

Modular MSOP8 EVM

User's Guide

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 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.

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.

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

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

EVM IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation kit being sold by TI is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not considered by TI to be fit for commercial use. As such, the goods being provided may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety measures typically found in the end product incorporating the goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may not meet the technical requirements of the directive.

Should this evaluation kit not meet the specifications indicated in the EVM User's Guide, the kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Please be aware that the products received may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive.**

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.**

Please read the EVM User's Guide and, specifically, the EVM Warnings and Restrictions notice in the EVM User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact the TI application engineer.

Persons handling the product must have electronics training and observe good laboratory practice standards.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

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.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

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

Information About Cautions and Warnings

This book may contain cautions and warnings.

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Related Documentation From Texas Instruments

To obtain a copy of any of the following TI documents, call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center (PIC) at (972) 644-5580. When ordering, identify this booklet by its title and literature number. Updated documents can also be obtained through our website at www.ti.com.

EVM Compatible Device Data Sheets:

ADS7816
ADS7817
ADS7818
ADS7822
ADS7834
ADS7835
ADS8320
ADS8321
ADS8324
ADS8325

Literature Number:

SBAS110
SBAS230
SBAS078
SBAS062
SBAS098
SBAS102
SBAS108
SBAS123
SBAS172
SBAS226

Application Notes/Additional Literature:

Op Amps for Everyone
5-6K Interface Board
Single and Bipolar Supply Signal Conditioning Boards

Literature Number:

SLOD006
SLAU104
SLAU105

Third Party Tools:

HPA449 Development Board (MSP430 Tools)
Speedy 33 (DSP Tools)

Vendor Website:

www.softbaugh.com
www.hyperception.com

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

Contents

1	EVM Overview	1-1
1.1	Features	1-2
1.2	Introduction	1-2
2	Analog Interface	2-1
3	Digital Interface	3-1
4	Power Supplies	4-1
4.1	ADC Power	4-2
4.2	Stand Alone Operation	4-2
4.3	Reference Voltage	4-2
5	EVM Operation	5-1
5.1	Analog Input	5-2
5.2	Digital Control	5-2
5.3	Chip Select (Shut Down)	5-2
5.4	Digital I/O Buffers	5-2
5.5	Default Jumper Locations	5-2
6	EVM BOM and Schematic	6-1
6.1	EVM Schematic	6-2

Tables

2-1	Analog Interface Pin Out	2-1
3-1	Digital Interface Pin Out	3-1
4-1	Power Supply Pin Out	4-1
5-1	List of Jumpers	5-2
6-1	Bill of Materials	6-1

EVM Overview

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

Topic	Page
1.1 Features	1-2
1.2 Introduction	1-2

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	Pins are unused and should be left open for use with future amplifier and sensor input modules.
J1.8	Unused	
J1.10	Unused	
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{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	4-2
4.2 Stand Alone Operation	4-2
4.3 Reference Voltage	4-2

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.

EVM Operation

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

Topic	Page
5.1 Analog Input	5-2
5.2 Digital Control	5-2
5.3 Chip Select (Shut Down)	5-2
5.4 Digital I/O Buffers	5-2
5.5 Default Jumper Locations	5-2

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)

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 μ F, 0805, ceramic, X7R, 25 V, 10%	Panasonic	ECJ-2YB1C474K
C11 C12 C14	0.1 μ F, 0805, ceramic, X7R, 50 V, 10%	Panasonic	ECJ-2YB1H104K
C6 C8 C10	10 μ F, 1206, ceramic, Y5V, 10 V, 10%	Panasonic	ECJ-3YF1A106Z
C5 C14 C15	10 μ F, A case, tantalum, 10 V	Panasonic	ECS-T1AY106R
L1 L2 L3	15 μ H inductor, SMT, 1608 Series	Inductors, Inc.	CTDS1608C-153
J1 J2 (top side)	10 Pin, dual row, SMT header (20 [positive])	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 positive)	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

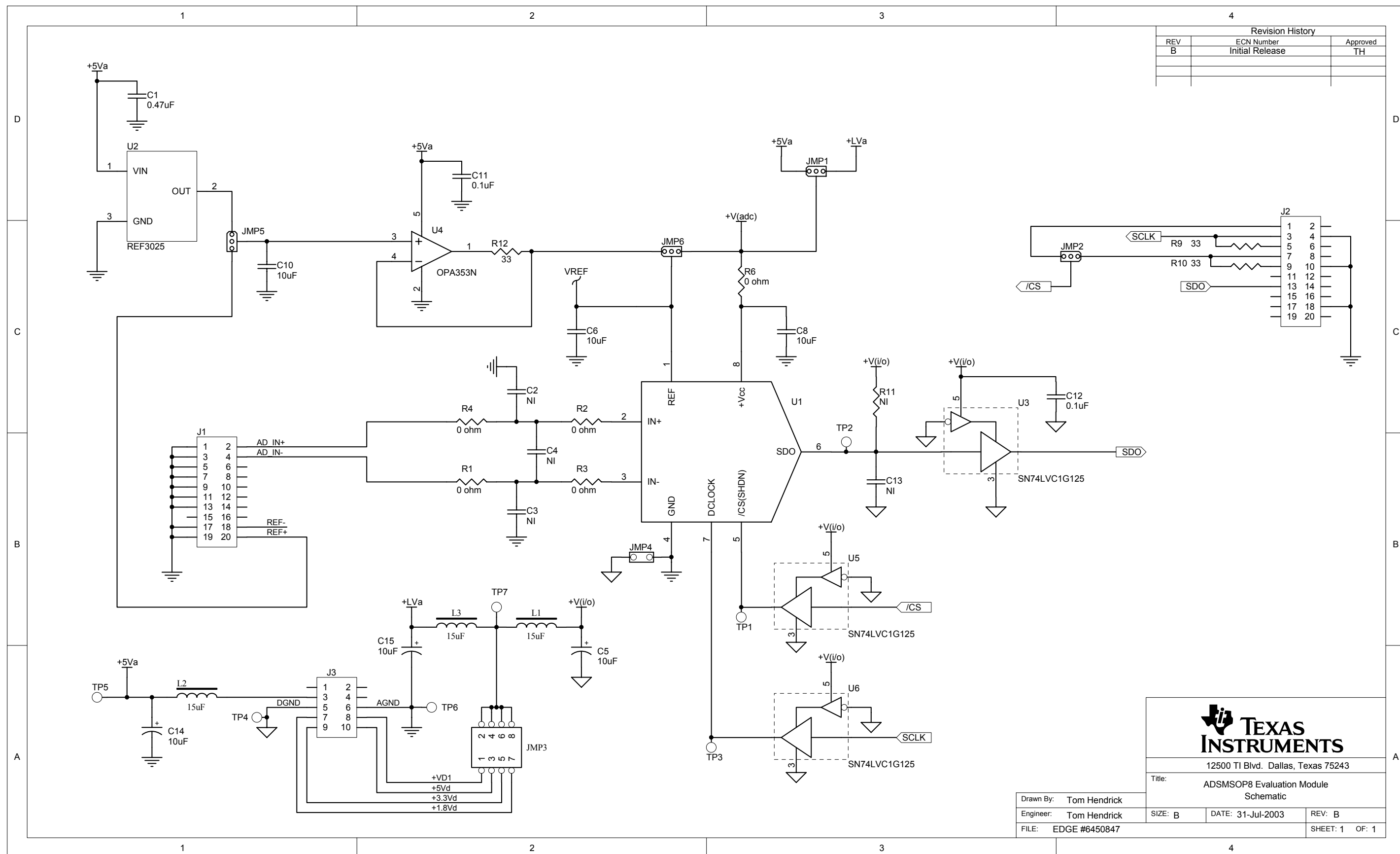
Note: The device installed at location U1 is dependent on the EVM ordered. This device is soldered to the board for best performance. U1 may be replaced with any device listed in the EVM compatible device data sheets table found at the beginning of this document.

Topic	Page
6.1 EVM Schematic	6-2

6.1 EVM Schematic

The schematic diagram is provided as a reference.

Revision History		
REV	ECN Number	Approved
B	Initial Release	TH



TEXAS INSTRUMENTS
 12500 TI Blvd. Dallas, Texas 75243

Title: **ADMSOP8 Evaluation Module Schematic**

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