TAS5806MEVM User's Guide

This user's guide describes the operation of the TAS5806M Evaluation Module (EVM). The EVM is connected to the PurePath™ Console Motherboard (PPCMB). The main contents of this document are:

- Hardware descriptions and implementation

Required equipment and accessories:

- TAS5806MEVM
- PurePath Console Motherboard
- A USB micro type-B cable
- Power supply unit (PSU)
- Speakers and cables
- Desktop or laptop running Microsoft® Windows® 7, Windows 8, or Windows 8.1
- Audio source: This can be a DVD player with appropriate SPDIF cable or *Playback Media* from Windows 7, Windows 8 or Windows 8.1.

Trademarks

1 Hardware Overview

The TAS5806MEVM showcases the latest TI digital input Class-D closed-loop amplifier. The TAS5806M is an inductor-less digital input stereo Class-D audio amplifier with enhanced processing and low power dissipation. The EVM is used in conjunction with the PurePath Console Motherboard (PPCMB). The PVDD supply is provided via the TAS5806MEVM (Figure 1) and is regulated to 5 VDC and 3.3 VDC on the PPCMB. The PPCMB provides the I²S, I²C, and 3.3 VDC to the TAS5806MEVM.

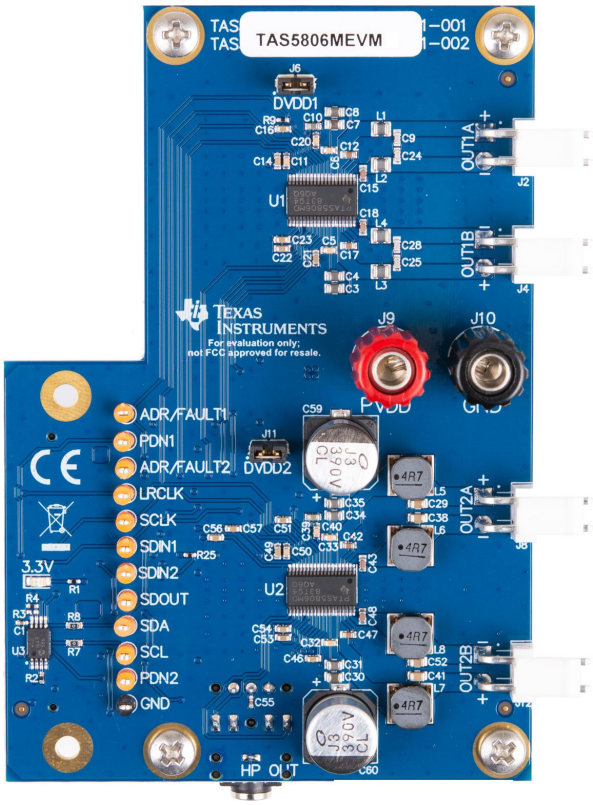

Figure 1. TAS5806MEVM

1.1 Features

The EVM has the following features:

- 96-kHz input sample rate support
- 2.0, mono and 2.1 capable
- Operates in BTL or PBTL
- PurePath Console Motherboard provides flexible input signal routing (USB, SPDIF, and analog)
- Demonstration, evaluation and development environment via the PurePath Console 3 software (GUI)

1.2 Functions

The TAS5806MEVM is controlled by the PPCMB. The digital audio data input to the TAS5806MEVM is sent from PPCMB and is selectable from USB audio, optical SPDIF, coaxial SPDIF, PSIA (external I²S) and analog ADC sources.

1.3 Detailed Operations

Upon power-on, the PPCMB uses USB audio input (default). The I²S signals LRCLK, SCLK, SDIN and MCLK come from the TAS1020B.

foobar2000 or similar non-processing media source can be used to stream audio. The TAS1020B enumerates as the following device on a Microsoft Windows operating system (OS): USB audio (USB-AudioEVM) (See Figure 2).

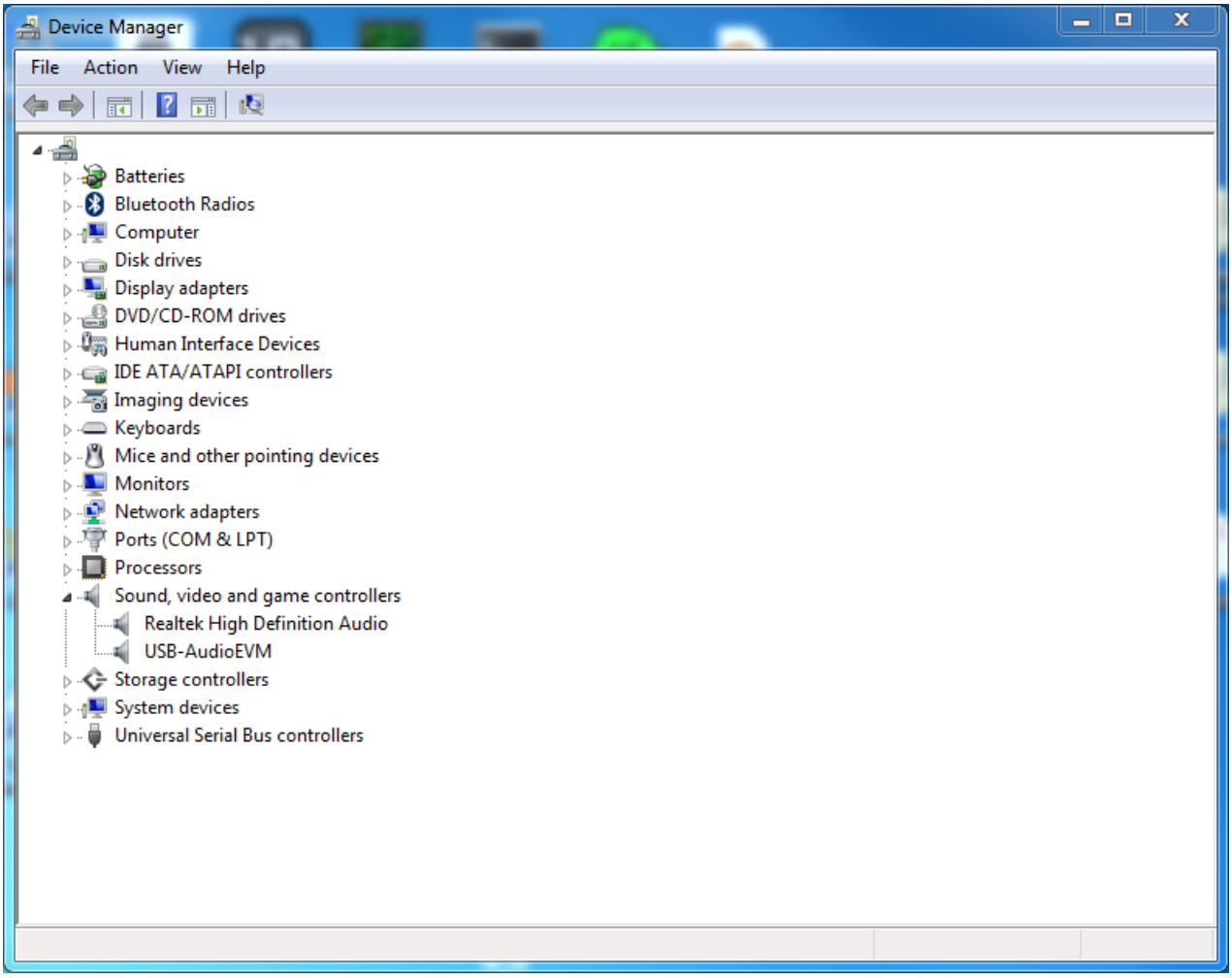

Figure 2. Device Manager

USB audio output quality can be configured as shown in Figure 3. Users must select "2 channel, 16 bit, 48000 Hz (DVD Quality)".

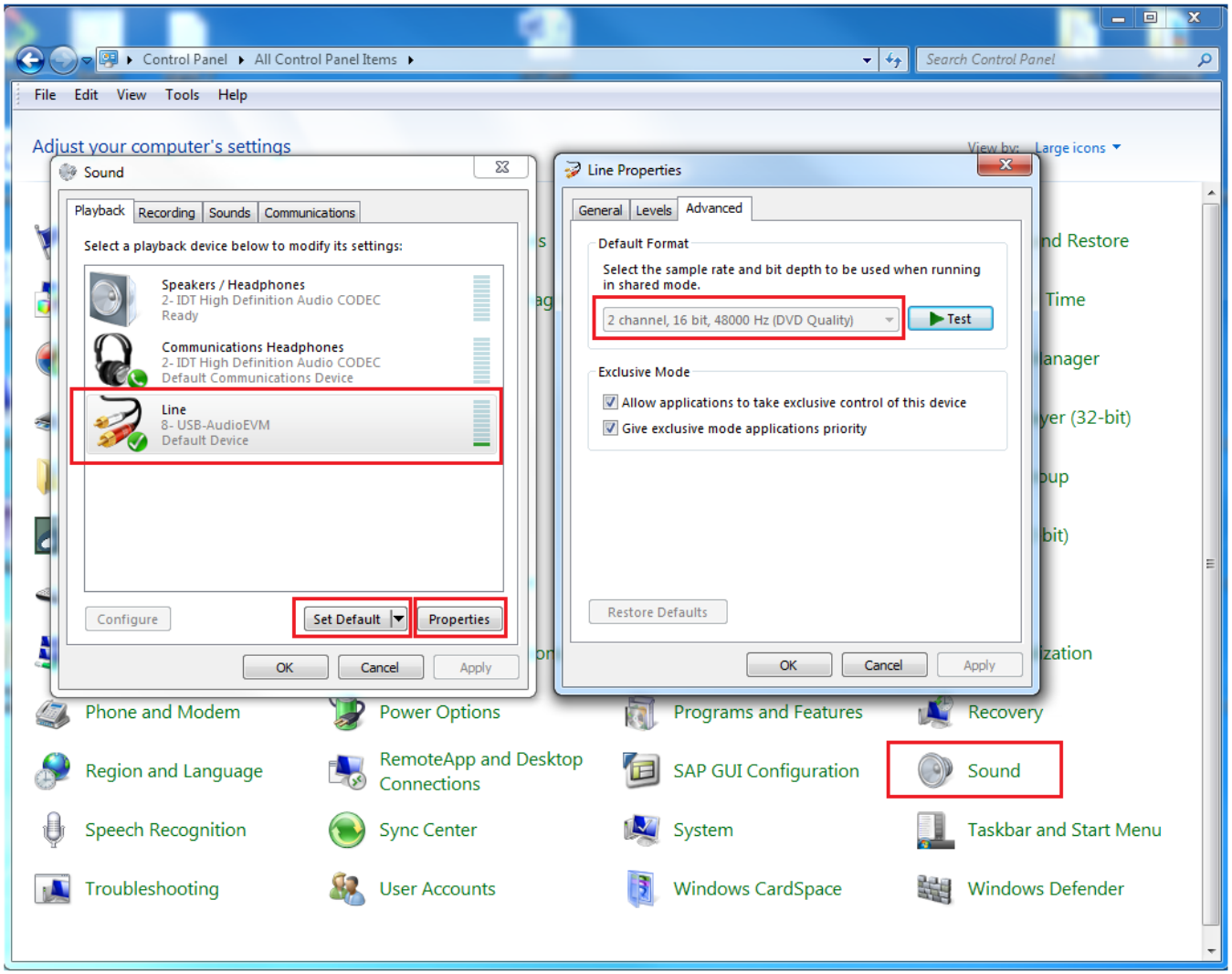

Figure 3. Default Format

2 Hardware Setup

Use the following steps when setting up the hardware:

Step 1. Connect the PPCMB to the TAS5806MEVM.

Step 2. Connect speakers to the TAS5806MEVM.

Step 3. Connect a PSU to the TAS5806MEVM and turn on the power. 5-V and 3.3-V LEDs (Yellow) are illuminated. The USB Lock LED (Blue) is also illuminated.

Step 4. Plug in a USB cable from the PC to the PPCMB.

Step 5. If an optical SPDIF source is used, the blue SPDIF clock-locked LED is illuminated.

2.1 I^2C Device Addresses

The default I^2C addresses on the EVM are set to 0x58 for the top device (U1) and 0x5A for the bottom one (U2).

3 Troubleshooting

3.1 Power Cycle

To perform a power cycle, disconnect both the USB cable and the power supply from the board.

4 Board Layouts, Bill of Materials, and Schematic

This section includes the EVM schematics, board layouts and bill of materials.

4.1 Schematics

Figure 4 to Figure 6 illustrate the schematics for this EVM.

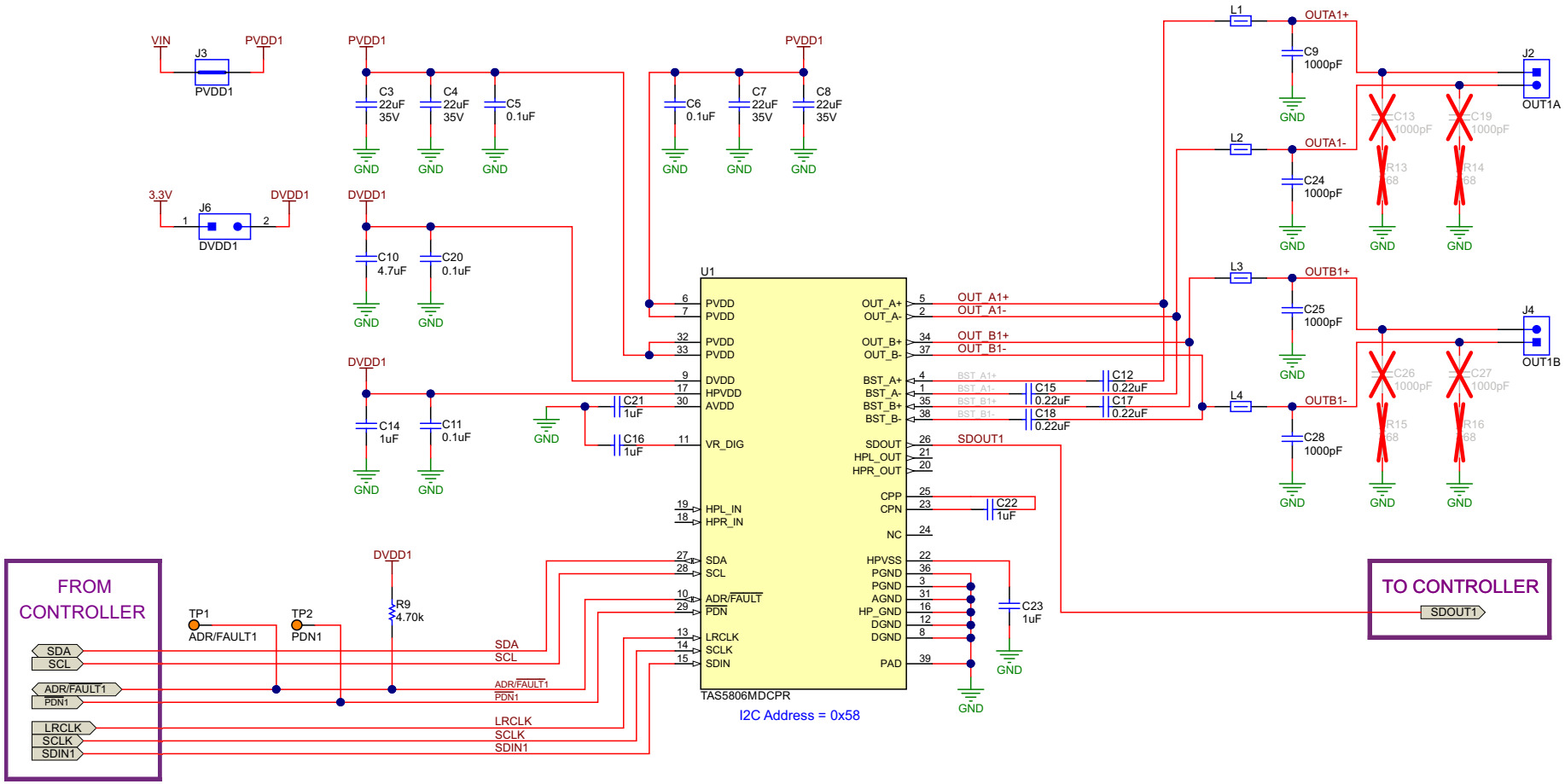

Figure 4. TAS5806MEVM Schematic (1 of 3)

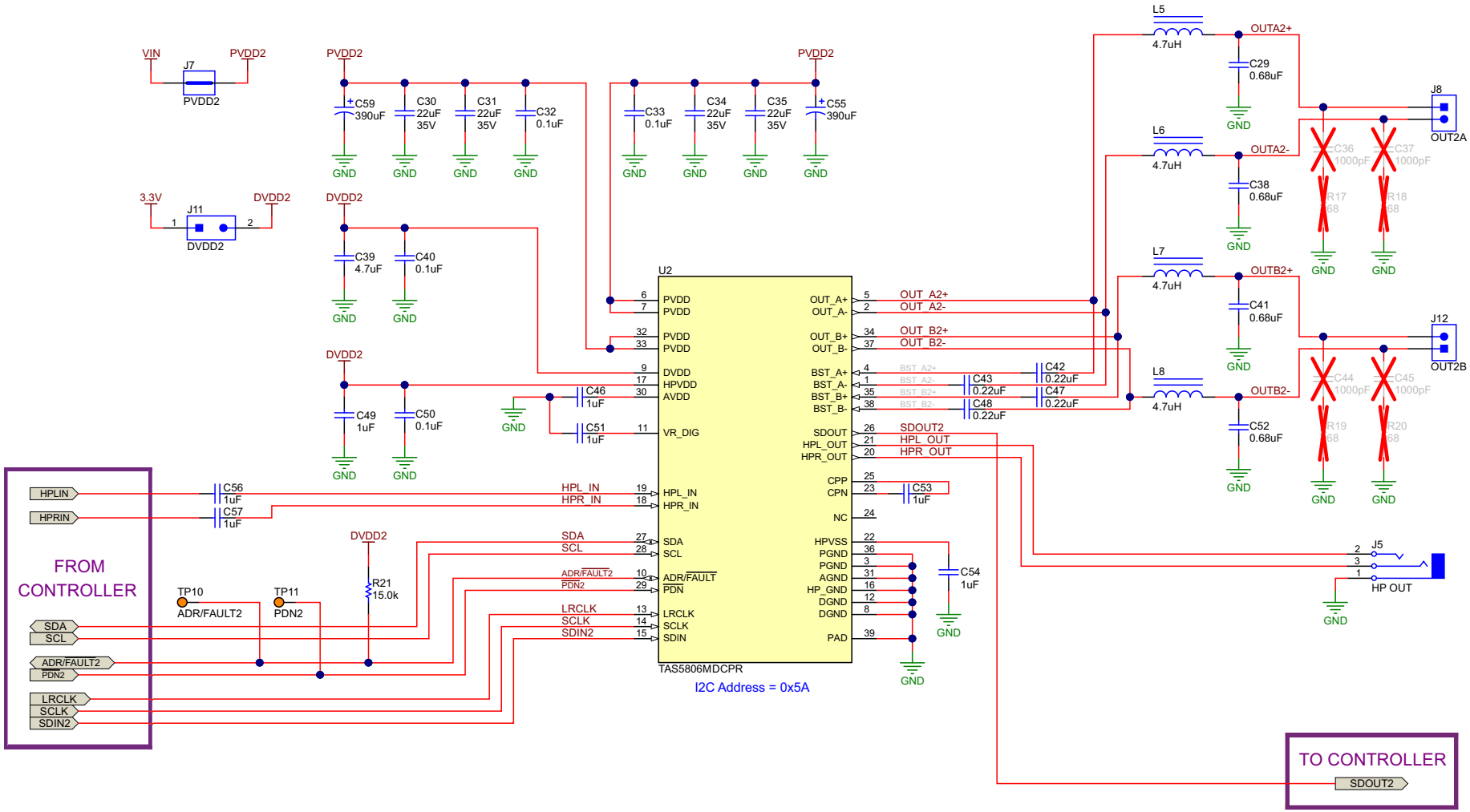

Figure 5. TAS5806MEVM Schematic (2 of 3)

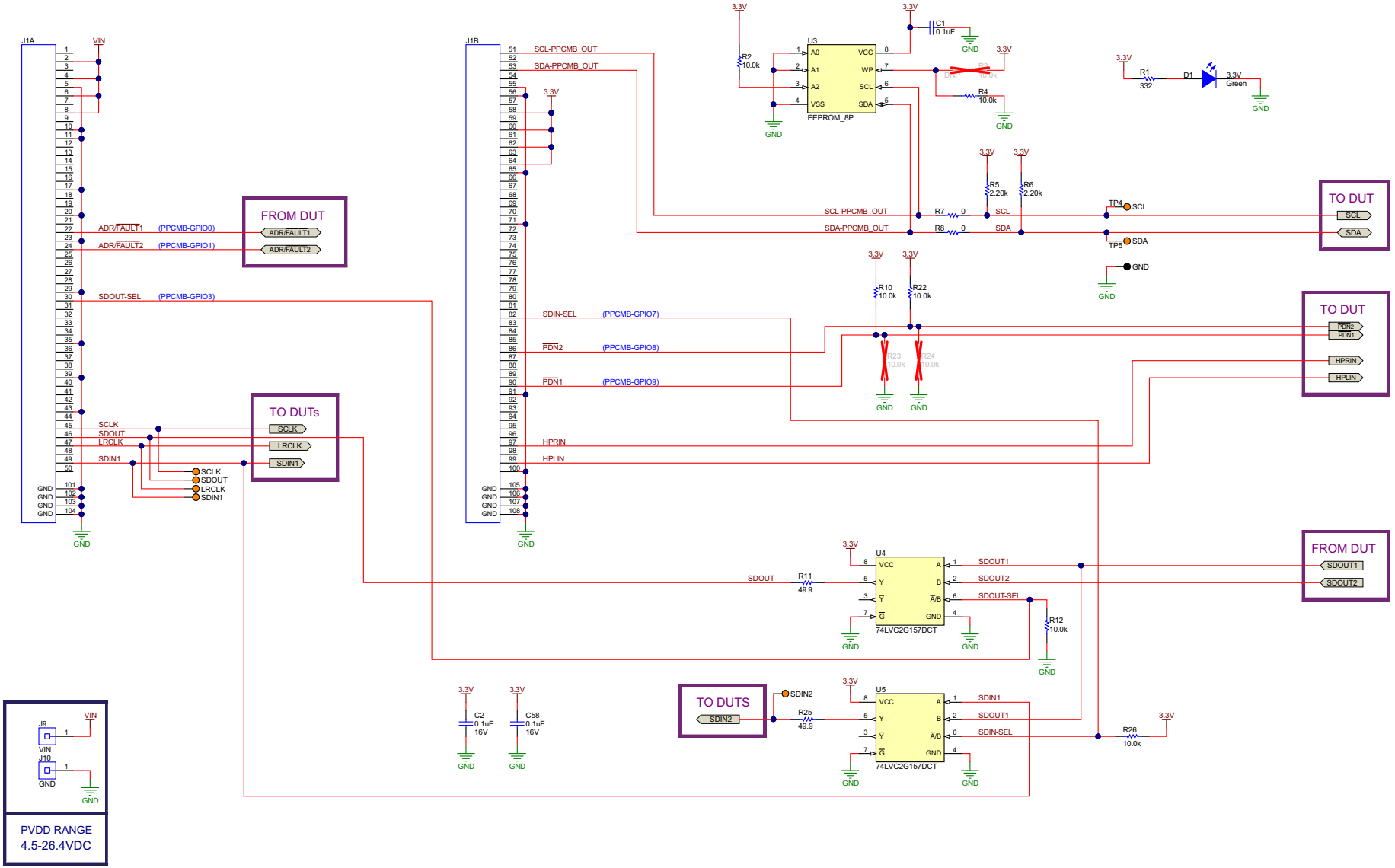

Figure 6. TAS5806MEVM Schematic (3 of 3)

4.2 Board Layouts

Figure 7 and Figure 8 illustrate the board layouts for the EVM.

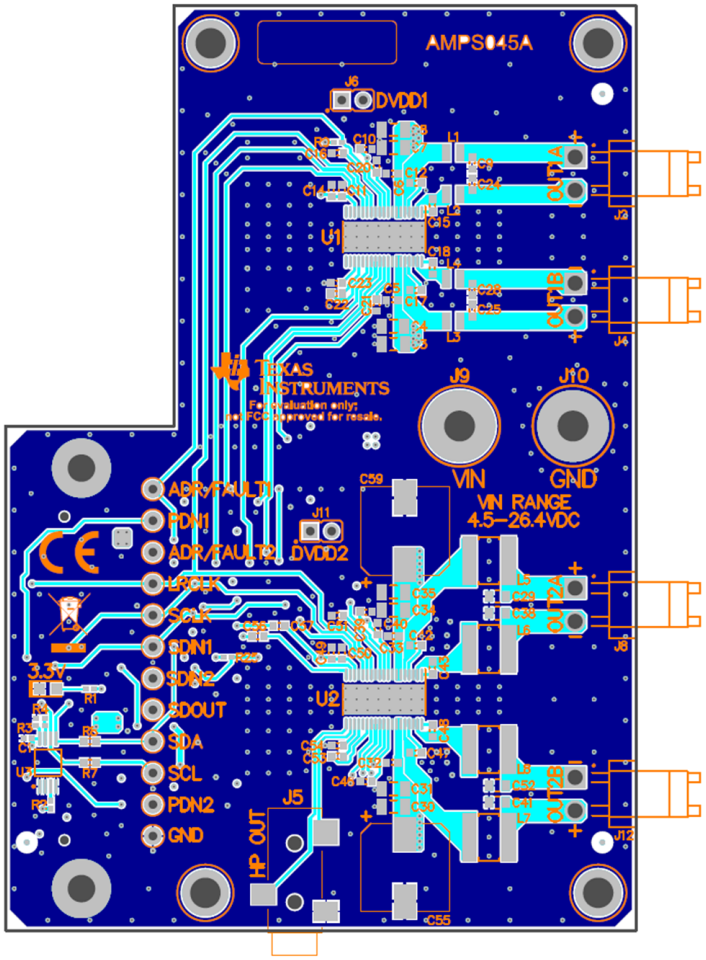

Figure 7. TAS5806MEVM Top Composite Assembly

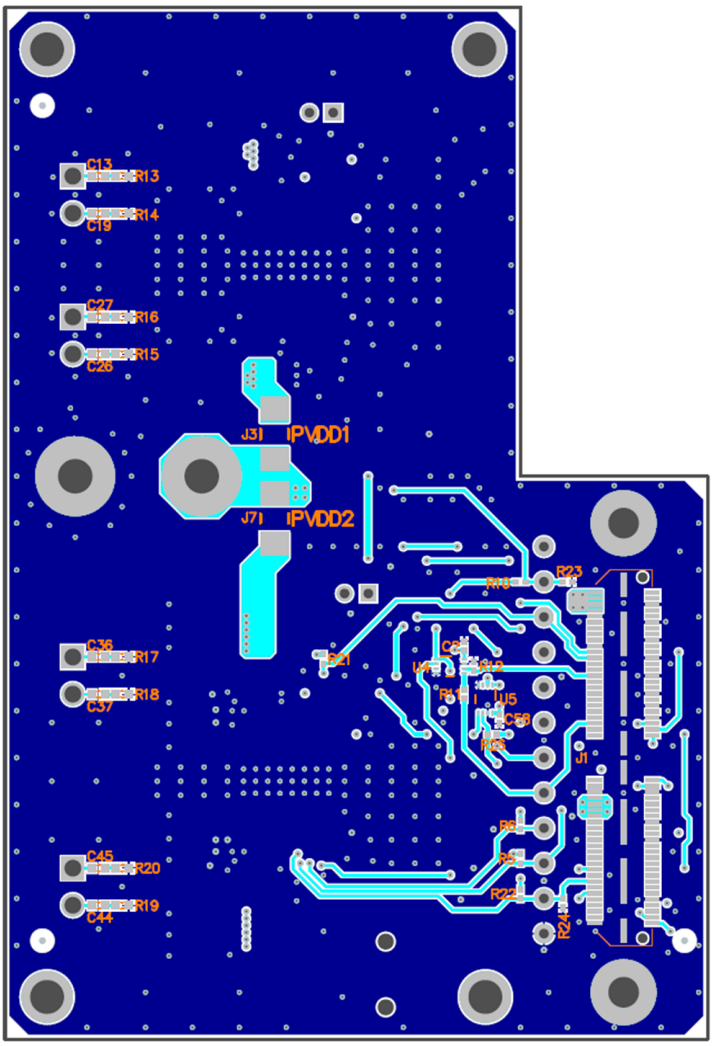

Figure 8. TAS5806MEVM Bottom Composite Assembly

4.3 Bill of Materials

Table 1 details the EVM BOM.

Table 1. Bill of Materials[1]

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
C1, C2, C58	3	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	GCM155R71C104KA55D	MuRata		
C3, C4, C7, C8, C30, C31, C34, C35	8	22uF	CAP, CERM, 22 uF, 35 V, +/- 20%, X5R, 1206	1206	C3216X5R1V226M160AC	TDK		
C5, C6, C11, C20, C32, C33, C40, C50	8	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0603	0603	C0603C104K4RACTU	Kemet		
C9, C24, C25, C28	4	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, C0G/NP0, 0603	0603	06035A102KAT2A	AVX		
C10, C39	2	4.7uF	CAP, CERM, 4.7 uF, 10 V, +/- 10%, X5R, 0603	0603	C0603C475K8PACTU	Kemet		
C12, C15, C17, C18, C42, C43, C47, C48	8	0.22uF	CAP, CERM, 0.22 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	CGA3E3X7R1H224K080AB	TDK		
C14, C16, C21, C22, C23, C46, C49, C51, C53, C54, C56, C57	12	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X5R, 0603	0603	C0603C105K4PACTU	Kemet		
C29, C38, C41, C52	4	0.68uF	CAP, CERM, 0.68 uF, 50 V, +/- 10%, X7R, 0805	0805	C0805C684K5RACTU	Kemet		
C55, C59	2	390uF	CAP, AL, 390 uF, 35 V, +/- 20%, 0.08 ohm, SMD	10x10	UCL1V391MNL1GS	Nichicon		
D1	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On		
H1, H2, H3, H4	4		MACHINE SCREW PAN PHILLIPS M3	M3 Screw	RM3X8MM 2701	APM HEXSEAL		
H5, H6, H7, H8	4		Washer, Flat, #4 Nylon		3200	Keystone		
H9, H10, H11, H12	4		Standoff, HexBrass M3, 30 mm	Spacer M3, 30mm	R30-1003002	Harwin		
J1	1		Connector, 100 Pos. 0.635mm, SMT	Connector, 1575x235x280 mil	QTS-050-01-F-D-A	Samtec		
J2, J4, J8, J12	4		Header (friction lock), 3.96mm, 2x1, Tin, R/A, TH	Header, 2x1, 3.96mm, R/A	B2PS-VH(LF)(SN)	JST Manufacturing		
J3, J7	2		JUMPER TIN SMD	6.85x0.97x2.51 mm	S1911-46R	Harwin		
J5	1		Audio Jack, 3.5mm, Stereo, R/A, SMT	Audio Jack SMD	SJ-3523-SMT	CUI Inc.		
J6, J11	2		Header, 100mil, 2x1, Gold, TH	Sullins 100mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
J9	1		Binding Post, RED, TH	11.4x27.2mm	7006	Keystone		
J10	1		Binding Post, BLACK, TH	11.4x27.2mm	7007	Keystone		
L1, L2, L3, L4	4	300 ohm	Ferrite Bead, 300 ohm @ 100 MHz, 3.1 A, 0806	0806	NFZ2MSM301SN10L	MuRata		
L5, L6, L7, L8	4	4.7uH	Inductor, Shielded, 4.7 uH, 4 A, 0.023 ohm, SMD	6.3x4.5x6.3mm	1255AY-4R7M=P3	MuRata Toko		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady		
R1	1	332	RES, 332, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402332RFKED	Vishay-Dale		
R2, R4, R10, R22	4	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0FKED	Vishay-Dale		
R5, R6	2	2.20k	RES, 2.20 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04022K20FKED	Vishay-Dale		
R7, R8	2	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06030000Z0EA	Vishay-Dale		
R9	1	4.70k	RES, 4.70 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF4701X	Panasonic		
R11, R25	2	49.9	RES, 49.9, 1%, 0.063 W, 0402	0402	RC0402FR-0749R9L	Yageo America		

(1) Unless otherwise noted in the *Alternate Part Number* or *Alternate Manufacturer* columns, all parts may be substituted with equivalents.

Table 1. Bill of Materials[(1)] (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R12, R26	2	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT10K0	Stackpole Electronics Inc		
R21	1	15.0k	RES, 15.0 k, .1%, .063 W, AEC-Q200 Grade 0, 0402	0402	ERA-2AEB153X	Panasonic		
SH-J1, SH-J2	2	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1, TP2, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12	11		Test Point, Miniature, Orange, TH	Orange Miniature Testpoint	5003	Keystone		
TP3	1		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone		
U1, U2	2		20W Inductor-Less, Digital Input, Stereo, Closed-Loop Class-D Audio Amplifier with Enhanced Processing and and DirectPath HP Driver, DCP0038A (TSSOP-38)	DCP0038A	TAS5806MDCPR	Texas Instruments	TAS5806MDCPT	Texas Instruments
U3	1		EEPROM, 512KBIT, 400KHZ, 8TSSOP	TSSOP-8	24LC512-I/ST	Microchip		
U4, U5	2		Single 2-Line to 1-Line Data Selector/Multiplexer, DCU0008A, LARGE T&R	DCU0008A	'SN74LVC2G157DCUR	Texas Instruments	SN74LVC2G157DCUT	Texas Instruments
C13, C19, C26, C27, C36, C37, C44, C45	0	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, C0G/NP0, 0603	0603	06035A102KAT2A	AVX		
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
R3, R23, R24	0	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0FKED	Vishay-Dale		
R13, R14, R15, R16, R17, R18, R19, R20	0	68	RES, 68, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060368R0JNEA	Vishay-Dale		

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   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

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   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *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

NOTE: 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

NOTE: 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.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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.

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.

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.

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

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs 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 EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

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