ADS8401/ADS8405/ADS8411EVM User's Guide

This user's guide describes the characteristics, operation, and use of the ADS8401/ADS8405/ADS8411 16-bit parallel analog-to-digital converter evaluation board. A complete circuit description, as well as schematic diagram, layout, and bill of materials, are included.

Contents

1 EVM Overview 2
2 Digital Interface 4
3 Power Supplies 5
4 Using the EVM 6
5 Related Documentation From Texas Instruments 7
Appendix A ADS8401EVM/ADS8405EVM/ADS8411EVM BOM 8
Appendix B ADS8401/ADS8405/ADS8411EVM Layout 10
Appendix C ADS8401/ADS8405/ADS8411EVM Schematic 14

List of Figures

1 ADS8411 Input Buffer Circuit 3
2 Decoding Control Signals Using the Address Bus 7
B-1 Toplayer – Layer 1 10
B-2 Ground Plane – Layer 2 11
B-3 Power Plane – Layer 3 12
B-4 Bottom Layer – Layer 4 13

List of Tables

1 Analog Input Connector 2
2 Pad Jumper Setting 3
3 Parallel Control Connector P2 4
4 Pin Jumper Setting for Decoder Outputs 4
5 Data Bus Connector P3 4
6 Pinout for Converter Control Connector J3 5
7 Power Supply Test Points 5
8 Power Connector, J1, Pin Out 6
A-1 Bill of Materials 8

1 EVM Overview

1.1 Features

- Full-Featured evaluation board for the high speed SAR type ADS8401, ADS8405, and ADS8411 16-bit, single channel, parallel interface analog-to-digital converters.
- On board signal conditioning
- On board reference
- Input and output digital buffers
- On board decoding for stacking multiple EVMs

1.2 Analog Interface

The ADS8401, ADS8405, and ADS8411 analog-to-digital converters have both a positive and negative analog input pin. The EVM gives the provision to ground the negative input close to the device via SJP3, or to wire in a user ground. The negative input pin, which has a range of –200 mV up to 200 mV, arrives shorted to ground on the EVM via SJP3. A signal to the positive input pin can be applied at connector P1 pin 2 (shown in Table 1) or at center pin of SMA connector J2.

Table 1. Analog Input Connector

Connector.Pin#[(1)]	Signal	Description
P1.2	+IN	Non-inverting input channel
P1.4	Reserved	
P1.6	Reserved	
P1.8	Reserved	
P1.10	Reserved	
P1.12	Reserved	
P1.14	Reserved	
P1.16	Reserved	
P1.18	Reserved	
P1.20	REF+	External reference input

(1) All odd numbered pins of P1 are tied to AGND.

1.3 Signal Conditioning

The factory recommends the analog input to any SAR type converter be buffered and low pass filtered. This input buffer on the ADS8411/ADS8405/ADS8401EVM utilizes the THS4031 configured as an INVERTING gain of one, as shown in Figure 1. It is important to note the amplifier is not stable at a gain of one, thus, it is configured in for inverting gain of one. The THS4031 was selected for its low noise, high slew rate and fast settling time. The low pass filter resistor and capacitor values are selected such that ADS8411/ADS8405/ADS8401EVM meets the 100 kHz ac performance specifications listed in the data sheet. The series resistor works in conjunction with the capacitor to filter the input signal, and isolates the amplifier from the large capacitive load. The capacitor to ground at the input of the A/D works in conjunction with the series resistor to filter the input signal, and acts like a charge reservoir. This external filter capacitor works with the amplifier to charge the internal sampling capacitor during sampling mode.

The EVM has a provision to offset the input voltage by adjusting a 10 kΩ potentiometer (R25).

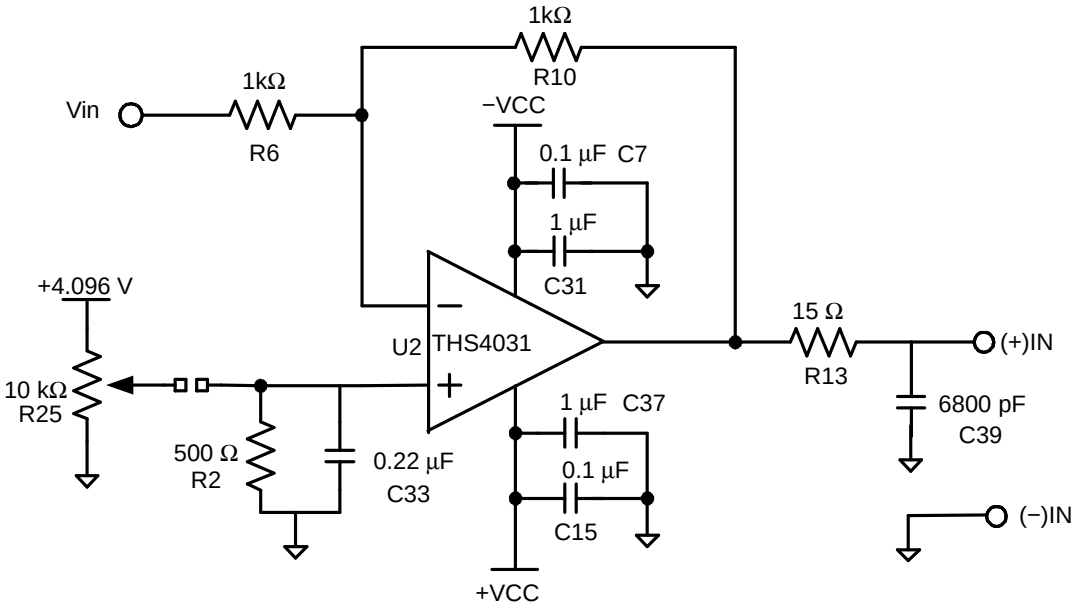


Figure 1. ADS8411 Input Buffer Circuit

1.4 Reference

The ADS8401/ADS8405/ADS8411EVM allows users to select from three different reference sources. It provides an onboard 4.096-V reference circuit. Allows for the user to supply a user reference voltage via connector P1 pin 20 or select the on-chip reference voltage. The user reference voltage and onboard reference voltages can be filtered by installing amplifier U1. The ADS8401, ADS8405, and ADS8411 analog-to-digital converters have a integrated onboard reference buffer; therefore, it is not necessary to buffer the voltage externally. The reference buffer (U1)circuit on the EVM is not populated with an amplifier for this reason. The EVM comes installed with on-chip internal reference shorted directly to the reference pin of the converter.

The EVM allows users to select from three reference sources via solder jumper pads SJP1, SJP2, and SJP3. Set SJP1, SJP2, and SJP3 to select from the three reference voltage sources. See Table 2 for jumper settings. See Appendix C for the full schematic.

Table 2. Pad Jumper Setting

Reference Designator	Description	Jumper Setting	
		1–2	2–3
SJP1	Select REF3040 output for reference voltage	Installed(1)	Not installed
	Select buffered reference voltage	Not installed	Installed
SJP2	Select internal A/D 4.096 V reference	Installed(1)	Not installed
	Select U3, REF3040, as 4.096 V reference	Not installed	Installed
SJP3	Short (–) IN pin to ground	Installed(1)	N/A
SJP4	Buffered REF3040 reference voltage	Installed(1)	Not installed
	Buffer user supplied reference voltage via P1 pin 20	Not installed	Installed
SJP5	Apply offset voltage to A/D buffer	Not installed	N/A
SJP6	Set negative rail of amplifier U1 to ground	Installed	Not installed
	Set negative rail of amplifier U1 to $-V_{CC}$	Not installed	Installed
SJP7	Set negative supply of amplifier U2 to ground	Installed	Not installed
	Set negative supply of amplifier U2 to $-V_{CC}$	Not installed	Installed(1)

(1) Factory set conditioin

2 Digital Interface

The ADS8411/ADS8405/ADS8401EVM is designed for easy interfacing to multiple platforms. Samtec plug and socket connectors provide a convenient dual row header/socket combination at P1, P2 and P3 to plug into prototype boards or ribbon cables. Consult Samtec at www.samtec.com or 1-800-SAMTEC-9 for a variety of mating connector options.

Table 3. Parallel Control Connector P2

Connecator.Pin[1]	Signal	Description
P2.1	$\overline{DC_CS}$	Daughter card Board Select pin
P2.3		
P2.5		
P2.7	A0	Address line from processor
P2.9	A1	Address line from processor
P2.11	A2	Address line from processor
P2.13		
P2.15		
P2.17		
P2.19	BUSY	Busy signal from converter. W4 must be shorted.

(1) All even numbered pins of P2 are tied to DGND

Read ($\overline{RD}$), conversion start ($\overline{CONVST}$), and reset ($\overline{RESET}$) signals to the converter can be assigned to two different addresses in memory via jumper settings. This allows for the stacking of up to two ADS8401EVM, ADS8405EVM and/or ADS8411EVMs into processor memory. See Table 4 for jumper settings. Note that the evaluation module does not allow the chip select ($\overline{CS}$) line of the converter to be assigned to different memory locations. It is, therefore, suggested the $\overline{CS}$ line be grounded or wired to an appropriate signal of the processor.

Table 4. Pin Jumper Setting for Decoder Outputs

Reference Designator	Description	Jumper Setting	
		1–2	2–3
W1	Set A[2..0] = 0x1 to generate $\overline{RD}$ pulse	Installed[1]	Not installed
	Set A[2..0] = 0x2 to generate $\overline{RD}$ pulse	Not installed	Installed
W2	Set A[2..0] = 0x3 to generate $\overline{CONVST}$ pulse	Installed[1]	Not installed
	Set A[2..0] = 0x4 to generate $\overline{CONVST}$ pulse	Not installed	Installed
W3	Set A[2..0] = 0x5 to generate $\overline{RESET}$ pulse	Installed[1]	Not installed
	Set A[2..0] = 0x6 to generate $\overline{RESET}$ pulse	Not installed	Installed
W4	Short busy signal to P2 pin 19	Installed[1]	N/A

(1) Factory set conditioin

The data bus is available at connector P3. See Table 5 for pin out information.

Table 5. Data Bus Connector P3

Connector.Pin[1]	Signal	Description
P3.1	D0	Buffered Data Bit 0 (LSB)
P3.3	D1	Buffered Data Bit 1
P3.5	D2	Buffered Data Bit 2

(1) All even numbered pins of P3 are tied to DGND.

Table 5. Data Bus Connector P3 (continued)

Connector.Pin[(1)]	Signal	Description
P3.7	D3	Buffered Data Bit 3
P3.9	D4	Buffered Data Bit 4
P3.11	D5	Buffered Data Bit 5
P3.13	D6	Buffered Data Bit 6
P3.15	D7	Buffered Data Bit 7
P3.17	D8	Buffered Data Bit 8
P3.19	D9	Buffered Data Bit 9
P3.21	D10	Buffered Data Bit 10
P3.23	D11	Buffered Data Bit 11
P3.25	D12	Buffered Data Bit 12
P3.27	D13	Buffered Data Bit 13
P3.29	D14	Buffered Data Bit 14
P3.31	D15	Buffered Data Bit 15 (MSB)

This evaluation module provides direct access to all the analog-to-digital converter control signals via connector J3, see Table 6.

Table 6. Pinout for Converter Control Connector J3

Connector.Pin[(1)]	Signal	Description
J3.1	$\overline{CS}$	Chip select pin, active low
J3.3	$\overline{RD}$	Read pin, active low
J3.5	$\overline{CONVST}$	Convert start pin, active low
J3.7	BYTE	BYTE mode pin, used for 8-bit buses
J3.9	$\overline{RESET}$	Reset pin, active low
J3.11	BUSY	Converter status output. High when a conversion is in process.

(1) All even numbered pins of J3 are tied to DGND.

3 Power Supplies

The EVM accepts four power supplies.

- A dual ±Vs dc supply for the dual supply op amps. Recommend ±12 VDC supply.
- A single +5 V dc supply for analog section of the board (A/D + Reference).
- A single +5 V or +3.3 V dc supply for digital section of the board (A/D + address decoder + buffers).

The two ways to provide these voltages are as follows:

1. Wire in voltages at test points on the EVM. See Table 7.

Table 7. Power Supply Test Points

Test Point	Signal	Description
TP11	+BVDD	Apply +3.3 VDC or +5 VDC. See respective ADC data sheet for full range.
TP10	+AVCC	Apply +5 VDC
TP12	+VA	Apply +12.0 VDC. Positive supply for amplifier.
TP14	–VA	Apply –12.0 VDC. Negative supply for amplifier.

2. Use the power connector J1, and derive the voltages elsewhere. See Table 8 for the pinouts for this connector.

Table 8. Power Connector, J1, Pin Out

Signal	Power Connector – J1		Signal
+VA (+12VA)	1	2	–VA (–12VA)
+AVCC (+5VA)	3	4	N/C
N/C	5	6	AGND
N/C	7	8	N/C
N/C	9	10	+BVCC (+5VD)

4 Using the EVM

The ADS8401/ADS8405/ADS8411EVM serves three functions:

1) a reference design
2) a prototype board
3) a test platform for the software engineer to develop code.

As a reference design, the ADS8401/ADS8405/ADS8411EVM contains the essential circuitry to showcase the analog-to-digital converter. This essential circuitry includes the input amplifier, reference circuit, and buffers. The EVM analog input circuit is optimized for 100 kHz sine wave, therefore users may need to adjust the resistor and capacitor values of the A/D input RC circuit. In AC type applications where signal distortion is concern, polypropylene capacitors should be used in the signal path. In applications where the input is multiplexed, the A/D input resistor and capacitor may need to be adjusted or possibly removed altogether.

As a prototype board, the buffer circuit consists of footprint is a standard 8–pin SOIC and resistor pads for inverting and non-inverting configurations. The ADS8401/ADS8405/ADS8411EVM can be used to evaluate both dual and single supply amplifiers. The EVM comes installed with a dual supply amplifier as it allows the user to take advantage of the full input voltage range of the converter. For applications that require signal supply operation and smaller input voltage range, the THS4031 can be replaced with the single supply amplifier like OPA300 or OPA355. Pad jumper SJP7 should be shorted between pads 1 and 2, as it shorts the minus supply pin of the amplifier to ground. Positive supply voltage can be applied via test pint TP12 or connector J1 pin 1.

As a software test platform, connectors P1, P2 and P3 plug into the parallel interface connectors of the 5-6K interface card. The 5-6K interface card sits on the C5000 and C6000 Digital Signal Processor starter kit (DSK). The ADS8401/ADS8405/ADS8411EVM is then mapped into the processor's memory space. This card also provides an area for signal conditioning. This area can be used to install application circuit(s) for digitalization by the ADS8401, ADS8405 or ADS8411 analog-to-digital converter. Refer to the 5-6K interface card user's guide (SLAU104) for more information.

For the software engineer the ADS8401/ADS8405/ADS8411EVM provides a simple platform for interfacing to the converter. The EVM provides standard 0.1 inch headers and sockets to wire into prototype boards. The user need only provide in 3 address lines (A2, A1, A0) and address valid line ($\overline{DC_CS}$) to connector P2, as shown in Figure 2. To choose which address combinations will generate $\overline{RD}$, $\overline{CONVST}$, and $\overline{RESET}$ set jumpers as shown in Table 4. Recall chip select ($\overline{CS}$) signal is not memory mapped or wired to P2, therefore it must be controlled via general purpose pin or shorted to ground at J3 pin 1. If address decoding is not required, the EVM provides direct access to converter data bus and control I/O via connectors P3 and J3, respectively.

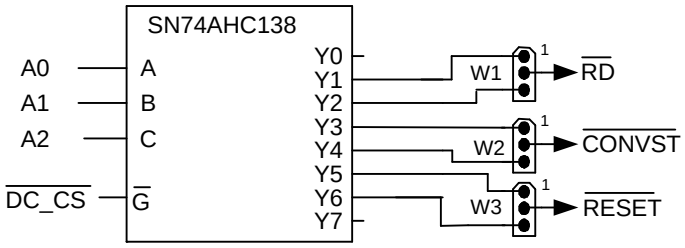


Figure 2. Decoding Control Signals Using the Address Bus

5 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.

Data Sheets	Literature Number:
ADS8401	SLAS376
ADS8405	SLAS427
ADS8411	SLAS369
THS4031	SLOS224
OPA627	SBOS165
REF3040	SBVS032
SN74AHC138	SCLS258
SN74AHC245	SCLS230

Appendix A ADS8401EVM/ADS8405EVM/ADS8411EVM BOM

Table A-1 contains a complete bill of materials for the ADS8401/ADS8405/ADS8411EVM. The schematic diagram is provided in Appendix C. Contact the Product Information Center or e-mail dataconvapps@list.ti.com for questions regarding this EVM.

Table A-1. Bill of Materials

Item No.	QTY	Value	Reference Designators	MFG	MFG. Part No.	Description
1	1	0 Ω	R24	Panasonic - ECG or alternate	ERJ-3GEY0R00V	Resistor, 0 Ω, 1/16 W, 5%, 0603 SMD
2	1	15 Ω	R1	Panasonic - ECG or alternate	ERJ-6ENF15R0V	Resistor, 15 Ω, 1/10 W, 1%, 0805 SMD
		0	R1(1)	Panasonic - ECG or alternate	ERJ-6GEY0R00V	Resistor 0 Ω, 805
3	1	49.9 Ω	R8	Panasonic - ECG or alternate	ERJ-8ENF49R9V	Resistor, 49.9 Ω, 1/8 W, 1%, 1206 SMD
4	1	NI	R11	Not installed	Not installed	
5	1	5 Ω	R13	Yageo America or alternate	9C08052A4R99FKHFT	Resistor, 4.99 Ω, 1/8 W, 1%, 0805 SMD
		15 Ω	R13(1)	Panasonic - ECG or alternate	ERJ-6ENF15R0V	Resistor, 15 Ω, 1/10W, 1%, 0805 SMD
6	1	75 Ω	R21	Panasonic - ECG or alternate	ERJ-6ENF75R0V	Resistor, 75 Ω, 1/10 W, 1%, 0805 SMD
7	1	100 Ω	R14	Panasonic - ECG or alternate	ERJ-6ENF1000V	Resistor, 100 Ω, 1/10 W, 1%, 0805 SMD
8	1	200 Ω	R4	Panasonic - ECG or alternate	ERJ-6ENF2000V	Resistor, 200 Ω, 1/10 W, 1%, 0805 SMD
9	1	499 Ω	R2	Panasonic - ECG or alternate Panasonic - ECG or alternate	ERJ-6ENF4990V	Resistor, 499 Ω, 1/10 W, 1%, 0805 SMD
10	2	1 kΩ	R6 R10	Panasonic - ECG or alternate	ERJ-6ENF1001V	Resistor, 1 kΩ, 1/10 W, 1%, 0805 SMD
11	5	10 kΩ	R16, R17, R18, R19, R20	Panasonic - ECG or alternate	ERJ-3EKF1002V	Resistor, 10 kΩ, 1/16 W, 1%, 0603 SMD
12	4	1 nF	C3, C5, C11, C23	TDK Corporation or alternate	C3216C0G1H102JT	Capacitor, 1000 pF, 50 V, ceramic, NPO 1206
13	1	4700 pF	C39	WIMA	MKP2 4700/630/5	Capacitor, 4700 pF, polypropylene
		6800 pF	C39(1)	WIMA	MKP2 6800/100/1	Capacitor, 6800 pF, polypropylene
14	10	0.01 µF	C13, C21, C38, C41, C44, C46, C48, C53 C50, C56	TDK Corporation or alternate	C1608X7R1H103JT	Capacitor, 10000 pF, 50 V, ceramic, X7R 0603
15	3	0.01 µF	C10, C18, C20	TDK Corporation or alternate	C2012X7R1H103KT	Capacitor, 10000 pF, 50 V, ceramic, X7R 0603
16	14	0.1 µF	C8, C25, C34, C40, C42, C43, C47, C51, C52, C54, C55, C57, C58, C62	TDK Corporation or alternate	C1608X7R1E104KT	Capacitor, 0.1 µF, 25 V, ceramic, X7R 0603
17	7	0.1 µF	C7, C9, C15, C22, C32, C36, C45	TDK Corporation or alternate	C2012X7R1H104JT	Capacitor, 0.10 µF, 50 V, ceramic, X7R 0805
18	2	0.01 µF	C4, C26	TDK Corporation or alternate	C3216X7R1H103JT	Capacitor, 10000 pF, 50 V, ceramic, X7R 1206
19	1	0.22 µF	C33	TDK Corporation or alternate	C2012X7R1C224KT	Capacitor, 0.22 µF, 16 V, ceramic, X7R 0805
20	4	1 µF	C31, C37, C59, C60	TDK Corporation or alternate	C2012X7R1E105KT	Capacitor,ceramic, 1 µF, 25 V, X7R 0805 T/R
21	2	1 µF	C2, C28	TDK Corporation or alternate	C3216X7R1E105KT	Capacitor, 0.1 µF, 25 V, ceramic, X7R 1206

(1) This part is to be used with the ADS8411EVM only.

Table A-1. Bill of Materials (continued)

Item No.	QTY	Value	Reference Designators	MFG	MFG. Part No.	Description
22	4	10 µF	C1, C6, C12, C19	TDK Corporation or alternate	C3216X5R1C106MT	Capacitor, 10 µF, 16 V, ceramic, X5R 1206
23	3	10 µF	C14, C24, C49	Kemet or alternate	T491B106K016AS	Capacitor, tantalum, 10 µF, 16 V, 10%, SMT
24	1	22 µF	C17	TDK Corporation or alternate	C3216X5R0J226MT	Capacitor, 22 µF, 6.3 V, ceramic, X5R 1206
25	2	47 µF	C27, C29	Kemet or alternate	T491B476M010AS	Capacitor, tantalum, 47 µF, 10 V, 20%, SMT
26	2	NI	C16, R3	Not installed	Not installed	
27	5	NI	C30, C35, C61, C63, R5	Not installed	Not installed	Chip resistor, 1/10 W, 0805
28	1	10 kΩ	R25	Bourns	3214W-1-103E	Trimpot, 10 kΩ, 4 mm top ADJ SMD
29	2	1 kΩ	RP1, RP3	CTS Corporation	742C163102JTR	Resistor array, 1 kΩ, 16 terminal, 8 resistor, SMD
30	1	100 Ω	RP2	CTS Corporation	742C163101JTR	Resistor array, 100 Ω, 16 terminal, 8 resistor, SMD
31	4	BLM21AJ601SN1L	L1, L2, Lc, L4	TDK Corporation or alternate	MPZ2012S601AT	Chip ferrite beads, 600 Ω at 100 MHz
32	1	OPA627	U1	Not installed	Not installed	
33	1	THS4031	U2	Texas Instruments	THS4031IDR	Amplifier, 100-MHz, low-noise, high-speed
34	1	REF3040	U3	Texas Instruments	REF3040AIDBZT	REF3040, 50 ppm/°C, 50 µA in SOT23-3 CMOS voltage reference
35	1	ADS8401	U4	Texas Instruments	ADS8401IPFBT	ADS8401, 16 bit, 1.25 MSPS
		ADS8405	U4(2)	Texas Instruments	ADS8405IPFBT	ADS8405, 16 bit, 1.25 MSPS
		ADS8411	U4(1)	Texas Instruments	ADS8411IPFBT	ADS8411, 16 bit, 2 MSPS
36	3	SN74AHC245PWR	U5, U6, U7	Texas Instruments	SN74AHC245PWR	Octal bus transceiver, 3-state
37	1	SN74AHC138PWR	U8	Texas Instruments	SN74AHC138PWR	3-line to 8-line decoder/demultiplexer
38	1	SOIC-8	U9	Not installed	Not installed	
39	1	5X2X.1	J1	Samtec Samtec	SSW-105-22-S-D-VS TSM-105-01-T-D-V-P	0.025" SMT socket - bottom side of PWB 0.025" SMT plug - top side of PWB
40	1	SMA_PCB_MT	J2	Johnson Components Inc.	142-0701-301	Right angle SMA connector
41	1	6X2X.1	J3	Samtec Samtec	SSW-106-22-S-D-VS TSM-105-01-T-D-V-P	0.025" SMT socket - bottom side of PWB 0.025" SMT plug - top side of PWB
42	2	10X2x.1	P1, P2	Samtec Samtec	SSW-110-22-S-D-VS TSM-110-01-T-D-V-P	0.025" SMT socket - bottom side of PWB 0.025" SMT plug - top side of PWB
43	1	16X2X.1_SMT_ PLUG_ &_SOCKET	P3	Samtec Samtec	SSW-116-22-S-D-VS TSM-116-01-T-D-V-P	0.025" SMT socket - bottom side of PWB 0.025" SMT plug - top side of PWB
44	1	SW-PB	S1	Panasonic	EVQ-PJU04K	Switch
45	2		SJP2, SJP3, SJP5	Not installed	Not installed	Pad 2 position jumper
46	5		SJP1, SJP2, SJP3, SJP4, SJP6, SJP7	Not installed	Not installed	Pad 3 position jumper
47	2	2POS_JUMPER	W4, W5	Samtec	TSW-102-07-L-S	2 Positiion jumper, 0.1" spacing
48	3	3POS_JUMPER	W1, W2, W3	Samtec	TSW-103-07-L-S	3 Positiion jumper, 0.1" spacing
49	14	TP_0.025	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14	Keystone Electronics	5000K-ND	Test point - Single, 0.025" pin

(2) This part is to be used with the ADS8405EVM only.

Appendix B ADS8401/ADS8405/ADS8411EVM Layout

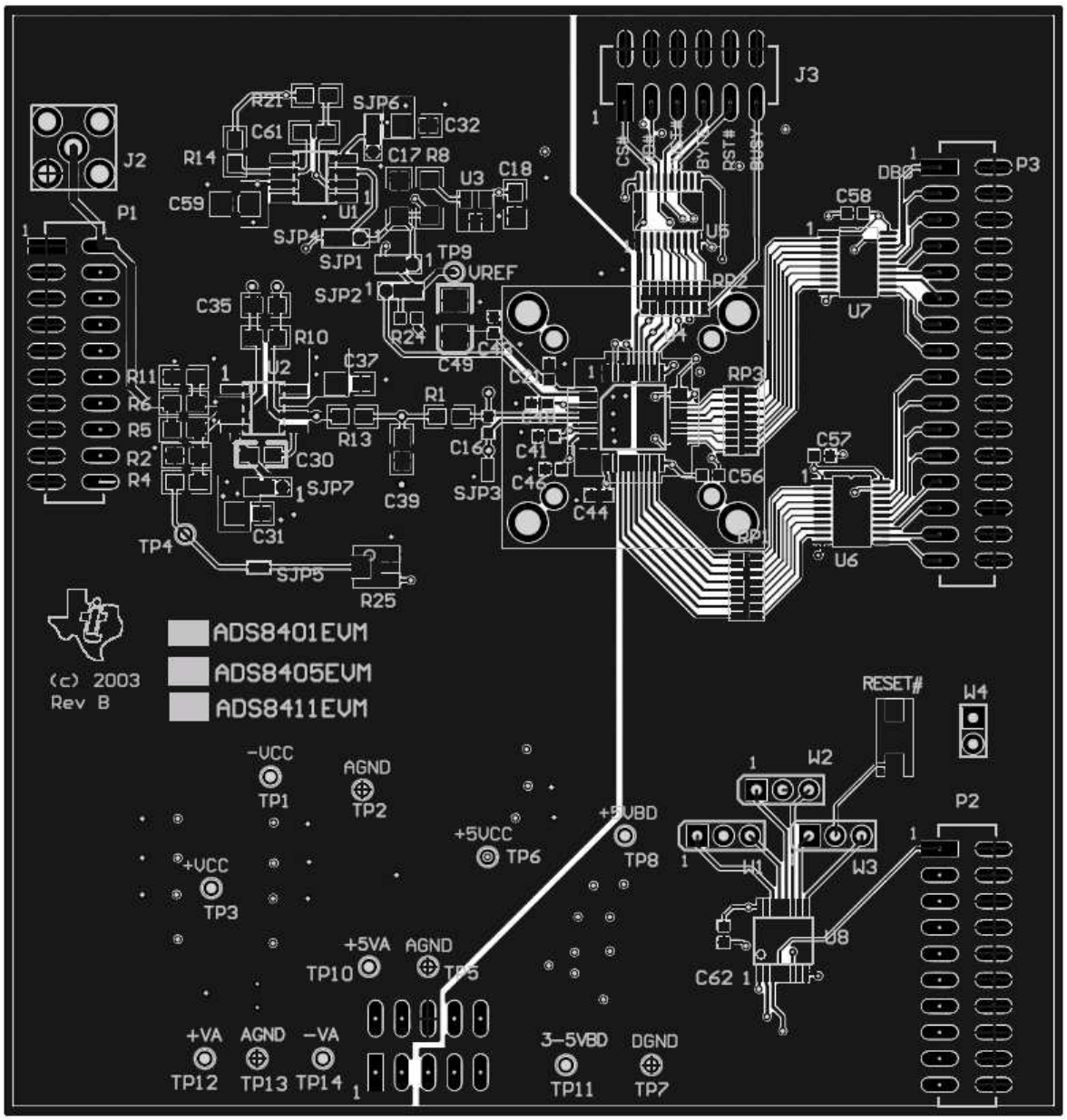


Figure B-1. Toplayer – Layer 1

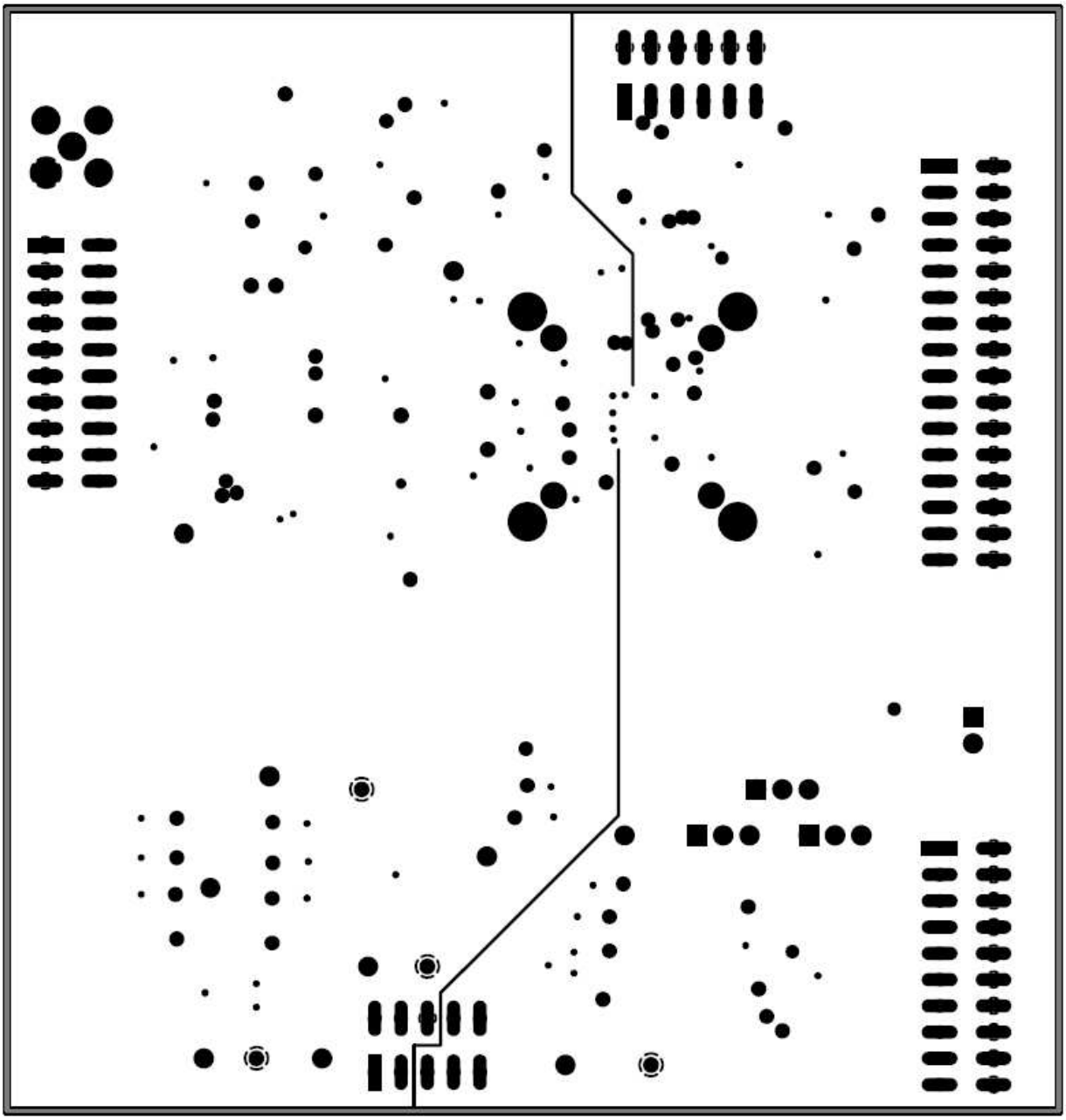


Figure B-2. Ground Plane – Layer 2

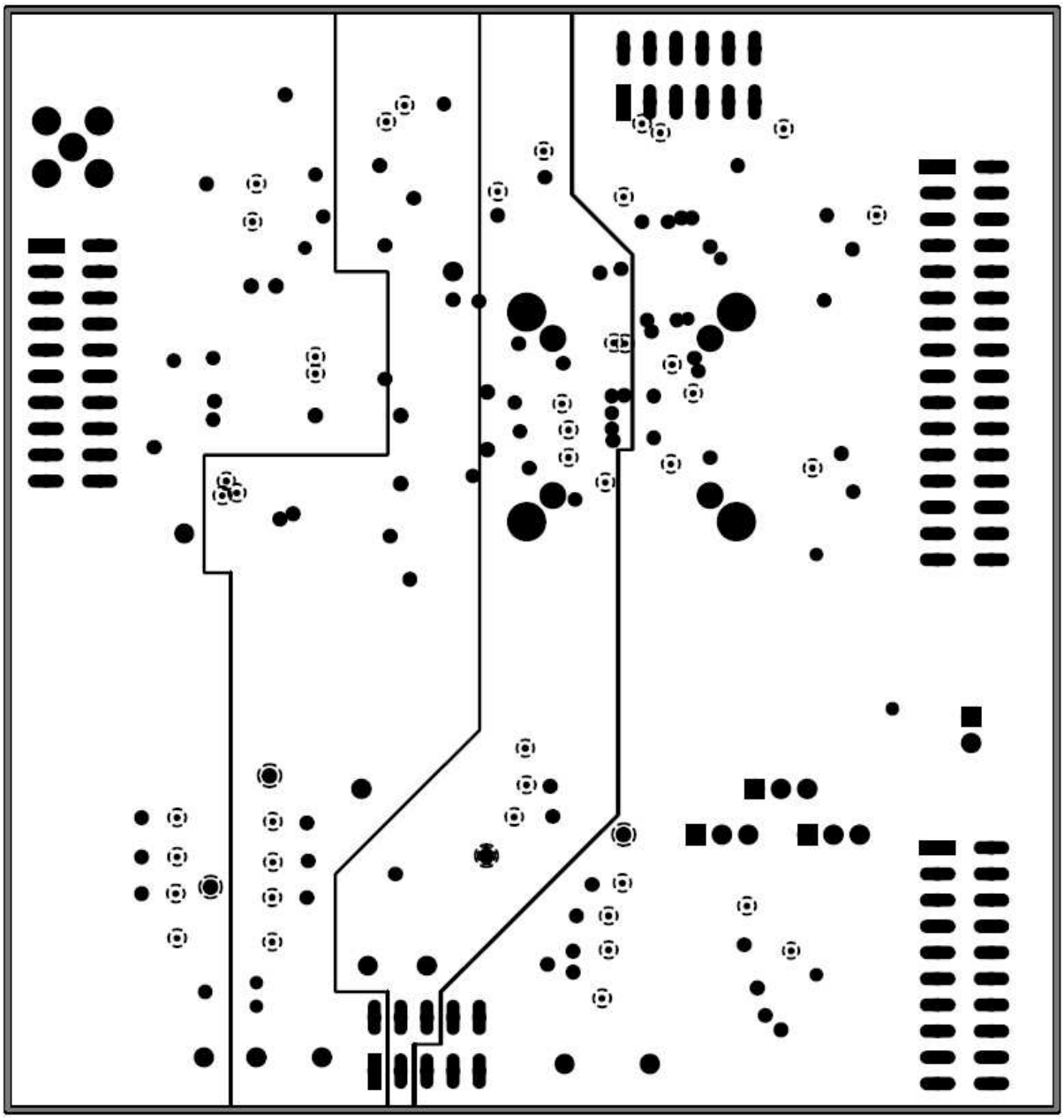


Figure B-3. Power Plane – Layer 3

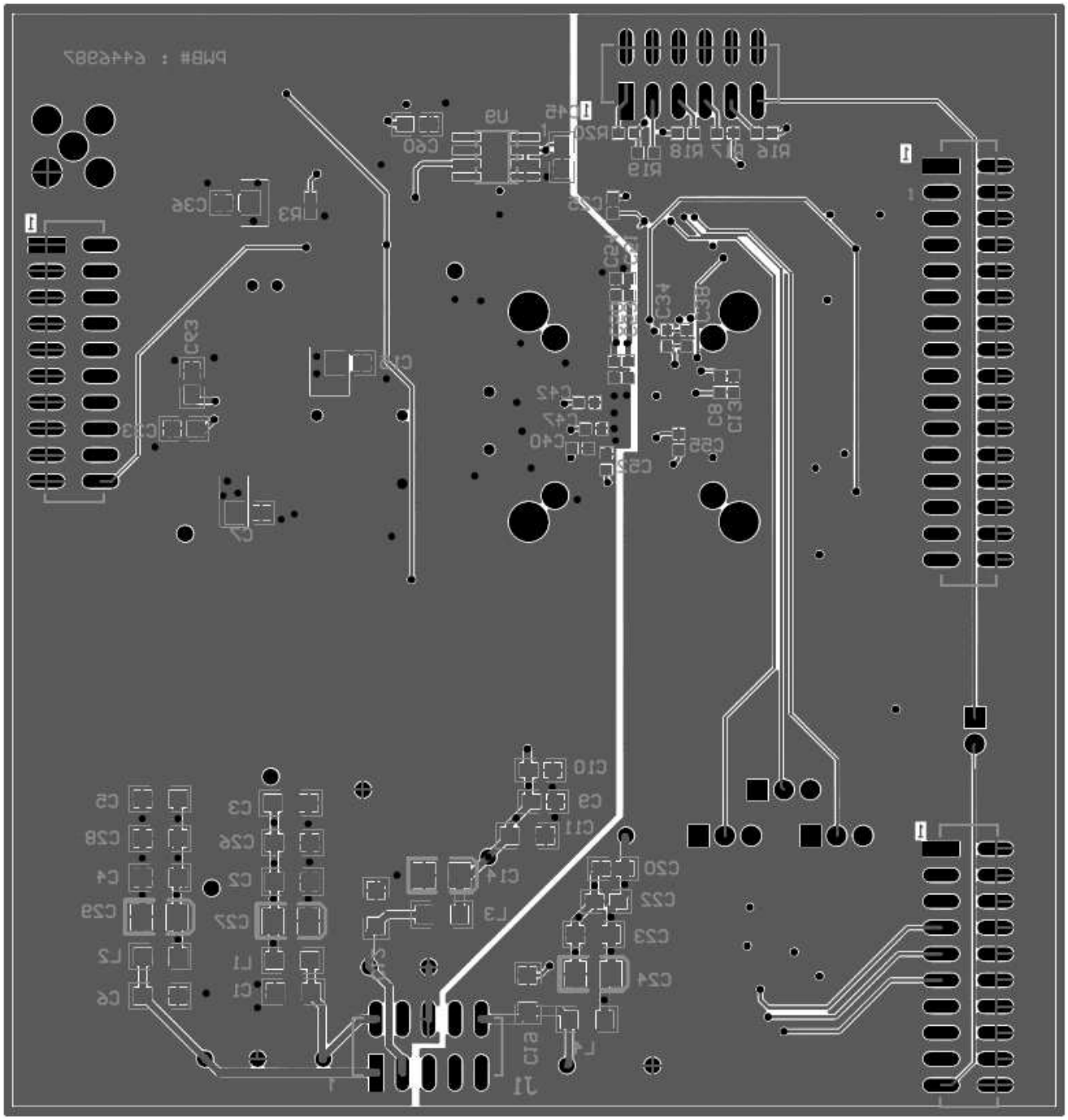
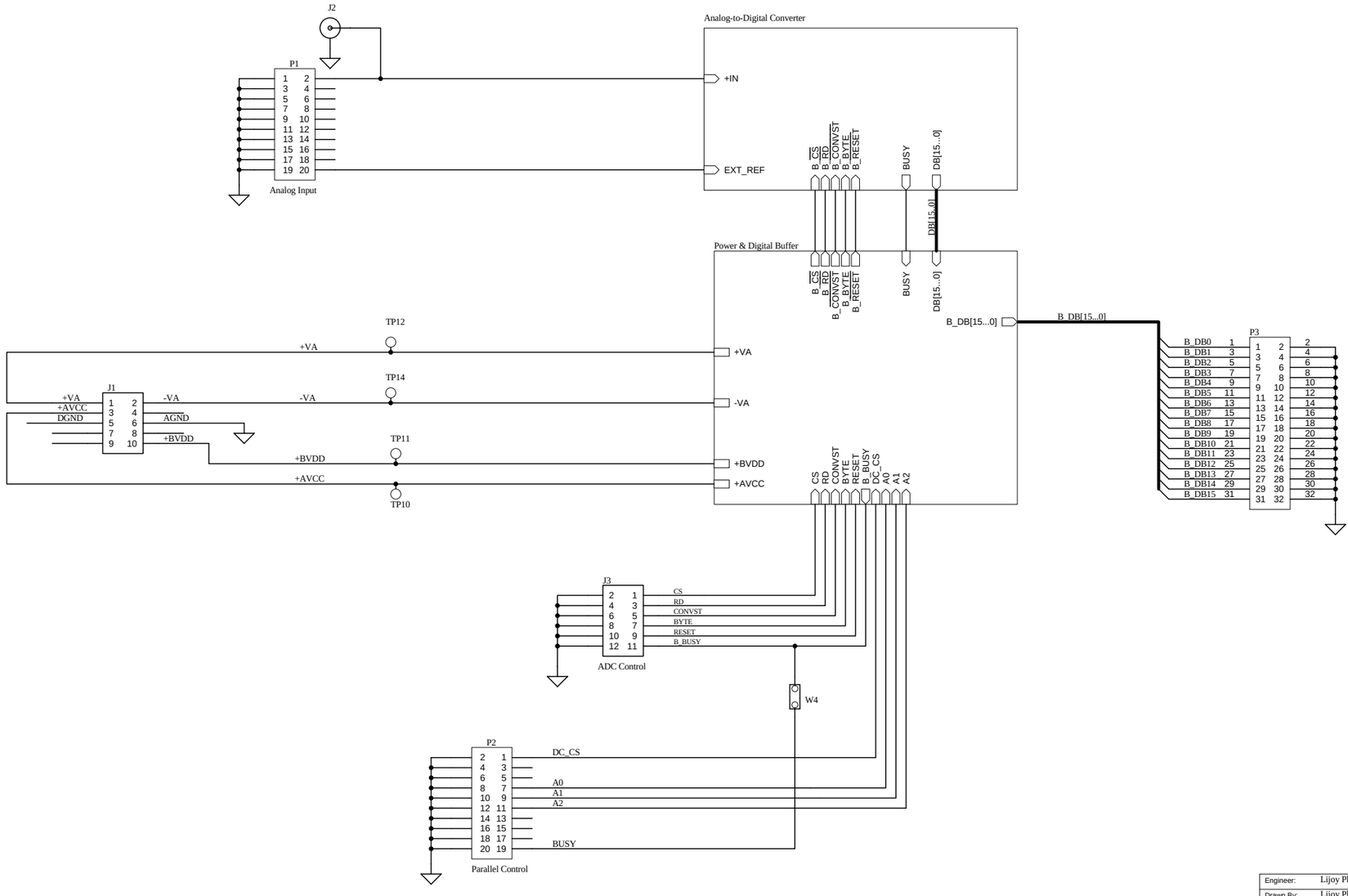


Figure B-4. Bottom Layer – Layer 4

Appendix C ADS8401/ADS8405/ADS8411EVM Schematic

The following pages contain the schematics for the ADS8401EVM, ADS8405EVM, and ADS8411EVM.

Revision History		
REV	ECN Number	Approved

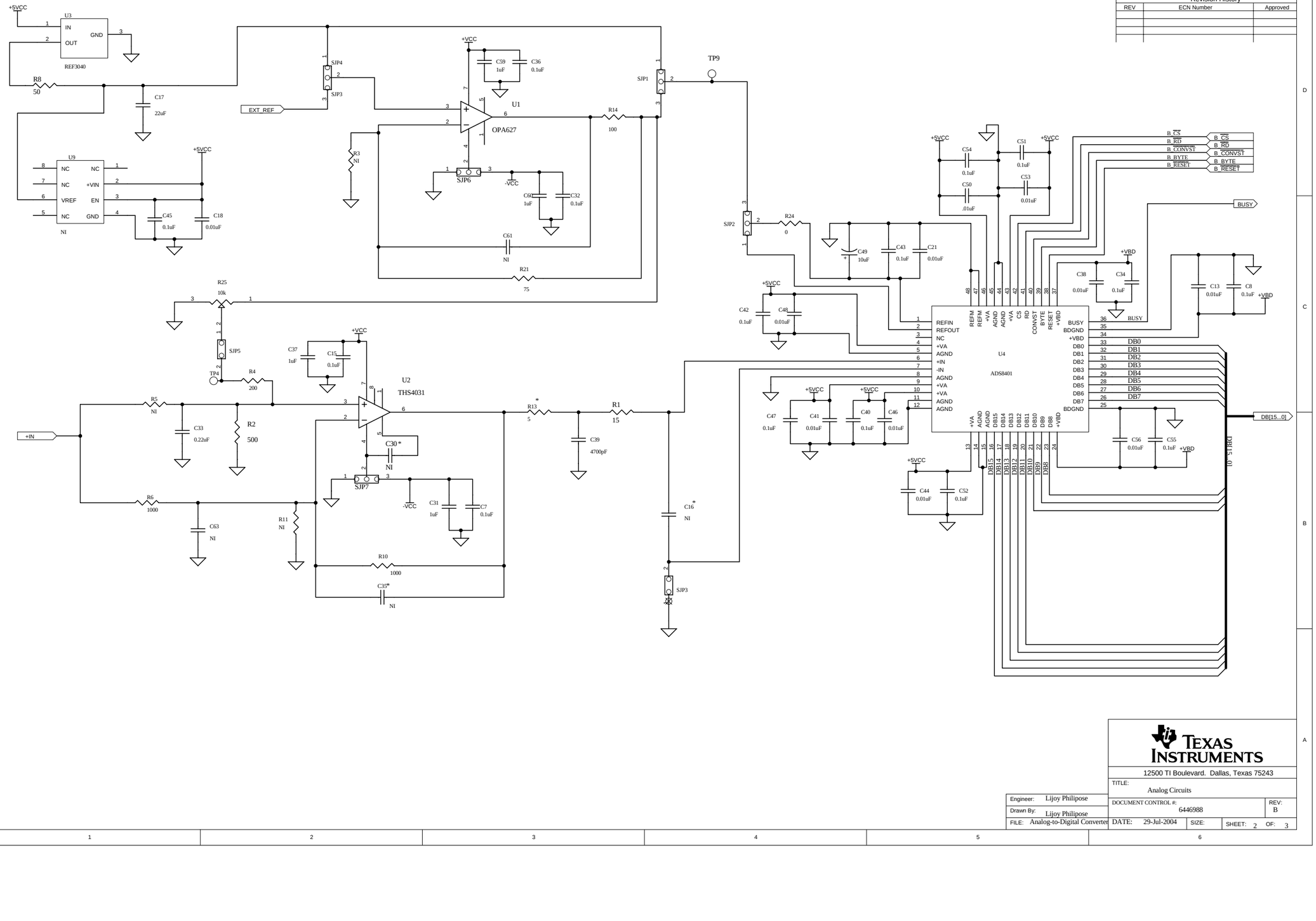


TEXAS INSTRUMENTS

12500 TI Boulevard. Dallas, Texas 75243

TITLE:	ADS8401/ADS8405/ADS8411EVM
DOCUMENT CONTROL #:	6446988
REV:	B
Engineer:	Lijoy Philipose
Drawn By:	Lijoy Philipose
FILE:	BlockDiagram.sch
DATE:	29-Jul-2004
SIZE:	
SHEET:	1 OF: 3

Revision History		
REV	ECN Number	Approved



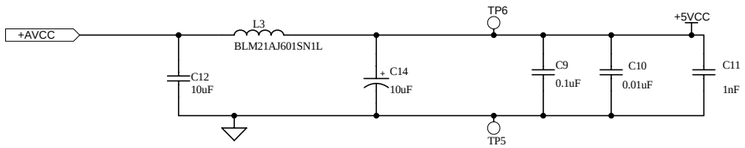
Engineer:	Lijoy Philipose
Drawn By:	Lijoy Philipose
FILE:	Analog-to-Digital Converter

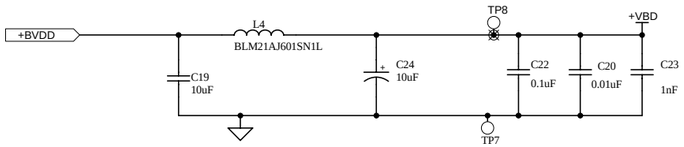
TEXAS INSTRUMENTS

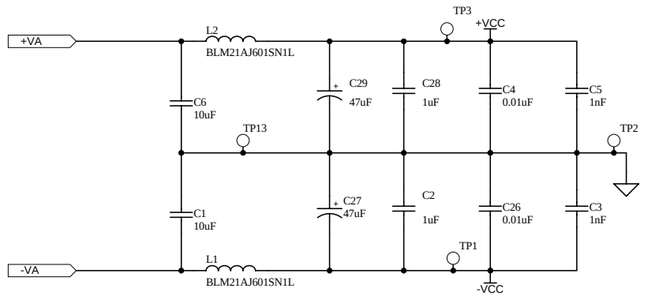
12500 TI Boulevard. Dallas, Texas 75243

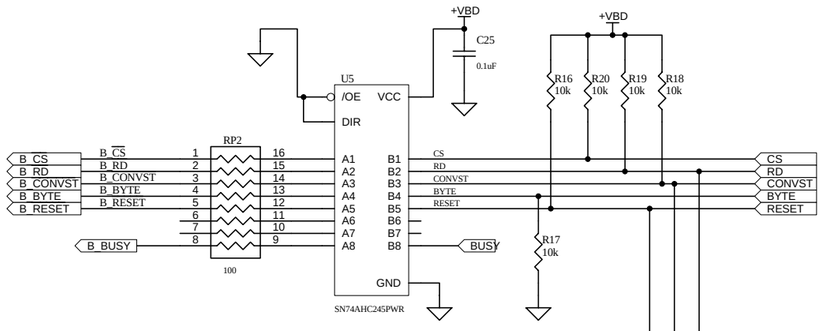
TITLE: Analog Circuits			
DOCUMENT CONTROL #: 6446988			REV: B
DATE: 29-Jul-2004	SIZE:	SHEET: 2	OF: 3

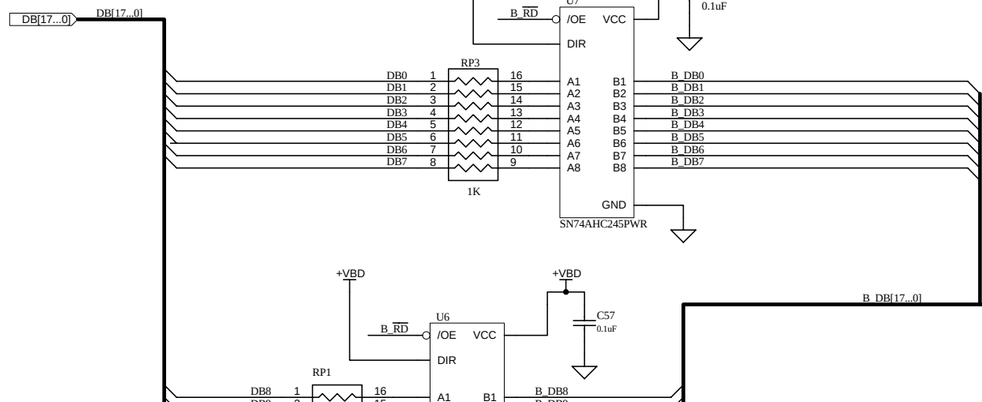
Revision History		
REV	ECN Number	Approved

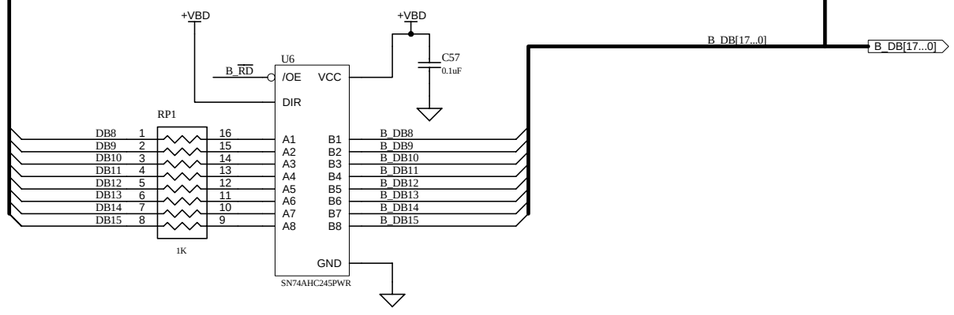


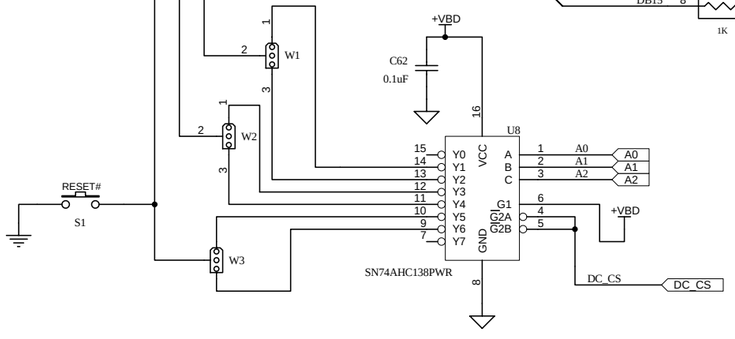












TEXAS INSTRUMENTS

12500 TI Boulevard. Dallas, Texas 75243

TITLE:	Power Supply & Digital Buffer Circuits
Engineer: Lijoy Philipose	DOCUMENT CONTROL #: 6446988 REV: B
Drawn By: Lijoy Philipose	DATE: 29-Jul-2004 SIZE: SHEET: 3 OF: 3
FILE: Power & Digital Buffer	

FCC Warnings

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.

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.

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of ±12 V and the output voltage range of 0 V to 5.5 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 60°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 © 2004, 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 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.

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