

LTC1407A, LTC1403A,
LTC1407A-1, LTC1403A-1,
LTC2356-14, LTC2355-14, 14-Bit,
3.5Msps/3Msps/2.8Msps SAR ADCs

DESCRIPTION

Demonstration circuit 1082A features the [LTC®1407](#) family of SAR ADCs. This quick start guide will focus on DC1082A-A which uses the LTC1407A-1, a bipolar, 2-channel, 14-bit, simultaneous sampling ADC. Total throughput is 3Msps; 1.5Msps per channel, with a typical channel-to-channel aperture skew of 200ps. Other family members have 12 bits (LTC1403, LTC1407, LTC2355-12 and LTC2356-12) or one channel (LTC1403, LTC1403A, LTC2355-14 and LTC2356-14). The LTC1407 family also has unipolar and bipolar versions. See Table 1 for the specific version of DC1082A that best suits your appli-

cation. DC1082A demonstrates the AC performance of the LTC1407 family in conjunction with the DC890 data collection board and PScope™ software. Alternatively, by connecting DC1082A into a customer application the performance of the LTC1407 family member can be evaluated directly in that circuit.

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

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DC1082A CONFIGURATION SUMMARY

VERSION	PART	NUMBER OF BITS	INPUT RANGE	SAMPLE RATE	NUMBER OF CHANNELS
DC1082A-A	LTC1407ACMSE-1	14	±1.25V	3Msps (1.5Msps/Ch)	2
DC1082A-B	LTC1407ACMSE	14	0V to 2.5V	3Msps (1.5Msps/Ch)	2
DC1082A-C	LTC1403ACMSE-1	14	±1.25V	2.8Msps	1
DC1082A-D	LTC1403ACMSE	14	0V to 2.5V	2.8Msps	1
DC1082A-E	LTC2356CMSE-14	14	±1.25V	3.5Msps	1
DC1082A-F	LTC2355CMSE-14	14	0V to 2.5V	3.5Msps	1

QUICK START PROCEDURE

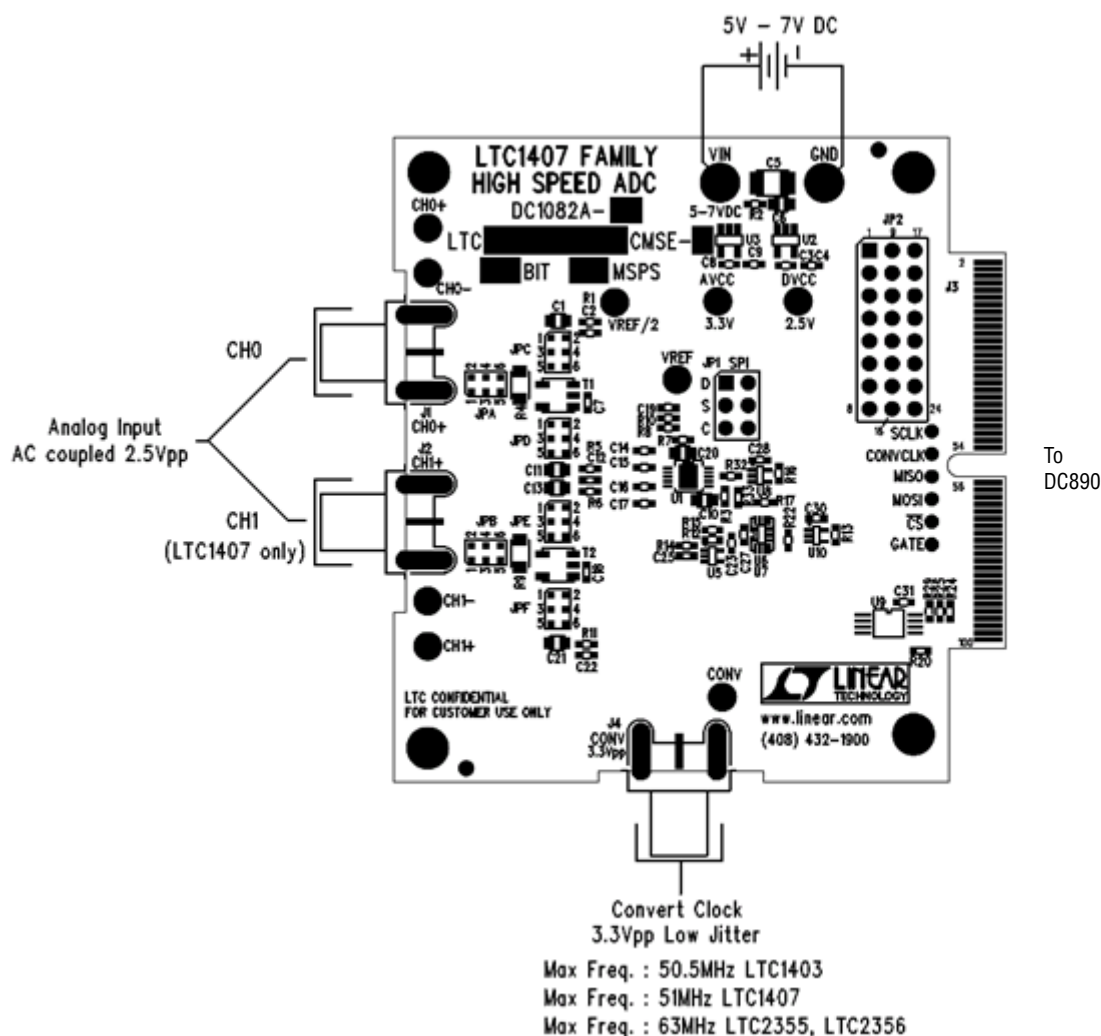


Figure 1. DC1082A Connection Diagram

- Connect DC1082A to a DC890 USB high speed data collection board, using connector J3.
- Connect DC890 to a host PC with a standard USB A/B cable.
- Apply 5V to 7V DC to the VIN and GND terminals.
- Apply a low jitter signal source to J1 (CH0) and J2 (CH1), if applicable. Both J1 and J2, if included, are terminated with 50Ω to ground.
- As a clock source, apply a low jitter 51MHz (50.5MHz for LTC1403, 63MHz for LTC2355 and LTC2356)

3.3V_{P-P} sine wave or square wave to connector J4. Note that J4 has a 50Ω termination resistor to ground.

- Run the PScope software (Pscope.exe version K46, 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.

SOFTWARE CONFIGURATION

The PScope software should recognize DC1082A and configure itself automatically.

Click the Collect button (See Figure 2) 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.

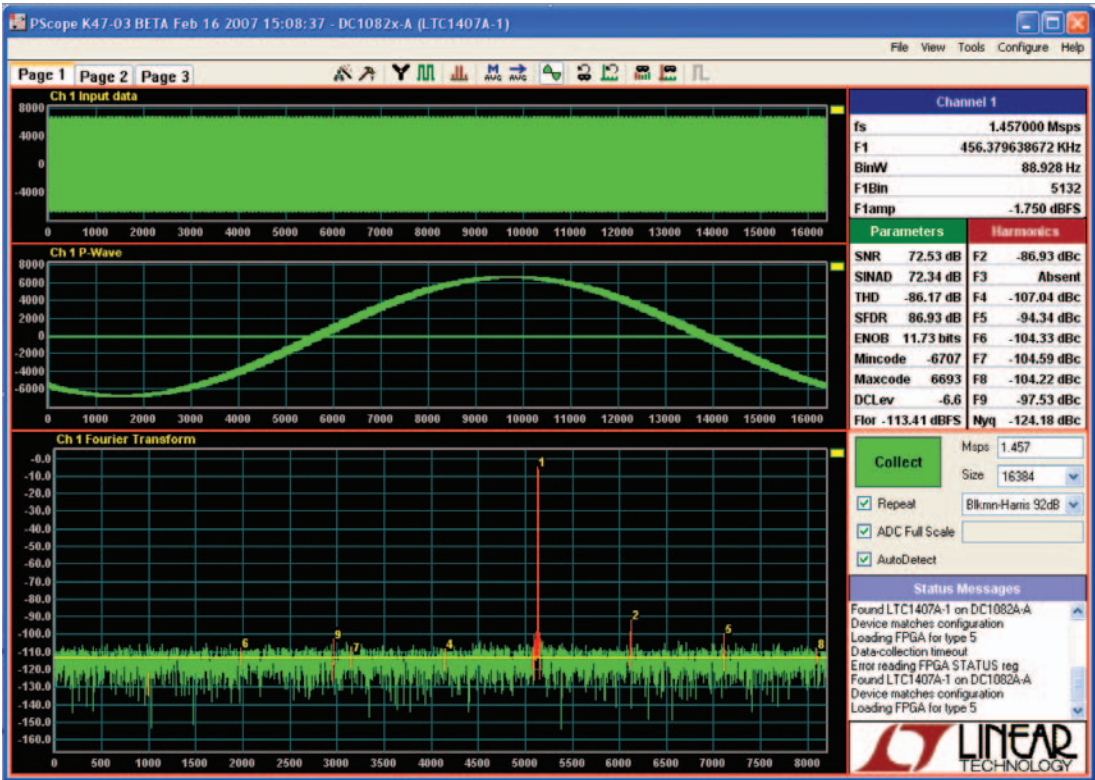


Figure 2. DC1082A Screenshot

HARDWARE SETUP

SIGNAL CONNECTIONS

J1 to J2: SMA connectors for CH0 and CH1 are differential inputs. These inputs have 50 Ω termination resistors. Limit input voltage swings to 2.5V_{p-p}. For optimum performance, the input should be band limited to the frequencies of interest. These signals are capacitively coupled to the ADC inputs, as shipped from the factory. If the DC level of the signal applied is important, JPC-JPF must be properly configured (see schematic for details).

J3: DC890 Interface. Connect to DC890.

J4: Conversion Clock Input. This input has a 50 Ω termination resistor, and is intended to be driven by a low jitter, 3.3V_{p-p} sine or square wave. To achieve the full AC

performance of this part, the clock jitter should be kept under 2ps. This input is capacitively coupled so that the input clock can be either 0V to 3.3V, or ± 1.65 V so that level shifting is not required. To run at maximum conversion rate, apply a 51MHz signal for the LTC1407, or 50.5MHz signal for the LTC1403, to this input. For the LTC2355 and LTC2356, apply a 63MHz signal to achieve the maximum conversion rate.

GROUNDING AND POWER CONNECTION

Connect a 5V to 7V power supply to the VIN and GND turret posts. For optimum performance, this supply should be floating with respect to any signal

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	9	C2, C7, C12, C23, C25, C27, C28, C30, C31	CAP., X7R, 0.1 μ F, 16V, 10%, 0603	AVX, 0603YC104KAT
2	2	C8, C3	CAP., X7R, 0.01 μ F, 50V, 10%, 0603	AVX, 06035C103KAT
3	2	C4, C9	CAP., X5R, 1 μ F, 16V, 20%, 0603	AVX, 0603YD105MAT
4	1	C19	CAP., X7R, 1 μ F, 16V, 20%, 0603	TDK, C1608X7R1C105M
5	2	C1, C11	CAP., X7R, 1.0 μ F, 10V, 20%, 0805	AVX, 0805ZC105MAT2A
6	1	C5	CAP., X5R, 100 μ F, 6.3V, 20%, 1210	AVX, 12106D107MAT
7	3	C6, C10, C20	CAP., X5R, 10 μ F, 6.3V, 20%, 0805	AVX, 08056D106MAT
8	2	C14, C15	CAP., C0G, 47pF, 50V, 10%, 0603	AVX, 06035A470KAT
9	2	E1-E2	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
10	7	E3-E6, E8, E9, E11	TESTPOINT, TURRET, 0.061"	MILL-MAX, 2308-2-00-80-00-00-07-0
11	1	JP1	JMP, 2 $\times$ 3, 0.100"	SAMTEC, TSW-103-07-L-D
12	2	J1, J4	CON., SMA, 50 Ω , EDGE-LAUNCH	CONNEX, 132357
13	2	R1, R5	RES., CHIP, 10k, 1/16W, 5%, 0603	AAC, CR16-103JM
14	1	R2	RES., CHIP, 10, 1/16W, 5%, 0603	AAC, CR16-100JM
15	1	R3	RES., CHIP, 1.0, 1/16W, 5%, 0603	AAC, CR16-1R0JM
16	1	R4	RES., CHIP, 49.9, 1/4W, 1%, 1206	AAC, CR18-49R9FM
17	2	R7, R14	RES., CHIP, 49.9, 1/16W, 1%, 0603	AAC, CR16-49R9FM
18	5	R8, R10, R24, R25, R29	RES., CHIP, 4.99k, 1/16W, 1%, 0603	AAC, CR16-4991FM
19	3	R12, R15, R22	RES., CHIP, 1k, 1/16W, 5%, 0603	AAC, CR16-102JM
20	3	R13, R16, R17	RES., CHIP, 33, 1/16W, 5%, 0603	AAC, CR16-330JM
21	1	R20	RES., CHIP, 4.7k, 1/16W, 5%, 0603	AAC, CR16-472JM
22	2	R32, R33	RES., CHIP, 510, 1/16W, 5%, 0603	AAC, CR16-511JM

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
23	1	U2	I.C., LTC1844ES5-2.5, TSOT-23, S5	LINEAR TECHNOLOGY, LTC1844ES5-2.5#PBF
24	1	U3	I.C., LTC1844ES5-3.3, TSOT-23, S5	LINEAR TECHNOLOGY, LTC1844ES5-3.3#PBF
25	3	U5, U8, U10	I.C., ULP INVERTER, SC70-5	FAIRCHILD, NC7SVU04P5X_NL
26	1	U6	I.C., SINGLE D, FLIP FLOP, US8	ON SEMI., NL17SZ74USG
27	0	U7 (OPT.)	I.C., NC7SZ66P5X, SC70-5	
28	1	U9	I.C., 24LC025, TSSOP-8	MICROCHIP, 24LC025-I /ST (PbF)
29	4	(STAND-OFF)	STAND-OFF, NYLON 0.25"	KEystone, 8831(SNAP-ON)

DC1082A-A Required Circuit Components

1	1	DC1082A	DC1082A GENERAL BOM	
2	2	C13, C21	CAP., X7R, 1.0μF, 10V, 20%, 0805	AVX, 0805ZC105MAT2A
3	2	C16, C17	CAP., COG, 47pF, 50V, 10%, 0603	AVX, 06035A470KAT
4	2	C18, C22	CAP., X7R, 0.1μF, 16V, 10%, 0603	AVX, 0603YC104KAT
5	2	T1, T2	TRANSFORMER	M/A-COM, MABAES0060
6	1	JP2	SOLDER JUMPER WIRE 22 AWG FROM PIN 8 TO PIN 16 (SEE ASSY DRAWING)	
7	1	J2	CON., SMA, 50Ω, EDGE-LAUNCH	CONNEX, 132357
8	2	E7, E10	TESTPOINT, TURRET, 0.061"	MILL-MAX, 2308-2-00-80-00-00-07-0
9	1	R9	RES., CHIP, 49.9, 1/4W, 1%, 1206	AAC, CR18-49R9FM
10	2	R6, R11	RES., CHIP, 10K, 1/16W, 5%, 0603	AAC, CR16-103JM
11	2	JPA: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
12	2	JPB: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
13	2	JPC: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
14	2	JPD: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
15	2	JPE: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
16	2	JPF: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
10	1	U1	I.C., LTC1407ACMSE-1 MSE	LINEAR TECHNOLOGY, LTC1407ACMSE-1#PBF

DC1082A-B Required Circuit Components

1	1	DC1082A	DC1082A GENERAL BOM	
2	2	C13, C21	CAP., X7R, 1.0μF, 10V, 20%, 0805	AVX, 0805ZC105MAT2A
3	2	C16, C17	CAP., COG, 47pF, 50V, 10%, 0603	AVX, 06035A470KAT
4	2	C18, C22	CAP., X7R, 0.1μF, 16V, 10%, 0603	AVX, 0603YC104KAT
5	0	T1, T2 (OPT.)	TRANSFORMER	
6	1	JP2	SOLDER JUMPER WIRE 22 AWG FROM PIN 8 TO PIN 16 (SEE ASSY DRAWING)	
7	1	J2	CON., SMA, 50Ω, EDGE-LAUNCH	CONNEX, 132357
8	2	E7, E10	TESTPOINT, TURRET, 0.061"	MILL-MAX, 2308-2-00-80-00-00-07-0
9	1	R9	RES., CHIP, 49.9, 1/4W, 1%, 1206	AAC, CR18-49R9FM
10	2	R6, R11	RES., CHIP, 10k, 1/16W, 5%, 0603	AAC, CR16-103JM
11	2	JPA: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
12	2	JPB: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
13	2	JPC: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
14	1	JPD: (3-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M

DEMO MANUAL DC1082A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
15	2	JPE: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
16	1	JPF: (3-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
10	1	U1	I.C., LTC1407ACMSE MSE	LINEAR TECHNOLOGY, LTC1407ACMSE#PBF

DC1082A-C Required Circuit Components

1	1	DC1082A	DC1082A GENERAL BOM	
2	0	C13, C21 (NOT INSTALLED)	CAP., 0805	
3	2	C16, C17	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
4	0	C18, C22 (NOT INSTALLED)	CAP., 0603	
5	1	T1	TRANSFORMER	M/A-COM, MABAES0060
6	0	T2 (NOT INSTALLED)	TRANSFORMER	
7	1	JP2	SOLDER JUMPER WIRE 22 AWG FROM PIN 16 TO PIN 24 (SEE ASSY DRAWING)	
8	0	J2 (NOT INSTALLED)		
9	0	E7, E10 (NOT INSTALLED)	TESTPOINT, TURRET, 0.061"	
10	0	R9 (NOT INSTALLED)	RES., CHIP, 1206	
11	0	R6, R11 (NOT INSTALLED)	RES., CHIP, 0603	
12	2	JPA: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
13	0	JPB: (OPEN)		
14	2	JPC: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
15	1	JPD: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
16	0	JPE: (OPEN)		
17	0	JPF: (OPEN)		
18	1	U1	I.C., LTC1403ACMSE-1 MSE	LINEAR TECHNOLOGY, LTC1403ACMSE-1#PBF

DC1082A-D Required Circuit Components

1	1	DC1082A	DC1082A GENERAL BOM	
2	0	C13, C21 (NOT INSTALLED)	CAP., 0805	
3	2	C16, C17	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
4	0	C18, C22 (NOT INSTALLED)	CAP., 0603	
5	0	T1 (OPT.)	TRANSFORMER	
6	0	T2 (NOT INSTALLED)	TRANSFORMER	
7	1	JP2	SOLDER JUMPER WIRE 22 AWG FROM PIN 16 TO PIN 24 (SEE ASSY DRAWING)	
8	0	J2 (NOT INSTALLED)	CON., SMA, 50Ω, EDGE-LAUNCH	
9	0	E7, E10 (NOT INSTALLED)	TESTPOINT, TURRET, 0.061"	
10	0	R9 (NOT INSTALLED)	RES., CHIP, 1206	
11	0	R6, R11 (NOT INSTALLED)	RES., CHIP, 0603	
12	2	JPA: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
13	0	JPB: (OPEN)		
14	2	JPC: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
15	1	JPD: (3-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
16	0	JPE: (OPEN)		
17	0	JPF: (OPEN)		
18	1	U1	I.C., LTC1403ACMSE MSE	LINEAR TECHNOLOGY, LTC1403ACMSE#PBF

DC1082af

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
DC1082A-E Required Circuit Components				
1	1	DC1082A	DC1082A GENERAL BOM	
2	0	C13, C21 (NOT INSTALLED)	CAP., 0805	
3	2	C16, C17	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
4	0	C18, C22 (NOT INSTALLED)	CAP., 0603	
5	1	T1	TRANSFORMER	M/A-COM, MABAES0060
6	0	T2 (NOT INSTALLED)	TRANSFORMER	
7	1	JP2	SOLDER JUMPER WIRE 22 AWG FROM PIN 16 TO PIN 24 (SEE ASSY DRAWING)	
8	0	J2 (NOT INSTALLED)		
9	0	E7, E10 (NOT INSTALLED)	TESTPOINT, TURRET, 0.061"	
10	0	R9 (NOT INSTALLED)	RES., CHIP, 1206	
11	0	R6, R11 (NOT INSTALLED)	RES., CHIP, 0603	
12	2	JPA: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
13	0	JPB: (OPEN)		
14	2	JPC: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
15	1	JPD: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
16	0	JPE: (OPEN)		
17	0	JPF: (OPEN)		
18	1	U1	I.C., LTC2356CMSE-14, MSE	LINEAR TECHNOLOGY, LTC2356CMSE-14#PBF
DC1082A-F Required Circuit Components				
1	1	DC1082A	DC1082A GENERAL BOM	
2	0	C13, C21 (NOT INSTALLED)	CAP., 0805	
3	2	C16, C17	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
4	0	C18, C22 (NOT INSTALLED)	CAP., 0603	
5	0	T1 (OPT.)	TRANSFORMER	
6	0	T2 (NOT INSTALLED)	TRANSFORMER	
7	1	JP2	SOLDER JUMPER WIRE 22 AWG FROM PIN 16 TO PIN 24 (SEE ASSY DRAWING)	
8	0	J2 (NOT INSTALLED)	CON., SMA, 50 Ω , EDGE-LAUNCH	
9	0	E7, E10 (NOT INSTALLED)	TESTPOINT, TURRET, 0.061"	
10	0	R9 (NOT INSTALLED)	RES., CHIP, 1206	
11	0	R6, R11 (NOT INSTALLED)	RES., CHIP, 0603	
12	2	JPA: (3-5), (4-6)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
13	0	JPB: (OPEN)		
14	2	JPC: (1-3), (2-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
15	1	JPD: (3-4)	RES., CHIP, 0, 1/16W, 0603	AAC, CJ06-000 M
16	0	JPE: (OPEN)		
17	0	JPF: (OPEN)		
18	1	U1	I.C., LTC2355CMSE-14 MSE	LINEAR TECHNOLOGY, LTC2355CMSE-14#PBF

SCHEMATIC DIAGRAM



Figure 3. LTC1407 Family High Speed ADC

SCHEMATIC DIAGRAM

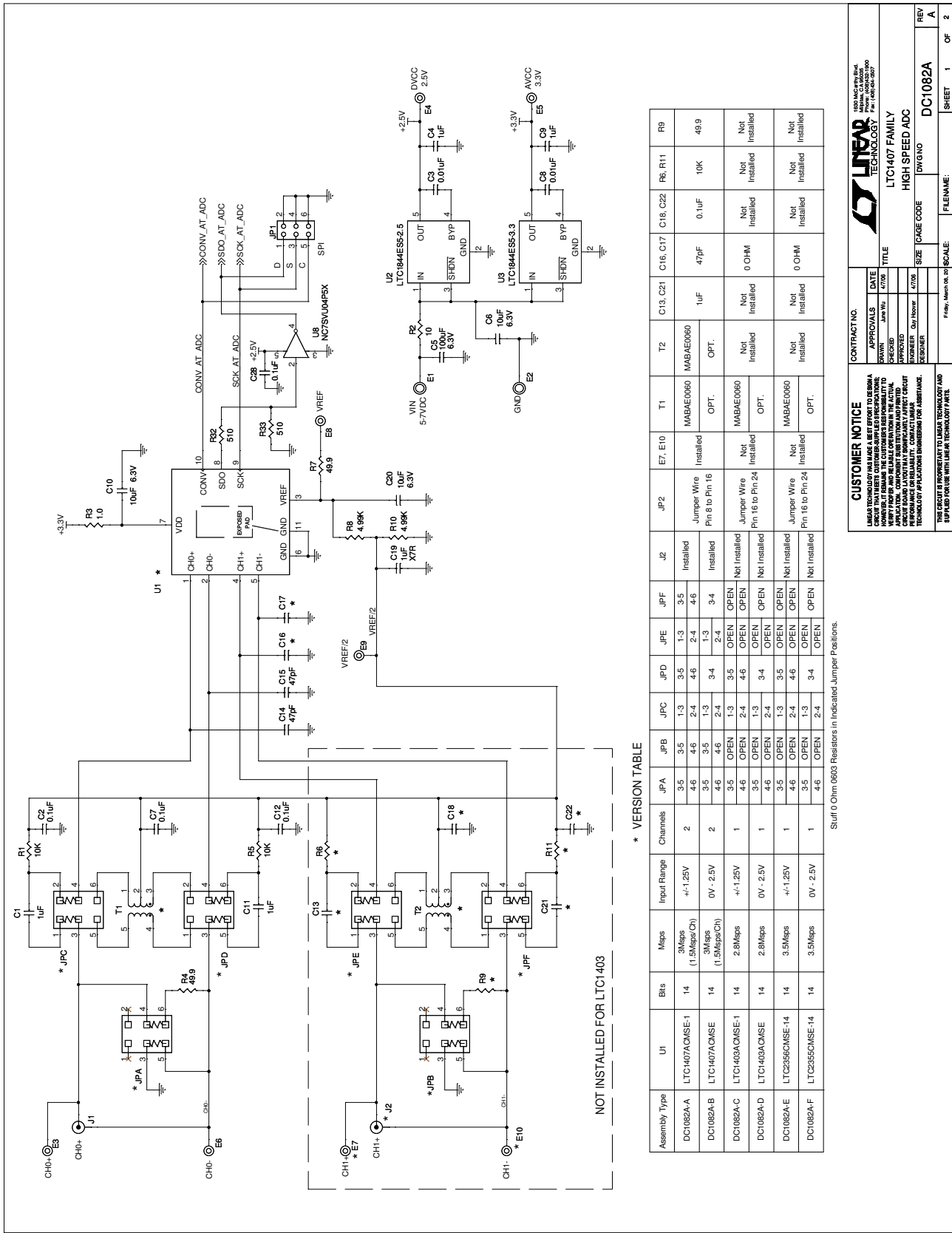


Figure 4. LTC1407 Family High Speed ADC

DEMO MANUAL DC1082A

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Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

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If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

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Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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