TPS22980EVM User's Guide

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The Texas Instruments TPS22980EVM evaluation module (EVM) helps designers evaluate the operation and performance of the TPS22980: 3.3 V to 18 V Mux with overcurrent limit. The TPS22980 is a current-limited power mux providing a connection to a peripheral device from either a low voltage supply (3.15 V up to 3.6 V) or a high voltage supply (5 V up to 18 V). The desired output is selected by digital control signals. The high voltage (VHV) and low voltage (V3P3) switch current limits are set with external resistances. Once the current limit is reached, the TPS22980 will control the switch to maintain the current at this limit.

The EVM contains one TPS22980 - 3.3 V to 18 V Mux with over current limit (See Table 1).

Table 1. Device and Package Configurations

CONVERTER	IC	PACKAGE
U1	TPS22980RGPR	RGP

2 Setup

This section describes the jumpers and connectors on the EVM as well and how to properly connect, set up and use the TPS22980EVM.

2.1 Power Supply Inputs

The table below shows the voltage input that should be applied in different places of the EVM.

Table 2. Input Supply Configuration

DEVICE	V3P3 TP11	VHV TP7	EN (V) TP1	S0 (V) TP4	HV_EN (V) TP5	VHV (V) TP7	VIN (V) TP3
TPS22980	3.15 – 3.60 V	4.50 – 18.00 V	3.3V	0V	0 V	5 V	3.3
TPS22980	3.15 – 3.60 V	4.50 – 18.00 V	3.3V	0V	3.3 V	5 V	3.3

See Table 2 for the EVM correct input supply voltage setting. Connect the V3P3 +3.3 V input power supply positive lead to TP11 VIN and the return lead to TP2 GND. Connect the VHV +5 V input power supply positive lead to TP7 and the return lead to TP15 GND.

2.2 Jumper Settings

There are two external resistances settings per mode that can be configured by setting a jumper in the correct position.

- For V3P3 mode, set J1 (30.9 kΩ) or J2 (400 kΩ):
  - 30.9 kΩ will limit the current to around 1.25 A on the output.
  - 400 kΩ will limit the current to around 10 0mA on the output.
- For VHV, S3 mode, set J3 (400 kΩ) or J4 (25.3 kΩ):
  - 400 kΩ will limit the current to around 100 mA on the output.
  - 25.3 kΩ will limit the current to around 1.5 A on the output.
- For VHV, S0 mode (S0 = 1), set J5 (8 0kΩ) or J6 (400 kΩ):
  - 80 kΩ will limit the current to around 500 mA on the output.
  - 400 kΩ will limit the current to around 100 mA on the output.

2.3 Measuring Output Voltage

Use a meter to measure the output voltage of the UUT. Connect the positive input of the voltmeter to TP8 OUT and the negative input of the meter to TP16 GND. If HV_EN is set to 0V, the user will measure the V3P3 input voltage at the output. If HV_EN is set to 3.3 V, the user will measure the VHV input voltage at the output.

2.4 Current Limit

To simulate a current limit condition, a high power resistor could be used in the output (between TP8 and TP16). This will cause TPS22980 to limit the current based on the external resistor settings.

3 Board Layout

Figure 5, Figure 6 and Figure 7 show the board layout for the TPS22980EVM PCB. The EVM offers resistors, and jumpers to program different current limits.

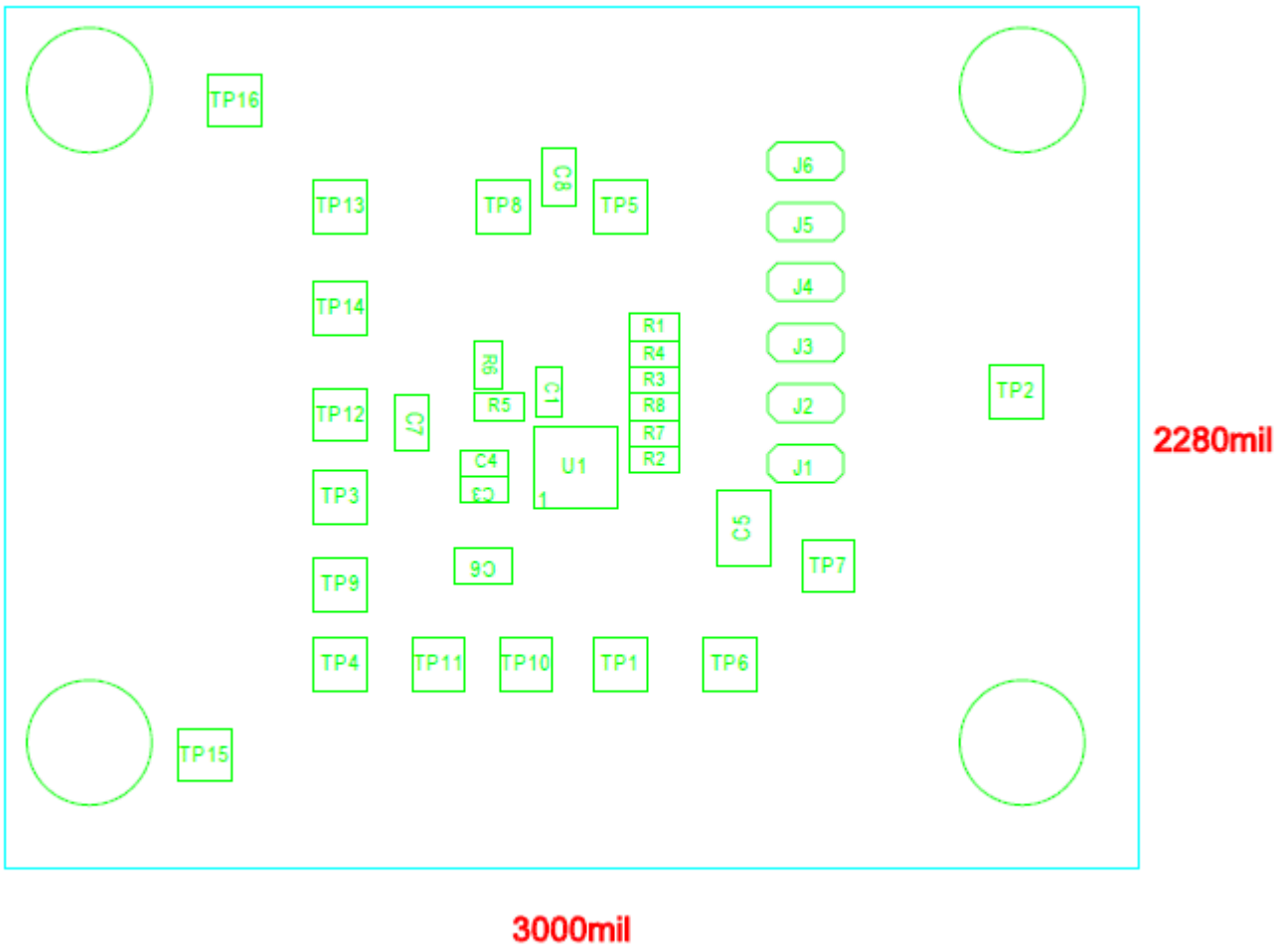

Figure 1. Top Layer Assembly

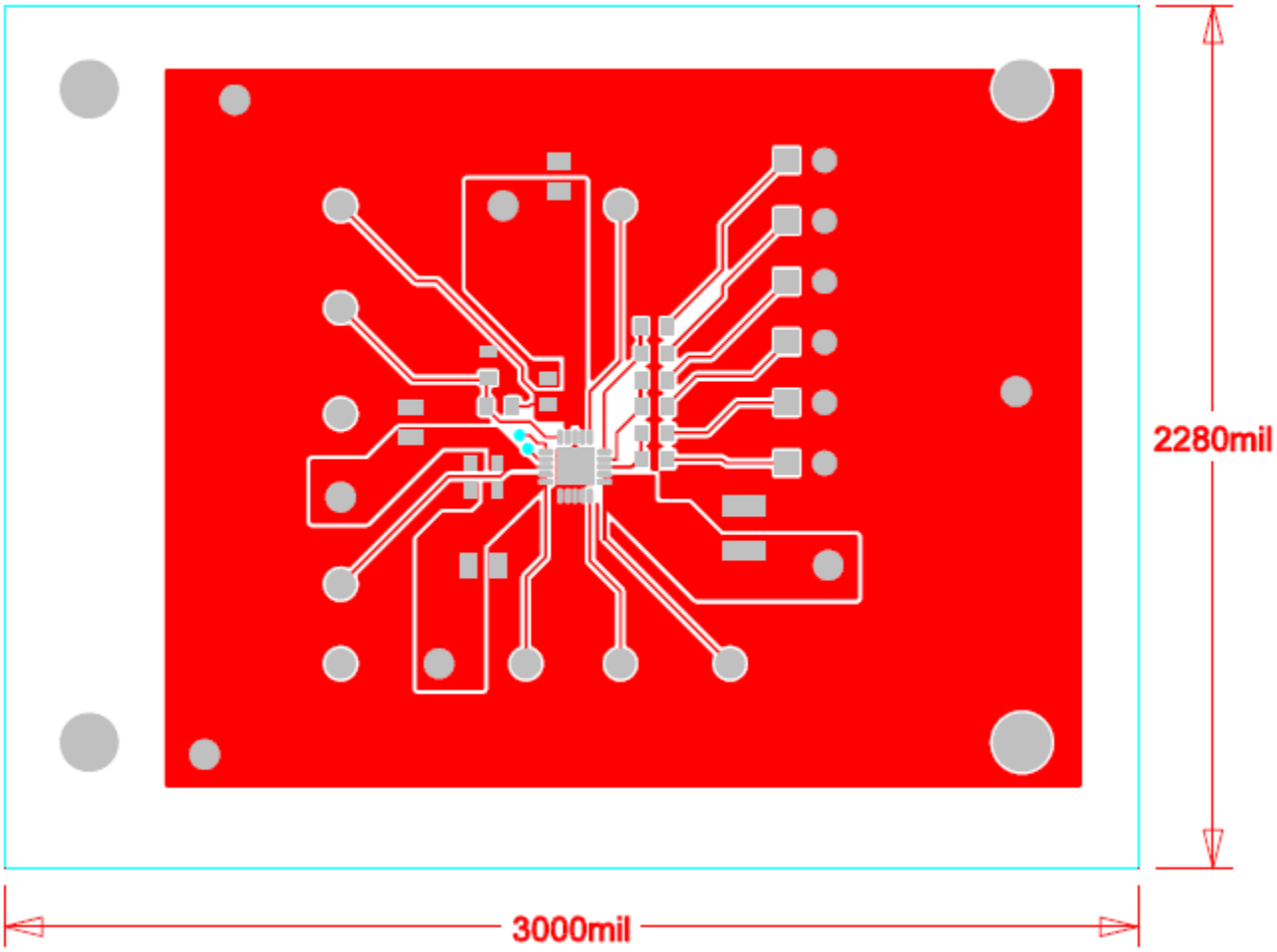

Figure 2. Top Layer Routing

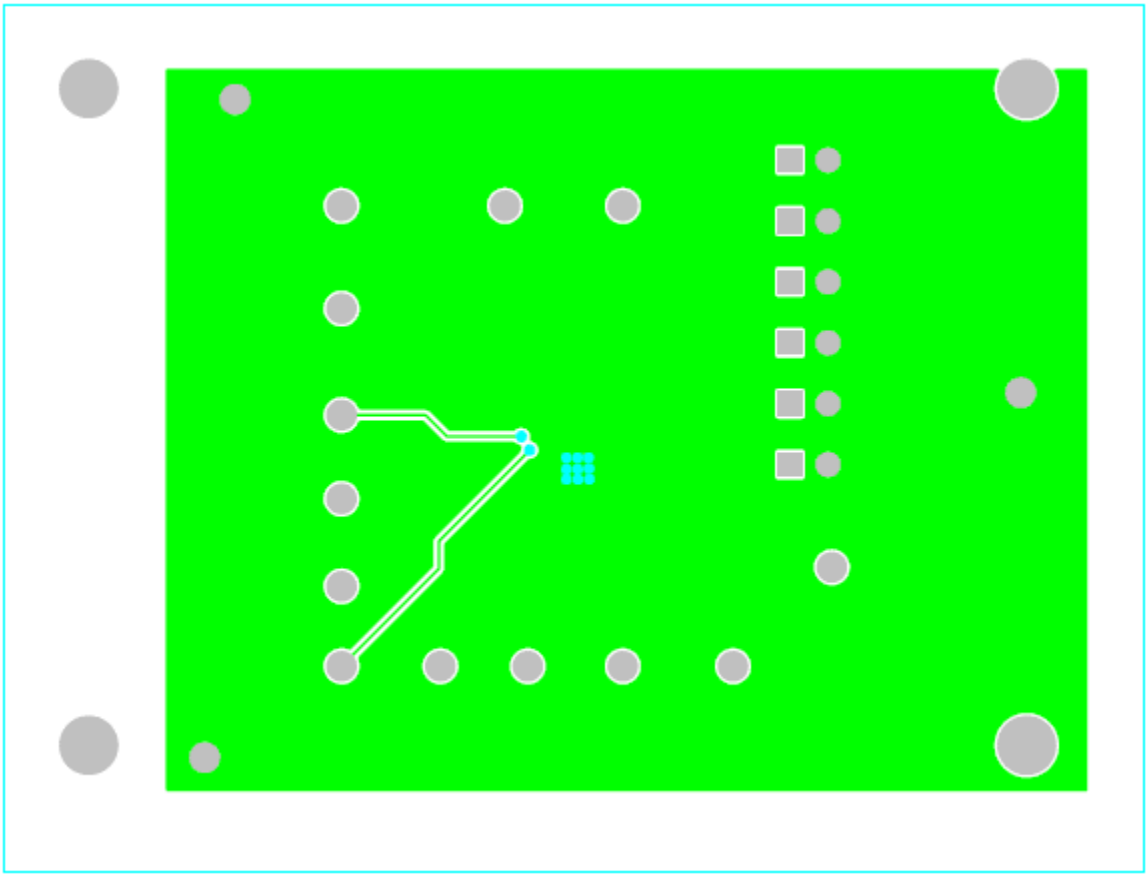

Figure 3. Bottom Layer Routing

4 Schematic

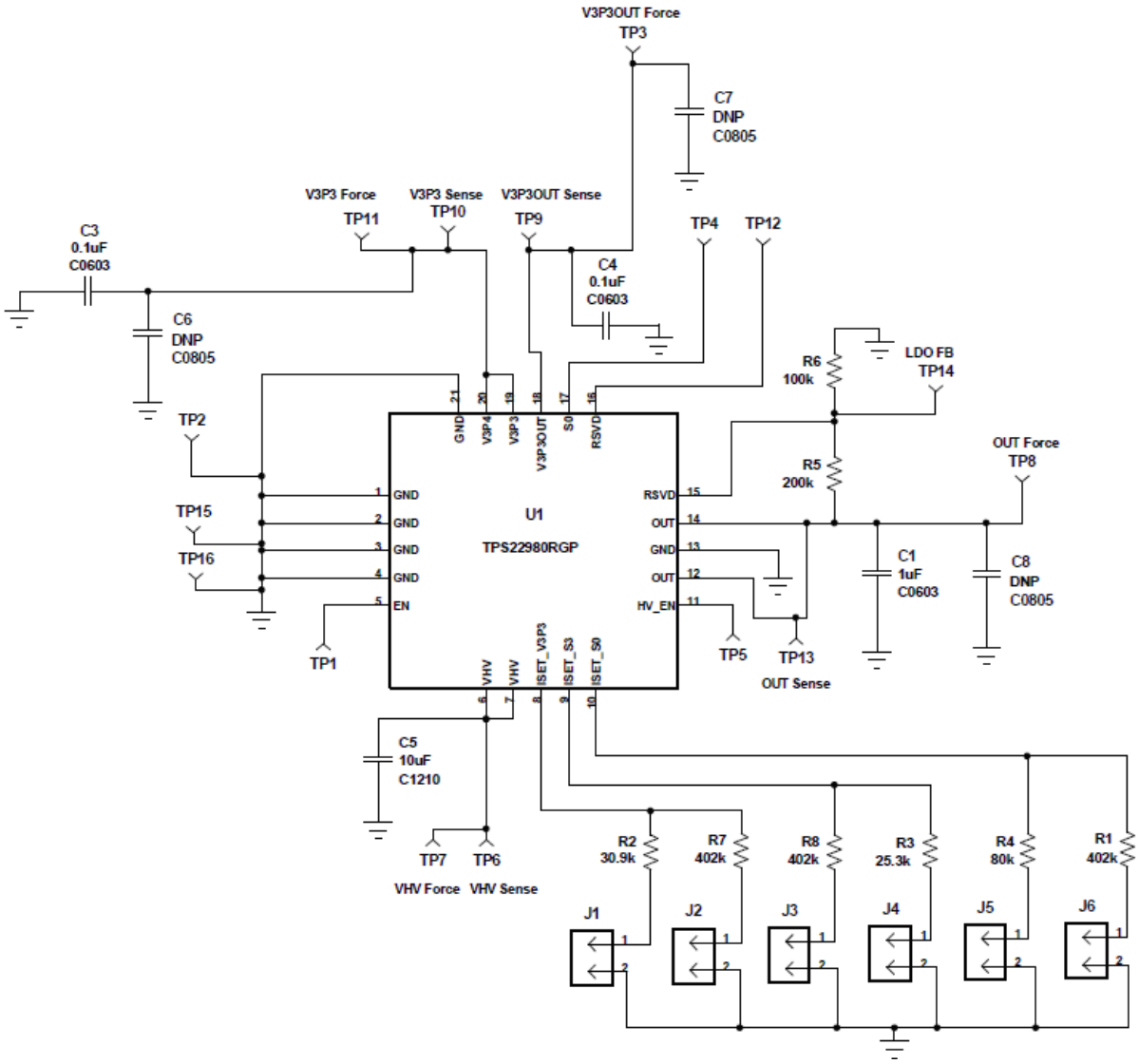

Figure 4. TPS22980EVM Schematic

Table 3. TPS22980EVM Bill of Materials

COUNT	RefDes	Value	Description	SIZE	Part Number	MFR
1	C1	1uF	Capacitor, Ceramic,50V, X5R,10%	603	Std	Std
2	C3, C4	0.1uF	Capacitor, Ceramic, 50V, X7R,10%	603	Std	Std
1	C5	10uF	Capacitor, Ceramic, 50V, X5R, 10%	1210	UMK325BJ106KM-T	Taiyo Yuden
0	C6-C8	OPEN	Capacitor, Ceramic,	805		
6	J1-J6		Header,2pin, 100mil spacing	0.100 inch x 2	PEC02SAAN	Sullins
2	R2	30.9K	Resistor, Chip,1/10W, 1%	603	Std	Std
1	R3	25.5K	Resistor, Chip,1/10W, 1%	603	Std	Std
1	R4	80.6K	Resistor, Chip,1/10W, 1%	603	Std	Std
1	R6	100K	Resistor, Chip,1/10W, 1%	603	Std	Std
2	R5	200K	Resistor, Chip,1/10W, 1%	603	Std	Std
3	R1,R7,R8	402K	Resistor, Chip,1/10W, 1%	603	Std	Std
13	TP1,TP3-TP14	RED	Test Point, 5000	.1mil	5000	Keystone
3	TP2,TP15, TP16	BLACK	Test Point, 5001	.1mil	5001	Keystone
3			Shunt Black	100 mil	929950-00	3M
1	U1		IC, Low Ron Load Switch	RGP-20PIN	TPS22980RGPR	TI
1			PCB	3IN X 2.28IN	HVL012	Any

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It is important to operate this EVM within the input voltage range of -3 V to 48 V and the output voltage range of 0.9 V to 18 V .

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 85°C. The EVM is designed to operate properly with certain components above 60°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.

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User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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

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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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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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Concerning EVMs including radio transmitters

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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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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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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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.

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