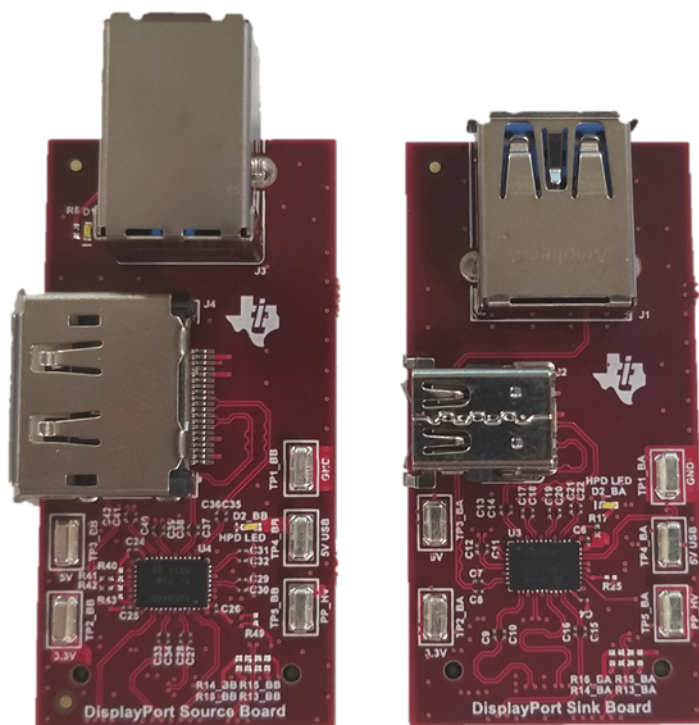


This is the user's guide for the 10G-EXPANSION-EVM for use with the TPS65987EVM supporting the expansion board connector. The 10G-EXPANSION-EVM is not intended to be used alone and requires the TPS65987EVM for operation.



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## Trademarks

All trademarks are the property of their respective owners.

## 1 Introduction

### 1.1 About This Manual

The 10G-EXPANSION-EVM user's guide contains an introduction, setup instructions, the EVM schematic, top and bottom board layouts and component views, layout, and a bill of materials (BOM).

### 1.2 Items Required for Operation

The following items are required to use the DP-EXPANSION-EVM:

- TPS65987 data sheet
- TPS65987EVM
- TPS65987EVM user's guide
- Barrel jack adapter or DC power supply
- Mini DisplayPort to DisplayPort, HDMI, VGA, or other cable
- DisplayPort-to-DisplayPort cable
- USB3.0 Type-A to Type-B
- USB Type-C cable
- USB Type-C to Type-A
- USB Type-A to Type-C
- Notebook with DisplayPort and USB
- Monitor with DisplayPort, HDMI, or VGA input

### 1.3 Description

The 10G-EXPANSION-EVM adds to the capabilities of the TPS6598xEVM supporting the expansion board connector by allowing the user to evaluate the USB Type-C and power-delivery (PD) capabilities of the TPS6598x USB Type-C and PD devices from the power and data perspective.

The TPS6598x USB Type-C and PD controller provides cable plug and orientation detection at the USB Type-C connector. Upon cable detection, the TPS6598x device communicates on the CC wire using the USB PD protocol. When cable detection and USB PD negotiation are complete, the TPS6598x device enables the appropriate power path and configures alternate mode settings for internal and (optional) external multiplexers.

This user guide describes the TPS65987EVM and the capabilities of this EVM with the 10G-EXPANSIONEVM.

## **2 Setup and Connectors, Test Point, and LED Description**

### **2.1 J1 Type-A USB Receptacle**

The J1 jumper is used to connect a USB device to the 10G-EXPANSION-EVM and TPS6598xEVM. This connection provides the USB host data to a device when appropriately connected.

### **2.2 J2 Mini DisplayPort Receptacle**

The J2 jumper is used to connect to a monitor either through a Mini DisplayPort cable to standard DisplayPort, VGA, HDMI, or other cable.

### **2.3 J3 Type-B USB Receptacle**

The J3 jumper is used to connect to a USB source from a notebook. The USB signals are routed to the Type-C connector when a connection is available on the Type-C connector on the TPS6598xEVM.

### **2.4 J4 Expansion Board Connector**

The J4 jumper connects the 10G-EXPANSION-EVM to the TPS6598xEVM. The super-speed signals are connected from the USB and DisplayPort connectors to the Type-C connector through J4. This jumper also includes certain GPIO control, I<sup>2</sup>C communication, and power from the TPS6598xEVM.

### **2.5 J5 DisplayPort Receptacle**

The J5 jumper is used to connect a DisplayPort source from a notebook. The DisplayPort signals are routed to the Type-C connector when a DisplayPort device is connected on the Type-C connector on the TPS6598xEVM.

### **2.6 TP2: 3.3-V TPS6598xEVM Supply**

This test point is used to access the 3.3-V supply from the connected TPS6598xEVM. Considering the J4 connector, the maximum current draw should be 1 A. This supply is used to supply power to the DisplayPort connector.

### **2.7 TP3: 5-V TPS6598xEVM Supply**

This test point is used to access the 5-V (high-current) supply from the connected TPS6598xEVM. Although the TPS6598xEVMs can provide 3 A from the main 5-V supply, TI recommends to draw a maximum of 1 A because of the J4 connector.

### **2.8 TP4: 5-V USB TPS6598xEVM Supply**

This test point is used to access the 5-V USB supply from the connected TPS6598xEVM. This supply powers VBUS on the Type-A receptacle on the DisplayPort Sink Board. This test point is not intended to draw current when a USB device is connected to J1. A maximum of 1A can be drawn from the test point when J1 is not connected.

## 2.9 TP5: PP\_HV TPS6598xEVM Main Supply

This test point is used to access the PP\_HV supply from the connected TPS6598xEVM and can vary from 5 V (low-voltage bus-powered operation) to 20 V (self-powered or high-voltage bus-powered operation). A maximum of 3 A can be drawn from this test point.

**NOTE:** The EVM can support up to 60 W of power (20 V at 3 A), use caution when connecting and disconnecting probes on TP5.

## 2.10 D1 LED Indicator

The D1 LED shows the state of the DisplayPort HPD signal on the DisplayPort source and sink board. This LED helps the user to determine the state of HPD when a DisplayPort connection is active.

# 3 Getting Started With the 10G-EXPANSION-EVM and TPS65987EVM

## 3.1 Separating the Source and Sink Board

The 10G-EXPANSION-EVM is built with the DisplayPort source board and sink board joined together. The boards must be snapped-off from each other and separated by hand. The board should break cleanly because of the perforated connection between the boards.

## 3.2 TPS65987EVM Firmware Configurations for 10G-EXPANSION-EVM

The TPS65987EVM can be configured to work with either the Source Board or the Sink Board.

For the Source Board, please ensure the following settings are configured on the TPS65987EVM:

Display Port Capabilities ( 0x51 )	
Field	Value
Enable Display Port SVID	<input checked="" type="checkbox"/>
Enable Display Port Mode 1	<input checked="" type="checkbox"/>
DP Port Capability	DP DFP_D only
Supports DP v1.3 signalling	<input checked="" type="checkbox"/>
Supports USB Gen 2 signalling	<input type="checkbox"/>
DP Receptacle Indication	Receptacle
USB2.0 Signalling Not Used	<input type="checkbox"/>
DFPD Receptacle or UFPD Plug Pin Assignment	<div> <div>A</div> <div>B</div> <div>C</div> <div>D</div> <div>E</div> <div>F</div> </div>
UFPD Receptacle or DFPD Plug Pin Assignment	<div> <div>A</div> <div>B</div> <div>C</div> <div>D</div> <div>E</div> </div>
Multifunction Preferred	<input checked="" type="checkbox"/>
Preferred DP Role	Prefers DFP_D
Force USB Configuration	<input type="checkbox"/>
DFP_D / UFPD_D Connected	Only DFP_D Connected
DisplayPort Mode Auto Entry Allowed	<input checked="" type="checkbox"/>

**Figure 1. TPS65987EVM Source Board Display Port Capabilities Register**

**GPIO #0**

Field	Value
Multiplexing for GPIO 0 pin	Pin Multiplexed to GPIO
Initial Value	0x0
Open Drain Output Enable	<input type="checkbox"/>
Internal Pull Down Enable	<input type="checkbox"/>
Internal Pull Up Enable	<input type="checkbox"/>
Mapped Event	Port 0 DP Mode Select Event
GPIO Polarity	Direct-mapped Event

**GPIO #1**

Field	Value
Multiplexing for GPIO 1 pin	Pin Multiplexed to GPIO
Initial Value	0x0
Open Drain Output Enable	<input type="checkbox"/>
Internal Pull Down Enable	<input type="checkbox"/>
Internal Pull Up Enable	<input type="checkbox"/>
Mapped Event	Port 0 Cable Orientation Event
GPIO Polarity	Direct-mapped Event

**GPIO #2**

Field	Value
Multiplexing for GPIO 2 pin	Pin Multiplexed to GPIO
Initial Value	0x0
Open Drain Output Enable	<input type="checkbox"/>
Internal Pull Down Enable	<input type="checkbox"/>
Internal Pull Up Enable	<input type="checkbox"/>
Mapped Event	Port 0 USB3 Event
GPIO Polarity	Direct-mapped Event

**GPIO #3 (DP HPD Port 0)**

Field	Value
Multiplexing for GPIO 3 pin	Pin Multiplexed to Alternate Function (DP HPD Port 0)

**Figure 2. TPS65987EVM Source Board I/O Config Register**

For the Sink Board, please ensure the following settings are configured on the TPS65987EVM:

Display Port Capabilities ( 0x51 )	
Field	Value
Enable Display Port SVID	<input checked="" type="checkbox"/>
Enable Display Port Mode 1	<input checked="" type="checkbox"/>
DP Port Capability	DP UFP_D only
Supports DP v1.3 signalling	<input checked="" type="checkbox"/>
Supports USB Gen 2 signalling	<input type="checkbox"/>
DP Receptacle Indication	Receptacle
USB2.0 Signalling Not Used	<input type="checkbox"/>
DFPD Receptacle or UFPD Plug Pin Assignment	<div>A</div> <div>B</div> <div>C</div> <div>D</div> <div>E</div> <div>F</div>
UFPD Receptacle or DFPD Plug Pin Assignment	<div>A</div> <div>B</div> <div>C</div> <div>D</div> <div>E</div>
Multifunction Preferred	<input checked="" type="checkbox"/>
Preferred DP Role	Prefers UFP_D
Force USB Configuration	<input type="checkbox"/>
DFP_D / UFP_D Connected	Only UFP_D Connected
DisplayPort Mode Auto Entry Allowed	<input checked="" type="checkbox"/>

**Figure 3. TPS65987EVM Sink Board Display Port Capabilities Register**

**GPIO #0**

Field	Value
Multiplexing for GPIO 0 pin	Pin Multiplexed to GPIO
Initial Value	0x0
Open Drain Output Enable	<input type="checkbox"/>
Internal Pull Down Enable	<input type="checkbox"/>
Internal Pull Up Enable	<input type="checkbox"/>
Mapped Event	Port 0 DP Mode Select Event
GPIO Polarity	Direct-mapped Event

**GPIO #1**

Field	Value
Multiplexing for GPIO 1 pin	Pin Multiplexed to GPIO
Initial Value	0x0
Open Drain Output Enable	<input type="checkbox"/>
Internal Pull Down Enable	<input type="checkbox"/>
Internal Pull Up Enable	<input type="checkbox"/>
Mapped Event	Port 0 Cable Orientation Event
GPIO Polarity	Direct-mapped Event

**GPIO #2**

Field	Value
Multiplexing for GPIO 2 pin	Pin Multiplexed to GPIO
Initial Value	0x0
Open Drain Output Enable	<input type="checkbox"/>
Internal Pull Down Enable	<input type="checkbox"/>
Internal Pull Up Enable	<input type="checkbox"/>
Mapped Event	Port 0 USB3 Event
GPIO Polarity	Direct-mapped Event

**GPIO #3 (DP HPD Port 0)**

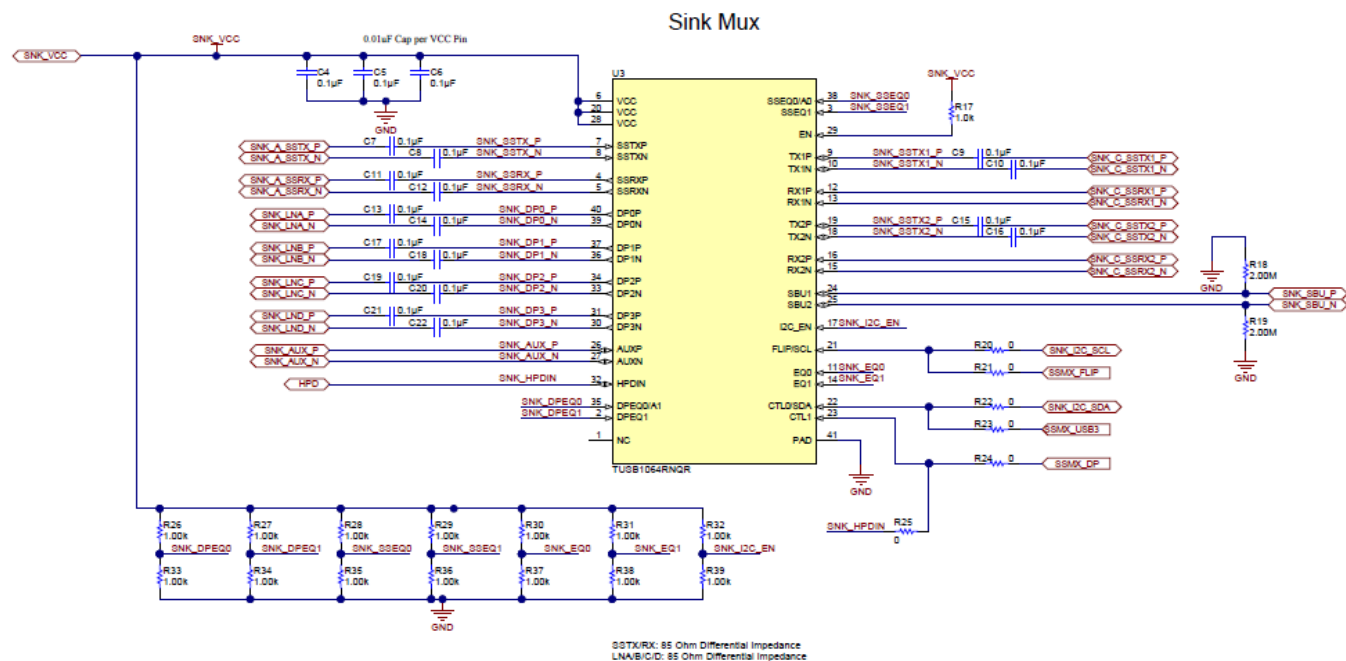
Field	Value
Multiplexing for GPIO 3 pin	Pin Multiplexed to Alternate Function (DP HPD Port 0)

**Figure 4. TPS65987EVM Sink Board I/O Config Register**

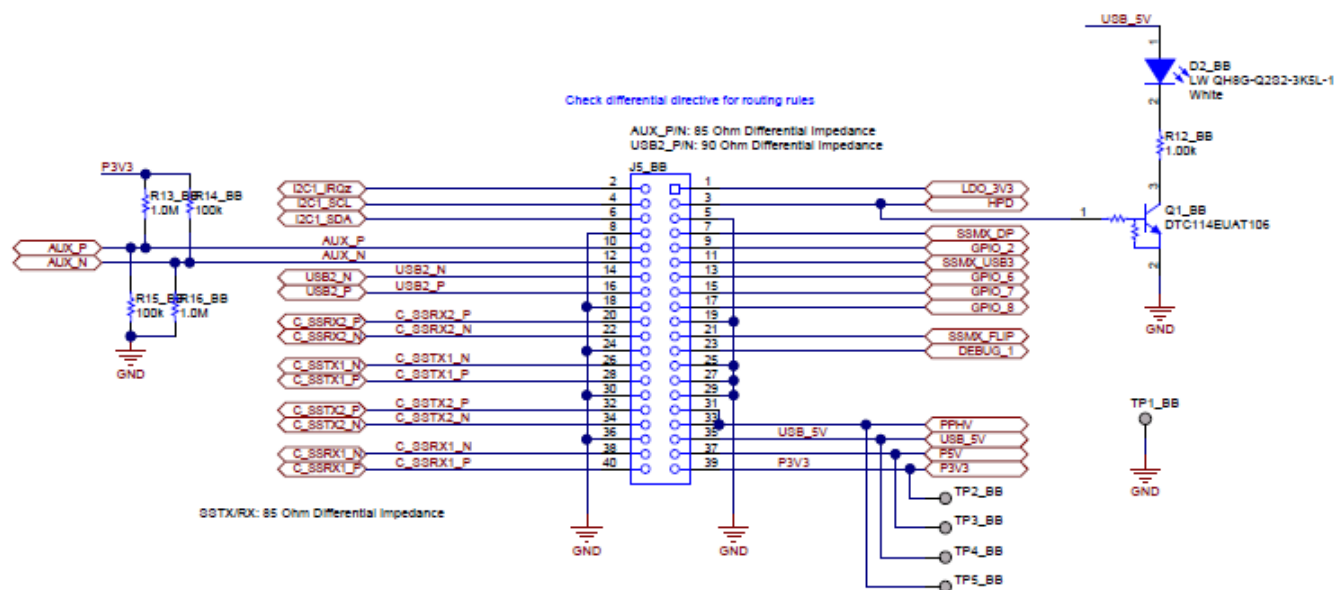








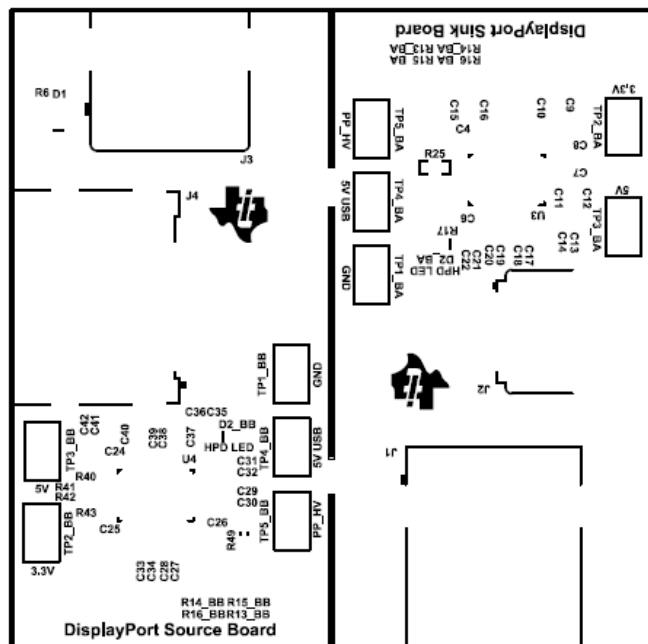
**Figure 6. 10G-EXPANSION-EVM Sink MUX**



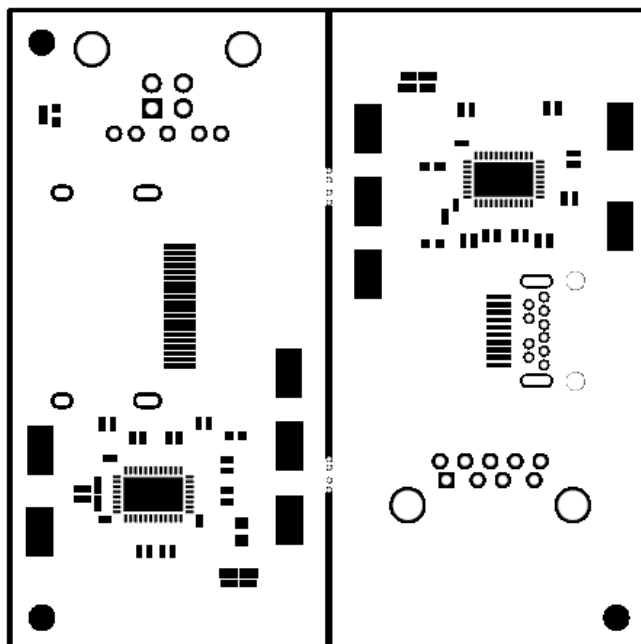
### Figure 7. 10G-EXPANSION-EVM Inter PCB Sink



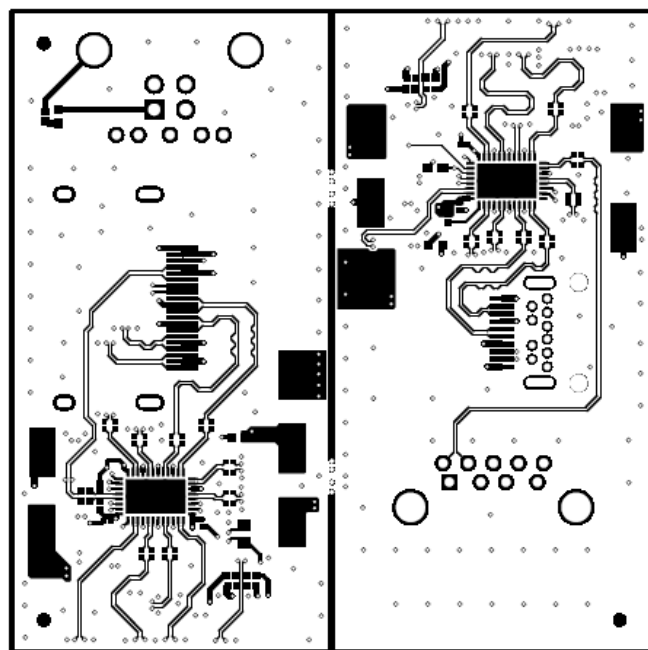
The following figures contain the PCB layouts of the 10G-EXPANSION-EVM



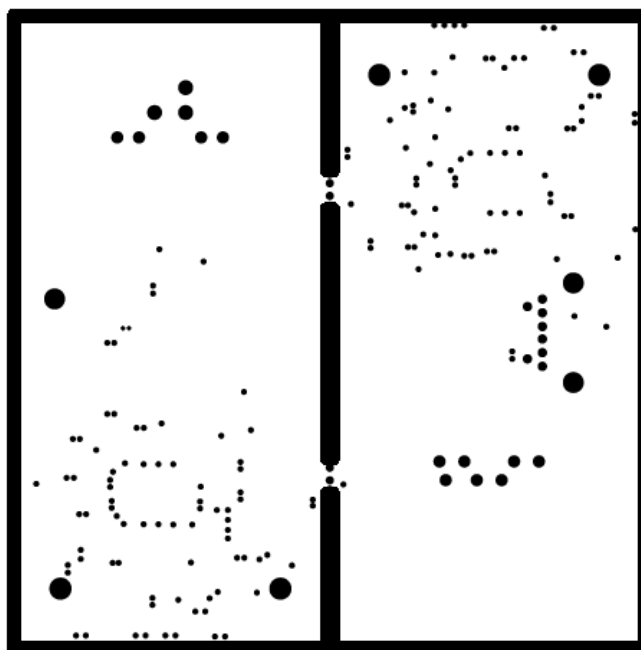
**Figure 10. 10G-EXPANSION-EVM Top Overlay**



**Figure 11. 10G-EXPANSION-EVM Top Solder**



**Figure 12. 10G-EXPANSION-EVM Top Layer**



**Figure 13. 10G-EXPANSION-EVM GND Plane 1**

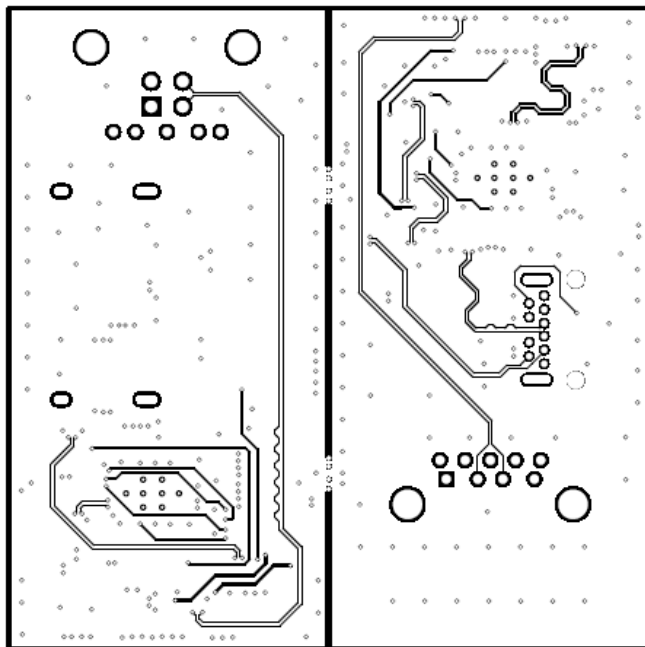


Figure 14. 10G-EXPANSION-EVM High Speed Layer

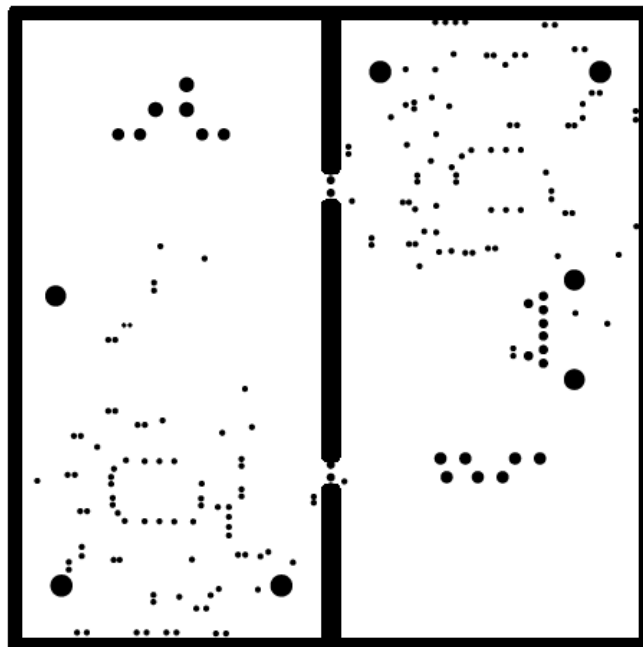


Figure 15. 10G-EXPANSION-EVM GND Plane 2

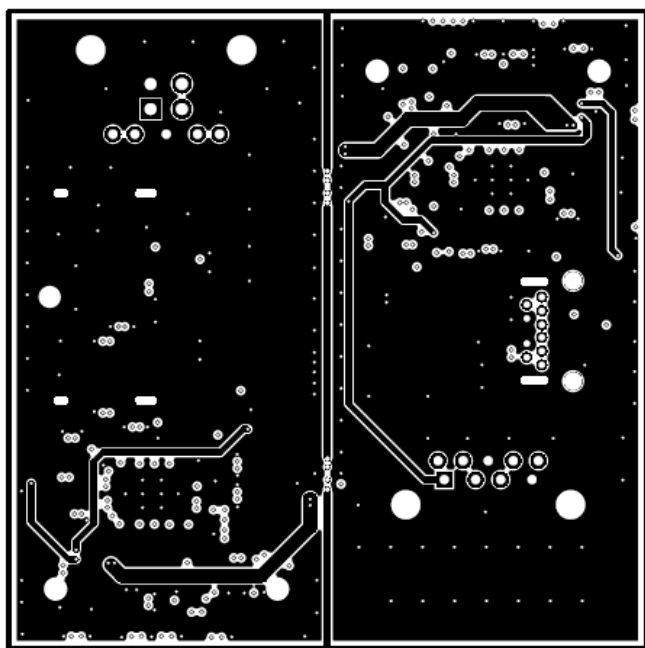


Figure 16. 10G-EXPANSION-EVM Power 1 Layer

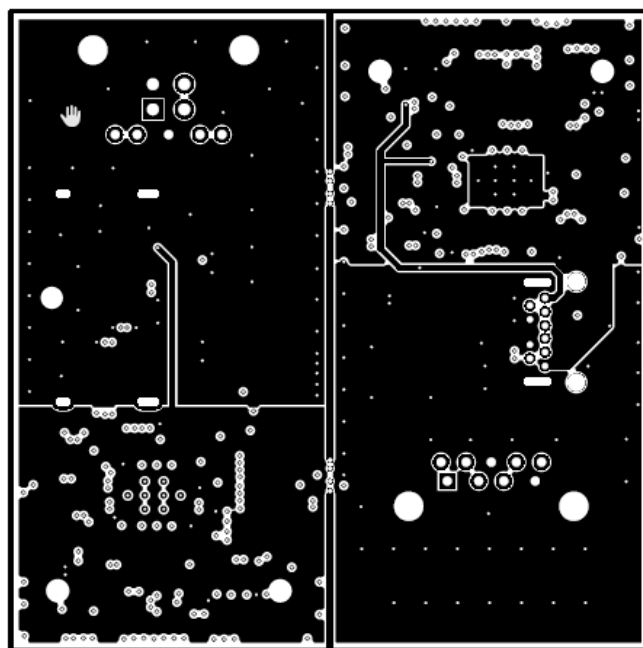


Figure 17. 10G-EXPANSION-EVM Power 2 Layer

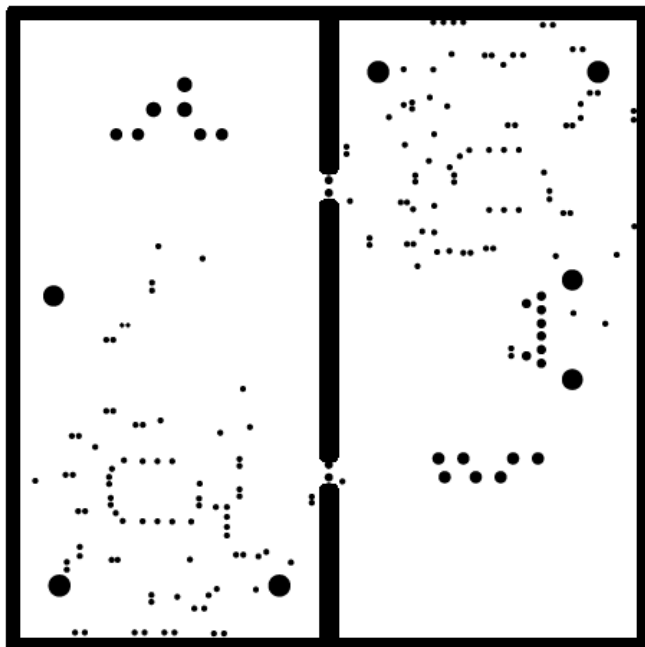


Figure 18. 10G-EXPANSION-EVM GND Plane 3

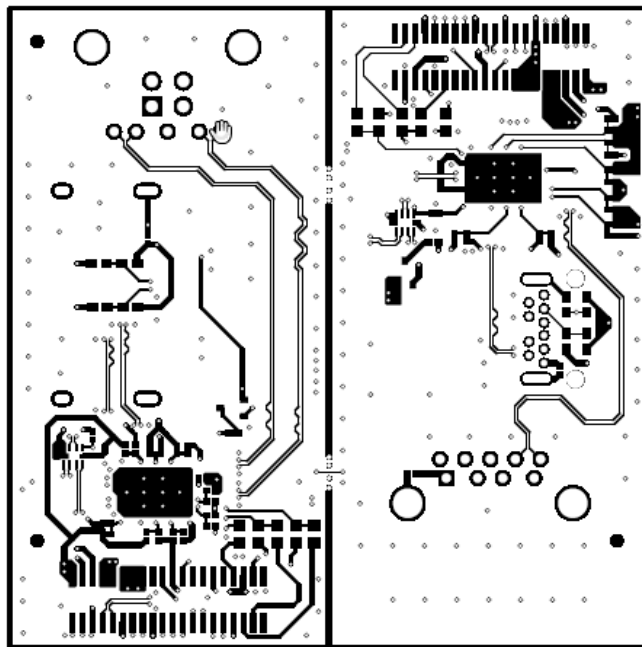


Figure 19. 10G-EXPANSION-EVM Bottom Layer

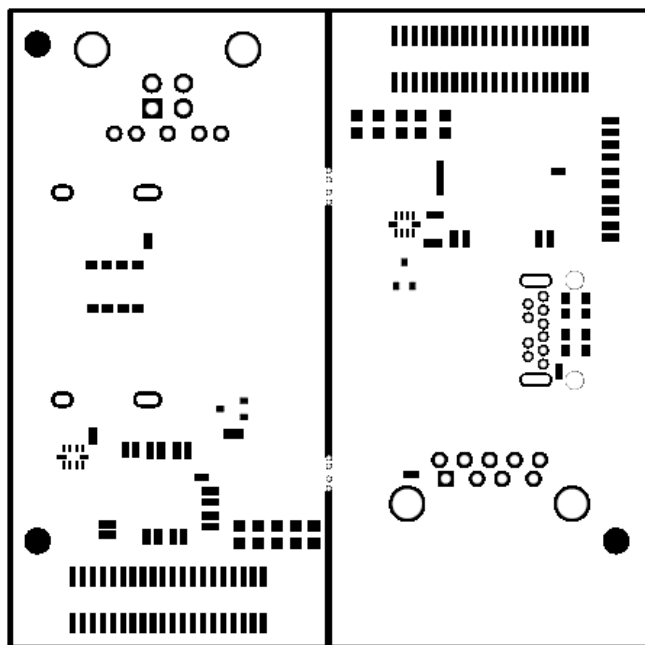


Figure 20. 10G-EXPANSION-EVM Bottom Solder

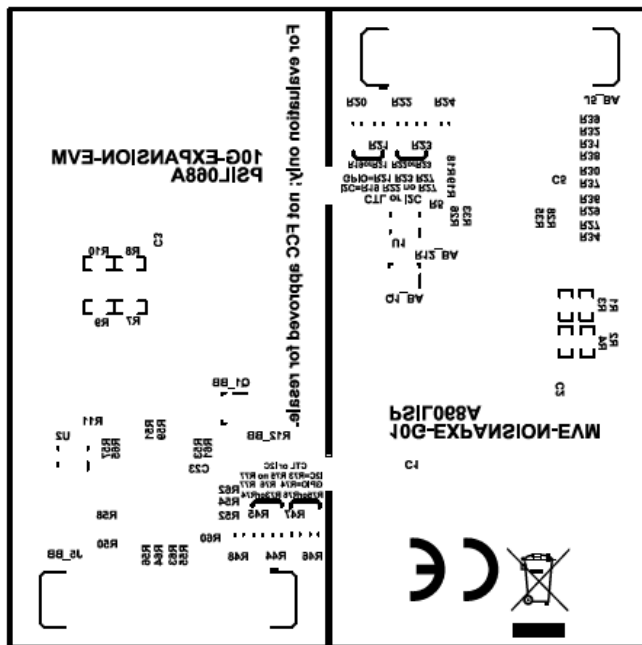


Figure 21. 10G-EXPANSION-EVM Bottom Overlay

## 5.1 Bill of Materials

Table 1 lists the bill of materials (BOM) for the 10G-EXPANSION-EVM.

**Table 1. Bill of Materials**

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
PCB1	1		Printed Circuit Board		PSIL068	Any
C1, C2, C3	3	0.1uF	CAP, CERM, 0.1 $\mu$ F, 10 V, +/- 10%, X5R, 0201	0201	CL03A104KP3NNNC	Samsung Electro-Mechanics
C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42	39	0.1uF	CAP, CERM, 0.1 $\mu$ F, 16 V, +/- 10%, X6S, 0201	0201	C0603X6S1C104K030 BC	TDK
D1, D2_BA, D2_BB	3	White	LED, White, SMD	0402, White	LW QH8G-Q2S2-3K5L-1	OSRAM
J1	1		Connector, Receptacle, USB 3.1 Type A, R/A, TH	Connector, Receptacle, USB 3.1 Type A, R/A, TH	GSB4111312HR	Amphenol Canada
J2	1		Mini DisplayPort Connector, 0.6 mm, 10x2, Gold, Black, SMT/TH	Mini DisplayPort Connector, 0.6 mm, 10x2	664-200260S60300	Bizlink
J3	1		Connector, Receptacle, USB 3.1 Type B, R/A, TH	Connector, Receptacle, USB 3.1 Type B, R/A, TH	GSB4211311WEU	Amphenol Canada
J4	1		Receptacle, HDMI, 20 Pos, R/A, SMT	Receptacle, HDMI, 20 Pos, R/A, SMT	47272-0001	Molex
J5_BA, J5_BB	2		Socket, 0.8mm, 20x2, Gold, SMT	Socket, 0.8mm, 20x2, Gold, SMT	LSEM-120-03.0-F-DV-A-N-K-TR	Samtec
Q1_BA, Q1_BB	2	50 V	Transistor, NPN, 50 V, 0.05 A, SOT-323	SOT-323	DTC114EUAT106	Rohm
R5, R11	2	10.0k	RES, 10.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0710KL	Yageo America
R6, R12_BA, R12_BB, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65	33	1.00k	RES, 1.00 k, 1%, 0.05 W, 0201	0201	CRCW02011K00FKE D	Vishay-Dale
R13_BA, R13_BB, R16_BA, R16_BB	4	1.0Meg	RES, 1.0 M, 5%, 0.05 W, 0201	0201	RC0201JR-071ML	Yageo America
R14_BA, R14_BB, R15_BA, R15_BB, R40, R43	6	100k	RES, 100 k, 1%, 0.05 W, 0201	0201	CRCW0201100KFKE D	Vishay-Dale
R17	1	1.0k	RES, 1.0 k, 5%, 0.05 W, 0201	0201	RC0201JR-071KL	Yageo America
R18, R19	2	2.00Meg	RES, 2.00 M, 1%, 0.05 W, 0201	0201	RC0201FR-072ML	Yageo America
R20, R21, R22, R23, R24, R44, R45, R46, R47, R48, R49	11	0	RES, 0, 5%, 0.1 W, 0603	0603	ERJ-3GEY0R00V	Panasonic
R25	1	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0ED	Vishay-Dale
R41, R42	2	0	RES, 0, 5%, 0.05 W, 0201	0201	CRCW02010000Z0ED	Vishay-Dale
TP1_BA, TP1_BB, TP2_BA, TP2_BB, TP3_BA, TP3_BB, TP4_BA, TP4_BB, TP5_BA, TP5_BB	10		Test Point, Miniature, SMT	Test Point, Miniature, SMT	5019	Keystone
U1, U2	2		High-Speed USB 2.0 (480 Mbps) 1:2 Multiplexer / Demultiplexer Switch with Single Enable, 6 ohm RON, 2.5 to 3.3V, -40 to 85 degC, 10-Pin UQFN (RSE), Green (RoHS & no Sb/Br)	RSE0010A	TS3USB221RSE	Texas Instruments

**Table 1. Bill of Materials (continued)**

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
U3	1		USB TYPE-C DP, Alt Mode Sink-Side Linear Redriver Crosspoint Switch, RNQ0040A (WQFN-40)	RNQ0040A	TUSB1064RNQR	Texas Instruments
U4	1		USB Type-C DP ALT Mode, 10 Gbps Linear Redriver Crosspoint Switch, RNQ0040A (WQFN-40)	RNQ0040A	TUSB1046-DCIRNQR	Texas Instruments
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
R1, R2, R7, R8, R9	0	100k	RES, 100 k, 0.5%, 0.063 W, 0402	0402	CRCW0402100KDHE DP	Vishay-Dale
R3	0	1.00Meg	RES, 1.00 M, 1%, 0.063 W, 0402	0402	CRCW04021M00FKE D	Vishay-Dale
R4, R10	0	4.99Meg	RES, 4.99 M, 1%, 0.063 W, 0402	0402	CRCW04024M99FKE D	Vishay-Dale



## STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

- 1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductor products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software
- 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.

- 2 *Limited Warranty and Related Remedies/Disclaimers:*

- 2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
- 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.

- 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](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](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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2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

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3.3.3 *Notice for EVMs for Power Line Communication:* Please see [http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_02.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page)  
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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.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL 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 HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

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