ISO1212 Isolated Digital-Input Receiver Evaluation Module

This user's guide describes the evaluation module (EVM) for the ISO1212 isolated digital-input receiver. This EVM allows designers to evaluate device performance for fast development and analysis of isolated systems. The EVM supports evaluation of four dual channel ISO1212 SOIC package devices, that helps user to evaluate 8 channels with four channel configured for fast data rate and the other channels configured for slow data rate.

CAUTION

This evaluation module is made available for evaluation of isolator parameter performance only and is not intended for isolation voltage testing. To prevent damage to the EVM, any voltage applied as a supply or digital input/output must be maintained within the recommended operating range.

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Trademarks

All trademarks are the property of their respective owners.

1 Overview

The ISO1212 device is dual-channel, integrated, isolated digital-input receiver with IEC 61131-2 Type 1/2/3 characteristics. The device receives up to a 60-V digital input signal and provides an isolated digital output. No field-side power supply is required. An external resistor, R_{SENSE}, on the input signal path precisely sets the limit for the current drawn from the field input. This resistor helps minimize power dissipated in the system. The current limit can be set for Type 1/2/3 operation. The voltage transition thresholds are compliant to Type 1/2/3 and can be further adjusted upwards using an external resistor, R_{THR}.

The ISO1212EVM is the evaluation module to test and evaluate the operation of an isolated dual-channel industrial input device, ISO1212. The EVM uses four ISO1212 devices to implement an 8 channel isolated industrial input solution with the first four channels working as fast signal input channels (up to 4 Mbps) and the last four channels as slow signal input channels (<1 Kbps). The first two devices (U1 and U2) of the ISO1212EVM use traditional approach of protecting the industrial input channel using TVS diode for EMC (such as surge, ESD, and others). Because the other two devices (U3 and U4) of the ISO1212EVM are configured to accept only slow signal inputs, EMC protection can be achieved by using only a capacitor (in place of TVS) between the input and FGND. Up to a 330-µs glitch can be filtered without TVS for the default values of the resistor (1 kΩ) and capacitor (0.33 µF).. Based on the input signal data rate, the value of this capacitor can be modified to achieve required EMC protection. If fast signal evaluation is required on the U3 and U4 channels of the device, remove the prepopulated capacitors (C13, C14, C15, and C16). For information on different levels of EMC protection available without using an additional TVS diode, refer to the ISO121x data sheet, *ISO121x Isolated Digital-Input Receivers With IEC 61131-2 Type 1/2/3 Characteristics*.

2 Pin Configuration of the ISO1212

Figure 1 shows the ISO1212 pin configuration in an 16-pin QSOP package.

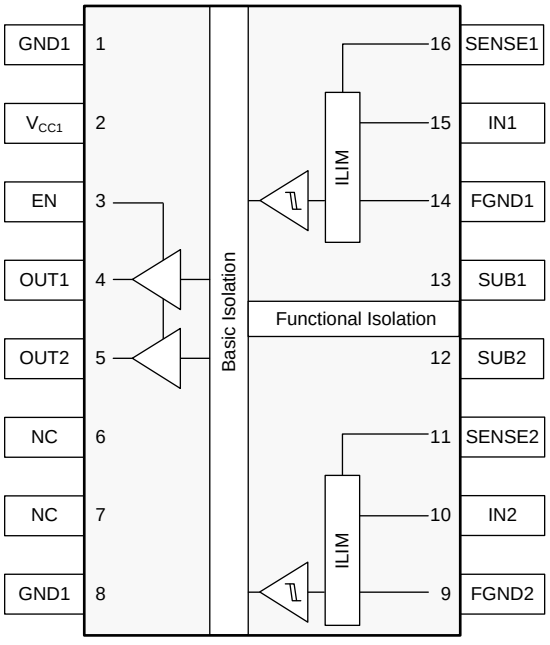
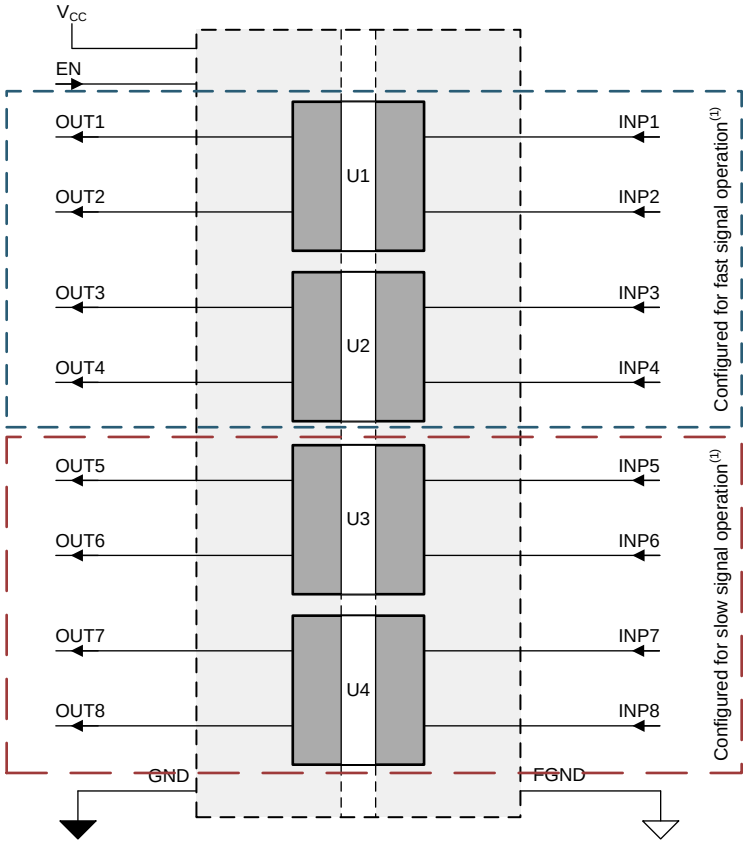


Figure 1. ISO1212 Isolated Digital-Input Receiver Pin Configuration

3 ISO1212EVM Board Block Diagram and Image

Figure 2 shows the board configuration of the EVM.



(1) For more information on fast and slow signal operation, see Section 1.

Figure 2. ISO1212EVM Configuration

Figure 3 shows the photograph of the EVM.

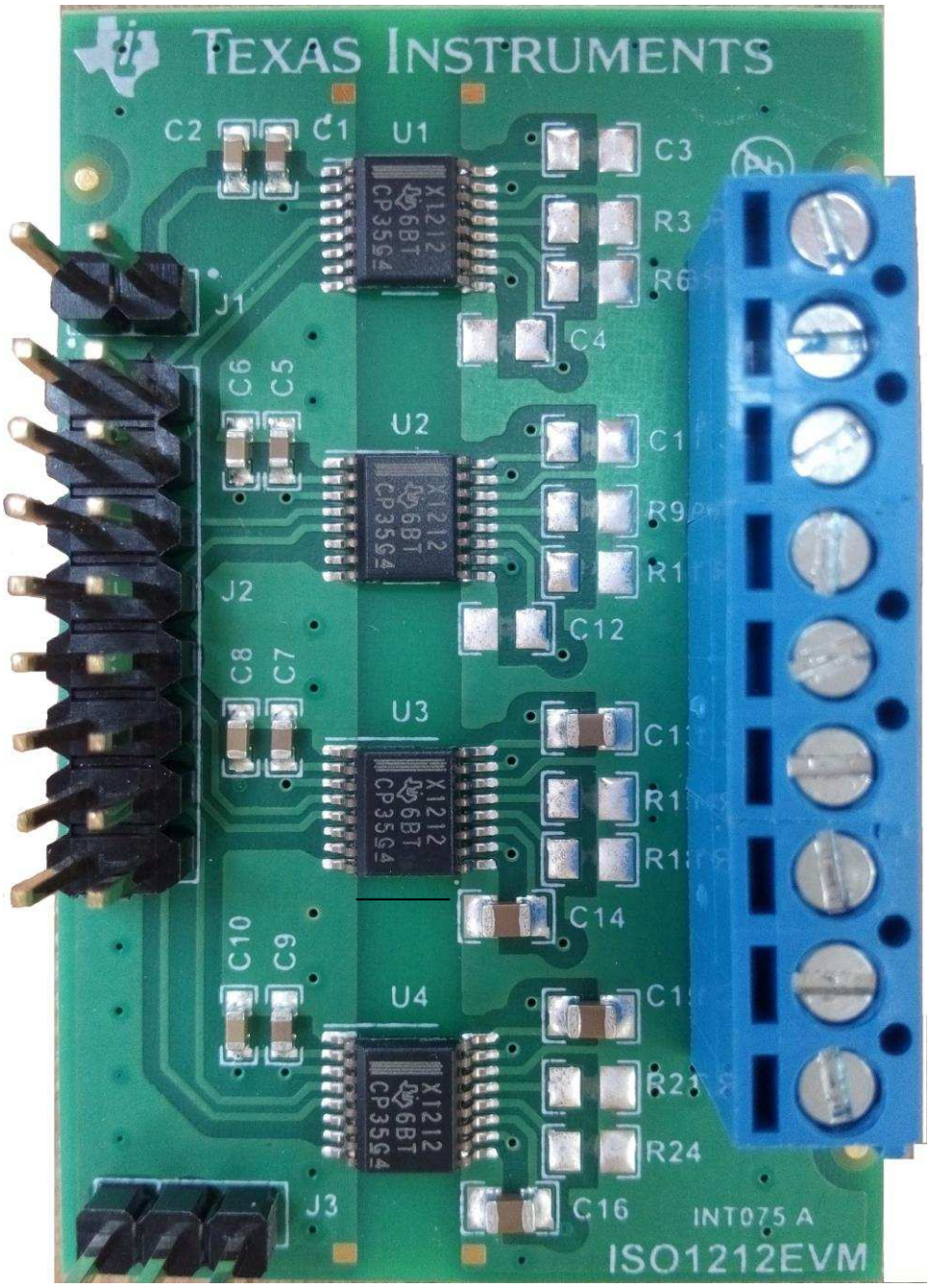


Figure 3. ISO1212EVM Board Photograph

4 EVM Setup and Operation

This section describes the setup and operation of the EVM for parameter performance evaluation. Figure 4 shows the configuration for operating the ISO1212EVM. In this setup, the 24 V, 10-kHz signal from the function generator is connected between channel 1 input (J4, pin 9) and FGND (J4, pin 1) of the EVM. A 5-V power supply is connected at J1 to power the logic side. A jumper was placed shorting pin 1 and pin 2 of J3 to enable the output. The input side and output side signals were monitored using an oscilloscope.

NOTE: To avail reverse polarity protection from the field input, do not populate the R3, R6, R9, R12, R15, and R18 resistors, thereby leaving pin 12 (SUB2) and pin 13 (SUB1) of the device floating.

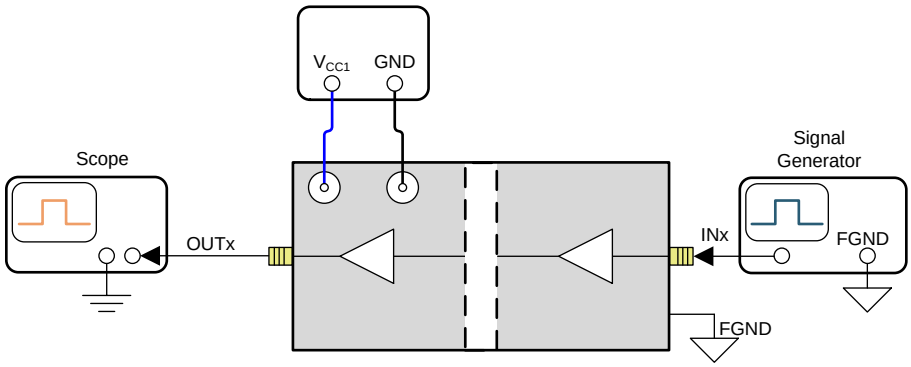


Figure 4. Basic EVM Operation

4.1 EVM Jumper Settings

Table 1 lists the jumper settings of the ISO1212EVM.

Table 1. Jumper Descriptions

Jumper	Configuration	Description
J3	Pin 1-Pin 2	Enables output
	Pin 2-Pin 3	Disables output

4.2 Typical Waveforms

Figure 5 shows the typical input and output waveforms of the EVM for a 10-kHz input. The input is shown as Channel 1, and the output is shown as Channel 2. Figure 6 shows the input current versus input voltage characteristics. The input current is limited by the R_{SENSE} resistor. A value of 562 Ω for R_{SENSE} is recommended for Type I and Type III operation and results in a current limit of 2.25 mA (typical).

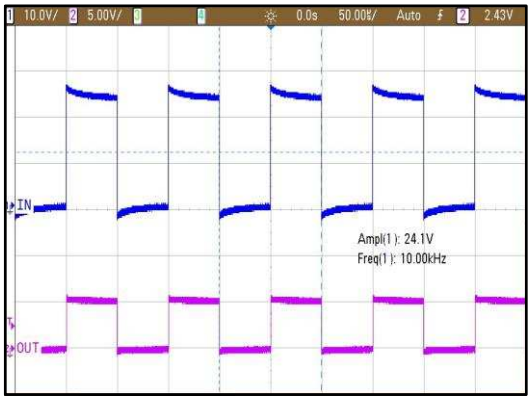


Figure 5. Example Measurement on ISO1212EVM

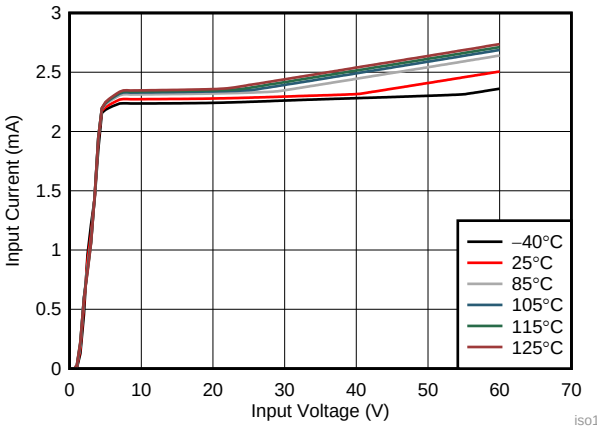


Figure 6. Input Current vs Input Voltage

5 Bill of Materials

Table 2 lists the bill of materials (BOM) for this EVM.

Table 2. BOM

Item	Designator	Description	Part Number	Manufacturer	Quantity
1	C1, C5, C7, C9	CAP, CERM, 1 µF, 50 V, +/- 10%, X5R, 0603	GRM188R61H105KAALD	MuRata	4
2	C2, C6, C8, C10	CAP, CERM, 0.1 µF, 25 V, +/- 5%, X7R, 0603	06033C104JAT2A	AVX	4
3	C13, C14, C15, C16	CAP, CERM, 0.33 µF, 50 V, +/- 10%, X5R, 0805	C2012X5R1H334K125AA	TDK	4
4	D1, D2, D3, D4	Diode, TVS, Uni, 36 V, 58.1 Vc, SOD-123FL	SMF36A	Littelfuse	4
5	H1, H2, H3, H4	Bumpon, Cylindrical, 0.312 X 0.200, Black	SJ61A1	3M	4
6	J1	Header, 100mil, 2x1, Gold, TH	HTSW-102-07-G-S	Samtec	1
7	J2	Header, 100mil, 8x2, Gold, TH	TSW-108-07-G-D	Samtec	1
8	J3	Header, 100mil, 3x1, Gold, TH	HTSW-103-07-G-S	Samtec	1
9	J4	Terminal Block, 3.5mm, 9x1, R/A, TH	ED555/9DS	On-Shore Technology	1
10	R1, R4, R7, R10, R13, R16, R19, R22	RES, 1.00 k, 1%, 0.25 W, AEC-Q200 Grade 1, 1.4x3.6mm	SMM02040C1001FB300	Vishay Draloric	8
11	R2, R5, R8, R11, R14, R17, R20, R23	RES, 562, 1%, 0.1 W, 0603	CRCW0603562RFKEA	Vishay-Dale	8
12	SH-J1	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Samtec	1
13	U1, U2, U3, U4	ISO1212DBQR, DBQ00016A (SSOP-16)	ISO1212DBQR	Texas Instruments	4

6 EVM Schematics and Layout

Figure 7 shows the ISO1212EVM schematic. Figure 8 and Figure 9 show the PCB layout of the EVM.

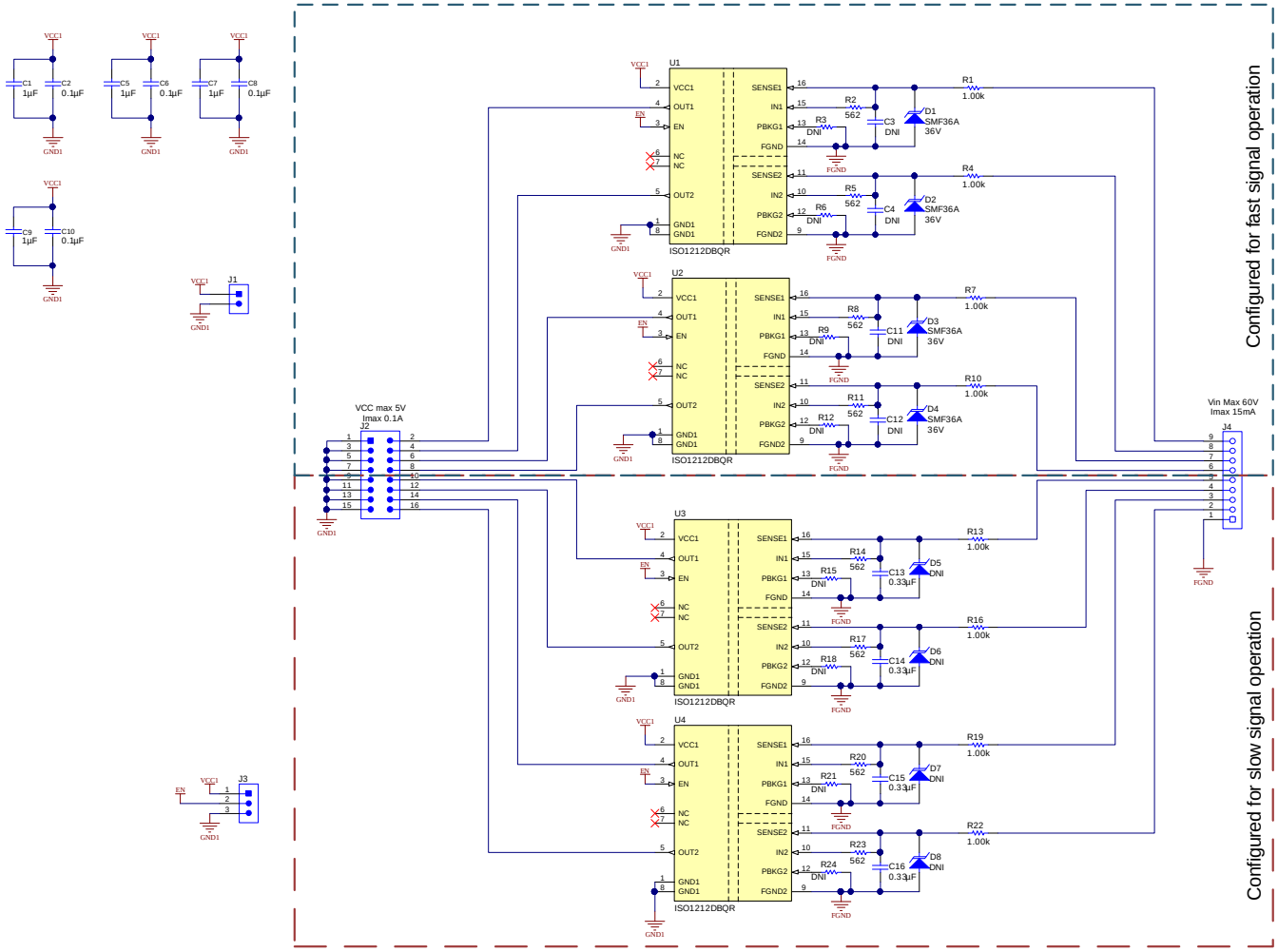


Figure 7. ISO1212EVM Schematic

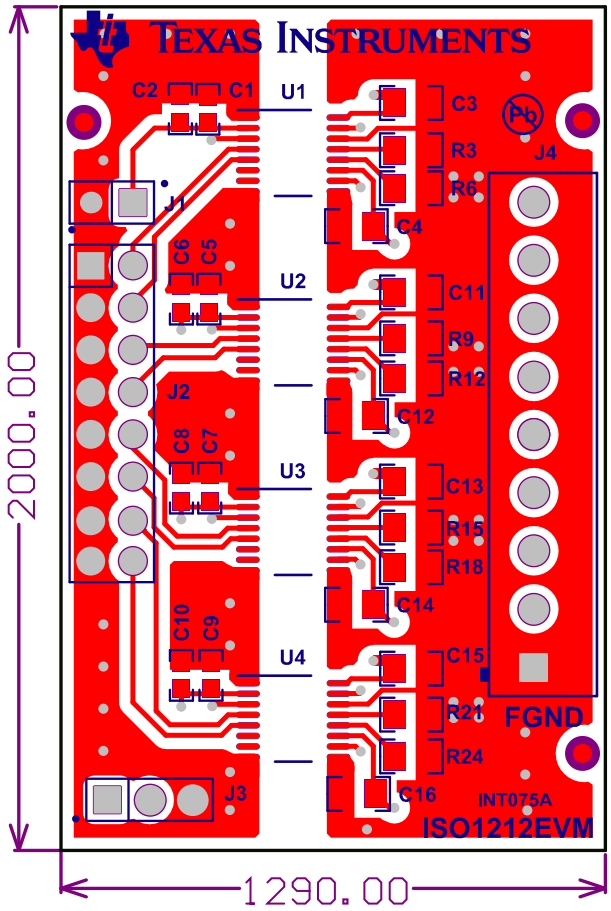


Figure 8. ISO1212EVM PCB Layout—Top Layer

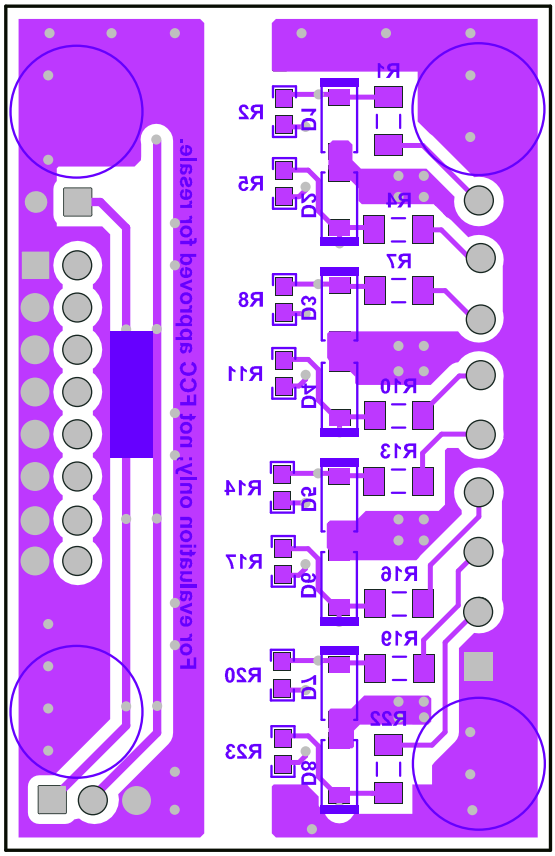


Figure 9. ISO1212EVM PCB Layout—Bottom Layer

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (May 2017) to A Revision	Page
• Changed the maximum values for fast and slow signal operation in the *Overview* section. Updated the *ISO1212EVM Configuration* and *ISO1212EVM EVM Schematic* to show the configurations for fast and slow signal operation	2

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      FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *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

      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.

FCC Interference Statement for Class B EVM devices

NOTE: 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.*

3.2 *Canada*

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Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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.

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.

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.

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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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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1. Use EVMs 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 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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4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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