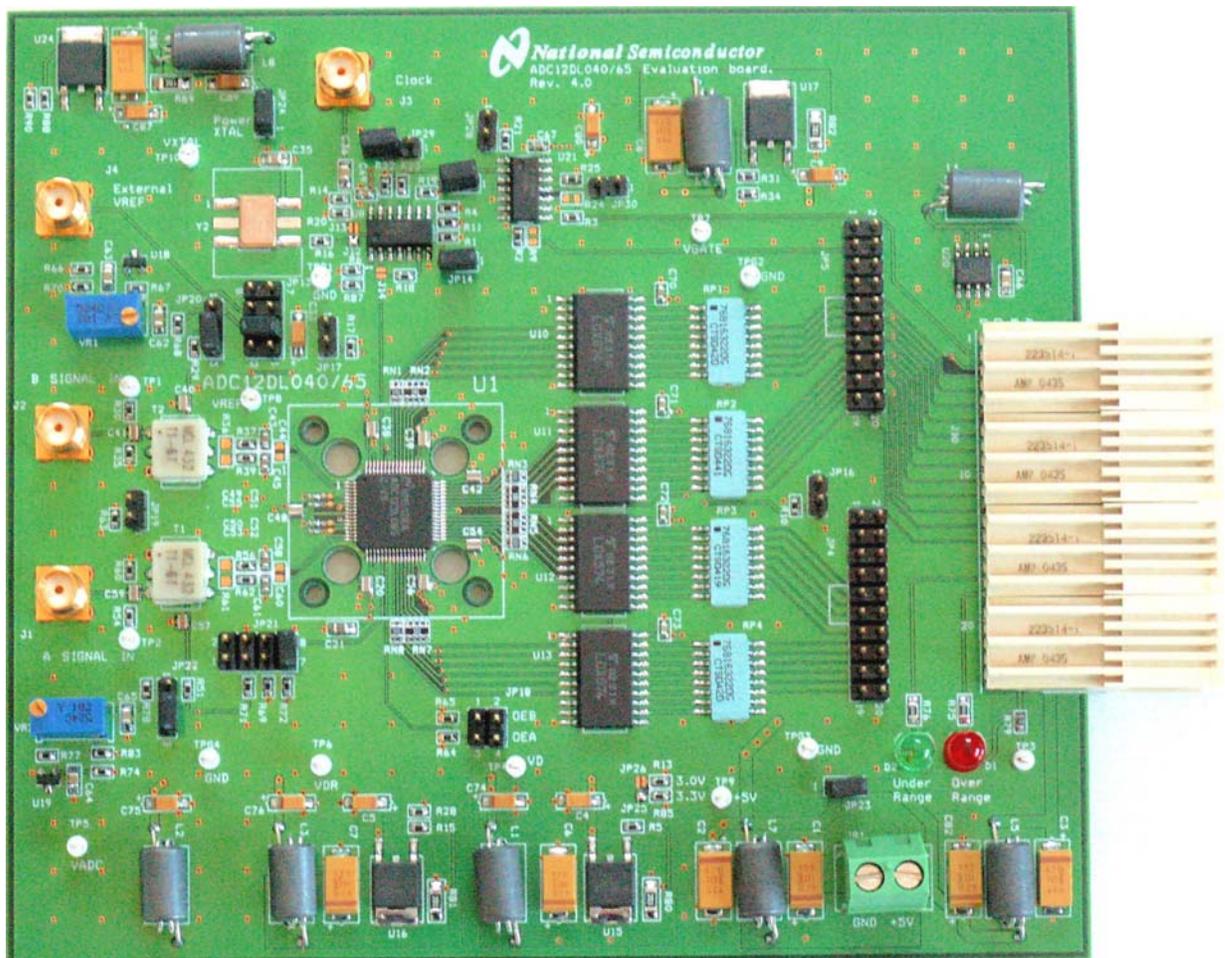**N** *National Semiconductor*

Evaluation Board Instruction Manual

ADC10DL065, 10-Bit, 65 Msps, 3.3V A/D Converter

ADC12DL040, 12-Bit, 40 Msps, 3.0V A/D Converter

ADC12DL065, 12-Bit, 65 Msps, 3.3V A/D Converter

Table of Contents

1.0 Introduction

This Design Kit (consisting of an Evaluation Board and this manual) is designed to ease evaluation and design-in of National Semiconductor's ADC10DL065, ADC12DL040, or ADC12DL065 Analog-to-Digital Converters. Further reference in this manual to the ADC12DL040 is meant to also include the ADC10DL065 and ADC12DL065 unless otherwise specified.

The evaluation board can be used in either of two modes. In the Manual mode suitable test equipment can be used with the board to evaluate the ADC12DL040 performance. In the Computer mode evaluation is simplified by connecting the board to the WaveVision™ Digital Interface Board (order number WAVEVSN BRD 4.0), which is connected to a personal computer through a USB port and running WaveVision™ 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 and SFDR.

The digital output data from Channel A of the ADC12DL040 is available at pins A4 (MSB) through A15 of the WaveVision™ (WV4) connector J10 and pins 8 (MSB) through 19 of header JP4. Channel B output data is available at pins B4 (MSB) through B15 of the WV4 connector J10 and pins 8 (MSB) through 19 of header JP5. Disregard the two LSB's for the ADC10DL065.

2.0 Board Assembly

The ADC12DL040 Evaluation Board comes pre-assembled. Refer to the Bill of Materials in *Section 10* for a description of components, to *Figure 1* for major component placement and to *Section 8* for the Evaluation Board schematic.
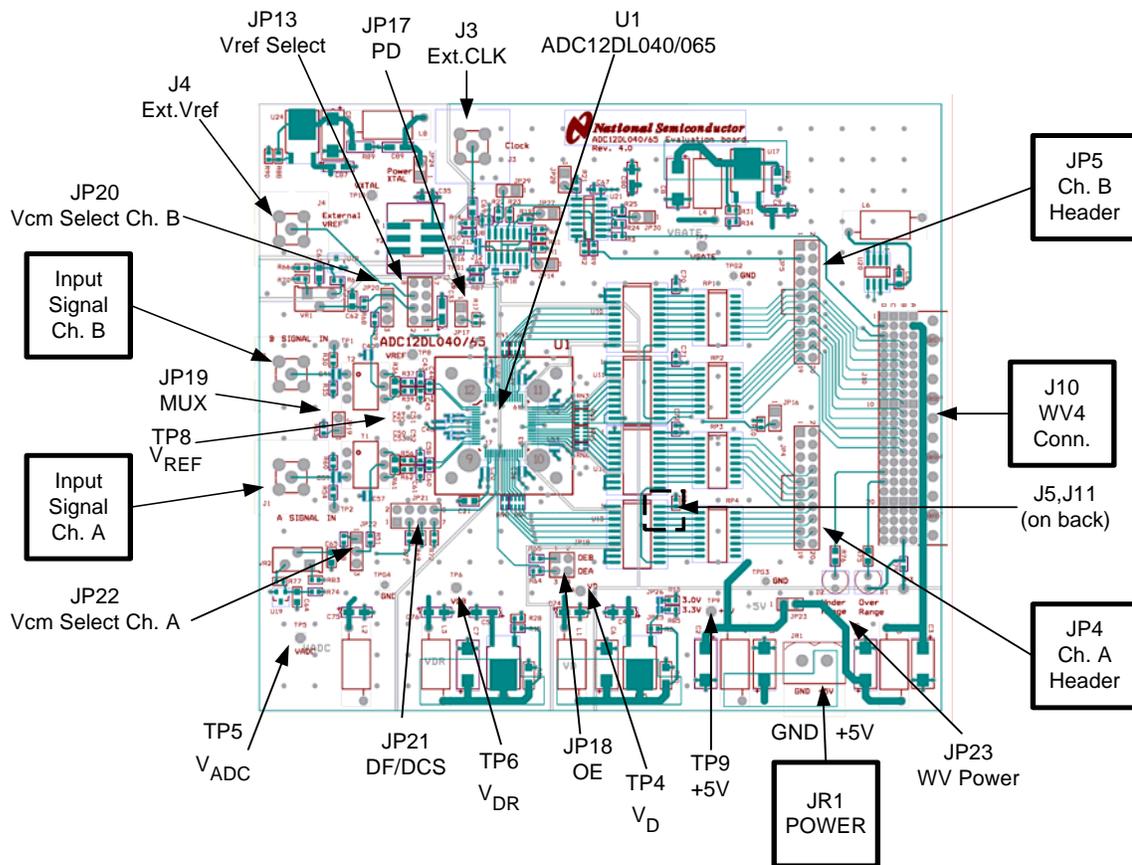

Figure 1. Major Component and Jumper Locations

3.0 Quick Start

Refer to *Figure 1* for locations of jumpers, test points and major components. The board is configured by default to use a crystal clock source, internal 1.0V reference, offset binary output data format, duty cycle stabilizer on, and parallel output mode. Refer to Section 4.0 and the Appendix for more information on jumper settings.

For Stand-Alone operation:

1. Connect a clean +5V power supply to pin 2 of Power Connector JR1. Pin 1 is ground.

2. Connect a signal from a 50-Ohm source to connector J1 (for Channel A). The ADC input signal can be observed at TP2. Because of isolation resistor R54 and the scope probe capacitance, the input signal at TP2 may not have the same frequency response as the ADC input. Be sure to use a bandpass filter before the Evaluation Board.

3. Adjust the input signal amplitude as needed to ensure that the signal does not over-range by examinining a histogram of the output data.

4. The digitized signal is available at pins 8 (MSB) through 19 (LSB) of JP4. See board schematic in *Section 8*.

For Computer Mode operation:

You must have version 4.1.7 or later of the WaveVision™ software to properly test this board. You can download the latest version from:
http://www.national.com/appinfo/adc/wv4.html

1. Connect the evaluation board to the WaveVision™ Digital Interface Board. See the WaveVision™ Board Manual for operation of that board. Connect the WaveVision™ board to the computer using a USB cable.

2. Connect a clean +5V power supply to pin 2 of Power Connector JR1. Pin 1 is ground. Short jumper JP23. With jumper JP23 shorted, the WaveVision™ board gets power from the ADC12DL040 Evaluation Board, therefore it does not require a separate power supply. *DO NOT provide separate power supplies to the Evaluation Board and the WaveVision Board when JP23 is shorted.*

3. Connect a clock source to connector J3. Connect a signal from a 50-Ohm source to connector J1 (for Channel A). The ADC input signal can be observed at TP2. Because of isolation resistor R54 and the scope probe capacitance, the input signal at TP2 may not have the same frequency response as the ADC input. Be sure to use a bandpass filter before the Evaluation Board.

4. 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.

5. Select which channel the WV4 board collects data from with the *Product Board Settings* item under the *Settings* menu. See the WaveVision™ Board Manual for instructions for gathering and analyzing data.

4.0 Functional Description

The ADC12DL040 Evaluation Board schematic is shown in *Section 8*. A list of test points and jumper settings can be found in the Appendix.

4.1 Input (signal conditioning) circuitry

This section describes the input circuitry for Channel A, which is the same as Channel B.

The input signal to be digitized should be applied to SMA connector J1. This 50 Ohm input is intended to accept a low-noise sine wave signal of up to 2V peak-to-peak amplitude. To accurately evaluate the dynamic performance of this converter, the input test signal will have to be passed through a high-quality bandpass filter with at least 14-bit equivalent noise and distortion characteristics.

Signal transformer T1 provides single-ended to differential conversion. The voltage $V_{RM}A$ from the ADC, or an adjustable voltage from VR2 sets the common mode of the input signal by biasing the center tap of the secondary of T1. When VR2 is used, the voltage should be set within the acceptable range of the ADC, 0.5 to 2.0V. Jumper JP22 selects the source of the common mode voltatge. Short pins 1-2 of JP22 to use VR2. The default setting is to use $V_{RM}A$ from the ADC, with pins 2-3 shorted.

Jumper JP20 selects the source of the common mode voltatge for Channel B. Short pins 1-2 of JP20 to use VR1. The default setting is to use $V_{RM}B$ from the ADC, with pins 2-3 shorted.

4.2 ADC reference circuitry

The ADC12DL040 can use an internal 1.0V reference, an internal 0.5V reference, or an external reference. The reference is selected using jumper JP13. The default is the internal 1.0V reference, shorting pins 1-2.

An adjustable reference circuit is provided on the board. The simple circuit here is not temperature stable and is not recommended for your final design solution. The reference circuit will generate a voltage in the range of 0.5 to 2.0V. The ADC12DL040 is specified to operate with V_{REF} in the range of 0.8 to 1.2V, with a nominal value of 1.0V. The reference voltage is set with VR1. This circuit can also be used as a common mode voltage source (see section 4.1). Short pins 3-4 of JP13 to use VR1.

Short pins 7-8 of JP13 to select the internal 0.5V reference. Short pins 5-6 of JP13 to use the external reference voltage applied at connector J4.

4.3 ADC clock circuit

Solder jumpers are used to select the path of the clock to the ADC, the latches, and the output data connectors. While not as convenient as pin-type jumpers, these introduce less distortion into the clock signal.

The clock source is selected with jumper J12 or J13. By default J12 is shorted and J13 is open, which selects the crystal oscillator. To use an external clock source, connect the signal to connector J3, open J12 , and short J13.

There are a number of solder jumpers which allow changes to the clock path, inversion of the clock, etc. Please refer to the schematic of *Section 8* and the Appendix for more information.

4.4 Digital Data Output

The default mode is Parallel Mode. This is set with JP19 open. In Parallel Mode the digital output data from Channel A of the ADC12DL040 is available at pins A4 (MSB) through A15 of the WV4 connector J10 and pins 8 (MSB) through 19 of header JP4. Channel B output data is available at pins B4 (MSB) through B15 of the WV4 connector J10 and pins 8 (MSB) through 19 of header JP5. When capturing data with WaveVision™ software, select which channel the WV4 board collects data from with the **Product Board Settings** item under the **Settings** menu. See the WaveVision™ Board Manual for instructions for gathering and analyzing data

Shorting JP19 puts the ADC in Multiplex Mode. In this mode the data from both channels is output on pins DA0:DA11 of the ADC. Refer to the ADC12DL040 datasheet for more detail of this function. To use Multiplex mode, open solder jumper J11, and short J5. The WaveVision™ software should be set to collect data on Channel A. The channel selected for output to WaveVision™ software is selected with JP16. With JP16 open, Channel A data is selected. Channel B is selected by shorting pins 1-2 of JP16.

4.5 Power Supply Connections

Power to this board is supplied through power connector JR1. The only supply needed is +5V at pin 2 plus ground at pin 1.

When using the ADC12DL040 Evaluation Board with the the WaveVision™ Digital Interface Board, a 5V logic power supply for the interface board is passed through the WV4 connector to the Digital Interface Board when jumper JP23 is installed. **DO NOT provide separate power supplies to the Evaluation Board and the WaveVision Board when JP23 is shorted.**

4.6 Power Requirements

Voltage and current requirements for the ADC12DL040 Evaluation Board mode are:

- +5.0V at 500 mA (1A when connected to the Digital Interface Board).

5.0 Installing the ADC12DL040 Evaluation Board

The evaluation board requires power supplies as described in *Section 4.5*. An appropriate signal source should be connected to the Signal Input SMA connector J1 or J2. When evaluating dynamic performance, an appropriate signal generator (such as the HP8644B or the R&S SME-03) with 50 Ohm source impedance should be connected to the Analog Input connector J1 and/or J2 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 WaveVision™ 4.0 Digital Interface Board and WaveVision™ software, a USB must be connected between the Digital Interface Board and the host. See the the WaveVision™ 4.0 Digital Interface Board manual for details.

6.0 Obtaining Best Results

Obtaining the best results with any ADC requires both good circuit techniques and a good PC board layout. The layout is taken care of with the design of this evaluation board. Note, the plots shown in Section 6 are for illustrative purposes only. They were not taken with the ADC12DL040.

6.1 Clock Jitter

When any circuitry is added after a signal source, some jitter is almost always added to that signal. Jitter in a clock signal, depending upon how bad it is, can degrade dynamic performance. We can see the effects of jitter in the frequency domain (FFT) as "leakage" or "spreading" around the input frequency, as seen in *Figure 2a*. Compare this with the more desirable plot of *Figure 2b*. Note that all dynamic performance parameters (shown to the right of the FFT) are improved by eliminating clock jitter.

Because the divided signal from the Digital Interface Board and the oscillator at Y1 are not synchronized, bad data will sometimes be taken because we are latching data when the outputs are in transition. This data might be as you see in *Figure 3* or *Figure 4*.
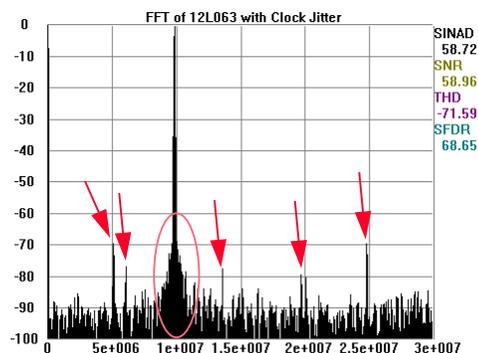

Figure 2a. Jitter causes a spreading around the input signal, as well as undesirable signal spurs.

The problem of *Figure 3* is obvious, but it is not as easy to see the problem in *Figure 4*, where the only thing we see is small excursions beyond the normal envelope. Compare *Figure 3* and *Figure 4* with *Figure 5*.

If your data capture results in something similar to what is shown here in *Figure 3* or in *Figure 4*, take another sample. It may take a few trials to get good data.

The use of WAVEVSN BRD 4.0 Digital Interface Board eliminates this problem, so that board is recommended.
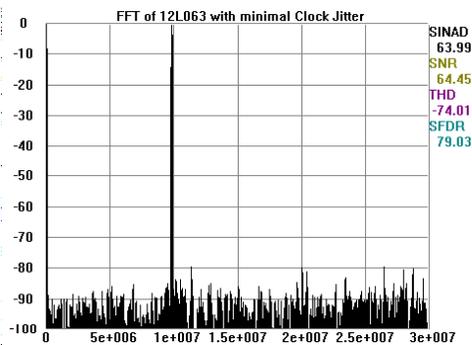
Figure 2b. Eliminating or minimizing clock jitter results in a more desirable FFT that is more representative of how the ADC actually performs.
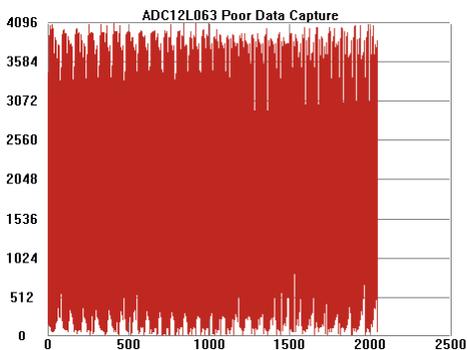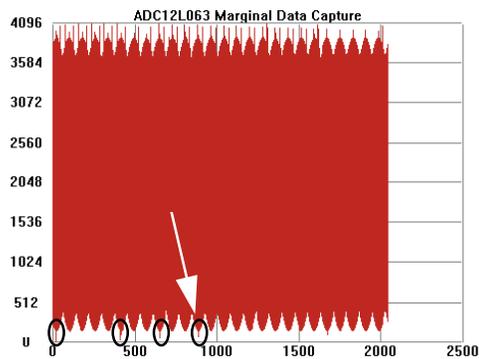

Figure 4 Marginal data capture that results from trying to capture data that is near but not right at the point where the ADC outputs are in transition.
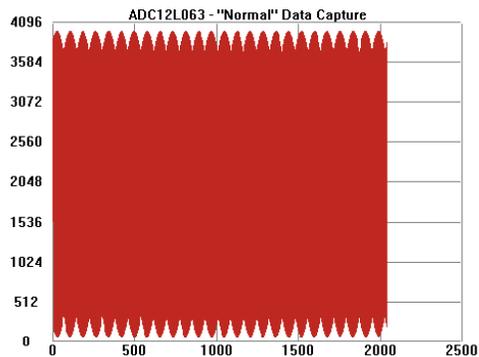

Figure 3. Poor data capture resulting from trying to capture data while the ADC outputs are in transition

Figure 5. Normal data capture.

$$\frac{CY}{SS} = \frac{f_{in}}{f_s}$$

6.2 Coherent Sampling

Artifacts can result when we perform an FFT on a digitized waveform, producing inconsistent results when testing repeatedly. The presence of these artifacts means that the ADC under test may perform better than the measurements would indicate.

We can eliminate the need for windowing and get more consistent results if we observe the proper ratios between the input and sampling frequencies. We call this *coherent sampling*. Coherent sampling greatly increases the spectral resolution of the FFT, allowing us to more accurately evaluate the spectral response of the A/D converter. When we do this, however, we must be sure that the input signal has high spectral purity and stability and that the sampling clock signal is extremely stable with minimal jitter.

Coherent sampling of a periodic waveform occurs when a prime integer number of cycles exists in the sample window. The relationship between the number of cycles sampled (CY), the number of samples taken (SS), the signal input frequency (f_{in}) and the sample rate (f_s), for coherent sampling, is

CY, the number of cycles in the data record, must be a prime integer number and SS, the number of samples in the data record, must be a factor of 2 integer.

Further, f_{in} (signal input frequency) and f_s (sampling rate) should be locked to each other so that the relationship between the two frequencies is exact. Locking the two signal sources to each other also causes whatever sample-to-sample clock edge timing variation (jitter) that is present in the two signals to cancel each other.

Windowing (an FFT Option under WaveVision™) should be turned off for coherent sampling.

7.0 Evaluation Board Specifications

Board Size:	5" x 5.63" (12.7 cm x 14.29 cm)
Power Requirements:	+5.0V, 1 A (ADC12DL040EVAL and WaveVision™ 4.0 Board
Clock Frequency Range:	40/65 MHz
Analog Input	
Nominal Voltage:	$2V_{P-P}$
Impedance:	50 Ohms

http://www.national.com
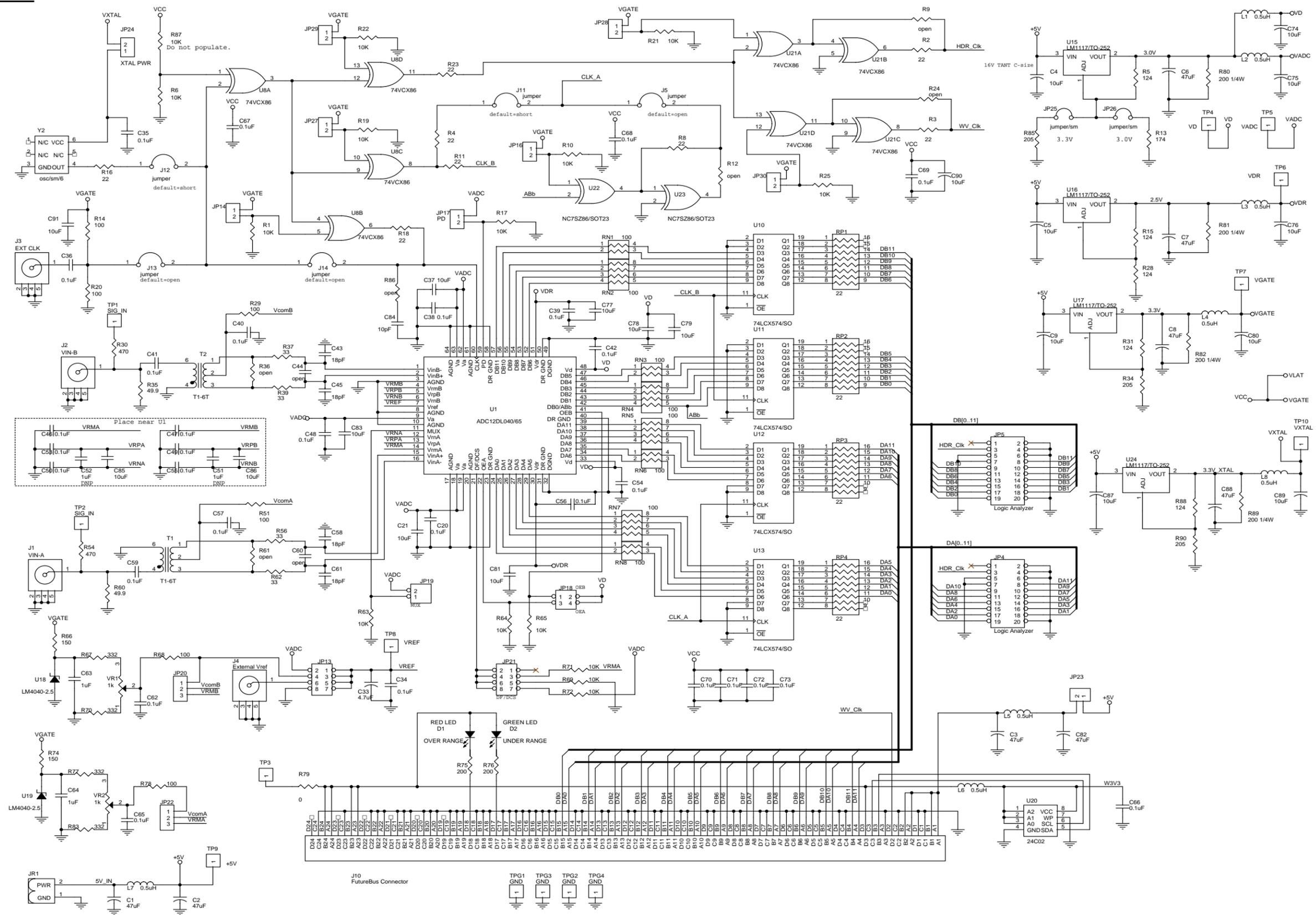
9.0 Assembly Drawing
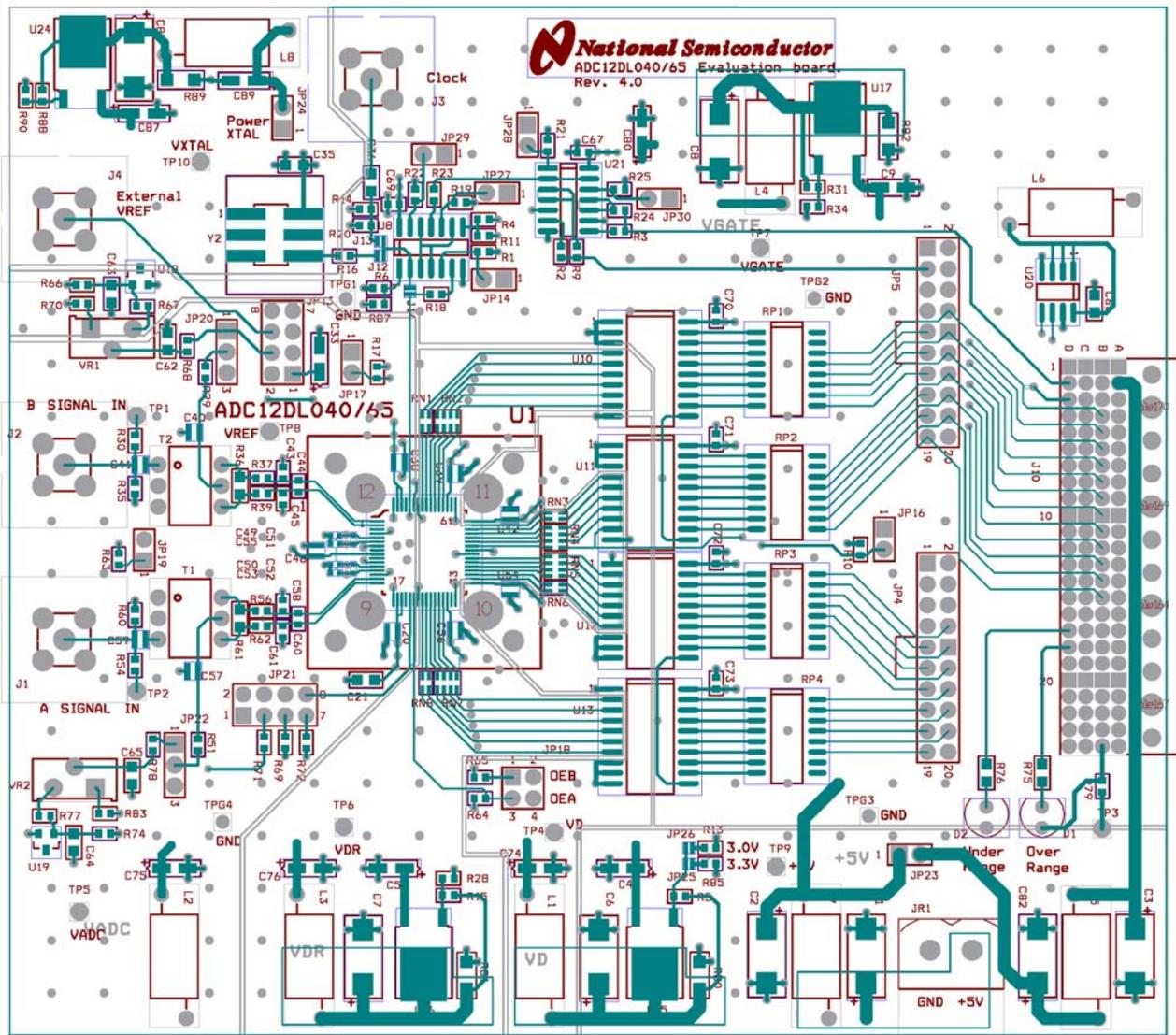
10.0 Evaluation Board Bill of Materials

QTY	REFERENCE	DESCRIPTION	VALUE	Package	Manufacturer	Manufacturer P/N
8	C1,C2,C3,C6,C7,C8,C82, C88	CAP TANT	47uF	SMD 7343	KEMET	T491D476K010AS
10	C4,C5,C9,C74,C75,C76,C80, C87,C89,C90	CAP TANT	10uF	SMD 3216	KEMET	T491A106K006AS
13	C20,C38,C39,C40,C41,C42, C46,C47,C48,C54,C56,C57, C59	CAP CER	0.1uF	SMD 0508	Panasonic	ECY-29RE104KV
10	C21,C37,C77,C78,C79,C81, C83,C85,C86,C91	CAP CER	10uF	SMD 0805	Panasonic	ECJ-2FF0J106Z
1	C33	CAP TANT	4.7uF	SMD 3216	Kemet	T491A475K010AS
8	C34,C67,C68,C69,C70,C71, C72,C73	CAP CER	0.1uF	SMD 0603	Panasonic	ECJ-1VB1C104K
5	C35,C36,C62,C65,C66	CAP CER	0.1uF	SMD 0805	Panasonic	ECJ-2VB1E104K
4	C43,C45,C58,C61	CAP CER	18pF	SMD 0603	Panasonic	ECJ-1VC1H180J
2	C44,C60	CAP	open			N/A
4	C49,C50,C53,C55	CAP CER	0.1uF	SMD 0402	Panasonic	ECJ-0EB1A104K
2	C51,C52	CAP CER	open	SMD 402	Panasonic	ECJ-0EF0J105Z
2	C63,C64	CAP CER	1uF	SMD 805	Panasonic	ECJ-2YB1A105K
1	C84	CAP CER.	10pF	SMD 0603	Panasonic	ECJ-1VC1H100D
1	D1	LED RED	OVER RANGE	5MM	Lumex OPTO/COMP	SSL-LX5093IT
1	D2	LED GREEN	UNDER RANGE	5MM	Lumex OPTO/COMP	SSL-LX5093GT
2	JP4,JP5	CON	HDR 2X10	.100 DUAL STR 60POS	Sullins Elect	PBC30DADN
2	JP13,JP21	CON	HDR 4X2	.100 DUAL STR 60POS	Sullins Elect	PBC30DADN
8	JP14,JP16,JP17,JP23,JP27, JP28,JP29,JP30	CON	HDR 1X2	.100 SINGL STR 36POS	Sullins Elect	PBC36SAAN
1	JP18	CON	HDR 2X2	.100 DUAL STR 60POS	Sullins Elect	PBC30DADN
1	JP19	CON	HDR 1X2	.100 SINGL STR 36POS	Sullins Elect	PBC36SAAN
2	JP20,JP22	CON	HDR 1X3	.100 SINGL STR 36POS	Sullins Elect	PBC36SAAN
1	JP24	CON	HDR 1X2	.100 SINGL STR 36POS	Sullins Elect	PBC36SAAN
2	JP25,JP26	JUMPER	jumper/sm			
1	JR1	CONN	ECL power	2 Pos 5.08MM	Phoenix Contacts	1755736
1	J1	CON	VIN-A	SMA RECEPTACLE	Amphenol	901-144-8RFX
1	J2	CON	VIN-B	SMA RECEPTACLE	Amphenol	901-144-8RFX
1	J3	CON	EXT CLK	SMA RECEPTACLE	Amphenol	901-144-8RFX
1	J4	CON	External Vref	SMA RECEPTACLE	Amphenol	901-144-8RFX
5	J5,J11,J12,J13,J14	JUMPER	jumper	N/A	N/A	N/A
1	J10	CONN RECEPT	FutureBus Con	RT/A 2MM 96POS 30AU	Tyco	5536511-3
8	L1,L2,L3,L4,L5,L6,L7,L8	FERRITE_CHOKE	2.5 TURNS		JW MILLER MAG.	FB20020-4B-RC
4	RN1,RN3,RN6,RN8	RES ARRAY	100	2 RES SMD	PANASONIC	EXB-V4V101JV
4	RN2,RN4,RN5,RN7	RES ARRAY	100	0603 x 4	PANASONIC	EXB-V8V101JV
4	RP1,RP2,RP3,RP4	RES-NET	22	16-PIN SMD	CTS CORP.	768163220G
14	R1,R6,R10,R17,R19,R21, R22,R25,R63,R64,R65,R69, R71,R72	RES	10K	SMD 0603	PANASONIC	ERJ-3EKF1002V
7	R2,R3,R4,R11,R16,R18,R23	RES	22.1	SMD 0603	PANASONIC	ERJ-3EKF22R1V
5	R5,R15,R28,R31,R88	RES	124	SMD 0603	PANASONIC	ERJ-3EKF1240V

1	R8	RES	22	SMD 0603	PANASONIC	ERJ-3EKF22R1V
3	R9,R12,R87	RES	open	N/A		N/A
1	R13	RES	174	SMD 0603	PANASONIC	ERJ-3EKF1740V
4	R14,R20,R68,R78	RES	100	SMD 0603	PANASONIC	ERJ-3EKF1000V
2	R24,R86	RES	open	N/A		N/A
2	R29,R51	RES	100	SMD 0603	PANASONIC	ERJ-3EKF1000V
2	R30,R54	RES	475	SMD 0603	PANASONIC	ERJ-3EKF4750V
3	R34,R85,R90	RES	205	SMD 0603	PANASONIC	ERJ-3EKF2050V
2	R35,R60	RES	49.9	SMD 0603	PANASONIC	ERJ-3EKF49R9V
2	R36,R61	RES	open	N/A		N/A
4	R37,R39,R56,R62	RES	33.2	SMD 0603	PANASONIC	P33.2HCT
2	R66,R74	RES	150	SMD 0603	PANASONIC	ERJ-3EKF1500V
4	R67,R70,R77,R83	RES	332	SMD 0603	PANASONIC	ERJ-3EKF3320V
2	R75,R76	RES	200	SMD 0805	PANASONIC	P200CCT
1	R79	RES	0	SMD 0603	PANASONIC	RC0603JR-070RL
4	R80,R81,R82,R89	RES	200	SMD 1206	PANASONIC	ERJ-8GEYJ201V
4	TPG1,TPG2,TPG3,TPG4	Hdr.	HDR 1X1	.100 SINGL STR 36POS	Sullins Elect	PBC36SAAN
2	TP1,TP2	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP3	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP4	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP5	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP6	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP7	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP8	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP9	TP	.040"D	MINI .040"D	Keystone Elec.	5002
1	TP10	TP	.040"D	MINI .040"D	Keystone Elec.	5002
2	T1,T2	XFMR	.015-300MHZ	SM	MINI-CIRCUITS	T1-6T X65
1	U1	IC	DUAL ADC	64-TQFP	NATIONAL	
2	U8,U21	IC	EXCL-OR QUAD	14SOIC	FAIRCHILD	74VCX86M
4	U10,U11,U12,U13	IC	FLIP FLOP OCT	20SOIC	FAIRCHILD	4LCX574WMX
4	U15,U16,U17,U24	IC	LM1117/TO-252	TO252	NATIONAL	LM1117DT-ADJ
2	U18,U19	IC	LM4040-2.5	SOT-23-5	NATIONAL	LM4040CIM3-2.5CT
1	U20	IC	EEPROM 2K	8SOIC	ATMEL	AT24C02BN-10SU-1.8
2	U22,U23	IC	EX-OR GATE 2-IN	SOT-23-5	Texas Instrument	SN74LVC1G86DBVR
2	VR1,VR2	POT	1k	3/8" SQ CERM SL MT	BOURNS INC	3296Y-1-102
1	Y2	OSC	40.00MHz or 66.00MHZ	5X7MM CERAMIC	PLETRONICS	SM7745HV-66.0M-Y9 or SM7745HV-40.00M-Y9

APPENDIX

A1.0 Operating in the Computer Mode

The ADC12DL040 Evaluation Board is compatible with the WaveVision™ 4.0 Digital Interface Board and WaveVision™ software. You must have version 4.1.7 or later of the WaveVision™ software to properly test this board. You can download the latest version from: http://www.national.com/appinfo/adc/wv4.html

When connected to the Digital Interface 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 and THD. Select which channel the WV4 board collects data from with the *Product Board Settings* item under the *Settings* menu. See the Digital Interface Board manual for more information.

A2.0 Summary Tables of Test Points, Connectors, and Jumper Settings

A2.1 Test Points

Test Points on the ADC12DL040 Evaluation Board

TP 1	Input Signal Channel B
TP 2	Input Signal Channel A
TP3	3.3V from WaveVision Board
TP4	ADC Digital Supply
TP5	ADC Analog Supply
TP6	ADC Output Driver Supply
TP7	Logic Supply
TP8	VREF
TP9	+5V
TPG1 – TPG4	Ground

A2.2 Connectors

JR1 Connector - Power Supply Connections

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

A2.3 Jumper settings
Note: Default settings are in **bold**

JP13 : VREF selection jumper settings

Connect 1-2	**Use internal 1.0V reference**
Connect 3-4	Use voltage from VR1 as reference voltage
Connect 5-6	Use external voltage from J4 as reference voltage
Connect 7-8	Use internal 0.5V reference

JP14 : Latch Invert

Connect 1-2	**Invert clock for latches**
1-2 OPEN	Do not invert clock

JP16 : Latch Invert in Multiplex Mode with ABb as clock

Connect 1-2	Channel B data is selected
1-2 OPEN	**Channel A data is selected**

JP17 : Power Down

Connect 1-2	Put ADC in Power Down mode
1-2 OPEN	**ADC is in normal operation**

JP18 : Output Enable

Connect 1-2	Channel B outputs are in high impedance state
Connect 3-4	Channel A outputs are in high impedance state
1-2 OPEN	**Channel B outputs are enabled**
3-4 OPEN	**Channel A outputs are enabled**

JP19 : Multiplex/Parallel Mode

Connect 1-2	Outputs are in Multiplex Mode on Channel A outputs
1-2 OPEN	**Outputs are in parallel mode**

JP20 : Channel B Vcm selection

Connect 1-2	Use voltage from VR1 as common mode voltage for Channel B
Connect 2-3	**Use common mode voltage from ADC for Channel B**

JP21 : Data Format / Duty Cycle Stabilizer

Connect 1-2	Select Output format of Offset Binary, Duty Cycle Stabilizer is OFF
Connect 3-4	Select Output format of 2's complement, Duty Cycle Stabilizer is OFF
Connect 5-6	Select Output format of 2's complement, Duty Cycle Stabilizer is ON
Connect 7-8	**Select Output format of Offset Binary, Duty Cycle Stabilizer is ON**

JP22 : Channel A Vcm selection

Connect 1-2	Use voltage from VR2 as common mode voltage for Channel A
Connect 2-3	**Use common mode voltage from ADC for Channel A**

JP23 : Wavevision Power (when used with WaveVision™ 4.0 Digital Interface Board

Connect 1-2	A +5V supply is applied to the WaveVision Board or the ADC12DL040 Board, but not both
1-2 OPEN	**Separate supplies are used for the WaveVision Board and the ADC12DL040 Board**

JP24 : Power for Crystal Oscillator

Connect 1-2	**Power is applied to the crystal**
1-2 OPEN	No power for the crystal

JP27 : Latch Invert

Connect 1-2	**Invert clock for latches**
1-2 OPEN	Do not invert clock

JP28 : Latch Invert

Connect 1-2	Invert clock for latches
1-2 OPEN	**Do not invert clock**

JP29 : Latch Invert

Connect 1-2	Invert clock for latches
1-2 OPEN	**Do not invert clock**

http://www.national.com

JP30 : Latch Invert

Connect 1-2	Invert clock for latches
1-2 OPEN	**Do not invert clock**

A2.4 Clock Circuit Solder Jumper settings

Solder jumpers are used to select the path of the clock to the ADC, the latches, and the capture device at J7. While not as convenient as pin-type jumpers, these introduce less distortion into the clock signal.

By default the following jumpers are OPEN:

J5, J13, J14

By default the following jumpers are shorted:

J11, J12

A2.5 VADC/VD Solder Jumper settings
Either J25 or J26 is shorted to set the voltage for the ADC's analog (VADC) and digital (VD) supplies.

J26 is shorted to produce a VADC and VD of 3.0V, which is the default value for the ADC12DL040.

J25 is shorted to produce a VADC and VD of 3.3V, which is the default value for the ADC12DL065.

The ADC12DL040/065 Evaluation Boards are intended for product evaluation purposes only and are not intended for resale to end consumers, is not authorized for such use and is not designed for compliance with European EMC Directive 89/336/EEC, or for compliance with any other electromagnetic compatibility requirements.

National Semiconductor Corporation does not assume any responsibility for use of any circuitry or software supplied or described. No circuit patent licenses are implied.

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

National Semiconductor Corporation Americas	National Semiconductor Europe	National Semiconductor Asia Pacific Customer Response Group	National Semiconductor Japan Ltd.
Tel: 1-800-272-9959 Fax: 1-800-737-7018 Email: support@nsc.com	Fax: +49 (0) 1 80-530 85 86 Email: europe.support@nsc.com Deutsch Tel: +49 (0) 699508 6208 English Tel: +49 (0) 870 24 0 2171 Français Tel: +49 (0) 141 91 8790	Tel: 65-2544466 Fax: 65-2504466 Email:sea.support@nsc.com	Tel: 81-3-5639-7560 Fax: 81-3-5639-7507

www.national.com

National does not assume any responsibility for any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		

TI E2E Community Home Page   e2e.ti.com