

Evaluation Board User's Guide

ADC16V130 16-Bit, 130 MSPS A/D Converter

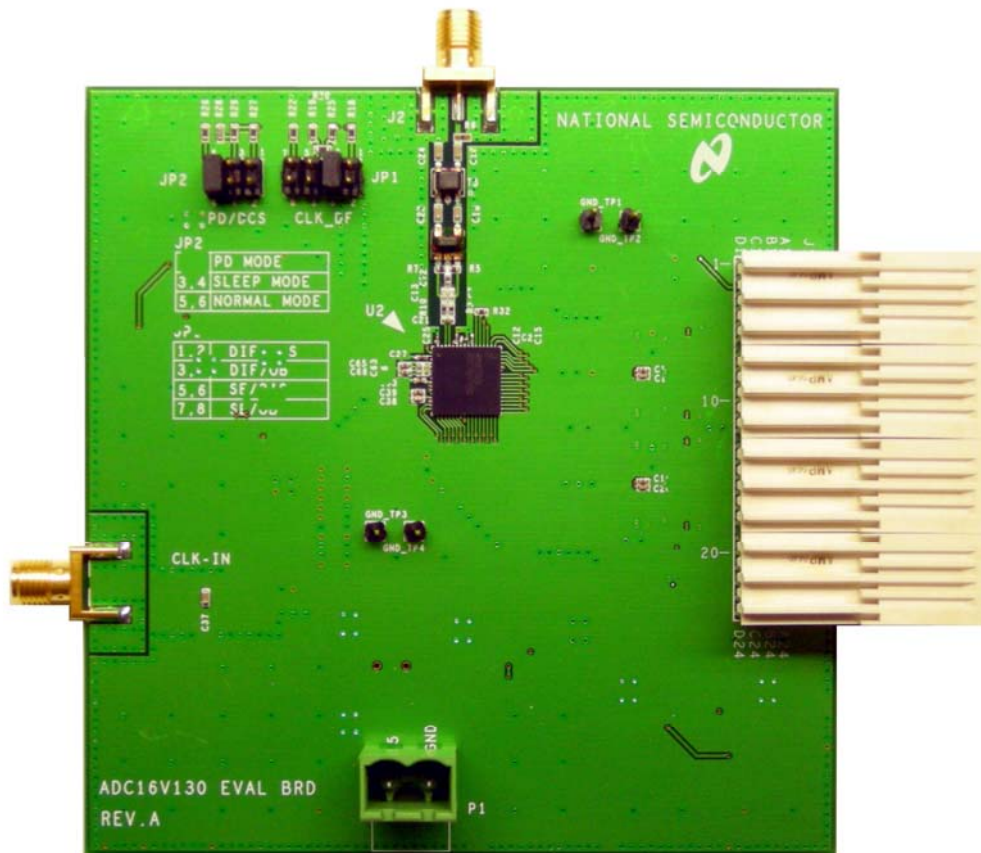


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1.0 Introduction

This Evaluation Board may be used to evaluate the ADC16V130. The ADC is a 16 bit analog to digital converters that provides data at rates of up to 130 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 ADC16V130 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.

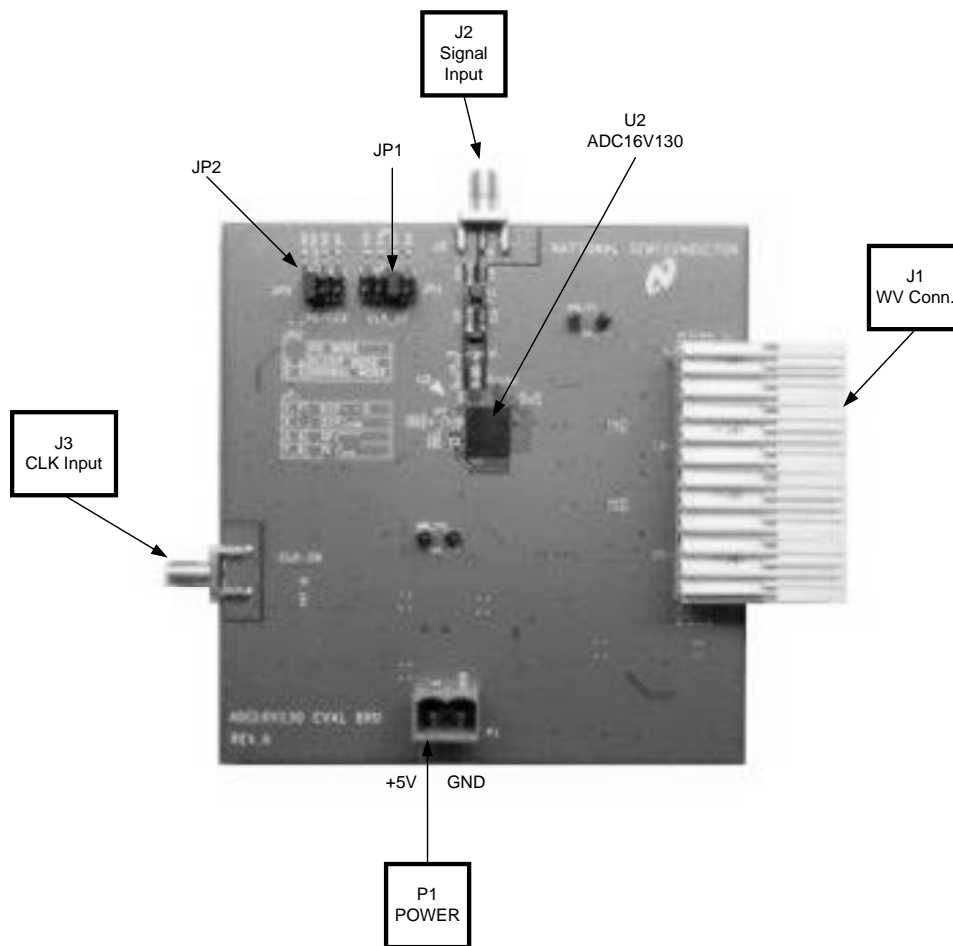


Figure 1. Major Component and Jumper Locations

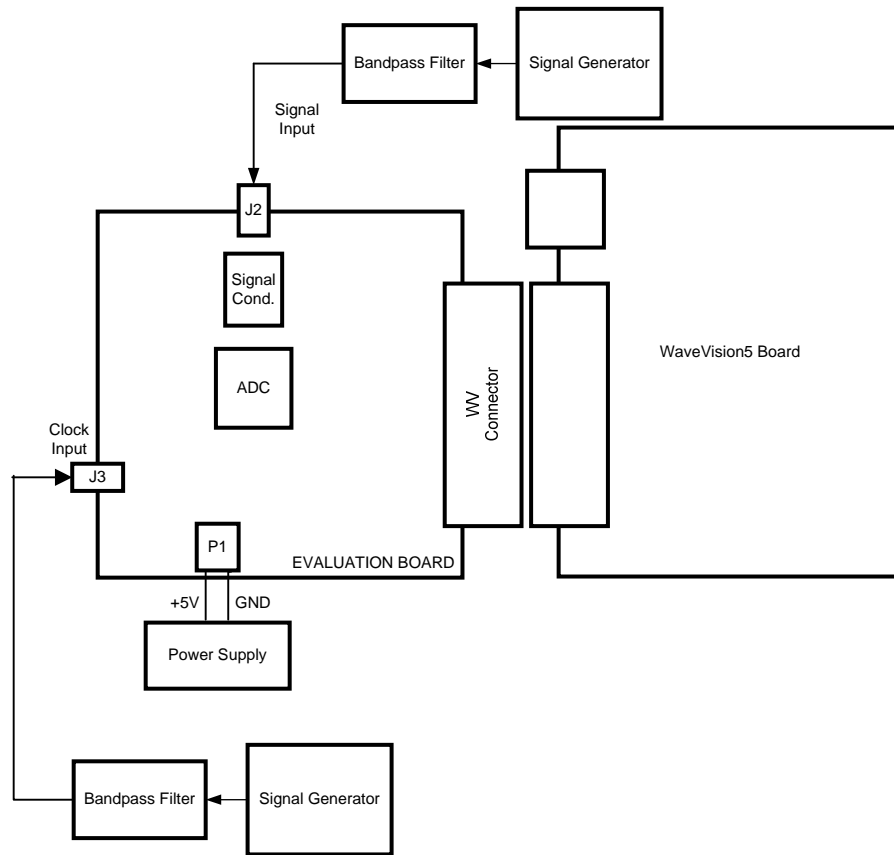


Figure 2: Test Set Up

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>

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 ADC16V130 Evaluation Board to insure that the FPGA on the WaveVision5 Data Capture Board is not damaged.**
2. Connect a clean +5V power supply to pin 1 of Power Connector P1. Pin 2 is ground.
3. Connect a 130 MHz signal from a 50-Ohm source to connector J3 for the input Clock. Be sure to use a bandpass filter before the Evaluation Board. Set the amplitude to 16 dBm.

4. Connect a signal from a 50-Ohm source to connector J2. Be sure to use a bandpass filter before the Evaluation Board.
5. Adjust the input signal amplitude as needed to ensure that the signal does not over-range by examining a histogram of the output data with the WaveVision™ software.

4.0 Functional Description

The ADC16V130 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 ADC16V130 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 to this board is supplied through power connector P1. The only supply needed is +5V at pin 1 plus ground at pin 2.

Voltage and current requirements for the ADC16V130 Evaluation Board are:

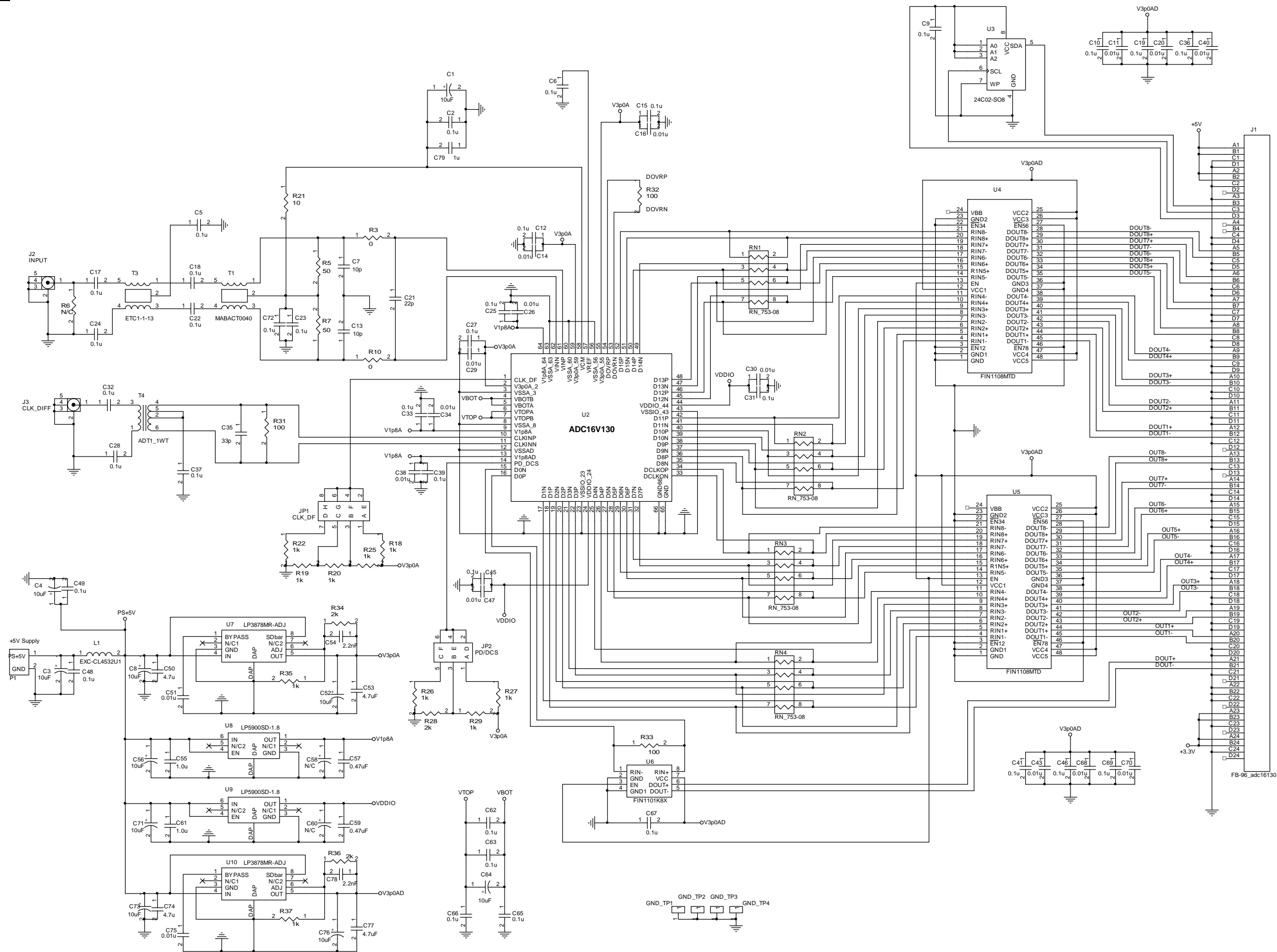
- +5.0V at 500 mA max

5.0 Installing the ADC16V130 Evaluation Board

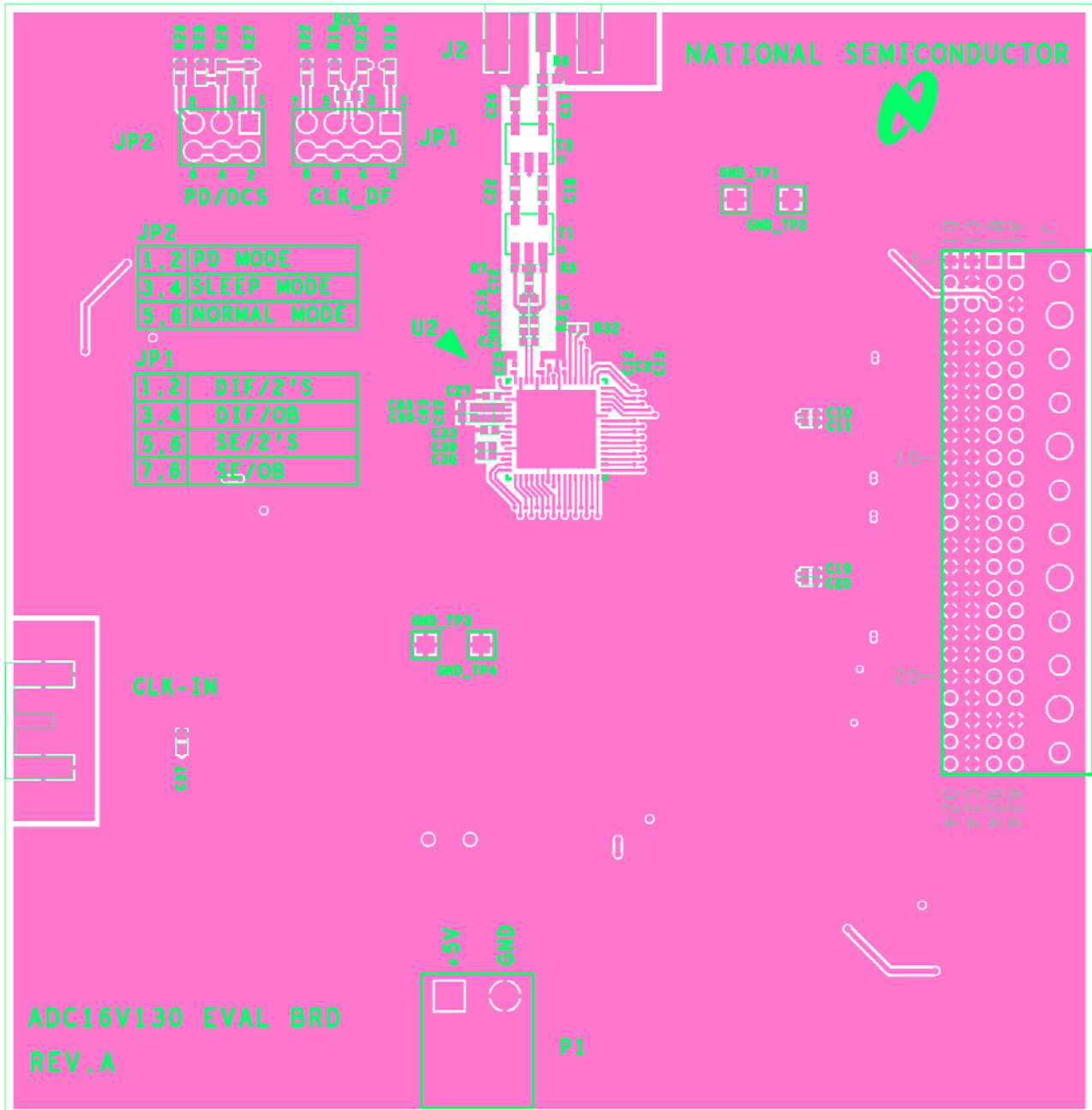
The evaluation board requires a single power supply as described in *Section 4.6*. **NOTE: power to the WaveVision5 Data Capture Board should be applied before power to the ADC16V130 Evaluation Board to insure that the FPGA on the WaveVision5 Data Capture Board is not damaged.** An low noise sinusoidal signal source should be connected to the Clock Input SMA connector J1. An appropriate signal source should be connected to the Signal Input SMA connector J2. When evaluating dynamic performance, an appropriate signal generator (such as the HP8644B or the 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.

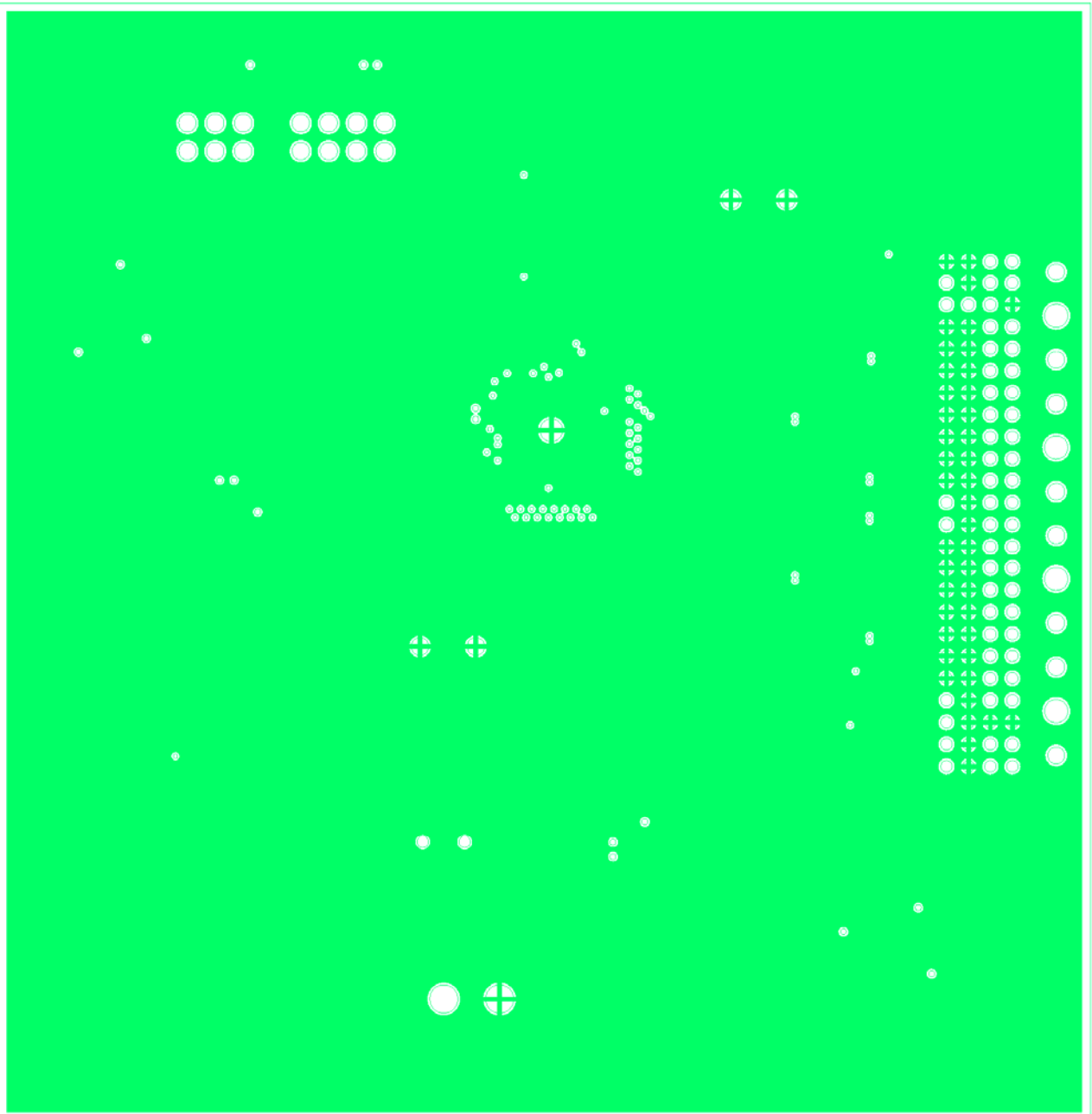
6.0 Hardware Schematic



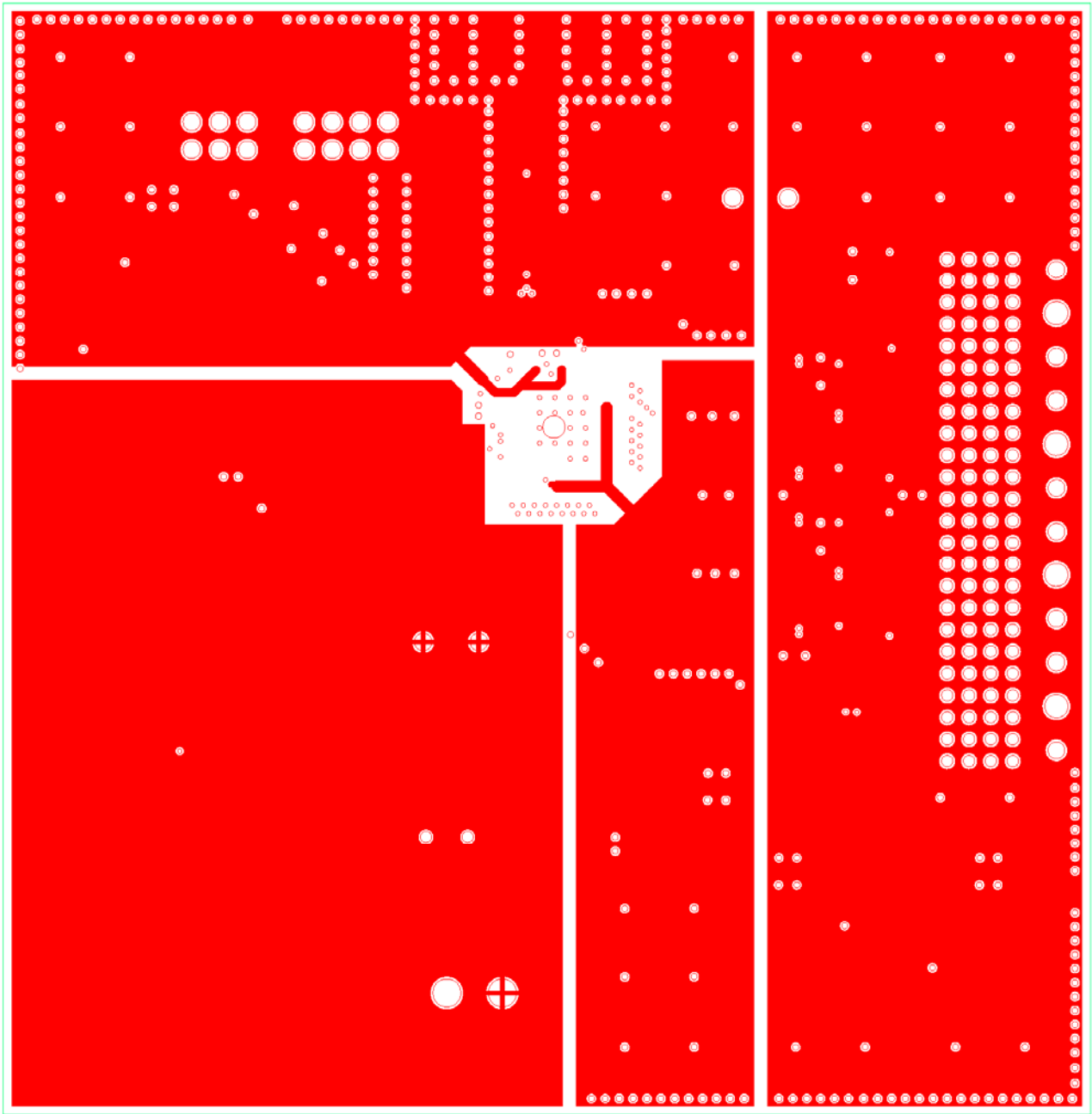
7.0 Evaluation Board Layout



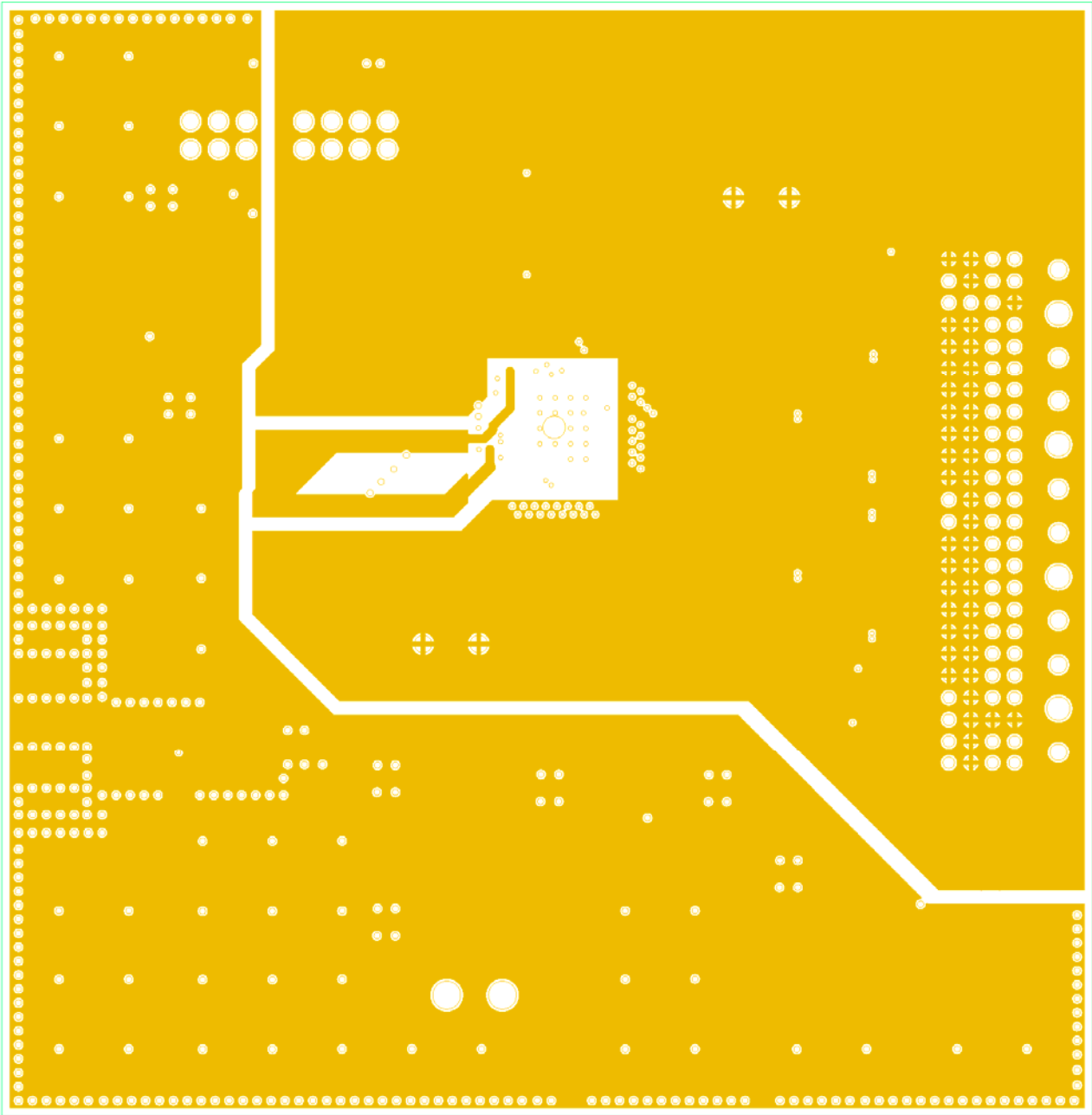
Layer 1: Component Side



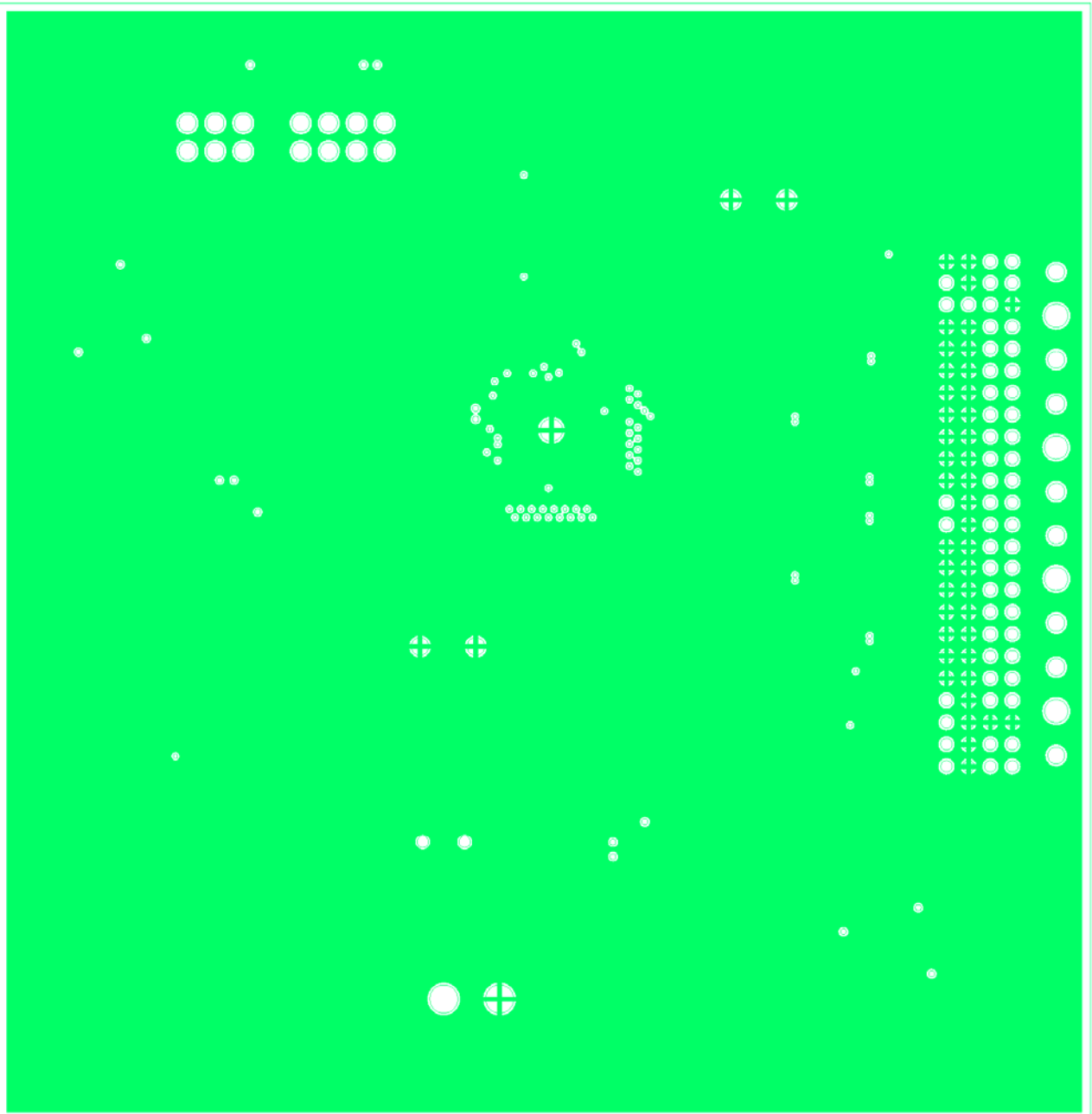
Layer 2: Ground



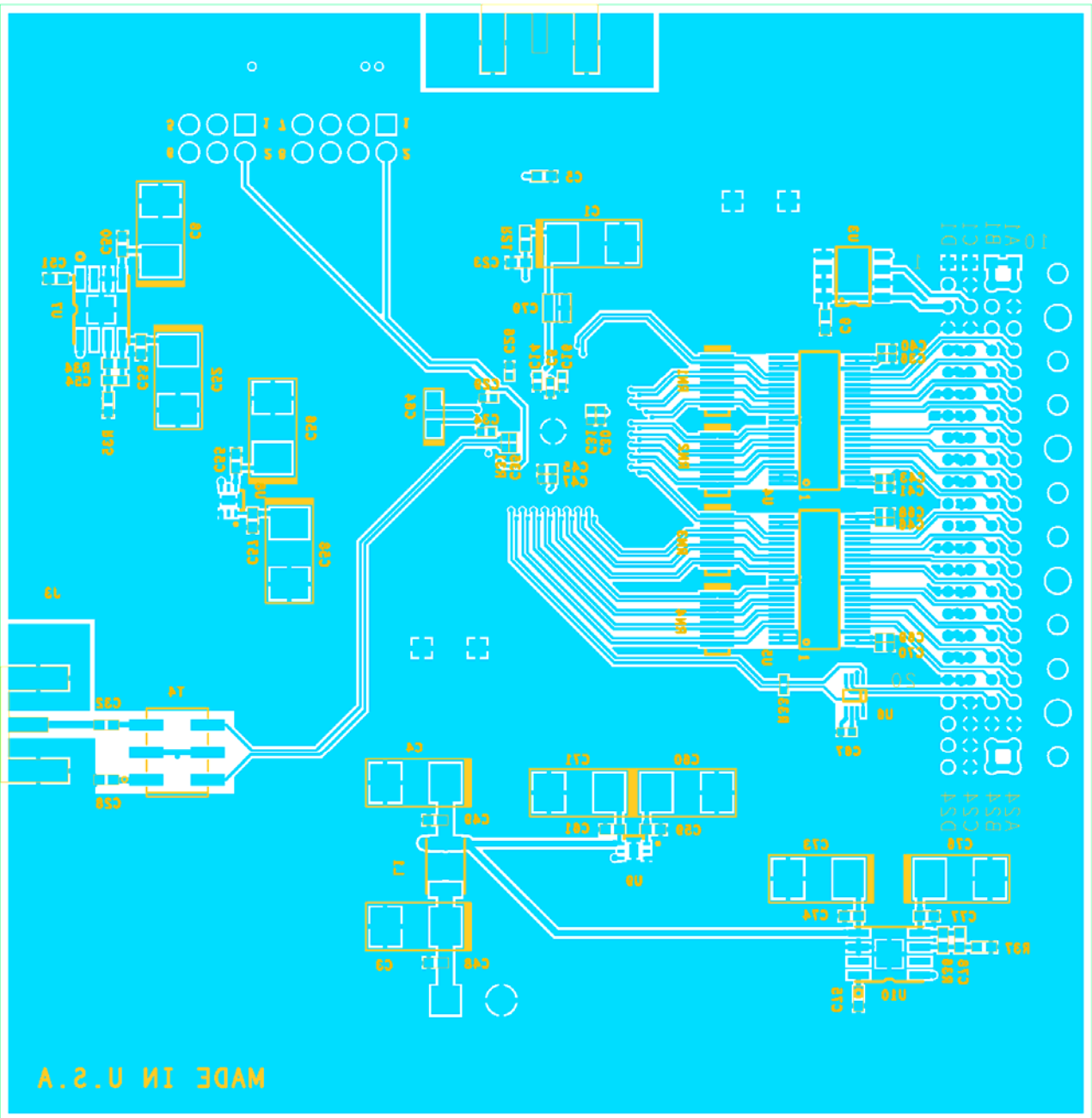
Layer 3: Power



Layer 4: Power



Layer 5: Ground



Layer 6: Circuit Side

8.0 Evaluation Board Bill of Materials

Qty	Reference	Part	PCB Footprint	Manufacturer	Manufacturer P/N
9	C1,C3,C4,C8,C52,C56,C71, C73,C76	10µF	cap_c-case	AVX	TAJC106K020R
2	C58,C60	N/C	cap_c-case	AVX	TAJC106K020R
4	C2,C12,C15,C25	0.1µF	0201	Murata	GRM033R60J104KE19D
12	C5,C9,C17,C18,C22,C23,C2 4,C28,C32,C37,C48,C49	0.1µF	0603	Murata	GRM188R71C104KA01D
2	C57,C59	0.47µF	0603		
2	C53,C77	4.7µF	0603		
18	C6,C10,C19,C27,C31,C33,C 36,C39,C41,C45,C46,C62,C 63,C65,C66,C67,C69,C72	0.1µF	0402	Murata	GRM155R61A104KA01D
2	C7,C13	10pF	0402	Murata	GRM1555C1H100JZ01D
14	C11,C14,C16,C20,C26,C29, C30,C34,C38,C40,C43,C47, C68,C70	0.01µF	0402	Murata	GRM155R71H103KA88D
1	C21	22pF	0402	Murata	GRM1555C1H220JZ01D
1	C35	33pF	0402	Murata	GRM1555C1H330JZ01D
2	C50,C74	4.7µF	0603	Panasonic	ECJ-1VB0J475M
2	C51,C75	0.01µF	0603	Panasonic	ECJ-1VB1H103K
2	C54,C78	2.2nF	0603	Panasonic	ECJ-1VB1H222K
2	C55,C61	1.0µF	0603	Murata	GRM188R71C105KA12D
1	C64	10µF	cap_a-case	Nichicon	F931A106MAA
1	C79	1.0µF	0508	Panasonic	ECY-29RA105KV
4	GND_TP1,GND_TP2,GND_ TP3,GND_TP4	TestPoint	hdr-1x1-100		
1	JP1	CLK_DF	hdr-2x4-100		
1	JP2	PD/DCS	hdr-2x3-100		
1	J1	CONN_FB-96		AMP/Tyco	223514-1
1	J2	INPUT	conn_sma- edge	JOHNSON	142-0701-851
1	J3	CLK_DIFF	conn_sma- edge	JOHNSON	142-0701-851
1	L1	EXC-CL4532U1			
1	P1	+5V Supply	tb-2pos_plug	Phoenix Contacts	1759017
4	RN1,RN2,RN3,RN4	753083101gtr		CTS	753083101GTR
2	R3,R10	0Ω	0402		
2	R5,R7	50Ω	0402		
1	R6	N/C	0603		
10	R18,R19,R20,R22,R25,R26, R27,R29,R35,R37	1kΩ	0603		
1	R21	10Ω	0603		
3	R28,R34,R36	2kΩ	0603		
3	R31,R32,R33	100Ω	0402		
1	T1	MABACT0040		MA-COM	MABACT0040
1	T3	ETC1-1-13		MA-COM	ETC1-1-13
1	T4	ADT1_1WT		Mini-Circuits	ADT1_1WT
1	U2	ADC16130			
1	U3	24C02-SO8		Atmel	AT24C02AN-10SU-2.7
2	U4,U5	FIN1108MTD		Fairchild	FIN1108MTD
1	U6	FIN1101K8X		Fairchild	FIN1101K8X
2	U7,U10	LP3878MR-ADJ		NSC	LP3878MR-ADJ/NOPB
2	U8,U9	LP5900SD-1.8		NSC	LP5900SD-1.8/NOPB

APPENDIX

A1.0 Operating in the Computer Mode

"The ADC16V130 Evaluation Board is compatible with the WaveVision5™ Data Capture Board (order part number WAVEVSN BRD 5.1") and WaveVision5™ software. You can download the latest version from: <http://www.national.com/analog/adc/wavevision5>

When connected to the WaveVision5™ Board, data capture is easily controlled from a personal computer operating in the Windows environment. The data samples that are captured can be observed on the PC video monitor in the time and frequency domains. The FFT analysis of the captured data yields insight into system noise and distortion sources and estimates of ADC dynamic performance such as SINAD, SNR, THD, SFDR and ENOB.

A2.0 Summary Tables of Connectors, and Jumper Settings

A2.1 Test Points

GND_TP1 -GND_TP4	Ground
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A2.2 Connectors

P1 Connector - Power Supply Connections

P1-1	+5V	+5V Power Supply
P1-2	GND	Power Supply Ground

A2.3 Jumper settings

Note: Default settings are in **bold**

JP1 : Clock/Data Format

Connect 1-2	Differential Clock, Output format is 2's complement
Connect 3-4	Differential Clock, Output format is Offset Binary
Connect 5-6	Single Ended Clock, Output format is 2's complement
Connect 7-8	Single Ended Clock, Output format is Offset Binary

JP2 : Power Down Mode

Connect 1-2	Power Down Mode
Connect 3-4	Sleep Mode
Connect 5-6	Normal Mode

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