TS3DV642EVM HDMI 1:2 Multiplexer and Demultiplexer Switch Evaluation Module

This user's guide describes the TS3DV642EVM evaluation module (EVM). This guide contains the EVM schematics, bill of materials (BOM), assembly drawings, and top and bottom board layouts.



Figure 1. EVM Board

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1 Preface

1.1 How to Use This Manual

This document contains the following chapters:

- Chapter 1 – Preface
- Chapter 2 – Introduction and Quick Start
- Chapter 3 – EVM Configuration and Description

1.1.1 Information about Cautions and Warnings



CAUTION

This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. For more information on proper handling, see the *Electrostatic Discharge (ESD)* application note (SSYA008).

The information in a caution or a warning is provided for your protection. Read each caution and warning carefully.

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2 Introduction

The TS3DV642EVM is an evaluation module for the Texas Instruments (TI) 1:2 multiplexer and demultiplexer high-bandwidth HDMI switch. It is specially designed to multiplex HDMI signals. All signals required for the HDMI protocol, high speed and low speed, are multiplexed through the EVM.

Additionally, the TS3DV642 provides an output enable input and two output select inputs for flexible configuration of the HDMI. See Figure 2 for the EVM block diagram.

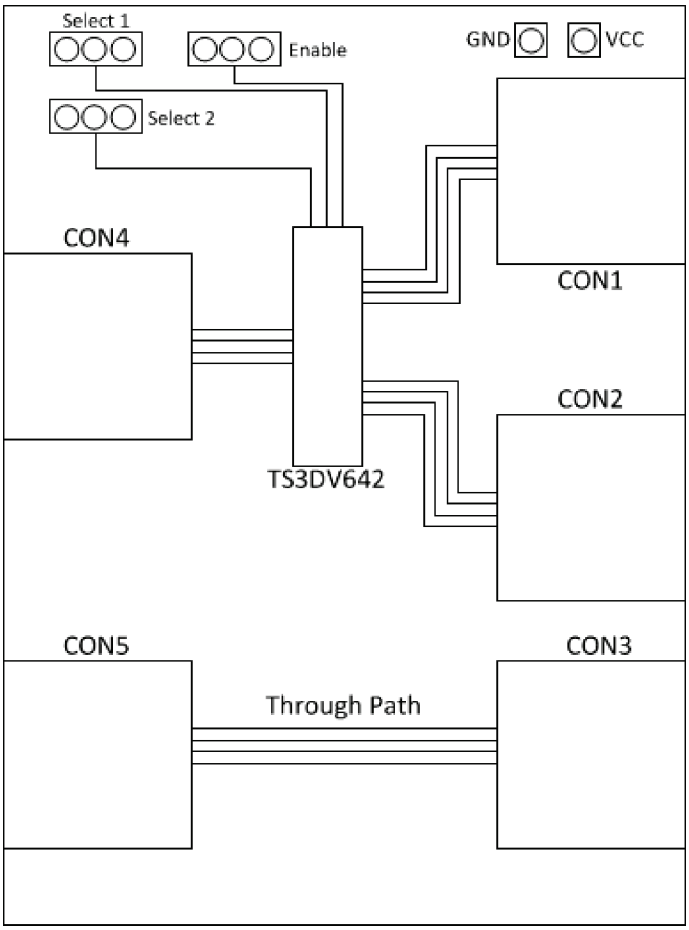


Figure 2. TS3DV642 EVM Block Diagram

2.1 List of Hardware Items for Operation

The following items are required for EVM evaluation:

- TS3DV642EVM EVM
- HDMI source (computer, DVD player, and so forth)
- HDMI sink (computer, DVD player, and so forth)
- At least two HDMI cables
- Power supply

The following items are optional for EVM evaluation:

- Either two sources or two sinks are required to evaluate switching between devices
- A breakout board from the HDMI socket to SMA is required to examine the HDMI eye

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2.2 Quick Start

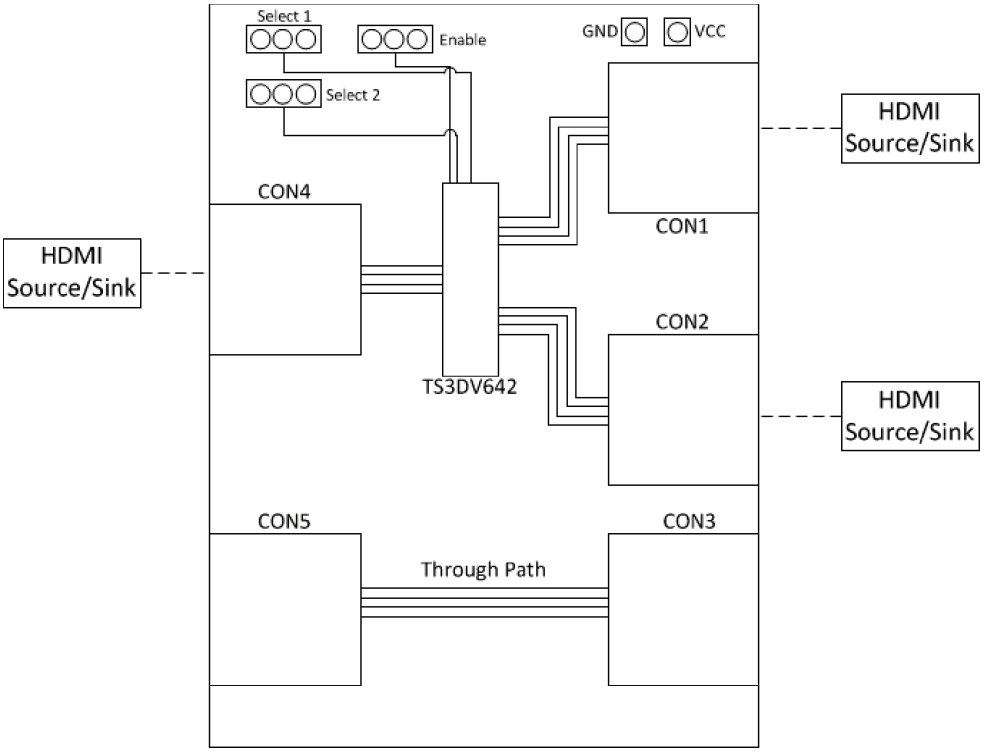


Figure 3. Quick Start Evaluation

1. Connect the power supply to any of the VDD and GND pins located on the board (TP1, TP2, TP4, TP5).
2. Connect two HDMI sinks through two HDMI cables to the connectors located on the top of the board (CON1 and CON2). Connect one sink to the connector on the underside of the board (CON1).

   Note: The above can be reversed and two HDMI sources can be connected to CON1 and CON2 with one sink connected to CON4. If there are not two sinks or sources available, the module can still be used with one of each to evaluate the ability of the signal to pass through the switch.
3. Ensure that three jumpers are connected so that the VCC pin is shorted to the center post of all headers.
4. To switch between the selected device (CON1 and CON2), simply change the position of the SEL2 jumper between VCC and GND. Table 1 describes which connections are made for each condition.
5. With the respective path enabled, the source will connect to the sink and the display will appear on the corresponding sink.

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3 EVM Configuration and Description

3.1 EVM Description

To conform to the HDMI specification, all four differential pairs on the board are impedance matched to a 100-Ω differential. The trace length of the through-path and the trace length through the TS3DV642 switch are also matched for comparison purposes. The printed-circuit board (PCB) is a four-layer top-side populated board (see the schematic and PCB layout in Section 3.3 and Section 3.4). The major features of the hardware design are detailed in the following sections.

NOTE: The dielectric material between the signal and GND plane is Rogers 4350B. This is a high-performance PCB material and if FR-4 is used under the same conditions, the same results should not be expected due to the board losses of FR-4.

3.2 Jumper Configuration

Table 1. EN and SEL2 Jumper Configuration

EN	SEL2	Function
L	X	Switch disabled. All channels Hi-Z.
H	L	CON1 enabled. CON2 Hi-Z.
H	H	CON2 enabled. CON1 Hi-Z.

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3.3 Schematics

Figure 4 and Figure 5 show the EVM schematics.

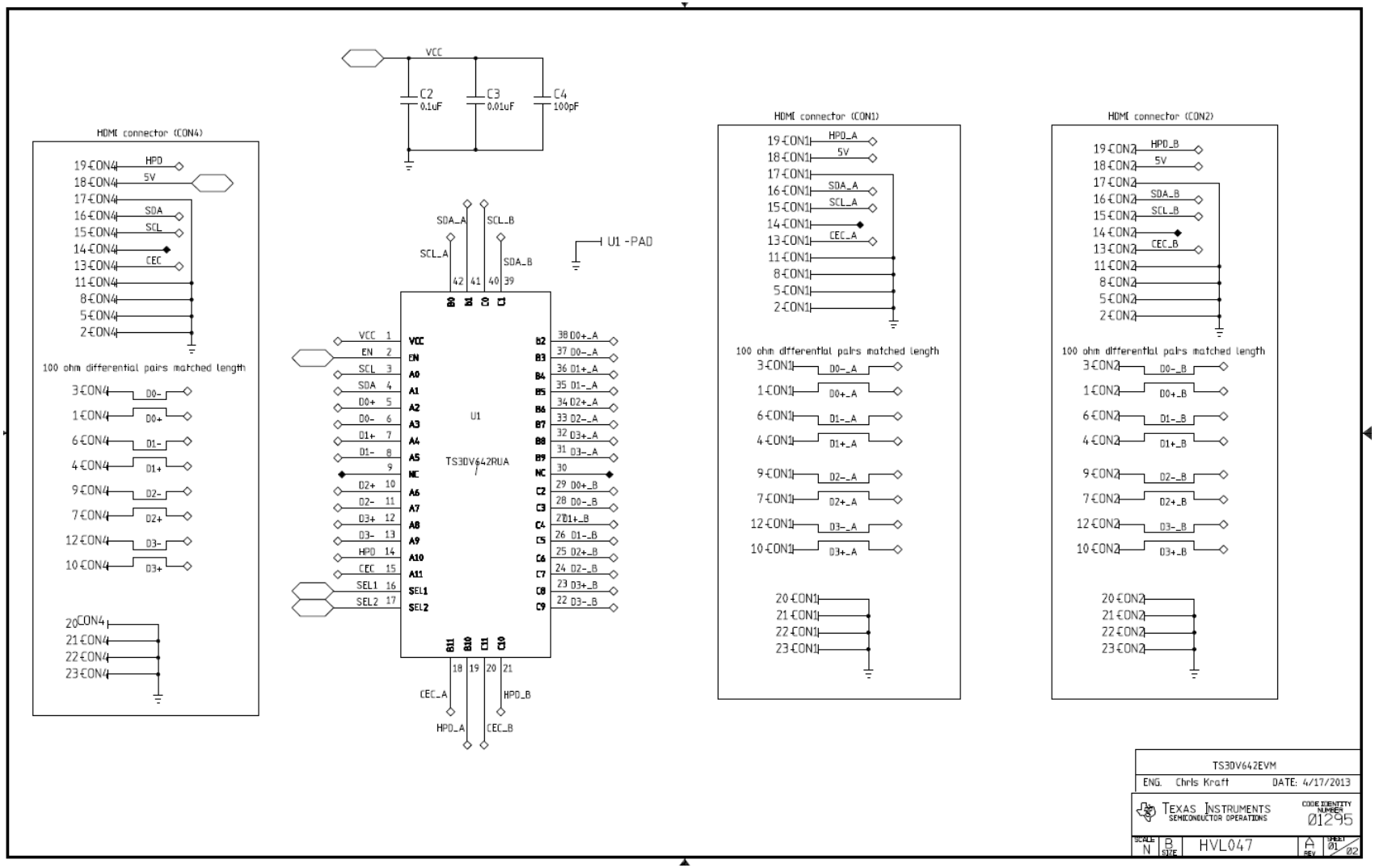


Figure 4. Schematic (1 of 2)

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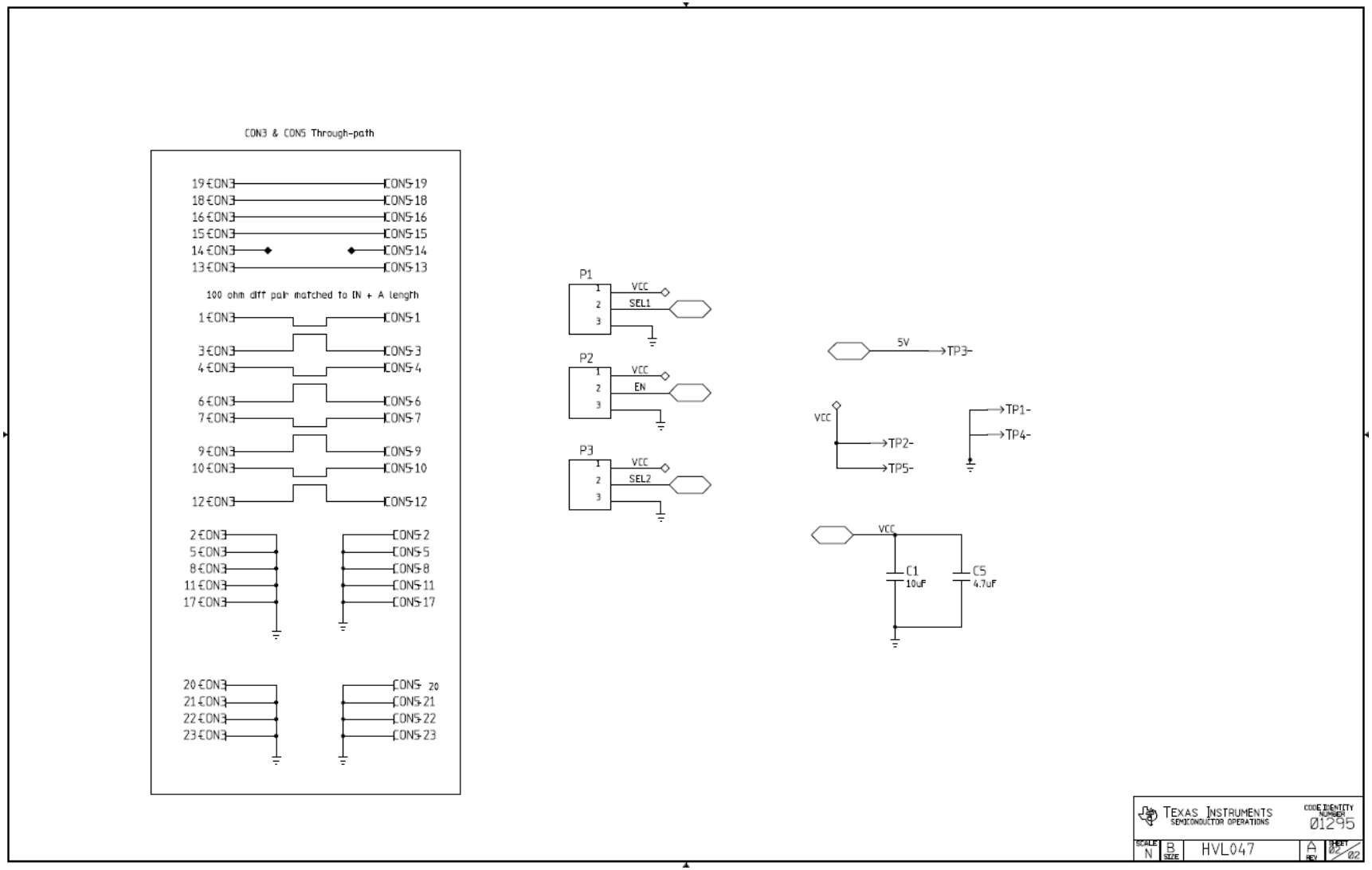


Figure 5. Schematic (2 of 2)

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3.4 PCB Layout

The PCB layouts for this EVM are displayed in Figure 6 through Figure 9.

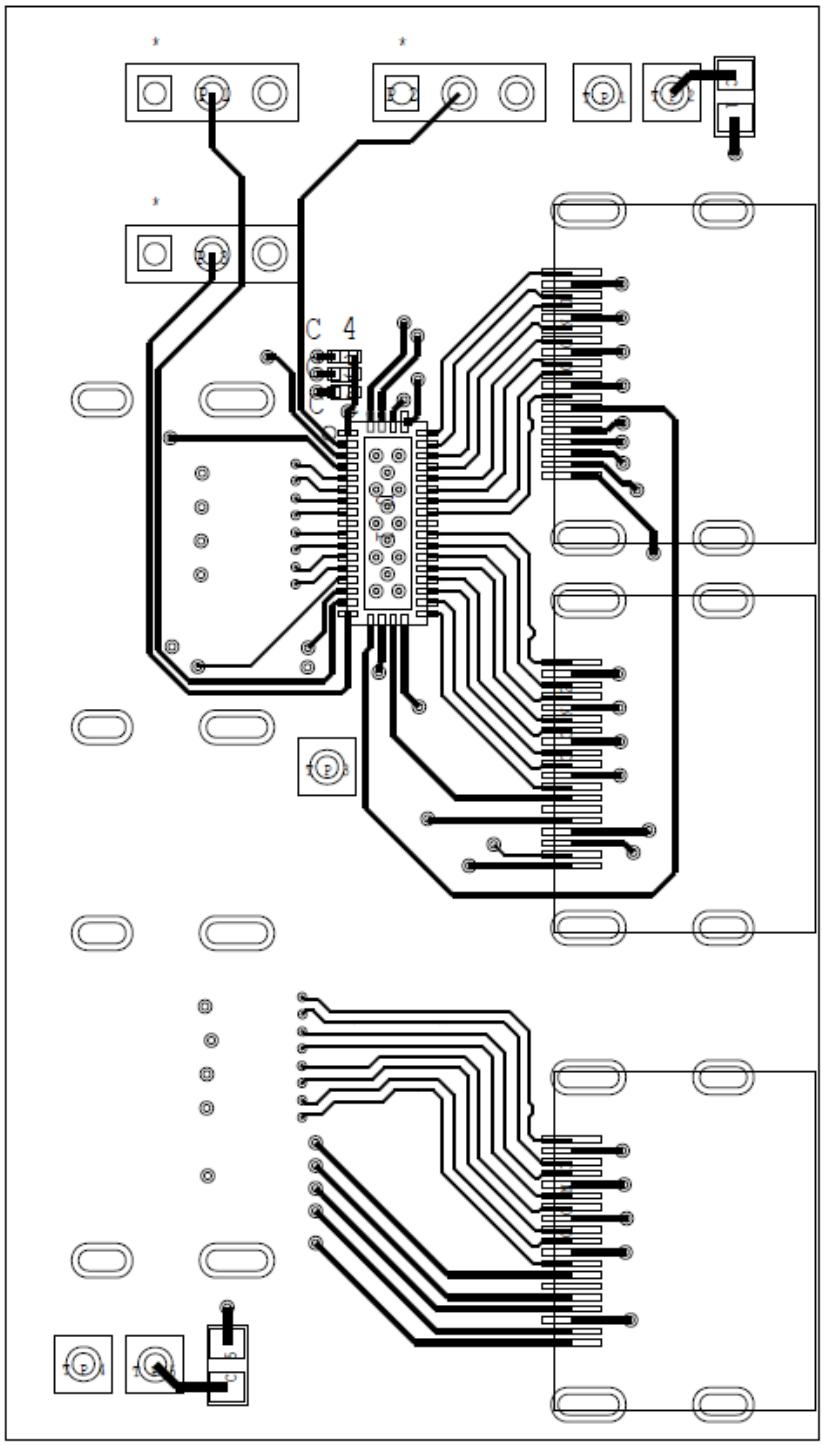


Figure 6. Top Routing and Assembly

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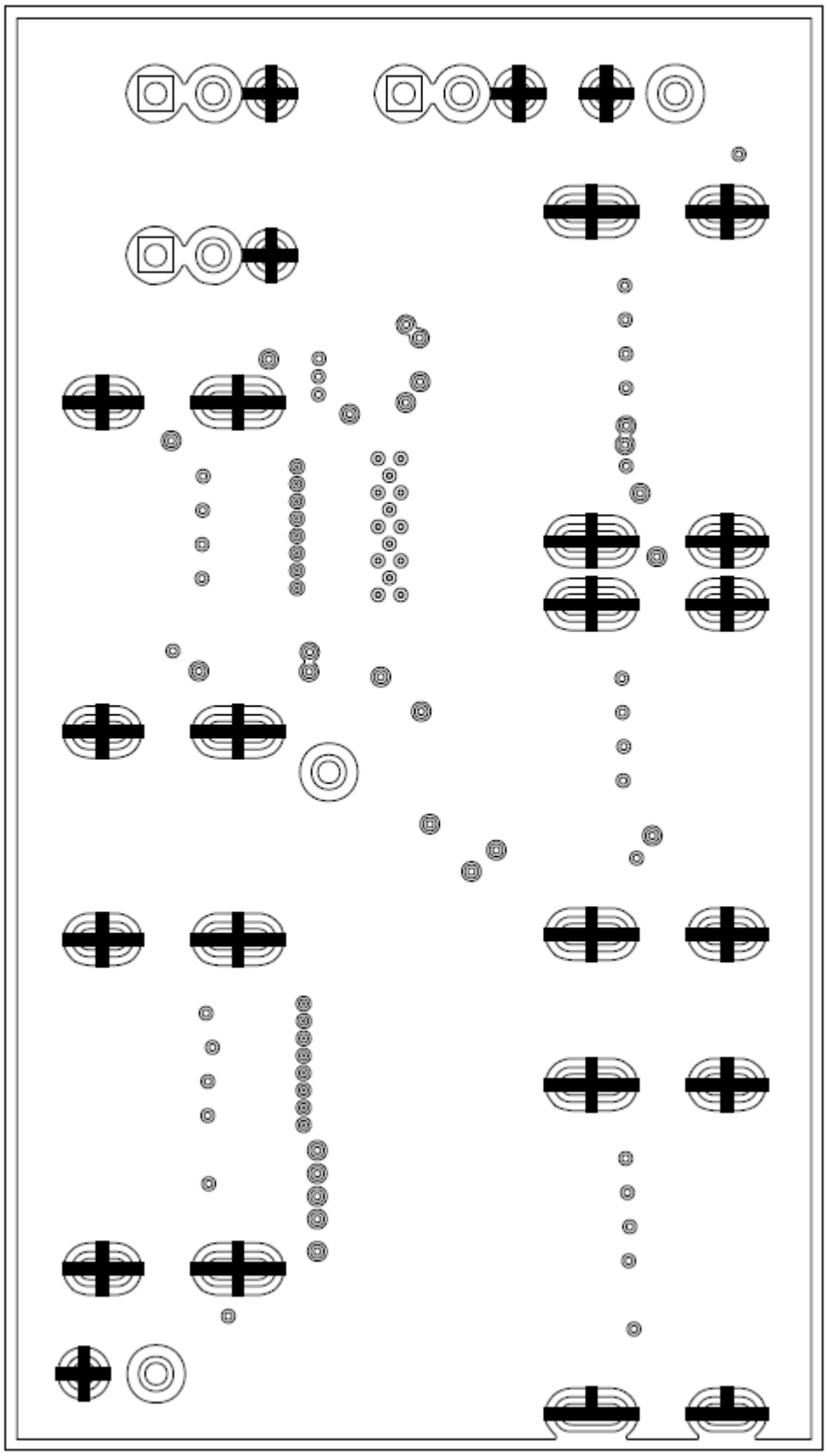


Figure 7. Internal Ground Plane

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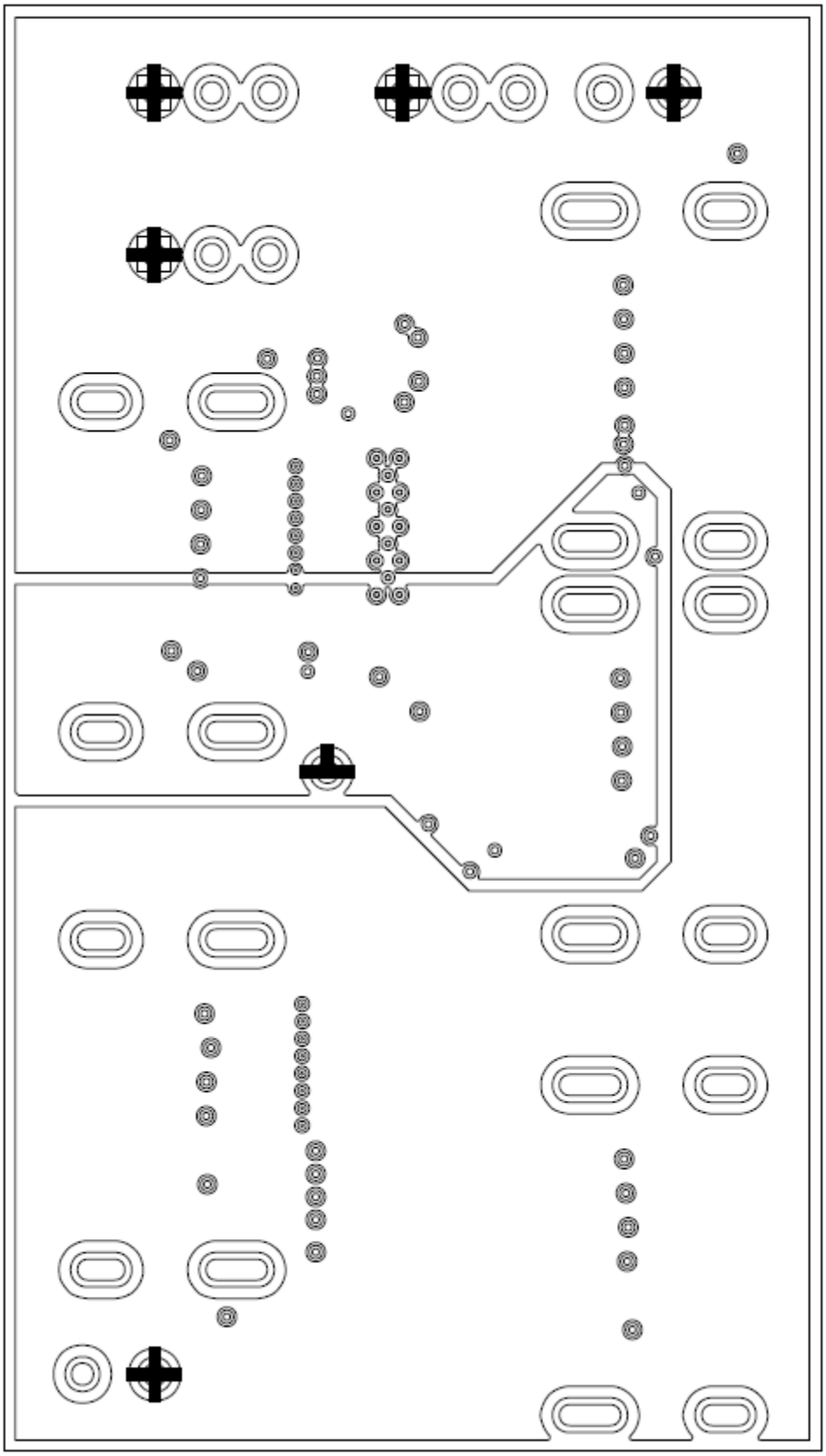


Figure 8. Internal Power Plane

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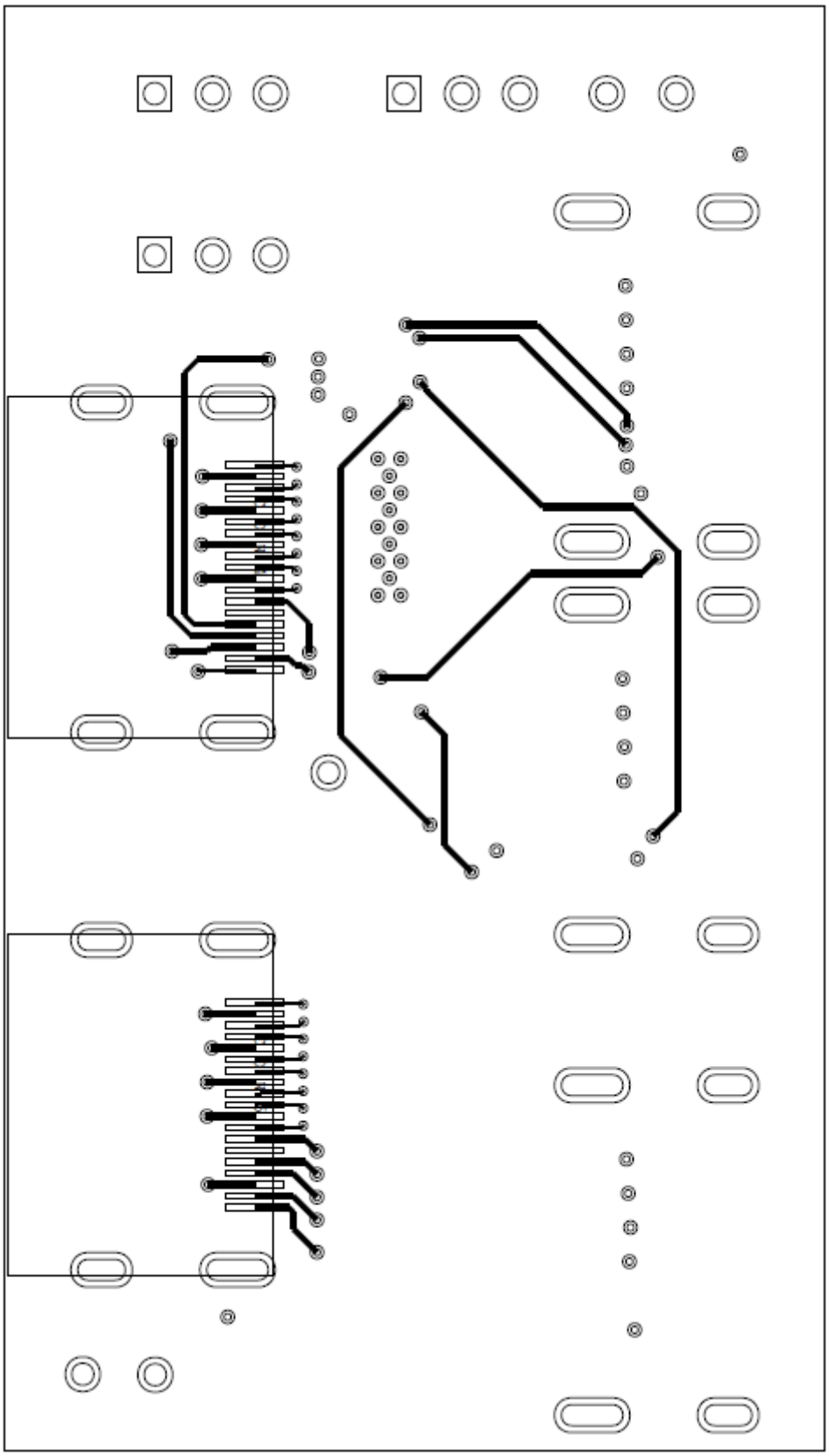


Figure 9. Bottom Layer

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3.5 Bill of Materials

The BOM for this EVM is listed in Table 2.

Table 2. Bill of Materials

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
C1, C5	2	10uF	CAP CER X5R 6.3V, 10%, 10uF	805	C0805C106K9PACTU	Kemet
C2	1	0.1uF	CAP CER 0.1UF 16V Y5V 0402 –20% +80%	402	C1005Y5V1C104Z	TDK
C3	1	0.01uF	CAP CER 10000PF 25V 10% X7R 0402	402	C1005X7R1E103K050BB	TDK
C4	1	100pF	CAP CER 100PF 50V 5% NP0 0402	402	C1005C0G1H101J050BA	TDK
CON1, CON2, CON3, CON4, CON5	5		CONN,SMT,19P	HDMI A female	1747981-1	TE
TP1, TP2, TP3, TP4, TP5	5		HEADER,THU,1P	0.100"	TSW-101-07-G-S	SAMTEC
N/A	3		JUMPER		382811-8	TE
P1, P2, P3	3		HEADER,THU,JUMPER 3P		68000-103HLF	FCI
U1	1		1:2 12 CHANNEL MUX:DE-MUX	RUA	TS3DV642RUA	Texas Instruments

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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.

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

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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.

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