# THE DATASHEET OF

# TPS2066CDGNEVM-015

# Dual-Channel, Power-Distribution Switch Evaluation Module

This user's guide describes the TPS20xxCDRCEVM-016 and TPS20xxCDGNEVM-015 evaluation modules (EVM). This guide contains the EVM schematics, bill of materials, assembly drawings, and top and bottom board layouts.

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# 1 Introduction

The TPS20xxCDRCEVM-016 and TPS20xxCDGNEVM-015 are evaluation modules (EVM) for the Texas Instruments family of dual-channel, current-limited, power distribution switches. These EVMs operate over a 4.5-V to 5.5-V range and provide a continuous output current of up to 2 A (see Table 1). Test points provide convenient access to all critical node voltages.

The TPS20xxCDRCEVM-016 accepts an SON packaged, power-distribution switch whereas the TPS20xxCDGNEVM-015 accepts MSOP-8 packaged switch with a thermal pad. These switches have an enable input, fault status output, and overtemperature shutdown.Table 1 and Table 2 summarize the configurable EVM options. Note that the shaded EVM options shown in these two tables are not currently available.

# 2 Schematics and Bill of Materials

## *2.1 EVM Options*

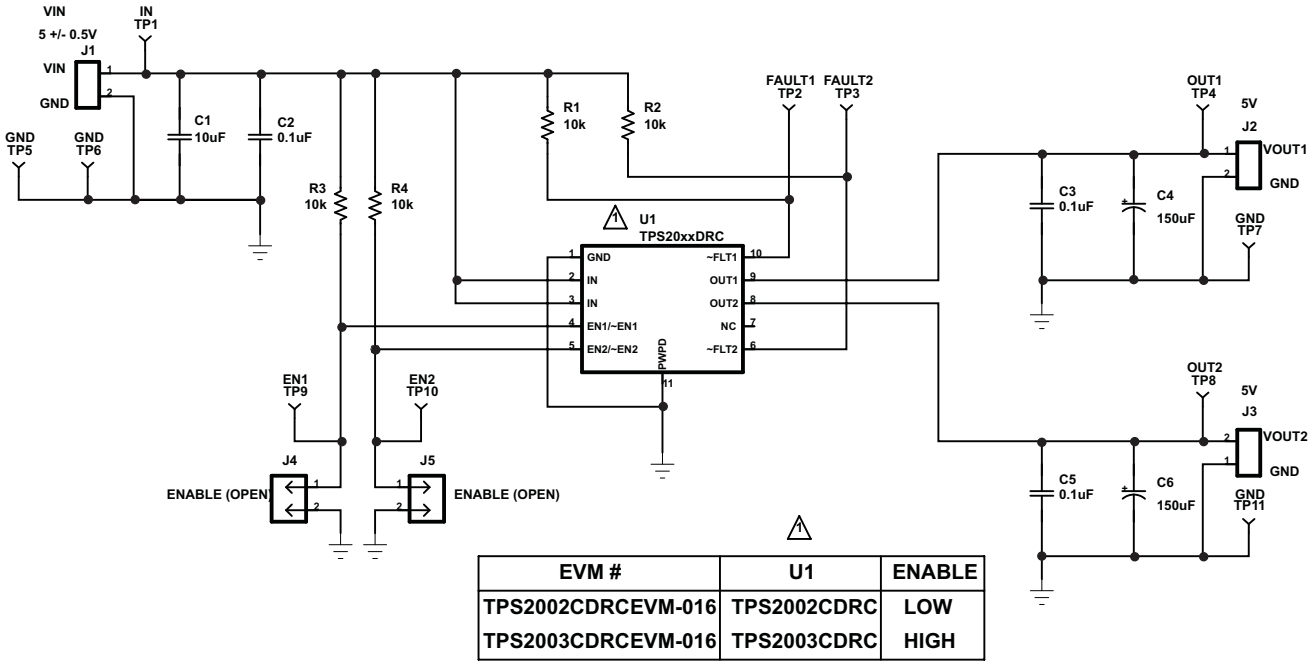
**Table 1. TPS20xxCDRCEVM-016 Options**

| EVM | Device | Continuous Output Current (A) | ENABLE |
|---|---|---|---|
| TPS2002CDRCEVM-016 | TPS2002CDRC | 2 | Active Low |
| TPS2003CDRCEVM-016 | TPS2003CDRC | 2 | Active High |

**Table 2. TPS20xxCDGNEVM-015 Options**

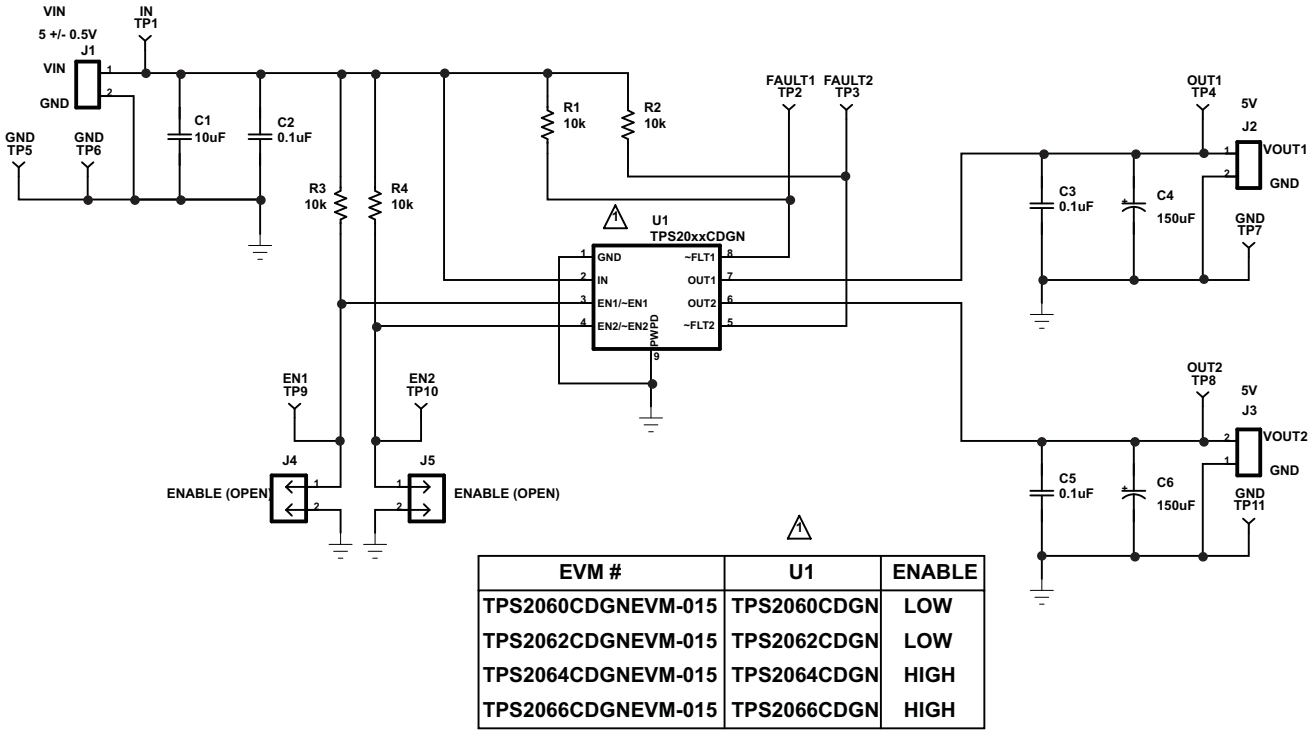
| EVM | Device | Continuous Output Current (A) | ENABLE |
|---|---|---|---|
| TPS2060CDGNEVM-015 | TPS2060CDGN | 1.5 | Active Low |
| TPS2062CDGNEVM-015 | TPS2062CDGN | 1 | Active Low |
| TPS2064CDGNEVM-015 | TPS2064CDGN | 1.5 | Active High |
| TPS2066CDGNEVM-015 | TPS2066CDGN | 1 | Active High |

## 2.2 Schematics




| EVM # | U1 | ENABLE |
|---|---|---|
| TPS2002CDRCEVM-016 | TPS2002CDRC | LOW |
| TPS2003CDRCEVM-016 | TPS2003CDRC | HIGH |

**Figure 1. TPS20xxCDRCEVM-016 Schematic**




| EVM # | U1 | ENABLE |
|---|---|---|
| TPS2060CDGNEVM-015 | TPS2060CDGN | LOW |
| TPS2062CDGNEVM-015 | TPS2062CDGN | LOW |
| TPS2064CDGNEVM-015 | TPS2064CDGN | HIGH |
| TPS2066CDGNEVM-015 | TPS2066CDGN | HIGH |

**Figure 2. TPS20xxCDGNEVM-015 Schematic**

## 2.3 Bill of Material

**Table 3. TPS20xxCDRCEVM-016 Bill of Materials**

| Count | RefDes | Value | Description | Size | Part Number | MFR |
|---|---|---|---|---|---|---|
| 1 | C1 | 10 µF | Capacitor, Ceramic, 10V, X5R, 10% | 1206 | Std | Std |
| 3 | C2-3 C5 | 0.1 µF | Capacitor, Ceramic, 16V, X7R, 10% | 603 | Std | Std |
| 2 | C4 C6 | 150 µF | Capacitor, Tant, 10V, ±10% | 7343(D) | TPSD157K010R0100 | AVX |
| 3 | J1-3 | ED555/2DS | Terminal Block, 2-pin, 6-A, 3.5mm | 0.27 x 0.25 inch | ED555/2DS | OST |
| 2 | J4-5 | PEC02SAAN | Header, Male 2-pin, 100mil spacing, | 0.100 inch x 2 | PEC02SAAN | Sullins |
| 4 | R1-4 | 10k | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |
| 0 | U1 | TPS2002CDRC or TPS2003CDRC | IC, Dual Current-Limited, Power-Distribution Switch | DRC-10 | TPS2002CDRC | TI |
| 1 | -- | | PCB, 2.25 In x 2.25 In x 0.062 In | | PWR016 | Any |

**Table 4. TPS20xxCDGNEVM-015 Bill of Materials**

| Count | RefDes | Value | Description | Size | Part Number | MFR |
|---|---|---|---|---|---|---|
| 1 | C1 | 10 µF | Capacitor, Ceramic, 10V, X5R, 10% | 1206 | Std | Std |
| 3 | C2-3 C5 | 0.1 µF | Capacitor, Ceramic, 16V, X7R, 10% | 603 | Std | Std |
| 2 | C4 C6 | 150 µF | Capacitor, Tantalum, 10V, 100milliohm, ±10% | 7343(D) | TPSD157K010R0100 | AVX |
| 3 | J1-3 | ED555/2DS | Terminal Block, 2-pin, 6-A, 3.5mm | 0.27 x 0.25 inch | ED555/2DS | OST |
| 2 | J4-5 | PEC02SAAN | Header, Male 2-pin, 100mil spacing, | 0.100 inch x 2 | PEC02SAAN | Sullins |
| 4 | R1-4 | 10k | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |
| 1 | U1 | TPS2060CDGN or TPS2062CDGN or TPS2064CDGN or TPS2066CDGN | IC, Dual Current-Limited, Power-Distribution Switch | MSOP | TPS2060CDGN | TI |
| 1 | – | | PCB, 2.25 In x 2.25 In x 0.062 In | | PWR015 | Any |

# 3 Board Layout

This section contains three views of the TPS20xxCDGNEVM-015 evaluation board as well as some layout considerations. Note that TPS20xxCDRCEVM-016 evaluation board is identical except for the U1 footprint.

## 3.1 TPS20xxCDGNEVM-015 Board

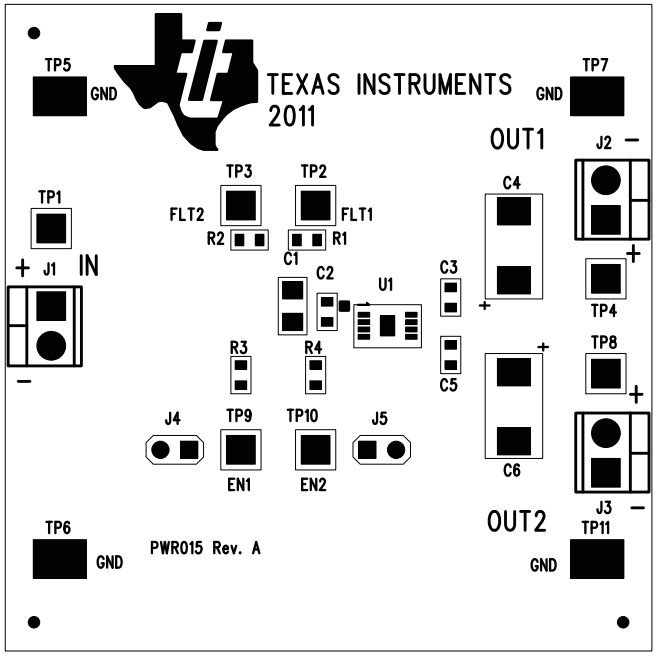



**Figure 3. TPS20xxCDGNEVM-015 Component Placement**

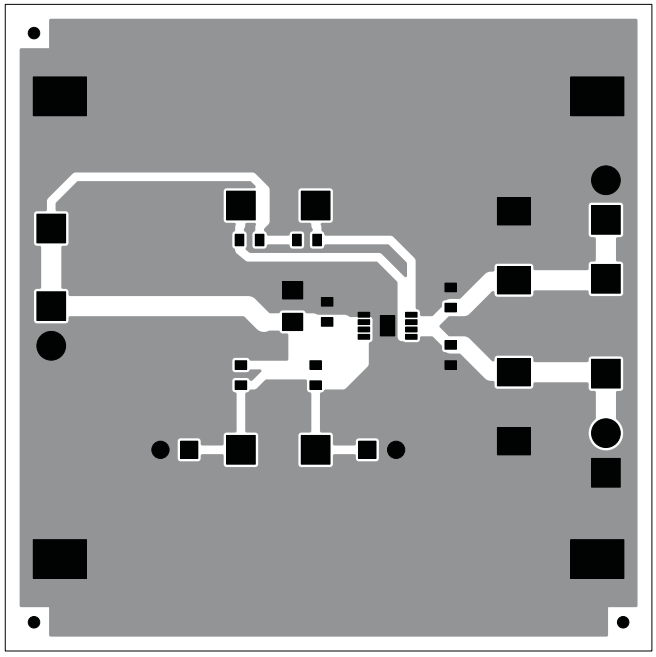


**Figure 4. TPS20xxCDGNEVM-015 Top-Side Layout**

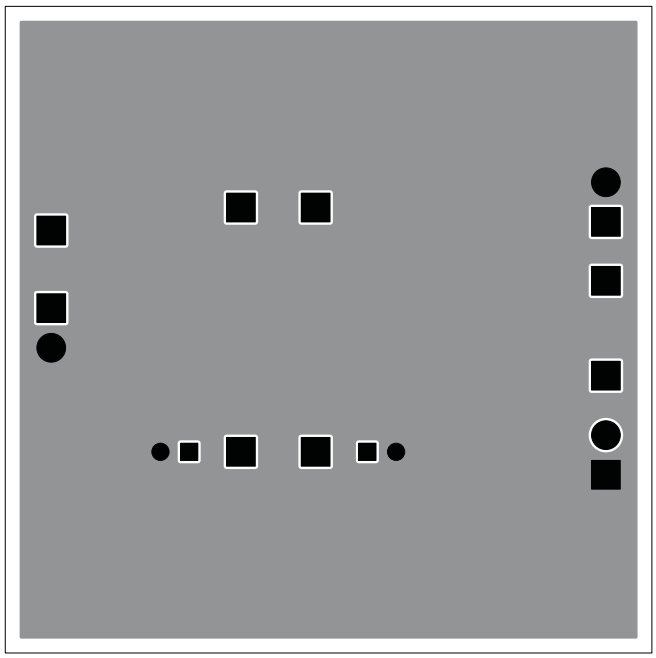


**Figure 5. TPS20xxCDGNEVM-015 Bottom-Side Layout**

### 3.2 Layout Considerations

The IN and OUT pins of U1 can carry significant current; so, traces to these pins must be of suitable length and width to minimize the voltage drop to the load. Locate the 0.1-µF bypass capacitors close to the IN and OUT pins of U1.

## 4 EVM Setup

### 4.1 Recommended Test Equipment

The following test equipment is recommended:

- Two-channel storage oscilloscope
- Current probe
- Voltage probe
- 5 V at 5-A power supply
- Volt-ohm meter
- A passive or active load

### 4.2 Measuring Current Limit

The user is advised to read the applicable data sheet before using the EVM.

Figure 6 shows the EVM test setup for measuring current limit. The power distribution switch is enabled into a short circuit for this measurement. Figure 7 shows the current waveform for TPS2064CDGNEVM-015

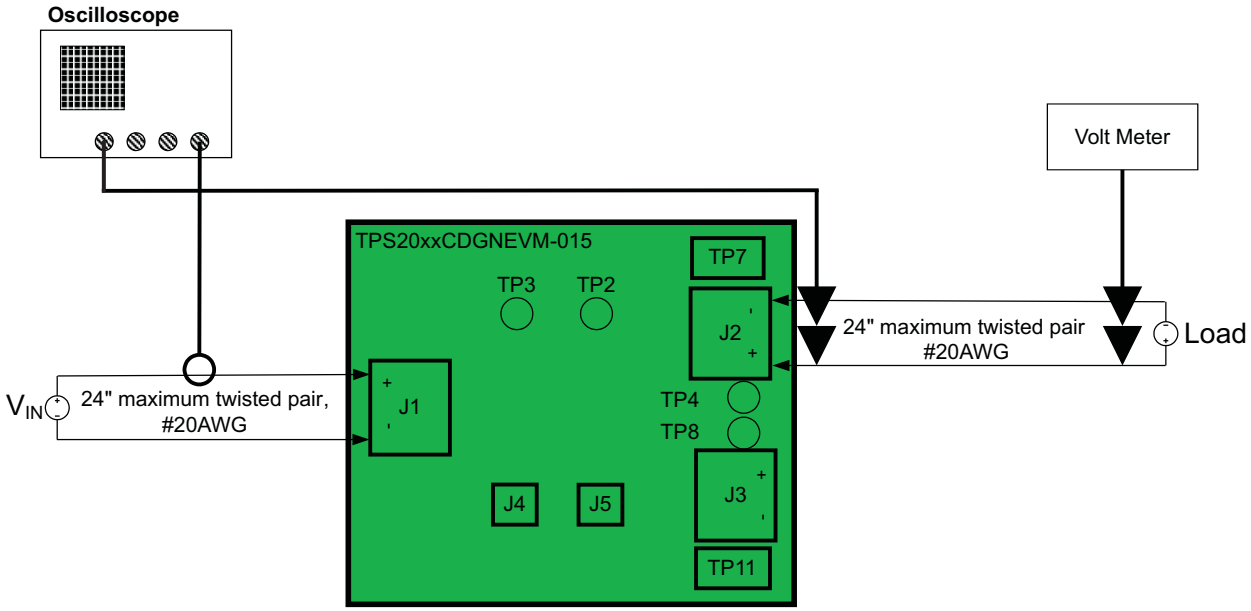



**Figure 6. EVM Setup For Measuring Current Limit**

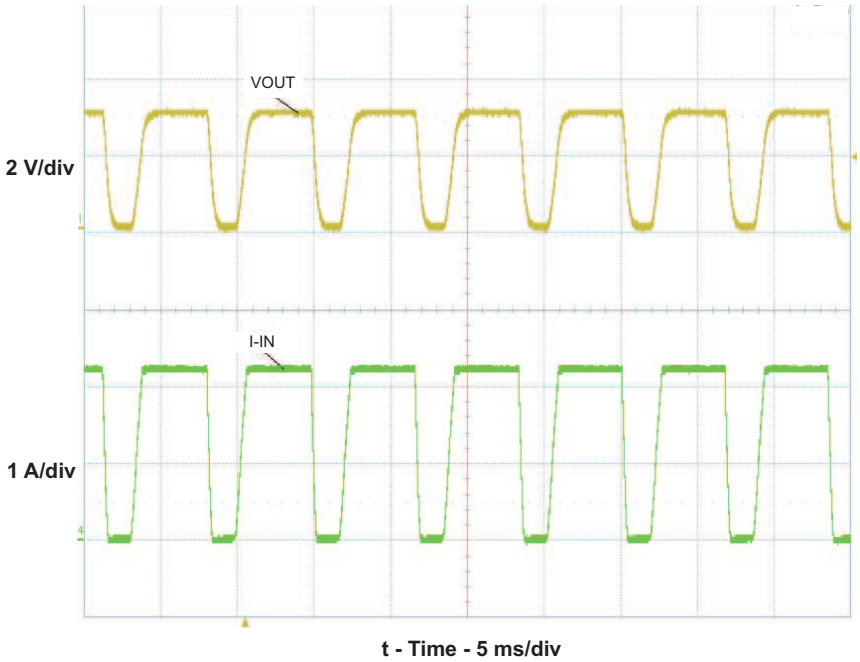



**Figure 7. TPS2064CDGNEVM-015 Short-Circuit Input Current and Output Voltage**

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## EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 4.5 V to 5.5 V and the output voltage range of 4.5 V to 5.5 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.

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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 85°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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**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. 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.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

**Certain Instructions**. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. 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 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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