LTC2268-14/-12, LTC2267-14/-12, LTC2266-14/-12, LTC2265-14/-12, LTC2264-14/-12, LTC2263-14/-12 12-/14-Bit, 25Msps to 125Msps Dual ADCs

DESCRIPTION

Demonstration circuit 1532 supports a family of 14-/12-bit 25Msps to 125Msps ADCs. Each assembly features one of the following devices: LTC2268-14, LTC2268-12, LTC2267-14, LTC2267-12, LTC2266-14, LTC2266-12, LTC2265-14, LTC2265-12, LTC2264-14, LTC2264-12, LTC2263-14, LTC2263-12 high speed, dual ADCs.

The versions of the 1532A demo board are listed in Table 1. Depending on the required resolution and sample rate, the DC1532 is supplied with the appropriate ADC. The circuitry on the analog inputs is optimized for analog input frequencies from 5MHz to 140MHz. Refer to the data sheet for proper input networks for different input frequencies.

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

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	VALUE
Supply Voltage – DC1532A	Depending on Sampling Rate and the A/D Converter Provided, this Supply Must Provide up to 500mA.	Optimized for 3V [3V ⇔ 6.0V Min/Max]
Analog Input Range	Depending on SENSE Pin Voltage	$1V_{P-P}$ to $2V_{P-P}$
Logic Input Voltages	Minimum Logic High	1.3V
	Maximum Logic Low	0.6V
Logic Output Voltages (Differential)	Nominal Logic Levels (100Ω Load, 3.5mA Mode)	350mV/1.25V Common Mode
	Minimum Logic Levels (100Ω Load, 3.5mA Mode)	247mV/1.25V Common Mode
Sampling Frequency (Convert Clock Frequency)	See Table 1	
Encode Clock Level	Single-Ended Encode Mode (ENC – Tied to GND)	0V to 3.6V
Encode Clock Level	Differential Encode Mode (ENC – Not Tied to GND)	0.2V to 3.6V
Resolution	See Table 1	
Input Frequency Range	See Table 1	
SFDR	See Applicable Data Sheet	
SNR	See Applicable Data Sheet	

QUICK START PROCEDURE

Table 1. DC1532 Variants

DC1532 VARIANTS	ADC PART NUMBER	RESOLUTION	MAXIMUM SAMPLE RATE	INPUT FREQUENCY
1532A-A	LTC2268-14	14-Bit	125Msps	5MHz to 140MHz
1532A-B	LTC2267-14	14-Bit	105Msps	5MHz to 140MHz
1532A-C	LTC2266-14	14-Bit	80Msps	5MHz to 140MHz
1532A-D	LTC2265-14	14-Bit	65Msps	5MHz to 140MHz
1532A-E	LTC2264-14	14-Bit	40Msps	5MHz to 140MHz
1532A-F	LTC2263-14	14-Bit	25Msps	5MHz to 140MHz
1532A-G	LTC2268-12	12-Bit	125Msps	5MHz to 140MHz
1532A-H	LTC2267-12	12-Bit	105Msps	5MHz to 140MHz
1532A-I	LTC2266-12	12-Bit	80Msps	5MHz to 140MHz
1532A-J	LTC2265-12	12-Bit	65Msps	5MHz to 140MHz
1532A-K	LTC2264-12	12-Bit	40Msps	5MHz to 140MHz
1532A-L	LTC2263-12	12-Bit	25Msps	5MHz to 140MHz

Demonstration circuit 1532 is easy to set up to evaluate the performance of the LTC2268 A/D converters. Refer to Figure 1 for proper measurement equipment setup and follow the procedure:

Setup

If a DC1371 QuikEval™ II Data Acquisition and Collection System was supplied with the DC1532 demonstration circuit, follow the DC1371 Quick Start Guide to install the required software and for connecting the DC1371 to the DC1532 and to a PC.

DC1532 Demonstration Circuit Board Jumpers

The DC1532 demonstration circuit board should have the following jumper settings as default positions: (as per Figure 1)

J13: PAR/SER: Selects Parallel or Serial programming mode. (Default – Serial)

Optional Jumpers:

J8: Term: Enables/Disable optional output termination. (Default – Removed)

J5: ILVDS: Selects either 1.75mA or 3.5mA of output current for the LVDS drivers. (Default – Removed)

J14: LANE: Selects either 1 lane or 2 lane output modes (Default – Removed) NOTE: The DC1371 does not support 1 lane operation.

J15: $\overline{\text{SHDN}}$: Enables and disables the LTC2268. (Default – Removed)

J2: WP: Enable/Disables write protect for the EEPROM. (Default – Removed)

Note: Optional jumper should be left open to ensure proper serial configuration.

QUICK START PROCEDURE

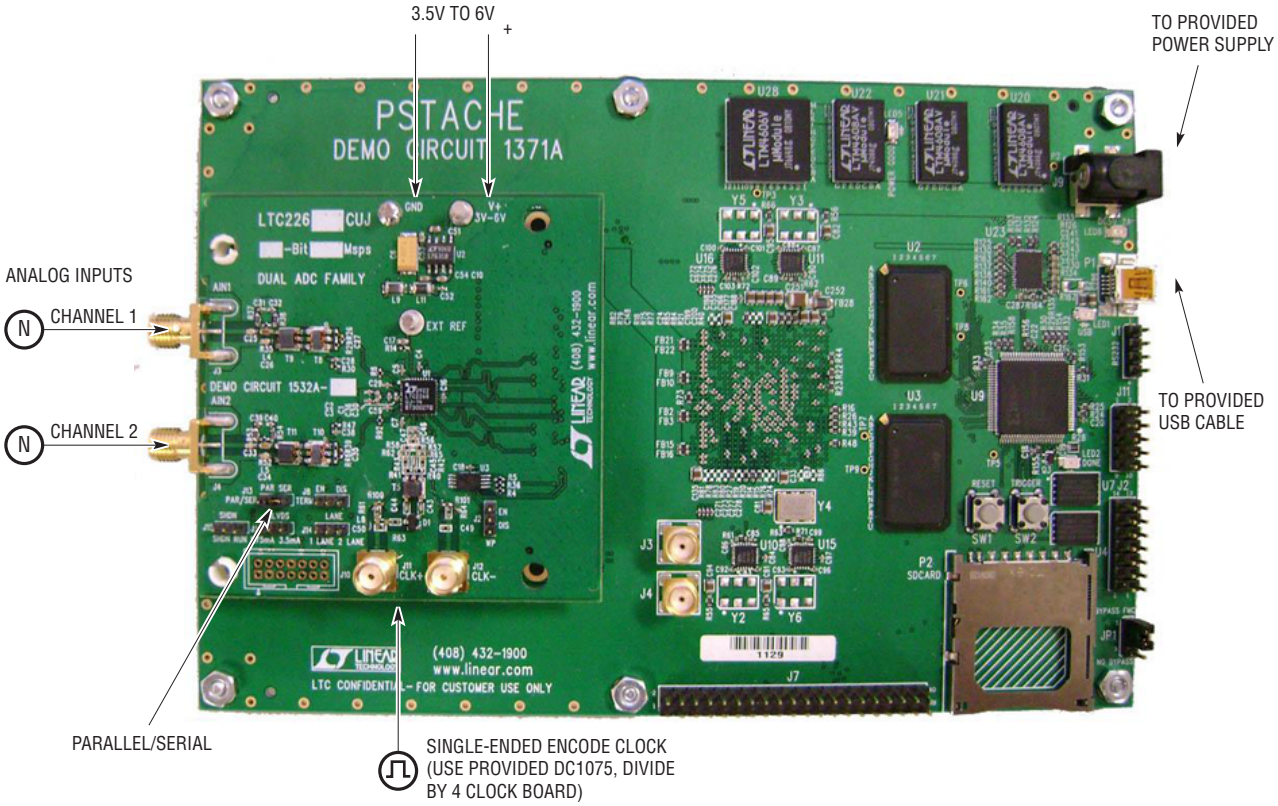


Figure 1. DC1532A Setup

Applying Power And Signals to the DC1532 Demonstration Circuit

The DC1371 is used to acquire data from the DC1532, the DC1371 must FIRST be connected to a powered USB port and have 5V applied power BEFORE applying 3.6V to 6.0V across the pins marked V^+ and GND on the DC1532. DC1532 requires 3.6V for proper operation.

Regulators on the board produce the voltages required for the ADC. The DC1532 demonstration circuit requires up to 500mA depending on the sampling rate and the A/D converter supplied.

The DC1532 should not be removed, or connected to the DC1371 while power is applied.

Analog Input Network

For optimal distortion and noise performance the RC network on the analog inputs may need to be optimized for different analog input frequencies. For input frequencies above 140MHz, refer to the LTC2268 datasheet for a proper input network. Other input networks may be more appropriate for input frequencies less that 5MHz.

In almost all cases, filters will be required on both analog input and encode clock to provide data sheet SNR.

The filters should be located close to the inputs to avoid reflections from impedance discontinuities at the driven end of a long transmission line. Most filters do not present 50Ω outside the passband. In some cases, 3dB to 10dB pads may be required to obtain low distortion.

QUICK START PROCEDURE

If your generator cannot deliver full scale signals without distortion, you may benefit from a medium power amplifier based on a Gallium Arsenide Gain block prior to the final filter. This is particularly true at higher frequencies where IC based operational amplifiers may be unable to deliver the combination of low noise figure and High IP3 point required. A high order filter can be used prior to this final amplifier, and a relatively lower Q filter used between the amplifier and the demo circuit.

Apply the analog input signal of interest to the SMA connectors on the DC1532 demonstration circuit board marked J3 AIN1, J4 AIN2, J6 AIN3, J7 AIN4. These inputs correspond with channels 1-4 of the ADC respectively. These inputs are capacitive coupled to balun transformers ETC1-1-13.

Encode Clock

NOTE: Apply an encode clock to the SMA connector on the DC1532 demonstration circuit board marked J11 CLK+. As a default the DC1532 is populated to have a single-ended input.

For the best noise performance, the ENCODE INPUT must be driven with a very low jitter, square wave source. The amplitude should be large, up to $3V_{P-P}$ or 13dBm. When using a sinusoidal signal generator a squaring circuit can be used. Linear Technology also provides demo board DC1075A that divides a high frequency sine wave by four, producing a low jitter square wave for best results with the LTC2268.

Using bandpass filters on the clock and the analog input will improve the noise performance by reducing the wideband noise power of the signals. In the case of the DC1532 a bandpass filter used for the clock should be used prior to the DC1075A. Data sheet FFT plots are taken with 10 pole LC filters made by TTE (Los Angeles, CA) to suppress signal generator harmonics, non harmonically related spurs and broadband noise. Low phase noise Agilent 8644B generators are used for both the Clock input and the Analog input.

Digital Outputs

Data outputs. data clock, and frame clock signals are available on J1 of the DC1532. This connector follows the VITA-57/FMC standard, but all signals should be verified when using an FMC carrier card other than the DC1371.

Software

The DC1371 is controlled by the PScope™ System Software provided or downloaded from the Linear Technology website at http://www.linear.com/software/.

To start the data collection software if PScope.exe is installed (by default) in \Program Files\LTC\PScope\, double click the PScope Icon or bring up the run window under the start menu and browse to the PScope directory and select PScope.

If the DC1532 demonstration circuit is properly connected to the DC1371, PScope should automatically detect the DC1532, and configure itself accordingly.

If everything is hooked up properly, powered and a suitable convert clock is present, clicking the Collect button should result in time and frequency plots displayed in the PScope window. Additional information and help for PScope is available in the DC1371A Quick Start Guide and in the online help available within the PScope program itself.

QUICK START PROCEDURE

Serial Programming

PScope has the ability to program the DC1532 board serially through the DC1371. There are several options available in the LTC2268 family that are only available through serially programming. PScope allows all of these features to be tested.

These options are available by first clicking on the Set Demo Board Options icon on the PScope toolbar (Figure 3).

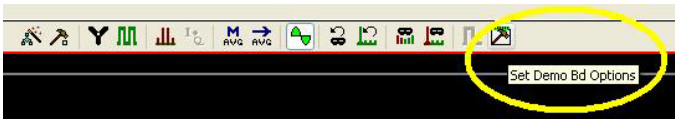


Figure 3. PScope Toolbar

This will bring up the menu shown in Figure 4.

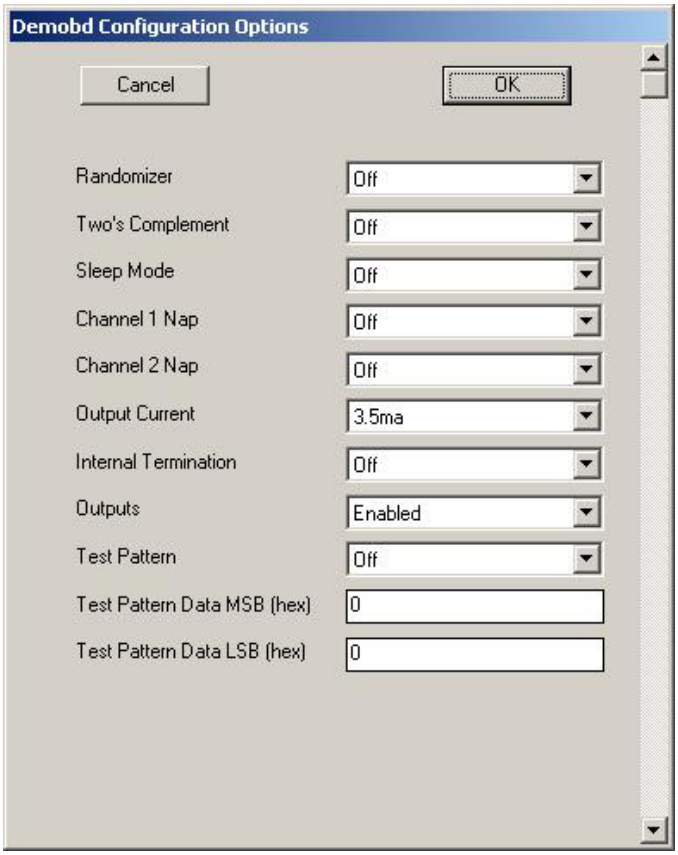


Figure 4: Demo Board Configuration Options

This menu allows any of the options available for the LTC2268 family to be programmed serially. The LTC2268 family has the following options:

Randomizer: Enables Data Output Randomizer

- Off (Default): Disables data output randomizer
- On: Enables data output randomizer

Two's complement: Enables two's complement mode

- Off (Default): Selects offset binary mode
- On: Selects two's complement mode

Sleep Mode: Selects between normal operation, sleep mode

- Off (Default): Entire ADC is powered, and active
- On: The entire ADC is powered down

Channel 1 Nap: Selects between normal operation and putting channel 1 in nap mode

- Off (Default): Channel one is active
- On: Channel one is in nap mode

Channel 2 Nap: Selects between normal operation and putting channel 2 in nap mode

- Off (Default): Channel two is active
- On: Channel two is in nap mode

Output Current: Selects the LVDS output drive current

- 1.75mA (Default): LVDS output driver current
- 2.1mA: LVDS output driver current
- 2.5mA: LVDS output driver current
- 3.0mA: LVDS output driver current
- 3.5mA: LVDS output driver current
- 4.0mA: LVDS output driver current
- 4.5mA: LVDS output driver current

QUICK START PROCEDURE

Internal Termination: Enables LVDS internal termination

- Off (Default): Disables internal termination
- On: Enables internal termination

Outputs: Enables Digital Outputs

- Enabled (Default): Enables digital outputs
- Disabled: Disables digital outputs

Test Pattern: Selects Digital output test patterns. The desired test pattern can be entered into the text boxes provided

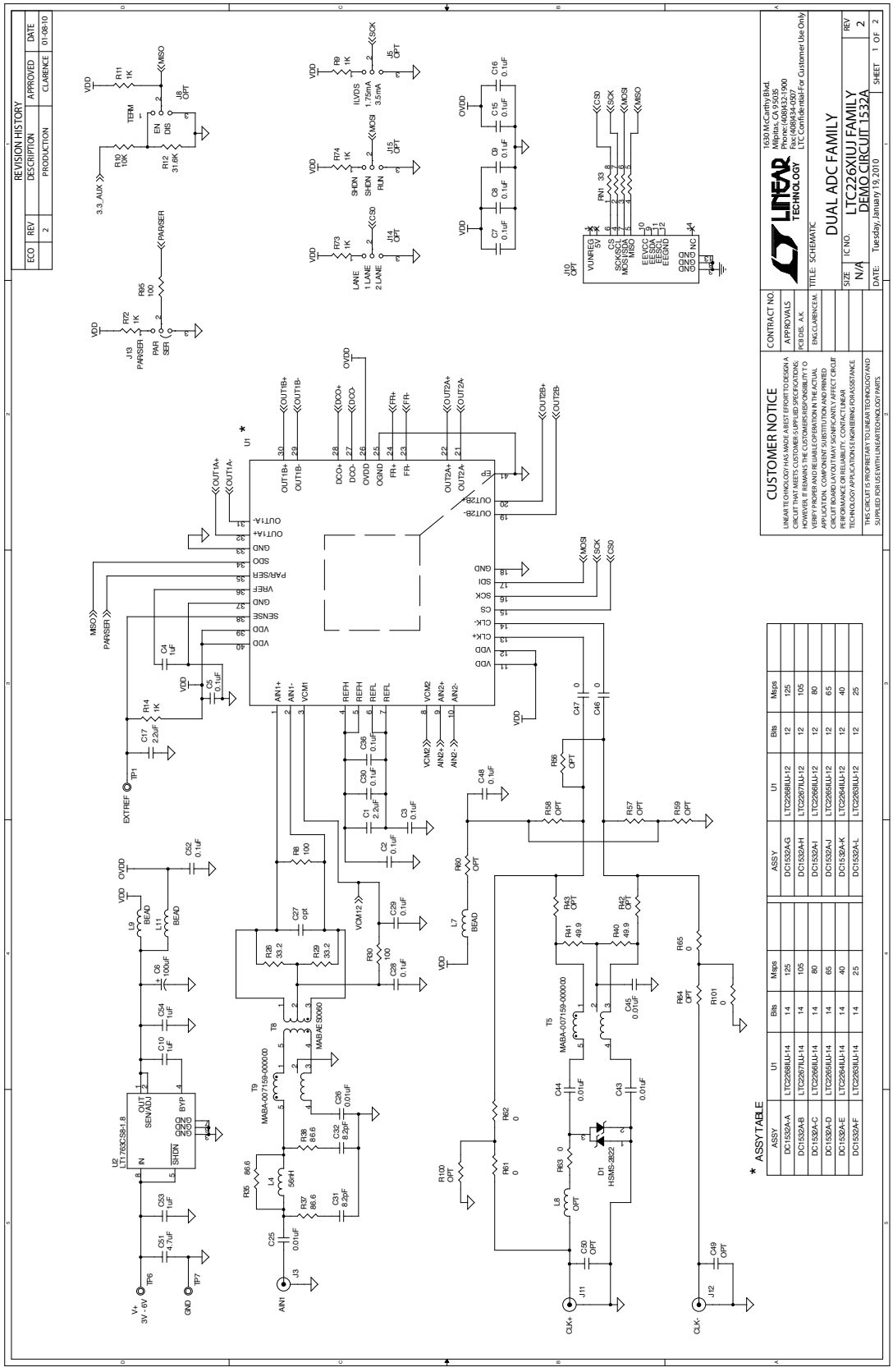
- Off (default): ADC input data is displayed
- On: Test pattern is displayed

Once the desired settings are selected hit OK and PScope will automatically update the register of the device on the DC1532 demo board

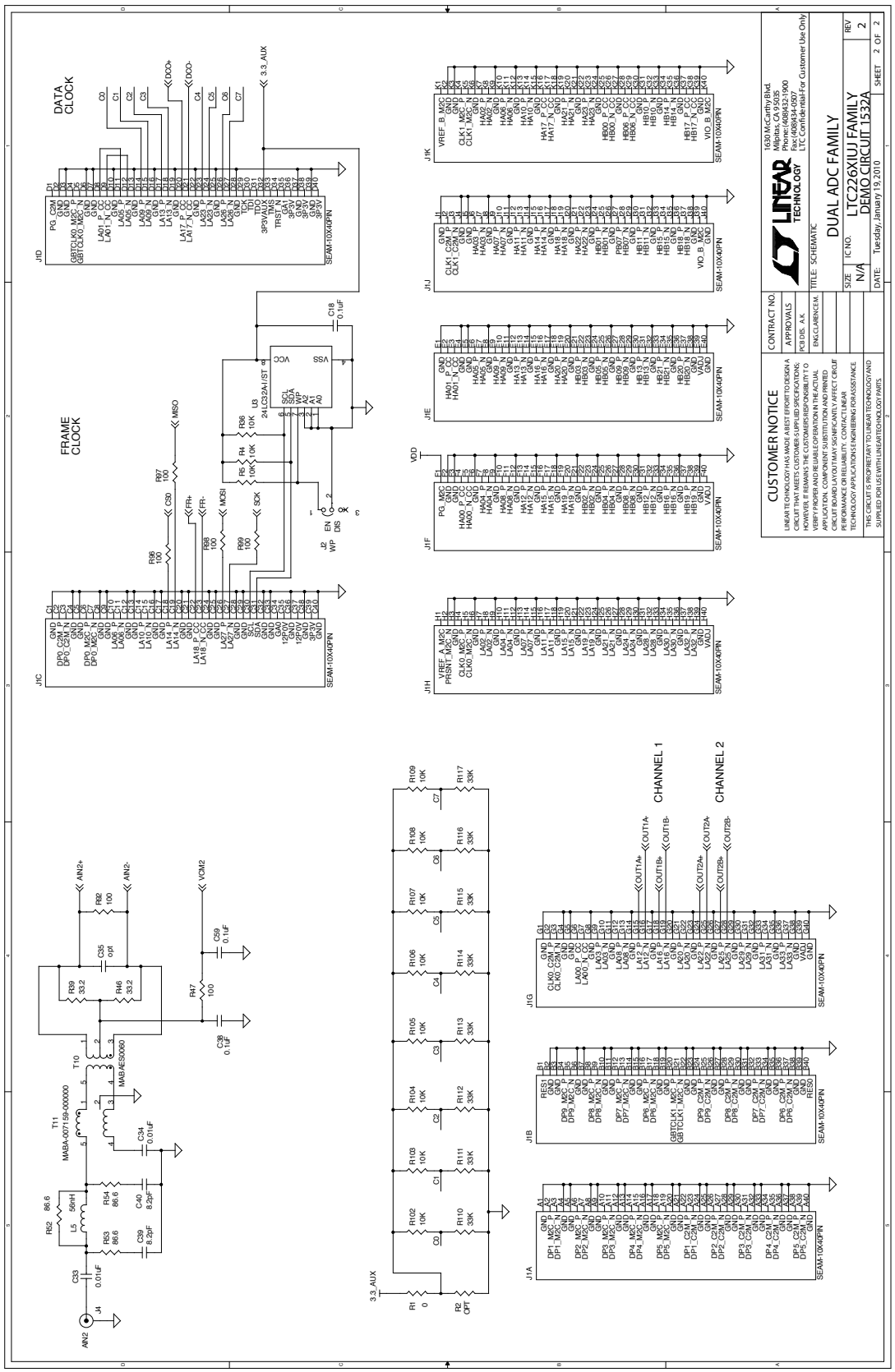
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	2	C1, C17	CAP., X5R, 2.2µF, 10V, 20%, 0603	AVX, 0603ZD225MAT2A
2	17	C2, C3, C5, C7–C9, C15, C16, C18, C28–C30, C36, C38, C48, C52, C59	CAP., X5R, 0.1µF, 10V, 10%, 0402	AVX, 0402ZD104KAQ2A
3	1	C4	CAP., X5R, 1µF, 10V, 10%, 0402	AVX, 0402ZC105KAT2A
4	1	C6	CAP., TANT, 100µF, 10%, 6032	AVX, TAJW107K010R
5	3	C10, C53, C54	CAP., X7R, 1µF, 10V, 10%, 0603	AVX, 0603ZC105KAT2A
6	4	C25, C26, C33, C34	CAP., X7R, 0.01µF, 50V, 10%, 0603	AVX, 06035C103KAQ2A
7	0	R2, C27, C35, R42, R43, C49, C50, R56, R57, R58, R59, R60, R64, R100	OPT 0402	
8	4	C31, C32, C39, C40	CAP., C0G, 8.2pF, 50V, 5%, 0402	AVX, 04025A8R2JAT2A
9	3	C43, C44, C45	CAP., X7R, 0.01µF, 16V, 10%, 0402	AVX, 0402YC103KAQ2A
10	1	C51	CAP., X5R, 4.7µF, 6.3V, 20%, 0603	AVX, 06036D475MAT2A
11	1	D1	DIODE SCHOTTKY RF SER 15V, SOT-23	AVAGO, HSMS-2822-TR1G
12	1	J1	BGA Connector 40 × 10	SAMTEC, SEAM-40-02.0-S-10-2-A
13	6	J2, J5, J8, J13, J14, J15	HEADER, 3-Pin, 0.079 Single Row	SAMTEC, TMM-103-02-L-S
14	6	XJ2, XJ5, XJ8, XJ13, XJ14, XJ15	Shunt, .079" Center	SAMTEC, 2SN-BK-G
15	0	J10, OPT	Header, 2×7PIN, 0.079CC	MOLEX, 87831-1420
16	2	J4, J3	CON., SMA 50Ω EDGE-LANCH	E.F. JOHNSON, 142-0701-851
17	2	J12, J11	CON., SMA 50Ω Straight Mount	Connex., 132134
18	2	L4, L5	Inductor, 56nH, 0603	Murata, LQP18MN56NG02D
19	0	L7, L8	OPT	
20	2	L11, L9	Ferrite Bead, 1206	Murata, BLM31PG330SN1L
21	8	R1, C46, C47, R61, R62, R63, R65, R101	RES., CHIP, 0Ω, 0402	VISHAY, CRCW04020000Z0ED
22	1	RN1	RES., 2 ×4 Array, CHIP, 33Ω ,ISO	VISHAY, CRA06E08333R0JTA
23	12	R4, R5, R10, R36	RES., CHIP, 10k, 1/16W, 5%, 0402	VISHAY, CRCW040210K0JNED
24		R102–R109		
25	9	R8, R30, R47, R92, R95–R99	RES., CHIP, 100, 1/16W, 5%, 0402	VISHAY, CRCW0402100RJNED
26	6	R9, R11, R14, R72, R73, R74	RES., CHIP, 1k, 1/16W, 5%, 0402	VISHAY, CRCW04021K00JNED
27	1	R12	RES., CHIP, 31.6k, 1/16W, 1%, 0402	VISHAY, CRCW040231K6FKED
28	4	R26, R29, R39, R46	RES., CHIP, 33.2, 1/16W, 1%, 0402	VISHAY, CRCW040233R2FKED
29	2	R35, R52	RES., CHIP, 86.6, 1/16W, 1%, 0402	VISHAY, CRCW040286R6FKED
30	4	R37, R38, R53, R54	RES., CHIP, 86.6, 1/16W, 1%, 0603	VISHAY, CRCW060386R6FNEA
31	2	R40, R41	RES., CHIP, 49.9, 1/16W, 1%, 0402	VISHAY, CRCW040249R9FKED
32	8	R110–R117	RES., CHIP, 33k, 1/16W, 1%, 0402	VISHAY, CRCW040233K0FKED
33	3	TP1, TP6, TP7	Testpoint, Turret, .094" pbf	MILL-MAX, 2501-2-00-80-00-00-07-0
34	3	T5, T9, T11	Transformer, MABA-007159-000000	M/A-COM, MABA-007159-000000
35	2	T10, T8	Transformer, MABAES0060	M/A-COM, MABAES0060
36	1	U2	I.C. LT1763CS8-1.8, SO8	LINEAR, LT1763CS8-1.8#TRPBF
37	1	U3	I.C., Serial EEPROM TSSOP-8	MICROCHIP, 24LC32A-I/ST

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



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