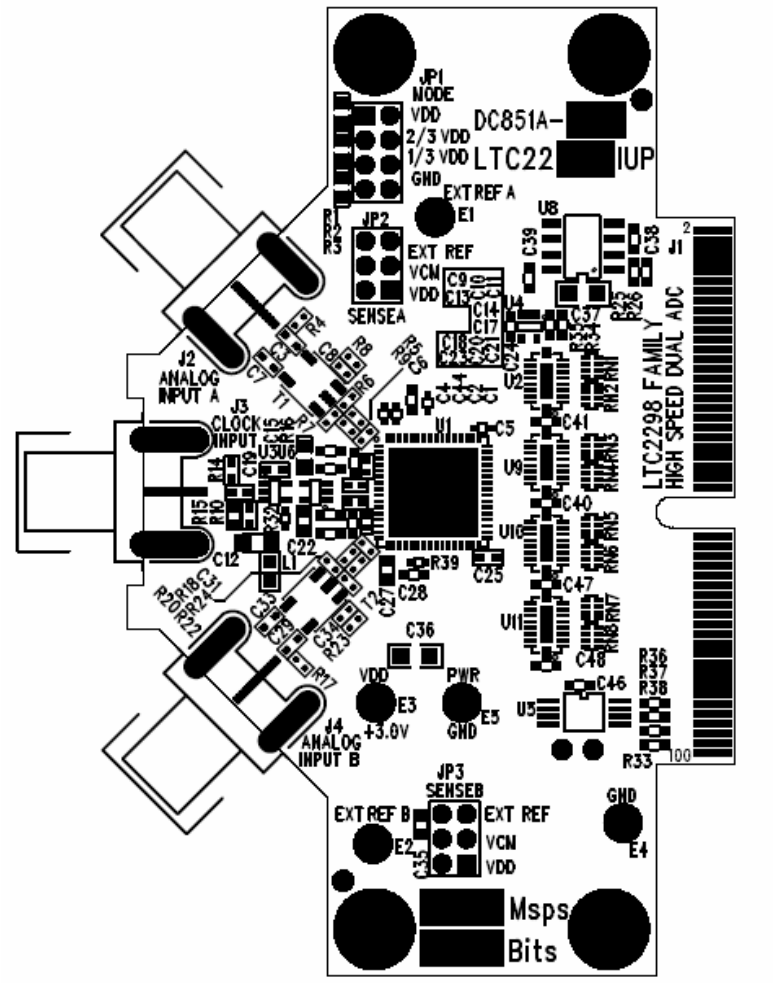
LTC2280, LTC2282, LTC2284, LTC2286, LTC2287, LTC2288 LTC2289, LTC2290, LTC2291, LTC2292, LTC2293, LTC2294, LTC2295, LTC2296, LTC2297, LTC2298 or LTC2299

DESCRIPTION

Demonstration circuit 851 supports a family of 10/12/14 BIT 10 to 105 MSPS ADCs. Each assembly features one of the following devices: LTC2280 thru LTC2299 high speed, high dynamic range ADCs.

The versions of 851 demo board are listed in Table 1. Depending on the required resolution, sample rate and input frequency, the DC851 is supplied with the appropriate A/D and with an optimized input circuit. The circuitry on the analog inputs is optimized for analog input frequencies below 70 MHz or from 70 MHz to 140MHz. For higher input frequencies, contact the factory for support.

Design files for this circuit board are available. Call the LTC factory.



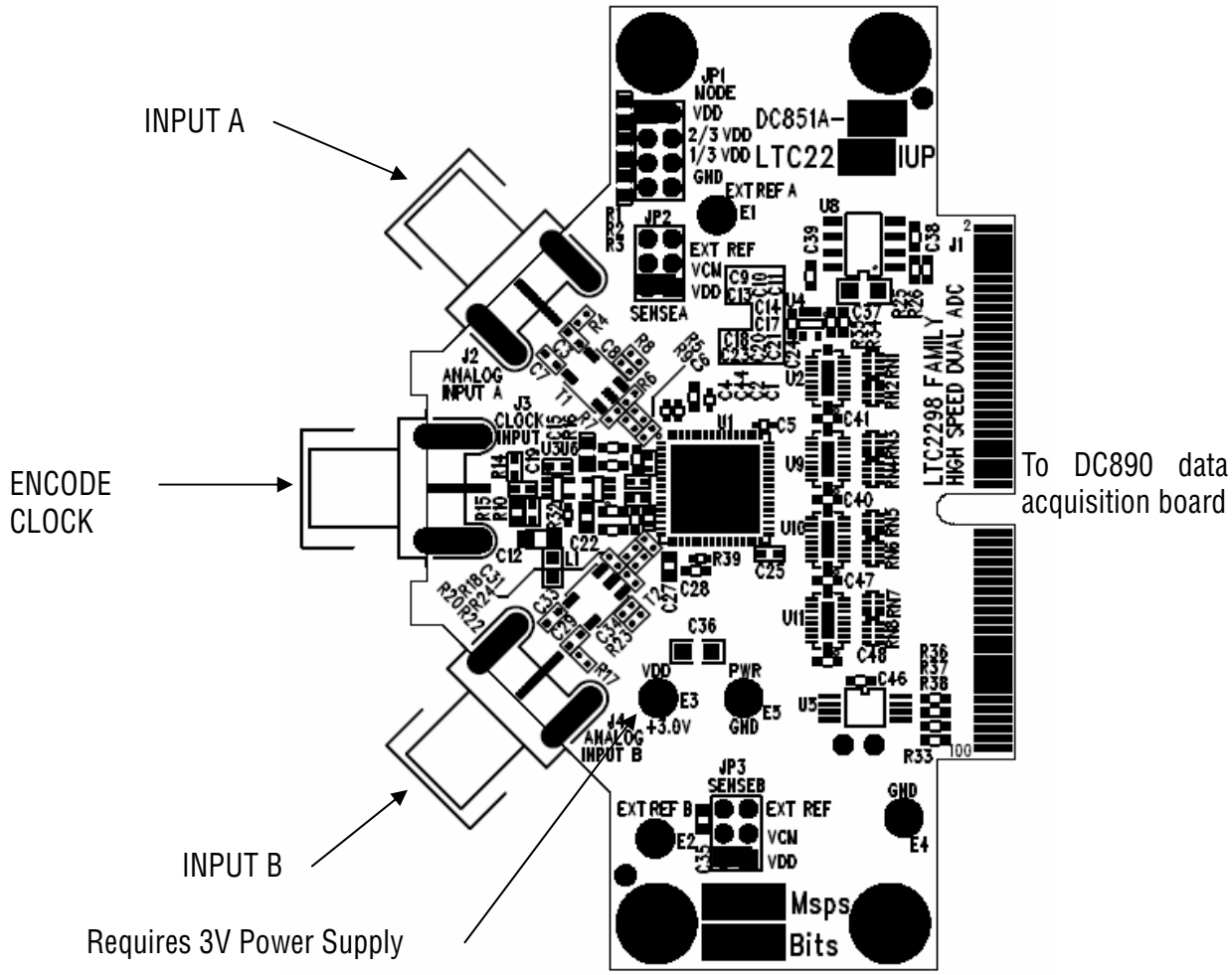


Figure 1. DC851 Setup

DC851 DEMONSTRATION CIRCUIT BOARD JUMPERS

The DC851 demonstration circuit board should have the following jumper settings as default: (as per figure 1)

JP1: Mode: Vdd. 2s complement, Clock duty stabilizer off (see data sheet for function of Mode pin.)

JP2: Sense A: Vdd, (2V P-P input range)

JP3: Sense B: Vdd, (2V P-P input range)

DC851A Variants

DC851 VARIANTS	ADC PART NUMBER	RESOLUTION*	MAXIMUM SAMPLE RATE	INPUT FREQUENCY
851A-A	LTC2299	14-Bit	80MSPS	1MHz - 70MHz
851A-B	LTC2298	14-Bit	65MSPS	1MHz - 70MHz
851A-C	LTC2297	14-Bit	40MSPS	1MHz -70MHz
851A-D	LTC2296	14-Bit	25MSPS	1MHz - 70MHz
851A-E	LTC2295	14-bit	10MSPS	1MHz - 70MHz
851A-F	LTC2299	14-Bit	80MSPS	70MHz -140MHz
851A-G	LTC2298	14-Bit	65MSPS	70MHz -140MHz
851A-H	LTC2294	12-Bit	80MSPS	1MHz - 70MHz
851A-I	LTC2293	12-Bit	65MSPS	1MHz - 70MHz
851A-J	LTC2292	12-Bit	40MSPS	1MHz - 70MHz
851A-K	LTC2291	12-Bit	25MSPS	1MHz - 70MHz
851A-L	LTC2290	12-bit	10MSPS	1MHz - 70MHz
851A-M	LTC2294	12-Bit	80MSPS	70MHz -140MHz
851A-N	LTC2293	12-bit	65MSPS	70MHz -140MHz
851A-O	LTC2289	10-Bit	80MSPS	1MHz - 70MHz
851A-P	LTC2288	10-Bit	65MSPS	1MHz - 70MHz
851A-Q	LTC2287	10-Bit	40MSPS	1MHz - 70MHz
851A-R	LTC2286	10-Bit	25MSPS	1MHz - 70MHz
851A-S	LTC2284	14-Bit	105MSPS	1MHz - 70MHz
851A-T	LTC2284	14-Bit	105MSPS	70MHz -140MHz
851A-U	LTC2282	12-Bit	105MSPS	1MHz - 70MHz
851A-V	LTC2282	12-Bit	150MSPS	70MHz -140MHz
851A-W	LTC2280	10-Bit	105MSPS	1MHz - 70MHz
851A-X	LTC2280	10-Bit	105MSPS	70MHz -140MHz

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Supply Voltage	Depending on sampling rate and the A/D converter provided, this supply must provide up to 200mA.	Optimized for 3.0V [2.7V ⇔3.6V min/max]
Analog input range	Depending on Sense Pin Voltage	$1V_{PP}$ to $2V_{PP}$
Logic Input Voltages	Minimum Logic High	2.4V
	Maximum Logic Low	0.8V
Logic Output Voltage (74VCX245 output buffer, V_{cc} = 2.5V)	Minimum Logic High @ -1.6mA	2.3V (33Ω Series terminations)
	Maximum Logic Low @ 1.6mA	0.7V (33Ω Series terminations)
Sampling Frequency (Convert Clock Frequency)	See Table 1	
Convert Clock Level	50 Ω Source Impedance, AC coupled or ground referenced (Convert Clock input is capacitor coupled on board and terminated with 50Ω.)	$2V_{P-P}$ ⇔$2.5V_{P-P}$ Sine Wave or Square wave (See Note 1)
Resolution	See Table 1	
Input frequency range	See Table 1	
SFDR	See Applicable Data Sheet	
SNR	See Applicable Data Sheet	

Note 1: For sample rates below 20MSPS a square wave must be used to achieve full performance.

QUICK START PROCEDURE

Demonstration circuit 851 is easy to set up to evaluate the performance of most members of the LTC22XX family of Dual A/D converters – LTC2280, LTC2282, LTC2284, LTC2286, LTC2287, LTC2288, LTC2289, LTC2290, LTC2291, LTC2292, LTC2293, LTC2294, LTC2295, LTC2296, LTC2297, LTC2298, or LTC2299.

Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

SETUP

If a DC890 FastDAACS Data Acquisition and Collection System was supplied with the DC851 demonstration circuit, follow the DC890 Quick Start Guide to install the required software and for connecting the DC890 to the DC851 and to a PC running Windows98, 2000 or XP.

APPLYING POWER AND SIGNALS TO THE DC851 DEMONSTRATION CIRCUIT BOARD:

If a DC890 is used to acquire data from the DC851, the DC890 should be powered up FIRST, before applying +3V across the pins marked "+3.0V" and "PWR GND" on the DC851. However, the output buffers on DC851 will not be enabled until power is applied to DC890. The DC851 demonstration circuit requires up to 200 mA depending on the sampling rate and the A/D converter supplied.

ENCODE CLOCK

NOTE: This is not a logic compatible input. It is terminated with 50 Ohms. Apply an encode clock to the SMA connector on the DC851 demonstration circuit board marked "J3 CLOCK INPUT". This input is connected to ground through a 50Ω resistor, and followed by a blocking capacitor. For the best noise performance, the CLOCK INPUT must be driven with a very low jitter source. When using a sinusoidal generator, the amplitude should be as large as possible, up to $3V_{P-P}$ or 13 dBm. Using band pass filters on the clock and the analog input will improve the noise performance by reducing the wideband noise power of the signals. 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 broad band noise. Low phase noise Agilent 8644B generators are used with TTE band pass filters for both the Clock input and the Analog input.

A square wave encode clock is recommended for sample rates lower than 20MSPS. This is because the lower slew rate of a sinusoidal encode clock translates to increased clock jitter and hence lower SNR.

The Encode Clock can be driven with a 2.5V CMOS Logic Level square wave if R14 is replaced with an acceptable load for the drive capability of the logic. Note that logic devices are generally not able to drive cable. A barrel is recommended for logic drive. If a cable is used, the cable carrying the clock signal must be terminated to maintain the signal integrity of the Encode Clock Source and the signal source must be able to drive the 0 to 2.5V square wave signal into 50Ω load.

ANALOG INPUT NETWORK

Apply the analog input signals of interest to the SMA connectors on the DC851 demonstration circuit board marked "ANALOG INPUT (A and B)". These inputs are capacitively coupled to ETC1-1-13 Balun transformers on high input frequency versions, or directly coupled through ETC1-1T Flux coupled transformers on low input frequency versions.

For optimal distortion and noise performance the RC network on the analog inputs are optimized for different analog input frequencies on the different versions of the DC851. For input frequencies below about 100 MHz, the circuit in Fig. 2 is recommended (this is installed on DC851 versions A, B, C, D, E, H, I, J, K, L, O, P, Q, R, S, U, W). For input frequencies above 100 MHz and below 250 MHz, the circuit in Fig. 3 is recommended (this is installed on versions F, G, M, N, T, V, X).

For input frequencies greater than 300 MHz, the circuit in Fig. 4 is recommended. For input frequencies greater than 250 MHz contact the factory for support.

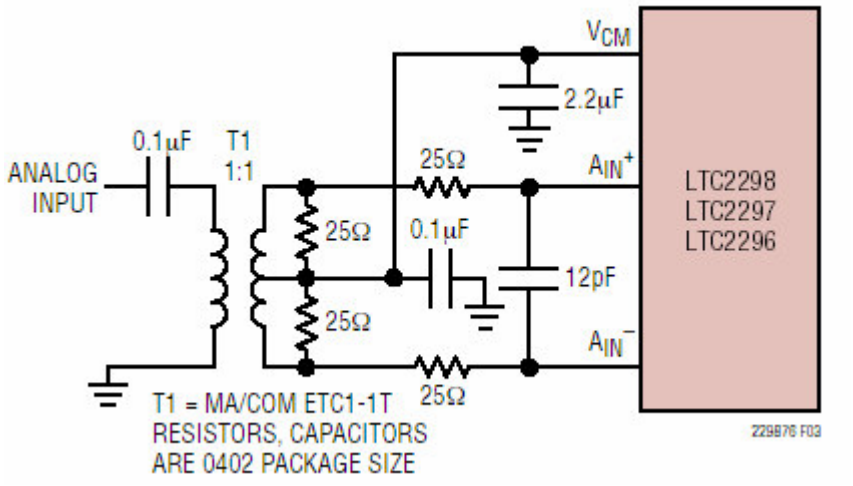


Figure 2. Analog Front End Circuit For 1MHz < A_{IN} < 70MHz (1 of 2)

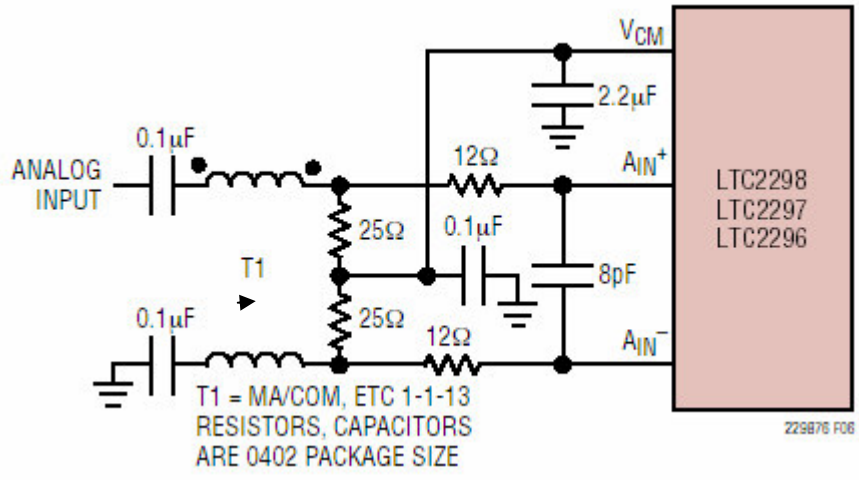


Figure 3. Analog Front End Circuit For 70MHz < A_{IN} < 170MHz (1 of 2)

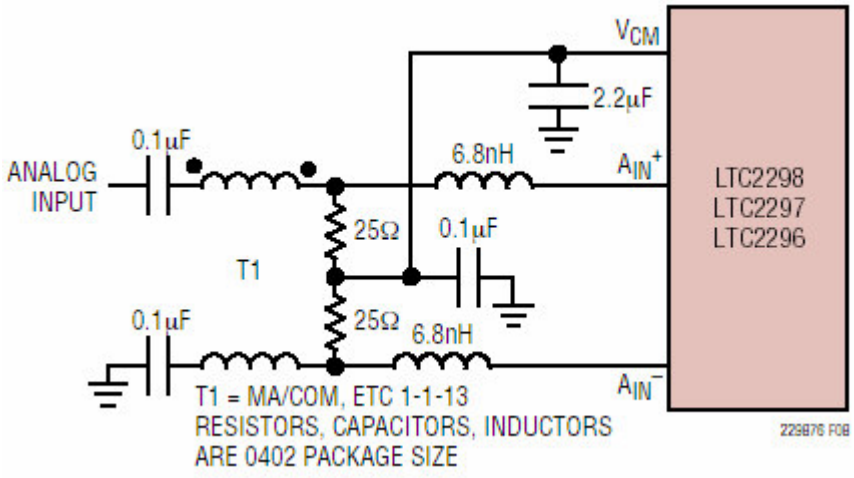


Figure 4. Analog Front End Circuit For A_{IN} < 300MHz

Note that relative aperture measurements require removal of these networks, or the results will simply show the relative phase through the RC network. The measure of relative phase further requires a resistive power divider, and matched cables, or the results will be misleading. Any relative phase measurements should be confirmed by reversing the signals to confirm that the relative delay is not due to the external network.

If relative phase measurements produce results of greater that a fractional psec, please consult the factory for assistance.

Channel to Channel Crosstalk on this demo board is better than -110 dB for input frequencies below 140 MHz.

DATA COLLECTION

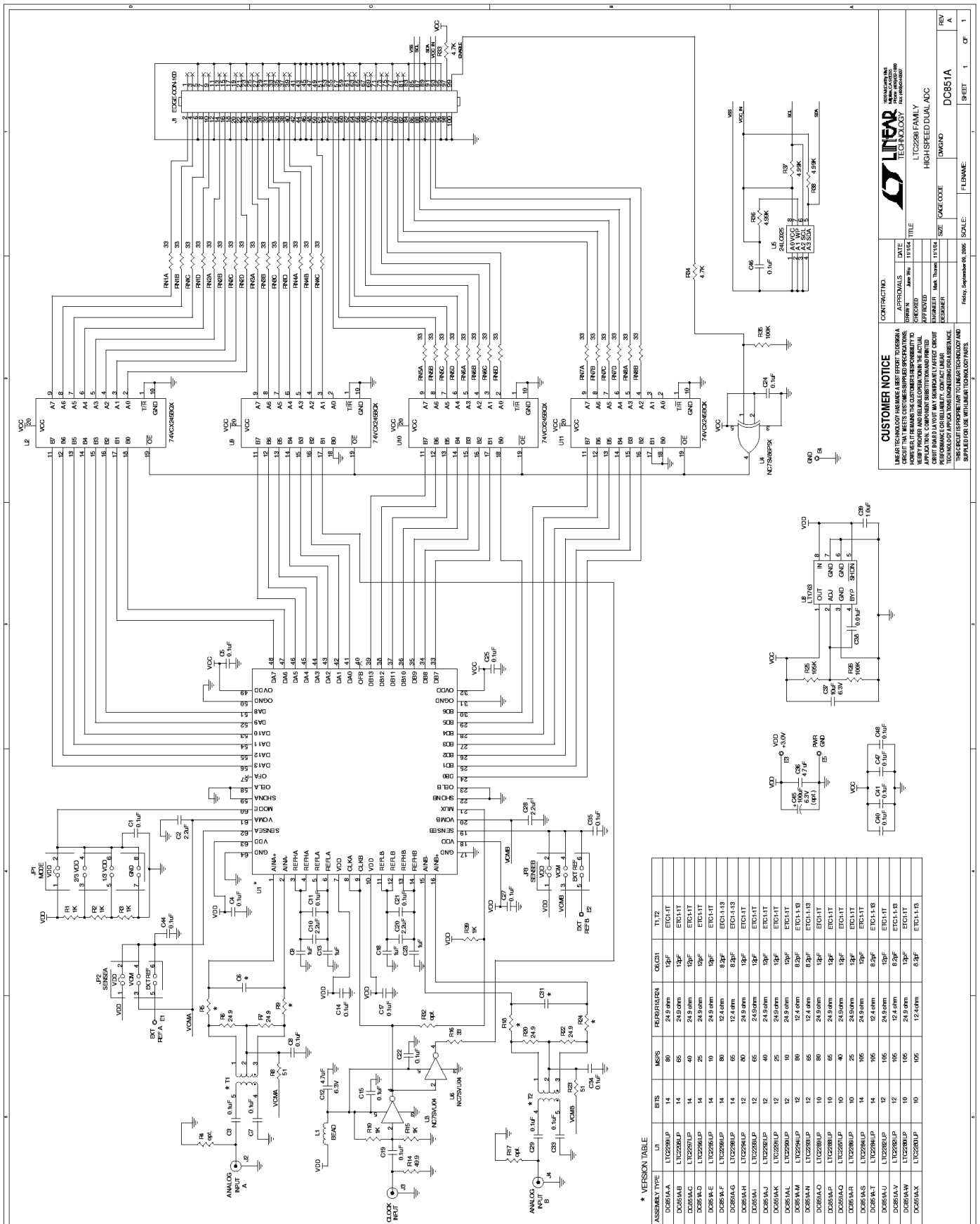
The conversion clock output and the parallel data for both ADC channels are available on J1. This connector is designed to mate with a Samtec model MEC8-150-02-L-D-EM2 receptacle. It is recommended that this receptacle be used if something other than a DC890 board is used to collect data.

DC890 QuickEval-II Data Acquisition Board uses the *PScope System Software* provided or downloaded from the Linear Technology website at http://www.linear.com/software/. If a DC890 was provided, follow the Quick Start Guide and the instructions below.

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.

Configure PScope for the appropriate variant of the DC851 demonstration circuit by selecting the correct A/D Converter as installed on the DC851. Under the "Configure" menu, go to "Device." Under the "Device" pull down menu, select device, LTC2280 through LTC2299. When evaluating 12 BIT parts, select the appropriate LTC22XX part in the Device List and PScope will automatically blank the last two LSBs when using a DC851 supplied with a 14 Bit part.

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. The two channel mode in Pscope provides a page for each channel, and a page showing the frequency domain plots of both channels. An additional window called "X-channel" displays relative phase and amplitude of the two channels. This can be used to gauge crosstalk, or validate relative aperture delay. Additional information and help for *PScope* is available in the DC890 Quick Start Guide and in the online help available within the *PScope* program itself.



* VERSION TABLE

ASSEMBLY TYPE	U5	BITS	MSPS	RS/RSP/RSP24	C6/C31	T1,T2
DC851A-A	LTC2298IUP	14	80	24.9 ohm	10pF	ETC1-1T
DC851A-B	LTC2268IUP	14	65	24.9 ohm	12pF	ETC1-1T
DC851A-C	LTC2267IUP	14	40	24.9 ohm	10pF	ETC1-1T
DC851A-D	LTC2266IUP	14	25	24.9 ohm	10pF	ETC1-1T
DC851A-E	LTC2265IUP	14	10	24.9 ohm	10pF	ETC1-1T
DC851A-F	LTC2299IUP	14	80	12.4 ohm	8.2pF	ETC1-1-13
DC851A-G	LTC2298IUP	14	65	12.4 ohm	8.2pF	ETC1-1-13
DC851A-H	LTC2294IUP	12	80	24.9 ohm	12pF	ETC1-1T
DC851A-I	LTC2293IUP	12	65	24.9 ohm	10pF	ETC1-1T
DC851A-J	LTC2292IUP	12	40	24.9 ohm	10pF	ETC1-1T
DC851A-K	LTC2291IUP	12	25	24.9 ohm	10pF	ETC1-1T
DC851A-L	LTC2290IUP	12	10	24.9 ohm	10pF	ETC1-1T
DC851A-M	LTC2289IUP	12	80	12.4 ohm	8.2pF	ETC1-1-13
DC851A-N	LTC2288IUP	12	65	12.4 ohm	8.2pF	ETC1-1-13
DC851A-O	LTC2286IUP	10	80	24.9 ohm	12pF	ETC1-1T
DC851A-P	LTC2285IUP	10	65	24.9 ohm	12pF	ETC1-1T
DC851A-Q	LTC2284IUP	10	40	24.9 ohm	10pF	ETC1-1T
DC851A-R	LTC2283IUP	10	25	24.9 ohm	10pF	ETC1-1T
DC851A-S	LTC2296IUP	14	105	24.9 ohm	10pF	ETC1-1T
DC851A-T	LTC2295IUP	14	105	12.4 ohm	8.2pF	ETC1-1-13
DC851A-U	LTC2292IUP	12	105	24.9 ohm	10pF	ETC1-1T
DC851A-V	LTC2288IUP	12	105	12.4 ohm	8.2pF	ETC1-1-13
DC851A-W	LTC2287IUP	10	105	24.9 ohm	10pF	ETC1-1T
DC851A-X	LTC2286IUP	10	105	12.4 ohm	8.2pF	ETC1-1-13

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