



TAS5825M Evaluation Module

This user's guide describes the operation of the TAS5825M 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:

- TAS5825MEVM
- 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.

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1 Hardware Overview

The TAS5825MEVM showcases the latest TI digital input Class-D closed-loop amplifier. The TAS5825M is a digital input Class-D audio amplifier with 96-kHz, and 192-kHz extended processing. The EVM is used in conjunction with the PurePath Console Motherboard (PPCMB). The PVDD supply is provided via the TAS5825MEVM (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 TAS5825MEVM.

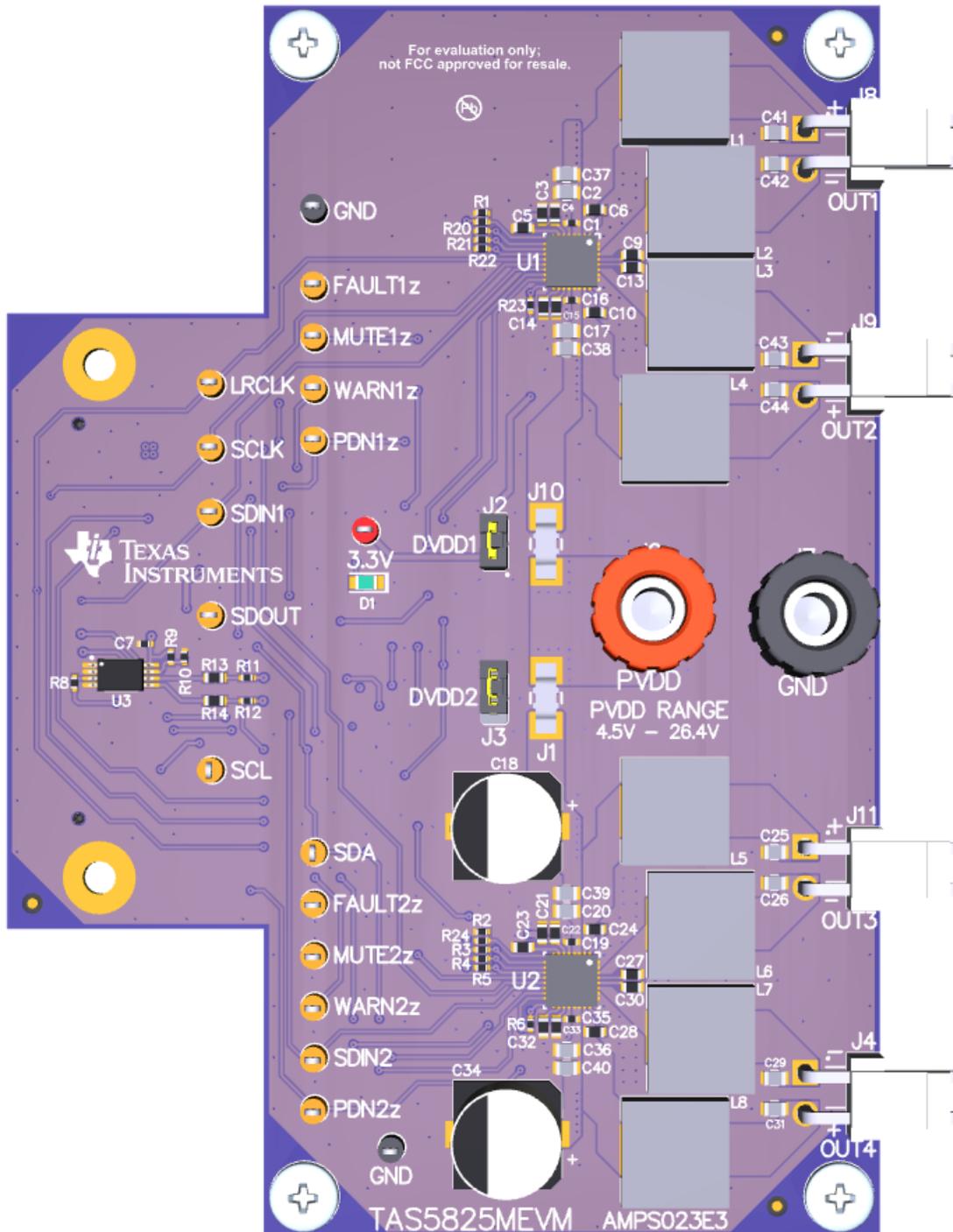


Figure 1. TAS5825MEVM

1.1 Features

The EVM has the following features:

- 96-kHz or 192-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 TAS5825MEVM is controlled by the PPCMB. The digital audio data input to the TAS5825MEVM 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), i, and *USB Composite Device*, see [Figure 2](#).

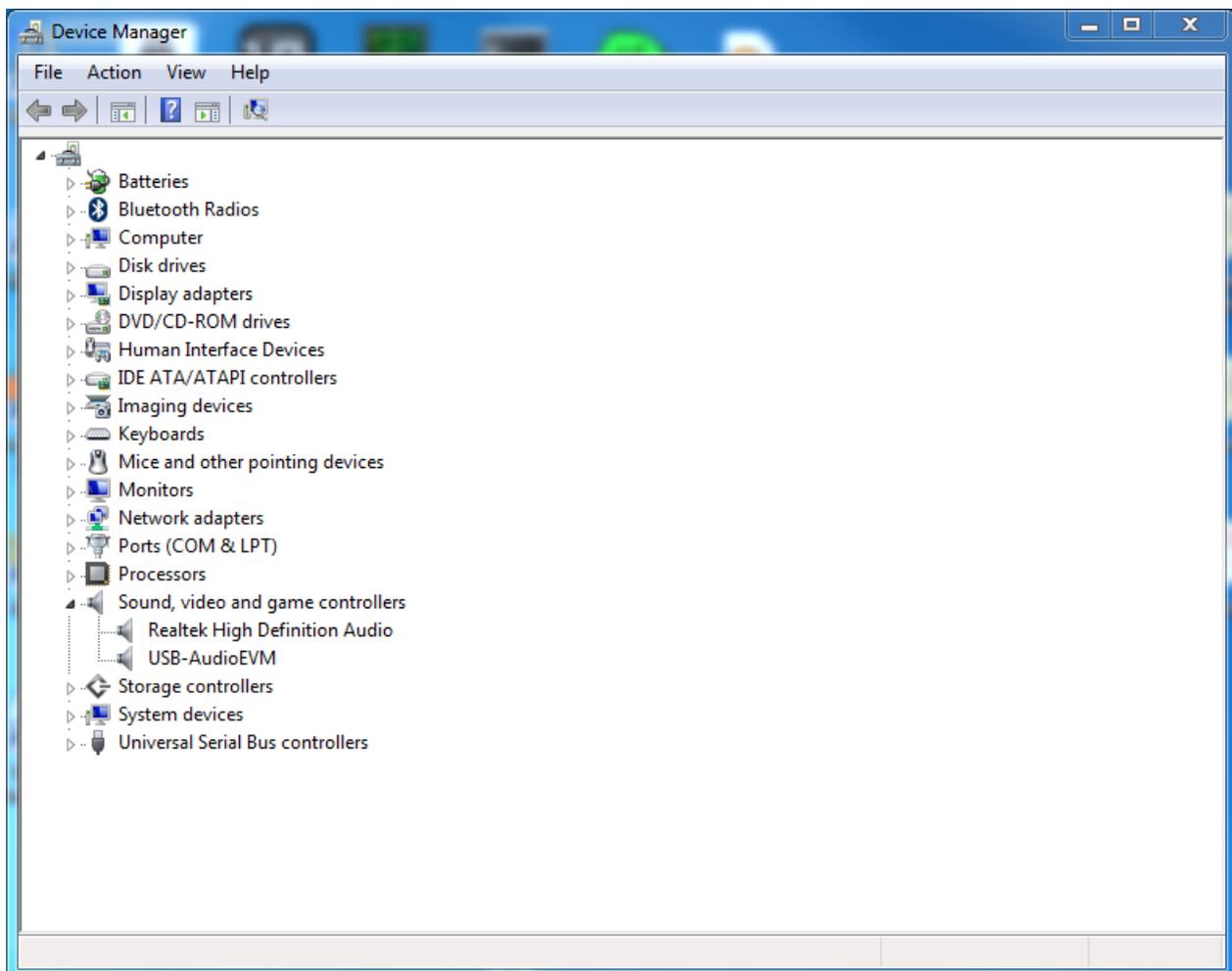


Figure 2. Device Manager

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

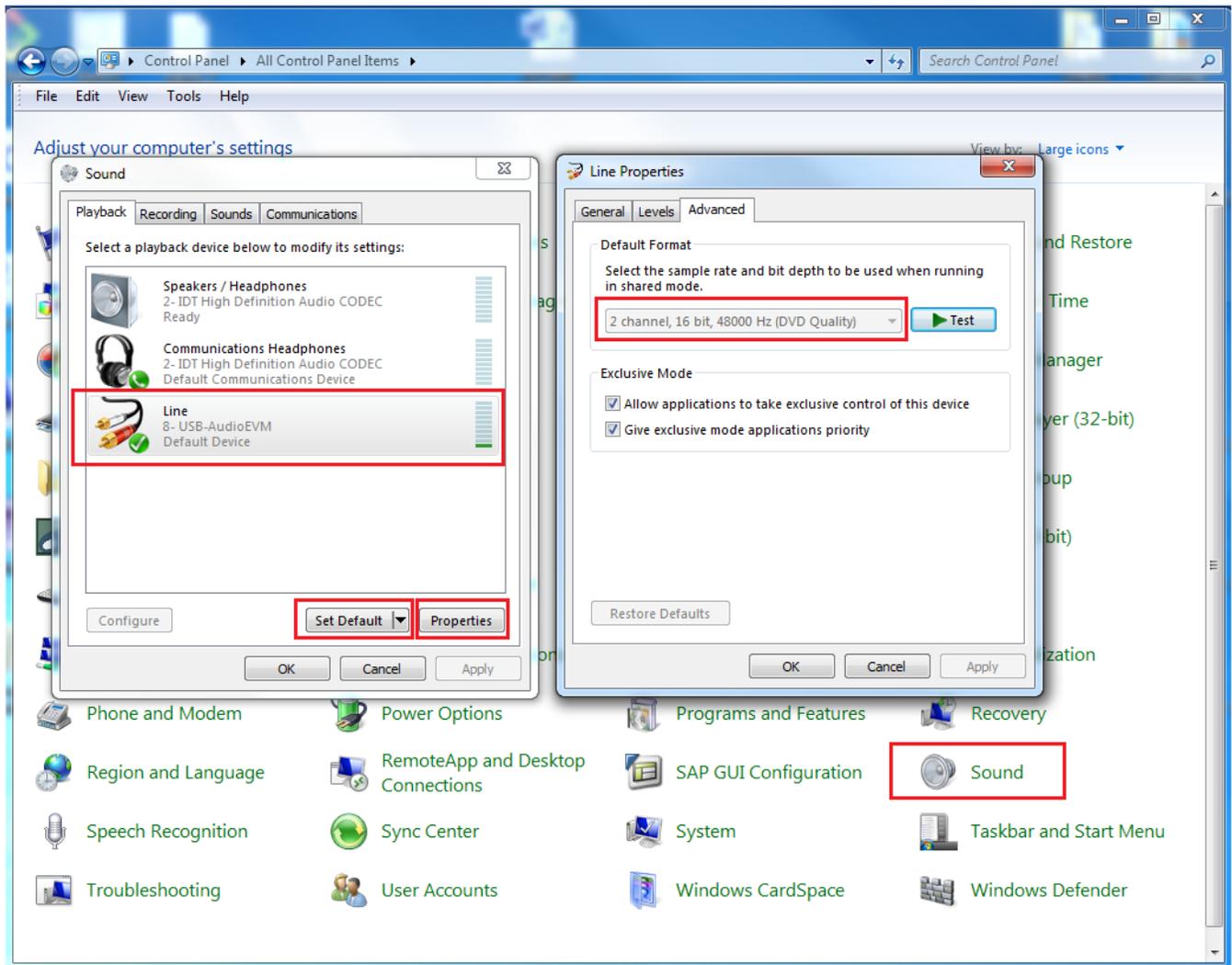


Figure 3. Default Format

2 Hardware Setup

Use the following steps when setting up the hardware:

- Step 1. Connect the PPCMB to the TAS5825MEVM.
- Step 2. Connect speakers to the TAS5825MEVM.
- Step 3. Connect a PSU to the TAS5825MEVM 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 I²C Device Addresses

The default I²C addresses on the EVM are set to 0x98 for the top device (U1) and 0x9A 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.

3.2 Change PPCMB Sample Rate

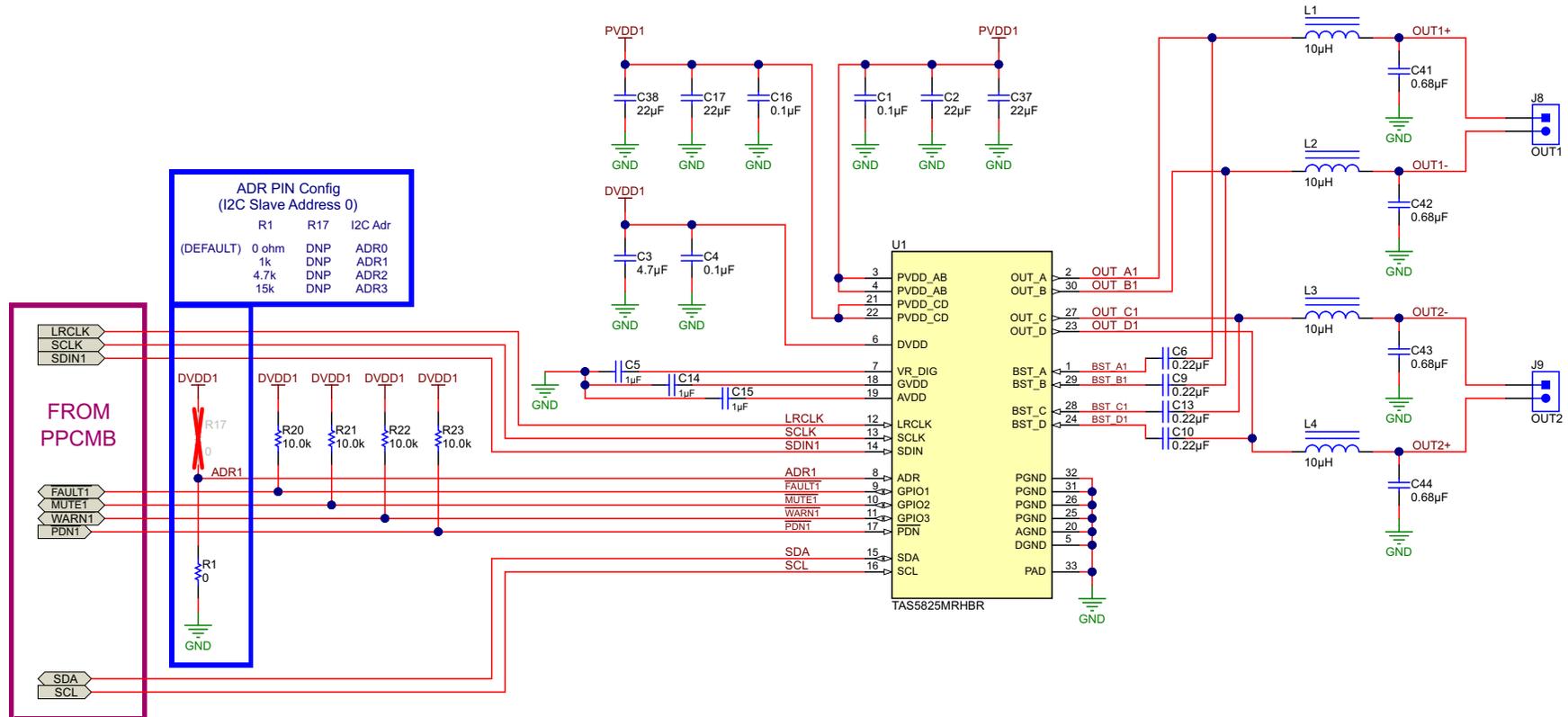
Older PPCMB devices may require a firmware update to support 48-kHz audio over USB. Instructions for updating the PPCMB firmware is found [here](#). Please note this update applies only to audio over USB.

4 Board Layouts, Bill of Materials, and Schematic

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

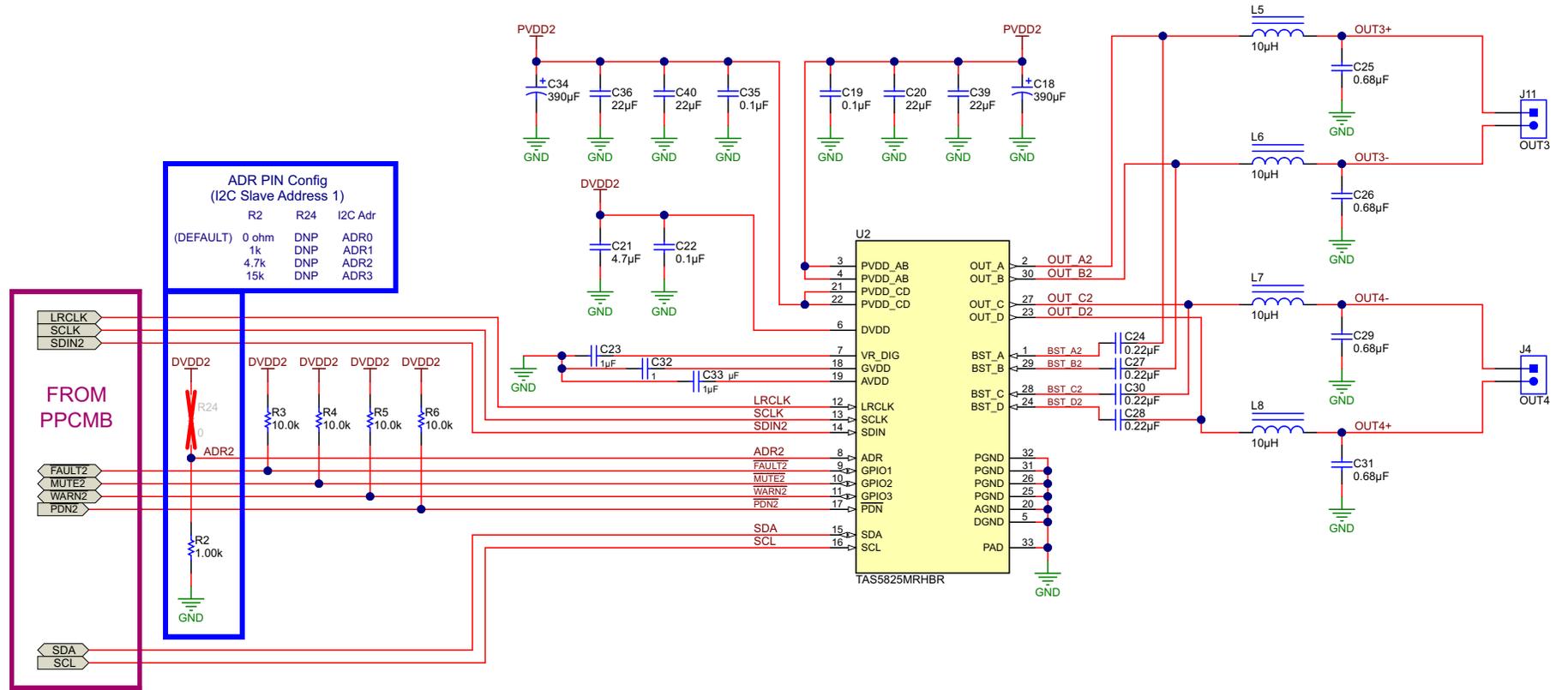
4.1 Schematics

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



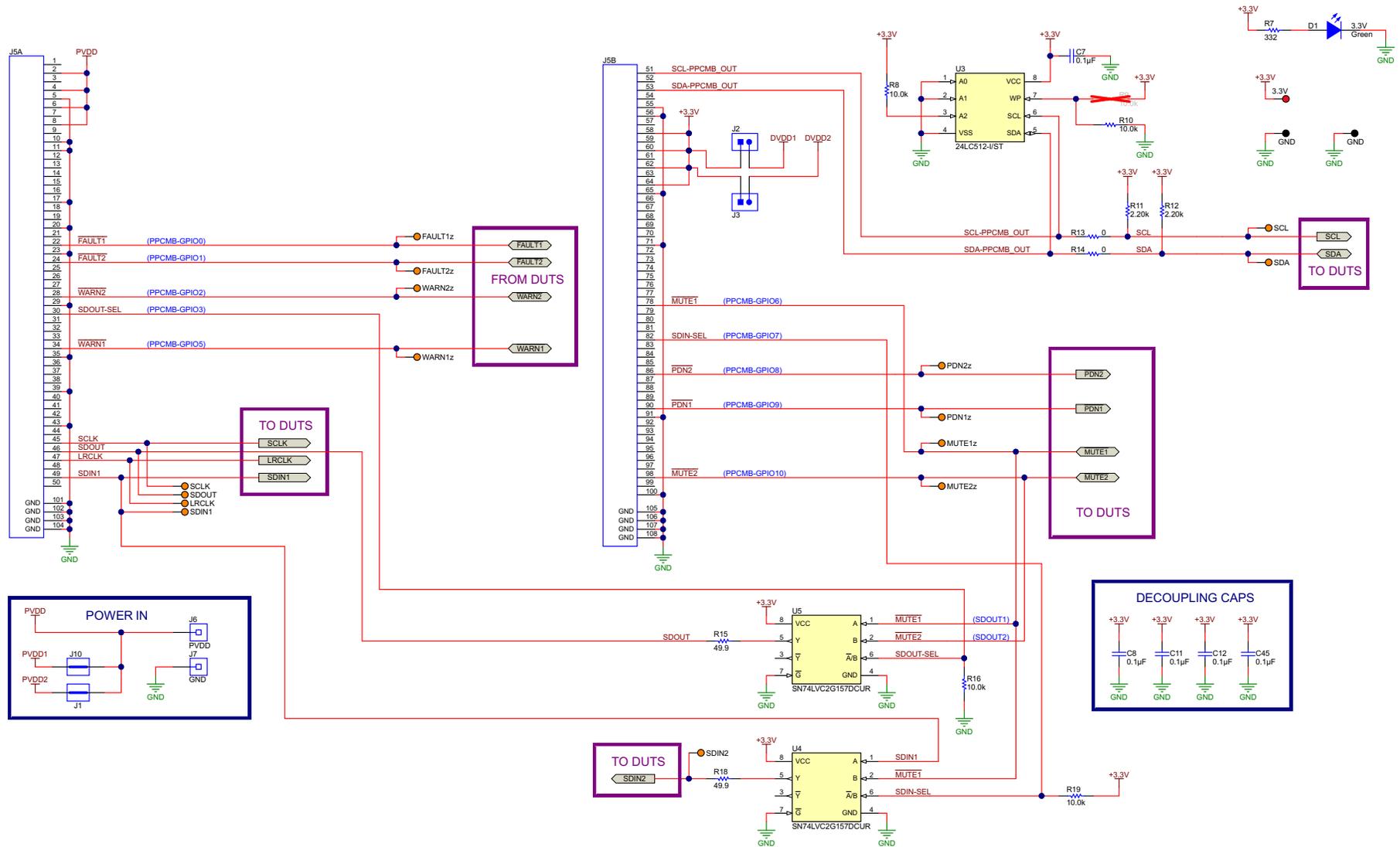
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Figure 4. TAS5825MEVM Schematic (1 of 3)



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Figure 5. TAS5825MEVM Schematic (2 of 3)



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Figure 6. TAS5825MEVM Schematic (3 of 3)

4.2 Board Layouts

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

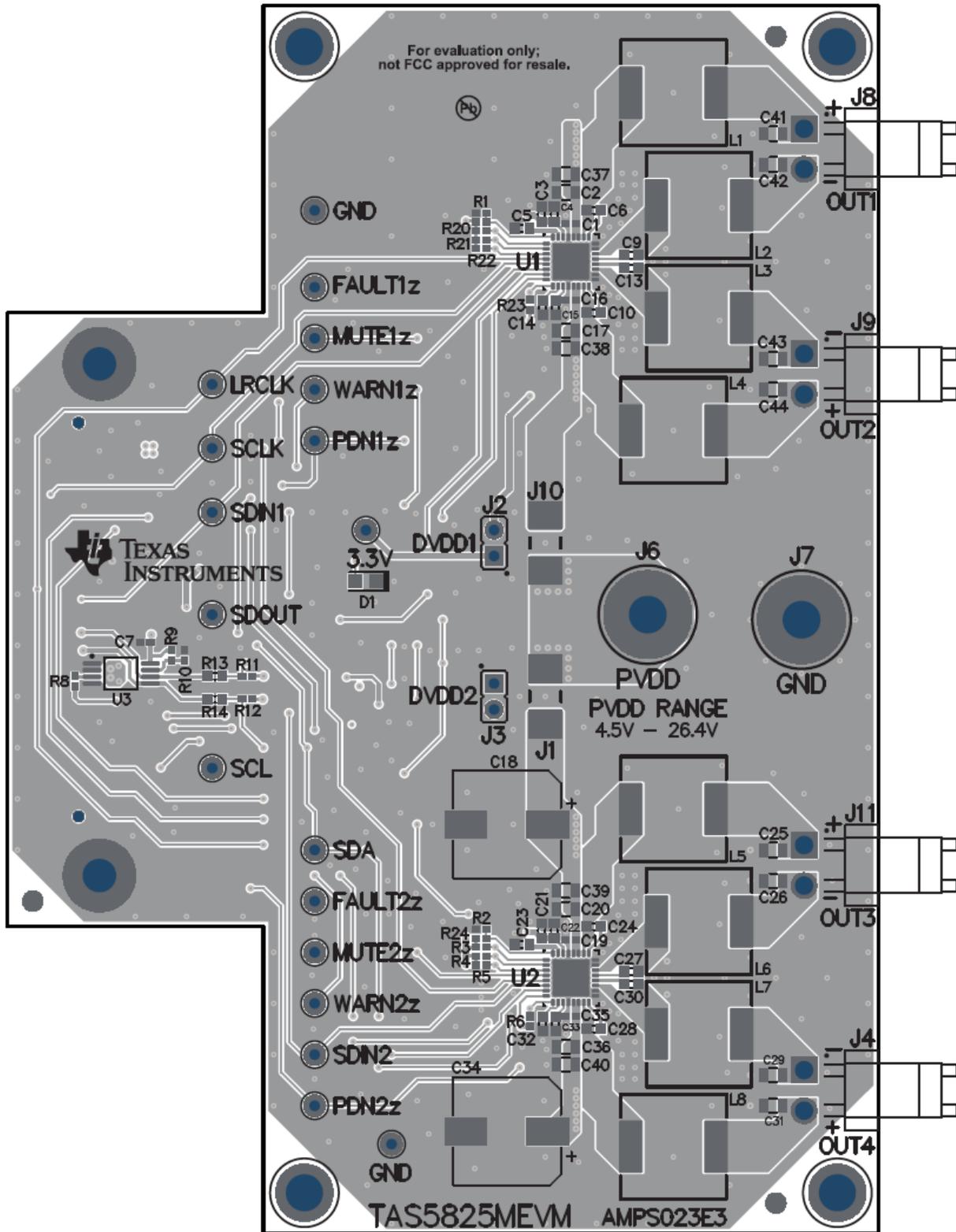


Figure 7. TAS5825MEVM Top Overlay

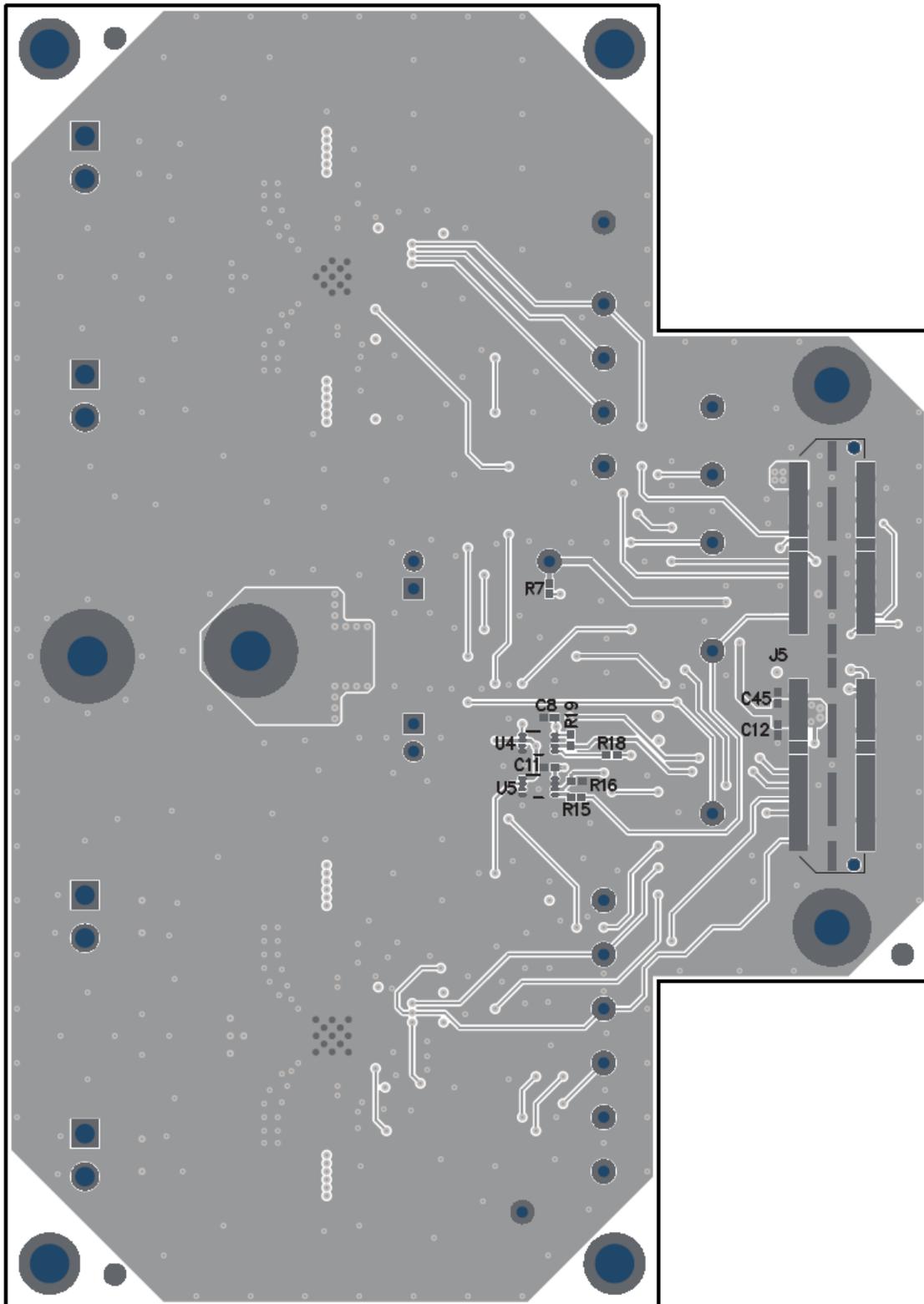


Figure 8. TAS5825MEVM Bottom Overlay

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, C7, C8, C11, C12, C16, C19, C35, C45	9	0.1uF	CAP, CERM, 0.1 µF, 50 V, ±10%, X7R, 0402	0402	C1005X7R1H104K050BB	TDK		
C2, C17, C20, C36, C37, C38, C39, C40	8	22uF	CAP, CERM, 22 µF, 35 V, ±20%, JB, 0805	0805	C2012JB1V226M125AC	TDK		
C3, C21	2	4.7uF	CAP, CERM, 4.7 µF, 10 V, ±10%, X5R, 0603	0603	C0603C475K8PACTU	Kemet		
C4, C22	2	0.1uF	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	0603	C0603C104K4RACTU	Kemet		
C5, C14, C15, C23, C32, C33	6	1uF	CAP, CERM, 1 µF, 16 V, ±10%, X5R, 0603	0603	C0603C105K4PACTU	Kemet		
C6, C9, C10, C13, C24, C27, C28, C30	8	0.22uF	CAP, CERM, 0.22 µF, 50 V, ±10%, X7R, 0603	0603	C1608X7R1H224K080AB	TDK		
C18, C34	2	390uF	CAP, AL, 390 µF, 35 V, ±20%, 0.08 ohm, SMD	10x10	UCL1V391MNL1GS	Nichicon		
C25, C26, C29, C31, C41, C42, C43, C44	8	0.68uF	CAP, CERM, 0.68 µF, 50 V, ±10%, X7R, 0805	0805	C0805C684K5RACTU	Kemet		
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, J10	2		JUMPER TIN SMD	6.85x0.97x2.51 mm	S1911-46R	Harwin		
J2, J3	2		Header, 100mil, 2x1, Gold, TH	Sullins 100mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
J4, J8, J9, J11	4		Header (friction lock), 3.96mm, 2x1, Tin, R/A, TH	Header, 2x1, 3.96mm, R/A	B2PS-VH(LF)(SN)	JST Manufacturing		
J5	1		Connector, 100 Pos. 0.635mm, SMT	Connector, 1575x235x280 mil	QTS-050-01-F-D-A	Samtec		
J6	1		Binding Post, RED, TH	11.4x27.2mm	7006	Keystone		
J7	1		Binding Post, BLACK, TH	11.4x27.2mm	7007	Keystone		
L1, L2, L3, L4, L5, L6, L7, L8	8	10uH	Inductor, Shielded, Ferrite, 10 µH, 4.4 A, 0.0304 ohm, SMD		1274AS-H-100M=P3	Murata		
R1	1	0	RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale		
R2	1	1.00k	RES, 1.00 k, 0.1%, 0.063 W, 0402	0402	ERA-2AEB102X	Panasonic		
R3, R4, R5, R6, R8, R10, R16, R19, R20, R21, R22, R23	12	10.0k	RES, 10.0 k, 1%, 0.063 W, 0402	0402	CRCW040210K0FKED	Vishay-Dale		
R7	1	332	RES, 332, 1%, 0.063 W, 0402	0402	CRCW0402332RFKED	Vishay-Dale		
R11, R12	2	2.20k	RES, 2.20 k, 1%, 0.063 W, 0402	0402	CRCW04022K20FKED	Vishay-Dale		
R13, R14	2	0	RES, 0, 5%, 0.1 W, 0603	0603	CRCW06030000Z0EA	Vishay-Dale		

⁽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
R15, R18	2	49.9	RES, 49.9, 1%, 0.063 W, 0402	0402	CRCW040249R9FKED	Vishay-Dale		
SH1, SH2	2	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec
TP1	1		Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone		
TP2, TP3	2		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone		
TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18	15		Test Point, Miniature, Orange, TH	Orange Miniature Testpoint	5003	Keystone		
U1, U2	2		30-W, Inductor-Less, Digital Input, Stereo, Closed-Loop Class-D Audio Amplifier with 96-Khz Extended Processing and Low Idle Power Dissipation, RHB0032N (VQFN-32)	RHB0032N	TAS5825MRHBR	Texas Instruments	TAS5825MRHBT	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 (VSSOP-8)	DCU0008A	SN74LVC2G157DCUR	Texas Instruments	SN74LVC2G157DCUT	Texas Instruments
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A		
R9	0	10.0k	RES, 10.0 k, 1%, 0.063 W, 0402	0402	CRCW040210K0FKED	Vishay-Dale		
R17, R24	0	0	RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale		

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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.

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http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page

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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:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should 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 also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user 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, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs 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 assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure 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. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

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