

TPS22971 Load Switch Evaluation Module

The TPS22971 evaluation module (EVM) allows the user to connect power to and control the 8-pin YZP package load switch. Parameters such as the on-resistance, rise time, and output pull-down resistance can be easily evaluated. [Table 1](#) lists a short description of the TPS22971 load switch performance specifications; for additional details on load switch performance, application notes, and the datasheet see www.ti.com/loadswitch.

Table 1. TPS22971 Rise Time, Output Current Rating, Enable, and Output Discharge Characteristics

EVM	Device	Rise Time Typical	VIN (V)	Maximum Continuous Current	Enable (ON Pin)	Quick Output Discharge
HVL177	TPS22971	Adjustable	3.6	3 A	Active High	Yes

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1 Introduction

1.1 Description

The TPS22971EVM is a two-sided PCB containing the TPS22971 load switch device. The VIN and VOUT connections to the device and the PCB layout routing are capable of handling high continuous currents and provide a low resistance pathway into and out of the device under test. Test point connections allow the EVM User to control the device with user defined test conditions and make accurate R_{ON} measurements.

1.2 Features

- VIN input voltage range: 0.65 V to 3.6 V.
- EVM allows access to the VIN, VOUT, PG, GND, and ON pin of the *TPS22971 Load Switch Devices*.
- On board C_{IN} and C_{OUT} capacitors.
- 3-A maximum continuous current operation.
- Power good (PG) signal can be monitored via test point.

2 Electrical Performance

Refer to the datasheet ([SLVSDK7](#)) for detailed electrical characteristics of the TPS22971.

3 Schematic

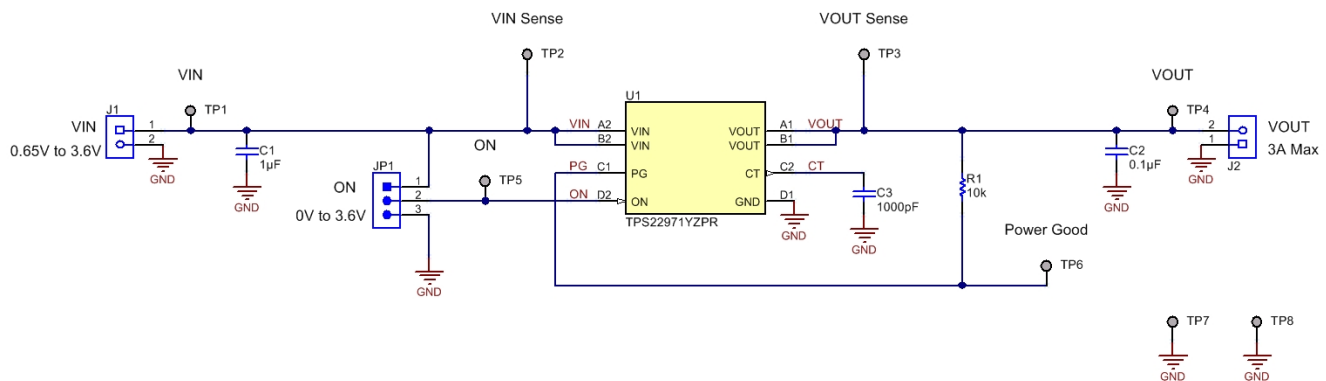


Figure 1. TPS22971EVM Schematic

4 Layout

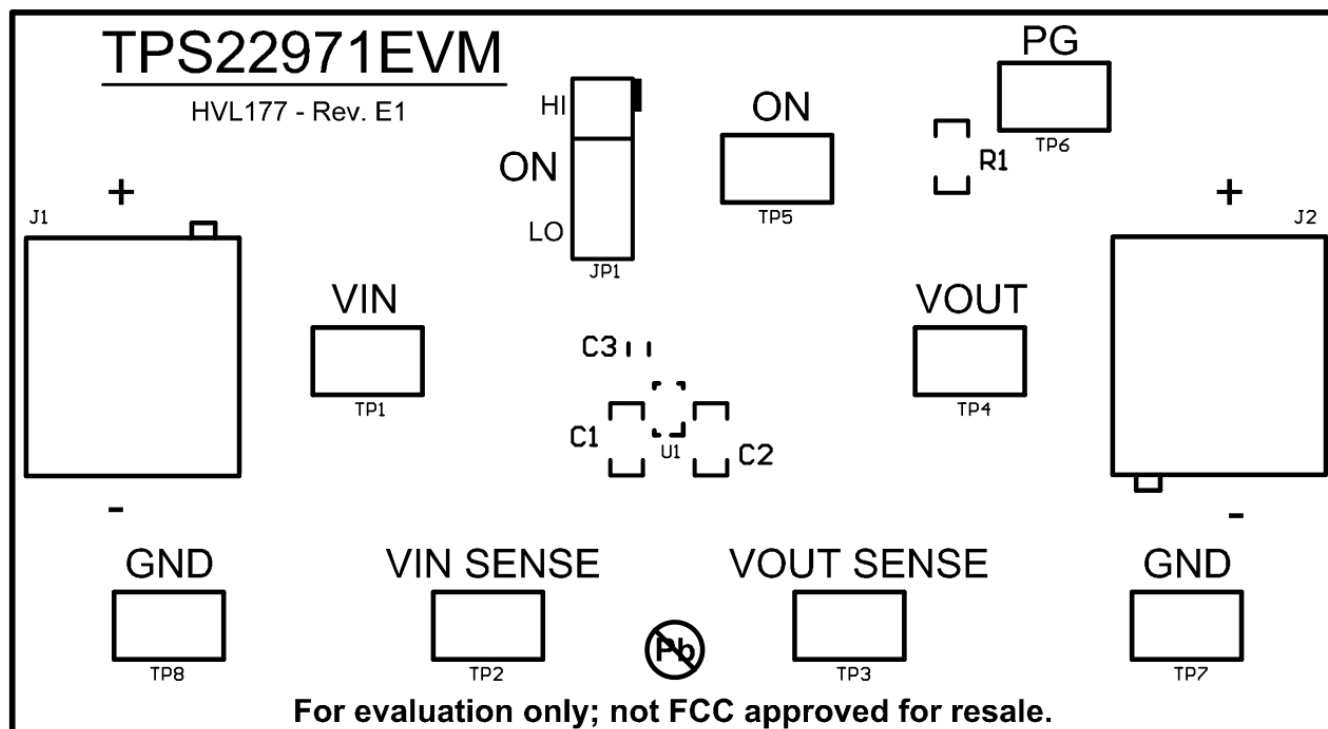


Figure 2. TPS22971EVM Top Assembly

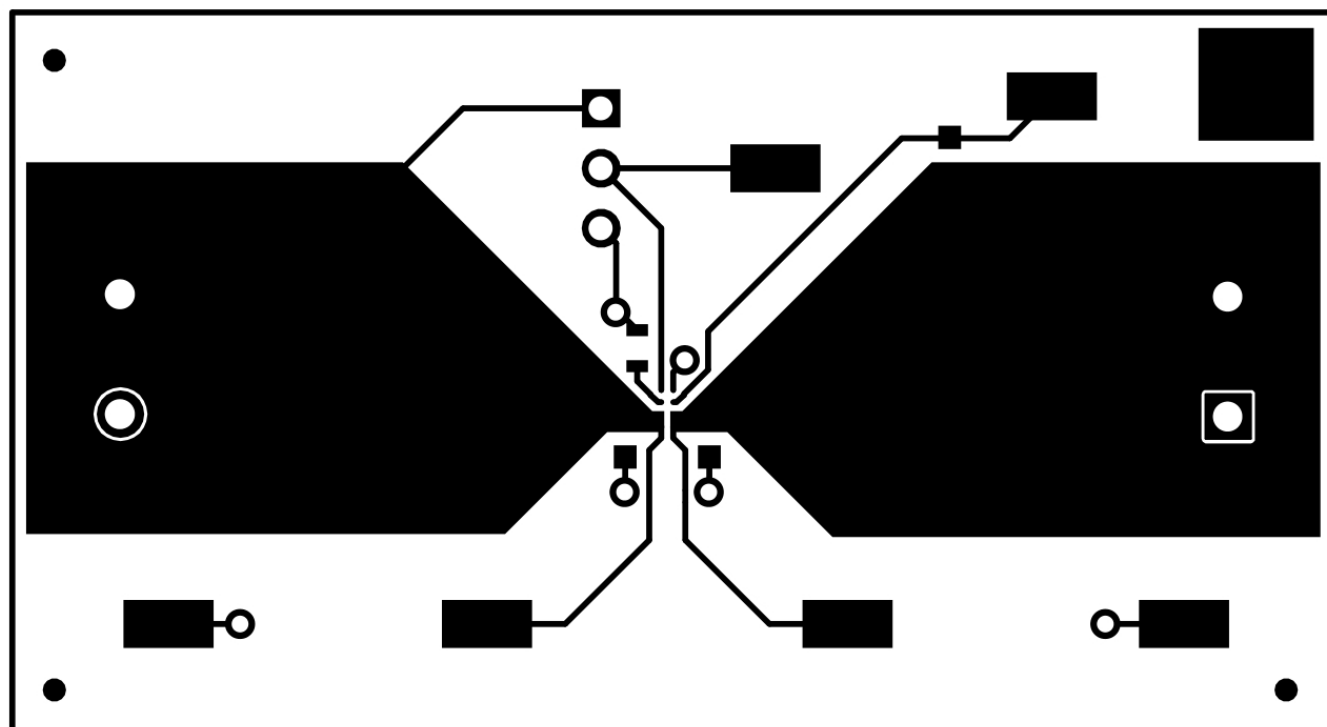


Figure 3. TPS22971EVM Top Layout

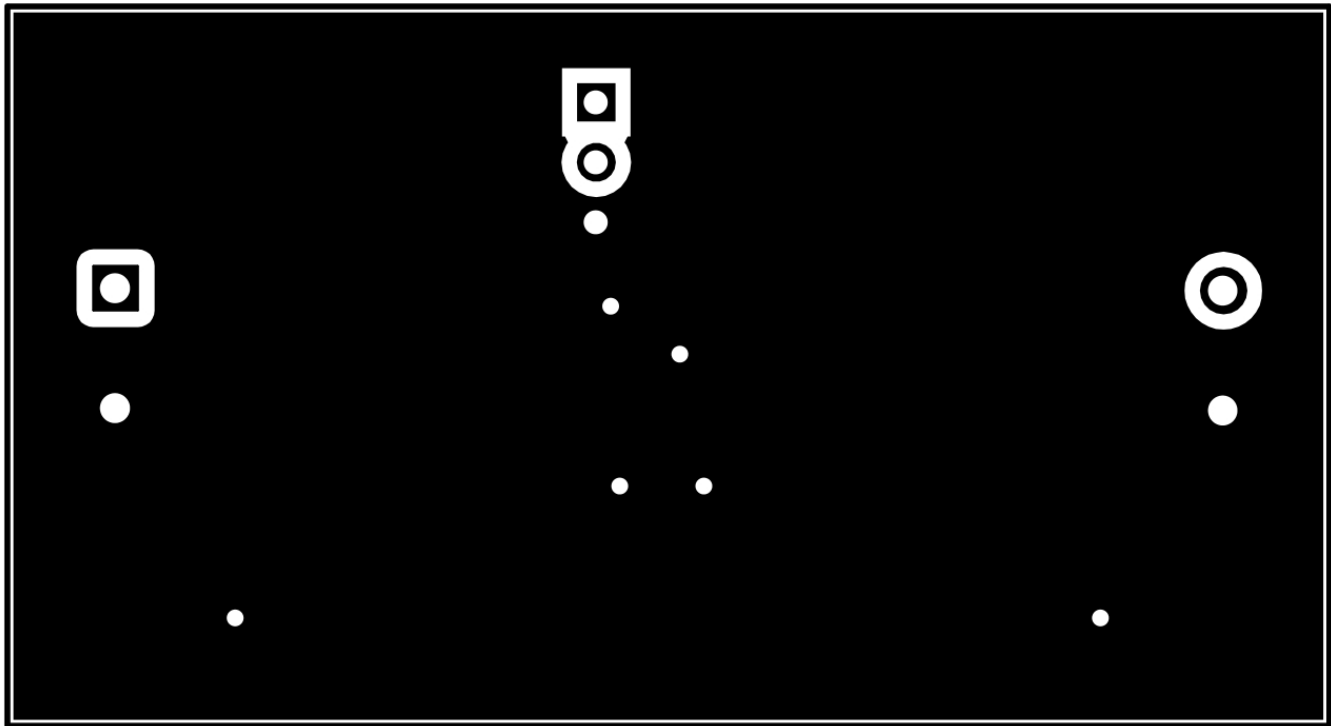


Figure 4. TPS22971EVM Bottom Layout

4.1 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the EVM.

4.1.1 J1/TP1 – Input Connection

This is the connection for the leads from the input source. Connect the positive lead to J1/TP1 and the negative lead to TP7/TP8 (GND).

4.1.2 J2/TP4 – Output Connection

This is the connection for the output of the EVM. Connect the positive lead to J2/TP4 terminals and the negative lead to TP7/TP8 terminals (GND).

4.1.3 JP1/TP5 – ON

This is the enable input for the device. A shorting jumper must be installed on JP1 in either the high or low position. The TPS22971 is active high. ON must not be left floating. An external enable source can be applied to the EVM by removing the shunt and connecting a signal to TP5. Refer to the datasheet ([SLVSDK7](#)) for proper ON and OFF voltage level settings. A switching signal may also be used and connected at this point.

4.1.4 TP2 - VIN Sense, TP3 - VOUT Sense

These two connections are used when very accurate measurements of the input or output are required. R_{ON} measurements must be made using these sense connections when measuring the voltage drop from VIN to VOUT to calculate the resistance.

4.1.5 TP6 - Power Good

This test point is used to monitor the PG pin voltage which is tied to VOUT through a 10-k Ω resistor

4.1.6 TP7/TP8 – GND

These are connections to GND.

5 Operation

Connect the positive input of the VIN power supply to VIN at J1/TP1. Connect the negative lead of the power supply to GND at TP7/TP8. The input voltage range of the TPS22971EVM is 0.65 V to 3.6 V.

External output loads can be applied to the switch by using J2 VOUT and TP7/TP8 GND. The TPS22971EVM is rated for a maximum continuous current of 3 A. Configure JP1 as required. JP1 must be installed for proper operation. When the ON pin is asserted high, the output of the TPS22971 is enabled.

6 Test Configurations

6.1 On-Resistance (R_{ON}) Test Setup

Figure 5 shows a typical setup for measuring on-resistance. The voltage drop across the switch is measured using the sense connections. This value is then divided by the current into the load, yielding the R_{ON} resistance.

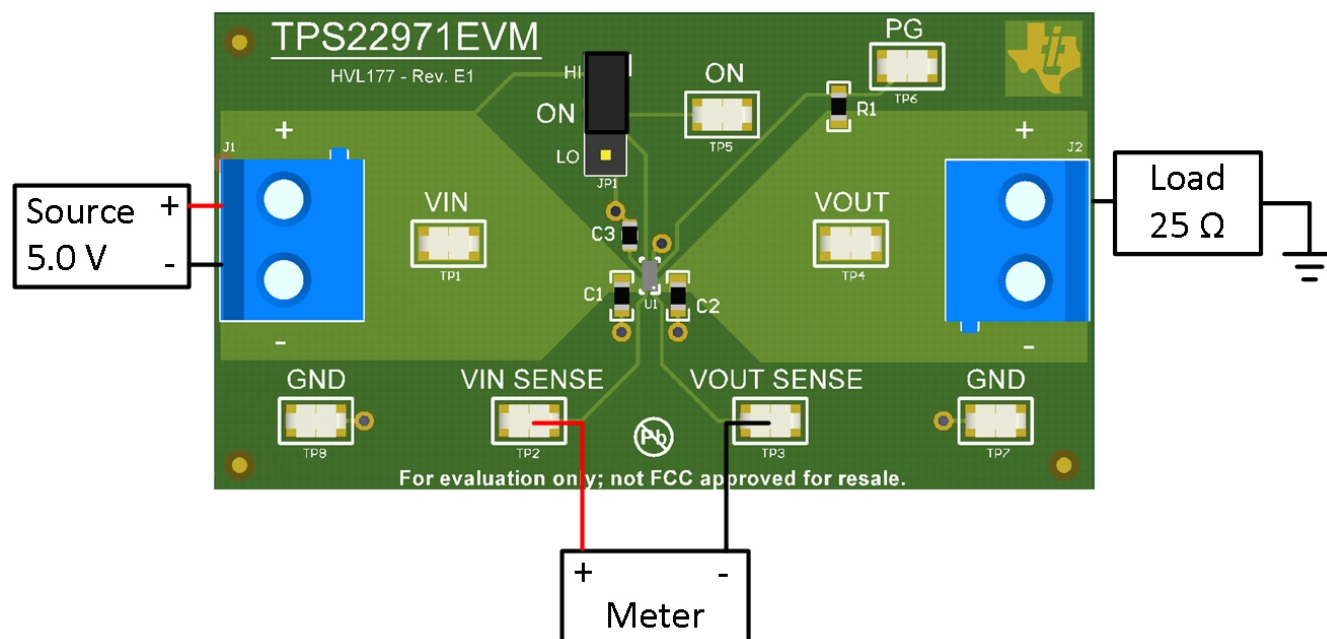


Figure 5. R_{ON} Setup

6.2 Slew Rate Test Setup

Figure 6 shows a test setup for measuring the slew rate of the load switch. Apply a square wave to the ON pin of the switch using a function generator and apply a voltage to the VIN terminal using a power supply. Observe waveform at VOUT with a scope to measure the slew rate and rise time of the switch with a given input voltage.

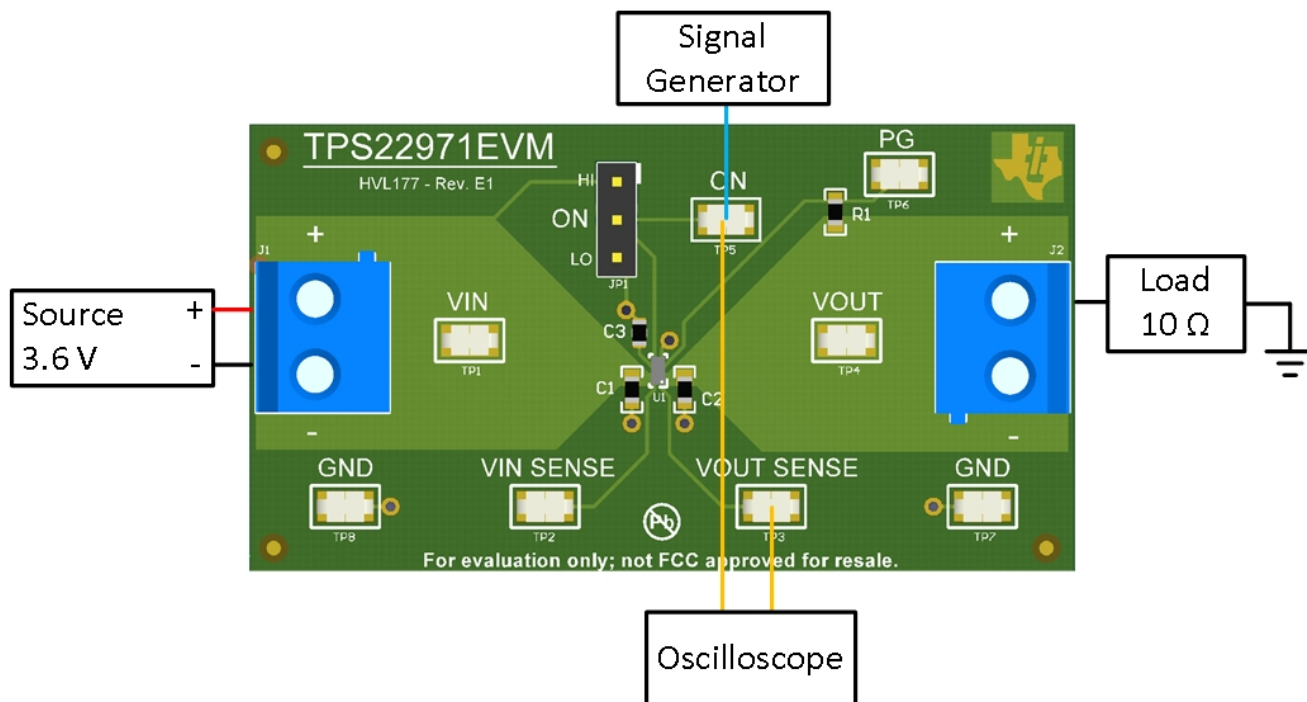


Figure 6. Slew Rate Setup

7 Bill of Materials (BOM)

Table 2. Bill of Materials TPS22971EVM

Qty	Designator	Value	Description	Package Reference	Manufacturer	Part Number
1	!PCB1		Printed Circuit Board		Any	HVL078
1	C1	1 uF	CAP, CERM, 1 uF, 25 V, ±10%, X7R, 0603	0603	MuRata	GRM188R71E105KA12D
1	C2	0.1 uF	CAP, CERM, 0.1 uF, 100 V, ±10%, X7R, 0603	0603	MuRata	GRM188R72A104KA35D
1	C3	CAP, CERM, 1000 pF, 50 V, ±10%, X7R, 0603	0603	Kemet	C0603C102K5RACTU	
4	H9, H10, H11, H12		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	3M	SJ-5303 (CLEAR)
2	J1, J2	PEC02SAAN	Terminal Block, 5.08 mm, 2x1, Brass, TH	2x1 5.08 mm Terminal Block	On-Shore Technology	2x1 5.08 mm Terminal Block
1	JP1		Header, 100mil, 3x1, Gold, TH	Header, 3 PIN, 100mil	Samtec	TSW-103-07-G-S
1	R1	10 kΩ	RES, 10 k, 5%, 0.1 W, 0603	0603	Vishay-Dale	CRCW060310K0JNEA
1	SH-J1	1x2	Shunt, 100 mil, Gold plated, Black	Shunt	3M, alternate: Samtec	969102-0000-DA, alternate: SNT-100-BK-G
8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8		Test Point, Miniature, SMT	Test Point, Miniature, SMT	Keystone	5019
1	U1		Single Channel Ultra-Low Resistnace Load Switch	YZP0008	Texas Instruments	TPS22971YZPR
0	FID1, FID2, FID3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A

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CAUTION

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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.*

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3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

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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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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.

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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.

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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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