

ADS8344/45 EVM User's Guide

Contents

1	Introduction	1
2	Analog Interface	2
3	Digital Interface	2
4	Power Supplies	3
5	EVM Operation	3
6	EVM Bill of Materials and Schematic	4
7	Related Documentation from Texas Instruments	5

List of Tables

1	Pinout of the Analog Input Connector, P1	2
2	Pinout of J3	3
3	Factory Default Jumper Locations	4
4	Bill of Materials	4
5	EVM Compatible Device Data Sheets, Users Guides and Additional Resources	5

1 Introduction

The ADS8344 and ADS8345 are complete 16-bit analog-to-digital (A/D) using state-of-the-art CMOS structures. They contain a complete 16-bit, capacitor-based, successive approximation register (SAR) A/D with sample-and-hold, external reference, and a serial data interface. Programmable options allow the use of an internal oscillator or the external serial clock as the conversion clock source.

The EVM is available with either the ADS8344 and ADS8345 installed. The EVM can accommodate the 12-bit ADS7844 by simply removing and replacing the installed device. Samples of the ADS7844 can be obtained through the sample program at Texas Instruments. See the ADS7844 Product Folder for details.

1.1 Features

- Full-featured Evaluation Board for the ADS8344 or ADS8345, serial Analog to Digital Converters
- 5V Analog Input Range
- Built in reference
- High-Speed Serial Interface
- Compatible with the 5-6K Interface Card for use with a variety of DSP Starter Kits as well as the HPA-MCU Interface for use with C2000 and TMS470 processors.
- Field Programmable Gate Array (FPGA) users can evaluate the ADS8344/45 EVM by obtaining the Texas Instruments Analog Adapter Kit from Avnet Design Services (www.em.avnet.com).

2 Analog Interface

For maximum flexibility, the ADS8344/45 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 ten-pin dual row header/socket combination at P1. 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 1 shows the pin out of the analog input connector, J1.

Table 1. Pinout of the Analog Input Connector, P1

Pin Number	Signal	Description
P1.2 thru P1.16 (even)	Analog Input	The eight analog inputs are applied to the even pins of P1. CH7 is configured via jumper W1 to use either the on-board amplifier U1 or the R/C filter combination of R17 and C25.
P1.20	REF(+)J	External reference source input, accessible through W5.
P1.15	REFOUT	Not connected on this EVM
P1.1- P1.19 (odd)	AGND	Analog ground connections.

The analog front-end (AFE) circuitry for channels 0-6 found on the EVM consists of a simple RC filter. When used in combination with the 5-6K Interface Board, the circuits found on both DAP Signal Conditioning Boards (see [SLAU105](#)) provide the level shifting and amplifier configurations to realize single ended or bi-polar mode operation of the analog-to-digital converter installed on the EVM.

2.1 Amplifier Input to CH7

Jumper W1 provides access to an amplifier/buffer circuit on the front end of the data converter. Component U1, an OPA132, is installed on the EVM by default and is configured as a simple voltage follower. Any standard 8 pin SOIC single amplifier component can be installed at this location to explore the tradeoffs of speed and performance when interfacing to the ADC.

The amplifier circuit is connected to the $\pm V_A$ terminals for split supply operation. If single supply amplifiers are used, the $-V_A$ (J3 pin 2) can be tied to analog ground using jumper W4. When used in conjunction with the 5-6K Interface Board, be aware that the $-V_A$ supply is common to all power connectors (JP1 through JP6). Shorting the $-V_A$ supply to ground on the ADS8344/45 EVM is possible only if it is not used elsewhere on the interface board.

3 Digital Interface

The ADS8344/45 EVM is designed for easy interfacing to multiple control platforms. Jumper options are provided on the EVM to allow direct control over the chip select source and the BUSY signal output.

The active low $\overline{CS}$ pin is connected to the center terminal of W8. Pins 1 and 3 of W8 connect to P2 pins 1 and 7 respectively. This allows the $\overline{CS}$ line to be controlled through GPIO functions on the 5-6K Interface Board or the HPA-MCU, as well as through the Frame Sync function of various TI DSP's. For stand alone operation, a shunt jumper can be placed between P2 pins 1 and 2 of W8 to tie $\overline{CS}$ to ground.

The DATA output from the EVM is applied to P2 pin 13. The BUSY output can be applied to either P2.9 or P2.15 to act as an external interrupt to the host processor, or the Frame Sync return input to 5000 and 6000 series DSPs.

3.1 Additional Digital Control and Monitoring

W2 controls the device power down function. Closing W2 applies a logic low to the SHDN pin, shutting down the ADC. W2 can be wired to GPIO output P2 pin 19 for use with the HPA-MCU board.

Wire loops W6 and W8 provide access to the BUSY and $\overline{CS}$ signals respectively. These can be monitored by referencing an oscilloscope to P2.18, which connects to digital ground.

4 Power Supplies

The ADS8344/45 EVM board requires +5V DC for the analog and +3.3 – +5V DC for the digital sections of the board. Power to the ADC is sourced from J3 pin 3. Power for the digital section of the board is sourced from J3 pin 9 or 10 via wire jumper W7. The positive supply voltage to the amplifier at U1, U4 and the reference at U3 are provided via J3 pin 1. The negative supply for amplifier U1 is provided by J3 pin 2.

Note: Use caution when applying power to the EVM.

The following table shows the pin out of J3:

Table 2. Pinout of J3

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

For stand alone operation, power sources can be applied via various test points located on the EVM (VANA to TP2 and VDIG to TP3). Refer to the schematic at the end of this document for details.

Note: While filters are provided for all power supply inputs, optimal performance of the EVM requires a clean, well-regulated power source.

4.1 Reference Voltages

The ADS8344/45 is normally configured to use its on-board reference source. Jumper W5 provides options to allow the EVM user to send the voltage output from U3 or the external reference applied to P1.20 through buffer amplifier U4. U4 is always in circuit – to bypass U4, resistor R7 can be removed from the circuit.

5 EVM Operation

Once power is applied to the EVM, the analog input source can be connected directly to P1 (top or bottom side) or through optional amplifier and signal conditioning modules using the 5-6K Interface Board or HPA-MCU Interface Boards.

The digital control signals can be applied directly to P2 (top or bottom side). The ADS8344/45 EVM can also be connected directly to the 5-6K Interface Board for use with a variety of C5000 and C6000 series DSP Starter Kits (DSK). The analog and digital input connectors are designed to allow pattern generators and/or logic analyzers to be connected to the EVM using standard ribbon type cables on 0.1" centers.

No specific evaluation software is provided with this EVM, however, various code examples are available that show how to use this EVM with a variety of digital signal processors from Texas Instruments. Check the product folders or send e-mail to dataconvapps@list.ti.com for a listing of available code examples. The EVM Gerber files are available on request.

Table 3 shows the factory default jumper locations for the ADS8344/45 EVM:

Table 3. Factory Default Jumper Locations

Jumper	Function	Default Condition
W1	Controls application of the applied analog signal to CH7	1–2
W2	Controls application of the DC level to SHDN pin	Open
W3	Controls application of the applied +VA to input amplifier	1–2
W4	Controls application of the applied -VA to input amplifier	1–2
W5	Controls the application of the reference voltage	1–2
W6	Controls the output location of the BUSY signal - INT (default) or FSR	1–2
W7	Controls the application of digital I/O voltage	1–2
W8	Controls the application of the /CS Source	1–2

6 EVM Bill of Materials and Schematic

Table 4 contains a complete Bill of Materials for the ADS8344/45EVM. The schematic diagram is also provided for reference.

Table 4. Bill of Materials

Designators	Description	Manufacturer	Mfg. Part Number
C1 C2 C3 C13 C14 C15 C16 C18 C21 C26	0.1μF, Ceramic, X7R, 25V	TDK	C2012X7R1E104K
C4 C6 C11 C12 C19 C20	10μF, Ceramic, 0805, 16V	Murata	GRM21BR61C106KE15L
C7 C8 C9 C10 C22 C23 C24 C25	680 pF, Ceramic, 0603, 50V	TDK	C1608C0G1H681J
C17	0.47μF, Ceramic, 0603, X5R, 10V	TDK	C1608X5R1A474K
C27	22μF, Ceramic, 0805, Y5V, 6.3V	TDK	C2012Y5V0J226Z
C28	0.01μF, Ceramic, 0805, COG, 16V	AVX	0805YA103JAT2A
C5	Not Installed		
P1 P2 (top side)	10 pin, dual row, SMTheader (20 pos.)	Samtec	TSM-110-01-T-DV-P
J1 J2 (bottom side)	10 pin, dual row, SMT socket (20 pos.)	Samtec	SSW-110-22-F-D-VS-K
J3 (bottom side)	5 pin, dual row, SMT socket (10 Pos.)	Samtec	SSW-105-22-F-D-VS-K
FB1 FB2 FB3 FB4	Ferrite Chip, 120 Ω, 200mA, 1206	TDK	MZA3216D121C
R2 R8	0Ω, 0603	Yageo America	9C06031A0R00JLHFT
R3 R4 R5 R6 R14 R15 R16 R17	200 Ω, 0603, 5%	Yageo America	9C06031A2000JLHFT
R7	100 Ω, 0603, 5%	Yageo America	9C06031A1000JLHFT
R9 R20 R21	10K Ω, 0603, 5%	Yageo America	9C06031A1002JLHFT
R10 R11 R12	1K Ω, 0603, 5%	Yageo America	9C06031A1001JLHFT
R13 R22 R23	10 Ω, 0603, 5%	Yageo America	9C06031A10R0JLHFT
R18 R19	0 Ω, 0603 - Depending on U2 - See the Schematic	Yageo America	9C06031A0R00JLHFT
TP1 TP2	Black test point loop	Keystone	5001
U1	OPA132	TI	OPA132U
U2	ADS8344 or ADS8345	TI	ADS8344E or ADS8345E
U3	REF3240	TI	REF3240AIDBVR
U4	OPA364	TI	OPA364AIDBVR

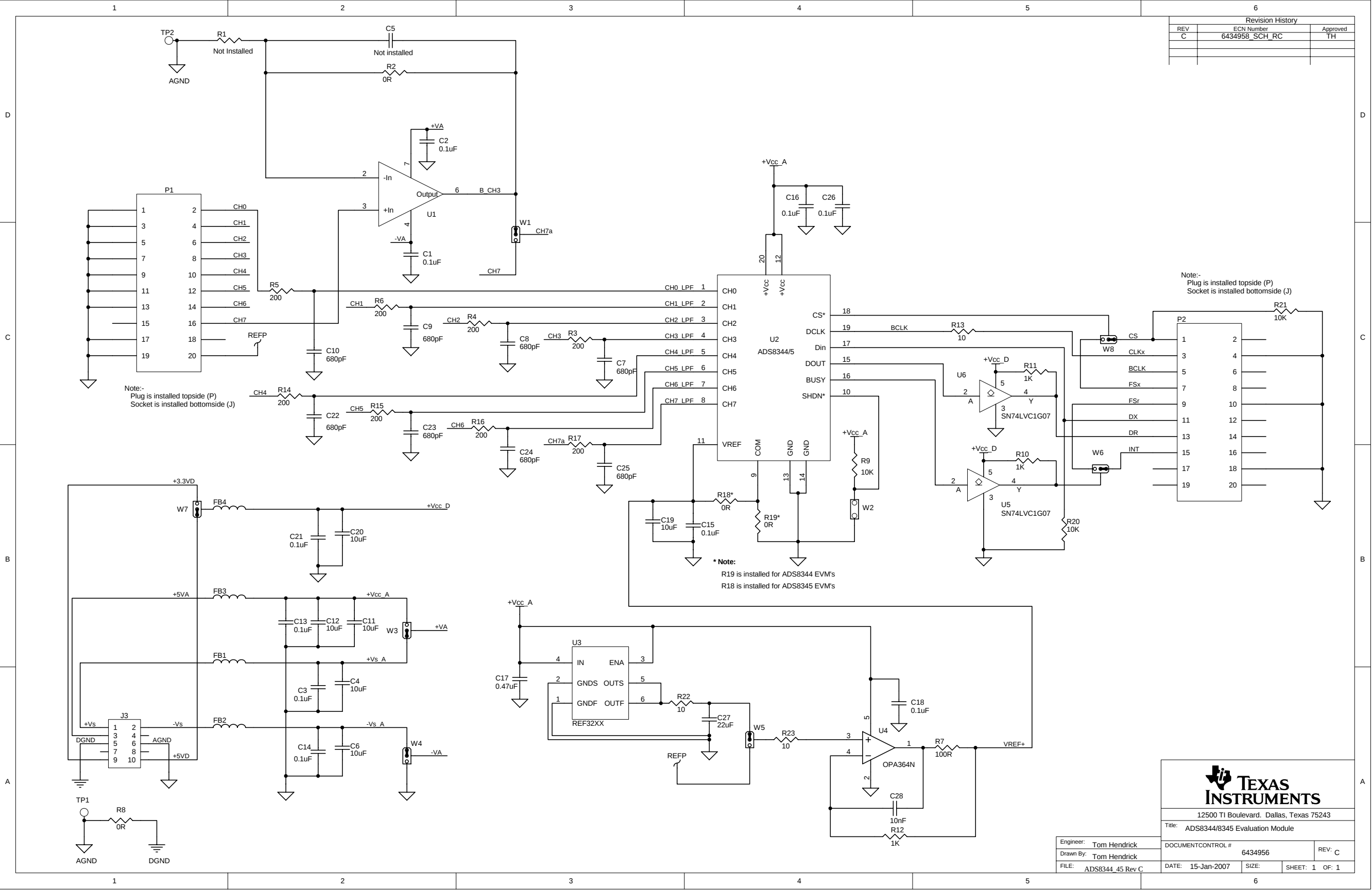
Table 4. Bill of Materials (continued)

Designators	Description	Manufacturer	Mfg. Part Number
U5 U6	SN74LVC1G07	TI	SN74LVC1G07DBVR
W1 W3 W4 W5 W6 W7 W8	3 pin , 0.1" header	Samtec	TSW-103-07-L-S
W2	2 pin , 0.1" header	Samtec	TSW-102-07-L-S

7 Related Documentation from Texas Instruments

Table 5. EVM Compatible Device Data Sheets, Users Guides and Additional Resources

Data Sheet	Literature Number
ADS8344	SBAS139
ADS8345	SBAS177
ADS7844	SBAS100
Users Guides	Literatuare Number
5-6K Interface Board	SLAU104
DAP Signal Conditioning Boards	SLAU105
Additional Resources	Literature Number
Op Amps for Everyone	SLOD006



EVALUATION BOARD/KIT IMPORTANT NOTICE

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

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. Persons handling the product(s) must have electronics training and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards. This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/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. 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 User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please contact the TI application engineer or visit www.ti.com/esh.

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.

FCC Warning

This evaluation board/kit is intended for use for **ENGINEERING DEVELOPMENT, DEMONSTRATION, OR EVALUATION PURPOSES ONLY** and is not considered by TI to be a finished end-product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to 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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 15 V and the output voltage range of 0 V to 5 V.

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 60°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
Copyright © 2007, Texas Instruments Incorporated

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	
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
RFID	www.ti-rfid.com	Telephony	www.ti.com/telephony
Low Power Wireless	www.ti.com/lpw	Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated