National Semiconductor

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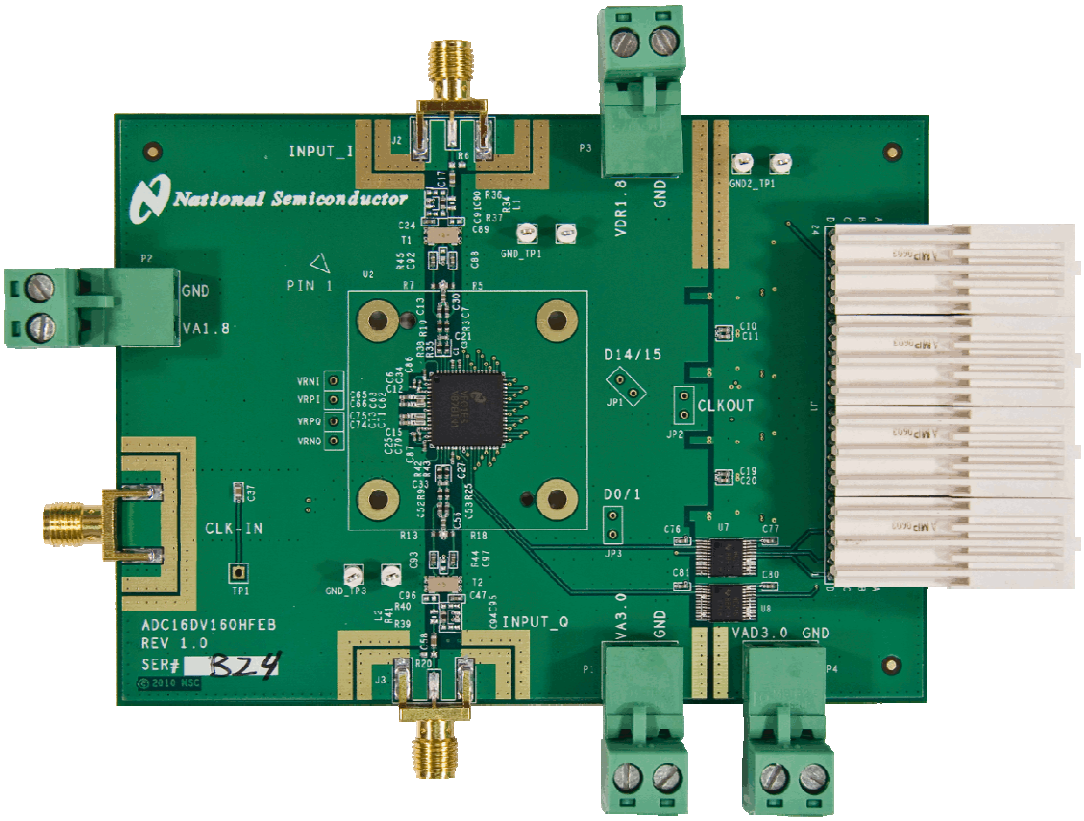
ADC16DV160HFEB

Evaluation Board User's Guide

ADC16DV160 Dual 16-Bit, 160 MSPS A/D Converter



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1.0 Introduction

This Evaluation Board may be used to evaluate the ADC16DV160. The ADC is a dual 16 bit analog to digital converters that provides data at rates of up to 160 MHz.

The evaluation board is designed to be used with the WaveVision5™ Data Capture Board which is connected to a personal computer through a USB port and running WaveVision5™ software, operating under Microsoft Windows. The software can perform an FFT on the captured data upon command and, in addition to a frequency domain plot, shows dynamic performance in the form of SNR, SINAD, THD SFDR and ENOB. The latest WaveVision software is available through the National Semiconductor website: http://www.national.com/analog/adc/wavevision5

2.0 Board Assembly

The ADC16DV160 Evaluation Board comes pre-assembled. Refer to the Bill of Materials in *Section 8* for a description of components, to *Figure 1* for major component placement and to *Section 6* for the Evaluation Board schematic.

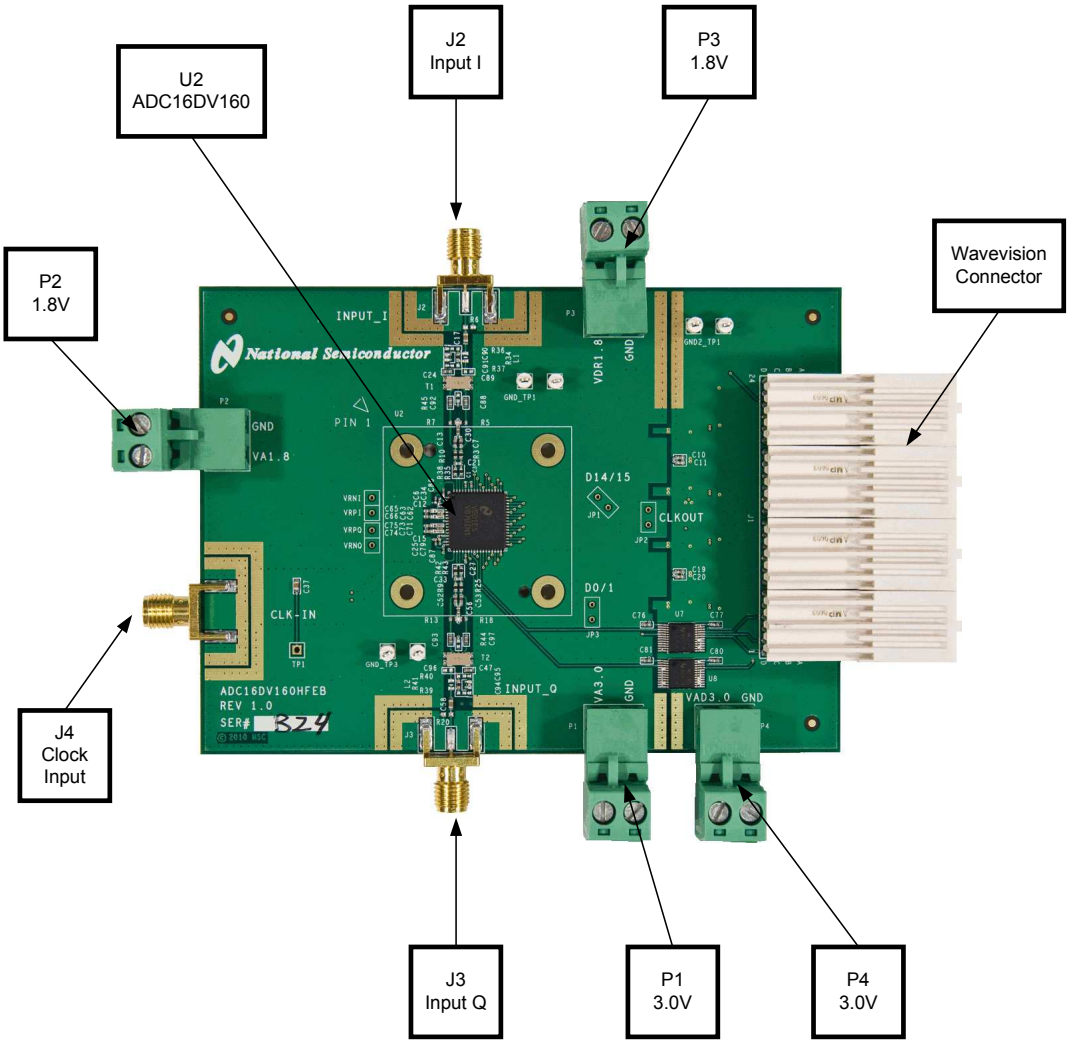


Figure 1. Major Component Locations

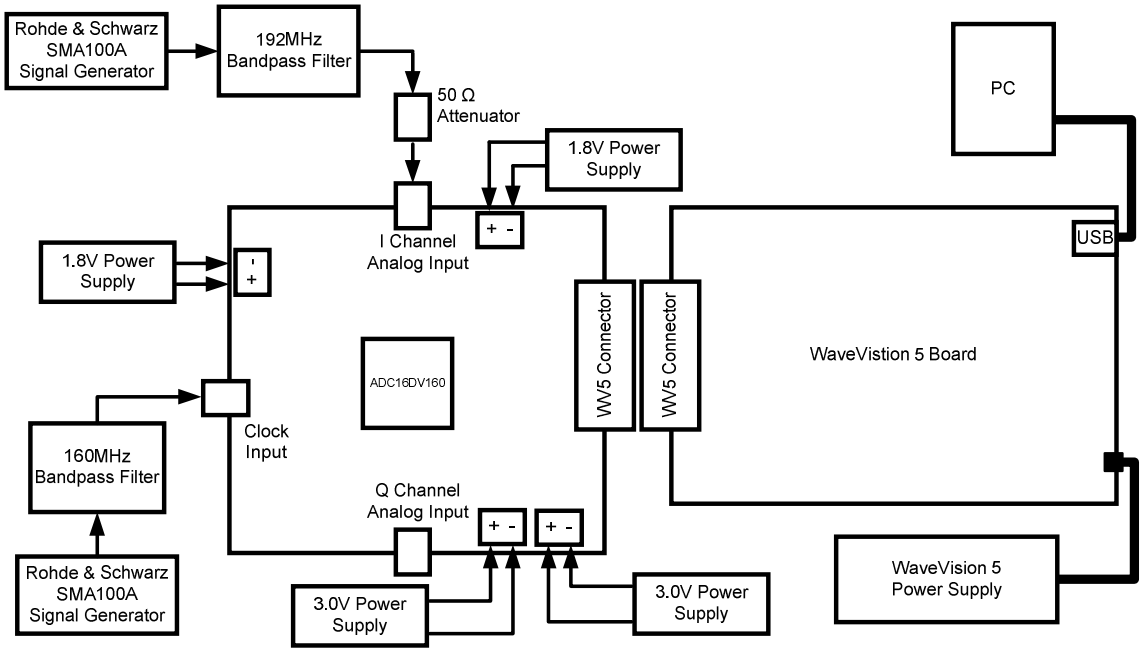


Figure 2: Test Set Up

3.0 Quick Start

Refer to *Figure 1* for locations of jumpers, test points and major components. Refer to *Figure 2* for the test set up.

The latest WaveVision software is available through the National Semiconductor website: http://www.national.com/analog/adc/wavevision5.

If a software CD is included with the evaluation board kit, then use the provided software and instructions to install WaveVision and ensure compatibility with this evaluation board.

1. Apply power to the WaveVision5™ board and connect it to the computer using a USB cable. See the WaveVision5™ User Guide for operation of that board. Connect the evaluation board to the WaveVision5™ Data Capture Board. **NOTE: power to the WaveVision5 Data Capture Board should be applied before power to the ADC16DV160 Evaluation Board to insure that the FPGA on the WaveVision5 Data Capture Board is not damaged.**
2. Connect a clean +3.0V power supply to Power Connectors P1 and P4. Connect a clean +1.8V power supply to Power Connectors P2 and P3.
3. Connect a 160 MHz signal from a 50-Ohm source to connector J4 for the input Clock. Be sure to use a bandpass filter before the Evaluation Board. Set the amplitude to 18 dBm.
4. Connect a signal from a 50-Ohm source to connector J2 (I Channel) or J3 (Q-Channel). Be sure to use a bandpass filter before the Evaluation Board. For best results, also attach a 3dB 50 ohm attenuator right at the input SMA of the eval board. This will help match the impedance between the cables/signal source to the eval board input.
5. Adjust the input signal amplitude as needed to ensure that the signal does not over-range by examinining a histogram of the output data with the WaveVision™ software.

4.0 Functional Description

The ADC16DV160 Evaluation Board schematic is shown in *Section 6.* A list of test points and jumper settings can be found in the Appendix.

4.1 Analog Input

To obtain the best distortion results the analog input network must be optimized for the signal frequency being applied. The ADC16DV160 Evaluation Board comes configured for input frequencies greater than 70MHz. To accurately evaluate the dynamic performance of this converter, the input test signal will have to be passed through a high-quality bandpass filter.

4.2 ADC reference circuitry

This Evaluation Board is configured to use the internal reference.

4.3 ADC clock circuit

Care must be taken to provide a high quality low jitter clock source. The board is configured to accept a single ended sinusoidal. It converts the sine wave to a differential signal through transformer T4. Refer to the schematic for more detail.

4.4 Power Supply Connections

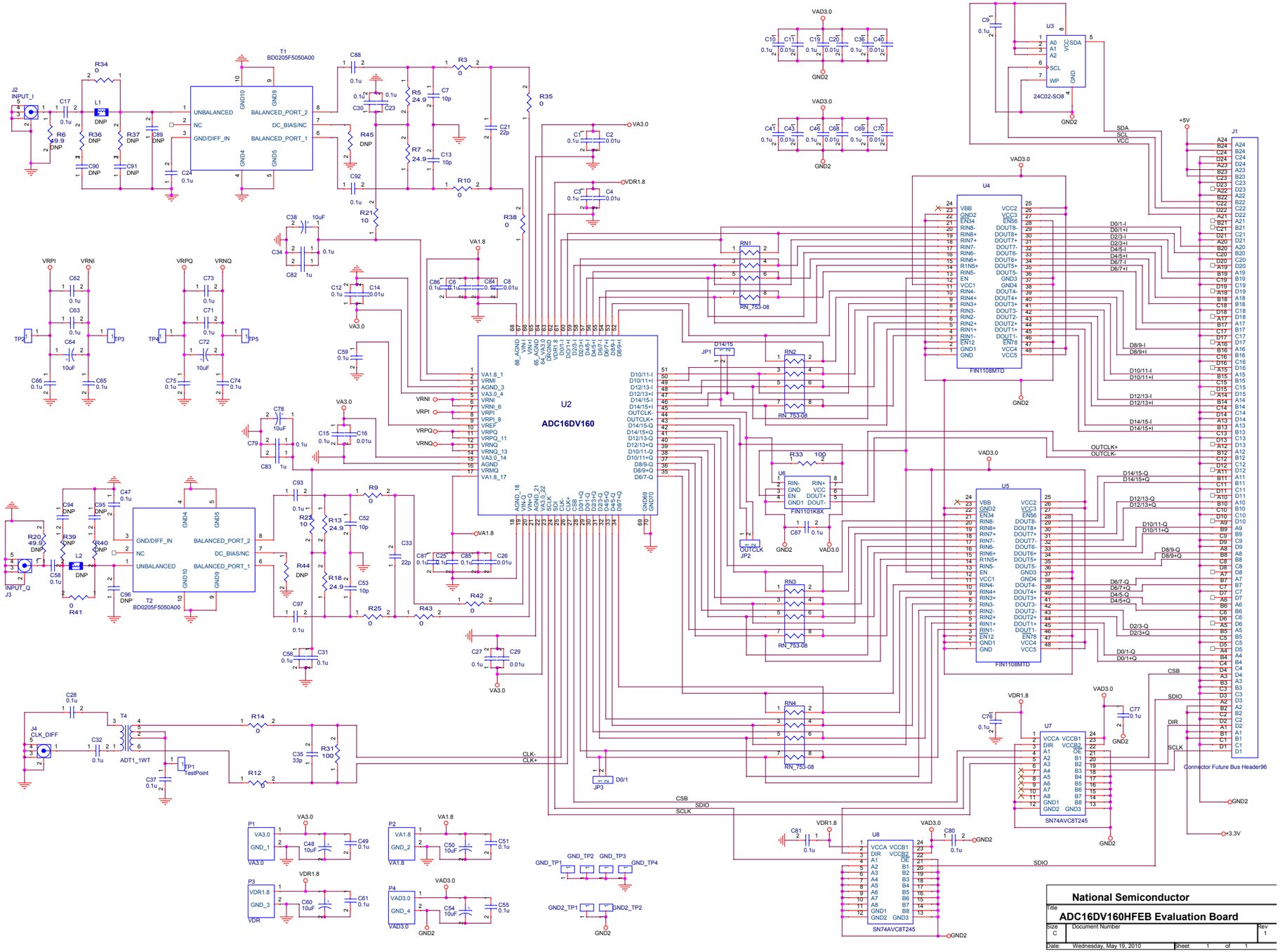
Power is applied to the board through power connectors P1 – P4. Care must be taken to observe the correct polarity.

5.0 Installing the ADC16DV160 Evaluation Board

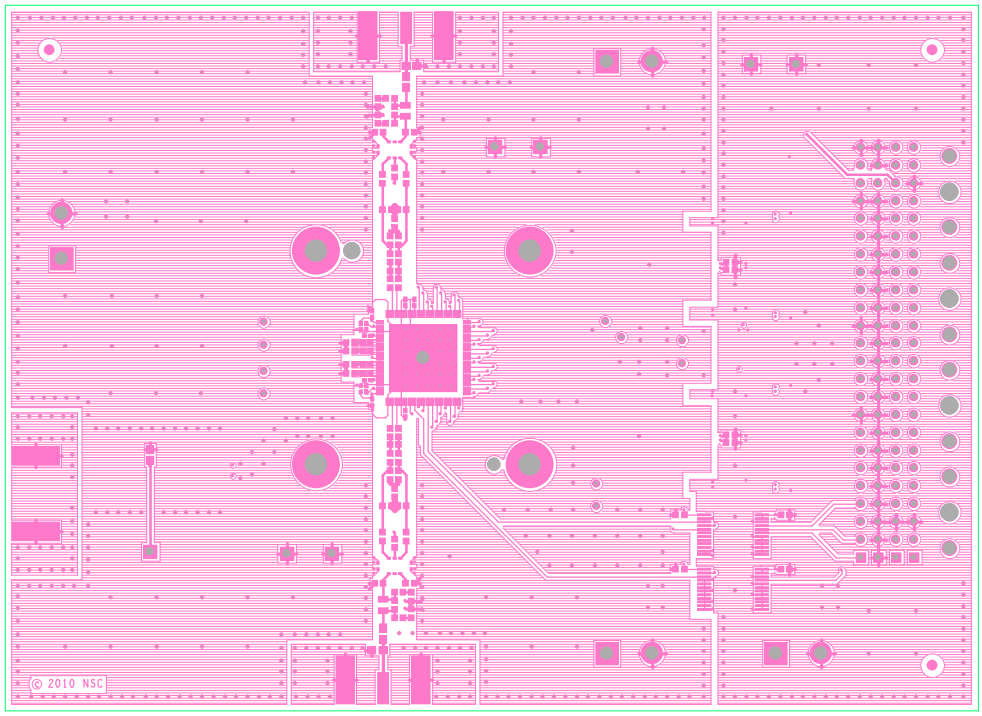
The evaluation board requires a dual power supplies as described in *Section 4.4*. **NOTE: power to the WaveVision5 Data Capture Board should be applied before power to the ADC16DV160 Evaluation Board to insure that the FPGA on the WaveVision5 Data Capture Board is not damaged.** A low noise sinusoidal signal source should be connected to the Clock Input SMA connector J4. An appropriate signal source should be connected to the Signal Input SMA connector J2. When evaluating dynamic performance, an appropriate signal generator (such as R&S SMA-100A) with 50 Ohm source impedance should be connected to the Analog Input connector through an appropriate bandpass filter as even the best signal generator available can not produce a signal pure enough to evaluate the dynamic performance of an ADC.

If this board is used in conjunction with the the WaveVision5™ Data Capture Board and WaveVision5™ software, a USB cable must be connected between the Data Capture Board and the host. See the WaveVision5™ Data Capture Board manual for details.

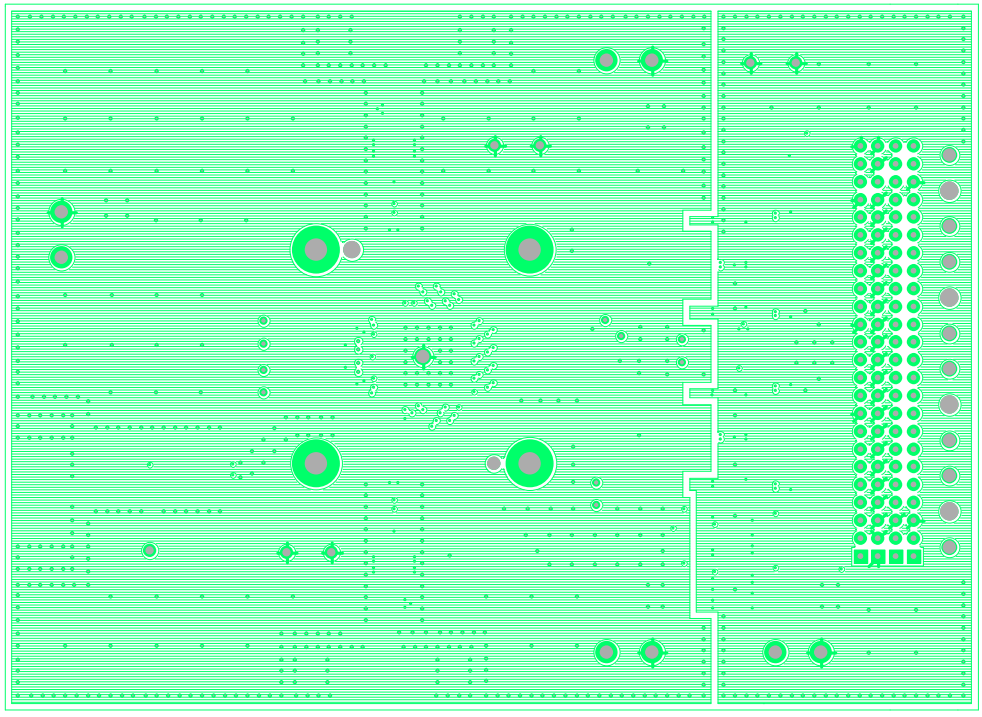
6.0 Hardware Schematic



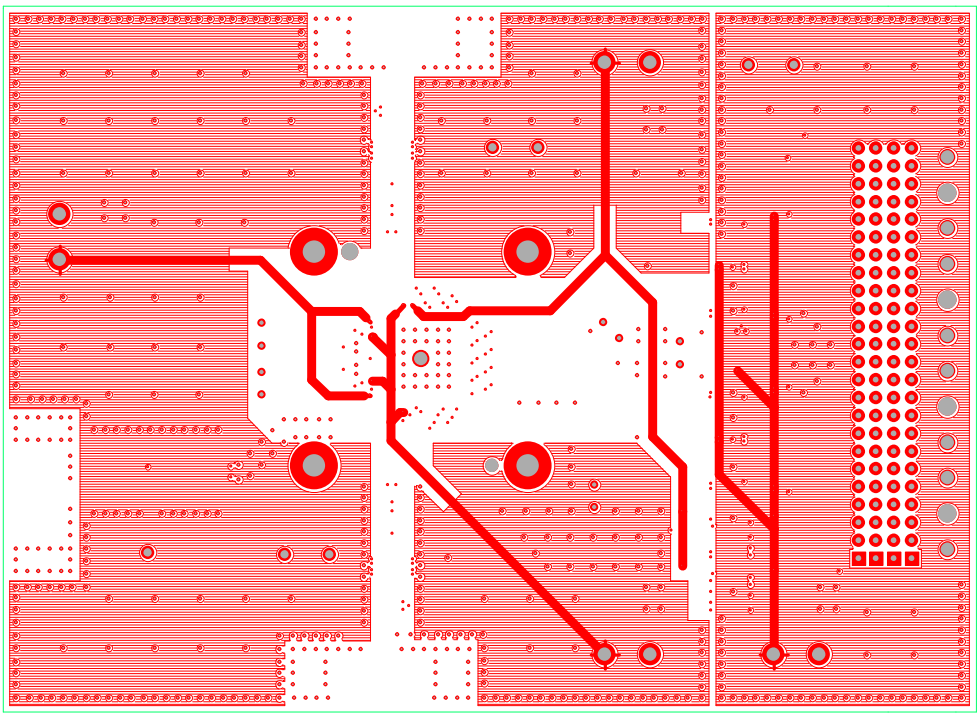
7.0 Evaluation Board Layout



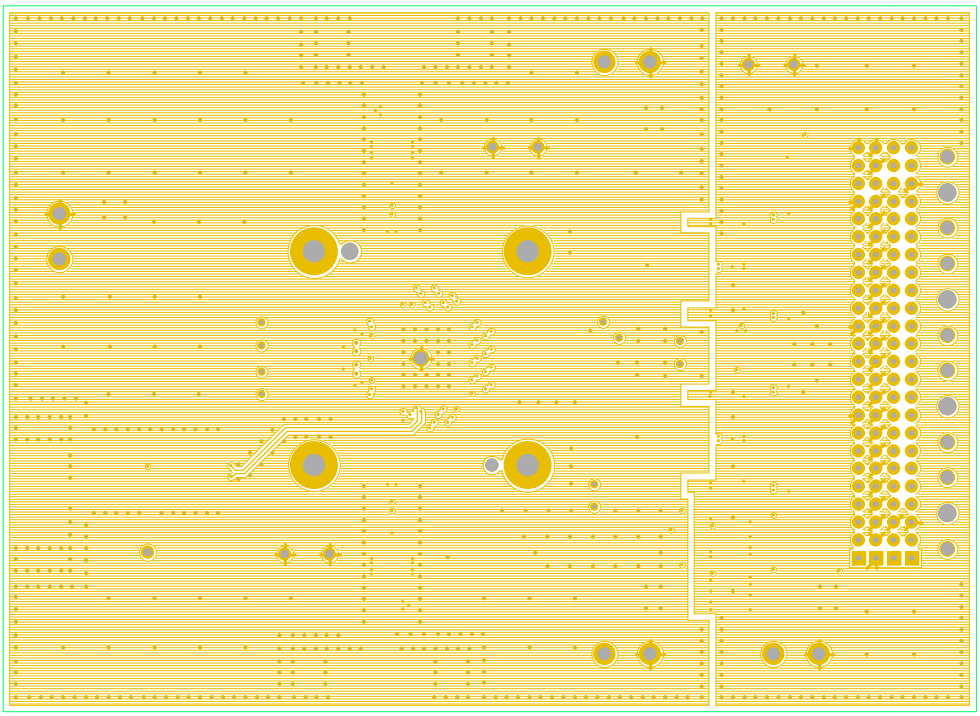
Layer 1: Component Side



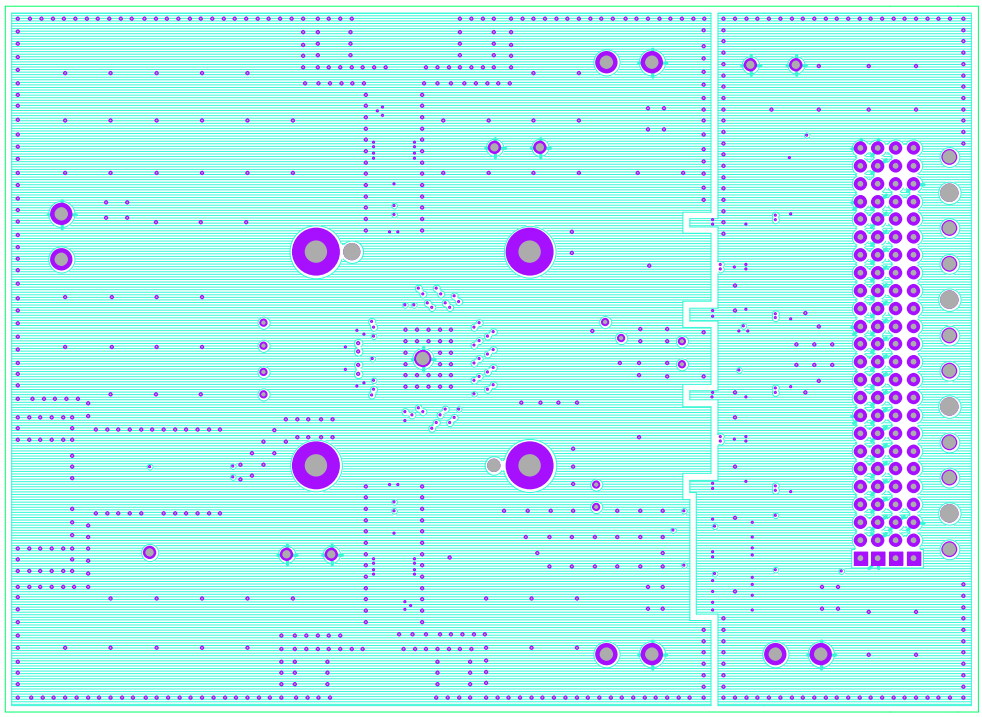
Layer 2: Ground



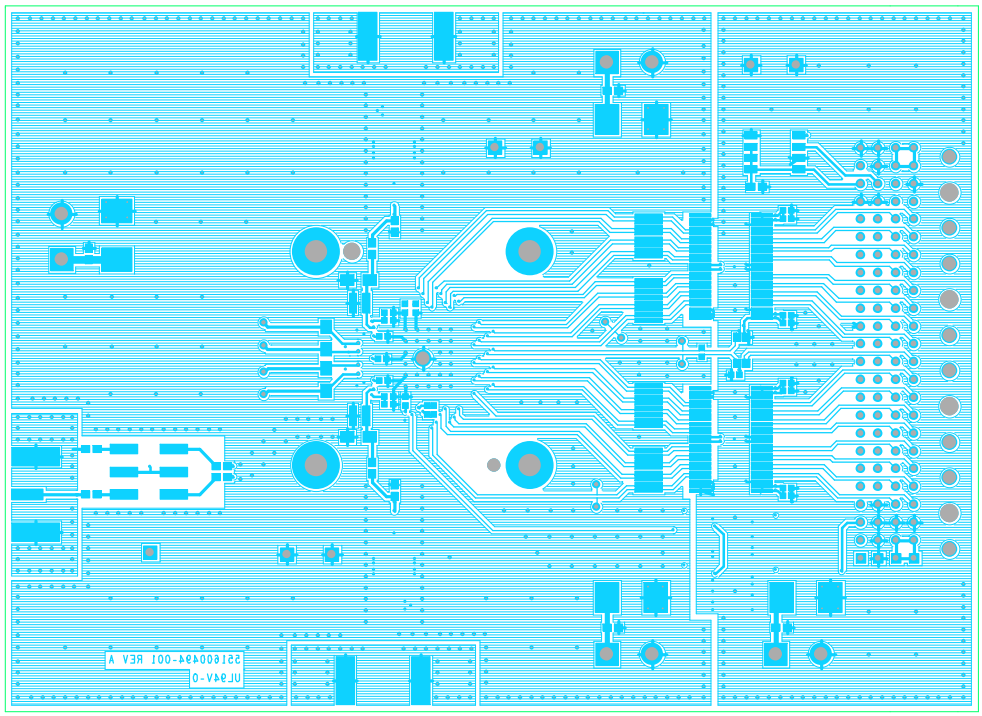
Layer 3: Power



Layer 4: Ground, Clock



Layer 5: Ground



Layer 6: Circuit Side

8.0 Evaluation Board Bill of Materials

Item	Quantity		Reference	Part	Manufacturer	Manufacturer P/N
1	11		C1,C3,C6,C12,C15,C25,C27,	0.1u	Murata	GRM033R60J104KE19D
			C34,C79,C86,C87			
2	13		C2,C4,C8,C11,C14,C16,C20,	0.01u	Murata	GRM155R71H103KA88D
			C26,C29,C40,C43,C68,C70			
3	4		C7,C13,C52,C53	10p	Murata	GRM1555C1H100JZ01D
4	12		C9,C17,C23,C28,C31,C32,	0.1u	Murata	GRM188R71C104KA01D
			C37,C49,C51,C55,C58,C61			
5	30		C10,C19,C24,C30,C36,C41,	0.1u	Murata	GRM155R61A104KA01D
			C46,C47,C56,C59,C62,C63,			
			C65,C66,C67,C69,C71,C73,			
			C74,C75,C76,C77,C80,C81,			
			C84,C85,C88,C92,C93,C97			
6	2		C21,C33	22p	Murata	GRM1555C1H220JZ01D
7	1		C35	33p	Murata	GRM1555C1H330JZ01D
8	4		C38,C64,C72,C78	10uF	Nichicon	F931A106MAA
9	4		C48,C50,C54,C60	10uF	AVX	TAJC106K020R
10	2		C82,C83	1u	Panasonic	ECY-29RA105KV
13	6		GND_TP1,GND_TP2,GND_TP3,	TestPoint	Keystone	5002
			GND_TP4,GND2_TP1,			
			GND2_TP2			
17	1	NSC	J1	Connector Future Bus Header96	Tyco Electronics	5223514-3
18	1		J2	INPUT_I	Johnson	142-0701-851
19	1		J3	INPUT_Q	Johnson	142-0701-851
20	1		J4	CLK_DIFF	Johnson	142-0701-851
22	1		P1	VA3.0	Phoenix Contacts	1759017
23	1		P2	VA1.8	Phoenix Contacts	1759017
24	1		P3	VDR	Phoenix Contacts	1759017
25	1		P4	VAD3.0	Phoenix Contacts	1759017
26	4		RN1,RN2,RN3,RN4	RN_753-08	CTS Resistor	753083101GTR
27	10		R3,R9,R10,R25,R34,R35,	0	Yageo	RC0402JR-070RL
			R38,R41,R42,R43			
28	4		R5,R7,R13,R18	24.9	Panasonic - ECG	ERJ-2RKF24R9X
30	2		R12,R14	0	Yageo	RC0603JR-070RL
31	2		R21,R22	10	Panasonic - ECG	ERJ-3EKF10R0V
32	2		R31,R33	100	Panasonic - ECG	ERJ-2RKF1000X
37	2	NSC	T1,T2	BD0205F5050A00	Anaren	BD0205F5050A00
38	1		T4	ADT1_1WT	Mini-Circuits	ADT1-1WT+
39	1	NSC	U2	ADC16DV160	National Semiconductor	ADC16DV160
40	1		U3	24C02-SO8	Atmel	AT24HC02BN-SH-B
41	2		U4,U5	FIN1108MTD	Fairchild	FIN1108MTD
42	1		U6	FIN1101K8X	Fairchild	FIN1101K8X
43	2		U7,U8	SN74AVC8T245	Texas Instuments	SN74AVC8T245DGVR

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