

EVM User's Guide: TLV672XEV **TLV672X Evaluation Module**



Description

The TLV672X evaluation module (EVM) is a platform to evaluate the main features of the TLV6722. The TLV6722 device integrates the OSFP module-side INT/RSTn and LPWn/PRSn circuits into a small-size DSBGA-9 (YBJ) package. The TLV672XEVN supports OSFP host-side components to demonstrate in-application functionality of the TLV6722.

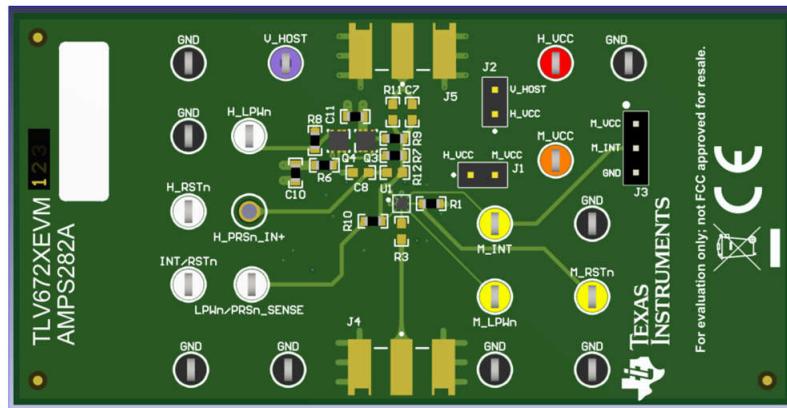
Features

- On-board OSFP MSA valued host-side passives and switches

- On-board logic inversions to align with OSFP MSA host-side logic polarities
- On-board test points for easy probing of all TLV6722 input and output signals

Applications

- Optical Module



TLV672XEV

1 Evaluation Module Overview

1.1 Introduction

The TLV672XEV is a platform for evaluating the main features and performance of the TLV6722. The TLV672XEV is able to be configured to evaluate the TLV6722 device only or to include host-side passives to demonstrate in-application functionality.

This user's guide describes the characteristics, operation, and use of the TLV672XEV. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the TLV672XEV. This document includes the schematic, PCB layer plots, and a complete bill of materials (BOM).

1.2 Kit Contents

Table 1-1 lists the contents of the EVM kit. Contact the Texas Instruments Product Information Center if any components are missing.

Table 1-1. Kit Contents

ITEM	QUANTITY
TLV672XEV	1

1.3 Specification

The TLV672XEV is intended to demonstrate in-application functionality of the TLV6722. The layout is not laid out for electromagnetic compatibility (EMC) testing. Component selection on the TLV672XEV is intended to emulate the INT/RSTn and LPWn/PRSn circuits as described on the OSFP MSA, but should not be used as a guide for the actual application circuits.

1.4 Device Information

The TLV6722 is a device that fully integrates the module-side INT/RSTn and LPWn/PRSn circuits as defined by the OSFP MSA. This includes precision trimmed resistors R2, R3, and R13 to set the OSFP MSA defined voltage zones, integrated reference and dual channel comparators to ensure correct M_RSTn and M_LPWn outputs, and an M_INT open-drain buffer for interrupt functionality.

2 Hardware

2.1 Recommended Equipment

- DC Power Supply
- Arbitrary Waveform Generator
- Oscilloscope

2.2 Quick Start Procedure

Note

DO NOT TURN ON POWER SUPPLY OR ARBITRARY WAVEFORM GENERATOR UNTIL ALL CONNECTIONS TO THE DEVICE ARE MADE TO THE BOARD.

The following configuration is used to evaluate the TLV6722 with 3.3V logic in a single-supply configuration.

- Short J1 pin 1 (H_VCC) to J1 pin 2 (M_VCC) with a jumper.
- Short J2 pin 1 (H_VCC) to J1 pin 2 (V_HOST) with a jumper.
- Short J3 pin 2 (M_INT) to J3 pin 3 (GND) with a jumper.
- Short TP17 (H_LPWN) to TP15 (H_RSTN) with a grabber to grabber cable.
- Set power supply positive terminal to 3.3V and disable the output.
- Connect the power supply positive terminal to TP1 (H_VCC).
- Connect the power supply ground terminal to TP10 (GND).
- Set arbitrary waveform generator (AWG) to generate a 50kHz square wave with a high voltage of 3.3V and a low voltage of 0V and disable the output.
- Connect the AWG output signal to TP17 (H_LPWN) and the ground terminal to TP7 (GND).
- Connect TP12 (M_RSTN) to a Hi-Z terminated oscilloscope channel and connect the ground lead to GND wherever possible.
- Connect TP14 (M_LPWN) to a Hi-Z terminated oscilloscope channel and connect the ground lead to GND wherever possible.
- Connect TP15 (H_RSTN) to a Hi-Z terminated oscilloscope channel and connect the ground lead to GND wherever possible.
- First, enable the DC power supply output to power the TLV672XEVN with 3.3V. Then, enable the AWG output to generate input signals for H_LPWN and H_RSTN.
- Monitor the oscilloscope waveform to make sure the comparator outputs are switching and the polarities of the host and module signals match.

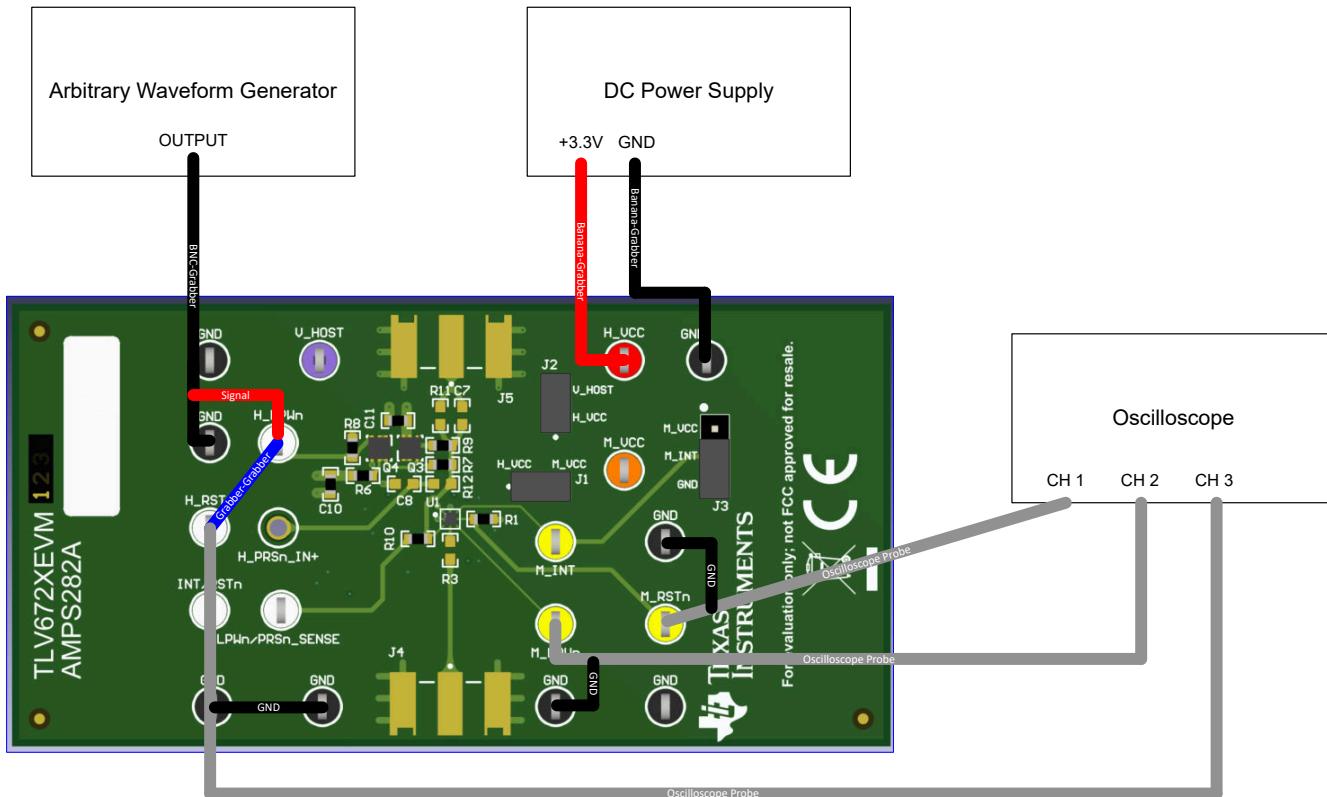


Figure 2-1. Quick Start Connections

2.3 Setup

2.3.1 Supply Voltage

The TLV672XEVFM can operate using separate H_VCC, M_VCC, and V_HOST power supplies. H_VCC sets the input voltage zones for the OSFP MSA INT/RSTn circuit and powers the TLV6722. Power H_VCC with a nominal 3.3V power supply to set the proper voltage zones for the INT/RSTn circuit. M_VCC sets the logic levels for the M_LPWN push-pull output and the M_INT digital input. M_VCC can be powered with the same voltage as H_VCC down to 1.1V. V_HOST powers the host logic inverters and the pull-up network for the OSFP LPWN/PRSN circuit. Power V_HOST with a nominal 3.3V to set proper voltage zones for the OSFP MSA LPWN/PRSN circuit. H_VCC and M_VCC can be shorted using jumper on J1. H_VCC and V_HOST can be shorted using a jumper on J2. All three power rails (H_VCC, M_VCC, and V_HOST) have supply bypass capacitors to GND.

2.3.2 *Inputs*

The TLV672XEV is a demonstration board that contains resistors and switches at the INT/RSTn and LPWn/PRSn nodes to demonstrate in-application behavior. Input behavior is described below assuming V_HOST is powered by 3.3V.

- When H_RSTn is driven to 3.3V, Q2 is Hi-Z and INT/RSTn is in OSFP Voltage Zone 2 (M_INT = LOW) or Voltage Zone 3 (M_INT = HIGH)
- When H_RSTn is driven to GND, Q2 pulls INT/RSTn to GND and INT/RSTn is in OSFP Voltage Zone 1
- When H_LPWn is driven to 3.3V, (TLV672XEVM R9) 15kΩ resistor is connected from LPWn/PRSn to V_HOST and LPWn/PRSn is in OSFP Voltage Zone 2
- When H_LPWn is driven to GND, (TLV672XEVM R9) 15kΩ resistor is disconnected from LPWn/PRSn and LPWn/PRSn is in OSFP Voltage Zone 1

The TLV672XEVFM has test-points TP11 and TP18 at the INT/RSTn and LPWn/PRSn inputs of the TLV6722.

These test points can be used to drive the INT/RSTn and LPWn/PRSn nodes directly if the user wants to bypass the input resistors and switches. If bypassing the input switches and resistors, the user still powers V_HOST and drive H_RSTn to 3.3V to avoid shorting the INT/RSTn driver to ground.

Another way to evaluate the TLV6722 is to configure the TLV672XEV to have the device only. The user can depopulate R4, R9, and R7, as well as connecting V_HOST to GND to remove the effects of the host-side passives.

M_INT is the digital input to the TLV6722 that determines the connection of the internal 8k Ω resistor in the INT/RSTn circuit. M_INT behavior is described below.

- When M_INT is driven to GND, the 8k Ω resistor is connected to GND.
- When M_INT is driven to M_VCC, the 8k Ω resistor is opened (disconnected from GND).

Since M_INT is a digital input to the TLV6722, the M_INT node **MUST** be driven to a well-defined voltage. The user can short M_INT to M_VCC or GND with a jumper on J3, or drive the M_INT pin at TP13 directly.

2.3.3 Outputs

The TLV672XEV has the comparator outputs of the TLV6722 connected to test-points on the board.

The M_RSTn open-drain output is pulled up to M_VCC through a 10k Ω resistor. The output can be measured through the M_RSTn test-point TP12.

The M_LPWn push-pull output can be measured through the M_LPWn test-point TP14.

3 Hardware Design Files

3.1 Schematics

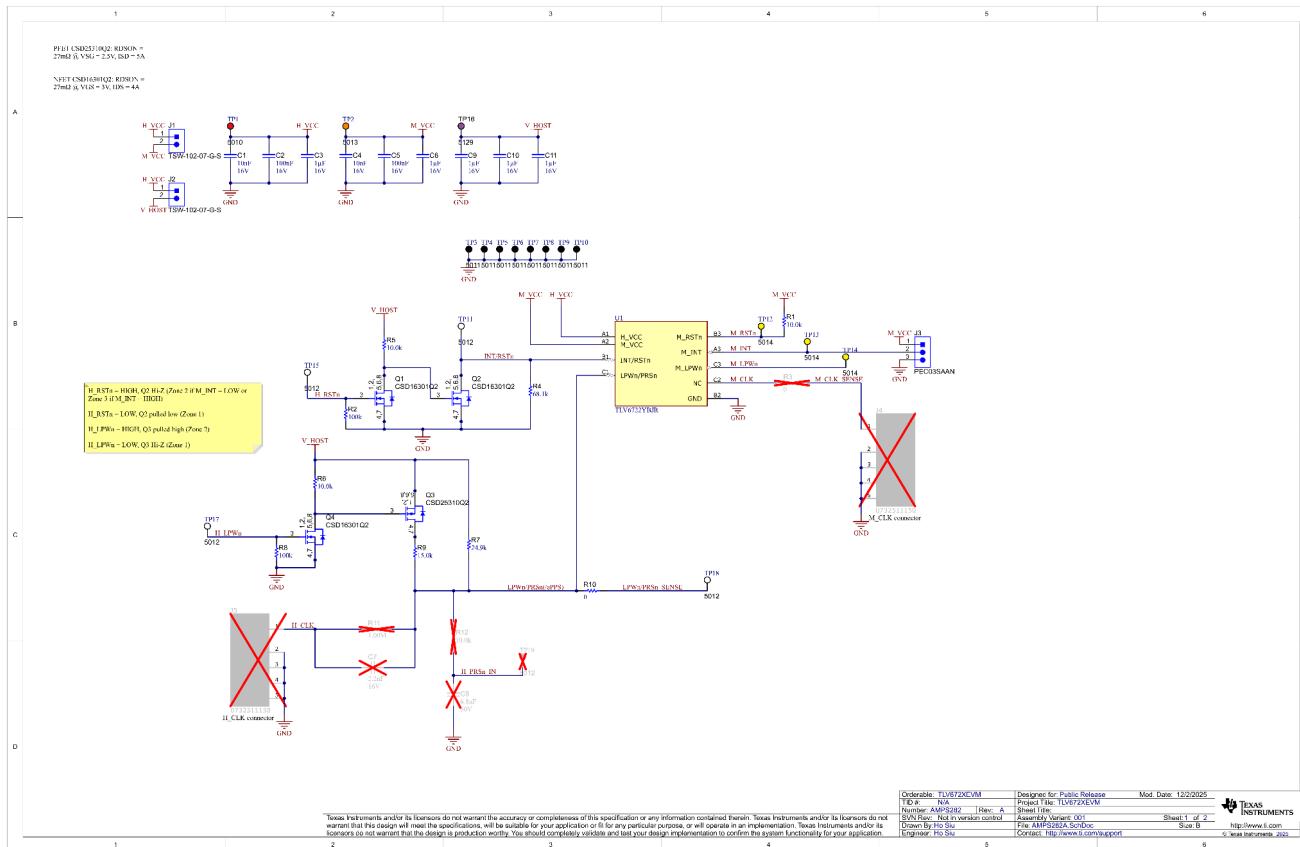


Figure 3-1. TLV672XEVM Schematic

3.2 PCB Layouts

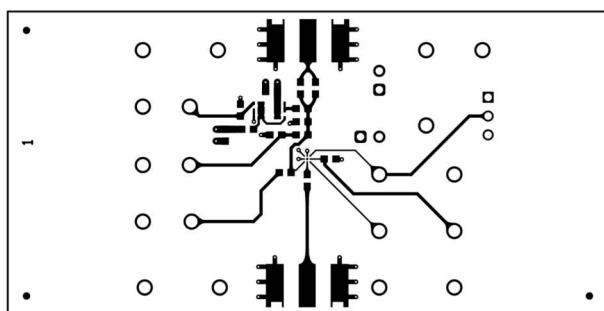


Figure 3-2. TLV672XEV (1st Layer)

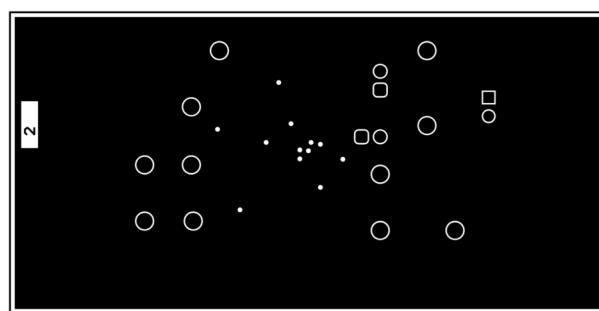


Figure 3-3. TLV672XEV (2nd Layer)

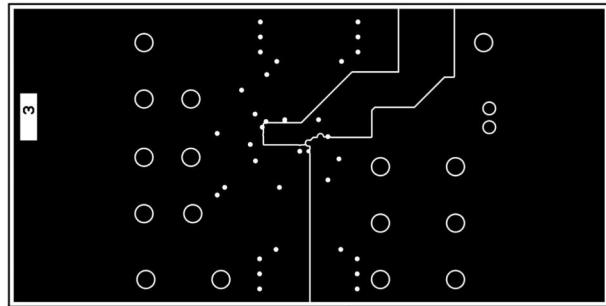


Figure 3-4. TLV672XEVM (3rd Layer)

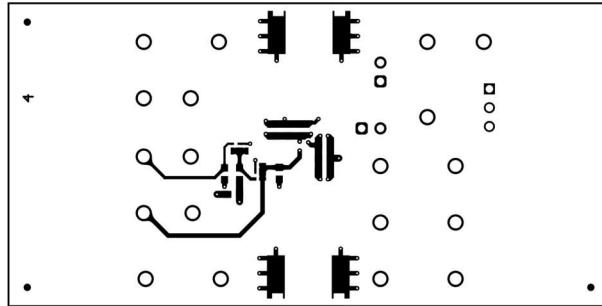


Figure 3-5. TLV672XEVM (4th Layer)

3.3 Bill of Materials (BOM)

Table 3-1. TLV672XEVM Bill of Materials

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
C1, C4	2	0.01uF	CAP, CERM, 0.01 uF, 16 V, +/- 10%, X7R, 0603	0603	885012206040	Wurth Elektronik
C2, C5	2	0.1uF	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0603	0603	CL10B104K08WP NC	Samsung Electro-Mechanics
C3, C6, C9, C10, C11	5	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	EMK107B7105KA -T	Taiyo Yuden
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2	2		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
J3	1		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	Sullins Connector Solutions
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady
Q1, Q2, Q4	3		MOSFET, N-CH, 25 V, 5 A, DQK0006C (WSON-6)	DQK0006C	CSD16301Q2	Texas Instruments
Q3	1		MOSFET, P-CH, -20 V, -20 A, DQK0006C (WSON-6)	DQK0006C	CSD25310Q2	Texas Instruments
R1, R5, R6	3	10.0kΩ	RES, 10.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0710K L	Yageo
R2, R8	2	100kΩ	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100 KL	Yageo
R4	1	68.1kΩ	RES, 68.1 k, 1%, 0.1 W, 0603	0603	RC0603FR-0768K 1L	Yageo
R7	1	24.9kΩ	RES, 24.9 k, 1%, 0.1 W, 0603	0603	RC0603FR-0724K 9L	Yageo
R9	1	15.0kΩ	RES, 15.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0715K L	Yageo
R10	1	0	RES, 0, 5%, 0.1 W, 0603	0603	MCR03EZPJ000	Rohm

Table 3-1. TLV672XEV Bill of Materials (continued)

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
TP1	1		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone Electronics
TP2	1		Test Point, Multipurpose, Orange, TH	Orange Multipurpose Testpoint	5013	Keystone Electronics
TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10	8		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone Electronics
TP11, TP15, TP17, TP18	4		Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone Electronics
TP12, TP13, TP14	3		Test Point, Multipurpose, Yellow, TH	Yellow Multipurpose Testpoint	5014	Keystone Electronics
TP16	1		Test Point, Multipurpose, Purple, TH	Purple Multipurpose Testpoint	5129	Keystone Electronics
U1	1		OSFP/OSFP-XD Module Low-Speed Signals Controller with ePPS Support	DSBGA9	TLV6722YBJR	Texas Instruments

4 Additional Information

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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 isotope 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/lsts/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.

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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.

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.

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