

TPS3421EGEVM-156 Evaluation Module

This user's guide describes the operational use of the TPS3421EGEVM-156 evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the TPS3421EGEVM, a dual-channel, push-button reset timer. Included in this user's guide are setup instructions, a schematic diagram, PCB layout drawings, and a bill of materials for the evaluation module. This user's guide also discusses how to modify the EVM board to evaluate the TPS3420 and TPS3422.

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1 Introduction

TI's TPS3421EGEVM-156 EVM helps design engineers evaluate the operation and performance of a dual-channel, push-button reset timer for possible use in their own circuit application. This EVM contains a precise, space-conscious micro-power solution for system resetting in a very small μ SON (1.45 mm x 1 mm) package. This document describes the configuration and set up of the EVM board.

2 Setup

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

2.1 Input/Output Connector Descriptions

2.1.1 J1 – VCC

This connector is the input power supply connection.

2.1.2 J2 – GND

Return connector for the input power supply. This connector is also connected to J4 in the EVM.

2.1.3 J3 – $\overline{\text{RST}}$

This connector is the open-drain output that pulls up to VPU through a 50-k Ω resistor in the EVM.

2.1.4 J4 – GND

Return connector for $\overline{\text{RST}}$. This connector is also connected to J2 in the EVM.

2.2 Jumpers/Switches

2.2.1 JP1 – TS

Place a shorting jumper between Pin 2 and Pin 3 (TS GND). In normal operation, this pin should be connected to GND and should not be changed. Switching between time delays should only be done during power off. Connecting TS to VCC is only for factory evaluation and not for normal operation. [Table 1](#) shows the connection for choosing between the two.

Table 1. Connector JP1 Time-Delay Selections

Short Pins	TS	Time Delay TS (s)
1 and 2	VCC	0
2 and 3	GND	7.5

2.2.2 JP2 – VPU

This EVM is designed for $\overline{\text{RST}}$ to pull up to either VCC or an external voltage source. [Table 2](#) shows the connections for choosing between the two. If the shorting jumper is removed, an external voltage can be placed on Pin 1.

Table 2. Connector JP2 Pull-Up Voltage Selections

Short Pins	Pull-Up Voltage VPU
1 and 2	VCC
Open	External Voltage

2.2.3 JP3 – PB2

This EVM is designed to evaluate performance for a single or dual push-button performance. [Table 3](#) shows the connections for choosing between the two.

Table 3. Connector JP3 Push-Button Performance

Short Pins	PB2	Push-Button Performance
1 and 2	GND	Single Button
2 and 3	S2	Dual Button

2.2.4 SW1 – Push-Button Switch 1

This is the push-button input. PB1 and PB2 must be asserted for $> T_{\text{timer}}$ time to initiate the reset output.

2.2.5 SW2 – Push-Button Switch 2

This is the push-button input. PB1 and PB2 must be asserted for $> T_{\text{timer}}$ time to initiate the reset output.

2.3 Equipment Setup

- Set a power supply voltage between 1.6 V–6.5 V. Turn the power supply off. Connect the positive voltage lead from the power supply to J1 (VCC). Connect the ground lead from the power supply to J2 (GND).
- Select the output delay time, T_{timer} , by placing a shorting jumper between TS and GND on JP1.
- Select the desired pull-up voltage by placing a shorting jumper or applying an external voltage on JP2 (VPU).
- Place a voltmeter across J5 ($\overline{\text{RST}}$) and J6 (GND).
- Turn on the power supply and assert PB1 and PB2 as needed to evaluate the TPS3421.

3 Operation

This section provides information about the operation of the EVM.

3.1 General Operation

The TPS3421 device is a low-current, ultra-small, push-button reset timer IC with long timing set up delay preventing unintended reset from short push-button closures or key presses.

This section provides typical performance waveforms for the EVM. Actual performance data can be affected by measurement techniques and environmental variables; therefore, these curves are presented for reference and may differ from actual results obtained by some users.

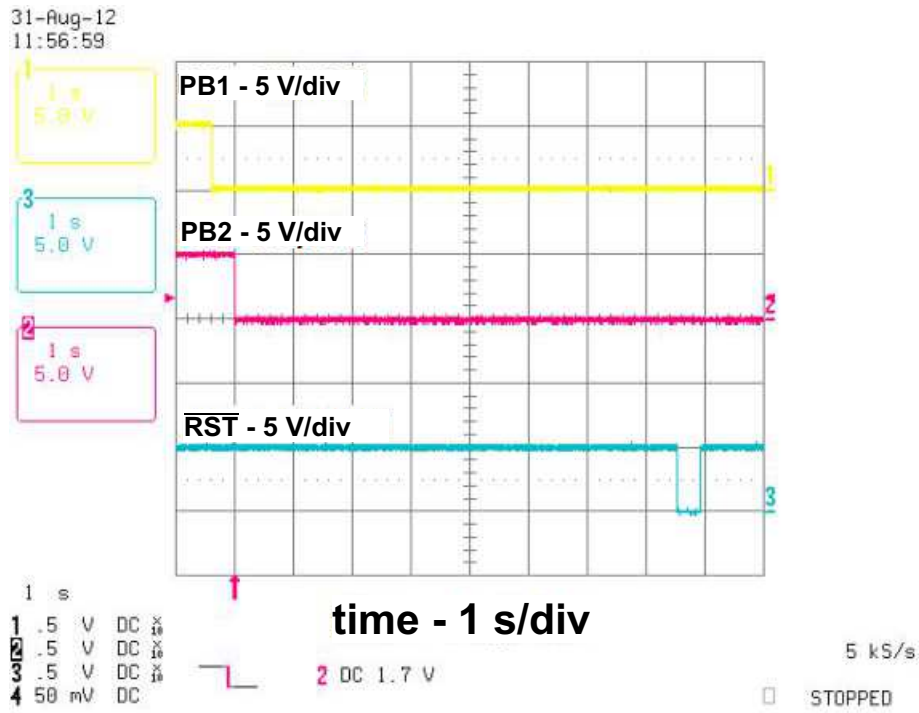


Figure 1. TPS3421EG $\overline{\text{RST}}$ function for TS = GND

4 Board Layout

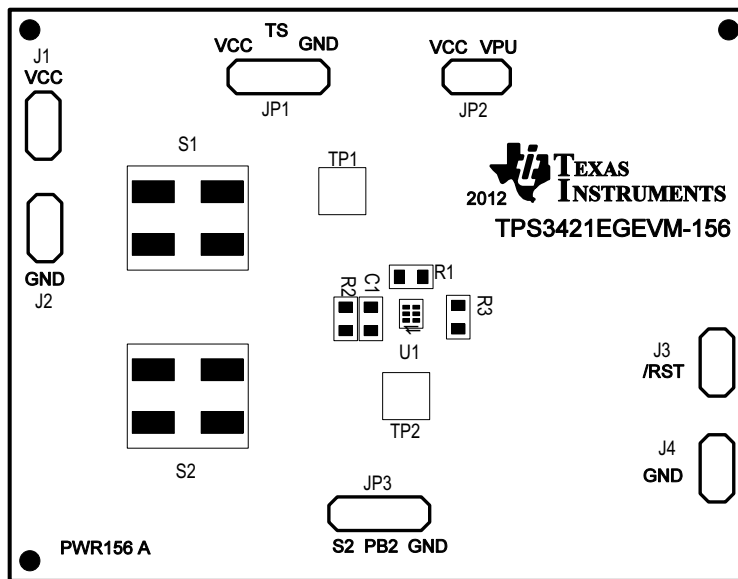


Figure 2. Assembly Layer

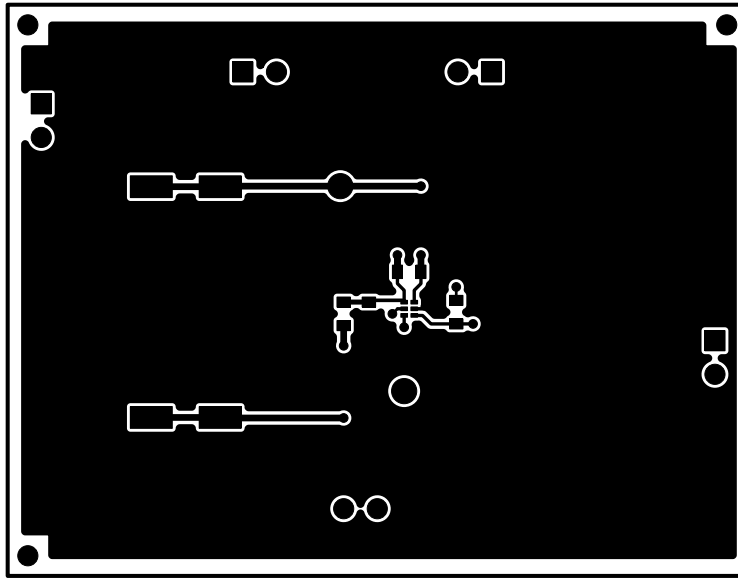


Figure 3. Top Layer Routing

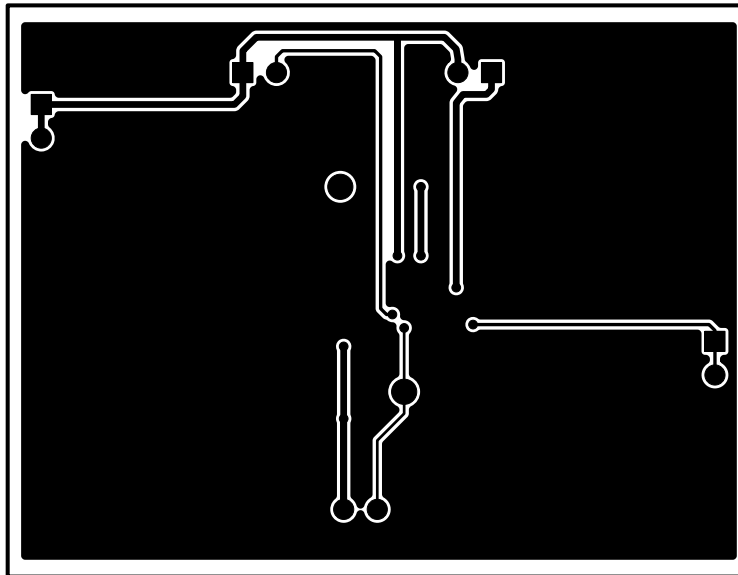


Figure 4. Bottom Layer Routing

5 Schematic

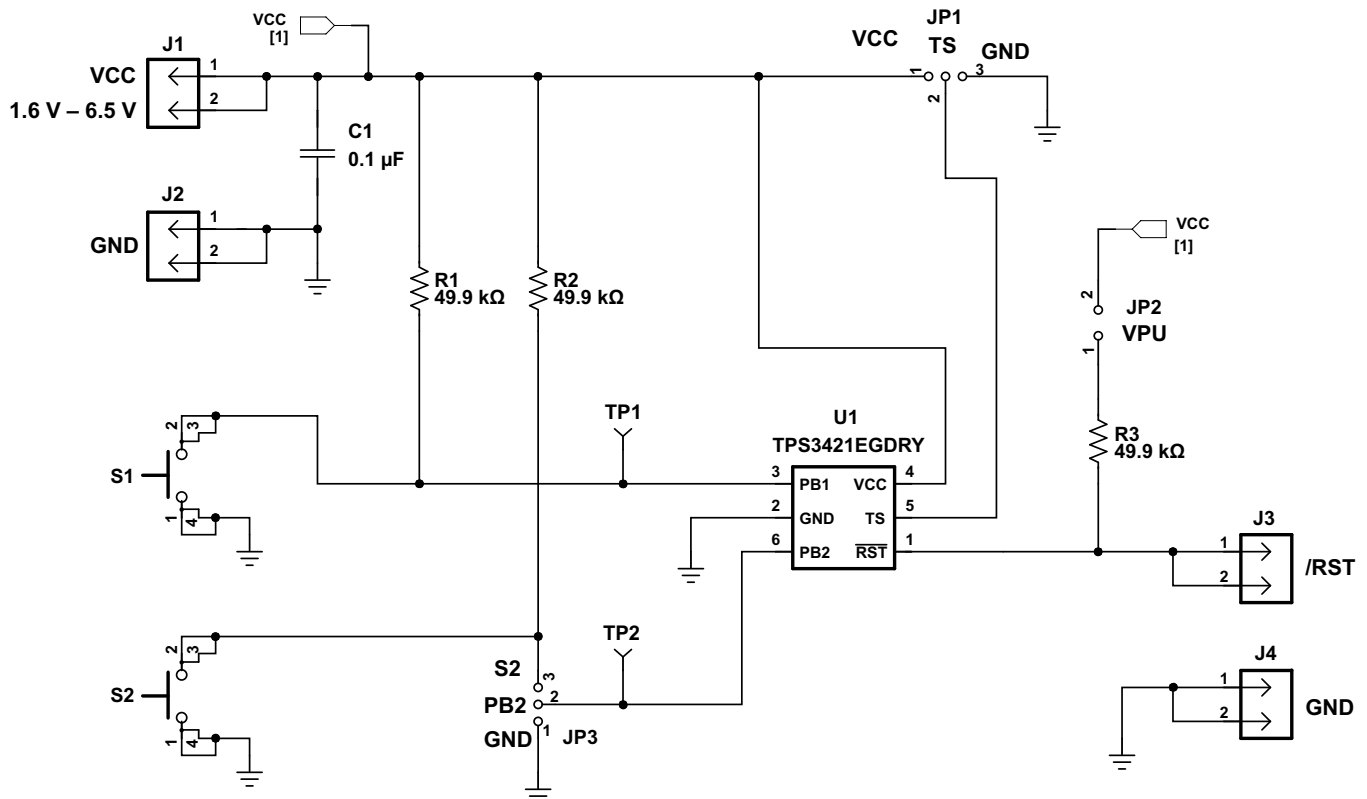


Figure 5. TPS3421EGEVM-156 Schematic

6 Bill of Material

Table 4. TPS3421EGEVM-156 Bill of Material

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	0.1 µF	Capacitor, ceramic chip, 16 V, X5R, ±10%	0603	STD	STD
4	J1-4	PEC02SAAN	Header, male 2-pin, 100-mil spacing	STD	PEC02SAAN	PEC02SAAN
2	JP1, JP3	PEC03SAAN	Header, male 3-pin, 100-mil spacing	STD	PEC03SAAN	PEC03SAAN
1	JP2	PEC02SAAN	Header, male 2-pin, 100-mil spacing	0.100 inch x 2	PEC02SAAN	Sullins
3	R1-3	49.9 kΩ	Resistor, chip, 1/16W, 1%	0603	STD	STD
2	S1-2		Switch, SPST, PB momentary, sealed washable		KT11P2JM	C&K Components
2	TP1-2		Test point, red, thru-hole color keyed	STD	5000	STD
1	U1	TPS3421EGDRY	IC, dual channel push-button reset timer	DRY	TPS3421EGDRY	TI
1	—		PCB, 2.2 in × 1.65 in × 0.062 in		PWR156	Any
3	JP1-2		Shunt, black	100-mil	929950-00	3M

Notes: 1. These assemblies are ESD sensitive, observe ESD precautions.

2. These assemblies must be clean and free from flux and all contaminants. Use of no-clean flux is not acceptable.

3. These assemblies must comply with workmanship standards IPC-A-610 Class 2.

4. Ref designators marked with an asterisk (***) cannot be substituted. All other components can be substituted with equivalent MFG's components.

7 Evaluating the TPS3420 using the TPS3421EGEVM-156 Board

The TPS3420 is a threshold-based version of the TPS3421 (see TPS3420 datasheet, [SBVS214](#)). The TPS3420 does not require pull-up resistors at the inputs of PB1 and PB2.

7.1 Modifying the TPS3421EVM-156 Board

The following modifications to the TPS3421EVM-156 board can be made to evaluate the TPS3420:

- Remove resistors R1 and R2.
- Place a shorting jumper between Pin 2 and Pin 3 (TS GND).

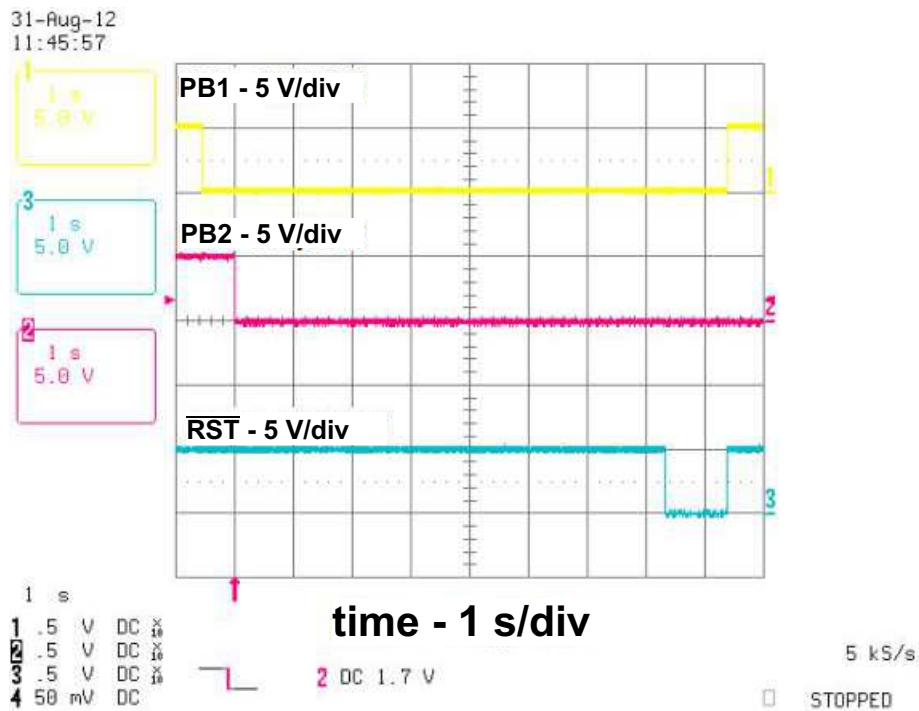


Figure 6. TPS3420D $\overline{\text{RST}}$ Function for TS = GND

8 Evaluating the TPS3422 using the TPS3421EVM-156 Board

The TPS3422 is a more integrated version of the TPS3421. The TPS3422 does not require pull-up resistors at the inputs of PB1 and PB2.

8.1 Modifying the TPS3421EVM-156 Board

The following modifications to the TPS3421EVM-156 board can be made to evaluate the TPS3422:

- Remove resistors R1 and R2.
- Place a shorting jumper between Pin 2 and Pin 3 (TS GND).
- Since Pin 6 is N/C. User can select any option on JP3.

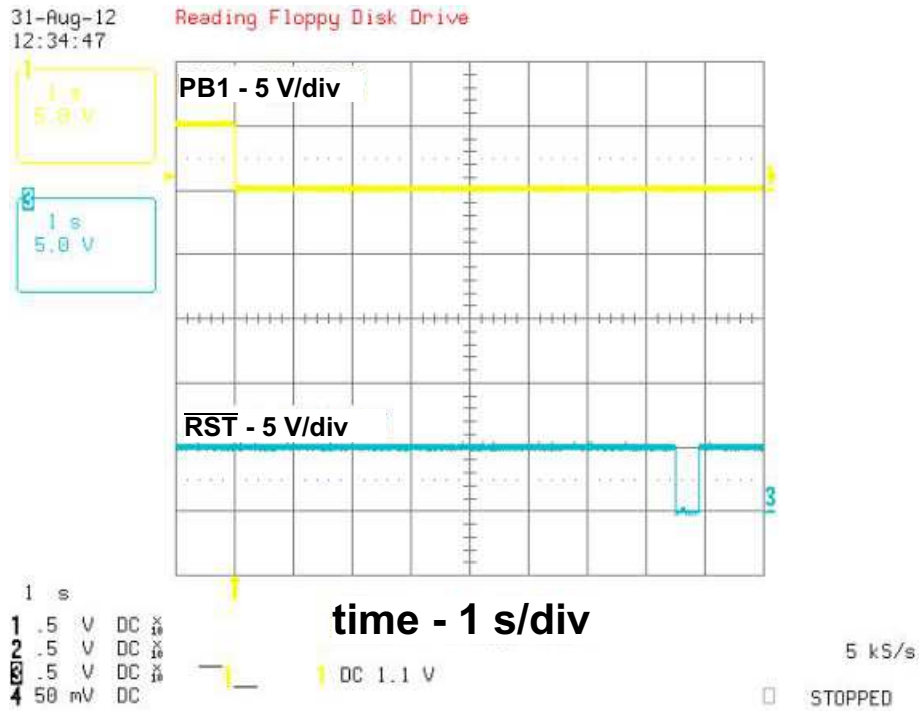


Figure 7. TPS3422EG $\overline{\text{RST}}$ Function for TS = GND

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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.

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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.

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

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.

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.

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.

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1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

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