TPS6282xEVM-005 Evaluation Module

The TPS6282xEVM-005 facilitates the evaluation of the TPS6282x 1-A, 2-A, and 3-A pin-to-pin compatible step-down converters with DCS-Control™ in a 2-mm × 1.5-mm QFN package. The BSR005-001 uses the 1-A TPS62821, the BSR005-002 uses the 2-A TPS62822, and the BSR005-003 uses the 3-A TPS62823. The EVMs output a 1.8-V output voltage with 1% accuracy from input voltages from 2.4 V to 5.5 V with a maximum solution height of 1 mm. The TPS6282x is a highly efficient and small solution for point-of-load (POL) converters in all types of equipment, such as solid-state drives (SSDs), computing, and factory automation.

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1 Introduction

The TPS6282x are synchronous, step-down converters in a small 2- × 1.5- × 1-mm QFN package. Three different devices in this family support 1 A, 2 A, or 3 A of output current.

1.1 Performance Specification

Table 1 provides a summary of the TPS6282xEVM-005 performance specifications.

Table 1. Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input voltage		2.4	5	5.5	V
Output voltage setpoint			1.8		V
Output current	TPS62821EVM-005	0		1	A
	TPS62822EVM-005	0		2	A
	TPS62823EVM-005	0		3	A

1.2 Modifications

Additional input and output capacitors can be added. Also, the loop response of the IC can be measured.

1.2.1 Input and Output Capacitors

C5 is provided for an additional input capacitor. This capacitor is not required for proper operation but can be used to reduce the input voltage ripple.

C7 and C8 are provided for additional output capacitors. These capacitors are not required for proper operation but can be used to reduce the output voltage ripple and to improve the load transient response. The total output capacitance must remain within the recommended range in the data sheet for proper operation.

1.2.2 Loop Response Measurement

The loop response of the TPS6282xEVM-005 can be measured by lifting both R1 and C3 and inserting a 50-Ω resistor in series with these two components to inject the measurement signal across. The results of this test are shown in Figure 2.

2 Setup

This section describes how to properly use the TPS6282xEVM-005.

2.1 Input/Output Connector Descriptions

J1, Pin 1 and 2 – VIN	Positive input connection from the input supply for the EVM.
J1, Pin 3 and 4 – S+/S–	Input voltage sense connections. Measure the input voltage at this point.
J1, Pin 5 and 6 – GND	Input return connection from the input supply for the EVM.
J2, Pin 1 and 2 – VOUT	Output voltage connection
J2, Pin 3 and 4 – S+/S–	Output voltage sense connections. Measure the output voltage at this point.
J2, Pin 5 and 6 – GND	Output return connection
J3 – PG/GND	The PG output appears on pin 1 of this header with ground on pin 2.
JP1 – EN	EN pin input jumper. Place the supplied jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC.
JP2 – PG Pullup Voltage	PG pin pullup voltage jumper. Place the supplied jumper on JP3 to connect the PG pin pullup resistor to V_{IN}. Alternatively, the jumper can be removed and a different voltage can be supplied on pin 2 to pull up the PG pin to a different level. This externally applied voltage must remain below 6 V.

2.2 Setup

To operate the EVM, set jumpers JP1 through JP2 to the desired position per Section 2.1. Connect the input supply to J1 and connect the load to J2.

3 TPS6282xEVM-005 Test Results

The TPS6282xEVM-005 was used to take all the data in *TPS6282x 2.4-V to 5.5-V, 1-, 2-, 3-A Step-Down Converter with 1% Accuracy*. See the device data sheet for the performance of this EVM.

Figure 1 shows the thermal performance of the EVM.

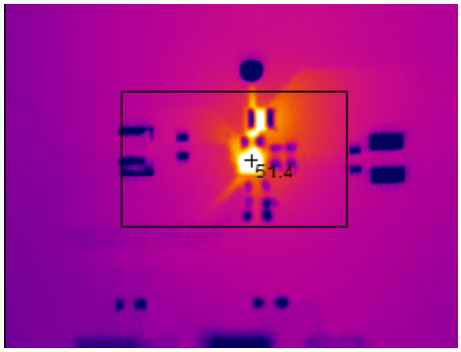

Figure 1. Thermal Performance (V_{IN} = 5 V, I_{OUT} = 3 A)

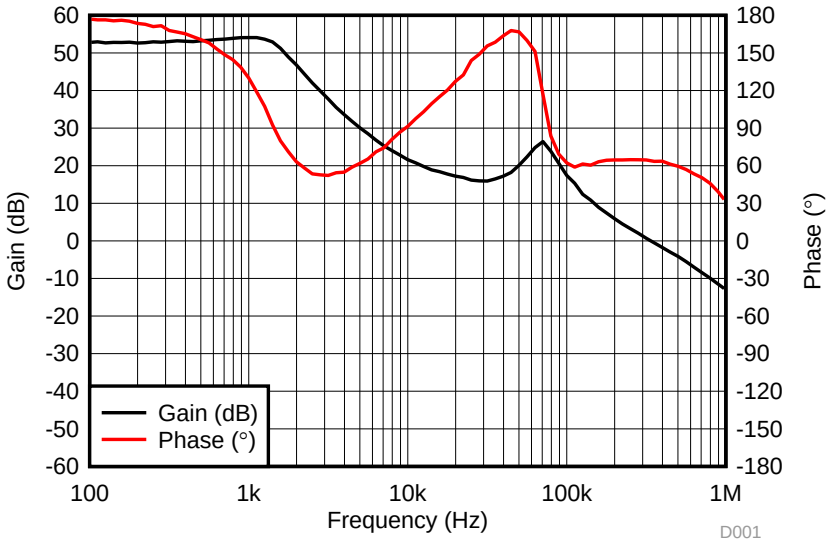

Figure 2. Loop Response Measurement (V_{IN} = 5 V, Load = 3 A)

4 Board Layout

This section provides the TPS6282xEVM-005 board layout and illustrations in Figure 3 through Figure 8. The Gerbers are available on the EVM product page: TPS62821EVM-005.

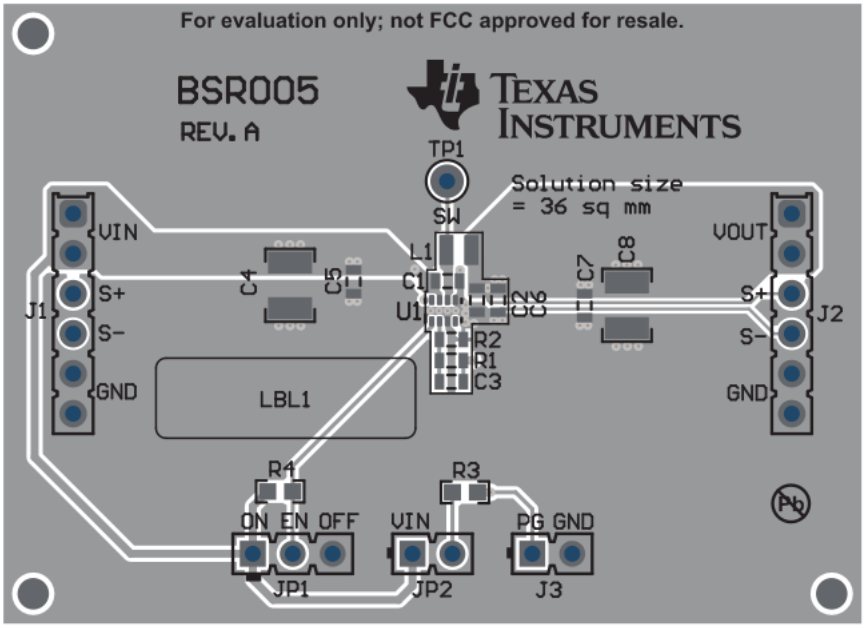

Figure 3. Top Assembly

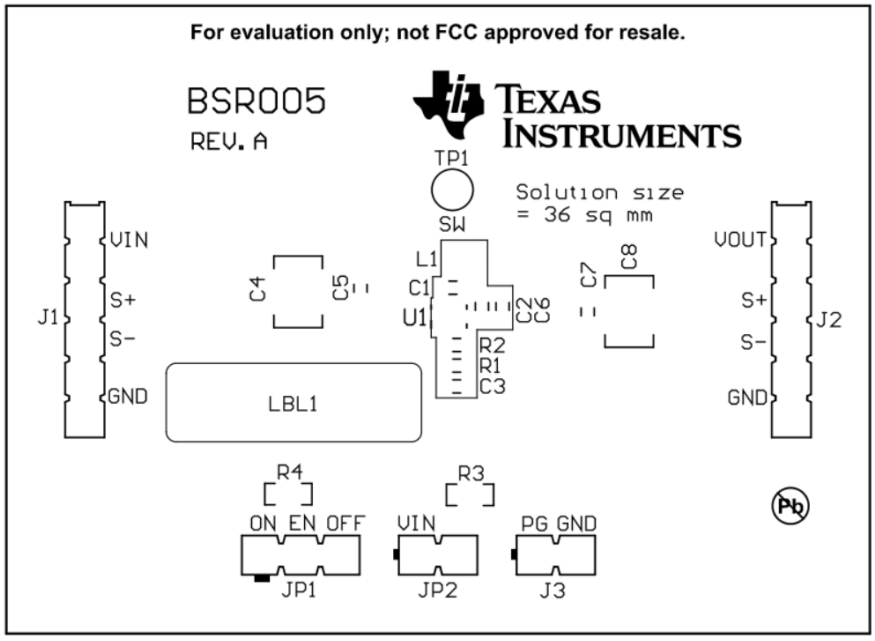

Figure 4. Top Overlay

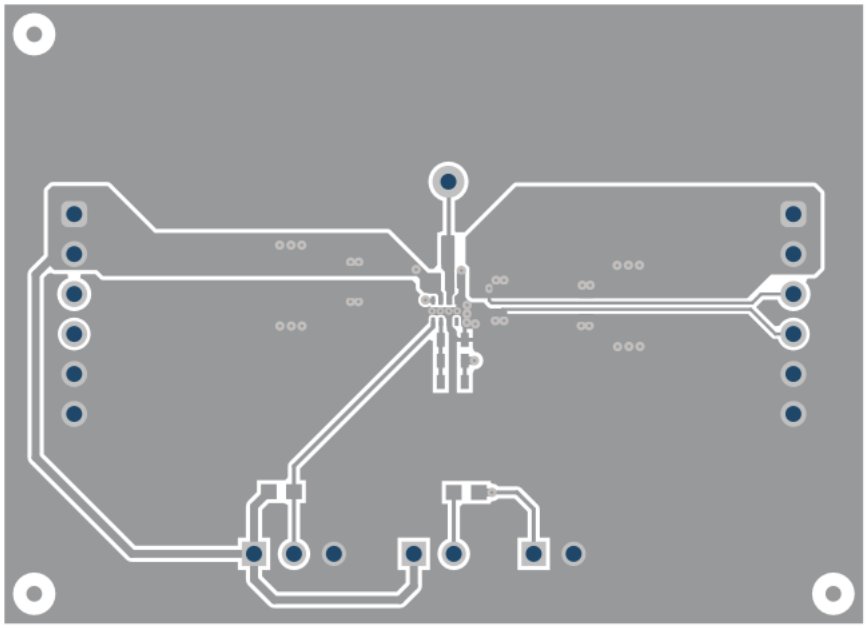

Figure 5. Top Layer

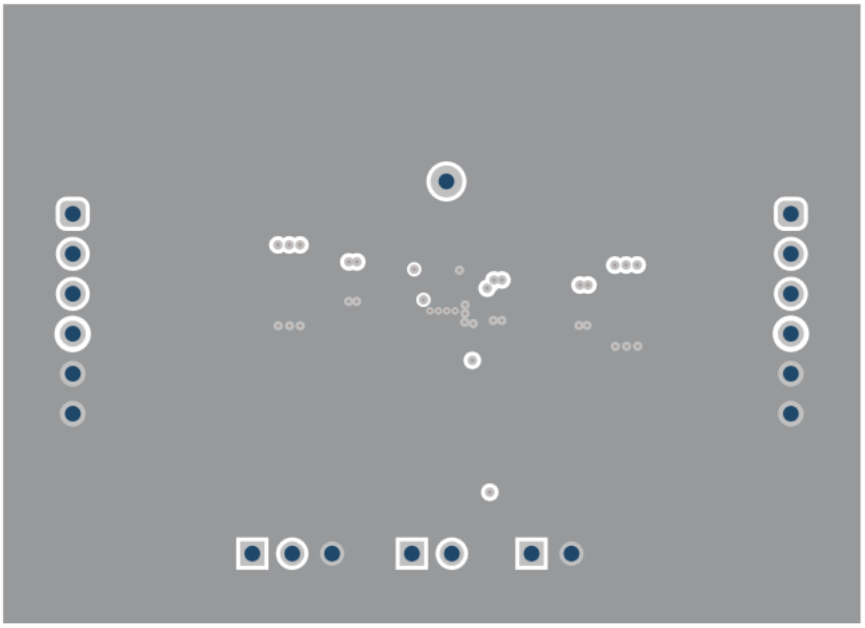

Figure 6. Signal Layer 1

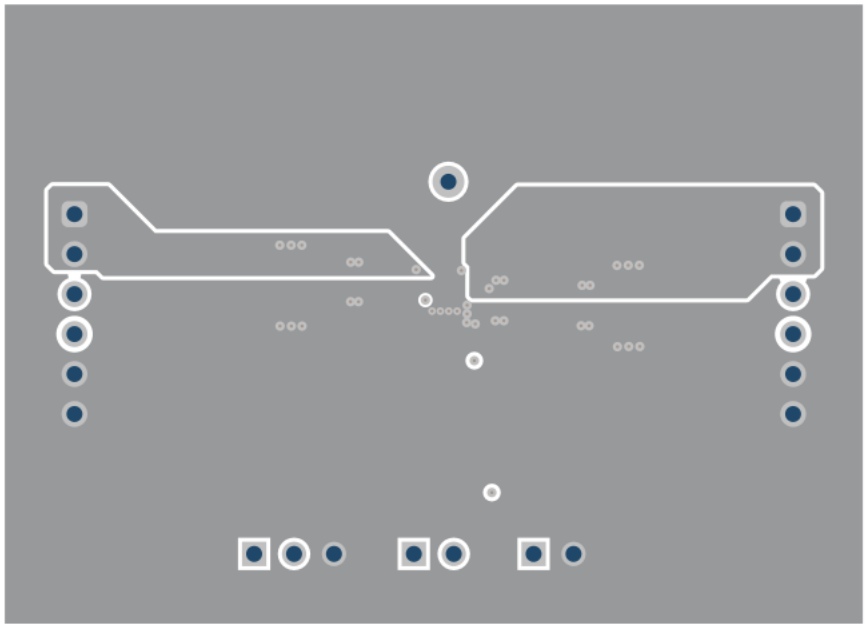

Figure 7. Signal Layer 2

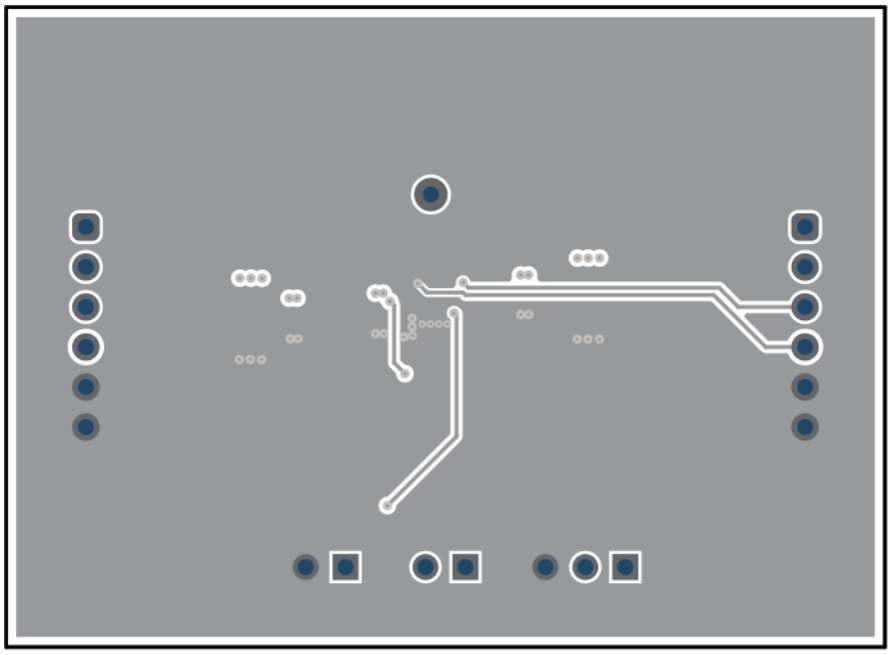

Figure 8. Bottom Layer

5 Schematic and Bill of Materials

This section provides the TPS6282xEVM-005 schematic and bill of materials (BOM).

5.1 Schematic

Figure 9 illustrates the EVM schematic.

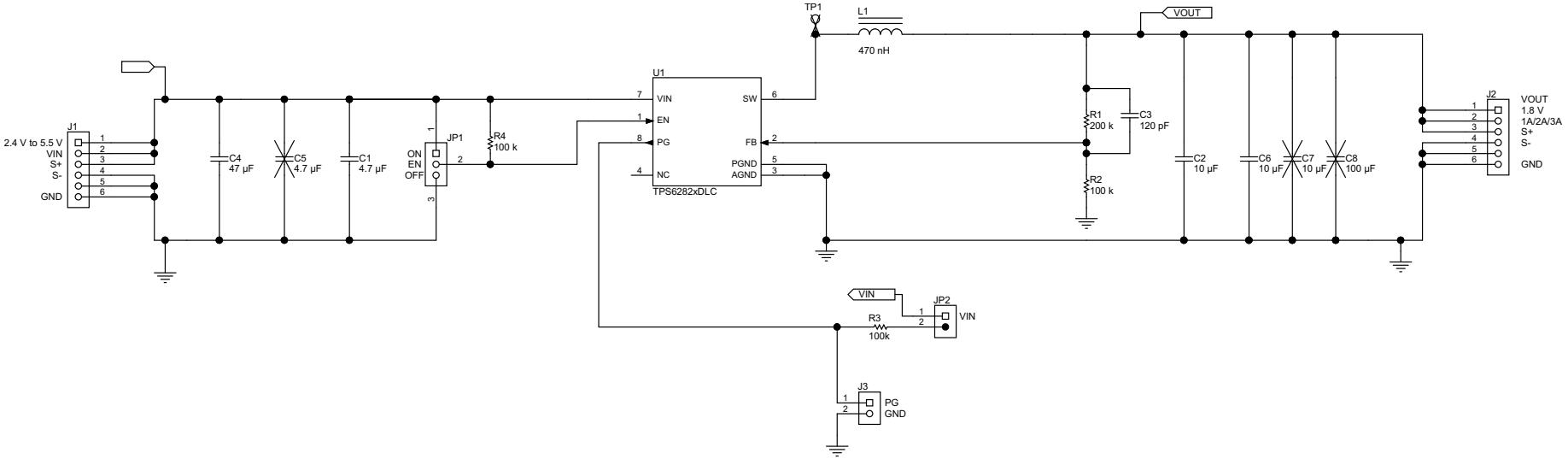

Figure 9. TPS6282xEVM-005 Schematic

5.2 Bill of Materials

Table 2 lists the BOM for this EVM.

Table 2. TPS6282xEVM-005 Bill of Materials

Count			Designator	Value	Description	Package Reference	Part Number	Manufacturer
-001	-002	-003						
1	1	1	C1	4.7uF	CAP, CERM, 4.7 µF, 6.3 V, +/- 10%, X7R, 0603	0603	JMK107BB7475MA-T	Taiyo Yuden
2	2	2	C2, C6	10uF	CAP, CERM, 10 µF, 10 V, +/- 20%, X7R, 0603	0603	GRM188Z71A106MA73D	Murata
1	1	1	C3	120pF	CAP, CERM, 120 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603	Std	Std
1	1	1	C4	47uF	CAP, CERM, 47 µF, 10 V, +/- 20%, X7R, 1210	1210	GRM32ER71A476ME15L	Murata
1	1	1	L1	470nH	Inductor, Shielded, 470 nH, 3.6 A, 0.032 ohm, SMD	2016	DFE201610E-R47M=P2	Murata
1	1	1	R1	200k	RES, 200 k, 1%, 0.1 W, 0603	0603	Std	Std
3	3	3	R2, R3, R4	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	Std	Std
1	0	0	U1		2.4-V to 5.5-V, 1-, 2-, 3-A Step-Down Converter with 1% Accuracy	2x1.5mm	TPS62821DLC	Texas Instruments
0	1	0	U1		2.4-V to 5.5-V, 1-, 2-, 3-A Step-Down Converter with 1% Accuracy	2x1.5mm	TPS62822DLC	Texas Instruments
0	0	1	U1		2.4-V to 5.5-V, 1-, 2-, 3-A Step-Down Converter with 1% Accuracy	2x1.5mm	TPS62823DLC	Texas Instruments

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      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      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*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

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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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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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10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

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