

TPA6203A1 Audio Power Amplifier Evaluation Module

The TPA6203A1 audio amplifier evaluation module is a complete, low-power single-channel audio power amplifier. It consists of the TI TPA6203A1 1.25-W low-voltage audio power amplifier IC in a very small MicroStar Junior™ BGA package, along with a small number of other parts mounted on a circuit board that is approximately one and a quarter inches square.

Contents

| | | |
|---|--|---|
| 1 | Introduction | 1 |
| 2 | Operation | 2 |
| 3 | Related Documentation From Texas Instruments | 7 |
| 4 | Addendum | 8 |

List of Figures

| | | |
|---|---|---|
| 1 | Quick-Start Module Map | 3 |
| 2 | TPA6203A1 EVM Connected for Stereo BTL Output | 4 |
| 3 | TPA6203A1 EVM Schematic Diagram | 5 |
| 4 | TPA6203A1 EVM Top Layer, Revision A..... | 6 |
| 5 | TPA6203A1 EVM Top Layer, Revision B..... | 7 |
| 6 | TPA6203A1 EVM Bottom Layer, Revision A..... | 7 |
| 7 | TPA6203A1 EVM Bottom Layer, Revision B..... | 7 |

List of Tables

| | | |
|---|----------------------------------|---|
| 1 | TPA6203A1ZQVEVM Parts List | 5 |
|---|----------------------------------|---|

1 Introduction

This chapter provides an overview of the Texas Instruments (TI) TPA6203A1 MicroStar Junior™ BGA audio amplifier evaluation module. It includes a list of EVM features, a brief illustrated description of the module, and a list of EVM specifications.

1.1 Feature Highlights

The TI TPA6203A1 Low-Voltage Audio Power Amplifier Evaluation Module includes the following features:

- TPA6203A1 Low-Voltage Audio Power Amplifier Evaluation Module
- 2 mm × 2 mm MicroStar Junior™ BGA
- Fully differential amplifier
- Single-channel, bridge-tied load (BTL)
- 2.5-V to 5.5-V operation
- 1.25-W @ 10% THD output power into 8 Ω at 5 V, BTL
- Internal depop and quick start-up circuitry
- Internal thermal and short-circuit protection
- Module gain is set at 2 V/V

1.2 Description

The TPA6203A1 audio power amplifier evaluation module is a complete, low-power single-channel audio power amplifier. It consists of the TI TPA6203A1 1.25-W low-voltage audio power amplifier IC in a very small MicroStar Junior™ BGA package, along with a small number of other parts mounted on a circuit board that is approximately one and a quarter inches square.

1.3 TPA6203A1 EVM Specifications

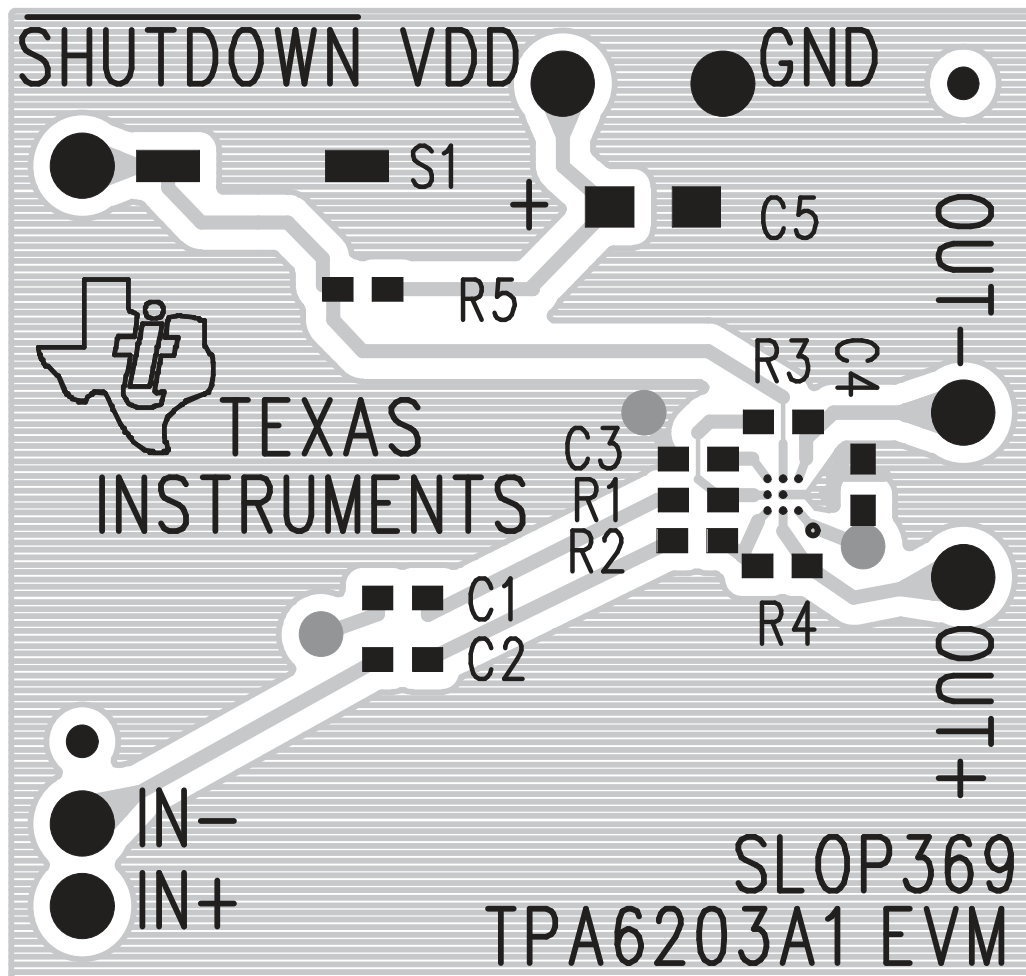
| | | VALUE | UNIT |
|----------|---|-----------------------|------|
| V_{DD} | Supply voltage range | 2.5 to 5.5 | V |
| I_{DD} | Power supply current rating required | 450 | mA |
| P_O | Continuous output power, 8Ω BTL, $V_{DD} = 5$ V | 1.25 | W |
| V_I | Audio input voltage | 0 V to V_{DD} , max | V |
| Z_L | Minimum load impedance | 8 | Ω |

2 Operation

Follow the steps in this chapter to prepare the TPA6203A1 audio amplifier EVM for use. The audio amplifier evaluation module is a stand-alone unit and can be used by making connections directly to the module pins, and it can be wired directly into existing circuits or equipment.

2.1 Quick-Start List

Follow these steps to use the TPA6203A1 EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the TPA6203A1 module header pins can be made via individual sockets, wire-wrapping, or soldering to the pins, either on the top or the bottom of the module circuit board.



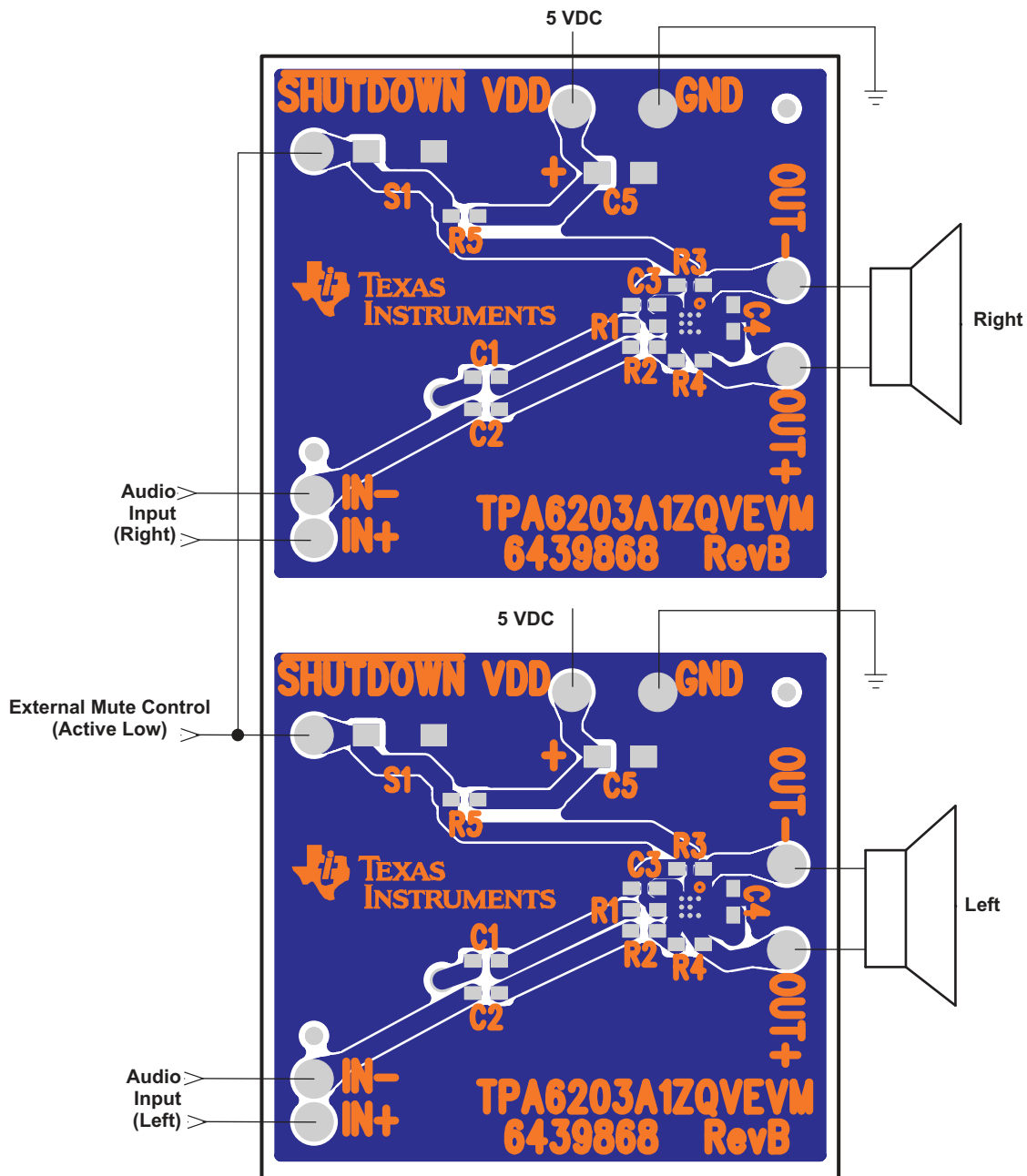
NOTE: Due to the very small size of the MicroStar Junior™ BGA IC package, the standard part number TPA6203A1 is replaced with the code AADI.

Figure 1. Quick-Start Module Map

- Power Supply
 1. Ensure that all external power sources are set to off.
 2. Connect an external regulated power supply set to 5 V to the module V_{DD} and GND pins, taking care to observe marked polarity.
- Inputs and Outputs
 1. Ensure that the signal source level is set to minimum.
 2. Connect the positive lead from the audio source to the module IN+ pin and the negative lead to the IN- pin.
 3. Connect the SHUTDOWN pin through a normally open switch to GND.
 4. Connect an 8 Ω –32 Ω speaker to the module OUT+ and OUT- pins.
- Power Up
 1. Verify correct voltage and input polarity and set the external power supply to on. The EVM begins operation.
 2. Adjust the signal source level as needed.

2.2 References

2.2.1 TPA6203A1 EVM Connected for Stereo BTL Output



NOTE: Due to the very small size of the MicroStar Junior™ BGA IC package, the standard part number TPA6203A1 is replaced with the code AADI.

Figure 2. TPA6203A1 EVM Connected for Stereo BTL Output

2.2.2 TPA6203A1 EVM Schematic Diagram

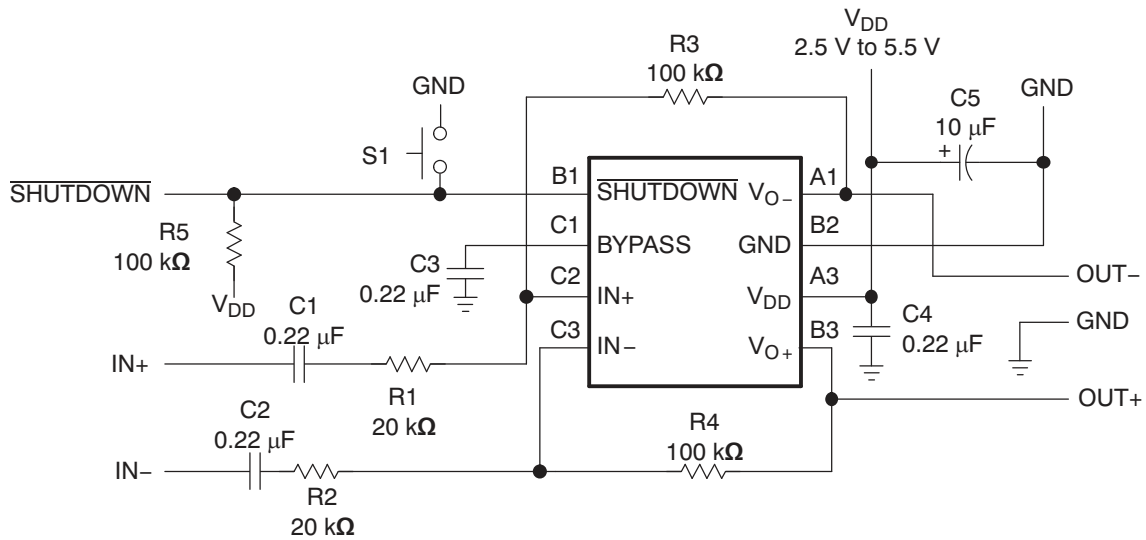


Figure 3. TPA6203A1 EVM Schematic Diagram

NOTE: Figure 3 is for both Revision A and Revision B EVMs.

2.2.3 TPA6203A1 Audio Power Amplifier Evaluation Module Parts List

Table 1. TPA6203A1ZQVEVM Parts List

| MANU Part No. | QTY | RefDes | Vendor Part No. | Description | Vendor | MANU |
|--------------------------------|-----|--|-----------------|---|----------|-------------------|
| TI-SEMICONDUCTORS | | | | | | |
| TPA6203A1ZQVR | 1 | U1 | 296-17902-1 | 1.25W MONO DIFFERENTIAL AUDIO POWER AMP BGA8-ZQV ROHS | DIGI-KEY | TEXAS INSTRUMENTS |
| CAPACITORS | | | | | | |
| ECJ-1VF1C224Z | 4 | C1, C2, C3, C4 | PCC1790CT | CAP CERM SMD0603 22UF 16V Y5V -20%/+80% ROHS | DIGI-KEY | PANASONIC |
| TAJA106K006RNJ | 1 | C5 | 478-1653-1 | CAP TANT SMD1206 10UF 6.3V 10 ROHS | DIGI-KEY | AVX CORP. |
| RESISTORS | | | | | | |
| ERJ-3EKF2002V | 2 | R1, R2 | P20.0KHCT | RESISTOR SMD0603 20KΩ 1% 1/10W ROHS | DIGI-KEY | PANASONIC |
| ERJ-3GEYJ104V | 3 | R3, R4, R5 | P100KGCT | RESISTOR SMD0603 100KΩ 1% 1/10W ROHS | DIGI-KEY | PANASONIC |
| HEADERS AND JACKS | | | | | | |
| PBC01SAAN | 7 | VDD, GND, IN-, IN+, OUT-, OUT+, SHUTDOWN | S1011E-01 | SINGLE PIN HEADER GOLD ROHS | DIGI-KEY | SULLINS |
| TESTPOINTS AND SWITCHES | | | | | | |
| TL1015AF160QG | 1 | S1 | EG4344CT | SWITCH, MOM, 160G SMT 4X3MM ROHS | DIGI-KEY | E-SWITCH |
| COMPONENT COUNT | 19 | | | | | |

2.2.4 TPA6203A1 EVM PCB Layers

The following illustrations depict the TPA6203A1 EVM PCB layers and silkscreen. These drawings are not to scale. Gerber plots can be obtained from any TI sales office.

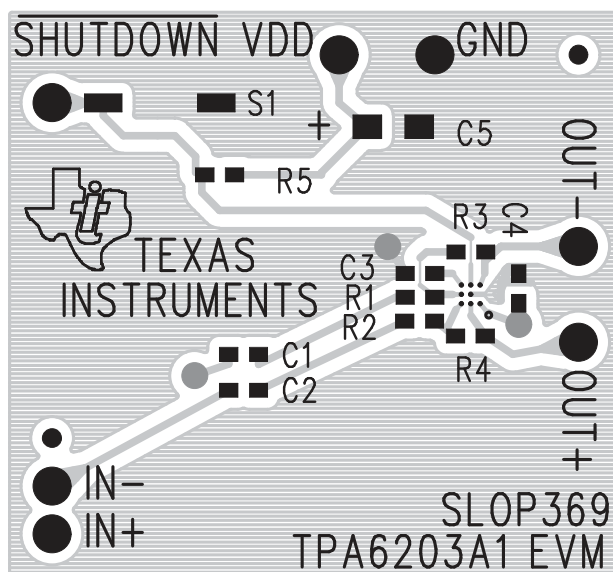


Figure 4. TPA6203A1 EVM Top Layer, Revision A

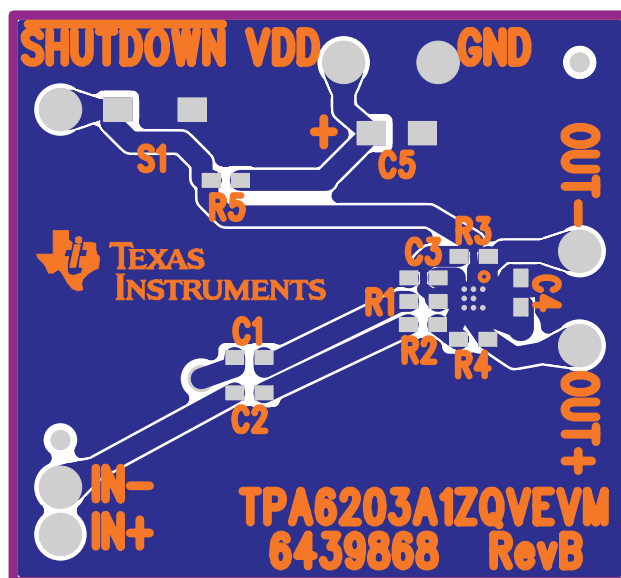


Figure 5. TPA6203A1 EVM Top Layer, Revision B

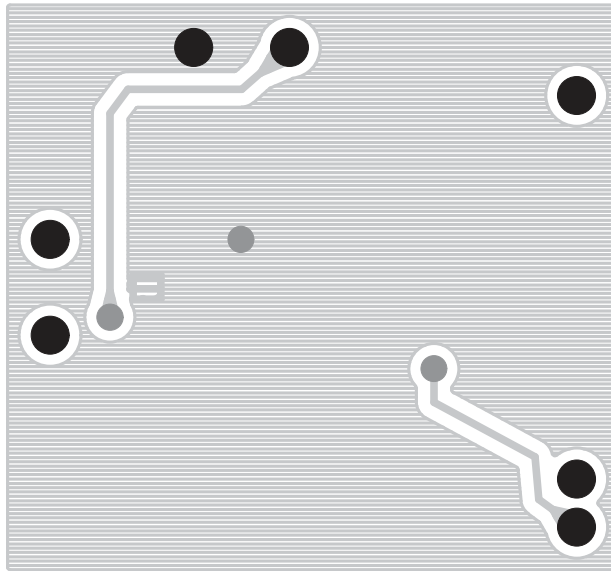


Figure 6. TPA6203A1 EVM Bottom Layer, Revision A

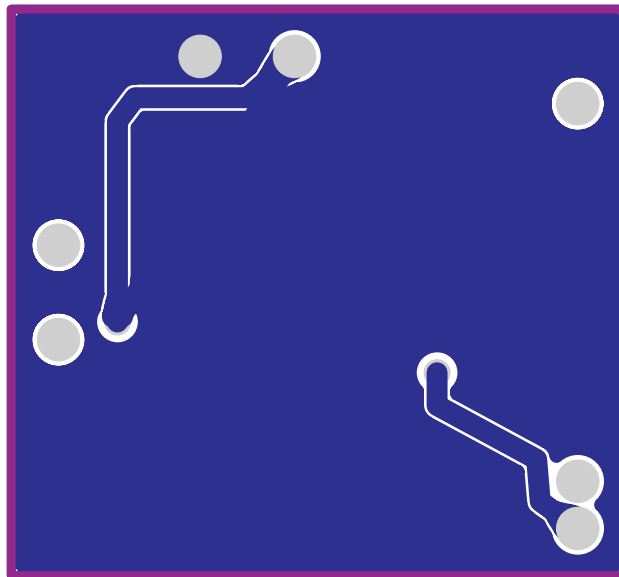


Figure 7. TPA6203A1 EVM Bottom Layer, Revision B

3 Related Documentation From Texas Instruments

- *TPA6203A1, 1.25-W Mono Fully Differential Audio Power Amplifier* data sheet ([SLOS364](#))

4 Addendum

This is a list of modification made to the TPA6203A1ZQV EVM Rev. A and appearing on Rev. B. The modifications do not affect the performance of the board.

| Modification | Description |
|--------------|---|
| Pin 1 Marker | Moved to top right corner |
| Text | Updated with new TI logo, EVM identifier, board number, revision letter |
| Schematic R5 | Changed to a pullup resistor |
| Schematic S1 | Modified to pass ground when active |

This user's guide contains layouts for both Revision A and Revision B, so use the document accordingly.

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.

EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 2.5 V to 5.5 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 85° 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
Copyright © 2009, 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

| | |
|-----------------------------|--|
| Amplifiers | amplifier.ti.com |
| Data Converters | dataconverter.ti.com |
| DLP® Products | www.dlp.com |
| DSP | dsp.ti.com |
| Clocks and Timers | www.ti.com/clocks |
| Interface | interface.ti.com |
| Logic | logic.ti.com |
| Power Mgmt | power.ti.com |
| Microcontrollers | microcontroller.ti.com |
| RFID | www.ti-rfid.com |
| RF/IF and ZigBee® Solutions | www.ti.com/lprf |

Applications

| | |
|--------------------|--|
| Audio | www.ti.com/audio |
| Automotive | www.ti.com/automotive |
| Broadband | www.ti.com/broadband |
| Digital Control | www.ti.com/digitalcontrol |
| Medical | www.ti.com/medical |
| Military | www.ti.com/military |
| Optical Networking | www.ti.com/opticalnetwork |
| 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
Copyright © 2009, Texas Instruments Incorporated