

# EVM User's Guide: TMUXHS4446EVM

## TMUXHS4446 Evaluation Module



### Description

The TMUXHS4446EVM is a PCB that helps customers evaluate the TMUXHS4446 when applying Type-C Alternate Mode with data rates up to 10Gbps for a downstream facing port (host). This EVM also functions as a hardware reference design for TMUXHS4446 implementations. The PCB design and layout files provide illustrations of the routing and placement rules for using the TMUXHS4446 component.

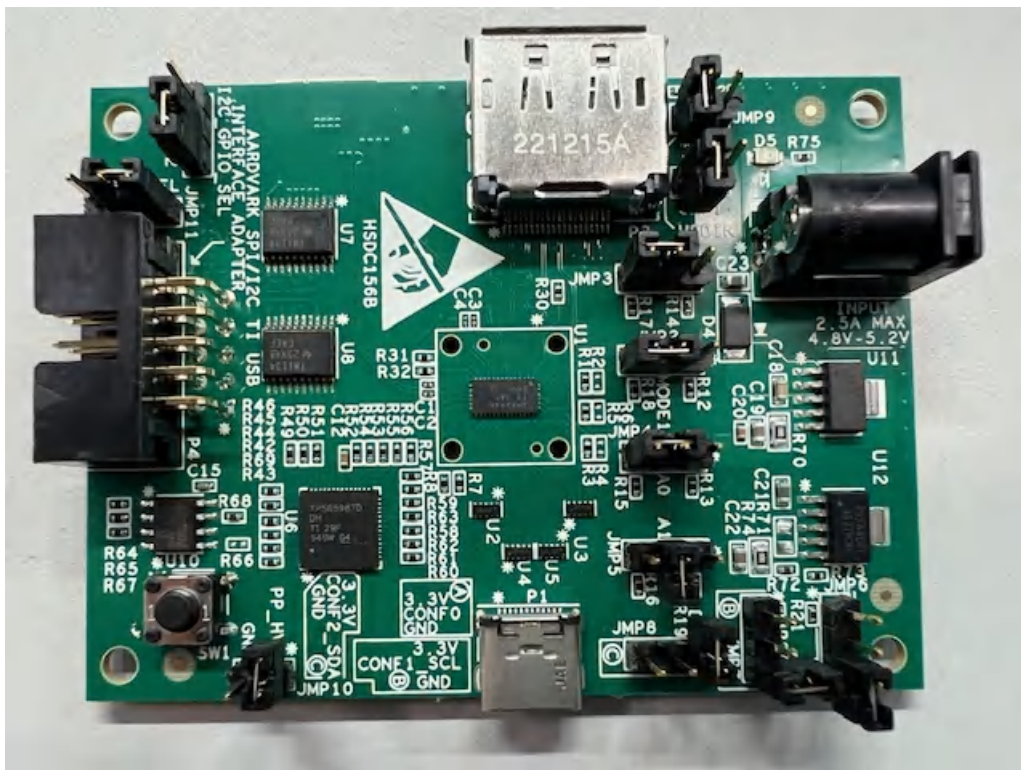
### Features

- Passive bidirectional USB-C Alternate Mode Mux switches between USB and DisplayPort signals
- Supports USB 3.2 up to 10Gbps (Gen 2.0) and DisplayPort 2.1 up to 10Gbps per lane (UHBR10)
- Compatible for Source/Host and Sink/Device application

- Dynamic characteristics:
  - Insertion loss =  $-1.8\text{dB}$  at 5GHz
  - Return loss =  $-15\text{dB}$  at 5GHz
- Compatible for Source/Host and Sink/Device application
- Single supply voltage VCC of 3.3V or 1.8V
- Low active ( $340\mu\text{A}$ ) and standby power consumption ( $0.7\mu\text{A}$  in pin mode)
- Extended industrial temperature option of  $-40^\circ$  to  $105^\circ\text{C}$
- Available in  $3\text{mm} \times 6\text{mm}$  QFN package (RET)

### Applications

- [PC and notebooks](#)
- [TV](#)
- [Gaming](#)
- [Home theater and entertainment](#)
- [Smart phone](#)
- [Tablets](#)



# 1 Evaluation Module Overview

## 1.1 Introduction

This user guide describes how to use the TMUXHS4446 evaluation module (EVM) and includes reference design schematics that can guide users in implementing alternate mode of the host system using the TMUXHS4446 device. The TMUXHS4446EVM can be used with a legacy DP source, or USB host system, to evaluate the USB Type-C implementation. [Figure 1-1](#) is a typical test setup.



**Figure 1-1. TMUXHS4446EVM Typical Test Setup**

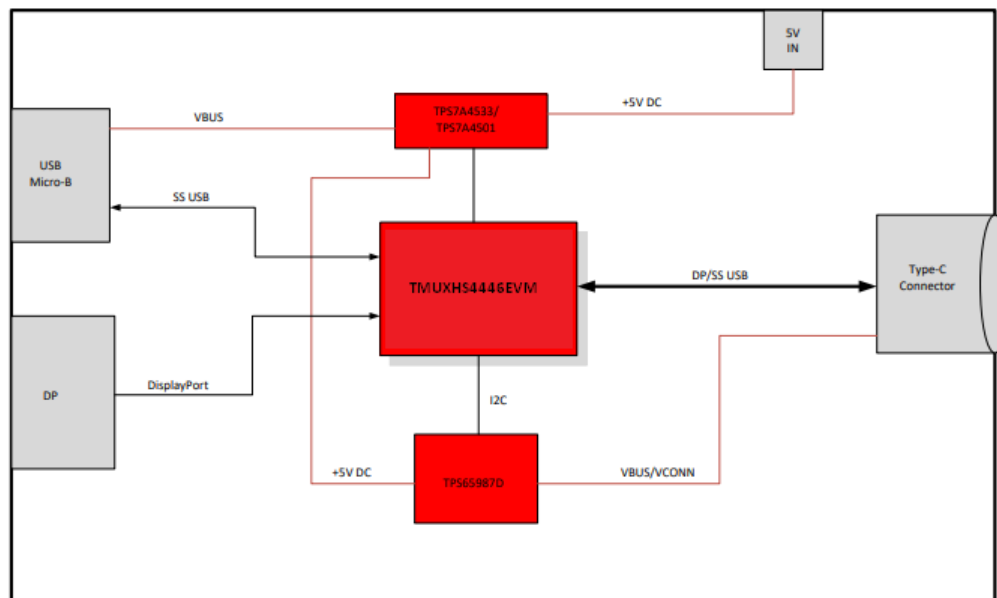
## 1.2 Kit Contents

The TMUXHS4446 EVM includes:

- The TMUXHS4446 device
- A Micro B USB receptacle that connects to USB host systems
- A DisplayPort receptacle that connects to a DisplayPort-capable source
- Standard 5V barrel jack receptacle
- Headers for configuring various TDP2004 features

The TMUXHS4446 EVM uses the Texas Instruments' [TPS65987D](#) controller for power delivery and CC pin control.

## 1.3 Specification



**Figure 1-2. Block Diagram**

## 1.4 Device Information

The TMUXHS4446 is a high-speed bidirectional passive crosspoint switch used to switch between USB 3.2 Gen2 SuperSpeed and DisplayPort 1.4 signals over a USB Type-C connection. The device supports a USB 3.2 Gen2 data rate of 10Gbps and a DisplayPort 1.4 HBR3 data rate of 8.1Gbps.

## 2 Hardware

### 2.1 TMUXHS4446EVM Configuration

This section provides the configuration options available in the TMUXHS4446EVM.

#### 2.1.1 TMUXHS4446EVM Default Configuration

Table 2-1 provides configuration guidance for TMUXHS4446. The TMUXHS4446 is configured by default with GPIO mode control using TPS65987D.

**Table 2-1. TMUXHS4446 Configuration Pins**

Reference Designator	JMP Control	Configuration
JMP1	DP_PWR	OPEN
JMP2	MODE1	Install on pins 2-3
JMP3	MODE0	Install on pins 2-3
JMP4	A0	Install on pins 2-3
JMP5	A1	OPEN
JMP6	CONF0	OPEN
JMP7	CONF1	OPEN
JMP8	CONF2	OPEN
JMP9	HPD	OPEN
JMP10	PPV	OPEN
JMP11	ADAPTOR	Install on pins 2-3
JMP12	I2C_GPIO	Install on pins 2-3

#### 2.1.2 High Speed and Low Speed Channel Mapping

This section describes how to configure the TMUXHS4446 control pins to toggle between USB mode or displayport mode. Channel names are based off of the TMUXHS4446 used in a source-side application.

**Table 2-2. High Speed and Low Speed Channel Mapping**

System Channel	Connector Side Channel							
	OPEN	OPEN	USB SS Only	USB SS Only (flipped)	4 Ln DP	4 Ln DP (flipped)	2 Ln DP + USB SS	2 Ln DP + USB SS (flipped)
	CONF[2:0] = 000	CONF[2:0] = 001	CONF[2:0] = 100	CONF[2:0] = 101	CONF[2:0] = 010	CONF[2:0] = 011	CONF[2:0] = 110	CONF[2:0] = 111
SSTX	X	X	CTX1	CTX2	X	X	CTX1	CTX2
SSRX	X	X	CRX1	CRX2	X	X	CRX1	CRX2
DP0	X	X	X	X	CRX2	CRX1	CRX2	CRX1
DP1	X	X	X	X	CTX2	CTX1	CTX2	CTX1
DP2	X	X	X	X	CTX1	CTX2	X	X
DP3	X	X	X	X	CRX1	CRX2	X	X
AUX+	X	X	X	X	SBU1	SBU2	SBU1	SBU2
AUX-	X	X	X	X	SBU2	SBU1	SBU2	SBU1

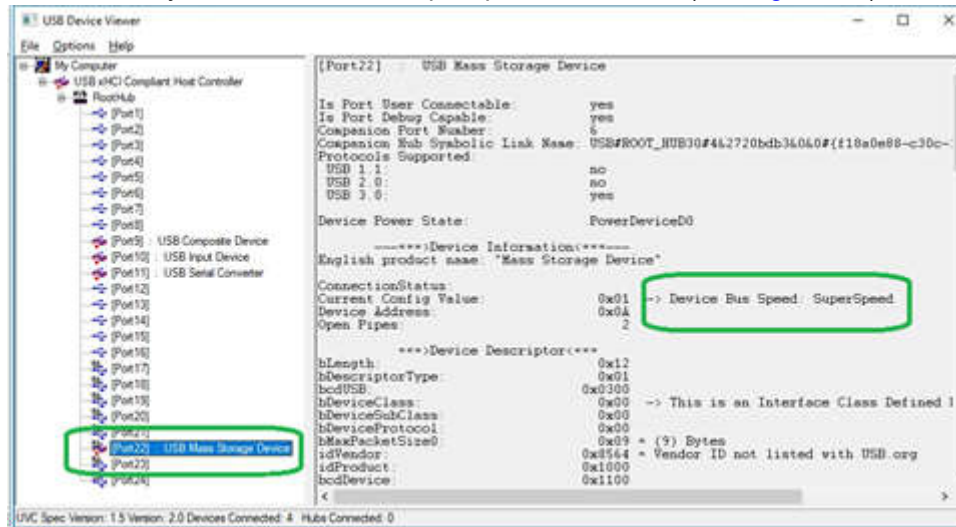
#### 2.1.3 Power

The TMUXHS4446EVM is designed to operate off the VBUS from a USB host connected to a USB Micro B, P2. No external power is applied by J5 unless standalone operation is desired.

The TMUXHS4446EVM must be powered by J1 (5V, 1A input) if testing the DisplayPort only or if bypassing VBUS power.

### 2.1.4 How to Test USB Mode

1. Connect P2 to a USB using a USB Type-A to Type-MicroB cable.  
Alternative method: Connect P2 to a USB using a Type-C to MicroB cable if using a Type-C host.
2. Attach a Type-C SuperSpeed device to the downstream port of the TUSB4446EVM (Connector P1).
3. Run USBView and verify the host shows a SuperSpeed connection (see [Figure 2-1](#)).



**Figure 2-1. USB Viewer**

4. Flip the Type-C Cable to connector P1 of the TUSB4446EVM connection 180° and check SuperSpeed connection.

### 2.1.5 How to Test DisplayPort Mode

1. Connect P2 to a DisplayPort output of any video card with a DisplayPort cable.
2. Connect P1 to a monitor with a Type-C cable.
3. Power on the EVM with power from a J1 (5V, 1A input).

## 3 Hardware Design Files

### 3.1 TMUXHS4446EVM Schematics

Figure 3-1 through Figure 3-4 show the EVM schematics.

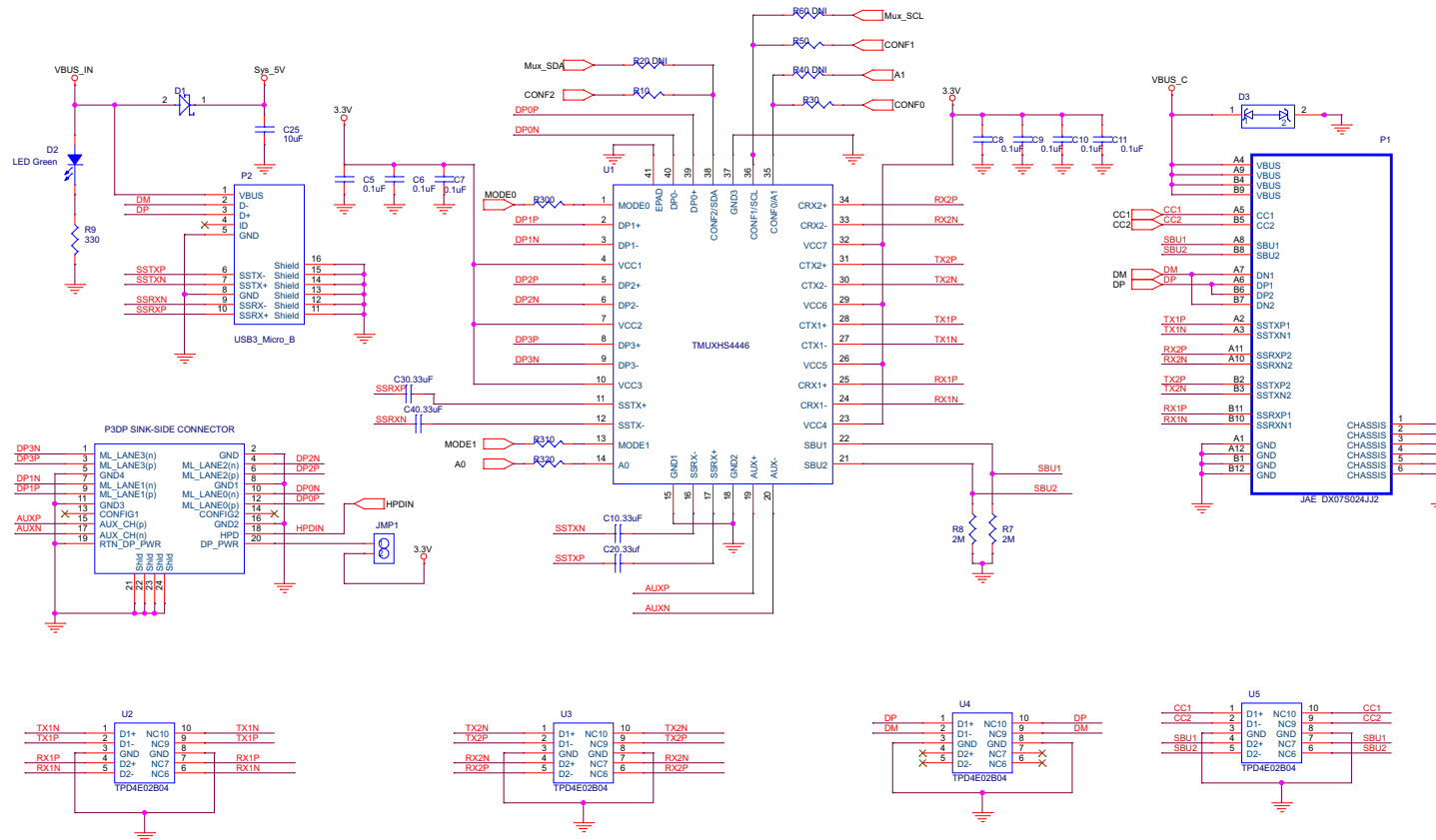
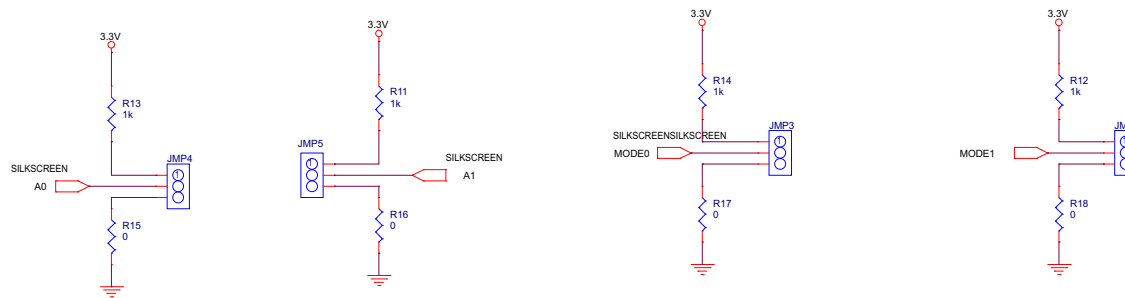
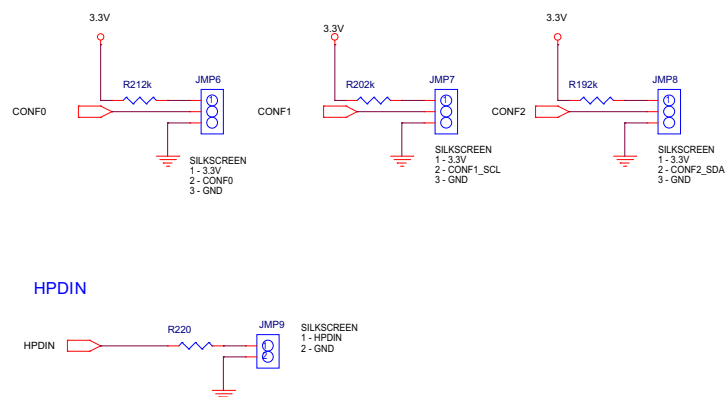


Figure 3-1. TMUXHS4446EVM Schematics (1 of 5)

MODE Config



GPIO CONFIG Control



CONF2	CONF1	CONF0	Mux Operation
LOW	LOW	LOW	POWER DOWN
LOW	LOW	HIGH	POWER ON
LOW	HIGH	LOW	4 Lane DP No FLIP
LOW	HIGH	HIGH	4 Lane DP With FLIP
HIGH	LOW	LOW	One Port USB3.1 No FLIP
HIGH	LOW	HIGH	One Port USB3.1 With FLIP
HIGH	HIGH	LOW	1 Port USB3.1 + 2 Lane DP No FLIP
HIGH	HIGH	HIGH	1 Port USB3.1 + 2 Lane DP With FLIP

Figure 3-2. TMUXHS4446EVM Schematics (2 of 5)



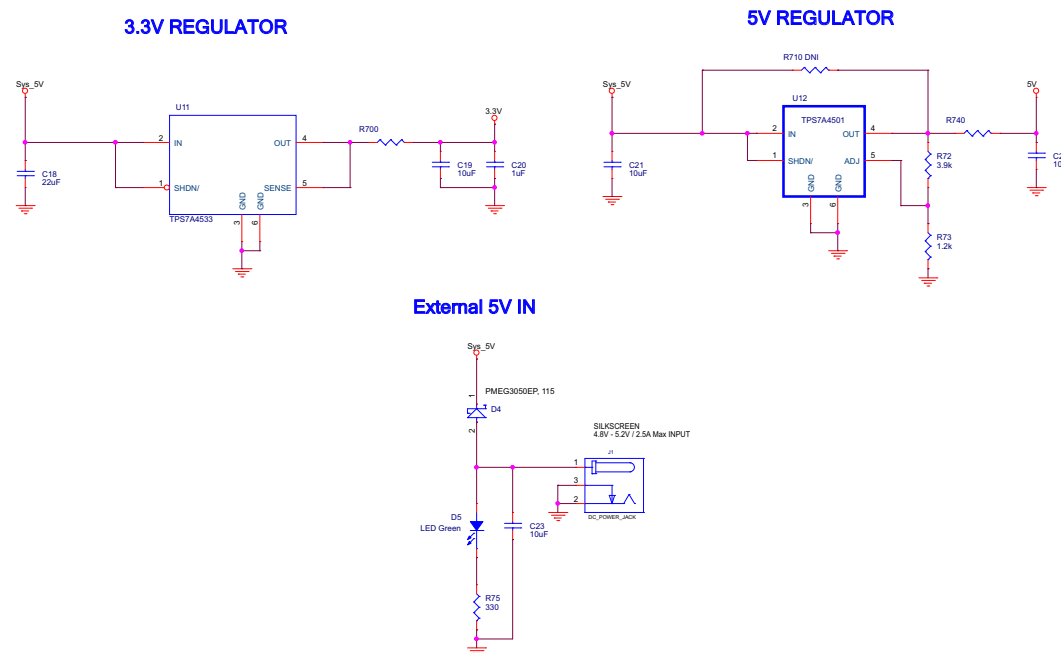


Figure 3-4. TMUXHS4446EVM Schematics (4 of 5)



Install label in silkscreened box after final wash. Text shall 8 pt font. Text shall be per the label table in the PDF Schematic

Variant / Label Table	
Variant	Label Text
001	TMUXHS4446EVM

LB1



TMUXHS4446EVM

PCB1



HSDC156B

PCB LOGO  
Texas Instruments

PCB LOGO  
ESD1

PCB LOGO  
FCC Disclaimer

PCB LOGO  
CE LOGO

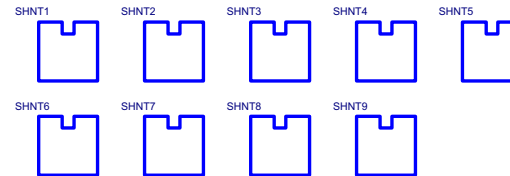
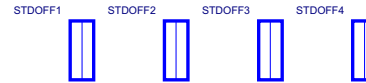
PCB LOGO  
WEEE LOGO

FID1 FID2 FID3 FID5 FID6



FID4

Mounting Hole Mounting Hole Mounting Hole Mounting Hole



**Figure 3-5. TMUXHS4446EVM (5 of 5)**

## 3.2 PCB Layouts

Figure 3-6 through Figure 3-11 show the EVM PCB layers.

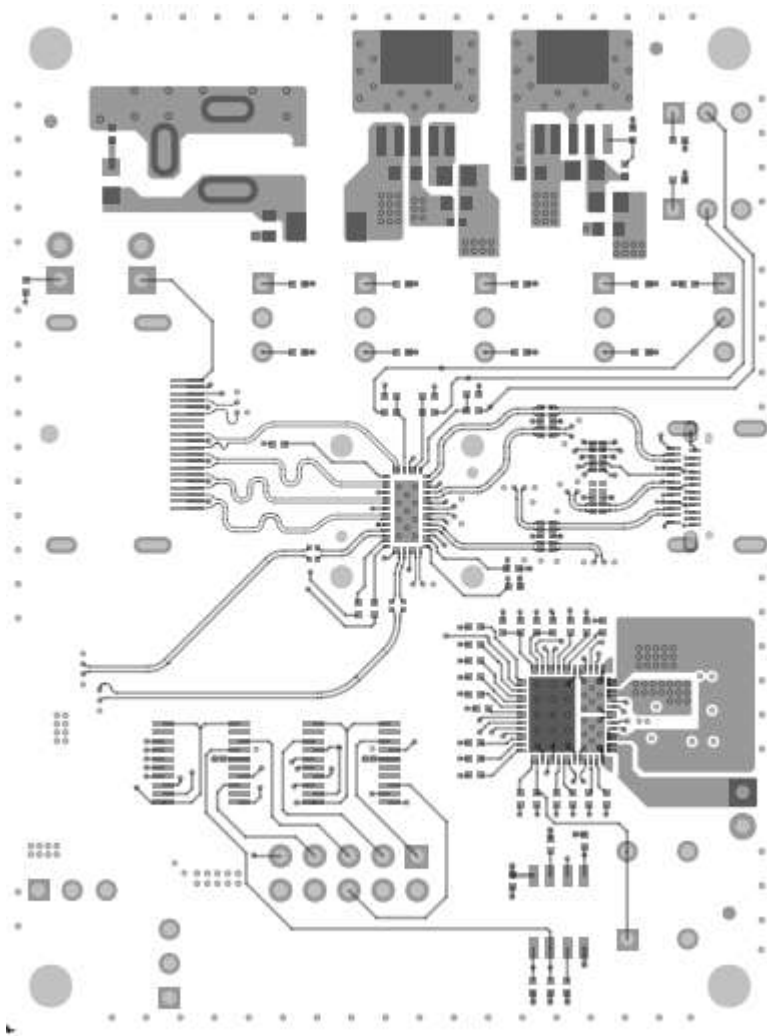


Figure 3-6. TMUXHS4446EVM PCB Layers (1 of 6)

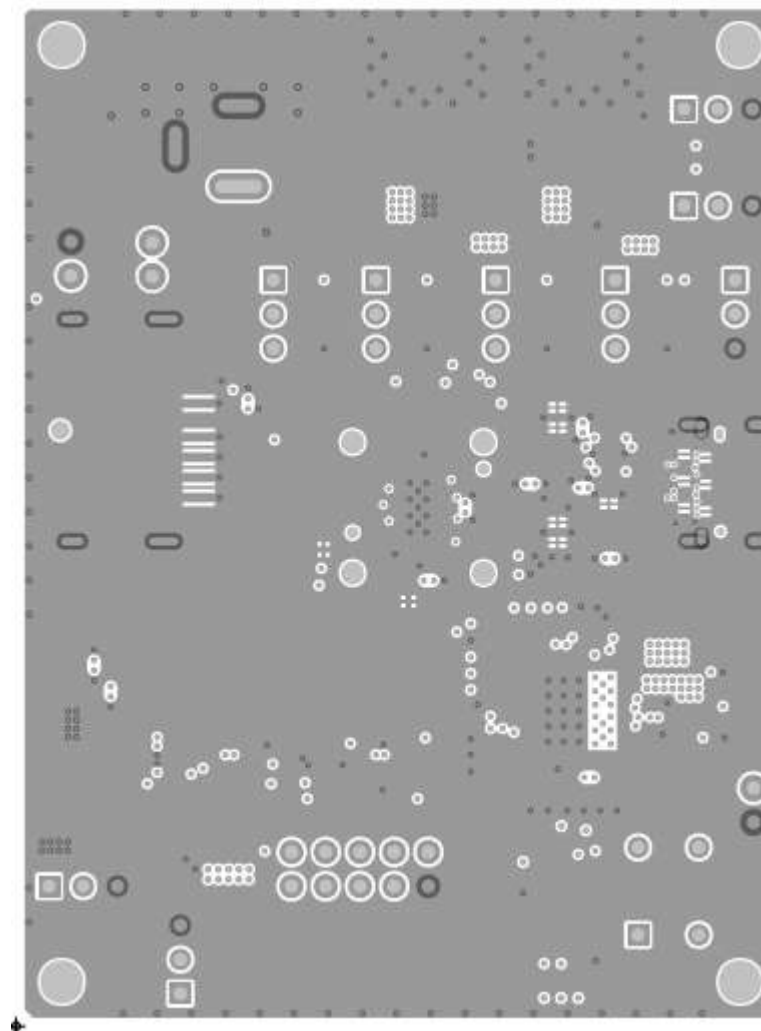


Figure 3-7. TMUXHS4446EVM PCB Layers (2 of 6)

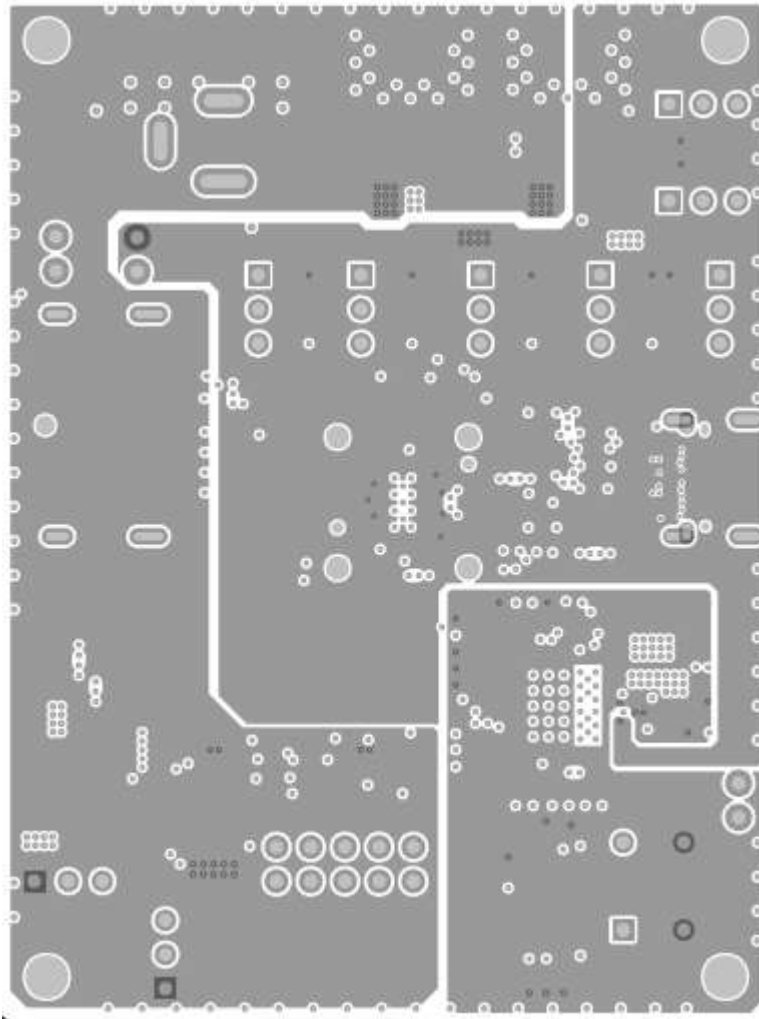


Figure 3-8. TMUXHS4446EVM PCB Layers (3 of 6)

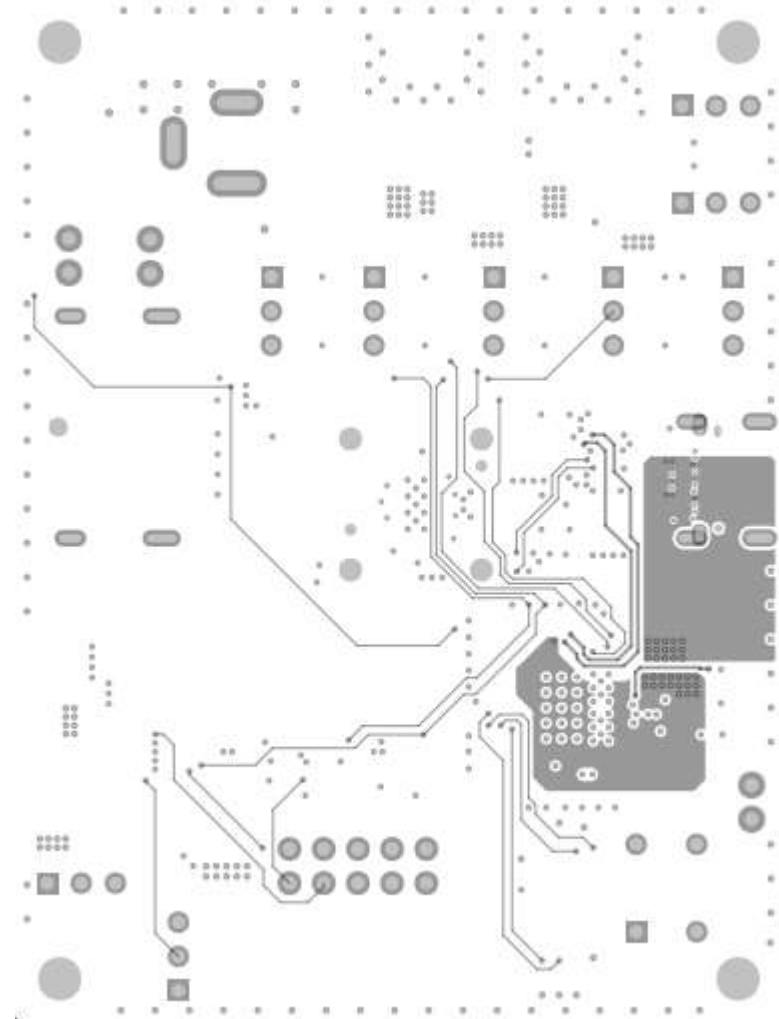


Figure 3-9. TMUXHS4446EVM PCB Layers (4 of 6)

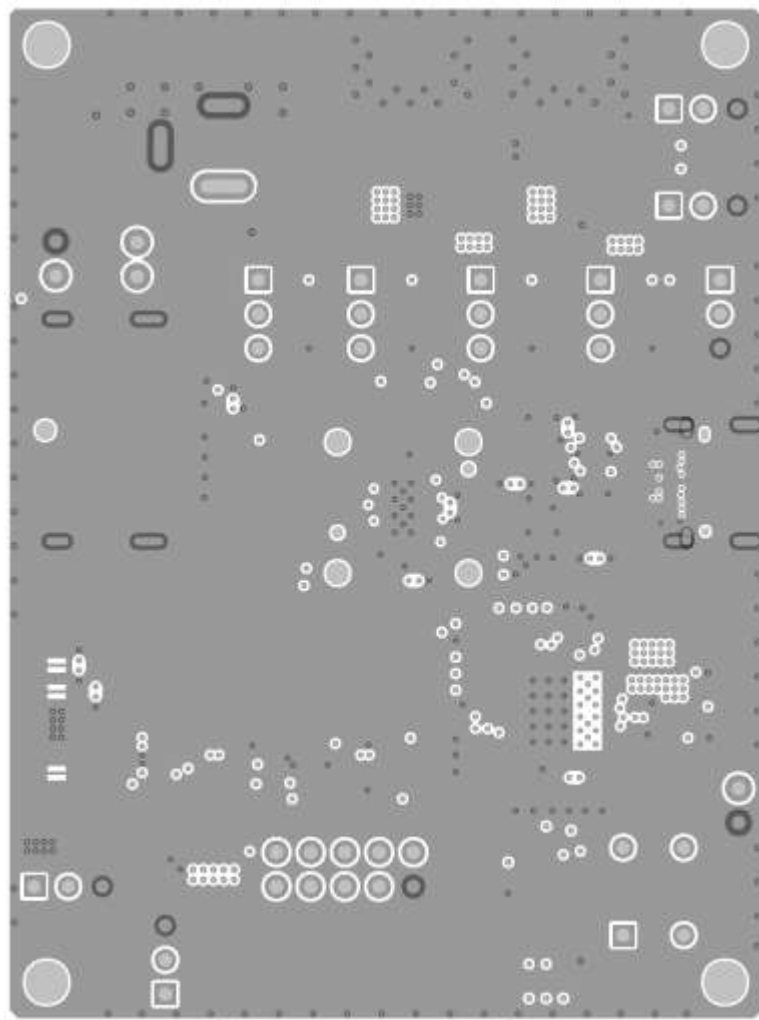


Figure 3-10. TMUXHS4446EVM PCB Layers (5 of 6)

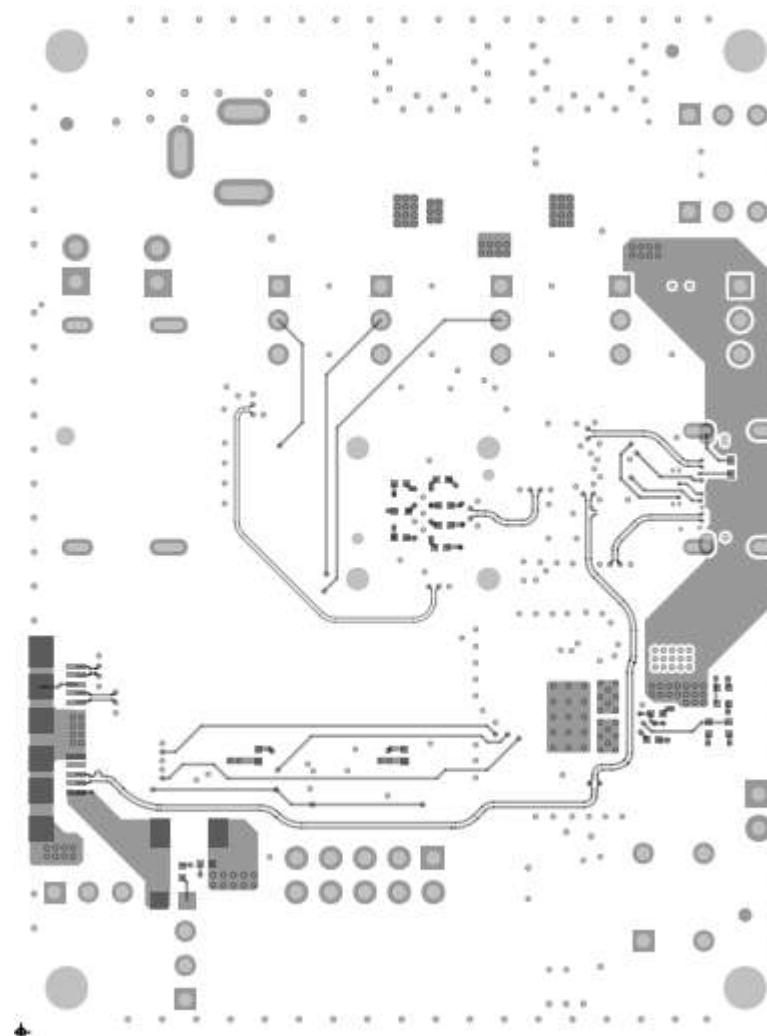


Figure 3-11. TMUXHS4446EVM PCB Layers (6 of 6)

### 3.3 Bill of Materials

**Table 3-1. Bill of Materials**

Designator	Quantity	Description	Part Number	Manufacturer
C1,C2,C3,C4	4	330nF	GRM033R60J334ME90D	Murata
C5,C6,C7,C8,C9,C10,C11,C13,C16,C17	10	100nF	GRM033R60J104KE19D	Murata
C12,C14,C25	3	10 uF	GRM155R60G106ME44D	Murata
C15	1	.01 uF	GRM155R71H103KA88D	Murata
C19,C21,C22,C23	4	10 uF	GRM188R61C106MA73D	Murata
C20	1	1 uF	GRM155C81A105KA12D	Murata
C18	1	22 uF	GRM188R61A226ME15D	Murata
D1,D4	2	SCHOTTKY	PMEG3050EP,115	NXP
D2,D5	2	LED Green	LTST-C170KGKT	LITE-ON TECHNOLOGY CORPORATION
D3	1	TPD1E10B06	TPD1E10B06DPYR	Texas Instruments
JMP1,JMP9,JMP103	3	Header 2x1	68001-402HLF	FCI
JMP2,JMP3,JMP4,JMP5,JMP6,JMP7,JMP8,JMP11,JMP12	9	Header 3x1	961103-6404-AR	3M
JMP3,JMP6,JMP7,JMP9,JMP11,JMP14,JMP15	7	HDR1x1	68001-401HLF	FCI
J1	1	DC_PWR_JACK	PJ-202AH	CUI Inc.
PCB1	1	HSDC156B	HSDC156B	Any
P1	1	JAE DX07S024JJ2	DX07S024JJ2	Jae
P2	1	USB3_Micro_B	GSB343133HR	Amphenol
P3	1	DP SINK-SIDE CONNECTOR	472720001	Molex Inc
P4	1	Header 5x2 0.1" Shroud RA thru-hole	30310-5002HB	3M
R9,R75	2	330	ERJ-2GEJ331X	Panasonic Electronic Components
R2,R3,R4,R5,R6,R7,R8,R9	8	1	ERJ-1GNJ1R0C	Panasonic Electronic Components
R7,R8	2	2 M	ERJ-2GEJ205X	Panasonic Electronic Components
R11,R12,R13,R14	4	1 k	ERJ-2GEJ102X	Panasonic Electronic Components
R19,R20,R21	3	2 k	ERJ-2GEJ202X	Panasonic Electronic Components
R1,R3,R5	3	0	ERJ-2GE0R00X	Panasonic Electronic Components
R2,R4,R6	3	0 DNI	ERJ-2GE0R00X	Panasonic Electronic Components
R15,R16,R17,R18,R59,R63,R22	7	0	ERJ-2GE0R00X	Panasonic Electronic Components
R33,R38	2	22	ERA-2AKD220X	Panasonic Electronic Components
R35,R36,R37,R53,R54,R57,R58,R64,R65,R67,R68	11	3.3 k	ERJ-2GEJ332X	Panasonic Electronic Components
R42,R43,R44,R46,R47,R48,R49,R50,R51,R55,R60,R61,R62,R69	14	100 k	ERJ-2GEJ104X	Panasonic Electronic Components
R40,R41	2	10k DNI	ERJ-2GEJ103X	Panasonic Electronic Components
R45	1	100	ERA-2AED101X	Panasonic Electronic Components
R52,R56	2	10k	ERJ-2GEJ103X	Panasonic Electronic Components
R53,R54,R57,R58,R64,R65,R67,R68	8	3.3k	ERJ-2GEJ332X	Panasonic Electronic Components

**Table 3-1. Bill of Materials (continued)**

Designator	Quantity	Description	Part Number	Manufacturer
R66	1	3.3k DNI	ERJ-2GEJ332X	Panasonic Electronic Components
R70,R74	2	0	ERJ-6GEY0R00V	Panasonic Electronic Components
R71	1	0 DNI	ERJ-6GEY0R00V	Panasonic Electronic Components
R72	1	3.9k	ERJ-2GEJ392X	Panasonic Electronic Components
R73	1	1.2k	ERJ-2GEJ122X	Panasonic Electronic Components
SW1	1	B3F-1020	B3F-1020	Omron Electronics
U1	1	Tmuxhs4446	Tmuxhs4446	Texas Instruments
U2,U3,U4,U5	4	TPD4E02B04	TPD4E02B04DQAR	Texas Instruments
U6	1	TPS65987D	TPS65987DDHRSHR	Texas Instruments
U7,U8	2	TMUX1134	TMUX1134PWR	Texas Instruments
U9	1	TMUX1133	TMUX1133PWR	Texas Instruments
U10	1	W25Q80	W25Q80DVSNIG	WINBOND
U11	1	TPS7A4533	TPS7A4533DCQ	Texas Instruments
U12	1	TPS7A4501	TPS7A4501DCQ	Texas Instruments
SCRW1,SCRW2,SCRW3,SCRW4	4	NY PMS 440 0050 PH	NY PMS 440 0050 PH	B & F Fastener
SHNT1,SHNT2,SHNT3,SHNT4,SHNT5,SHNT6,SHNT7,SHNT8,SHNT9	9	QPC02SXGN-RC	QPC02SXGN-RC	Sullins Connector Solutions
STDOFF1,STDOFF2,STDOFF3,STDOFF4	4	1902E	1902E	Keystone

## **4 Additional Information**

### **Trademarks**

All trademarks are the property of their respective owners.

## 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 semiconductors 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.

### **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 DEGRADATION 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/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/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。

<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
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。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・イ

ンスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

西新宿三井ビル

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)

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。 <https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html>

#### 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.

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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.
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8. *Limitations on Damages and Liability:*

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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.

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