by the DC890 only. It is ignored by the DC590.

GROUNDING AND POWER CONNECTION

Connect a 6V to 9V power supply to the 6-9VDC and GND posts when using DC890. If DC590 is used, it will provide power to DC1186A. For optimum performance, this supply should be floating with respect to any signal generators connected to the analog inputs.

HARDWARE SETUP

Table 1. LTC2308 Channel Configuration

S/D	O/S	S1	S0	0	1	2	3	4	5	6	7	COM
0	0	0	0	+	–							
0	0	0	1			+	–					
0	0	1	0					+	–			
0	0	1	1							+	–	
0	1	0	0	–	+							
0	1	0	1			–	+					
0	1	1	0					–	+			
0	1	1	1							–	+	
1	0	0	0	+								–
1	0	0	1			+						–
1	0	1	0					+				–
1	0	1	1							+		–
1	1	0	0		+							–
1	1	0	1				+					–
1	1	1	0						+			–
1	1	1	1								+	–

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	17	C1, C3, C4, C23-C35, C37	CAP., X7R, 0.1µF, 10V, 10%, 0603	AVX, 0603ZC104KAT
2	4	C2, C15, C20, C38	CAP., X5R, 10µF, 6.3V, 20%, 0603	TDK, C1608X5R0J106M
3	2	C5, C36	CAP., X5R, 2.2µF, 16V, 20%, 0603	TDK, C1608X5R1C225M
4	9	C6-C14	CAP., NPO, 47pF, 50V, 10%, 0603	AVX, 06035A470KAT1A
5	3	C16, C18, C22	CAP., X7R, 1µF, 10V, 10%, 0603	AVX, 0603ZD105KAT1A
6	2	C17, C21	CAP., X7R, 0.01µF, 16V, 10%, 0603	AVX, 0603YC103KAT1A
7	1	C19	CAP., X5R, 100µF, 6.3V, 10%, 1210	AVX, 12106D107KAT2A
8	22	E2-E11, E13, E14, E16, E18-E26	TP, TURRET, 0.061"	MILL-MAX, 2308-2-00-80-00-00-07-0
9	0	E1, E12 (OPT)		
10	2	E15, E17	TP, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
11	4	JP1-JP4	JMP, 1×3, 0.100"	SAMTEC, TSW-103-07-L-S
12	10	JPX1-JPX10	SHUNT, 0.100" CENTER	SAMTEC, SNT-100-BK-G
13	1	JP5	JMP, 3×8, 0.100"	SAMTEC, TSW-108-07-L-T
14	2	J5, J1	CON., SMA 50Ω EDGE-LAUNCH	E. F. JOHNSON, 142-0701-851
15	1	J2	HEADER 12×2	SAMTEC, TSW-112-07-L-D
16	1	J3	HEADER 4×2	SAMTEC, TSW-104-07-L-D

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
17	0	J4	DO NOT INSTALL	
18	1	J6	HEADER, 2×7 PIN, 0.079"	MOLEX, 87831-1420
19	0	R1 (OPT)	RES., CHIP, 1206	
20	1	R18	RES., CHIP, 49.9, 1/4W, 1%,1206	AAC, CR18-49R9FM
21	1	R9	RES., CHIP, 49.9, 1/10W, 1%, 0603	AAC, CR16-49R9FM
22	9	R2, R3, R5-R8, R10-R12	RES., CHIP, 100Ω, 1/10W, 1%, 0603	VISHAY, CRCW0603100RFKED
23	1	R4	RES., CHIP, 301Ω, 1/10W, 1%, 0603	VISHAY, CRCW0603301RFKEA
24	6	R13, R14, R25, R26, R30, R31	RES., CHIP, 4.99k, 1/10W, 1%, 0603	AAC, CR16-4991FM
25	1	R15	RES., CHIP, 10Ω, 1/10W, 5%, 0603	AAC, CR16-100JM
26	2	R16, R19	RES., CHIP, 1k, 1/10W, 5%, 0603	AAC, CR16-102JM
27	5	R17, R20, R21, R22, R24	RES., CHIP, 33Ω, 1/10W, 5%, 0603	AAC, CR16-330JM
28	1	R23	RES., CHIP, 4.7k, 1/10W, 5%, 0603	AAC, CR16-472JM
29	1	R27	RES., CHIP, 2k, 1/10W, 1%, 0603	AAC, CR16-2001FM
30	2	R28, R29	RES., CHIP, 2.49k, 1/10W, 1%, 0603	AAC, CR16-2491FM
31	1	R32	RES., CHIP, 3k, 1/10W, 1%, 0603	VISHAY, CRCW06033K00FKEA
32	4	MTGS AT 4 CORNERS	STANDOFF, NYLON 0.25, 1/4"	KEYSTONE, 8831 (SNAP-ON)
33	1	U1	I.C., LTC2308CUF, 24-PIN QFN	LINEAR TECHNOLOGY, LTC2308CUF
34	2	U2, U7	I.C., NC7SVU04P5X, SC70-5	FAIRCHILD SEMI., NC7SVU04P5X
35	1	U3	I.C., SN74AHCT1G04DCK	TEXAS INSTRUMENTS, SN74AHCT1G04DCK
36	1	U4	I.C., LT1761ES5-2.5, SOT23-5	LINEAR TECHNOLOGY, LT1761ES5-2.5
37	1	U5	I.C., LT1761ES5-5, SOT23-5	LINEAR TECHNOLOGY, LT1761ES5-5
38	3	U6, U14, U15	I.C., NC7SZ04P5X, SC70-5	FAIRCHILD SEMI., NC7SZ04P5X
39	3	U8, U11, U12	I.C., LT1719CS6, SOT23-6	LINEAR TECHNOLOGY, LT1719CS6
40	1	U9	I.C., NC7SZ66P5X, SC70-5	FAIRCHILD SEMI., NC7SZ66P5X
41	1	U10	I.C., NL17SZ74USG, US8	ON SEMI, NL17SZ74USG
42	1	U13	I.C. 24LC025, TSSOP-8	MICROCHIP, 24LC025-I /ST (PbF)

SCHEMATIC DIAGRAM

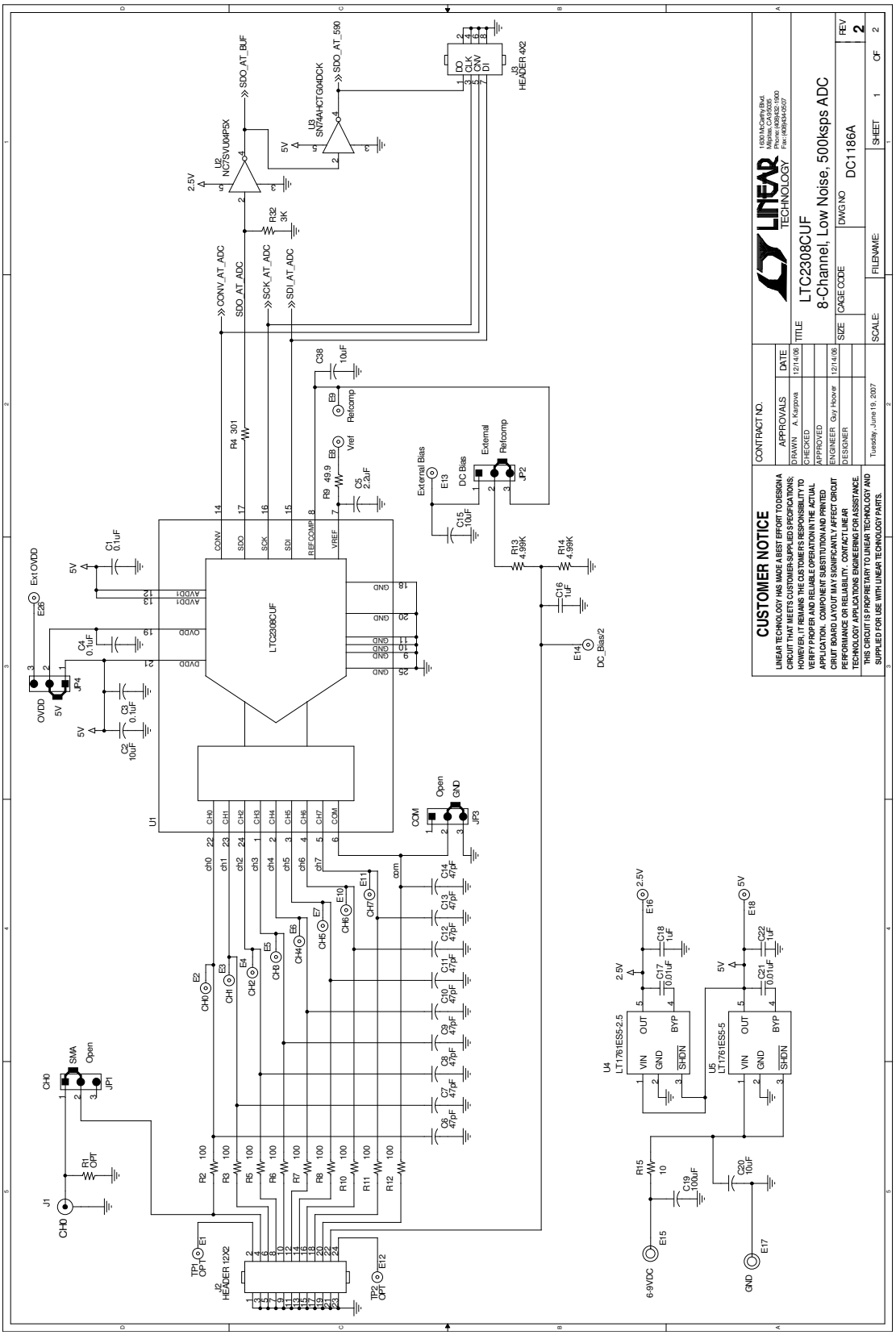

Figure 6. LTC2308CUF 8-Channel, Low Noise, 500ksps ADC

SCHEMATIC DIAGRAM

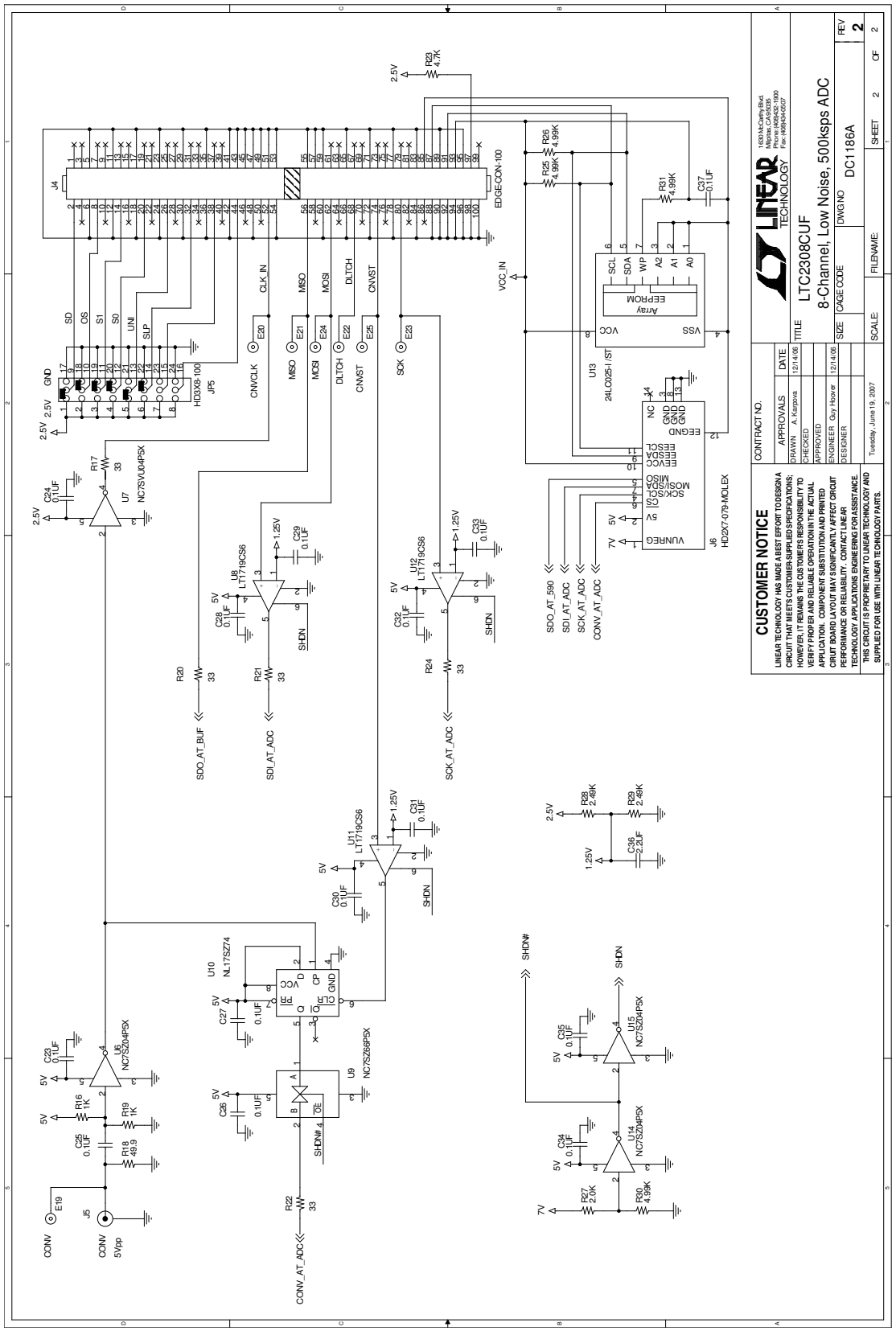

Figure 7. LTC2308CUF 8-Channel, Low Noise, 500ksps ADC

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