



ABSTRACT

This user's guide describes the characteristics, operation, and use of the TMUX72XXDGKEVM Evaluation Module (EVM). A complete schematic diagram, printed-circuit board layouts, and bill of materials are included in this document.

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Trademarks

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1 Introduction

The TMUX72XXDGKEVM supports evaluation of the TMUX72XX devices in the 8-pin VSSOP (DGK) package, including TMUX7219DGK. TMUX7219 is a complementary metal-oxide semiconductor (CMOS) switch with latch-up immunity in a single channel, 2:1 (SPDT) configuration. The device works well with dual supplies (± 4.5 V to ± 22 V), a single supply (4.5 V to 44 V), or asymmetric supplies (such as $V_{DD} = 12$ V, $V_{SS} = -5$ V). The TMUX7219 supports bidirectional analog and digital signals on the source (Sx) and drain (D) pins ranging from V_{SS} to V_{DD} . All logic control inputs support logic levels from 1.8 V to V_{DD} , ensuring both TTL and CMOS logic compatibility when operating in the valid supply voltage range. Fail-Safe Logic circuitry allows voltages on the control pins to be applied before the supply pin, protecting the device from potential damage.

1.1 Information About Cautions and Warnings

The information in the warning statement is provided for personal protection and the information in the caution statement is provided to protect the equipment from damage. Read each caution and warning statement carefully.



CAUTION

This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. See [Electrostatic Discharge \(ESD\) application report](#) for more information on proper handling.

1.2 Features of this EVM

The EVM has the following features:

- Quick prototyping and testing setup for the 8-pin TMUX72XX devices in the VSSOP (DGK) package, including TMUX7219DGK.
- Evaluation module supports multiple TMUX72XX family IC's. No specific TMUX72XX is supplied or soldered to the evaluation module. Allows flexibility to choose the desired IC for evaluation.
- Support for both single supply and dual supply operation.
- Six power supply decoupling capacitors ($2 \times 0.1 \mu\text{F}$, $2 \times 1 \mu\text{F}$, and $2 \times 10 \mu\text{F}$).
- Jumpers to three possible signal lanes, both VDD and VSS power rails, and control signals.
- Three pads available for placement of SMA connectors.
- Pads available for pull-up or pull-down resistors on control signal pathways.
- Pads available for surge protection diodes.
- 0805 capacitor pads available on all signal pathways referenced to ground.

1.3 EVM Images

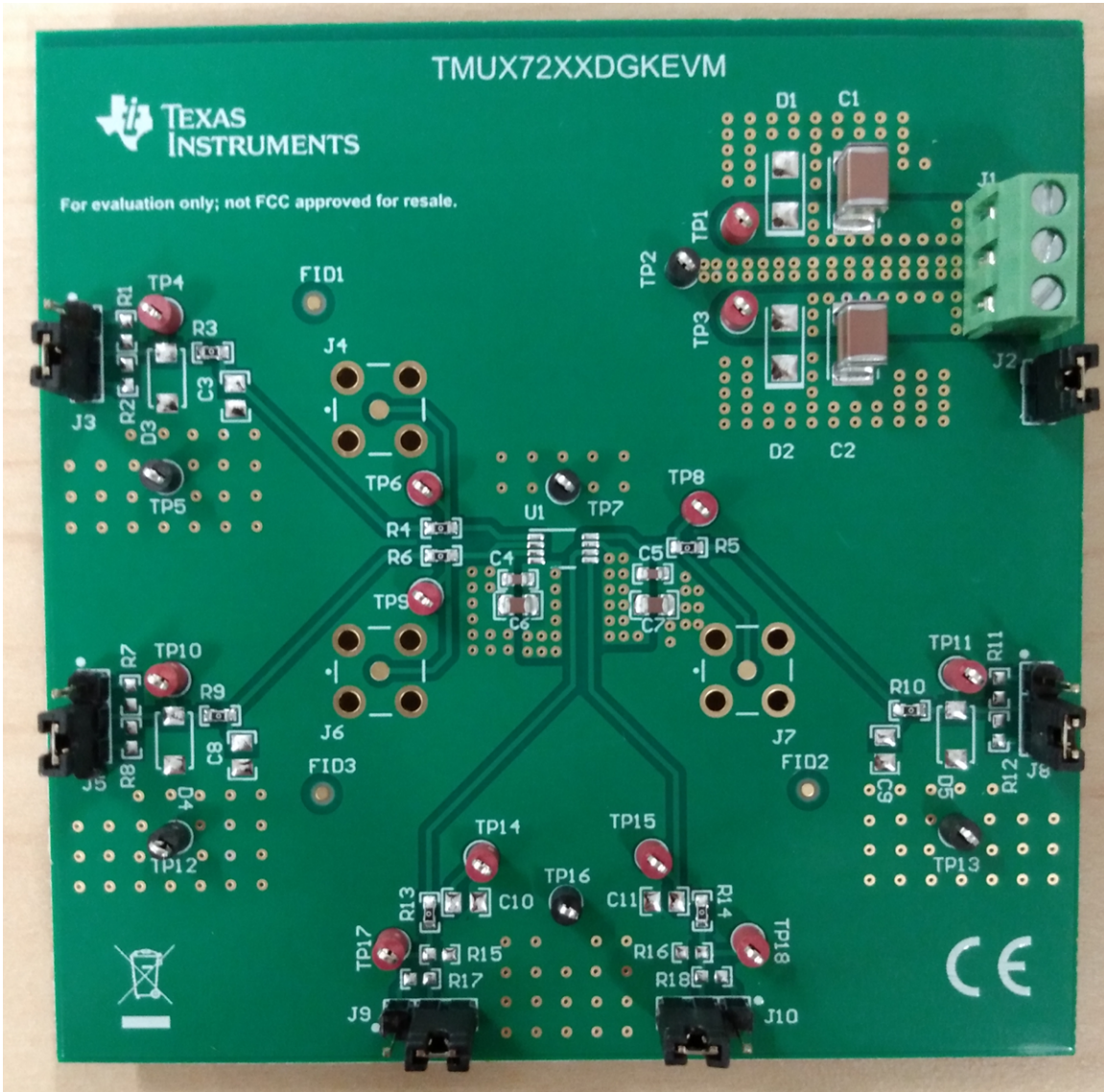


Figure 1-1. TMUX72XXDGKEVM Topside View

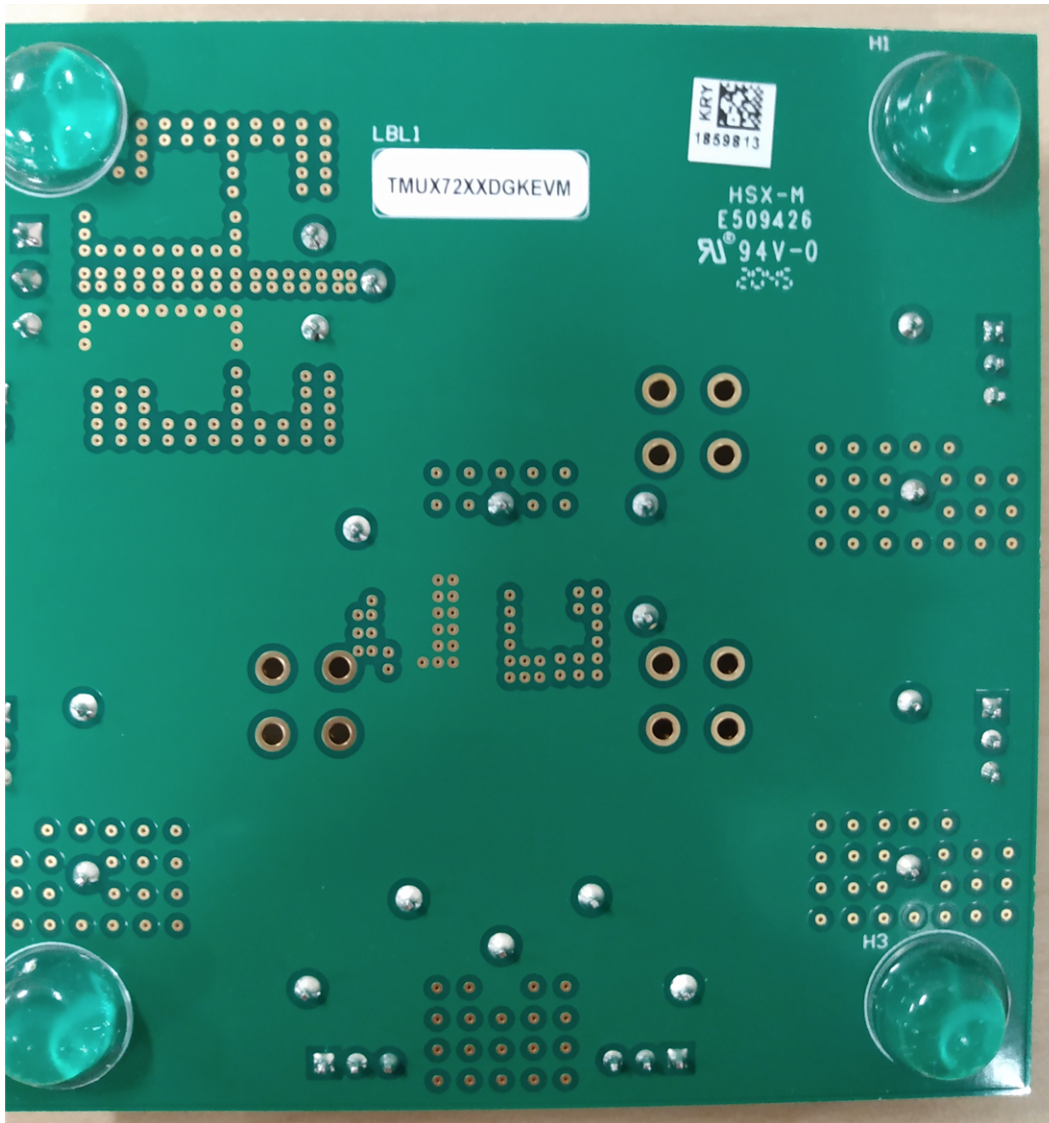


Figure 1-2. TMUX72XXDGKEVM Bottom View

2 EVM Setup

Instructions for setting up the EVM are as follows:

- The control inputs and signal lines may be loaded by soldering components to signal path pads as needed. [Table 2-1](#) describes which load pads correspond to what pin on the DUT. SMA connectors can be soldered to corresponding pads accordingly.

Table 2-1. Component Pad to TMUX72XX Pin Matrix

Pin #	0805 Capacitor Pad ID	Protection Diode Pad	Protection Diode PN#	0603 Pull-up Pad	0603 Pull-Down Pad	Pad Locations
1	C3	D3	SMAJ36CA	R1	R2	Top Layer
2	C8	D4	SMAJ36CA	R7	R8	Top Layer
8	C9	D5	SMAJ36CA	R11	R12	Top Layer

- The board is powered by attaching $\pm 5\text{ V}$ to $\pm 22\text{ V}$ dual power supply or 5 V to 44 V single power supply to the screw terminal J1, with VDD, VSS, and GND oriented. See [Table 3-1](#) for jumper and header position functions.
- Jumpers should be placed according to desired functionality. [Figure 2-1](#) displays a generic jumper, with the indicating dot to designate position 1.

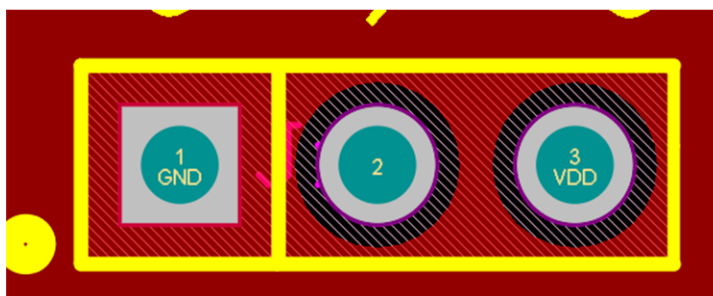


Figure 2-1. Generic Jumper and Header Position 1 Designator

[Table 2-2](#) is the truth table for the TMUX72XXDGKEVM compatible device, TMUX7219, for reference to configure the corresponding control jumpers. Additional signal path jumpers may be configured as shown in [Table 3-1](#).

Table 2-2. TMUX7219 Truth Table

EN J10	SEL J9	Selected Source Connected to Drain (D) Pin
0	X	All sources are off (HI-Z)
1	0	S1
1	1	S2

3 EVM Connectors and Test Points

3.1 Connectors

Table 3-1. Jumper and Header Position Functions

Jumper ID	Header Pos. 1	Header Pos. 2	Header Pos. 3	Board Function	Fitted (Y/N)
J1	VDD	GND	VSS	Power Rails	Y
J2	VSS	GND	N/A	Single Supply Short VSS to GND	Y
J3	VDD	I/O	VSS	Signal Input – can short to either rail	Y
J4	I/O	SMA GND (pos 2/3)	SMA GND (pos 4/5)	SMA Pad	N
J5	VDD	I/O	VSS	Signal Input – can Short to either rail	Y
J6	I/O	SMA GND (pos 2/3)	SMA GND (pos 4/5)	SMA Pad	N
J7	I/O	SMA GND (pos 2/ 3)	SMA GND (pos 4/5)	SMA Pad	N
J8	VDD	I/O	VSS	Signal Input – can Short to either rail	Y
J9	VDD	SEL	GND	Can Short SEL line to VDD or GND	Y
J10	VDD	EN	GND	Can Short EN to VDD or GND	Y

3.2 Test Points

Table 3-2. Test Point Signal Connections

Signal	Test Point ID
VDD	TP1
GND	TP2, TP5, TP7, TP12, TP13, and TP16
VSS	TP3
I/O signal path 1	TP4 and TP6
I/O signal path 2	TP8 and TP11
I/O signal path 3	TP9 and TP10
SEL	TP14 and TP17
EN	TP15 and TP18

4 PCB Layouts

Figure 4-1 and Figure 4-2 show the EVM PCB layout images.

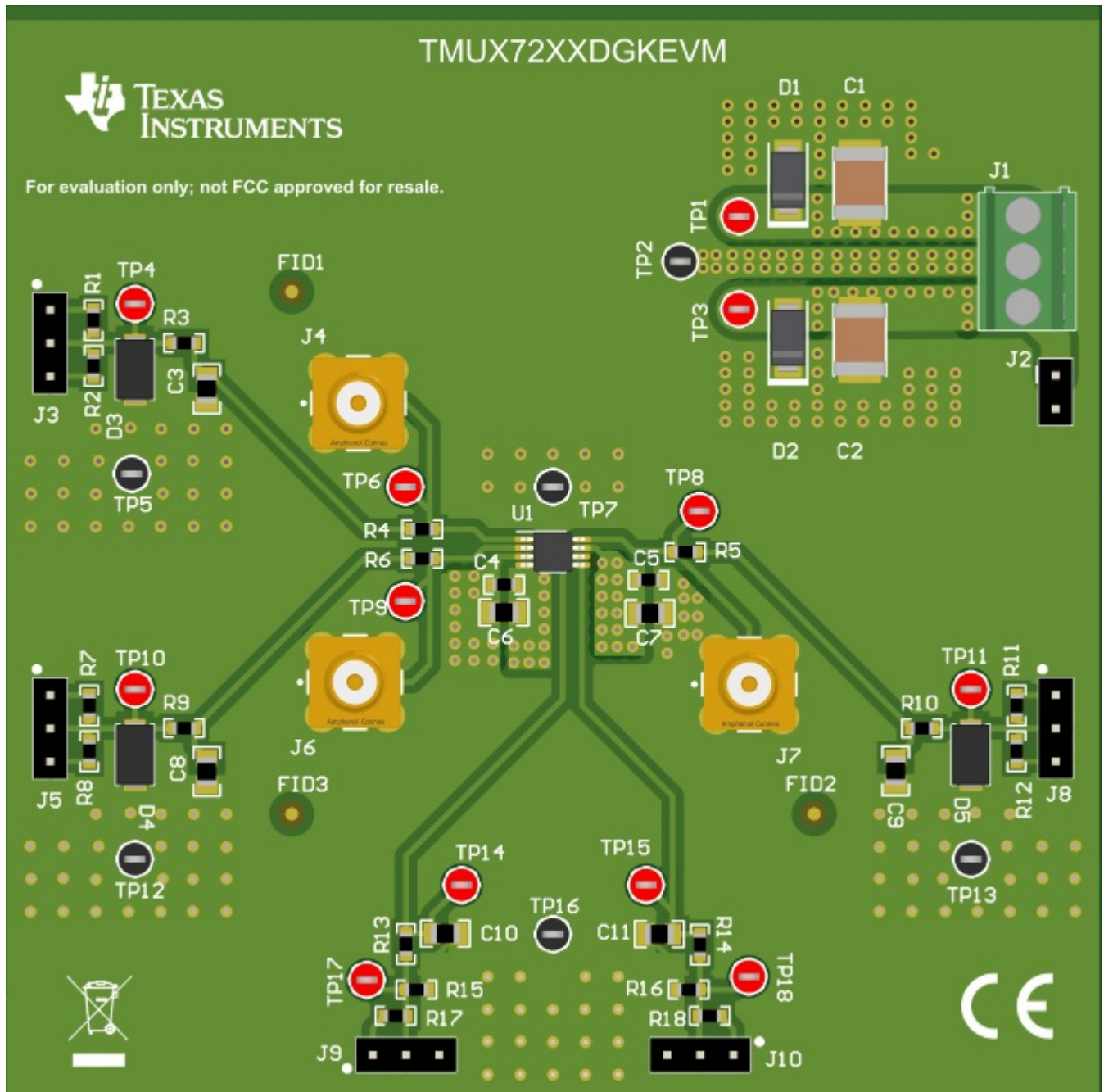


Figure 4-1. Top View Illustration of the TMUX72XXDGKEVM Layout

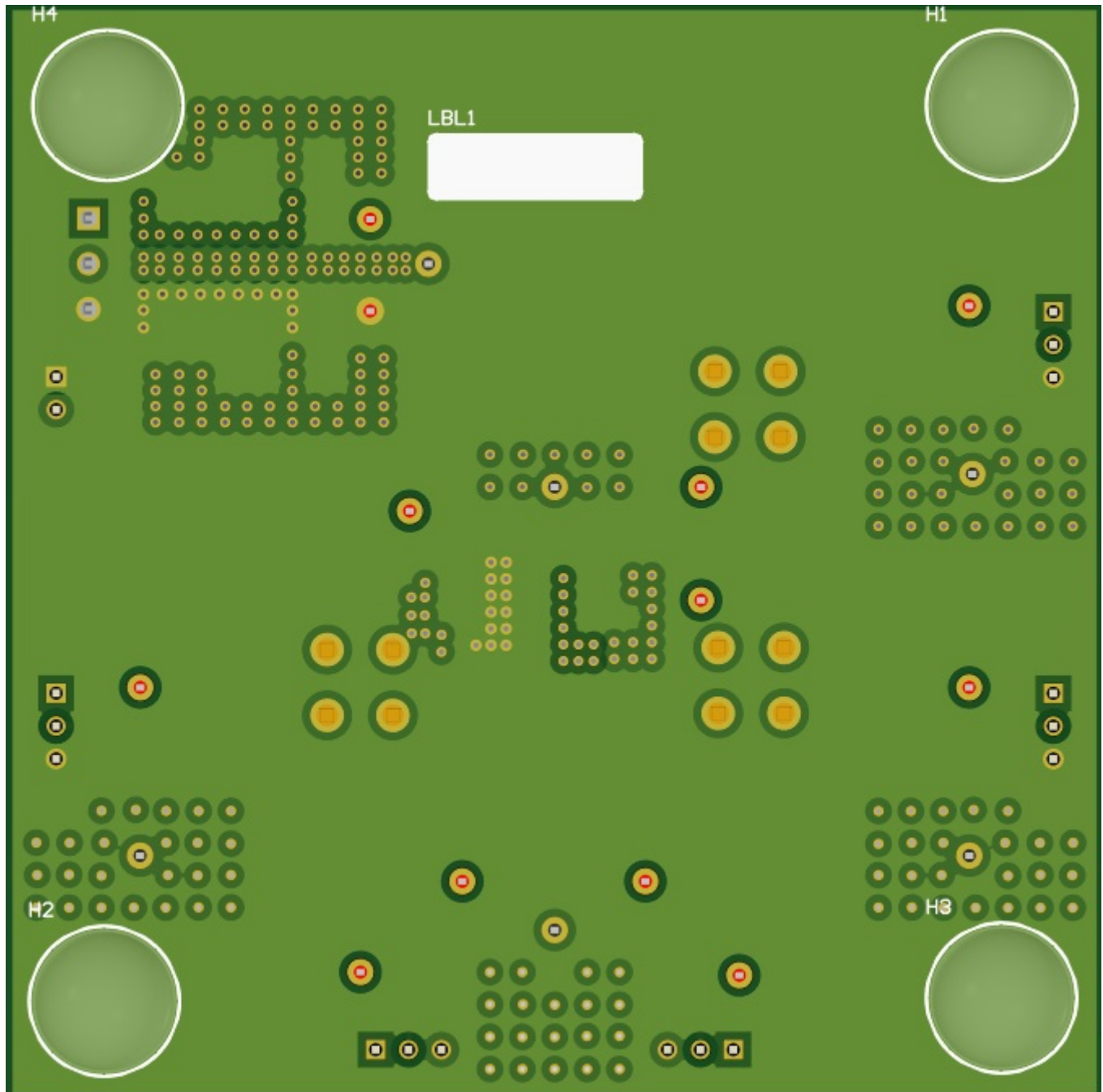


Figure 4-2. Bottom View Illustration of the TMUX72XXDGKEVM Layout

5 Schematics

Schematic View of the TMUX72XXDGKEVM. [Figure 5-1](#) shows the editor view, which includes all the connections and parts that are DNI. [Figure 5-2](#) shows the DNI view after removing the DNI parts which are not included on the out-of-the-box evaluation module.

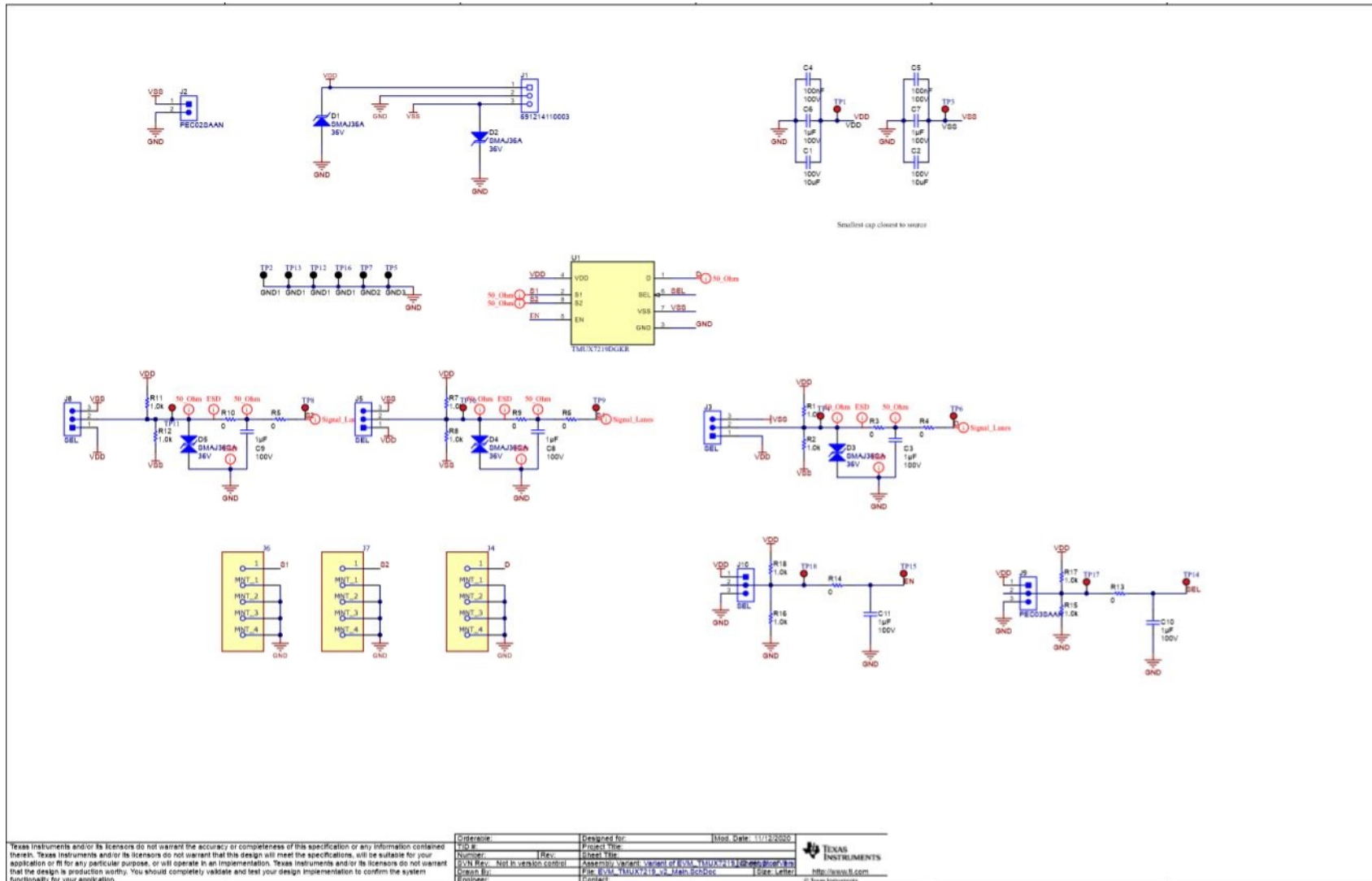


Figure 5-1. Schematic of the TMUX72XXDGKEVM (Editor View)

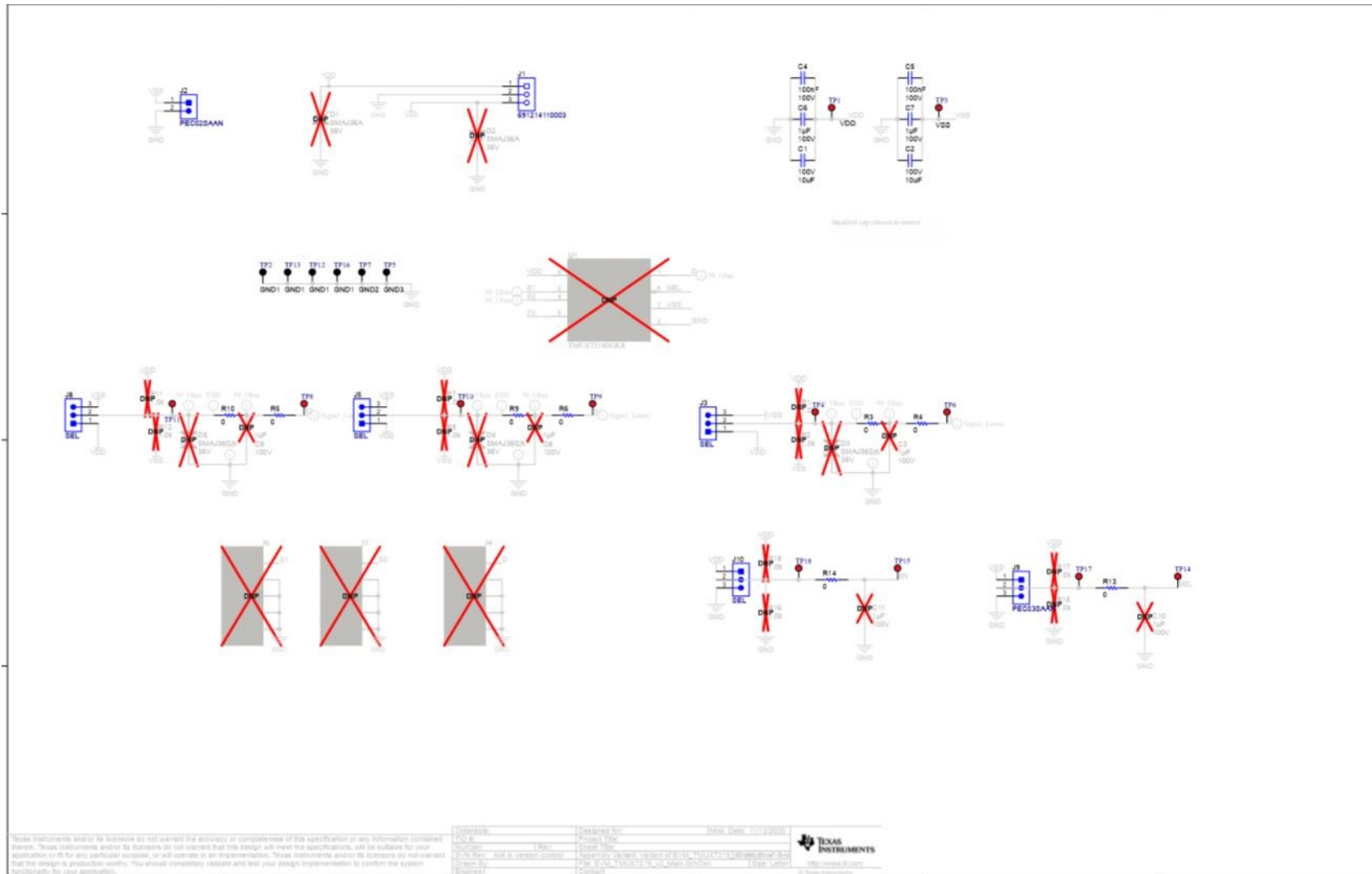


Figure 5-2. Schematic of the TMUX72XXDGKEVM (DNI View)

6 Bill of Materials

Table 6-1 details the EVM bill of materials.

Table 6-1. TMUX72XXDGKEVM Bill of Materials

Designator	Component	Manufacturer	Description	Quantity
C1, C2	CKG45NX7S2A106M500JJ	TDK	CAP, CERM, 10 μ F, 100 V, \pm 20%, X7S, AEC-Q200 Grade 1, 1812	2
C4, C5	C1608X7S2A104K080AB	TDK	CAP, CERM, 0.1 μ F, 100 V, \pm 10%, X7S, 0603	2
C6, C7	C2012X7S2A105K125AB	TDK	CAP, CERM, 1 μ F, 100 V, \pm 10%, X7S, 0805	2
H1, H2, H3, H4	SJ-5303 (CLEAR)	Bumper Specialties, Inc.	Bumpon, Hemisphere, 0.44 X 0.20, Clear	4
J1	691214110003	Würth Electronics	Terminal Block, 3.5 mm, 3x1, Tin, TH	1
J2	PEC02SAAN	Sullins Connector Solutions	Header, 100mil, 2x1, Tin, TH	1
J3, J8, J5, J9, J10	PEC03SAAN	Sullins Connector Solutions	Header, 100mil, 3x1, Tin, TH	5
R3, R4, R5, R6, R9, R10, R13, R14	RMCF0603ZT0R00	Stackpole Electronics Inc	RES, 0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	8
SH-J?	SPC02SYAN	Sullins Connector Solutions	Shunt, 100mil, Flash Gold, Black	7
TP1, TP3, TP4, TP6, TP8, TP9, TP10, TP11, TP14, TP15, TP17, TP18	5000	Keystone	Test Point, Miniature, Red, TH	12
TP2, TP5, TP7, TP12, TP13, TP16	5001	Keystone	Test Point, Miniature, Black, TH	6

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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 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/lstds/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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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:*
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