

# LTC2315/LTC2314/LTC2313/LTC2312/ 12-Bit/14-Bit, 5Msps/4.5Msps/ 2.5Msps/500ksps/Serial, High Speed SAR ADCs

## DESCRIPTION

Demonstration circuit 1563A features the LTC<sup>®</sup>2315 family. With sample rates up to 5Msps these unipolar, single channel, 12-/14-Bit, serial, high speed successive approximation register (SAR) ADCs are available in an 8-lead TSOT package. The LTC2315 family has an internal 20ppm reference and an SPI-compatible serial interface that supports 1.8V, 2.5V, 3V and 5V logic. The following text refers to the LTC2315 but applies to all members of the family, the only difference being the sample rate and the number of bits. The DC1563A demonstrates the DC and AC performance of the LTC2315 in conjunction with the DC590 QuikEval<sup>™</sup> and the DC718 PScope<sup>™</sup> data

collection boards. Use the DC590 to demonstrate DC performance such as peak-to-peak noise and DC linearity. Use the DC718 if precise sampling rates are required or to demonstrate AC performance such as SNR, THD, SINAD and SFDR. Alternatively, by connecting the DC1563A into a customer application the performance of the LTC2315 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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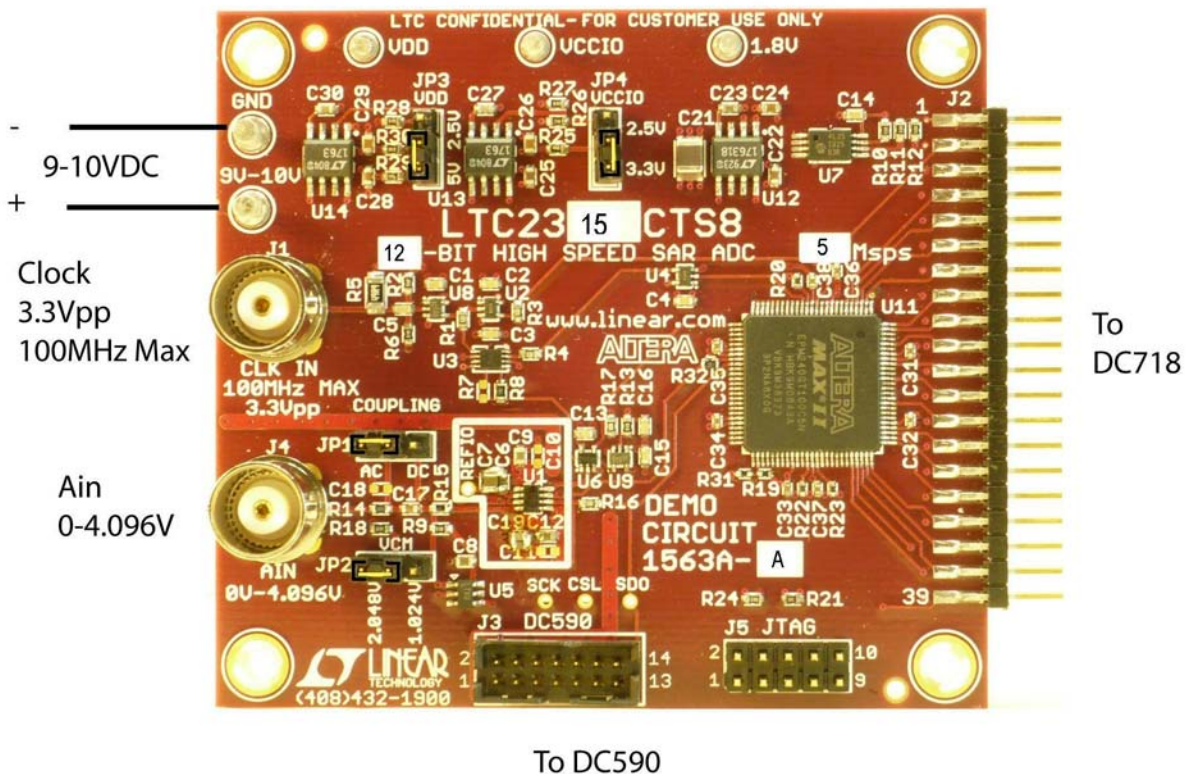


Figure 1. DC1563A Connection Diagram

## DESCRIPTION

Table 1. DC1563A Assembly Options

VERSION	U1 PART NUMBER	MAX CONVERSION RATE	# OF BITS	MAX CLOCK FREQUENCY
DC1563A-A	LTC2315CTS8-12	5Msps	12	90MHz
DC1563A-B	LTC2313CTS8-12	2.5Msps	12	82.5MHz
DC1563A-C	LTC2312CTS8-12	500ksps	12	16.5MHz
DC1563A-F	LTC2314CTS8-14	4.5Msps	14	90MHz
DC1563A-G	LTC2313CTS8-14	2.5Msps	14	100MHz
DC1563A-H	LTC2312CTS8-14	500ksps	14	20MHz

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## DC718 QUICK START PROCEDURE

Connect the DC1563A to a DC718 USB high speed data collection board using connector J2. Connect the DC718 to a host PC with a standard USB A/B cable. Apply 9V to 10V DC to the 9V to 10V and GND terminals. Apply a low jitter signal source to J4. As a clock source, apply a low jitter 10dBm sine wave or square wave to connector J1. See Table 1 for maximum clock frequencies. Note that J1 has a 50Ω termination resistor to ground. Run the PScope software (Pscope.exe version K73 or later) supplied with the DC718 or download it from [www.linear.com/software](http://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. The PScope software should recognize the DC1563A and configure itself automatically.

Click the Collect button (Figures 2 and 3) to begin acquiring data. The Collect button then changes to Pause, which can be used to stop data acquisition.

## DC590B QUICK START PROCEDURE

Connect the DC1563A to a DC590 USB serial controller using the supplied 14-conductor ribbon cable. **Make sure that VCCIO of the DC590 is set to 3.3V.** Connect the DC590 to a host PC with a standard USB A/B cable. Apply a signal source to J4. Run the QuikEval software supplied with the DC590 or download it from [www.linear.com/software](http://www.linear.com/software). The

correct control panel will be loaded automatically. Click the Collect (Figures 4 and 5) button to begin gathering data from the ADC. Make sure the reference voltage selected in the QuikEval control panel matches the  $V_{DD}$  and  $V_{CM}$  settings on the DC1563A.

## HARDWARE SETUP

### Signal Connections

**J1:** CLK IN. This input has a  $50\Omega$  termination resistor, and is intended to be driven by a low jitter, 10dBm sine or square wave. To achieve full AC performance of this part, the clock jitter should be kept under 20ps. This input is capacitively coupled so that the input clock can be either 0V to 3.3V or  $\pm 1.65$ V. This eliminates the need for level shifting. To run at the maximum conversion rate, apply the clock frequency specified in the Table 1.

**J2:** DC718 Interface. Connect to J7 of the DC718. Do not connect to both the DC718 and the DC590 at the same time. JP4 (VCCIO) should be set to 3.3V when interfacing to a DC718.

**J3:** DC590 Interface. Connect to J4 of the DC590 with the supplied 14-pin cable. Do not connect to both the DC590 and the DC718 at the same time. Make sure that VCCIO of the DC590 is set to 3.3V.

**J4:** AIN. Analog input of the DC1563A. Keep input voltage swings between GND and REF. For optimum performance, this input should be band limited to the frequencies of interest. The default filter comprised of R15 and C19 has a bandwidth of 67.8MHz.

**J5:** JTAG. Factory Use Only.

**JP1** Coupling. Use this jumper to select AC or DC coupling of AIN. The default setting is AC. At very low input frequencies, using AC coupling may degrade the distortion performance. When using AC coupling make sure that JP2(VCM) is set to half the REF value.

**JP2:** VCM. Use this jumper to set the DC bias point for AIN of the LTC2315 when JP1 (Coupling) is in the AC position. 2.048V is the default setting. Jumpers VCM and  $V_{DD}$  should be switched together so that the DC bias point (VCM) is half of the REF voltage.

**JP3:**  $V_{DD}$ . Use this jumper to select the ADC  $V_{DD}$  and REF voltages.  $V_{DD}$  can be set to 5V (REF = 4.096V) or 2.5V (REF = 2.048).  $V_{DD} = 5$ V (REF = 4.096V) is the default setting. Jumpers  $V_{DD}$  and VCM should be switched together so that the DC bias point (VCM) is half of the REF voltage.

**JP4:** VCCIO. Use this jumper to set VCCIO to 3.3V or 2.5V. The default setting is 3.3V. VCCIO sets the LTC2315  $OV_{DD}$  voltage and the DC1563A J2 logic high voltage.  $OV_{DD}$  sets the logic high voltage of the LTC2315 SDO pin and the thresholds of the LTC2315 digital inputs.

## HARDWARE SETUP

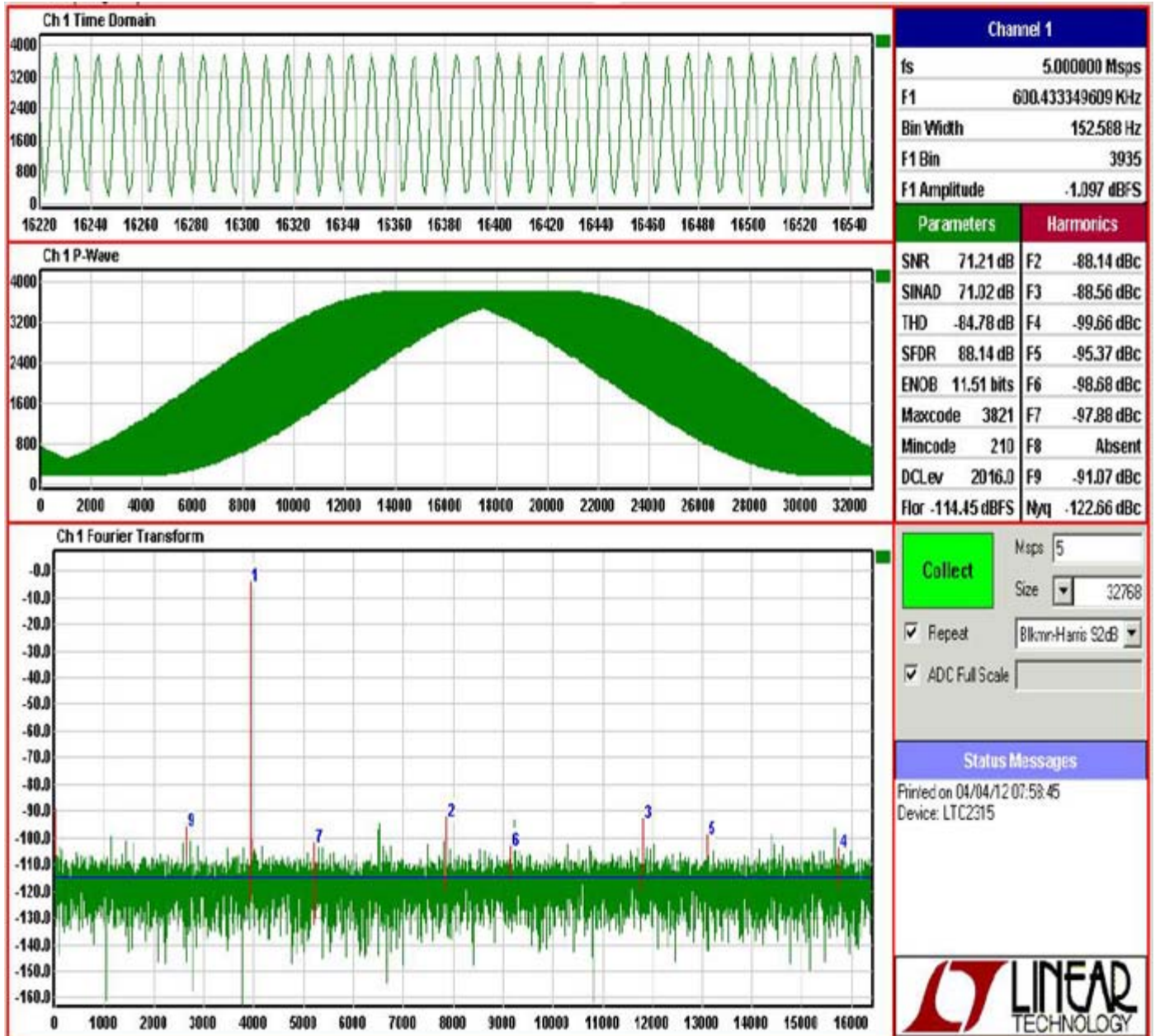


Figure 2. DC1563A-A PScope Screenshot

# HARDWARE SETUP

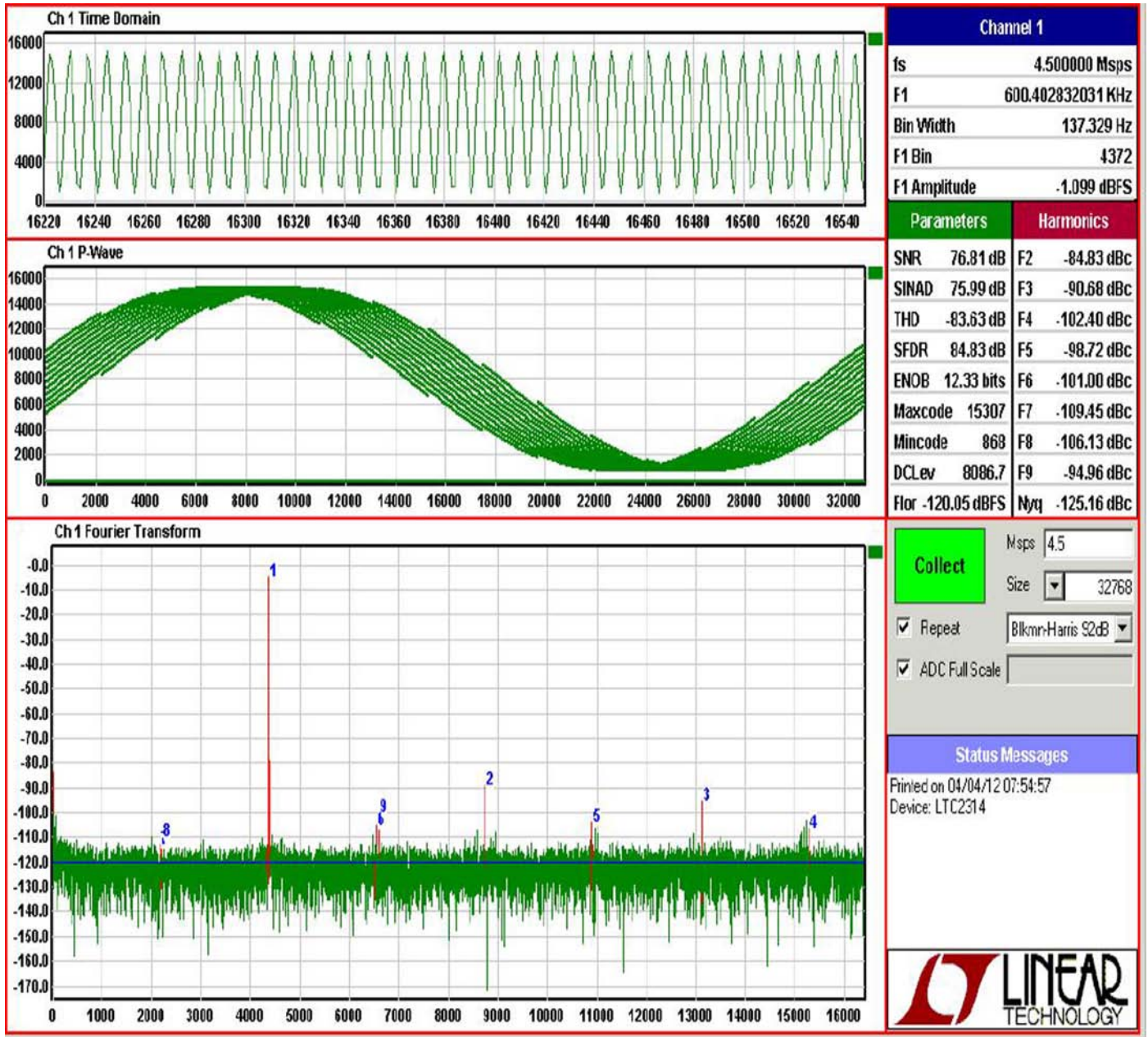


Figure 3. DC1563A-F PScope Screenshot

## HARDWARE SETUP

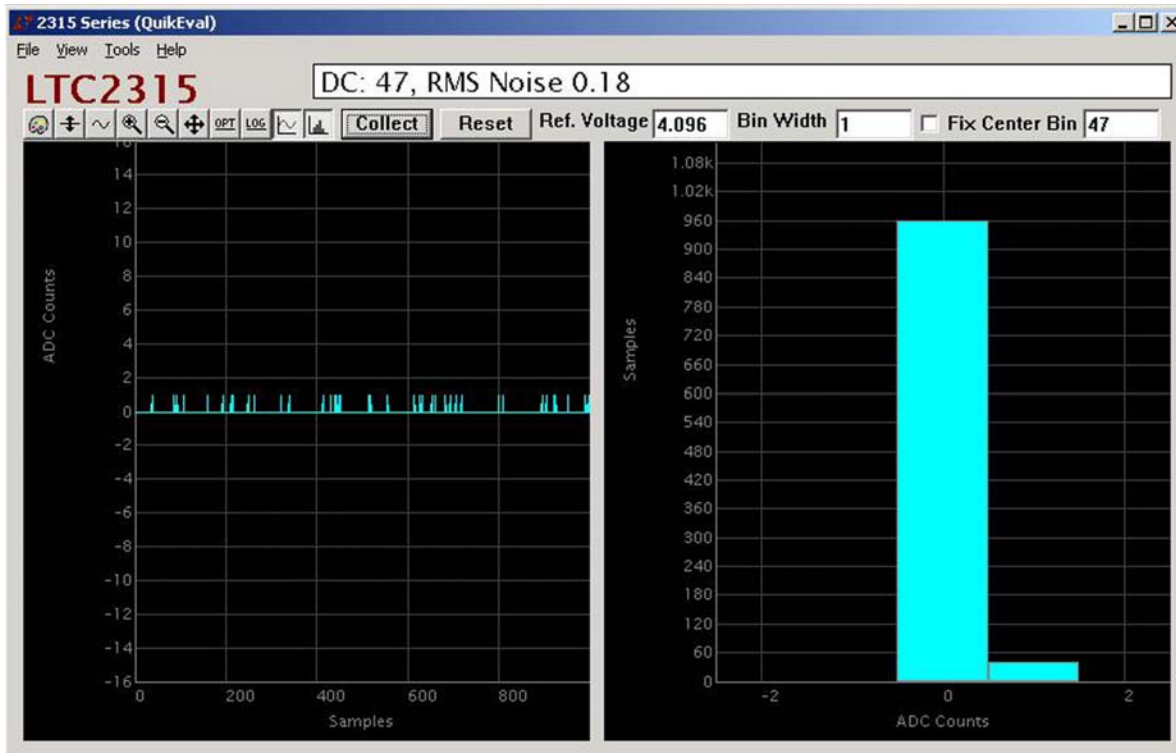


Figure 4. DC1563A-A QuikEval Screenshot

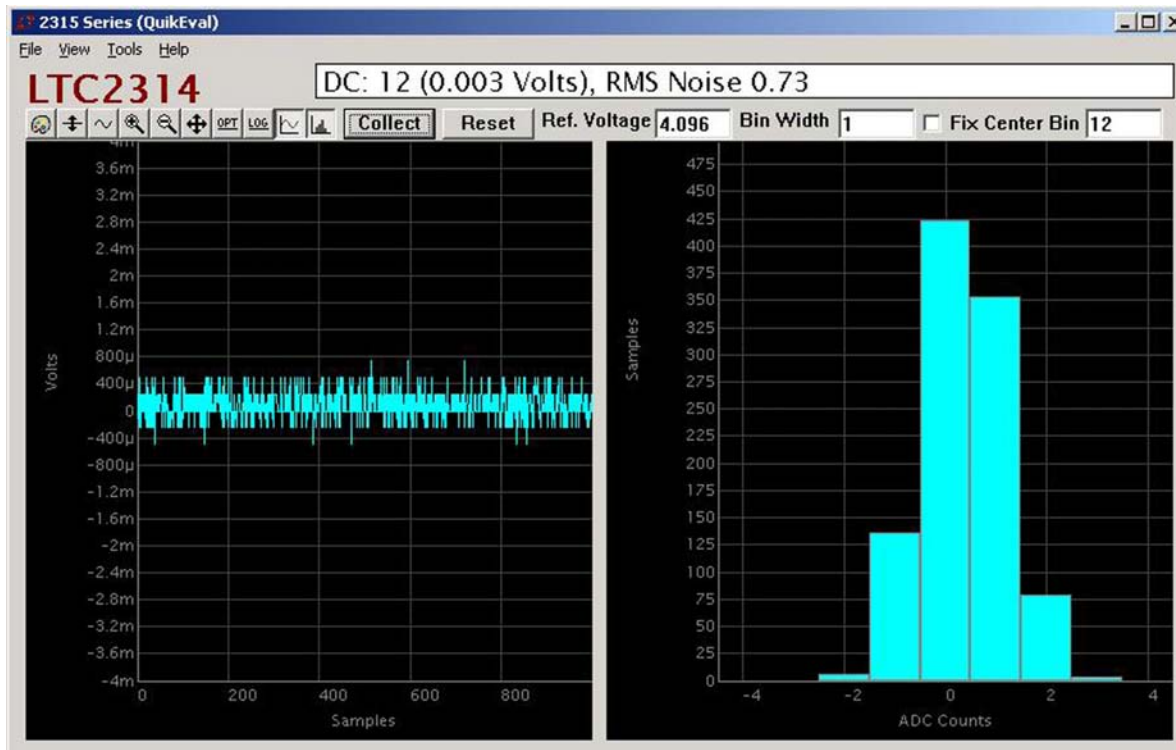


Figure 5. DC1563A-F QuikEval Screenshot

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>DC1563A General BOM</b>				
1	9	C1, C2-C5, C13-C16	CAP, X5R, 0.1µF 16V, 10%	AVX, 0603YD104KAT
2	3	C6, C9, C12	CAP, X5R, 4.7µF 6.3V, 20%, 0603	TAIYO YUDEN, JMK107BJ475MA-T
3	0	C7, C10, C11, C18	CAP, 0603	OPT
4	4	C8, C24, C26, C29	CAP, X5R, 10µF 6.3V, 20%, 0603	TDK, C1608X5R0J106MT
5	4	C17, C22, C25, C28	CAP, X7R, 1µF 16V, 10%, 0603	TDK, C1608X7R1C105K
6	1	C19	CAP, COG 47pF 50V 5%, 0603	MURATA, GRM1885C1H470JA01D
7	1	C21	CAP, X5R, 47µF 16V, 20%, 1210	TAIYO YUDEN, EMK325BJ476MM-T
8	3	C23, C27, C30	CAP, COG, 0.01µF, 25V, 10%, 0603	KEMET, C0603C103K3GACTU
9	8	C31-C38	CAP, X7R, 0.1µF, 16V, 10%	TDK, C1005X7R1C104KT
10	2	E1, E4	TP, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
11	3	E2, E3, E5	TP, TURRET, 0.064"	MILL-MAX, 2308-2-00-80-00-00-07-0
12	2	J1, J4	CONN., BNC-5PINS	CONNEX, 112404
13	1	J2	HEADER, 2X20, 0.100", HD2X20-100	SAMTEC, TSW-120-07-L-D
14	1	J3	HEADER, 2X7, 0.079"	MOLEX, 87831-1420
15	1	J5	HEADER, 2X5, 0.100", HD2X5-100	SAMTEC, TSW-105-07-L-D
16	4	JP1, JP2, JP3, JP4	JMP, 1X3, 0.100", HD1X3-100	SAMTEC, TSW-103-07-L-S
17	4	R1, R3, R4, R16	RES., CHIP 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
18	8	R2, R6, R9, R13, R18, R24, R27, R30	RES., CHIP 1k, 1%, 0603	NIC, NRC06F1001TRF
19	2	R5, R15	RES., CHIP 49.9Ω, 1%, 1206	NIC, NRC12F49R9TRF
20	3	R10, R11, R12	RES., CHIP 4.99k, 1%, 0603	NIC, NRC06F4991TRF
21	1	R14	RES., CHIP 0Ω, 1%, 0603	NIC, NRC06F0000TRF
22	1	R15	RES., CHIP 49.9Ω, 1%, 0603	NIC, NRC06F49R9TRF
23	1	R17	RES., CHIP 2k, 1%, 0603	NIC, NRC06F2001TRF
24	1	R19	RES., CHIP 10k, 1%, 0402	NIC, NRC04F1002TRF
25	3	R20, R22, R23	RES., CHIP 1k, 1%, 0402	NIC, NRC04F1001TRF
26	1	R21	RES., CHIP 10k, 1%, 0603	NIC, NRC06F1002TRF
27	1	R25	RES., CHIP 2.80K, 1%, 0603	NIC, NRC06F2801TRF
28	1	R26	RES., CHIP 1.74k, 1%, 0603	NIC, NRC06F1741TRF
29	1	R28	RES., CHIP 4.02k, 1%, 0603	NIC, NRC06F4021TRF
30	1	R29	RES., CHIP 3.16k, 1%, 0603	NIC, NRC06F3161TRF
31	0	R31	RES., 0402	OPT
32	2	U2, U4	IC, TINYLOGIC ULP-A UNBUFFERED INVERTER, SC70-5	FAIRCHILD, NC7SVU04P5X

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## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
33	1	U3	IC, SINGLE D FLIP FLOP, US8	ON SEMI., NL17SZ74
34	1	U5	IC., LT1790ACS6-2.048, SOT23-6	LINEAR TECH., LT1790ACS6-2.048
35	1	U6	IC, SINGLE SPST BUS SWITCH, SC70-5	FAIRCHILD, NC7SZ66P5X
36	1	U7	IC, SERIAL EEPROM, TSSOP	MICROCHIP, 24LC025-I/ST
37	2	U8, U9	IC, TINYLOGIC UHS INVERTER, SC70-5	FAIRCHILD, NC7SZ04P5X
38	1	U11	IC, MAX II FAMILY, TQFP100	ALTERA, EPM240GT100C5N
39	1	U12	IC., LT1763CS8-1.8, SO8	LINEAR TECH., LT1763CS8-1.8
40	2	U13, U14	IC., LT1763CS8, SO8	LINEAR TECH., LT1763CS8
41	4	STAND-OFF AT 4 CORNERS	STAND-OFF, NYLON (SNAP ON), 0.25" TALL	KEYSTONE, 8831(SNAP ON)
42	3	SHUNTS ON JP1-JP3 AS ON ASSY DWG	SHUNT, 0.100" CENTER	SAMTEC, SNT-100-BK-G
43	1	STENCIL	STENCIL TOP SIDE ONLY	DC1563A

### DC1563A-A

1	1	DC1563A	GENERAL BOM	
2	0	R7	RES., 0603	OPT
3	1	R8	RES., CHIP, 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
4	0	R31	RES., 0402	OPT
5	1	U1	IC, LTC2315CTS8-12, TSOT23-8	LINEAR TECH., LTC2315CTS8-12

### DC1563A-B

1	1	DC1563A	GENERAL BOM	
2	1	R7	RES., CHIP, 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
3	0	R8	RES., 0603	OPT
4	0	R31	RES., 0402	OPT
5	1	U1	IC, LTC2313CTS8-12, TSOT23-8	LINEAR TECH., LTC2313CTS8-12

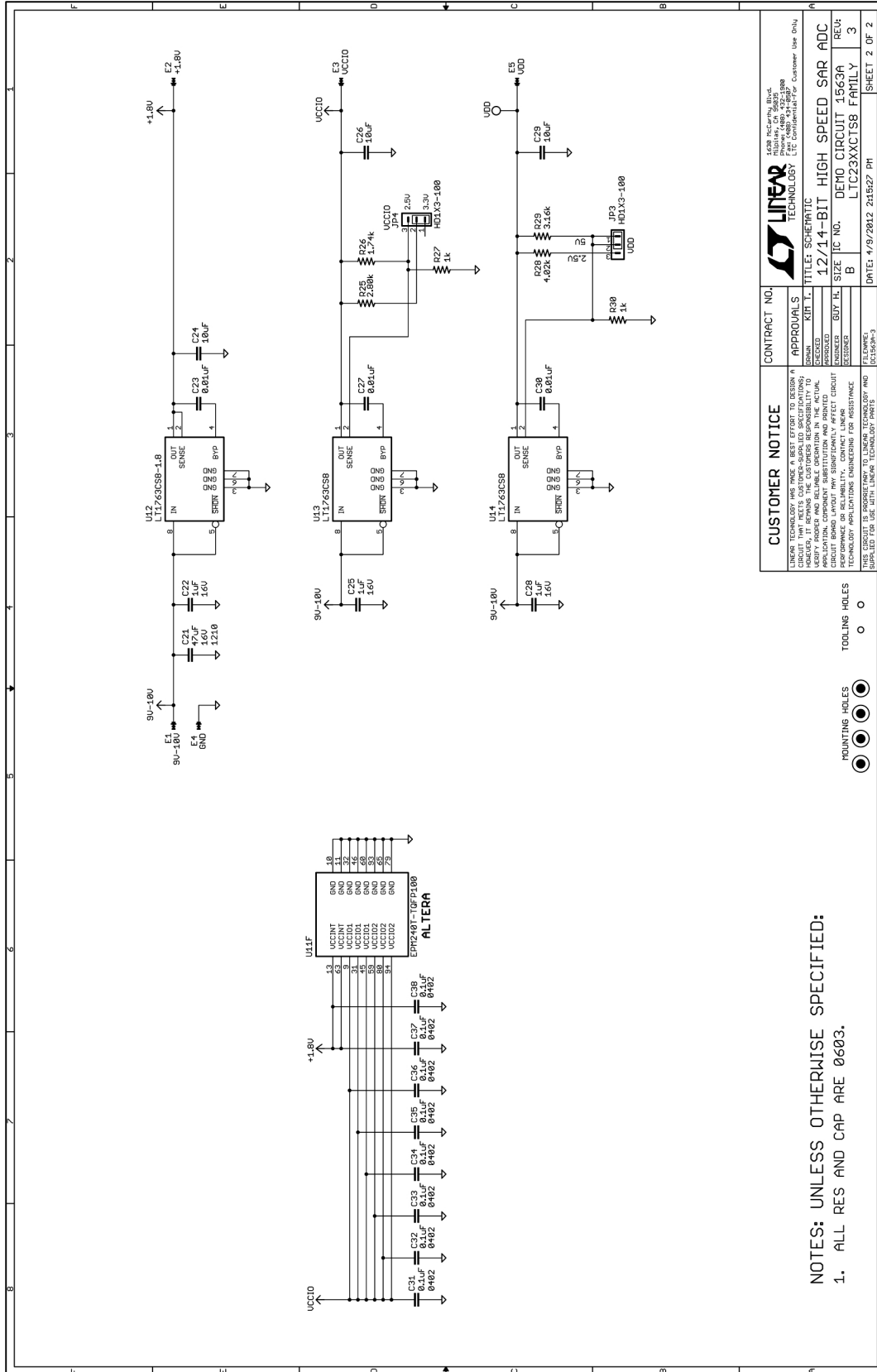


## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>DC1563A-C</b>				
1	1	DC1563A	GENERAL BOM	
2	1	R7	RES., CHIP, 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
3	0	R8	RES., 0603	OPT
4	0	R31	RES., 0402	OPT
5	1	U1	IC, LTC2312CTS8-12, TSOT23-8	LINEAR TECH., LTC2312CTS8-12
<b>DC1563A-F</b>				
1	1	DC1563A	GENERAL BOM	
2	0	R7	RES., 0603	OPT
3	1	R8	RES., CHIP, 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
4	1	R31	RES., CHIP, 300, 1%, 0402	NIC, NRC04F300RTRF
5	1	U1	IC, LTC2314CTS8-14, TSOT23-8	LINEAR TECH., LTC2314CTS8-14
<b>DC1563A-G</b>				
1	1	DC1563A	GENERAL BOM	
2	1	R7	RES., CHIP, 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
3	0	R8	RES., 0603	OPT
4	1	R31	RES., CHIP, 300, 1%, 0402	NIC, NRC04F300RTRF
5	1	U1	IC, LTC2313CTS8-14, TSOT23-8	LINEAR TECH., LTC2313CTS8-14
<b>DC1563A-H</b>				
1	1	DC1563A	GENERAL BOM	
2	1	R7	RES., CHIP, 33Ω, 1%, 0603	NIC, NRC06F33R0TRF
3	0	R8	RES., 0603	OPT
4	1	R31	RES., CHIP, 300, 1%, 0402	NIC, NRC04F300RTRF
5	1	U1	IC, LTC2312CTS8-14, TSOT23-8	LINEAR TECH., LTC2312CTS8-14



SCHEMATIC DIAGRAM



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# DEMO MANUAL DC1563A

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