# LM57EVM Evaluation Module (EVM)

# User's Guide

Literature Number: SNIU019
September 2013

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# Introduction

The Texas Instruments LM57EVM evaluation module (EVM) helps designers evaluate the operation and performance of the LM57. The LM57 is a precision, dual-output, temperature switch with an integrated analog temperature sensor. The programmable resistors allow user to set the Trip Temperature ($T_{TRIP}$). The LM57 can be programmed to any of 256 trip temperatures.

The EVM contains one LM57 Resistor-Programmable Temperature Switch and Analog Temperature Sensor. It comes pre-assembled with the LLP-8 LM57BISD-10, and has a 10°C hysteresis of LM57. The header connector allows user to bring all package pins out for ease of characterization and testing.

**Table 1-1. Device and Package Configurations**

| SENSOR | IC | Package |
|---|---|---|
| U1 | LM57BISD-10 | WSON |

# Board Connectors and Components

This section describes the jumpers and connectors on the LM57EVM, and how to properly connect, set up and use the LM57EVM.

## 2.1 Input/Output Connector Description and Components

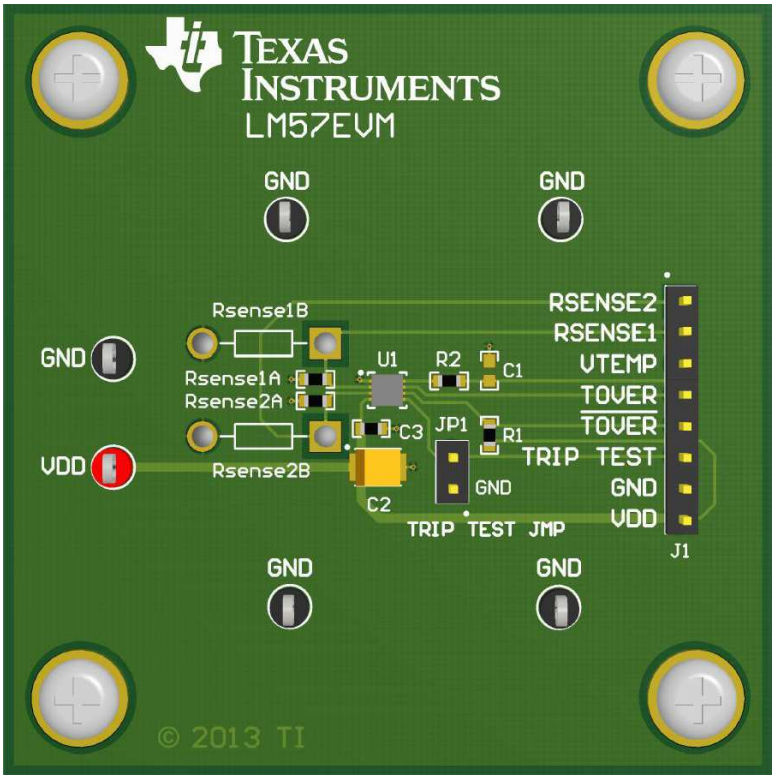


**Figure 2-1. LM57 Evaluation Board**

### 2.1.1 Power Supply Input – VDD and GND

The power supply pin of the device is connected to the VDD test point of the EVM. The EVM requires an external power source to power the LM57, and the test points shown in Figure 2-2 allow the EVM to connect. There are two bypass capacitors: 10µF tantalum and 0.1µF ceramic.


**Figure 2-2. VDD Input**

### 2.1.2 Resistor-Programmable

The LM57 uses the voltage at the two Rsense pins to set the trip point for the temperature switch. Rsense1A and Resense1B come pre-assembled 590kΩ and 412kΩ to set the trip point temperature around 70°C at J3 junction temperature. However, the through-hole axial lead resistors are not stuffed on the EVM allowing the customer to set their desired custom trip point, according to the values found in the "Trip Point (°C) vs. Set-Resistor Values (Ω)" table from the LM57 datasheet (literature number SNIS152). It is also possible to drive a set point voltage on the header connector of J1, with two precision voltage sources, using the VTEMP (mV) at the "Trip Point vs. Set-Resistor Value (Ω)" table from the LM57 datasheet (literature number SNIS152).

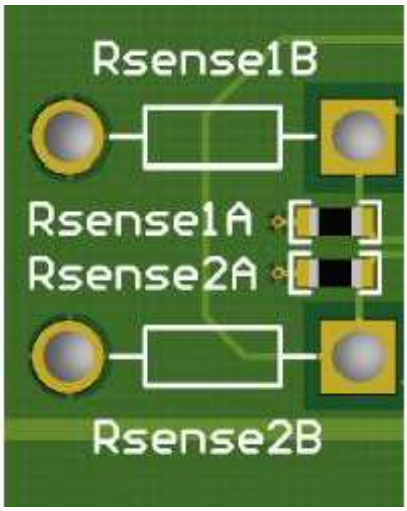


**Figure 2-3. Programmable Resistor**

### 2.1.3 Header Connector – J1

J1 is used to connect the package pins off from the board. When all of the device's pins are wired to this connector, the customer is able to further characterize and test.

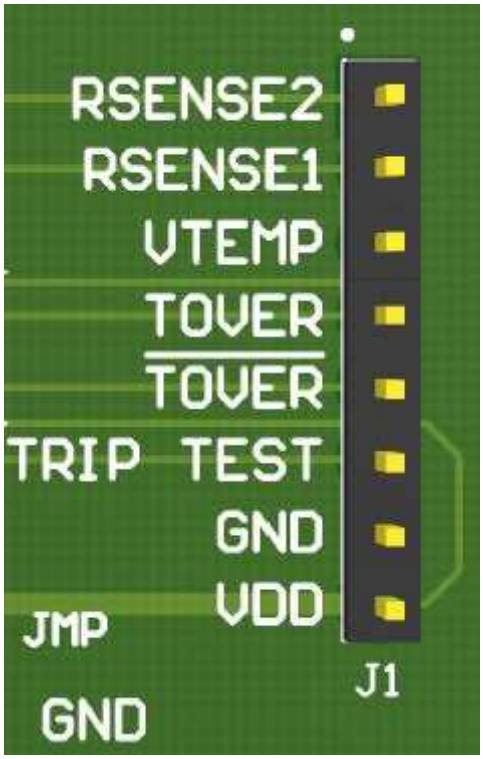


**Figure 2-4. Header Connector**

### 2.1.4 JP1 Test Trip Jumper

The JP1 jumper header shorts the Trip-Test pin to ground for normal use. To activate the Trip Test function, remove the shunt and drive the Trip Test pin with a VDD. Once activated, the output of the part will be asserted a LOW and high for $\overline{\text{TOVER}}$. The VTemp pin will correspond the voltage to the internal set point for the comparator. The purpose of this is to check if the external circuitry works with LM57 without having to use a temperature handler.

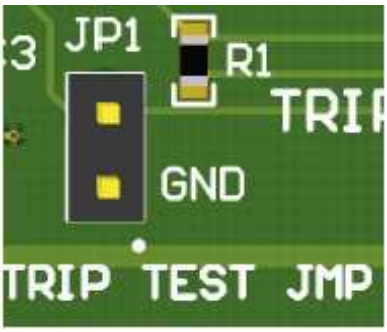


**Figure 2-5. Test Trip Jumper**

# Board Setup and Operation

1. For proper operation of the LM57, the test points VDD and GND (Section 2.1.1) should be applied to an external power source.
2. The EVM is pre-assembled Rsense1A and Rsense2A with 590kΩ and 412kΩ respectively to set a Trip Point at 70°C; therefore, the VTemp output voltage (J1 pin 3) corresponds to the approximated temperature of 1108mV.

# Board Layout

Figure 4-1, Figure 4-2, and Figure 4-3 show the board layout for the LM57EVM.

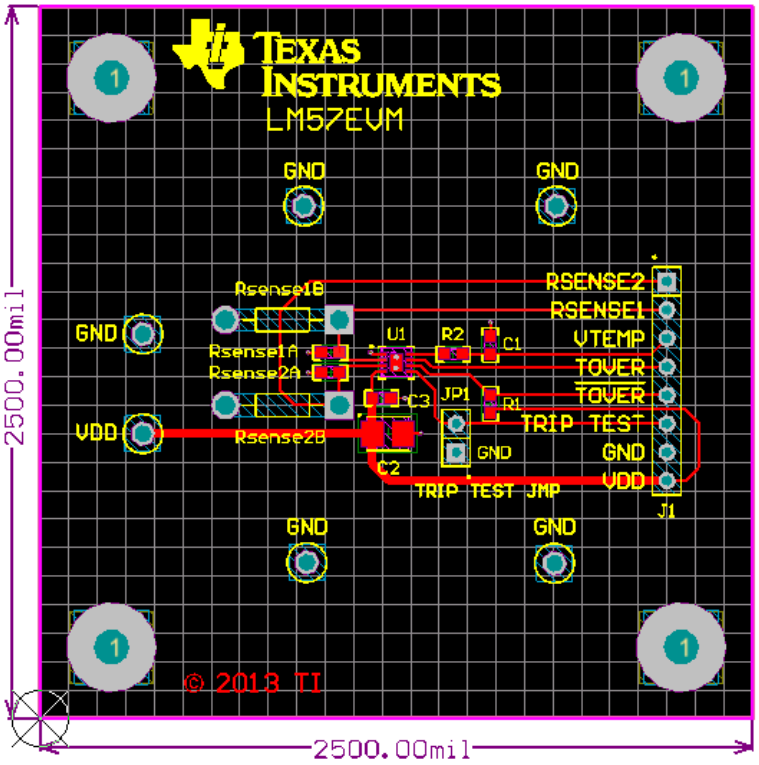


**Figure 4-1. Top Assembly Layer**

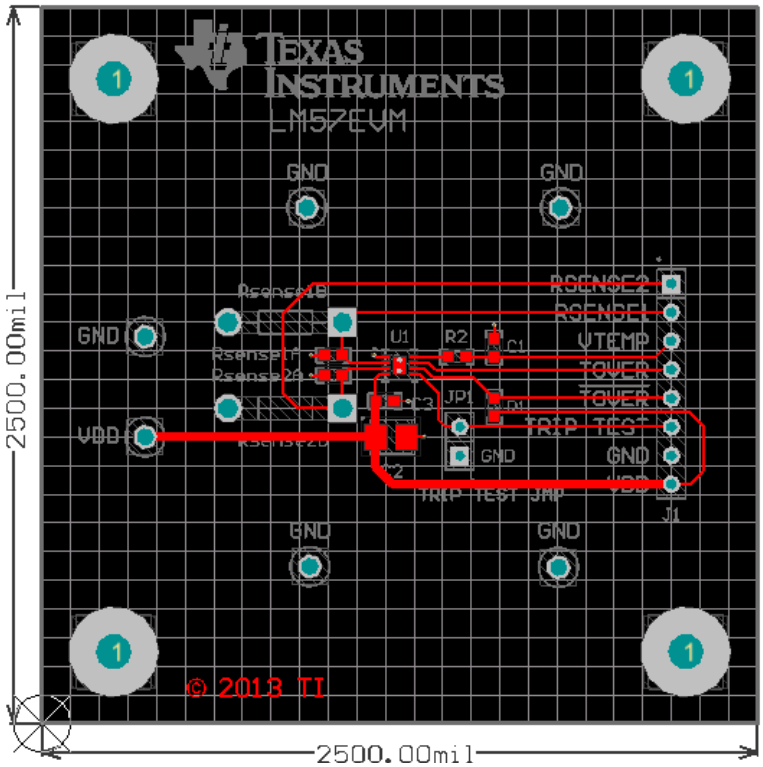


**Figure 4-2. Top Layer Routing**

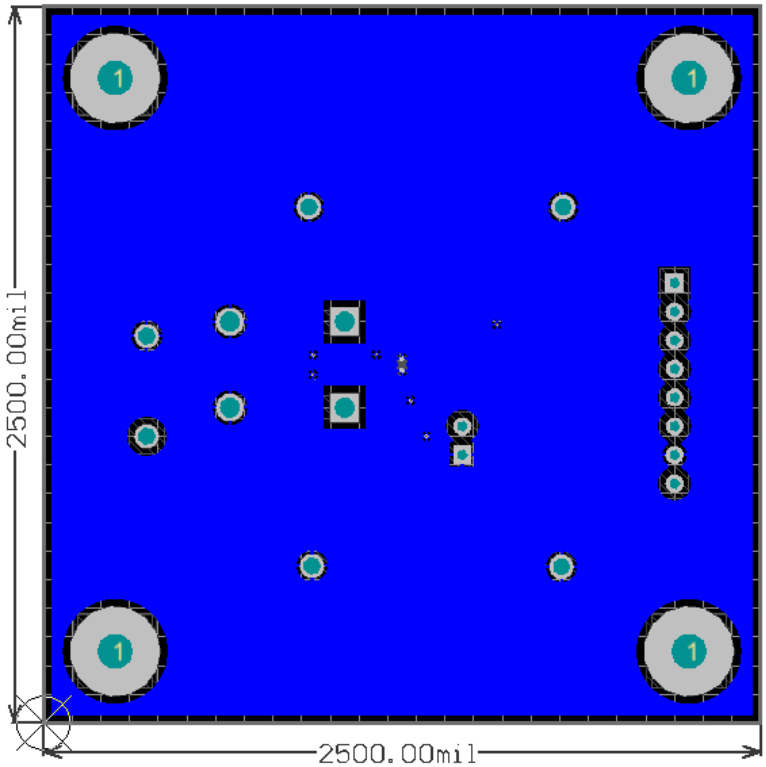


**Figure 4-3. Bottom Layer Routing**

# Schematic

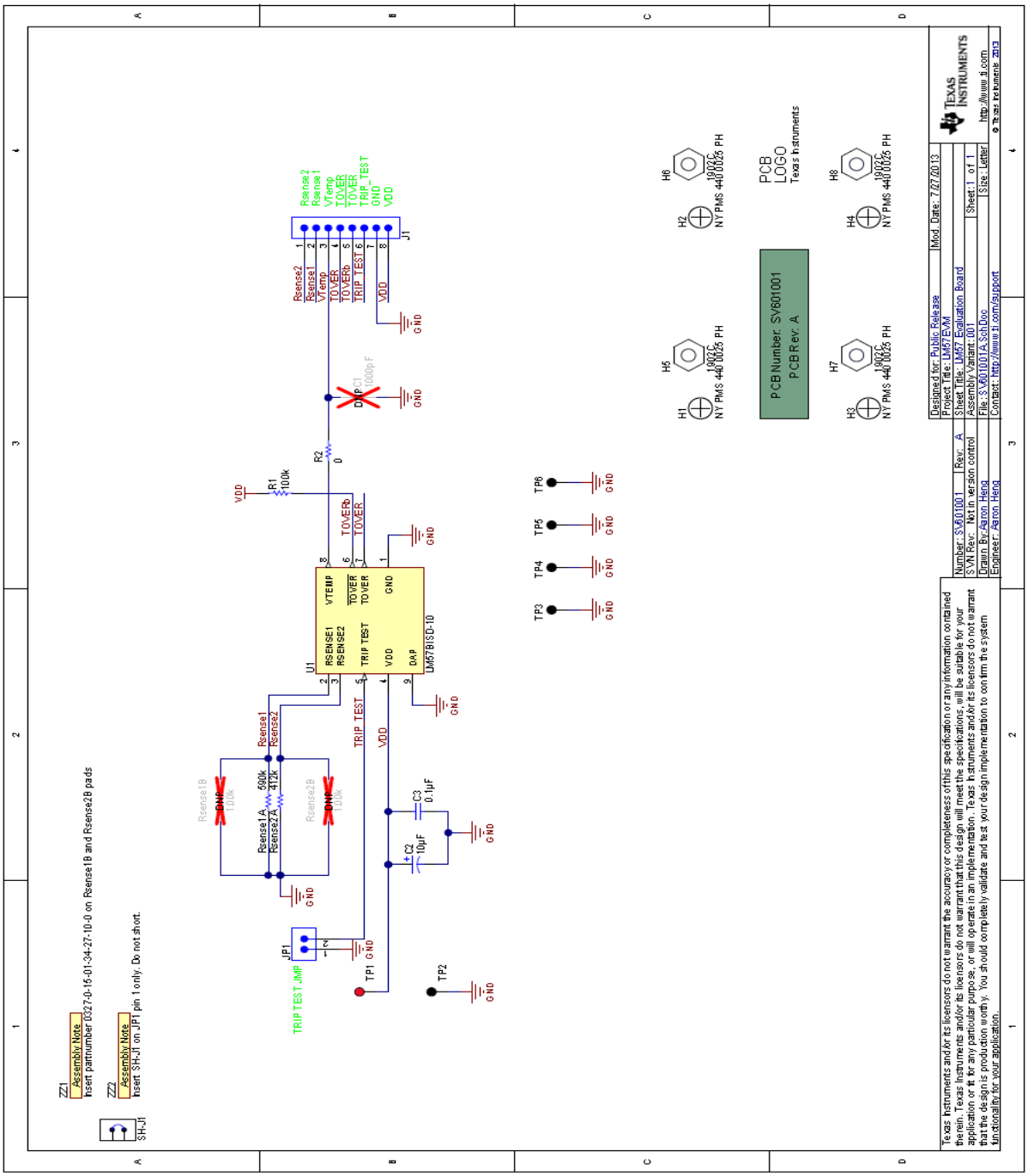


**Figure 5-1. LM57EVM Schematic**

# Bill of Materials

**Table 6-1. LM57EVM Bill of Materials**

| Designator | Description | Manufacturer | Part Number | Value |
|---|---|---|---|---|
| EVM | LM57 Evaluation Board | Texas Instruments | SV601001 | |
| C2 | CAP, TA, 10uF, 16V, +/-10%, 2 ohm, SMD | Vishay-Sprague | 293D106X9016B2TE3 | 10uF |
| C3 | CAP, CERM, 0.1uF, 16V, +/-5%, X7R, 0603 | AVX | 0603YC104JAT2A | 0.1uF |
| H1, H2, H3, H4 | Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead | B&F Fastener Supply | NY PMS 440 0025 PH | |
| H5, H6, H7, H8 | Standoff, Hex, 0.5"L #4-40 Nylon | Keystone | 1902C | |
| J1 | Header, TH, 100mil, 8x1, Gold plated, 230 mil above insulator | Samtec | TSW-108-07-G-S | |
| JP1 | Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator | Samtec | TSW-102-07-G-S | |
| R1 | RES, 100k ohm, 1%, 0.1W, 0603 | Vishay-Dale | CRCW0603100KFKEA | 100k |
| R2 | RES, 0 ohm, 5%, 0.1W, 0603 | Vishay-Dale | CRCW06030000Z0EA | 0 |
| Rsense1A | RES, 590k ohm, 0.1%, 0.1W, 0603 | Yageo America | RT0603BRD07590KL | 590k |
| Rsense2A | RES, 412k ohm, 0.1%, 0.1W, 0603 | Yageo America | RT0603BRD07412KL | 412k |
| SH-J1 | Shunt, 2mm, Gold plated, Black | Samtec | 2SN-BK-G | 1x2 |
| TP1 | Test Point, Multipurpose, Red, TH | Keystone | 5010 | Red |
| TP2, TP3, TP4, TP5, TP6 | Test Point, Multipurpose, Black, TH | Keystone | 5011 | Black |
| U1 | Resistor-Programmable Temperature Switch and Analog Temperature Sensor, 9-pin LLP | Texas Instruments | LM57BISD-10 | |
| Rsense1B, Rsense2B | Pin Receptacle 0.032/0.046 Diameter | Mill-Max | 0327-0-15-15-34-27-10-0 | |
| C1 | CAP, CERM, 1000pF, 50V, +/-5%, C0G/NP0, 0603 | Kemet | C0603C102J5GAC | 1000pF |
| Rsense1B, Rsense2B | RES, 1.00k ohm, 1%, 0.25W, TH | Vishay-Dale | CMF501K0000FHEB | 1.00k |

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**General Statement for EVMs including a radio**

*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.

**FCC Interference Statement for Class B EVM devices**

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.

**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.

**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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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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3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
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