TEXAS INSTRUMENTS

Modular MSOP8 EVM

User's Guide

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 1.8 VDC to 5 VDC and the output voltage range of 0 VDC and 5 VDC.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 30°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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Read This First

About This Manual

This user's guide describes the characteristics, operation, and use of the Modular MSOP8 EVM. This EVM is a multi-device, 12 to 16 bit, SSI, analog to digital converter Evaluation Module. A complete circuit description, as well as schematic diagram and bill of materials, are included.

How to Use This Manual

This document contains the following chapters:

Chapter 1—EVM Overview

Chapter 2—Analog Interface

Chapter 3—Digital Interface

Chapter 4—Power Supplies

Chapter 5—EVM Operation

Chapter 6—EVM Bill of Materials and Schematic

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EVM Compatible Device Data Sheets:	Literature Number:
ADS7816	SBAS110
ADS7817	SBAS230
ADS7818	SBAS078
ADS7822	SBAS062
ADS7834	SBAS098
ADS7835	SBAS102
ADS8320	SBAS108
ADS8321	SBAS123
ADS8324	SBAS172
ADS8325	SBAS226

Application Notes/Additional Literature:	Literature Number:
Op Amps for Everyone	SLOD006
5‑6K Interface Board	SLAU104
Single and Bipolar Supply Signal Conditioning Boards	SLAU105

Third Party Tools:	Vendor Website:
HPA449 Development Board (MSP430 Tools)	www.softbaugh.com
Speedy 33 (DSP Tools)	www.hyperception.com

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Contents

Tables

EVM Overview

The following section gives a general overview of the Modular MSOP8 evaluation board.

1.1 Features

Full‑featured evaluation board for a variety of single channel, eight pin Micro SOP, 12 and 16-bit, serial Output, analog to digital converters

On-board reference and buffer circuits

High-speed serial interface

Modular design for use with a variety of DSP and micro controller interface boards

1.2 Introduction

The Modular MSOP8 Evaluation Module is an updated version of the Burr-Brown DEM-MSOP8 evaluation board. The EVM is designed so that a single printed wiring board (PWB) supports a variety of high speed 12 and 16 bit serial ADC's.

The modular EVM form factor allows for direct evaluation of the ADC's performance and operating characteristics. This EVM is compatible with the 5‑6K Interface Board (SLAU104) from Texas Instruments and additional 3rd party boards such as the HPA449 demonstration board from SoftBaugh, Inc. (www.softbaugh.com) and the Speedy33™ from Hyperception, Inc. (www.hyperception.com).

Analog Interface

For maximum flexibility, the Modular MSOP8 EVM is designed for easy interfacing to multiple analog sources. Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P provide a convenient 10-pin dual row header/socket combination at J1. This header/socket provides access to the analog input pins of the ADC. Consult Samtec at www.samtec.com or call 1-800-SAMTEC-9 for a variety of mating connector options.

Table 2-1. Analog Interface Pin Out

Pin Number	Signal	Description
J1.2	AD_IN+	Noninverting Input (Differential Devices)/Analog Input (Single Ended Devices)
J1.4	AD_IN-	Inverting Input (Differential Devices)/Analog Ground (Single Ended Devices)
J1.6	Unused	
J1.8	Unused	
J1.10	Unused	Pins are unused and should be left open for use with future amplifier and sensor input modules.
J1.12	Unused	
J1.14	Unused	
J1.16	Unused	
J1.18	REF(-)	Unused
J1.20	REF(+)	External Reference Source Input (2.5V NOM, 2.525 MAX)
J1.15	Unused	
J1.1- J1.19 (odd)	AGND	Analog ground connections (except J1.15)

Digital Interface

The Modular MSOP8 EVM is designed for easy interfacing to multiple control platforms. Samtec part numbers, SSW-110-22-F-D-VS-K and TSM-110-01-T-DV-P, provide a convenient 10-pin dual row header/socket combination at J2. This header/socket provides access to the digital control and serial data pins of the MSOP8 EVM. Consult Samtec at www.samtec.com or 1-800-SAMTEC-9 for a variety of mating connector options.

Table 3-1. Digital Interface Pin Out

Pin Number	Signal	Description
J2.1	$\overline{\text{CS}}$	Chip Select – Active low signal, enables data transfer – jumper configurable (see schematic)
J2.3	SCLK	Serial Clock
J2.5	SCLKR	Serial Clock Return (for DSP Host systems)
J2.7	FS	Frame Sync for DSP host systems – alternate Chip Select through JMP2 (see schematic)
J2.9	FSR	Frame Sync Return (for DSP Host systems)
J2.11	Unused	
J2.13	SDO	Serial Data Output
J2.15	Unused	
J2.17	Unused	
J2.19	SPARE	

Power Supplies

The Modular MSOP8 EVM board requires 5 V dc for the analog section. This includes the voltage reference (U2), the reference buffer (U4), and optionally, the ADC installed on the EVM (via JMP1). Supply voltages of 1.8 V to 5 V dc for the digital section are also required. When used in combination with one of the DAP Interface boards, J3 provides connection to the common power bus described in document SLAU104. Table 4-1 shows the pin out of J3.

Table 4-1. Power Supply Pin Out

Signal	Pin Number		Signal
Unused	1	2	Unused
+5VA	3	4	Unused
DGND	5	6	AGND
+1.8VD	7	8	+VD1
+3.3VD	9	10	+5VD

When power is supplied to J3, JMP3 allows for one of four different dc voltages to be applied to the digital sections of the ADC. See the schematic and PWB silkscreen for details.

Topic **Page**

4.1 ADC Power

The device installed on the modular MSOP8 EVM has several options in regards to its power source. Refer to the schematic for the following discussion.

JMP1 and JMP3 allow the user to select the power supply used by the ADC. When JMP1 is in the default factory position (Shunt on pins 1-2), power to the ADC comes from J3.3 or TP5. Single gate digital buffers (U3, U5, and U6) are installed on the ADC's digital input/output lines to allow operation with low voltage controllers, such as the MSP430. The supply voltage to these buffers is determined by JMP3 or the voltage applied to TP7.

4.2 Stand Alone Operation

When used as a stand alone EVM, the analog power can be applied to TP5, referenced to TP6. Digital power can be applied to TP7 referenced to TP4. While filters are provided for all power supply inputs, optimal performance of the EVM requires a clean, well-regulated power source.

Caution

The ADC's that are compatible with this EVM have a variety of power supply requirements. Check the appropriate data sheets and verify all power supplies are within the safe operating limits of the ADC before applying power to the EVM.

4.3 Reference Voltage

The modular MSOP8 can be configured to use the onboard reference/buffer circuits (U2 and U4) or an external reference applied to J1.20. Jumpers JMP5 and JMP6 control the reference source. In the factory default position (shunt on JMP5 pins 1-2), a 2.5 V reference is supplied by U2. Moving the shunt at JMP5 to positions 2-3 allows an external reference applied to J1.20 to be used.

Caution

The ADC's that are compatible with this EVM have a variety of reference requirements. Check the appropriate data sheets and verify external reference sources are within the safe operating limits of the ADC before applying power to the EVM.

JMP6 controls the actual application of the reference source to the ADC. Note that JMP6 is not installed on EVM boards for ADS7818, ADS7834, and ADS7835 devices. In the factory default position (shunt on pins 1-2), the reference source is the on board reference/buffer circuit. Moving the shunt on JMP6 to pins 2-3 allows the voltage applied to the ADC (+Vadc) to be used as the reference source.

Chapter 5

EVM Operation

The following section provides information in the analog input, digital control, and general operating conditions of the Modular MSOP8 EVM.

5.1 Analog Input

The analog input source can be applied directly to J1 (top or bottom side) or through optional amplifier and signal conditioning modules. The analog input range is dependent on the configuration of the EVM and the ADC installed at location U1. Consult the datasheet for the device to determine the maximum analog input range.

5.2 Digital Control

The digital control signals can be applied directly to J2 (top or bottom side). The modular MSOP8 EVM can also be connected directly to a DSP or a micro controller interface board, such as the HPA449. See the product folder for the EVM or the installed device for a current list of compatible interface and/or accessory boards.

5.3 Chip Select (Shut Down)

Jumper JMP2 is provided to allow the selection of the signals applied to the chip select (/CS) or shutdown (SHDN) pin of the ADC installed on the EVM. The factory default condition for the EVM is to place a shunt jumper between pins 1-2 of JMP2. This allows the Frame Sync (FS) signal from DSP host systems to be used as a chip select for the ADC. This signal originates from J2.7. When JMP2 is moved to pins 2-3, the /CS (SHDN) signal is applied via J2.1.

5.4 Digital I/O Buffers

Single gate buffers U3, U5 and U6 are provided to ensure the safe operation of the modular MSOP8 EVM with low voltage host controllers. The digital I/O voltage applied to these buffers via JMP3 should be set in accordance with the operating voltage of the host controller.

5.5 Default Jumper Locations

Table 5-1 provides a list of jumpers found on the EVM and their factory default conditions.

Table 5-1. List of Jumpers

Jumper	Shunt Position	Jumper Description
JMP1	Pins 1-2	Controls ADC Supply Voltage (default is +5Va Source)
JMP2	Pins 1-2	Controls ADC /CS(SHDN) Pin (default is FS from DSP Host)
JMP3	Pins 5-6	Controls Digital I/O Voltage (default is +3.3Vd Source)
JMP4	CLOSED	Ties ANALOG and DIGITAL grounds together
JMP5	Pins 1-2	Controls External Ref. Source (default is +2.5V from U2)
JMP6	Pins 1-2	Controls REFERENCE Source to ADC (default is onboard reference/buffer circuit)

Chapter 6

EVM BOM and Schematic

The following table contains a complete bill of materials for the modular MSOP8 EVM bill of materials.

Table 6-1. Bill of Materials

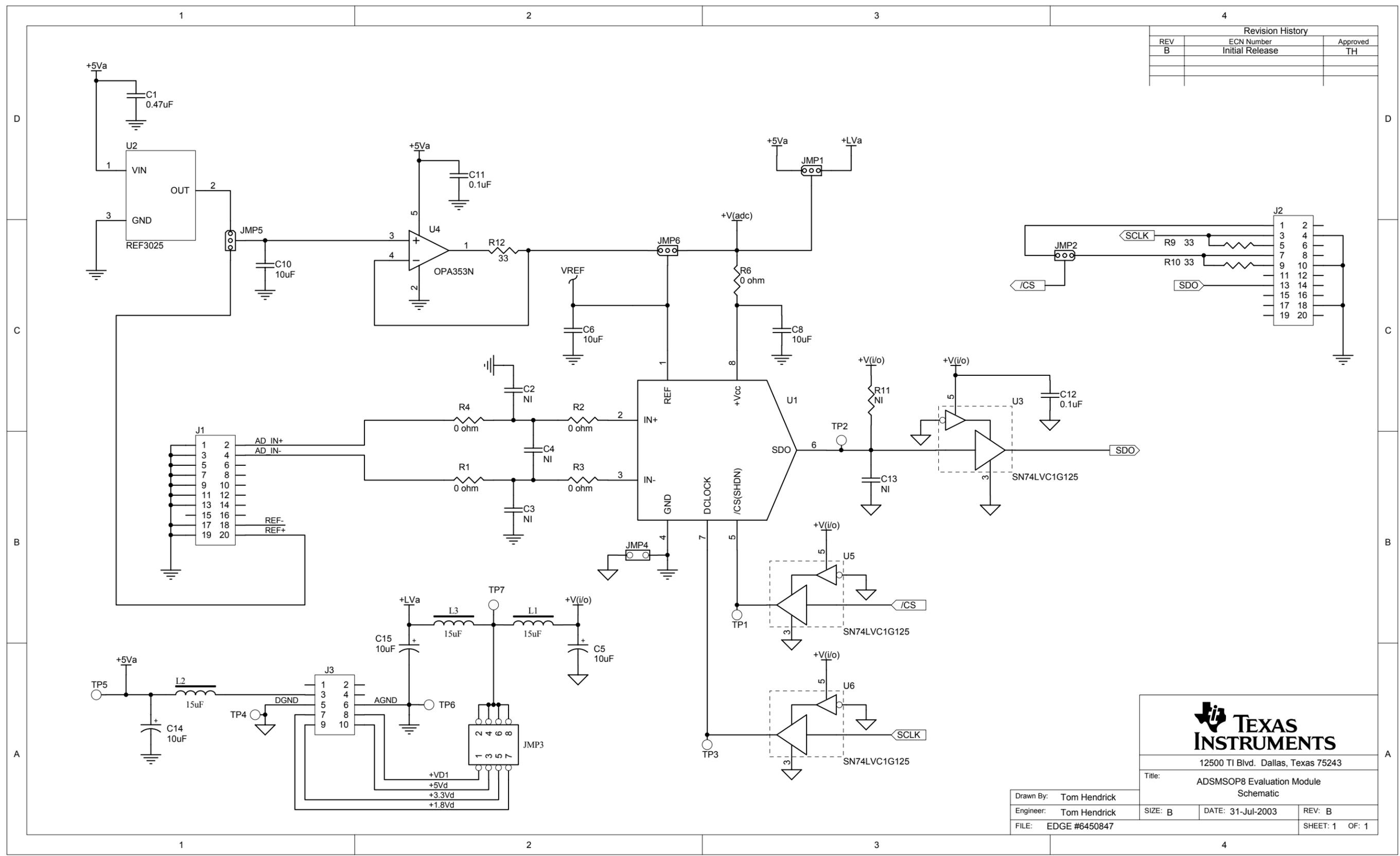| Designators	Description	Manufacturer	Mfg. Part Number
C2 C3 C4 C13	Not Installed		
R11	Not Installed		
C1	0.47 µF, 0805, ceramic, X7R, 25 V, 10%	Panasonic	ECJ-2YB1C474K
C11 C12 C14	0.1 µF, 0805, ceramic, X7R, 50 V, 10%	Panasonic	ECJ-2YB1H104K
C6 C8 C10	10 µF, 1206, ceramic, Y5V, 10 V, 10%	Panasonic	ECJ-3YF1A106Z
C5 C14 C15	10 µF, A case, tantalum, 10 V	Panasonic	ECS-T1AY106R
L1 L2 L3	15 µH inductor, SMT, 1608 Series	Inductors, Inc.	CTDS1608C-153
J1 J2 (top side)	10 Pin, dual row, SMT header (20 [postive)	Samtec	TSM-110-01-T-DV-P
J1B J2B (bottom side)	10 Pin, dual row, SMT socket (20 positive)	Samtec	SSW-110-22-F-D-VS-K
J3 (bottom side)	5 Pin, dual row, SMT socket (10 posotove)	Samtec	SSW-105-22-F-D-VS-K
R9 R10 R12	33 Ω, 0805, 5%, .1W Resistor	Yageo America	9C08052A33R0JLHFT
R1 R2 R3 R4 R6	0 Ω, 0805, 0.1 W resistor	Yageo America	9C08052A0R00JLHFT
TP1 TP2 TP3 TP5 TP7	Red test point loop	Keystone	5001
TP4 TP6	Black test point loop	Keystone	5000
U1	Varies (see Note)		
U2	REF3025	TI	REF3025AIDBZT
U3 U5 U6	SN74LVC1G125	TI	SN74LVC1G125DBVT
U4	OPA353N	TI	OPA353NA/250
JMP1 JMP2 JMP5 JMP6	3 Pin , 2 mm header	Samtec	TMMH-103-C-S-T
JMP3	4 Pin, dual row, TH header (8 positive)	Samtec	TSW-104-07-L-D

Note: The device installed at location U1 is dependent on the EVM ordered. This device is soldered to the board for best performance. U1 may be replaced with any device listed in the EVM compatible device data sheets table found at the beginning of this document.

6.1 EVM Schematic

The schematic diagram is provided as a reference.

+5Va
C1
0.47uF

U2
1 VIN
OUT 2
3 GND
REF3025

JMP5
C10
10uF

+5Va
C11
0.1uF

U4
3 +
1
R12
33
2 –
OPA353N

VREF

JMP6

+V(adc)

+5Va   +LVa
JMP1

R6
0 ohm

C6
10uF

C8
10uF

J2
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20

JMP2

SCLK R9 33
R10 33
/CS
SDO

REF
+Vcc

C2
NI

R4
0 ohm

R2
0 ohm
2 IN+

U1

SDO 6
TP2

+V(i/o)
R11
NI

+V(i/o)
C12
0.1uF

U3
SN74LVC1G125

SDO

C13
NI

J1
1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20

AD IN+
AD IN-

C4
NI

R1
0 ohm

R3
0 ohm
3 IN-

GND DCLOCK /CS(SHDN)

C3
NI

JMP4

REF-
REF+

+V(i/o)
U5
SN74LVC1G125
TP1
/CS

+LVa   TP7
C15
10uF
L3
15uF
L1
15uF
+V(i/o)
C5
10uF

+V(i/o)
U6
SN74LVC1G125
TP3
SCLK

+5Va
TP5
L2
15uF
DGND
AGND TP6
C14
10uF
TP4

J3
1 2
3 4
5 6
7 8
9 10

JMP3
2 4 6 8
1 3 5 7

+VD1
+5Vd
+3.3Vd
+1.8Vd

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Title: ADSMSOP8 Evaluation Module Schematic

Drawn By:	Tom Hendrick			
Engineer:	Tom Hendrick	SIZE: B	DATE: 31-Jul-2003	REV: B
FILE:	EDGE #6450847		SHEET: 1	OF: 1