TPS60150EVM-359, TPS60151EVM-359

This user's guide describes the characteristics, operation, and use of the TPS60150EVM-359 and TPS60151EVM-359 evaluation modules (EVM). These EVMs have either the TPS60150 or TPS60151 ICs and supporting components configured as a charge pump that provides a 5-V output. This document includes EVM specifications, recommended test setup, test results, bill of materials (BOM), and a schematic diagram.

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1 Introduction

The Texas Instruments TPS6015XEVM-359 evaluation module uses either the TPS60150 or TPS60151 IC and supporting components configured as a charge pump that provides a 5-V output. The goal of the EVM is to facilitate evaluation of the TPS60150 or TPS60151 IC.

1.1 Performance Specification Summary

Table 1 provides a summary of the TPS6015XEVM-359 performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1. Typical Performance Specification Summary

	Condition	Voltage Range (V)			Current Range (mA)		
		Min	Typ	Max	Min	Typ	Max
V_{OUT}	2.7 V ≤ V_{IN} < 3.1 V	4.8	5.0	5.2			50
	3.1 V ≤ V_{IN} < 5.5 V						140

1.2 Modifications

To aid user customization of the EVM, the board was designed with devices having 0603 or larger footprints. A real implementation likely occupies less total board space.

Changing components can improve or degrade EVM performance. For example, adding a larger output capacitor reduces output voltage undershoot but lengthens response time after a load transient event.

2 Input/Output Connector Descriptions

J1–VIN This header is a positive connection to the power input supply (V_{IN}).

J2–GND This header is the return connection for the bias (V_{BIAS}) supply.

J3–VOUT This header is the positive connection for the output load on V_{OUT}.

J4–GND This header is the ground return connection for the output load.

JP1– EN When this jumper is installed to ON, the enable pin (EN) is tied to VIN, thereby enabling the device. When this jumper is moved to OFF, EN is pulled to ground thereby disabling the device.

JP2– LED ON When this jumper is installed, VOUT is connected to the 5 paralleled WLEDs, pulling 75mA.

2.1 Test Setup

The absolute maximum voltage allowed on VIN is 5 V. In order to enable the device, move jumper JP1 to ON. When connecting external loads, use short, twisted leads.

2.2 Test Results

Figure 1 shows the test results at T_A = 25°C using this EVM:

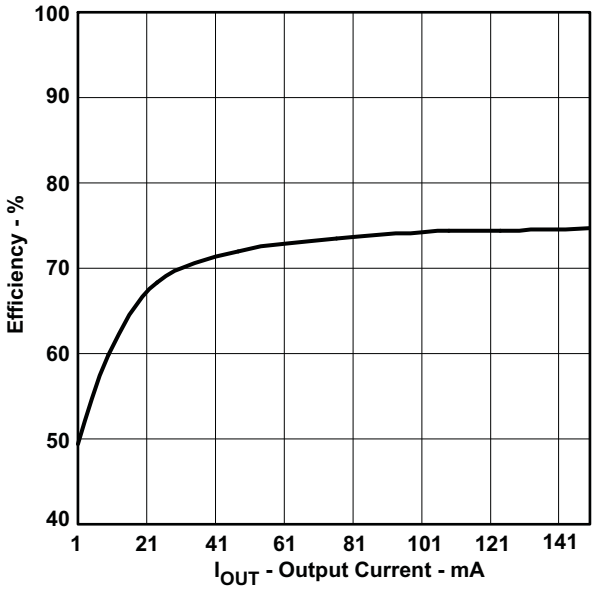

Figure 1. TPS60150 Efficiency with V_{IN} = 3.3 V

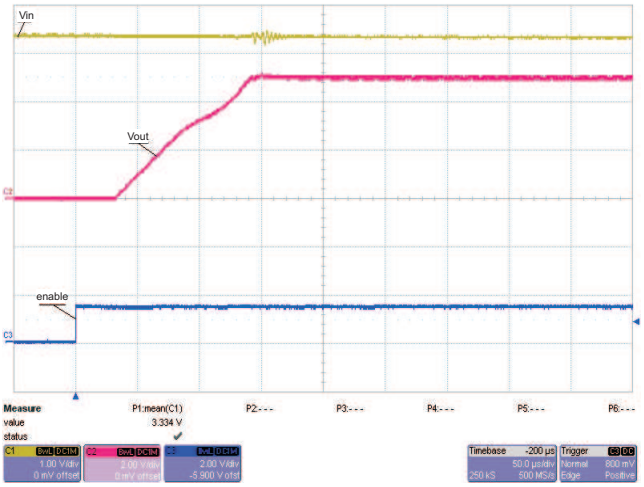

Figure 2. TPS60150 Startup with V_{IN} = 3.3 V and I_{OUT} = 75 mA

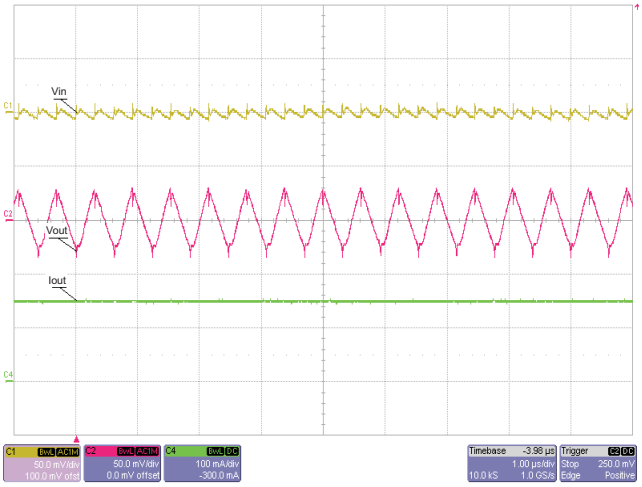

Figure 3. TPS60150 Operation with V_{IN} = 3.3 V and I_{OUT} = 150 mA

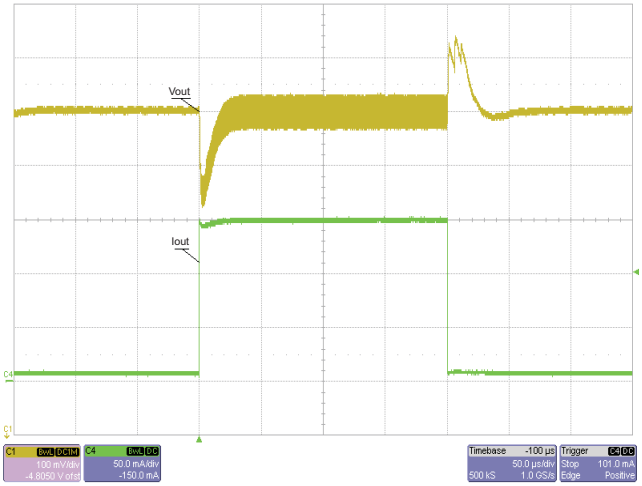

Figure 4. TPS60150 Load Transient with V_{IN} = 3.3 V and I_{OUT} = 15 mA to 150 mA

3 Board Layout

Figure 5, Figure 6, and Figure 7 show the board layout for the HPA359 PWB. See the data sheet (SLVS888) for more specific layout guidelines.

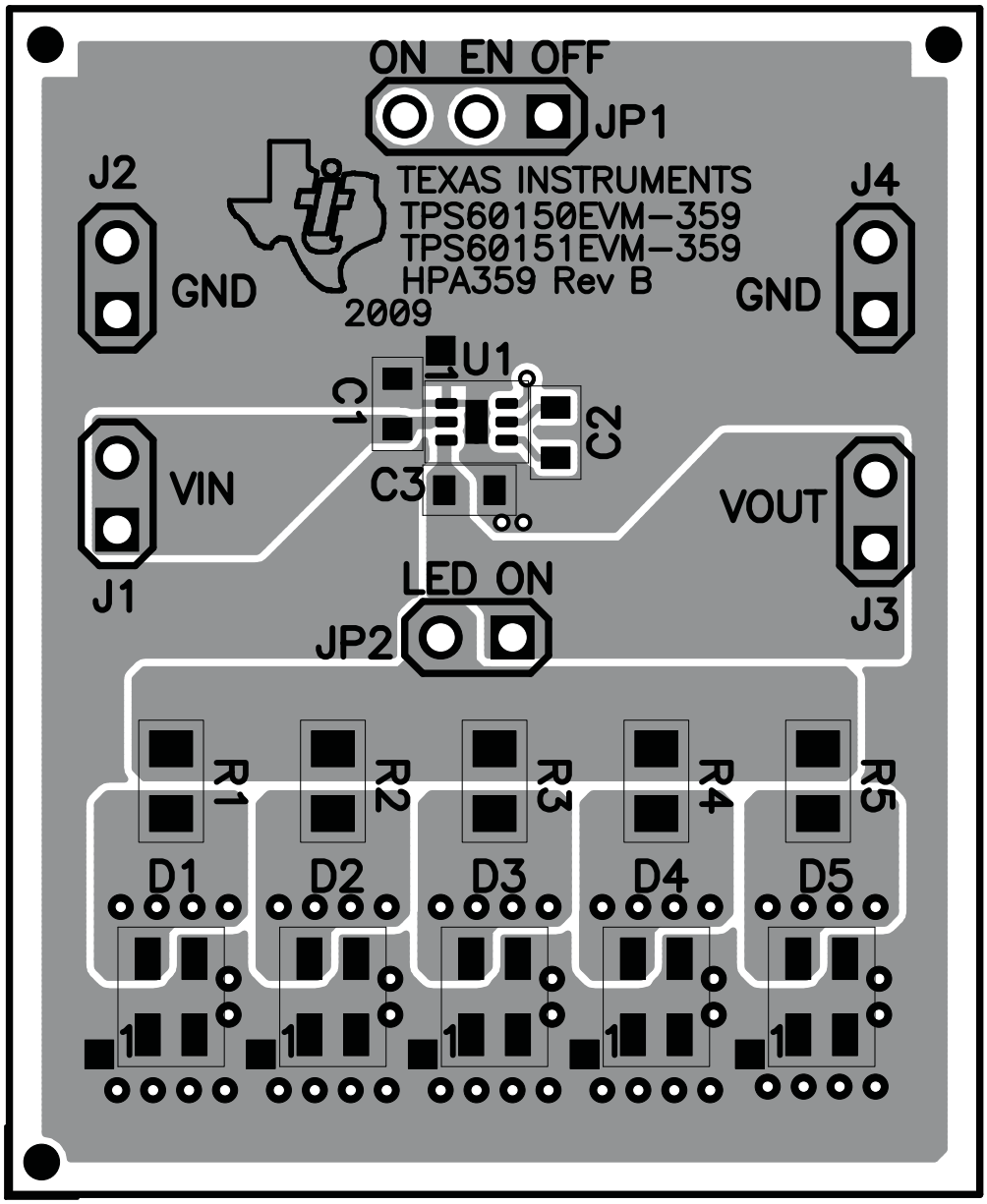

Figure 5. Top Assembly Layer

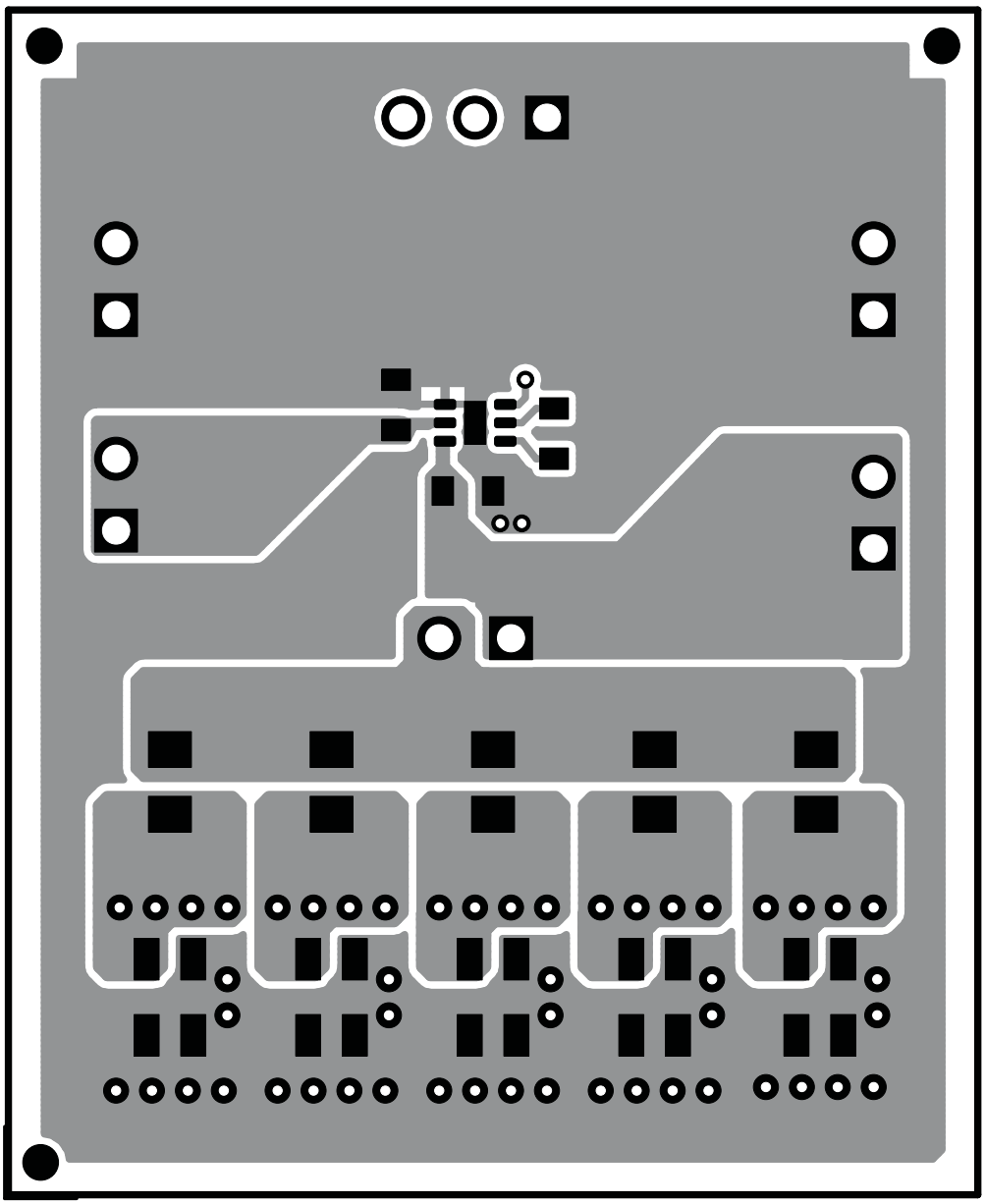

Figure 6. Top Layer

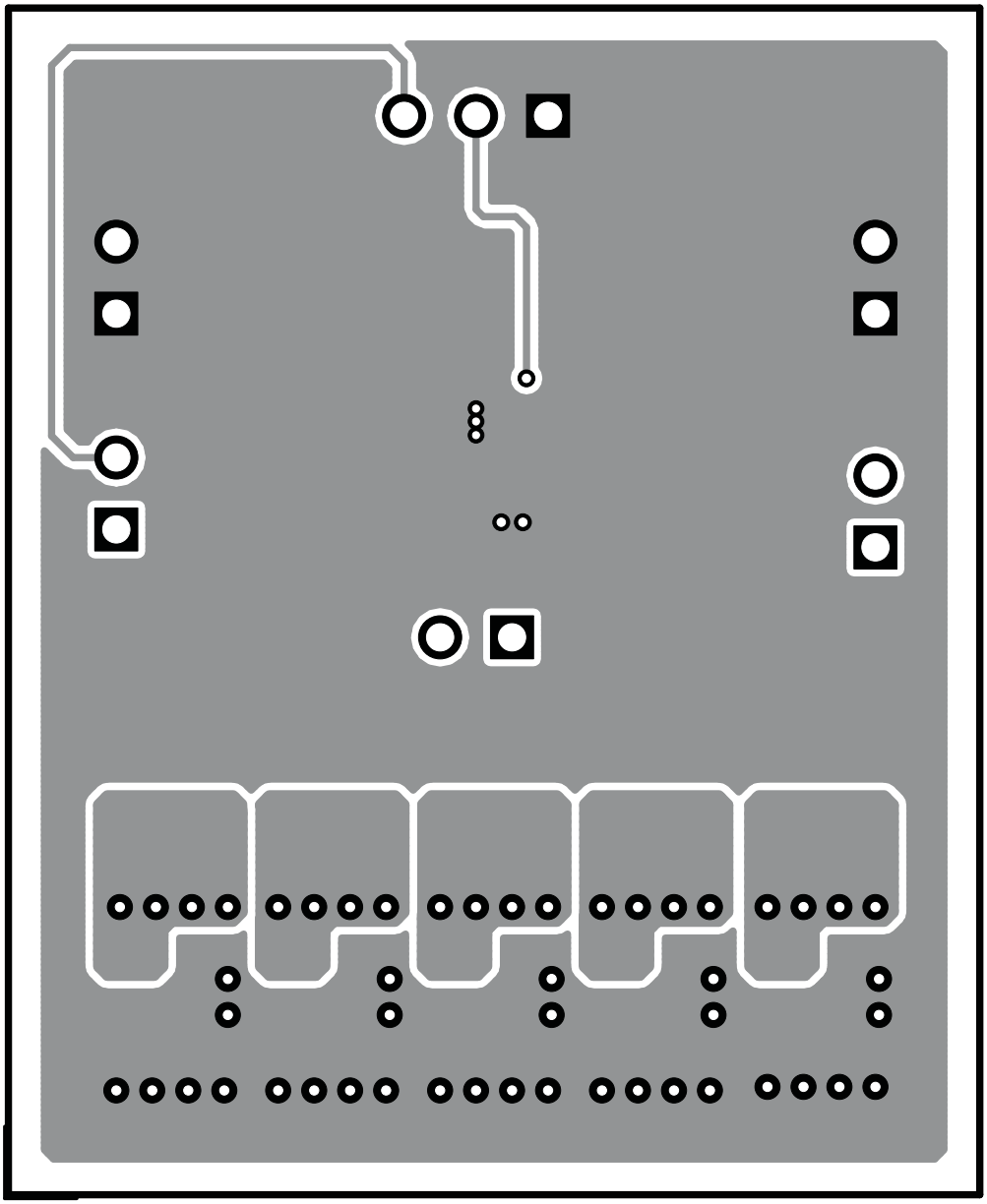

Figure 7. Bottom Layer

4 Bill of Materials and Schematic

4.1 Bill of Materials

Table 2. HPA359B Bill of Materials

Count							
-001	**-002**	**RefDes**	**Value**	**Description**	**Size**	**Part Number**	**MFR**
2	2	C1, C3	2.2µF	Capacitor, Ceramic, 10V, X5R, 10%	0603	STD	STD
1	1	C2	1µF	Capacitor, Ceramic, 10V, X5R, 10%	0603	STD	STD
0	0	D1–D5	LW E67C	Diode, LED, White, 30-mA, Common Anode	P-LCC-4	LW E67C	Osram
4	4	J1–J4	PTC02SAAN	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 inch x 2	PTC02SAAN	Sullins
1	1	JP1	PTC03SAAN	Header, 3-pin, 100mil spacing, (36-pin strip)	0.100 inch x 3	PTC03SAAN	Sullins
0	0	JP2	PTC02SAAN	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 inch x 2	PTC02SAAN	Sullins
0	0	R1–R5	Open	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	0	U1	TPS60150DRV	IC, 150mA Charge Pump	SON	TPS60150DRV	TI
0	1	U1	TPS60151DRV	IC, 150mA Charge Pump	SON	TPS60150DRV	TI
2	2	–		Shunt, 100-mil, Black	0.100	929950-00	3M
1	1			PCB, 1.65" × 1.35" × 0.062"		HPA359	Any

4.2 Schematic Drawing

Figure 8 is the schematic for the TPS60150EVM-359.

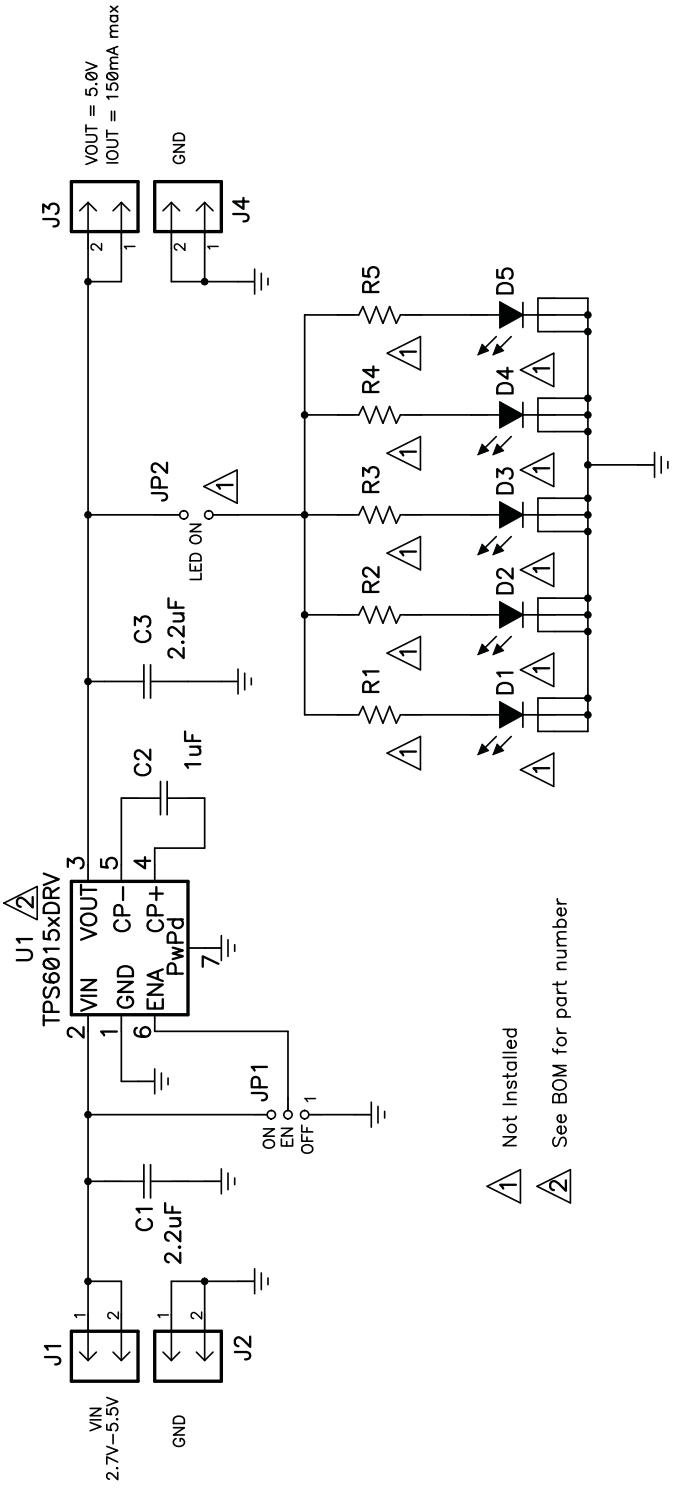

Figure 8. Schematic

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Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 25°C. The EVM is designed to operate properly with certain components above 25°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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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.

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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.

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- *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.

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

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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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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.

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