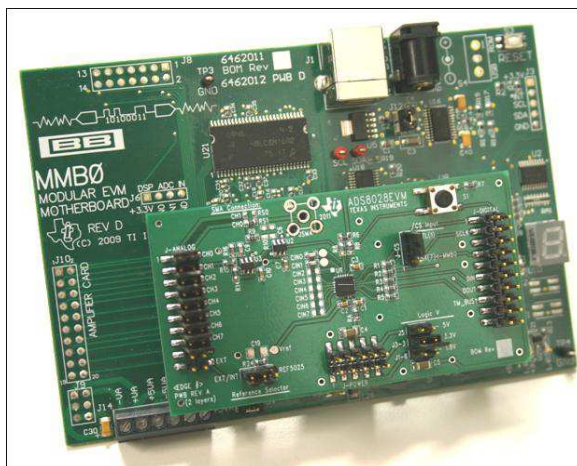


## ADS8028EVM-PDK



**Figure 1. ADS8028EVM-PDK**

This user's guide describes the characteristics, operation, and use of the [ADS8028EVM-PDK](#). This evaluation module and performance development kit (EVM-PDK) is an evaluation system for the [ADS8028](#), a 12-bit, 1-MSPS, 8-channel, successive approximation register (SAR) analog-to-digital converter (ADC). The EVM-PDK allows evaluation of all aspects of the ADS8028 device.

This document includes an EVM QuickStart section, hardware and software details, bill of materials, and schematic.

The following related documents are available through the Texas Instruments web site at <http://www.ti.com>.

**Table 1. EVM-Compatible Device Data Sheets**

Device	Literature Number
<a href="#">ADS8028</a>	<a href="#">SBAS549</a>
<a href="#">OPA836</a>	<a href="#">SLOS712</a>
<a href="#">REF5025</a>	<a href="#">SBOS410</a>

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## 1 EVM Overview

The ADS8028EVM-PDK is designed to evaluate the ADS8028. The ADS8028 is a 12-bit, 8-channel, multiplexed, SAR ADC, with a maximum throughput rate of 1 MSPS. The ADS8028 also offers an internal 2.5-V voltage reference and internal temperature sensor with 0.25°C resolution. The ADS8028EVM allows access to every pin of the converter and makes it easy to connect the ADS8028 SPI™-compatible serial interface to any host microprocessor or TI DSP based system with 1.8-V, 3.3-V, or 5-V logic capability. The ADS8028EVM-PDK combines the ADS8028EVM daughtercard with the digital sensor processor (DSP)-based MMB0 motherboard and ADCPro™ evaluation software for complete evaluation of the ADS8028.

### 1.1 Features

#### ADS8028EVM Features

- Easy-to-use ADCPro evaluation software for Microsoft Windows® operating systems
- Built-in analysis tools for ADCPro, including scope, FFT, and histogram displays
- Simple device operation with full control of single 16-bit control register
- Data collection to text files
- 1.8-V, 3.3-V, or 5-V logic compatible with 16-bit, 20-MHz SPI Interface
- Contains all support circuitry needed for the ADS8028:
  - Voltage reference options: ADS8028 (2.5 V) internal reference, on-board REF5025 (2.5 V) reference, or external reference
  - Two on-board OPA836 (205-MHz unity-gain bandwidth / 1-mA quiescent current) ADC input drivers
  - Power supplied by MMB0 motherboard
- Compatible with the TI modular EVM system

#### ADS8028EVM-PDK Features

The ADS8028EVM-PDK includes the ADS8028EVM board with the DSP-based MMB0 motherboard, that can be used with ADCPro to quickly evaluate the device.

This manual covers the operation of the ADS8028EVM-PDK. Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the ADS8028EVM.

### 1.2 Related Documentation from Texas Instruments

The related documents listed in [Table 2](#) are available for download through the Texas Instruments web site at [www.ti.com](http://www.ti.com).

**Table 2. Related Documents**

Device	Literature Number
<a href="#">ADS8028</a>	<a href="#">SBAS549</a>

## 2 EVM Setup

This section is a quick guide to begin evaluating the ADS8028EVM with ADCPro.

### 2.1 Default Jumper Configuration

Figure 2 shows the location of jumpers on the EVM and their respective factory default settings.

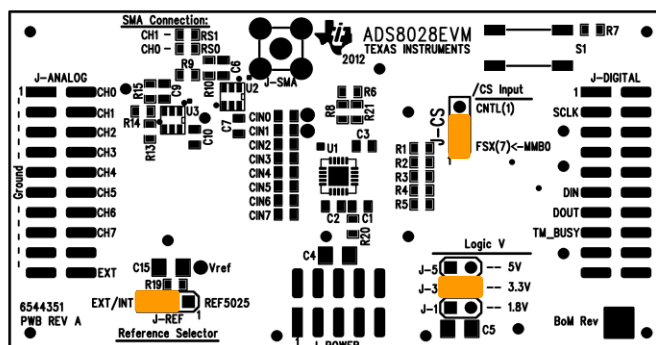


Figure 2. Jumper Locations and Default Settings

Table 3 lists the jumpers on the ADS8028EVM and their factory default settings.

Table 3. Default Jumper Configurations

Jumper	Default Position	Description
J-1	Open	1.8-V logic not selected
J-3	Short	3.3-V logic selected (BVDD = 3.3 V)
J-5	Open	5-V logic not selected
J-CS	Pins 1-2 (Down)	MMB0 FSX pin connected to $\overline{CS}$
J-REF	Pins 2-3 (Right)	Allows for external voltage reference input or internal voltage reference output

#### CAUTION

Only one of the digital interface jumpers (J-1, J-3, or J-5) should be shorted at a time to prevent large reverse currents that could potentially damage voltage regulators on the MMB0 motherboard.

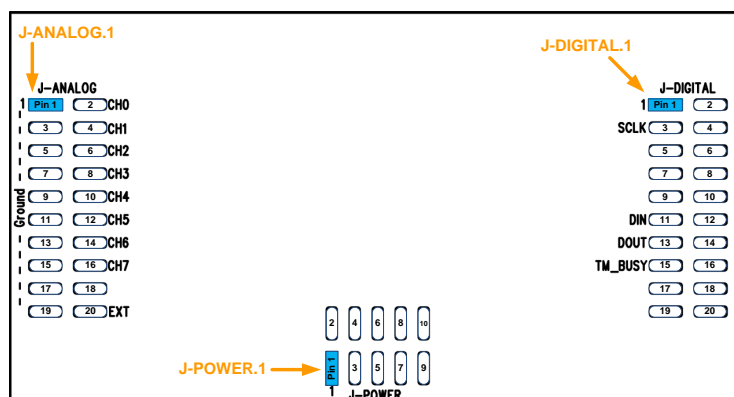
## 2.2 ADS8028EVM-PDK Kit Operation

To prepare to evaluate the ADS8028 with the ADS8028EVM-PDK, complete the following steps:

1. Verify the ADS8028EVM jumper settings from the factory as shown in [Figure 2](#) and also listed in [Table 3](#).
2. Install ADCPro and the ADS8028EVM plug-in software. Complete hardware connections and driver installation as per the [ADCPro HW/SW Installation Manual](#). Use the following jumper settings on the MMB0 to configure power with the ac adapter.
  - MMB0 J12 → Short (power supplied to the MMB0 through MMB0 J2 jack)
  - MMB0 J13A → Open (+VA supply is not used on the ADS8028EVM)
  - MMB0 J13B → Short (power supplied to the ADS8028EVM through the MMB0 J5 header)
  - No additional power connections are required
3. Plug the ADS8028EVM onto the MMB0 motherboard. The female portion of J-ANALOG, J-DIGITAL, and J-POWER on the bottom of the EVM align with male connectors J7, J4, and J5 (respectively) on the MMB0.
4. Connect the included USB cable to J1 on the MMB0 and to an unused USB port on the computer with ADCPro installed.
5. Connect the included ac adapter to the MMB0.

### 3 ADS8028EVM Hardware Details

Figure 3 shows the location of headers J-ANALOG, J-DIGITAL, and J-POWER and their assigned pin numbers. The notation *J-NAME.<#>* is used in this user's guide for identifying header pins. For example, J-ANALOG.1 refers to pin 1 on the J-ANALOG header.



**Figure 3. Headers and Pin Numbers**

Table 4 provides a quick summary of the connections required for operation of the ADS8028. The purpose of the MMB0 motherboard is to provide power and SPI communication to the ADS8028EVM. Analog inputs of interest must be applied to the ADS8028EVM by the user. For a complete list of connections and pins, refer to the ADS8028EVM schematic in Section 5.2.

**Table 4. Critical Connections**

Function	Header and Pin	Pin Name	Description
SPI	$\overline{CS}$	J-DIGITAL.7	FSX
	SCLK	J-DIGITAL.3	CLKX
	DIN	J-DIGITAL.11	DX
	DOUT	J-DIGITAL.13	DR
	TM_BUSY	J-DIGITAL.15	INT
Power	1.8V	J-POWER.7	+1.8VD
	3.3V	J-POWER.9	+3.3VD
	5.0V	J-POWER.10	+5VD
	5.0V (AVDD)	J-POWER.3	+5VA
	GND	J-POWER.5 and J-POWER.6	DGND and AGND
Analog inputs	Channels 0 and 1	J-ANALOG.1-4	—
	Channels 2 to 7	J-ANALOG.5-16	—

<sup>(1)</sup> Only one digital supply connection (BVDD) is required when evaluating the ADS8028EVM as a stand-alone board. Check that the corresponding jumper (J-1, J-3, or J-5) is correctly selected to power the ADS8028 digital interface.

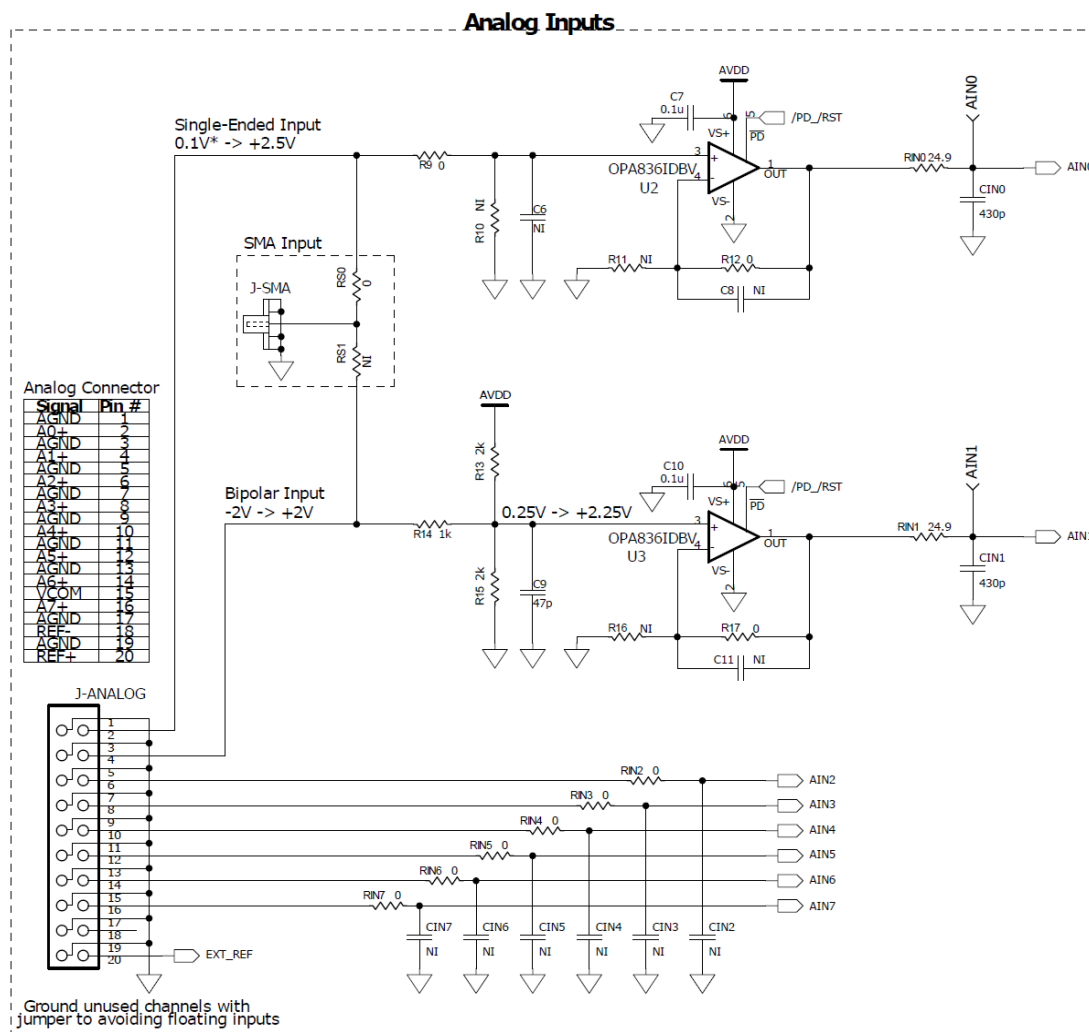
<sup>(2)</sup> AGND and DGND are shorted on the ADS8028EVM.

<sup>(3)</sup> All ADS8028 analog inputs are single-ended and connect between the even and odd pins on the J-ANALOG header. All odd pins on J-ANALOG are connected to AGND.

### 3.1 Analog Inputs

The ADS8028 provides eight single-ended input channels plus an internal temperature sensor. The eight analog input channels to the ADS8028 (AIN0 to AIN7) are connected to J-ANALOG on the ADS8028EVM. Channels 0 and 1 are buffered converter inputs. The [OPA836](#) is configured as a unity-gain buffer on these channels. Channels 2 to 7 connect directly to the converter with an option to add an RC filter before the converter input. [Figure 4](#) shows the EVM schematic portion of the analog inputs. All discrete resistors and capacitors shown in [Figure 4](#) are size 0603 and can be modified to adjust circuit gain and filtering. Note that not all components shown in [Figure 4](#) are installed and have values "NI" (not installed).

Optionally, the user can add an SMA connector at J-SMA and use an SMA input for channels 0 and 1 if an SMA connection is more convenient. RS0 and RS1 resistors select the SMA input channel. If the SMA input has a 50-Ω source impedance, R10 and other input resistors can be modified for impedance matching, otherwise they can provide signal attenuation and input current limiting.



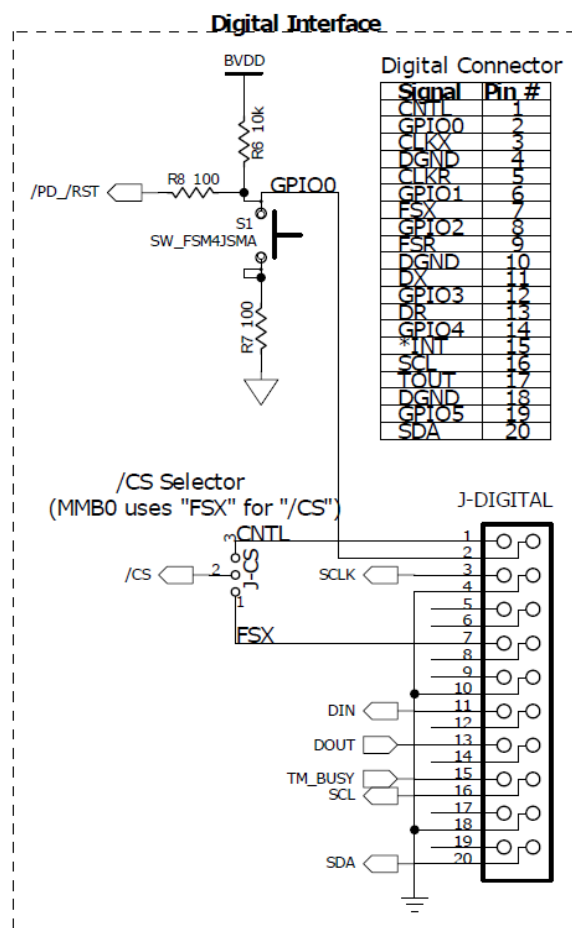
**Figure 4. Analog Input Header Schematic**

**NOTE:** All odd pins on J-ANALOG connect to GND. Therefore, all analog input connections can be easily made across even and odd pin numbers (The channel 0 input connects to J-ANALOG.1-2, channel 1 input connects to J-ANALOG.3-4, etc.).

## 3.2 Digital Control

The SPI digital control signals are applied directly to the J-DIGITAL header on the ADS8028EVM. When using the ADS8028EVM-PDK (the combination of the ADS8028EVM, MMB0 motherboard, and ADCPro software), these signals are supplied by the MMB0 motherboard through J4. If the ADS8028EVM is instead evaluated as a stand-alone board, these signals must be supplied by another microcontroller or processor according to the timing characteristics in the [ADS8028 data sheet](#).

Figure 5 shows the schematic connections to the J-DIGITAL header. The  $\overline{CS}$  signal can be routed to J-DIGITAL.1 or J-DIGITAL.7 (default) through the J-CS jumper. Ensure that the J-CS jumper is positioned to route  $\overline{CS}$  to J-DIGITAL.7 (short pins J-CS.1-2) for proper SPI communication when using the ADS8028EVM-PDK. Additionally, the S1 push-button switch allows the user to manually reset and power-down the ADS8028 and [OPA836](#) op amps on the ADS8028EVM while the button is held. When the button is released, the ADS8028 powers up with default conditions.



**Figure 5. Digital Interface Header Schematic**

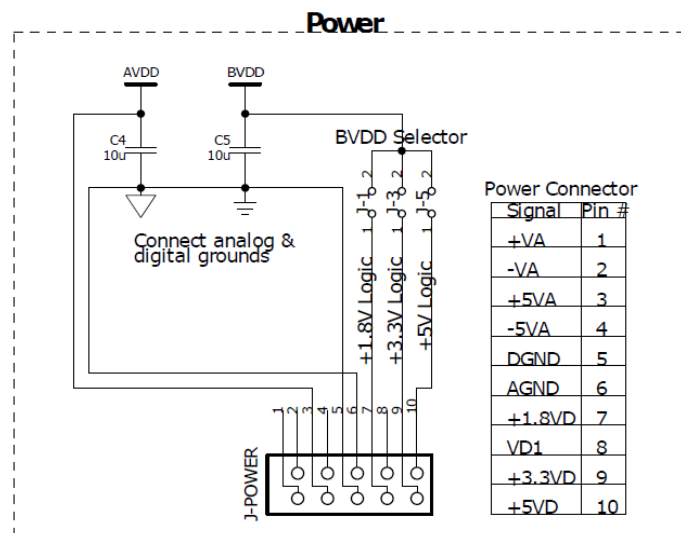
**NOTE:** By default, the J-CS jumper on the ADS8028EVM is shorted between pins J-CS.1-2. This setting is required for proper SPI communication between the MMB0 motherboard and the ADS8028.



### 3.3 Power Supply

The ADS8028EVM requires two power-supply rails: one 5-V analog supply (AVDD) and a configurable digital interface (BVDD). Three selectable voltages are available for the digital interface to make the EVM compatible with different logic levels. Jumpers J-1, J-3, and J-5 on the ADS8028EVM select 1.8-V, 3.3-V, or 5-V BVDD digital interface voltages, respectively. Refer to [Table 3](#) for the ADS8028EVM jumper functions and default settings. The default jumper settings of J-1 (open), J-3 (short), and J-5 (open) are recommended when using the ADS8028EVM with the MMB0 3.3-V logic.

Power rails are supplied to the ADS8028EVM through the J-POWER header. If the ADS8028EVM is being evaluated as a stand-alone board, the user must supply power to the J-POWER header by direct connections to a power supply. Otherwise, the MMB0 motherboard supplies the ADS8028EVM with power through J-5 when the ADS8028EVM daughtercard is mounted on the MMB0. Check the MMB0 jumper settings listed in the [ADS8028EVM-PDK Kit Operation](#) section if the ADS8028EVM is not receiving power when connected to the MMB0 motherboard. [Figure 6](#) shows a schematic of J-POWER header connections on the ADS8028EVM.



**Figure 6. Power Header Schematic**

#### CAUTION

Do not apply voltages that exceed the absolute maximum ratings of the installed components. The absolute maximum supply voltage of the OPA836 limits the maximum analog supply voltage of the ADS8028EVM to 5.5 V. The digital supply voltage should not exceed the analog supply voltage.



## 4 Using the ADS8028EVM-PDK with ADCPro

This section covers the use of the ADS8028EVM-PDK plug-in for ADCPro. For general ADCPro software use and instructions, refer to the [ADCPro User's Guide](#).

The ADS8028EVM-PDK plug-in for ADCPro provides complete control over all ADS8028 settings. It consists of a tabbed interface (see [Figure 8](#)), with different functions available on each tab. The tabs are:

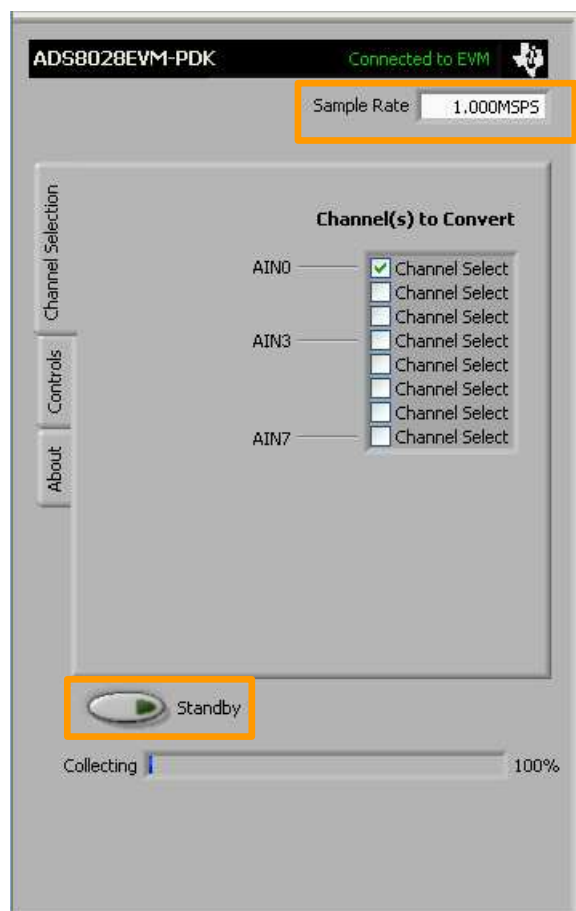
- Channel Selection
- Controls
- About

The ADS8028EVM settings can be adjusted when not acquiring data. During acquisition, all controls are disabled and settings may not be changed. When a setting is changed on the ADS8028EVM plug-in, it takes effect immediately. The effect of some settings, such as the Channel Selection, are not detected until the user starts acquiring data from the ADS8028. The option to acquire data is disabled until both an EVM plug-in and Test plug-in have been loaded from the respective drop-down file menus.

ADS8028EVM settings correspond to settings described in the [ADS8028 data sheet](#).

### 4.1 Top-Level Controls

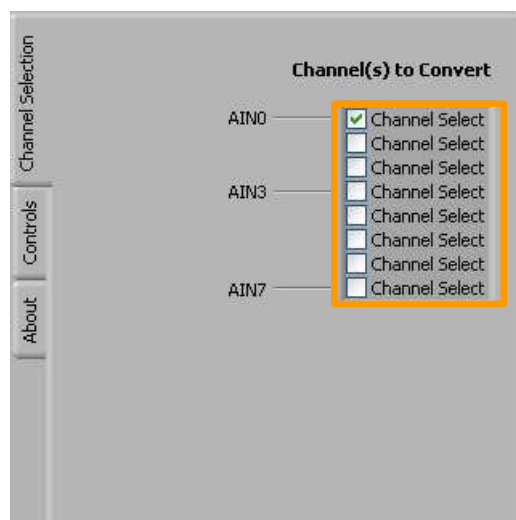
The ADCPro top-level controls for the ADS8028EVM-PDK plug-in include the sample rate and standby controls. The *Sample Rate* indicator, in the upper right corner of the plug-in interface, is always visible and can be modified by the user by typing in a different value. The *Standby* control, in the lower left corner, places the ADS8028 in standby mode when pressed. The user must exit standby mode to make the data acquisition option available again. The top-level controls are highlighted in [Figure 8](#).



**Figure 8. ADCPro: ADS8028EVM Panel**

## 4.2 Channel Selection Tab

The ADS8028 can acquire data from one to eight channels, sequentially. The *Channel Select* tab provides the control to select which channels are sampled. A channel is selected to be sampled if a check mark is seen in the box corresponding to the channel number. Channels are listed sequentially, starting with channel 0 (AIN0) at the top of the list and channel 7 (AIN7) at the bottom. [Figure 9](#) shows where to select channels in the *Channel Select* tab.



**Figure 9. ADCPro: Channel Selection Tab**

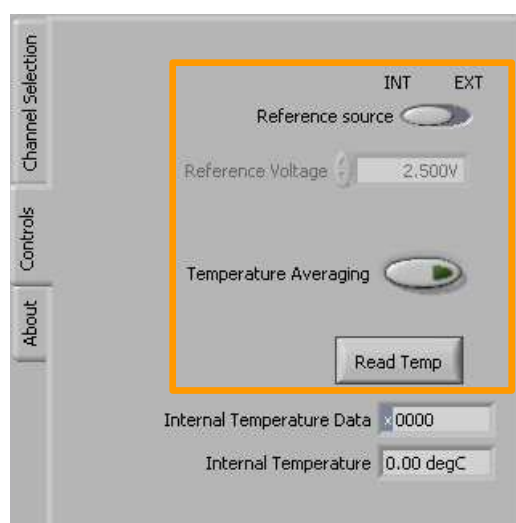
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**NOTE:** If multiple channels are selected for acquisition, then each channel is sampled at a slower rate, given by the sampling rate divided by the number of channels selected for acquisition.

---

## 4.3 Controls Tab

The *Controls* tab allows for reference source selection and operation of the ADS8028 internal temperature sensor. [Figure 10](#) highlights the controls the user can modify on the *Controls* tab.



**Figure 10. ADCPro: Controls Tab**

The *Reference Source* control selects between the ADS8028 internal voltage reference (INT) and an external voltage reference source (EXT). Selecting EXT disables the internal voltage reference and allows the user to specify the applied reference voltage in the *Reference Voltage* indicator to display the correct voltage output values.

The *Temperature Averaging* control configures the ADS8028 to average eight temperature measurements.

The *Read Temp* button returns the output of the internal ADS8028 temperature sensor reading. The output code is displayed in the *Internal Temperature Data* indicator and the corresponding temperature value in degrees Celsius is displayed in the *Internal Temperature* indicator.

#### 4.4 About Tab

The *About* tab provides information on the EVM hardware and software versions.

The plug-in version is the software version of the ADCPro plug-in. The firmware version is the firmware version loaded and running on the processor.

### 5 Schematics and Bill of Materials

A complete schematic for the ADS8028EVM is included in this user's guide. Refer to [Table 5](#) for a bill of materials. Gerber files are available on request. Please e-mail [support@ti.com](mailto:support@ti.com) or [E2E Community Forums](#) and ask for details on how to receive the files.

#### 5.1 Bill of Materials

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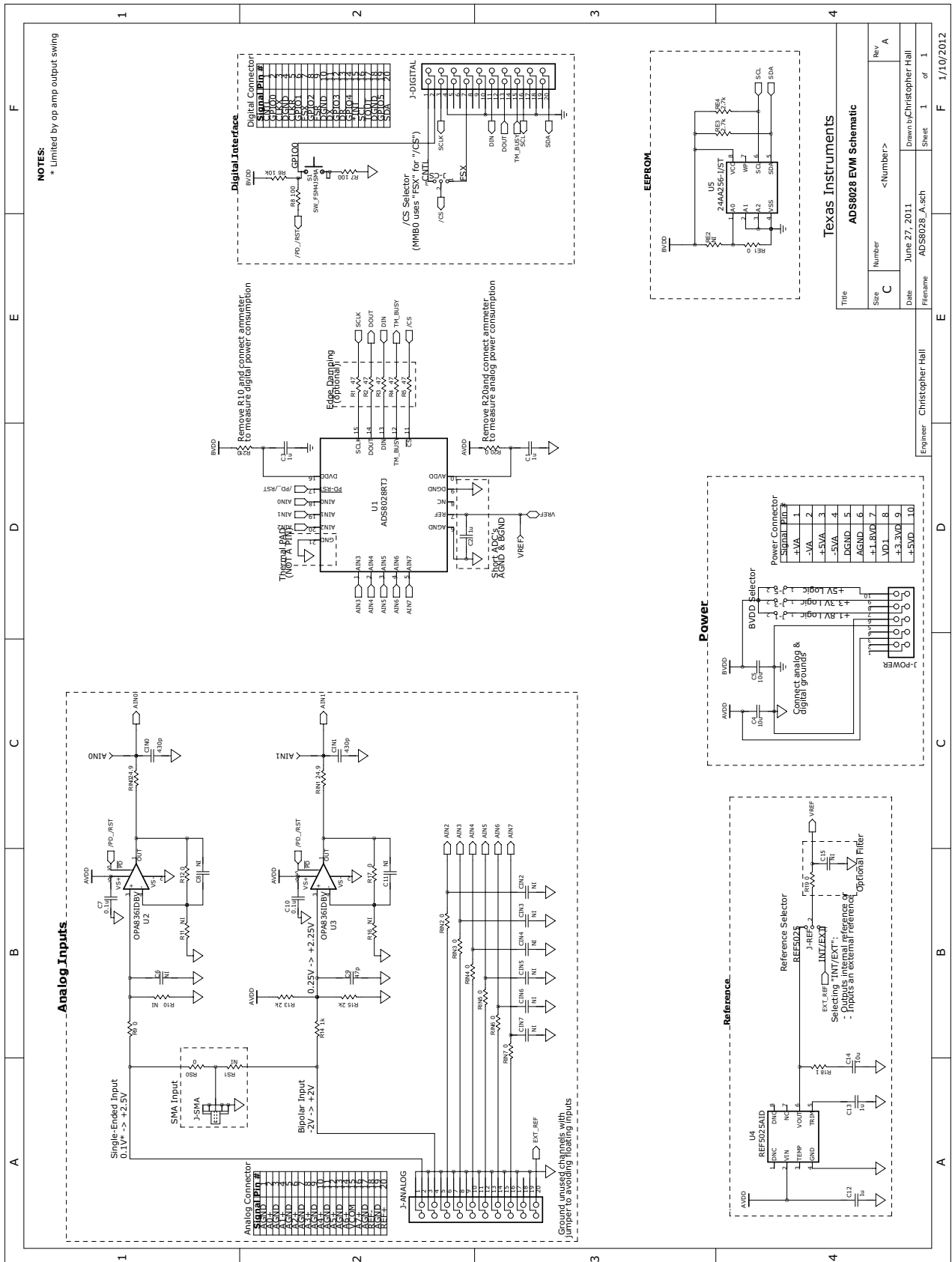
**NOTE:** All components should be compliant with the European Union Restriction on Use of Hazardous Substances (RoHS) Directive. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS-compliant. (For more information about TI's position on RoHS compliance, see the Design Support section at <http://www.ti.com>.)

---

**Table 5. ADS8028EVM Bill of Materials**

Item No.	Qty	Value	Ref Des	Description	Manufacturer	Part Number
1	1	—		Printed Circuit Board, 3.2 In x 1.7 In x 0.062 In	Any	6544351
2	2	430 pF	CIN0, CIN1	Capacitor, C0G Ceramic, 50V, 5%, 0603	Murata	GRM1885C1H431JA01D
3	5	1 $\mu$ F	C1-C3, C12, C13	Capacitor, X7R Ceramic, 25V, 10%, 0603	Murata	GRM188R71E105KA12D
4	3	10 $\mu$ F	C4, C5, C14	Capacitor, X7R Ceramic, 25V, 10%, 1206	Taiyo Yuden	TMK316B7106KL-TD
5	0	—	C6, C8, C11, CIN2-CIN7	Not Installed	—	—
6	2	0.1 $\mu$ F	C7, C10	Capacitor, X7R Ceramic, 25V, 10%, 0603	Murata	GRM188R71E104KA01D
7	1	47 pF	C9	Capacitor, C0G Ceramic, 50V, 5%, 0603	Murata	GRM1885C1H470JA01D
8	0	—	C15	Not Installed	—	—
9	3	—	J-1, J-3, J-5	CONN HEADER 2POS .100" SGL GOLD	Samtec	TSW-102-07-L-S
10	2	—	J-ANALOG(A), J-DIGITAL(A)	CONN HEADER 20POS .100" SMD TIN	Samtec	TSM-110-01-T-DV-P
11	2	—	J-ANALOG(B), J-DIGITAL(B)	CONN RECPT 20POS .100" SMT GOLD	Samtec	SSW-110-22-F-D-VS-K
12	1	—	J-POWER(A)	CONN HEADER 10POS .100" DBL SMD	Samtec	TSM-105-01-T-DV-P
13	1	—	J-POWER(B)	CONN RECPT 10POS .100" SMT GOLD	Samtec	SSW-105-22-F-D-VS-K
14	2	—	J-CS, J-REF	CONN HEADER 3POS .100" SGL GOLD	Samtec	TSW-103-07-L-S
15	0	—	J-SMA	Not Installed	—	—
16	2	24.9 $\Omega$	RIN0, RIN1	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-0724R9L
17	2	2.7 k $\Omega$	RE3, RE4	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-072K7L
18	5	47 $\Omega$	R1-R5	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-0747RL
19	1	10 k $\Omega$	R6	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-0710KL
20	2	100 $\Omega$	R7, R8	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-07100RL
21	14	0 $\Omega$	R9, R12, R17, R19-R21, RIN2-RIN7, RS0, RE1	Resistor, Chip, 1/10W, < 0.05 $\Omega$ , 0603	Yageo	RC0603JR-070RL
22	0	—	R10, R11, R16, RE2, RS1	Not Installed	—	—
23	1	1 $\Omega$	R18	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-071RL
24	2	2 k $\Omega$	R13, R15	Resistor, Chip, 1/10W, 1%, 0603	Panasonic	ERJ-3EKF2001V
25	1	1 k $\Omega$	R14	Resistor, Chip, 1/10W, 1%, 0603	Yageo	RC0603FR-071KL
26	1	—	S1	Tactile Switch, 6x6 mm, Surface Mount	TE Connectivity	FSM4JSMATR
27	1	—	U1	IC, ADC, SAR, 12-Bit, 1 MSPS, 8-Channel, RTJ-20	Texas Instruments	ADS8028IRTJT
28	2	—	U2, U3	IC, OPAMP, VFB, RRO, 205MHZ, SOT23-6	Texas Instruments	OPA836IDBVT
29	1	—	U4	IC, Precision Voltage Reference, 2.5V, SO-8	Texas Instruments	REF5025AID
30	1	—	U5	IC, EEPROM, 256KBIT, 400KHZ, TSSOP-8	Microchip Technology	24AA256-I/ST
31	11	—	—	Shunt, 100-mil, Black	3M	969102-0000-DA

## 5.2 Schematic



## Evaluation Board/Kit Important Notice

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## EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 3.3 V to 5 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 +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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## REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module 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 or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment 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.

### General Statement for EVMs including a radio

*User Power/Frequency Use Obligations:* This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

### For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

#### Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### **FCC Interference Statement for Class B EVM devices**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **For EVMs annotated as IC – INDUSTRY CANADA Compliant**

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **Concerning EVMs including radio transmitters**

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

### **Concerning EVMs including detachable antennas**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

### **Concernant les EVMs avec appareils radio**

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### **Concernant les EVMs avec antennes détachables**

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

## **【Important Notice for Users of this Product in Japan】**

**This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan**

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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## EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

**For Feasibility Evaluation Only, in Laboratory/Development Environments.** Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

**Certain Instructions.** It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. 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 as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

**Agreement to Defend, Indemnify and Hold Harmless.** You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

**Safety-Critical or Life-Critical Applications.** If you intend to evaluate the components for possible 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, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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TI has specifically designated certain components which meet ISO/TS16949 requirements, mainly for automotive use. Components which have not been so designated are neither designed nor intended for automotive use; and TI will not be responsible for any failure of such components to meet such requirements.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
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