TPS22981EVM

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1 Introduction

The Texas Instruments TPS22981EVM evaluation module (EVM) helps designers evaluate the operation and performance of the TPS22981: 3.3 V to 18 V Mux with over current limit. The TPS22981 is a current-limited power mux providing a connection to a peripheral device from either a low voltage supply (3.15 V up to 3.6 V) or a high voltage supply (4.5 V up to 18 V). The desired output is selected by digital control signals. The high voltage (VHV) and low voltage (V3P3) switch current limits are set with external resistances. Once the current limit is reached, the TPS22981 will control the switch to maintain the current at this limit.

The EVM contains one TPS22981 – 3.3 V to 18 V Mux with over current limit (See Table 1).

Table 1. Device and Package Configurations

Converter	IC	Package
U1	TPS22981RGPR	RGP

2 Setup

This section describes the jumpers and connectors on the EVM as well and how to properly connect, set up and use the TPS22981EVM.

2.1 Power Supply Inputs

Table 2 shows the voltage input that should be applied in different places of the EVM.

Table 2. Input Supply Configuration

Device	V3P3 TP11	VHV TP7
TPS22981	3.15 – 3.60 V	4.50 – 18.00 V
TPS22981	3.15 – 3.60 V	4.50 – 18.00 V

See Table 2 for the EVM correct input supply voltage setting. Connect the V3P3 +3.3 V input power supply positive lead to TP11 (V3P3 Force) and the return lead to TP2 GND. Connect the VHV +5 V input power supply positive lead to TP7 (VHV Force) and the return lead to TP15 GND.

2.2 Jumper Settings

There are four digital signals which can be set with jumpers as defined in Table 3. These signals can be set to a value of “0” or “1” by setting the jumpers according to the marking on the board. See the TPS22981 datasheet for more information on the functionality of these signals.

Table 3. Digital Signal Jumpers

Jumper	Name
J7	EN
J8	S0
J9	HV_EN
J10	ENHVU

There are two external resistances settings per mode that can be configured by setting a jumper in the correct position.

- For V3P3 mode, set J1 (402 kΩ) or J2 (80.6 kΩ):
  - 402 kΩ will limit the current to around 100 mA on the output.
  - 80.6 kΩ will limit the current to around 496 mA on the output.
- For VHV, S3 mode, set J3 (402 kΩ) or J4 (80.6 kΩ):
  - 402 kΩ will limit the current to around 100 mA on the output
  - 80.6 Ω will limit the current to around 496 mA on the output.
- For VHV, S0 mode (S0 = 1), set J5 (26.7 kΩ) or J6 (80.6 kΩ):
  - 26.7 kΩ will limit the current to around 1.5 A on the output.
  - 80.6 kΩ will limit the current to around 496 mA on the output

2.3 Measuring Output Voltage

Use a meter to measure the output voltage of the UUT. Connect the positive input of the voltmeter to TP8 (OUT Force) and the negative input of the meter to TP16 (GND). If HV_EN is set to 0V, you will measure the V3P3 input voltage at the output. If HV_EN is set to 3.3V, you will measure the VHV input voltage at the output.

2.4 Current Limit

To simulate a current limit condition, a high power resistor could be used in the output (between TP8 and TP16). This will cause TPS22981 to limit the current based on the external resistor settings.

3 Board Layout

Figure 1, Figure 2 and Figure 3 show the board layout for the TPS22981EVM PCB. The EVM offers resistors, and jumpers to program different current limits.

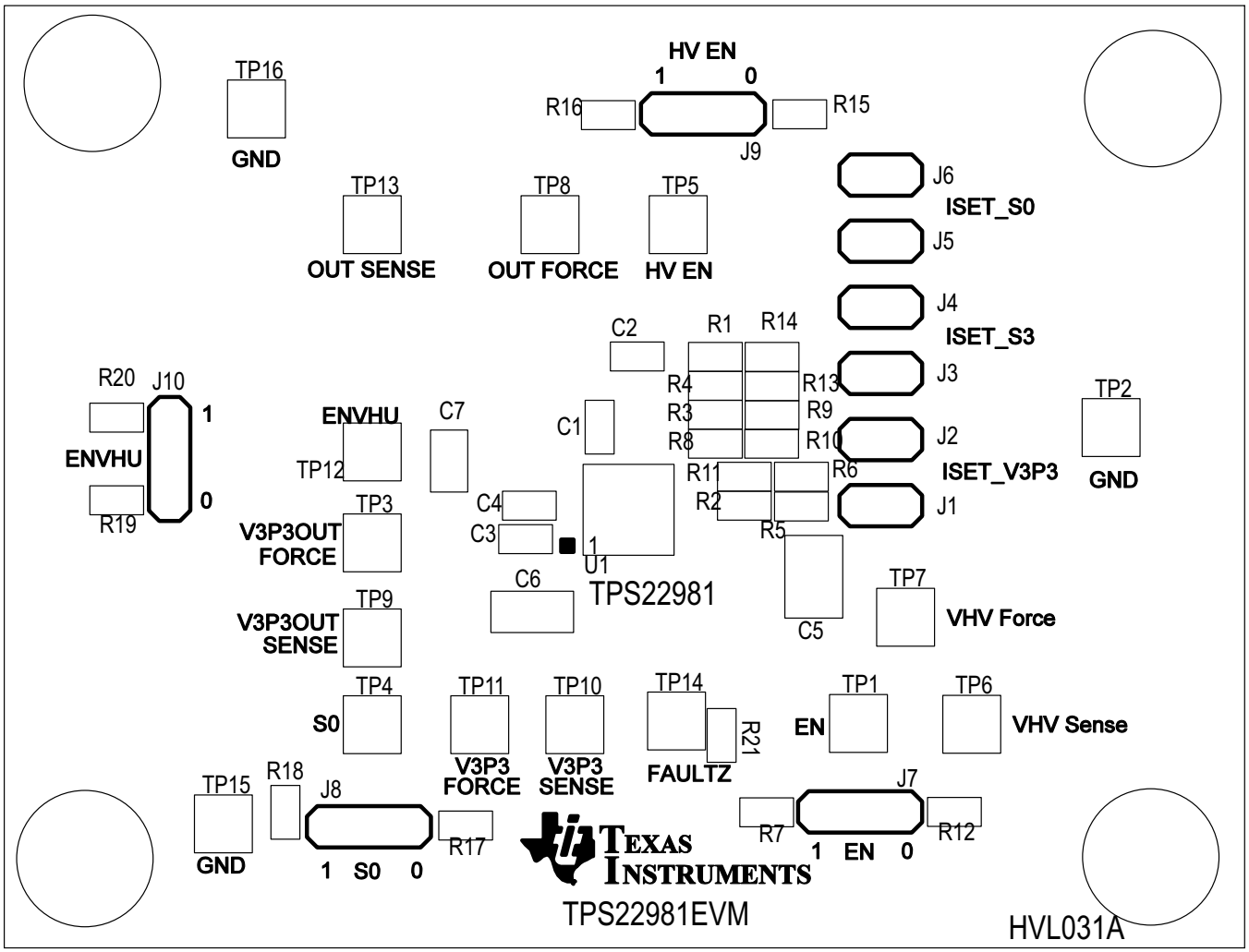

Figure 1. Top Layer Assembly

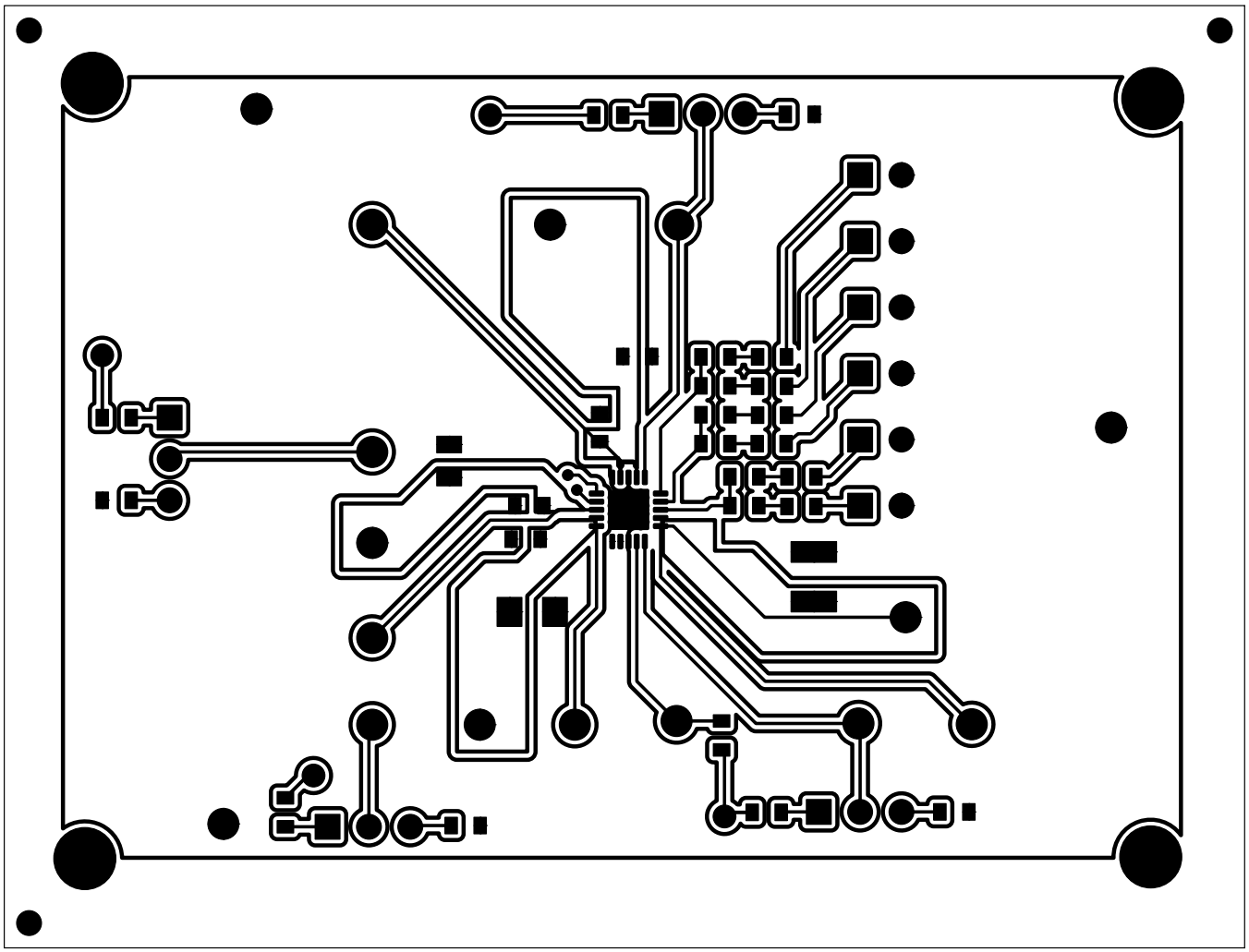

Figure 2. Top Layer Routing

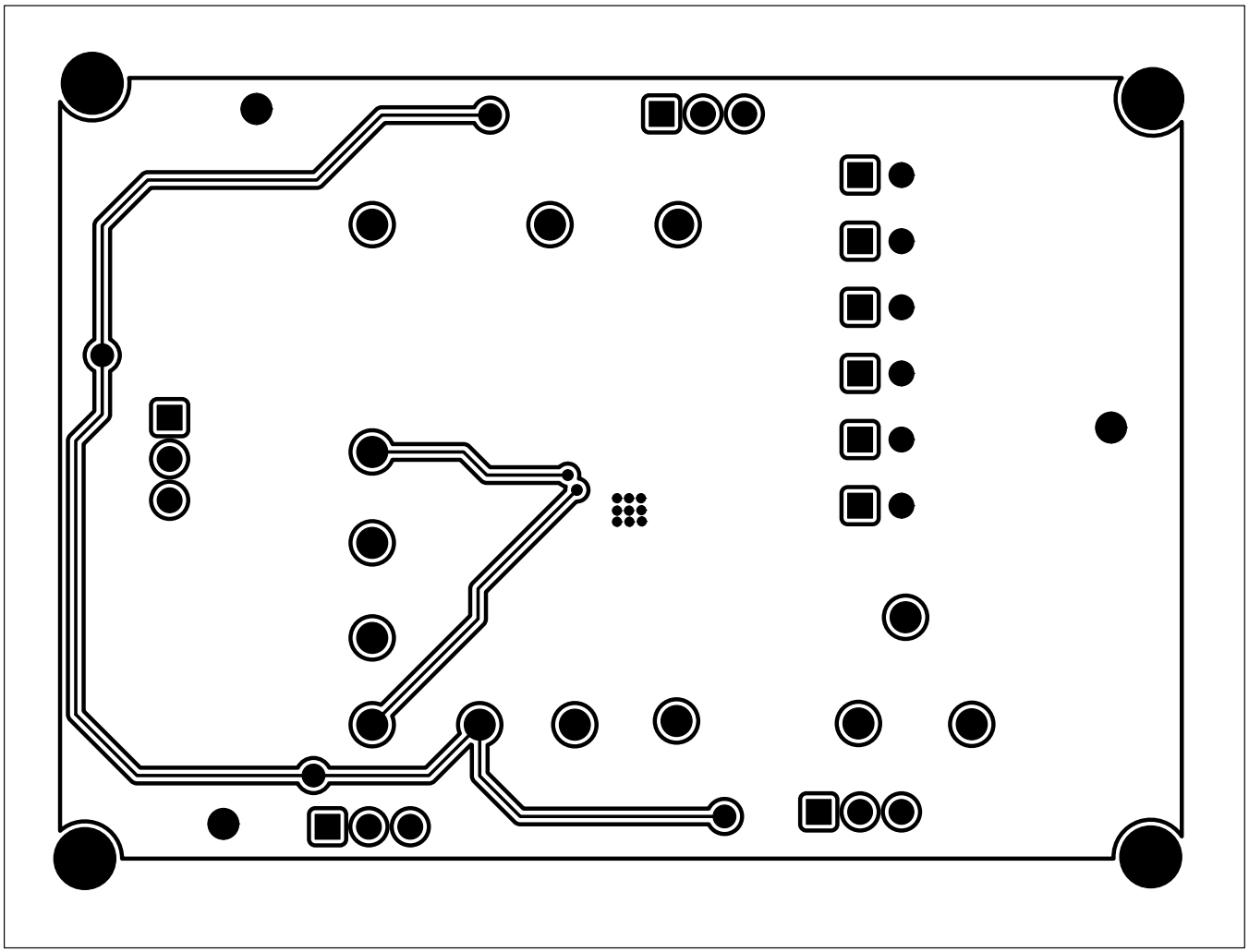

Figure 3. Bottom Layer Routing

4 Schematic

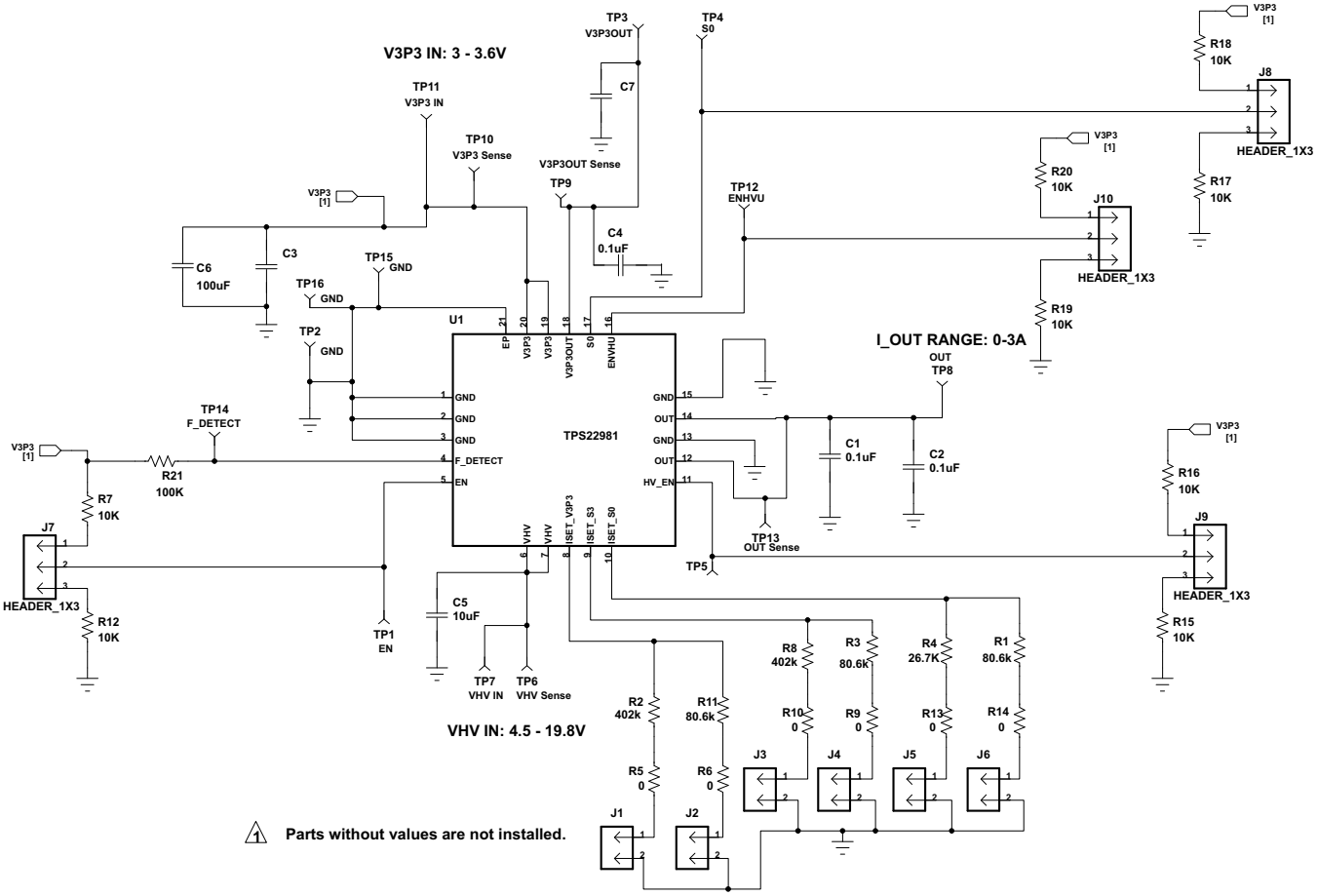

Figure 4. TPS22981EVM Schematic

Table 4. TPS22981EVM Bill of Materials[1][2][3][4]

Qty	Reference	Value	Description	Size	Part Number	Manufacturer
1		HVL031	PCB	2.28 x 3 x .062 in	HVL031	Any
3	C1, C2, C4	0.1uF	Capacitor, Ceramic, 50V, X7R,10%	0603	Std	Std
0	C3, C7	DNP	Capacitor, Ceramic Chip, 6.3V, ±10%	0603		
1	C6	100uF	Capacitor, Ceramic, 6.3V, X5R, 20%	1206	Std	Std
1	C5	10uF	Capacitor, Ceramic, 50V, X5R, 10%	1210	UMK325BJ106KM-T	Taiyo Yuden
1	U1	TPS22981RGP	IC, 3.3V TO 18V MUX WITH OVERCURRENT LIMIT	QFN	TPS22981RGP	TI
6	J1-6		Header, Male 2pin, 100mil spacing	.1 inch	PEC02SAAN	Sullins
4	J7-10		Header, Male 3-pin, 100mil spacing,	.1 inch	PEC03SAAN	Sullins
6	R5, R6, R9, R10, R13, R14,	0	Resistor, Chip,1/10W, 1%	0603	Std	Std
8	R7, R12, R15, R16, R17, R18, R19, R20	10K	Resistor, Chip,1/10W, 1%	0603	Std	Std
1	R4	26.7K	Resistor, Chip,1/10W, 1%	0603	Std	Std
3	R1, R3, R11	80.6K	Resistor, Chip,1/10W, 1%	0603	Std	Std
1	R21	100K	Resistor, Chip,1/10W, 1%	0603	Std	Std
2	R2, R8	402K	Resistor, Chip,1/10W, 1%	0603	Std	Std
13	TP1, TP3-14	RED	Test Point, Red, Thru Hole Color Keyed	.1mil	5000	Keystone
3	TP2, TP15, TP16	BLACK	Test Point, Black, Thru Hole Color Keyed	.1mil	5001	Keystone
10	NA	NA	SHUNT, 100mil, BLACK	.1 inch	929950-00	3M

(1) These assemblies are ESD sensitive, ESD precautions shall be observed.
(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.

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For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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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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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