TAS5760xxEVM

This User's Guide describes the operation of the TAS5760xxEVM, rev D. The TAS5760xxEVM is connected to the PurePath™ Console Motherboard (PPCMB). For questions and support go to the E2E forums (e2e.ti.com). The main contents of this document are:

- Hardware descriptions and implementation
- Start up procedure using PurePath Console (PPC) software with TAS5760 plug-in

Related documents:

TAS5760 Data Sheet (SLOS741)
PurePath™ Console Motherboard User's Guide (SLOU366)
PurePath™ Graphic Development Suite (PurePath Console)

Contents

1 Hardware Overview 2
1.1 TAS5760xxEVM Features 2
1.2 TAS5760xxEVM Functions 3
1.3 TAS5760xxEVM Detailed Operations 3
2 TAS5760xxEVM Setup 4
2.1 TAS5760xxEVM Setup 4
2.2 Software Installation 5
3 Using the PurePath™ Console with the TAS5760xxEVM Board 6
3.1 TAS5760 Main Tab 6
3.2 TAS5760 Block Diagram Tab 7
3.3 Pop-up Windows 7
3.4 Direct I²C Access Tab 8
3.5 Device Registers Tab 9
4 Board Layouts, Bill of Materials, and Schematic 10
4.1 TAS5760xxEVM Board Layouts 10
4.2 Bill of Materials 11
4.3 TAS5760xxEVM Rev D Schematic 12

List of Figures

1 PPCMB and TAS5760xxEVM 2
2 Device Manager 3
3 PPCMB and TAS5760xxEVM Connection 4
4 Target Selection List 5
5 Add Target List 5
6 PPCMB and TAS5760xxEVM 6
7 TAS5760 Block Diagram 7
8 Digital Gain Pop-up 7
9 Analog Gain Pop-up 8
10 Direct I²C Access 8
11 Device Registers Tab 9
12 TAS5760xxEVM Rev D Top Composite Assembly 10

13 PPCMB Rev D Bottom Composite Assembly 10
14 TAS5760xxEVM Rev D Schematic (Page 1 of 2) 12
15 TAS5760xxEVM Rev D Schematic (Page 2 of 2) 13

List of Tables

1 Bill of Materials 11

1 Hardware Overview

The TAS5760xxEVM showcases the latest TI digital input class D closed loop amplifier. The TAS5760 is a single-die I2S-input class D stereo amplifier with integrated headphone amplifier. The EVM is used in conjunction with the PurePath Console Motherboard (PPCMB). The PVDD supply is provided via the TAS5760xxEVM and is regulated to 5 VDC and 3.3 VDC on the PPCMB. The PPCMB provides the I2S, I^2C and 3.3 VDC to the TAS5760xxEVM.

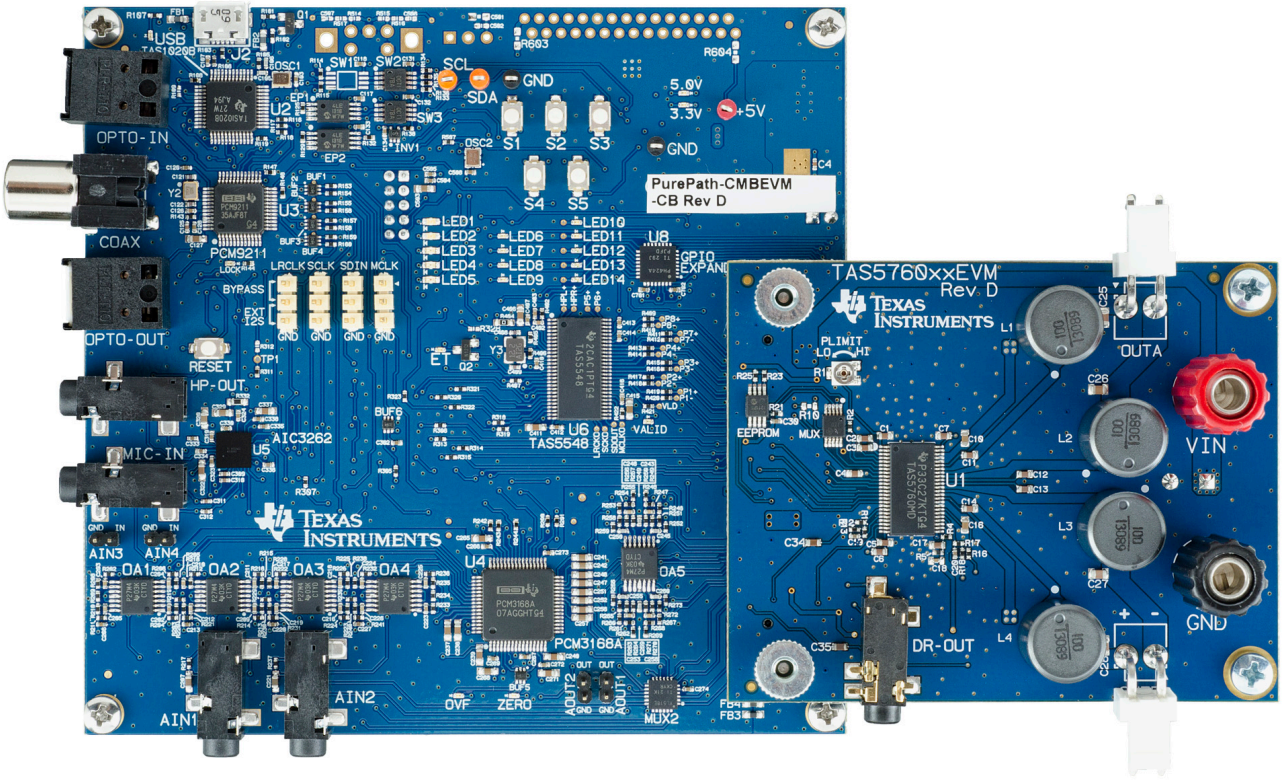


Figure 1. PPCMB and TAS5760xxEVM

1.1 TAS5760xxEVM Features

- GUI control via USB port
- Operation in hardware or software mode
- Stereo channels with I2S input
- Operate in BTL or PBTL
- Headphones input and output

1.2 TAS5760xxEVM Functions

The TAS5760xxEVM is controlled by the PPCMB. The PPCMB sends I^2C commands from PPC to the TAS5760. Upon PPC execution and connection, the TAS5760 is put in software mode.

The digital audio data input to the TAS5760xxEVM is sent from PPCMB and is selectable from USB audio, optical SPDIF, coaxial SPDIF, and analog ADC sources. When a digital audio data input is selected, the PPC will automatically send appropriate scripts to the device in use.

1.3 TAS5760xxEVM Detailed Operations

Upon power-on, the PPCMB uses USB audio input (default). The I2S signals, LRCLK, SCLK, SDIN, and MCLK, come from the TAS1020B. Windows® Media Player can be used to stream audio. The TAS1020B enumerates as the following device on Windows OS: USB audio (USB-miniEVM), Human Interface Devices and USB Composite Device, see Figure 2.

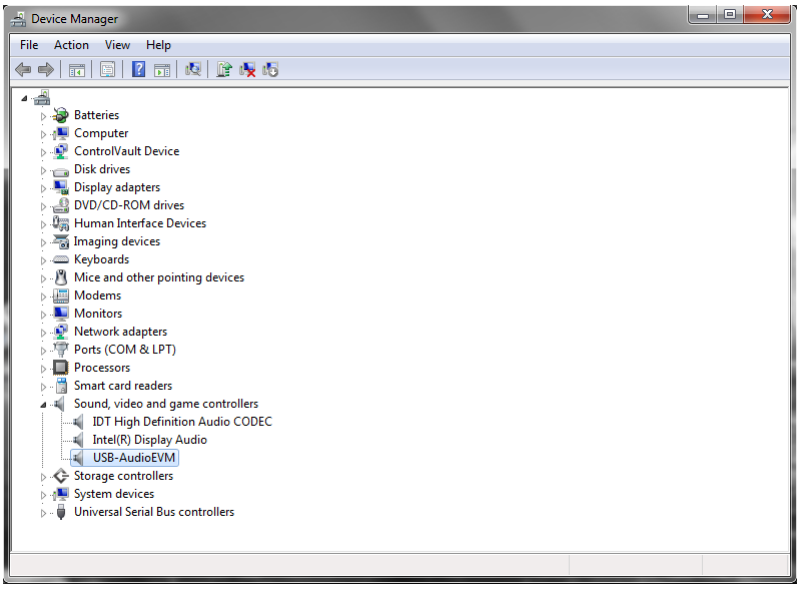


Figure 2. Device Manager

The PPC controls the TAS5760xxEVM and can put the device in two modes: software and hardware.

In hardware mode, GAIN0 and GAIN1 pins are set to the following combinations (00, 01 and 10). The mute, frequency, and PBTL pins are controlled by asserting them to logic high or low. All these settings are controlled via the PPC.

In software mode, the gain pins are set to 1 and the dual function pins (mute, frequency, PBTL) become address, SDA, and SCL.

2 TAS5760xxEVM Setup

This section describes the TAS5760xxEVM setup and software installation. Since PPCMB connects to one of the device under test (DUT) EVMs, it is necessary to show the connection in this section. TAS5760xxEVM is used for this purpose.

2.1 TAS5760xxEVM Setup

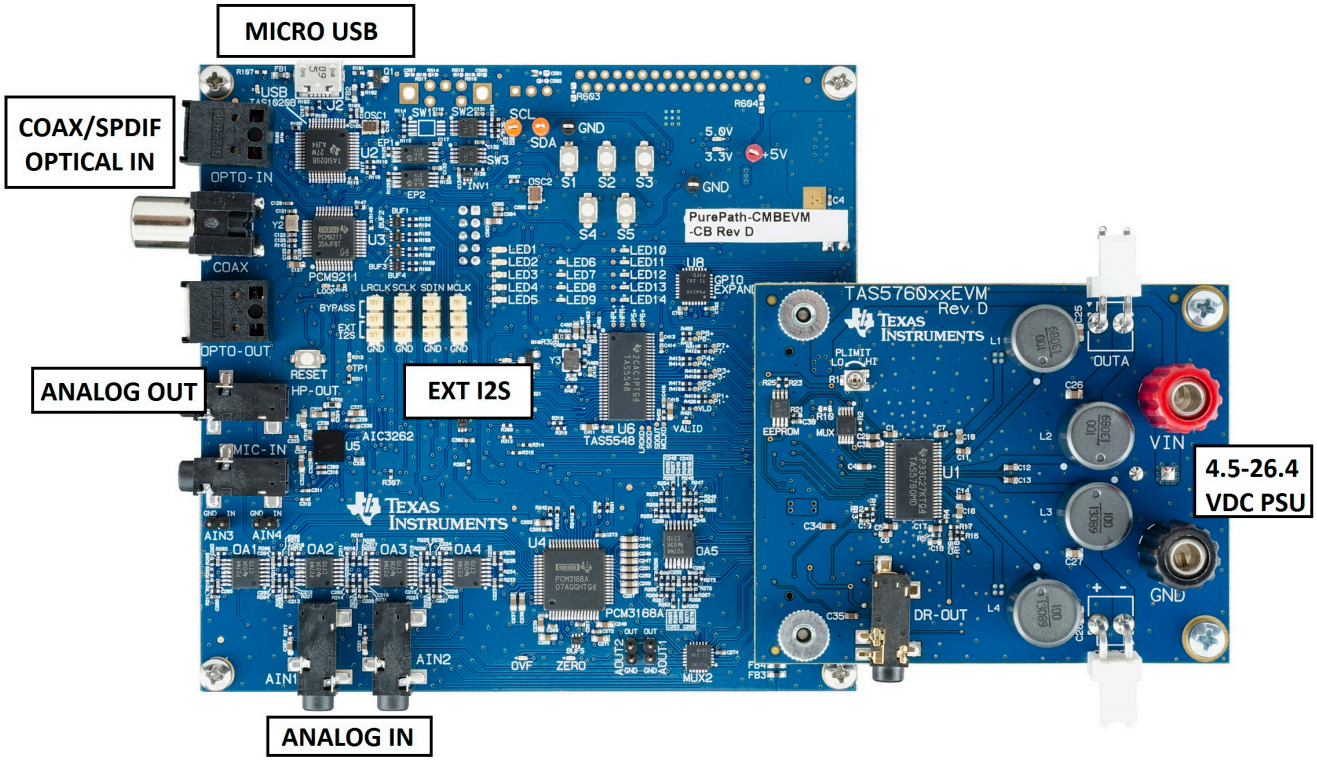


Figure 3. PPCMB and TAS5760xxEVM Connection

Hardware requirements:

- Desktop or laptop PC running either Windows XP or Windows 7
- Power supply 4.5–26.4 VDC
- Speakers and cable
- A USB micro type B cable
- Audio source: This can be a DVD player with appropriate SPDIF cable or Windows Media Player from Windows XP or Windows 7

Hardware setup:

- Plug in USB cable from the PC to the PPCMB; the USB Lock LED (blue) is illuminated.
- Connect the PPCMB to the TAS5760xxEVM.
- Connect PSU to TAS5760xxEVM and turn on the power. 5-V and 3.3-V LEDs are illuminated.
- If optical SPDIF source is used, the blue SPDIF clock-locked LED is illuminated.
- Disregard the orange LED indicating Energy Threshold (ET) level is exceeded. Clearing the ET value turns the orange LED off.

2.2 Software Installation

Download the PurePath Console (PPC) GUI from the PurePath Console folder (www.ti.com/tool/PurePathConsole). The TI Web site has the latest release of the GUI.

Execute the GUI installation program, Setup_PurePathConsole_Main_v**xx**_rev**xx**.exe. Once the program is installed, the program group and shortcut icon is created in Start → Program → Texas Instruments Inc → PurePath Console → Choose Target. The *Target Selection* window is displayed; select *TAS5760* as shown in Figure 4.

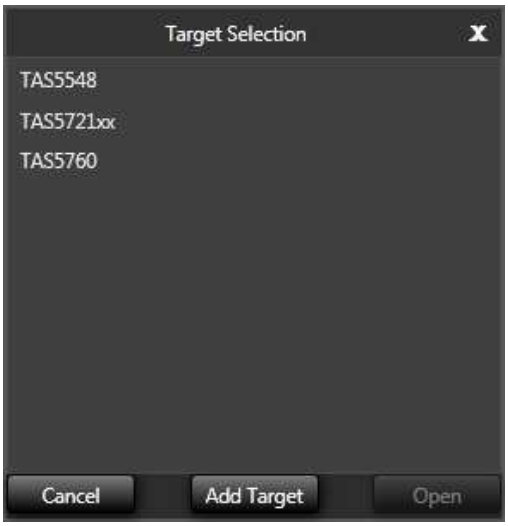


Figure 4. Target Selection List

If the device is not listed in the *Target Selection* List, click on *Add Target* and Windows Explorer displays. Navigate to the folder containing the target zip files (plugins) and choose the DUT. Make sure that the plugin has the same version and revision number as the PPC you are using.

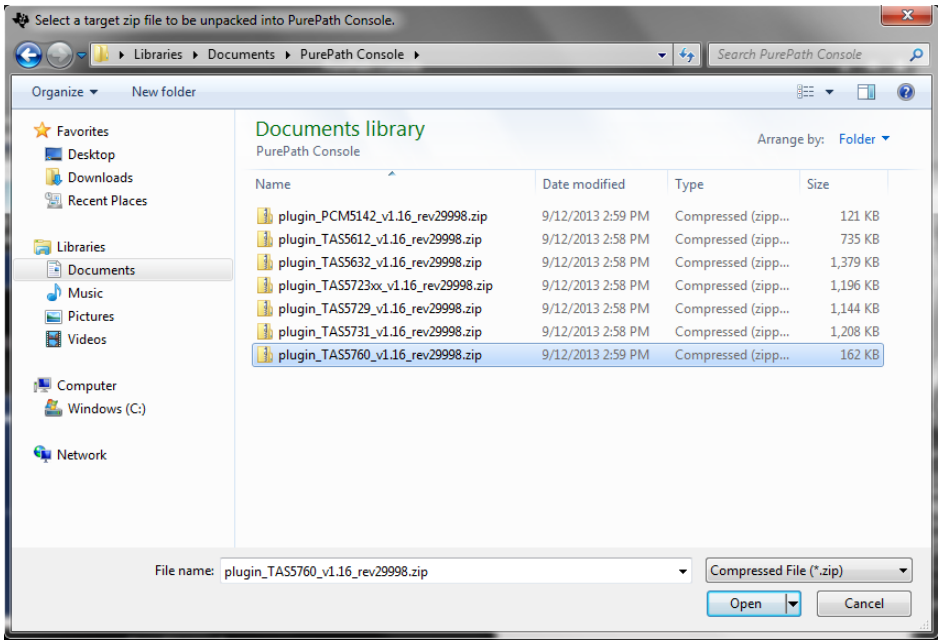


Figure 5. Add Target List

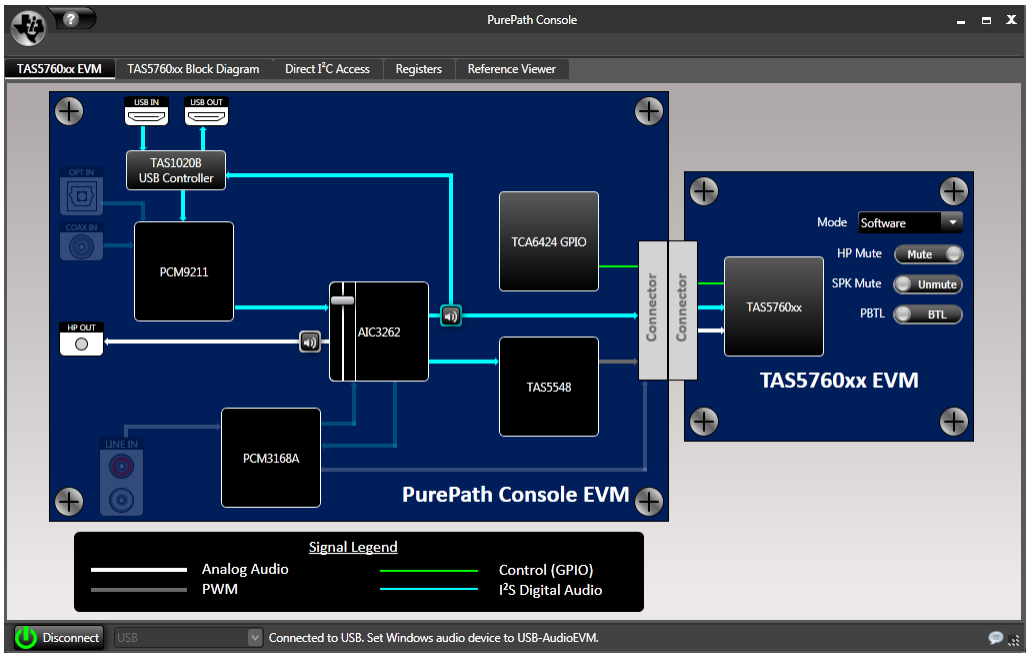


Figure 6. PPCMB and TAS5760xxEVM

The green LED on the bottom left corner of the PPC Window indicates the initialization of TAS5760 is valid.

The PPCMB is initialized with the USB audio (USB-miniEVM) selected. Streaming audio from USB host is routed to the TAS5760.

If an optical input is used, simply click on the OPT IN symbol on the PPC software, the I2S is then routed with this signal. Likewise with a COAX/SPDIF input using the COAX IN symbol. If an analog input is used, click on the LINE IN symbol on the PPC software, the ADC (PCM3168A) will be the source of I2S data.

3 Using the PurePath™ Console with the TAS5760xxEVM Board

The TAS5760xxEVM is initialized upon PurePath Console startup. Audio is streaming to the speakers if Windows Media (or similar program) is playing and mini-USB EVM is selected in the sound playback properties. The following indicators show both PPC GUI and TAS5760xxEVM are operating correctly:

- On the PPCMB, the USB blue LED is on, the green LEDs for 3.3 V and 5 V are on
- On the PPC, the green LED on the bottom left corner is on

3.1 TAS5760 Main Tab

The DUT tab is displayed when the PPC GUI starts up. Here, you can click on TAS5760 icon and it directs you to the device block diagram. See Figure 6.

3.2 TAS5760 Block Diagram Tab

This tab, illustrated in Figure 7, shows the device major blocks. The boxes with black background are selectable. When one is selected, it shows pop-up settings for the particular setting.

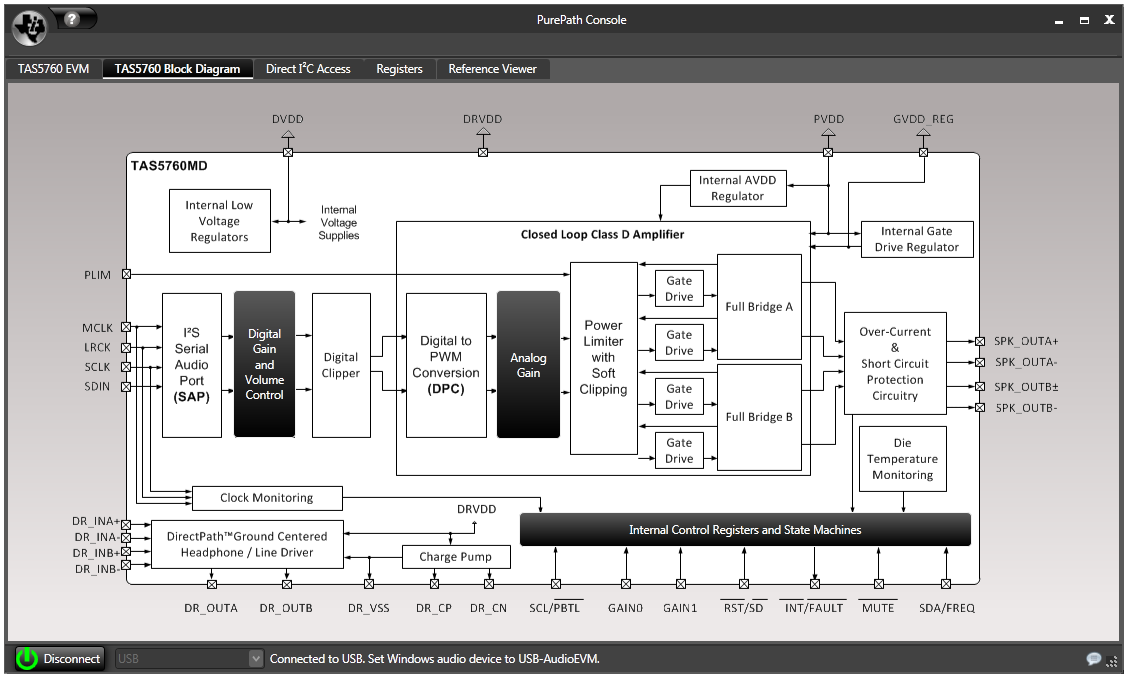


Figure 7. TAS5760 Block Diagram

3.3 Pop-up Windows

For TAS5760 there are several settings that are done via I²C. The GUI facilitates these settings seamlessly using the pop-up windows below. See Figure 8 and Figure 9.

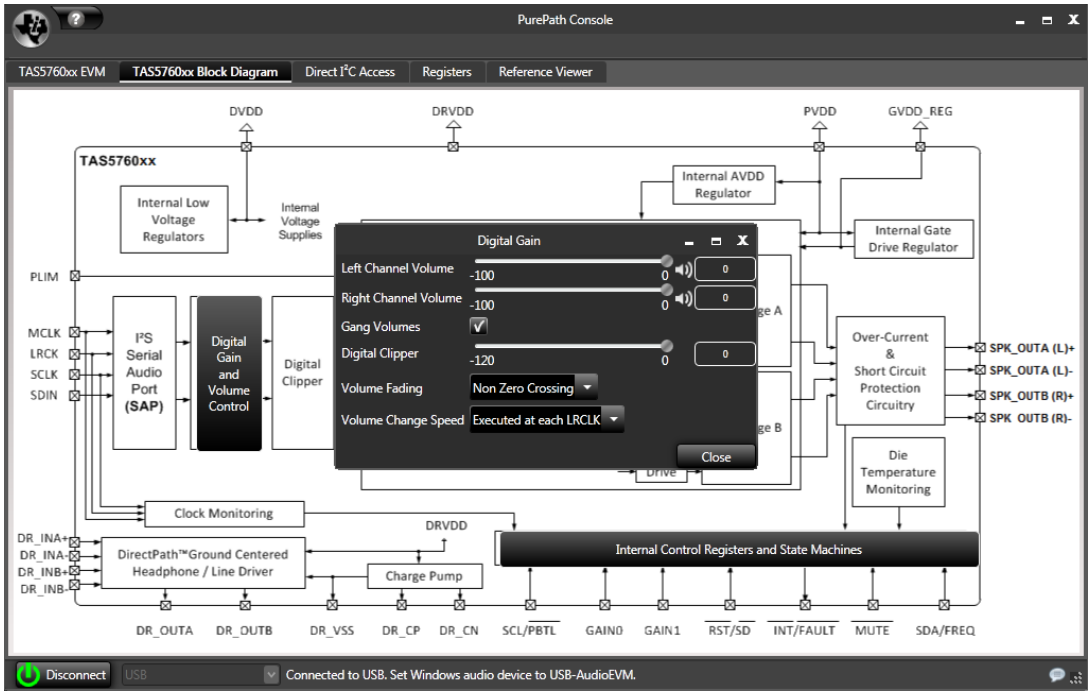


Figure 8. Digital Gain Pop-up

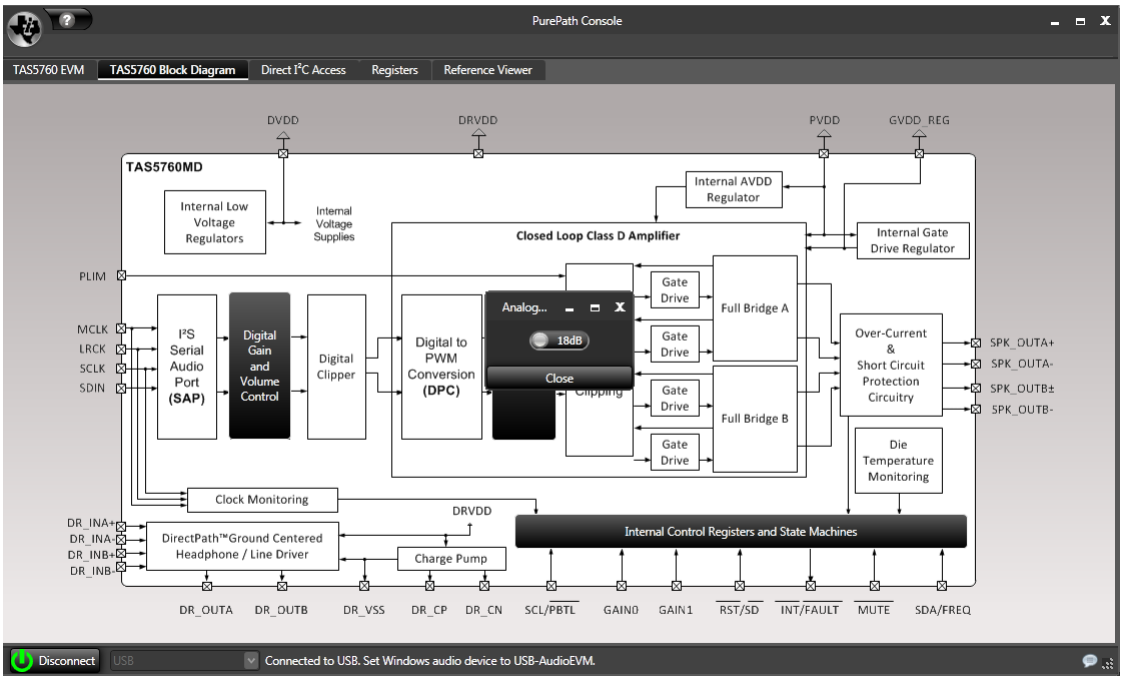


Figure 9. Analog Gain Pop-up

3.4 Direct I²C Access Tab

I²C registers read and write can be performed on this tab (see Figure 10). Type in the device I²C address and click *Set*. On the *Direct I2C Read/Write* box, enter a valid I²C register for read and type in both valid register and data for write.

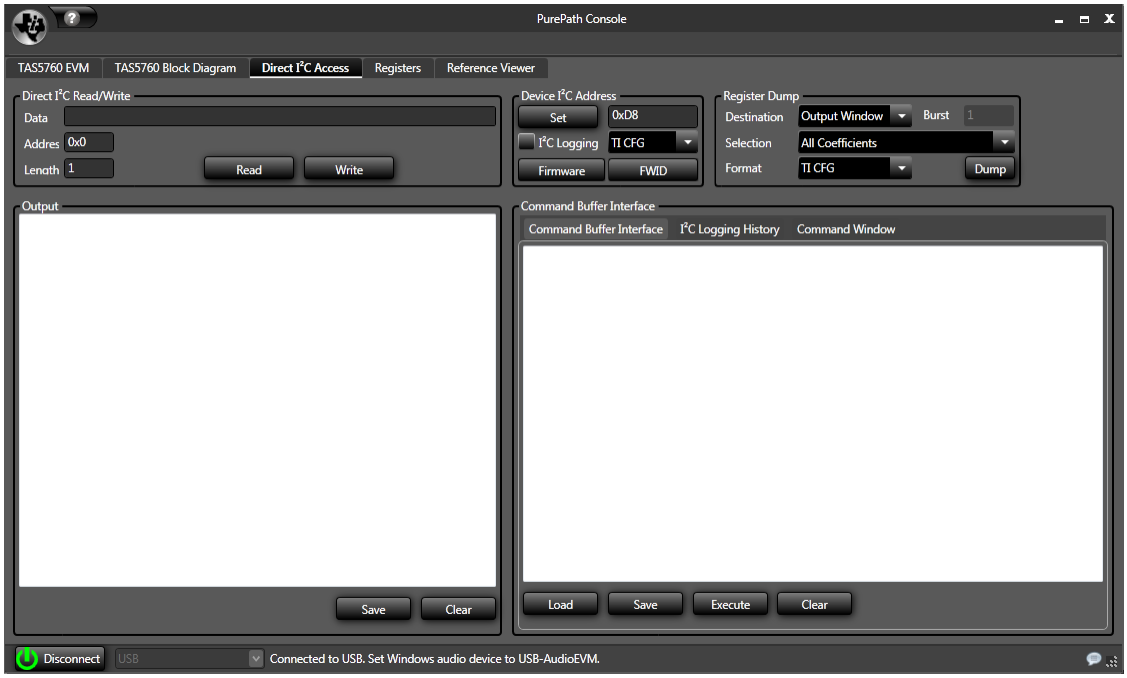
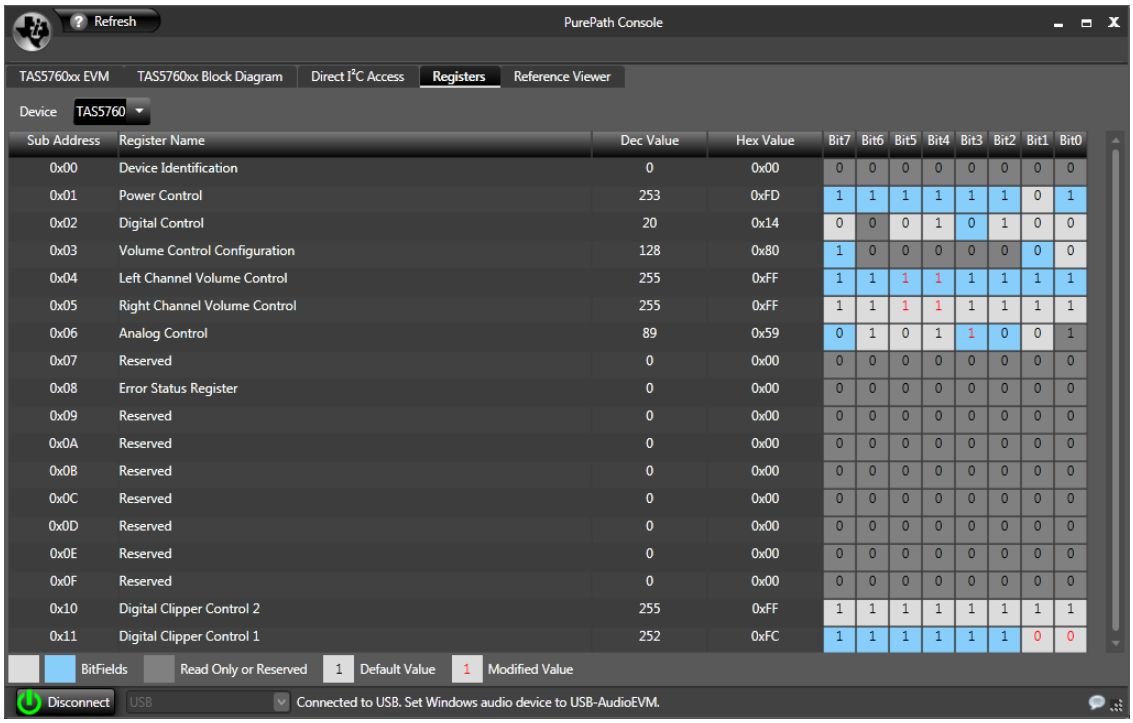


Figure 10. Direct I²C Access

3.5 Device Registers Tab

This tab shows the current I²C registers values (hexadecimal and decimal) in the TAS5760.



Sub Address	Register Name	Dec Value	Hex Value	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x00	Device Identification	0	0x00	0	0	0	0	0	0	0	0
0x01	Power Control	253	0xFD	1	1	1	1	1	1	0	1
0x02	Digital Control	20	0x14	0	0	0	1	0	1	0	0
0x03	Volume Control Configuration	128	0x80	1	0	0	0	0	0	0	0
0x04	Left Channel Volume Control	255	0xFF	1	1	1	1	1	1	1	1
0x05	Right Channel Volume Control	255	0xFF	1	1	1	1	1	1	1	1
0x06	Analog Control	89	0x59	0	1	0	1	1	0	0	1
0x07	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x08	Error Status Register	0	0x00	0	0	0	0	0	0	0	0
0x09	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x0A	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x0B	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x0C	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x0D	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x0E	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x0F	Reserved	0	0x00	0	0	0	0	0	0	0	0
0x10	Digital Clipper Control 2	255	0xFF	1	1	1	1	1	1	1	1
0x11	Digital Clipper Control 1	252	0xFC	1	1	1	1	1	1	0	0

Figure 11. Device Registers Tab

4 Board Layouts, Bill of Materials, and Schematic

4.1 TAS5760xxEVM Board Layouts

Figure 12 and Figure 13 illustrate the board layouts for the EVM.

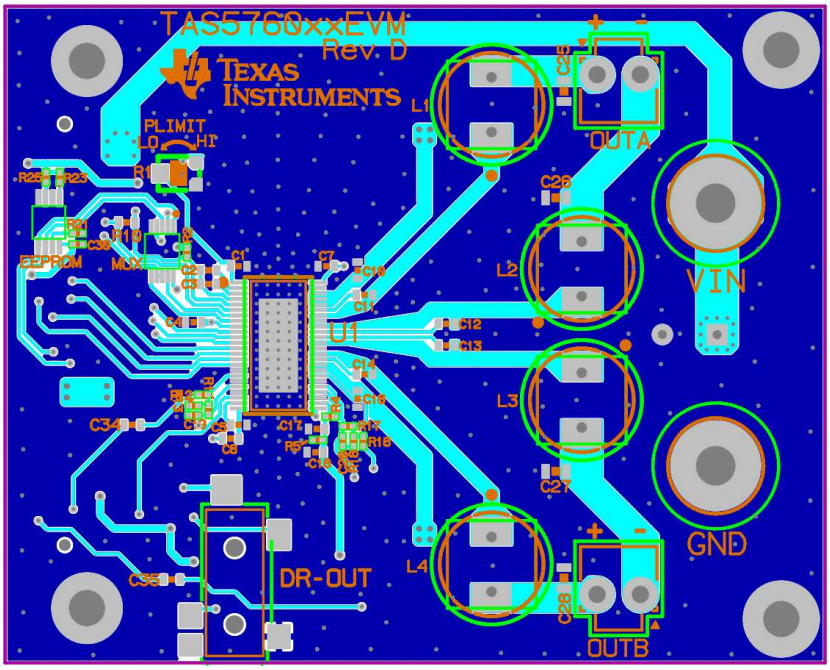


Figure 12. TAS5760xxEVM Rev D Top Composite Assembly

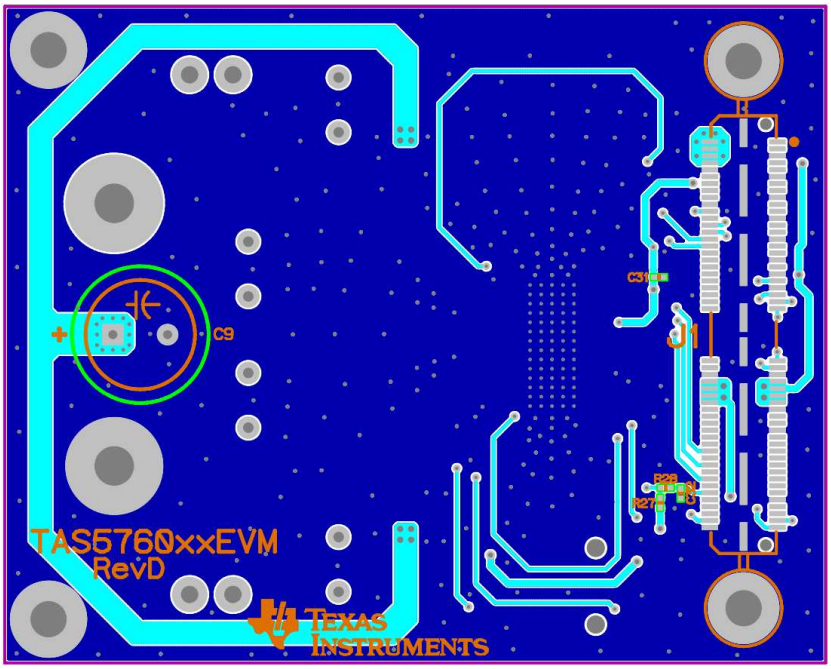


Figure 13. PPCMB Rev D Bottom Composite Assembly

4.2 Bill of Materials

Table 1 displays the BOM for this EVM.

Table 1. Bill of Materials

ITEM	MANU PART NUM	MANU	QTY	REF DESIGNATORS	DESCRIPTION
1	TAS5760xxDCA	TEXAS INSTRUMENTS	1	U1	I2S INPUT AMP W/POWER LIMITER AND HEADPHONE,HTSSOP48-DCA,ROHS
2	TS3A24157DGSR	TEXAS INSTRUMENTS	1	MUX	DUAL SPDT ANALOG SWITCH 0.65 OHMS MSOP10-DGS ROHS
3	24LC256-I/MS	MICROCHIP	1	EEPROM	SERIAL EEPROM I2C 256K 400kHz MSOP8-MS ROHS
4	C1608X7R1C105K	TDK CORP	8	C1, C2, C3, C4, C5, C6, C7, C17	CAP SMD0603 CERM 1.0UFD 16V 10% X7R ROHS
5	C1005X5R1A105K	TDK CORP	3	C30, C31, C32	CAP SMD0402 CERM 1.0UFD 10V 10% X5R ROHS
6	EEU-FC1H471	PANASONIC	2	C9	CAP THRU ALUM-ELECT FC SERIES 470ufd 50V 20% 12.5x5x25mm ROHS
7	GRM188R71H104KA93D	MURATA	2	C10, C16	CAP SMD0603 CERM 0.1UFD 50V 10% X7R ROHS
8	06033D224KAT2A	AVX	4	C11, C12, C13, C14	CAP SMD0603 CERM 0.22UFD 25V 10% X5R ROHS
9	GRM1885C1H471JA01D	MURATA	1	C18	CAP SMD0603 CERM 470PFD 50V 5% COG ROHS
10	GRM1555C1H221JA01D	MURATA	2	C19, C20	CAP SMD0402 CERM 220PFD 5% 50V COG ROHS
11	C2012X7R1H684K	TDK	4	C25, C26, C27, C28	CAP SMD0805 CERM 0.68ufd 50V 10% X7R ROHS
12	GRM188R60J106ME47D	MURATA	2	C34, C35	CAP SMD0603 CERM 10UFD 6.3V 20% X5R ROHS
13	3303W-3-104E	BOURNS	1	R1	POT SMD CERMET 100K OHMS 25% SINGLE TURN TOP ADJ ROHS
14	CRCW040210K0FKED	VISHAY	9	R2, R12, R16, R17, R21, R23, R25, R27, R28	RESISTOR SMD0402 10.0K OHMS 1% 1/16W ROHS
15	RC0402FR-0722KL	YAGEO	1	R4	RESISTOR SMD0402 THICK FILM 22.0K OHMS 1% 1/16W ROHS
16	RC0402FR-073K9L	YAGEO	1	R5	RESISTOR SMD0402 THICK FILM 3.90K OHM 1% 1/16W ROHS
17	RMCF0402ZT0R00	STACKPOLE ELECTRONICS	0	R10	ZERO OHM JUMPER SMT 0402 0 OHM 1/16W 5% ROHS
18	ERJ-2RKF5601X	PANASONIC	2	R13, R18	RESISTOR SMD0402 5.60K 1/16W 1% ROHS
19	CRCW040210K0FKED	VISHAY	3	R21, R23, R25	RESISTOR SMD0402 10.0K OHMS 1% 1/16W ROHS
20	A7503AY-100M	TOKO JAPAN	4	L1, L2, L3, L4	INDUCTOR SERIES 11RHBP/A7503AY 10uH/4.3A ROHS
21	QTS-050-01-F-D-A	SAMTEC	1	J1	CONNECTOR SMT/THU 100 POS+GND MATE HEIGHT 5mm ROHS
22	B2PS-VH(LF)(SN)	JST	2	OUTA, OUTB	JACK JST-VH RA 2-PIN 3.96mmLS ROHS
23	35RASMT4BHNTRX	SWITCHCRAFT	1	DR-OUT	JACK MINI STEREO 3.5mm SMT W/SHUNTS ROHS
24	7006	KEYSTONE ELECTRONICS	1	VIN	BINDING POST, RED, 15A ECONO ROHS
25	7007	KEYSTONE ELECTRONICS	1	GND	BINDING POST, BLACK, 15A ECONO ROHS
26	95947A060	MCMASTER-CARR	2	STANDOFFS	STANDOFF M3x30mm 6mm DIA HEX ALUMINUM F-F ROHS
27	92000A118	MCMASTER-CARR	4	STANDOFF SCREWS	SCREW M3x8 PHILIPS PANHEAD STAINLESS STEEL ROHS
28	92148A150	MCMASTER-CARR	2	STANDOFF WASHERS	WASHER SPLIT-LOCK M3 6.2mm OD 0.7mm THICK STAINLESS STEEL ROHS
		TOTAL	66		
X1	DO NOT POPULATE		1	R10	

4.3 TAS5760xxEVM Rev D Schematic

The schematics for TAS5760xxEVM rev. D are illustrated in Figure 14 and Figure 15.

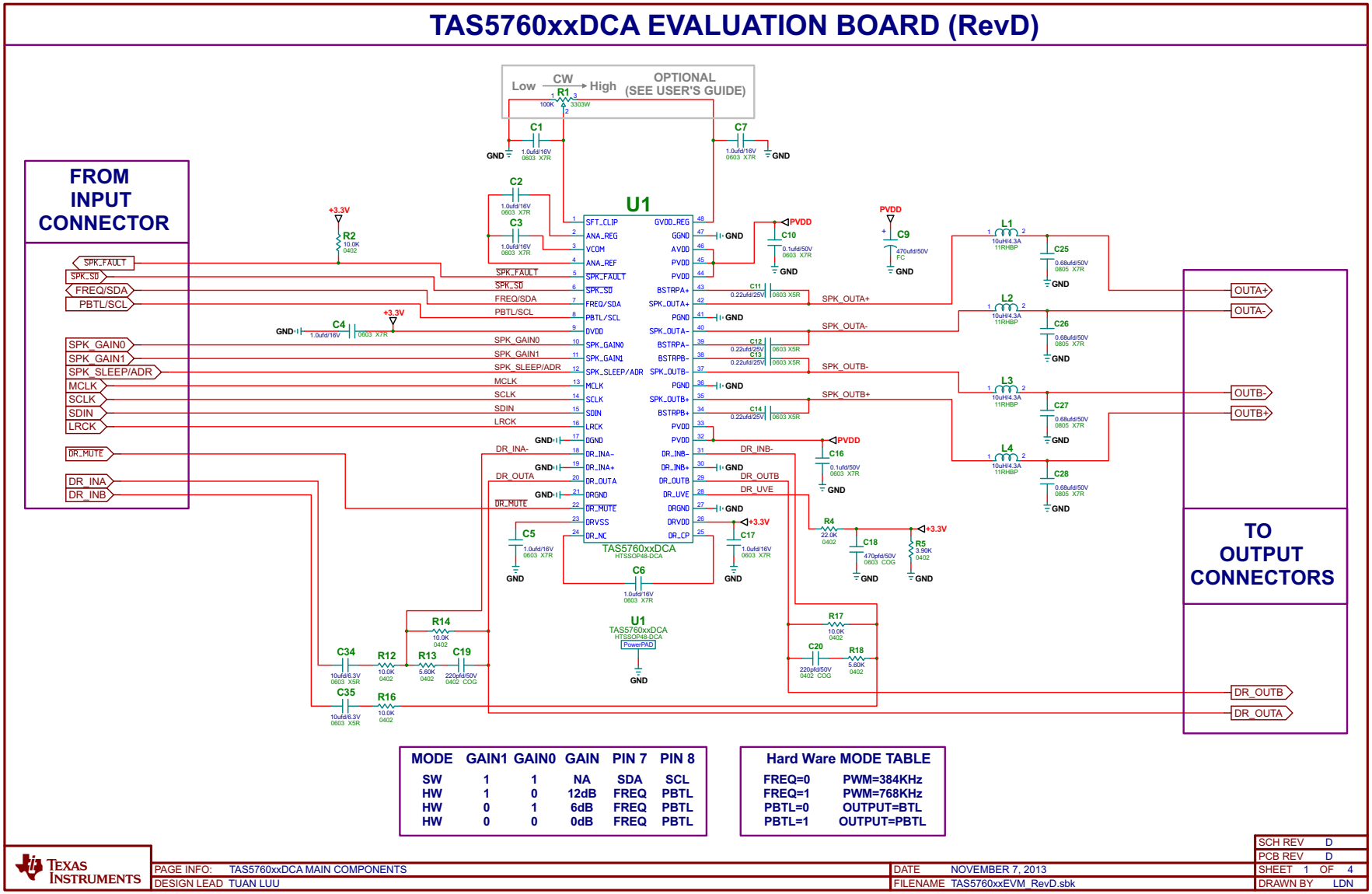


Figure 14. TAS5760xxEVM Rev D Schematic (Page 1 of 2)

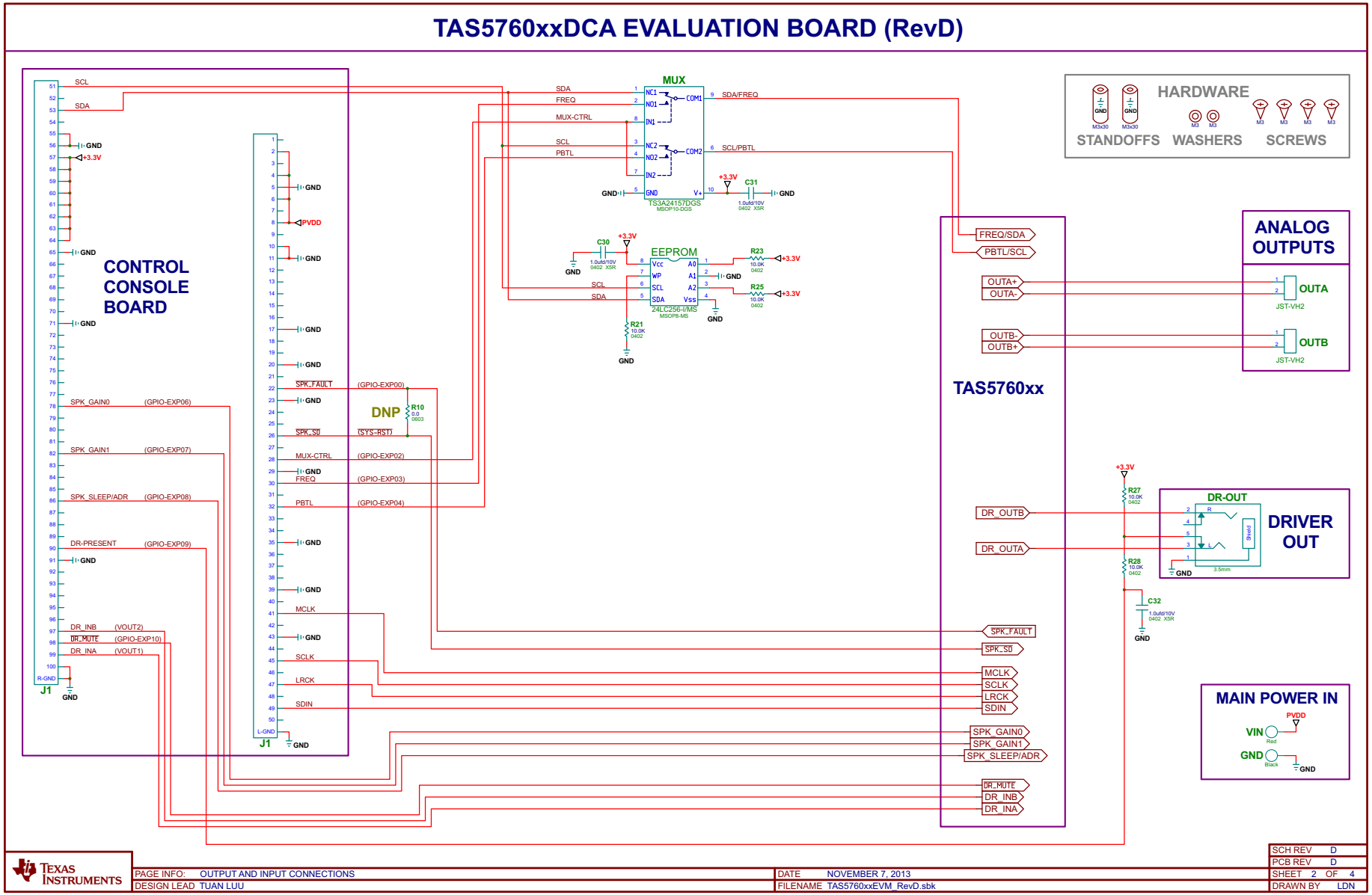


Figure 15. TAS5760xxEVM Rev D Schematic (Page 2 of 2)

Revision History

Changes from Original (July, 2013) to A Revision **Page**

- Added link to PPCMB web page. 1
- Added link to E2E forums. 1
- Changed PPCMB and TAS5760xxEVM board, Figure 1. 2
- Changed Device Manager, Figure 2. 3
- Deleted BTL from second sentence of second paragraph below Figure 2 3
- Changed first sentence of third paragraph after Figure 2 3
- Changed PPCMB and TAS5760xxEVM Connection, Figure 3. 4
- Changed power supply voltage from 24 to 4.5-26.4 VDC 4
- Added sentence before Figure 5. 5
- Changed Add Target List, Figure 5. 5
- PPCMB and TAS5760xxEVM, Figure 6. 6
- Changed last sentence of Section 2. 6
- Digital Gain Pop-up, Figure 8. 7
- Deleted last four rows of BOM. 11

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

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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 LIMITED 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. 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.

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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 EVMs for RF Products 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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本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

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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. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. 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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