

EVM User's Guide: TMUXHS5212-EVM

TMUXHS5212 Evaluation Module

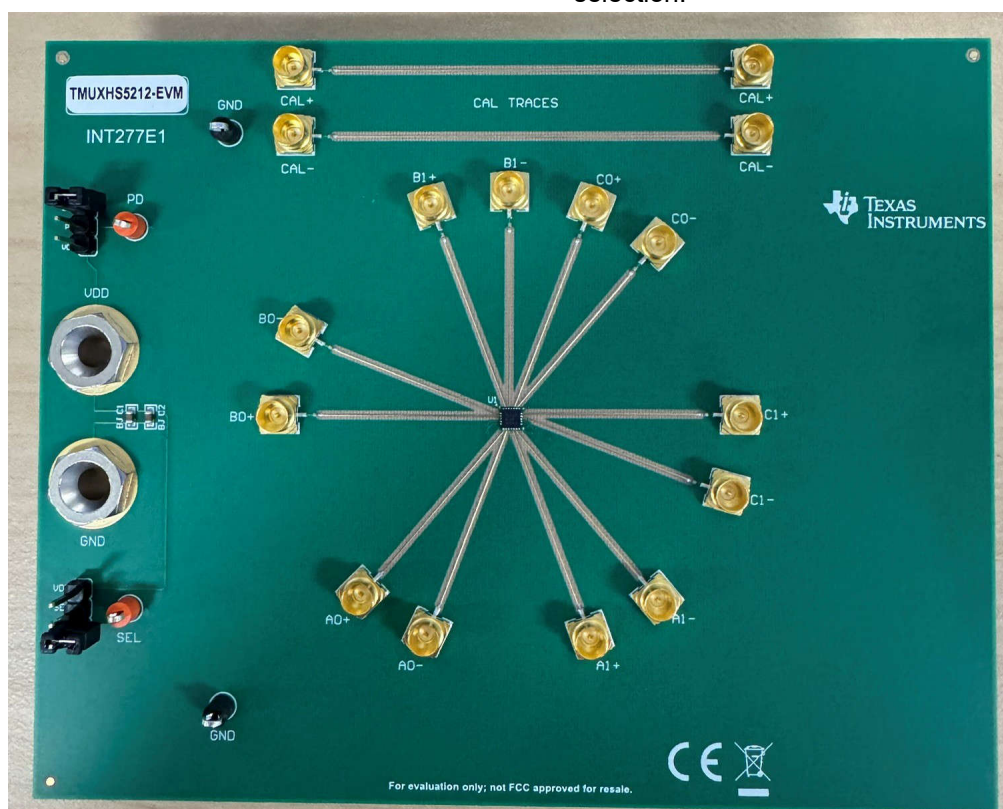


Description

The TMUXHS5212-EVM is used to evaluate the high-speed signaling performance of the TMUXHS5212. The evaluation module (EVM) comes with a soldered unit. The EVM allows for engineers to evaluate the signal performance passing through the multiplexer compared to just a trace. The I/Os are tied through SMP connectors and can be controlled by test points or headers correlated to the logic of the device.

Features

- VDD and GND banana jack plug ins for power supply connection option with decoupling capacitors (1 μ F 0603, 10 μ F 0603).
- Decoupling capacitors close to the DUT (0.01 μ F 0402, 0.1 μ F 0402).
- Twelve SMP connectors for I/O signaling.
- Four additional SMP connectors to evaluate signal performance without the device.
- PD and SEL test points for logic control.
- Two GND test points for easier connections.
- Two headers with jumpers for simple logic selection.



TMUXHS5212-EVM (Top View)

1 Evaluation Module Overview

1.1 Introduction

This EVM describes the TMUXHS5212-EVM evaluation module (EVM) and the intended use. The board allows for quick prototyping and characterization of TI's TMUXHS5212 high-speed multiplexer.

The EVM includes the following additional features:

- Banana jack plug ins to power up the device.
- SMP connectors on the I/Os for high-speed signaling.
- Two 3-pin headers for logic control and channel toggling.
- Logic and GND test points for an additional way to control the device.

1.2 Kit Contents

The EVM kit includes the following :

- (1) TMUXHS5212-EVM

1.3 Specification

The TMUXHS5212-EVM is used for evaluating the TMUXHS5212. The EVM allows for the powering and grounding of the DUT through the banana jack plug ins. Two headers are included for setting the logic of the device and toggling the channels, and SMP connectors for I/O signaling calibration.

The EVM also has logic and ground test points for controlling the DUT and providing more connection flexibility on the board.

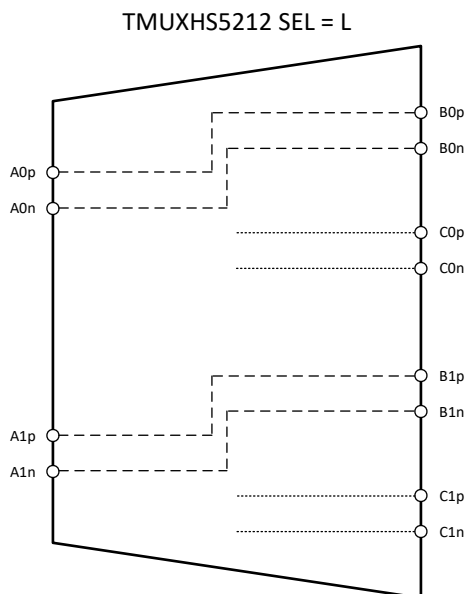


Figure 1-1. TMUXHS5212 SEL = L Simplified Circuit

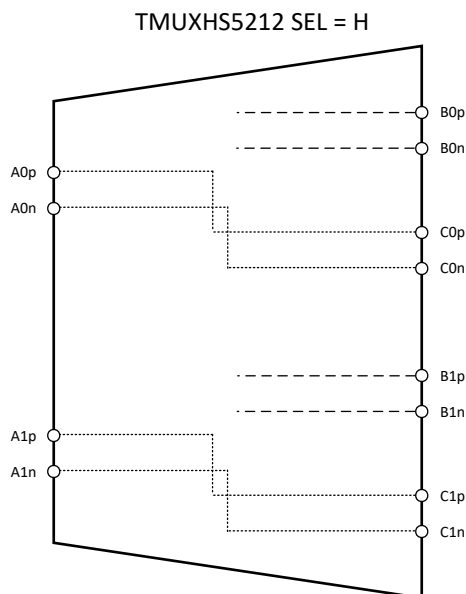


Figure 1-2. TMUXHS5212 SEL = H Simplified Circuit

1.4 Device Information

The TMUXHS5212 is a passive differential 2-channel 2:1 high-speed multiplexer. The logic control is done through GPIO with the active low PD pin enabling channel selection, while the SEL pins allow for toggling between the channels B and C.

The TMUXHS5212 is designed to pass PCIe Gen 5 signals with a supply operation of 1.65V to 1.95V.

2 Hardware

2.1 Power Requirements

TMUXHS5212-EVM requires a 1.65V to 1.95V supply provided through the banana jack plugins. The voltage supply of the device must not be left floating or grounded during operation.

2.2 Headers and SMP Connectors Information

The TMUXHS5212-EVM has two 3-pin headers and sixteen SMP connectors to set up the logic control and pass high speed signals. The EVM also allows for signal calibration and a comparison in signal integrity performance between the device and a simple trace. The following is a description of each header and SMP connector.

1. PD J Header

Header PD J connects the PD pin to the voltage supply or to ground via a jumper. [Figure 2-1](#) shows header PD J.

- To connect to VDD, short the J2-3 location on the header. The VDD banana jack plugin is now pulling up the PD pin.
- To connect to ground, short the J2-1 location on the header. The GND banana jack plugin is now pulling down the PD pin and activating the logic control of the device.

2. SEL J Header

Header SEL J connects the SEL pin to the voltage supply or to ground via a jumper. [Figure 2-1](#) shows header SEL J.

- To connect to VDD, short the J2-1 location on the header. The VDD banana jack plugin is now pulling up the SEL pin connecting channel A to channel C.
- To connect to ground, short the J2-3 location on the header. The GND banana jack plugin is now pulling down the SEL pin connecting channel A to channel B.

3. Calibration Traces

The SMP connectors are placed in a way to simulate a perfect differential pair. They can be used to compare high speed signal performance between the device and an ideal condition. This is for customer evaluation of the TMUXHS5212, to see its effect on signal performance and attenuation.

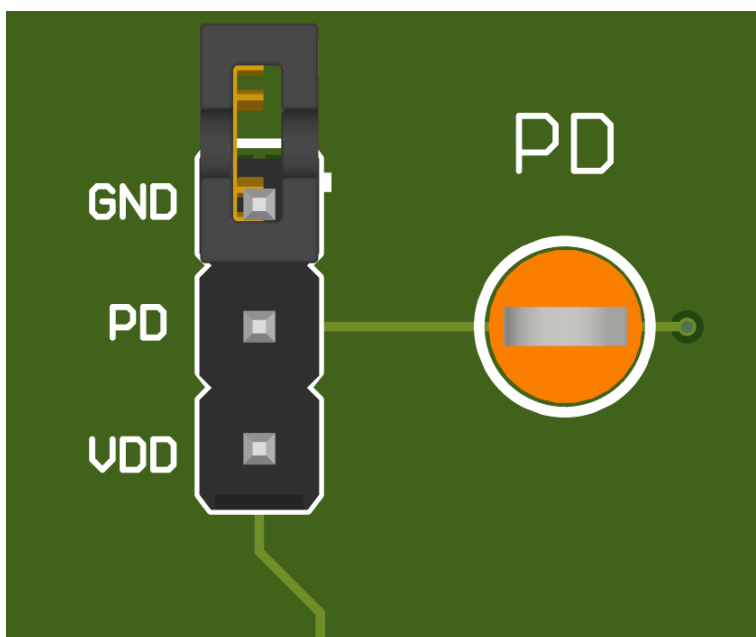


Figure 2-1. Header PD J: J-1(GND), J-2(Connection to device PD), J-3 (VDD)

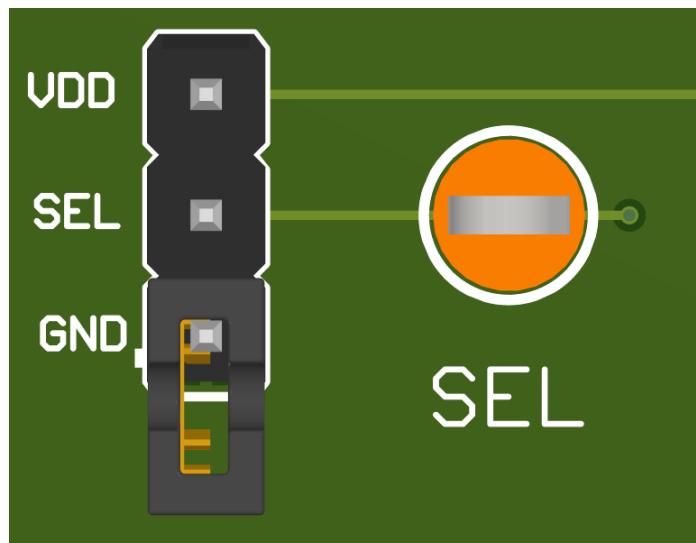


Figure 2-2. Header SEL J: J-1(VDD), J-2(Connection to device SEL), J-3 (GND)

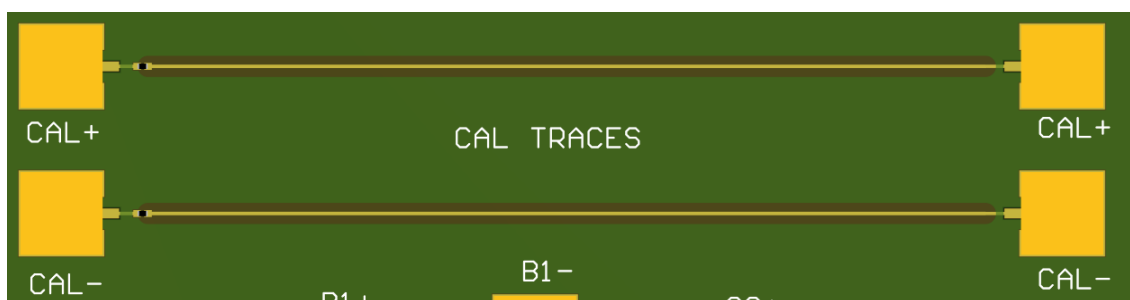


Figure 2-3. Calibration Traces

2.3 Test Points

The board has a total of 4 test points, 2 GND and 2 Logic Control.

Test Point ID	Description	Signal
PD	Orange TP	PD
SEL	Orange TP	SEL
GND	Black TP	GND
GND	Black TP	GND

3 Hardware Design Files

The following section includes hardware design files for TMUXHS5212-EVM . This section includes the board level schematic, PCB layout, and Bill of materials (BOM).

3.1 Schematics

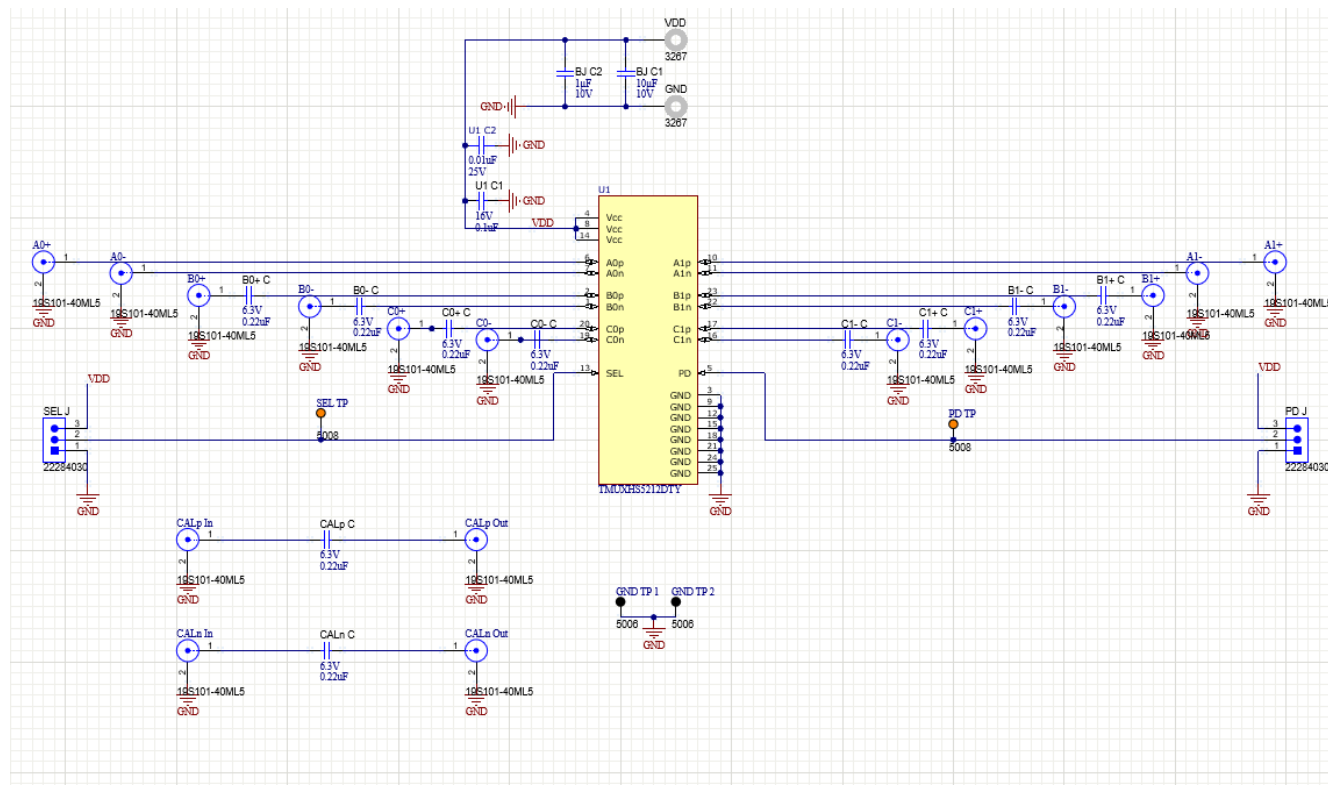


Figure 3-1. TMUXHS5212-EVM Schematic

3.2 PCB Layouts

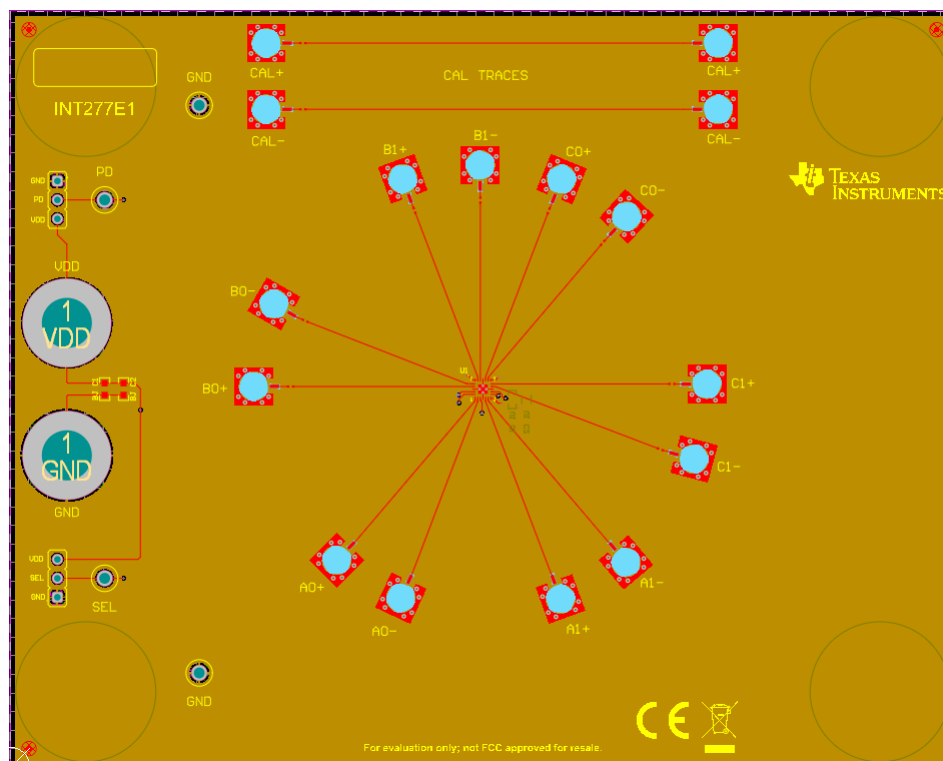


Figure 3-2. TMUXHS5212-EVM Top Layer Layout

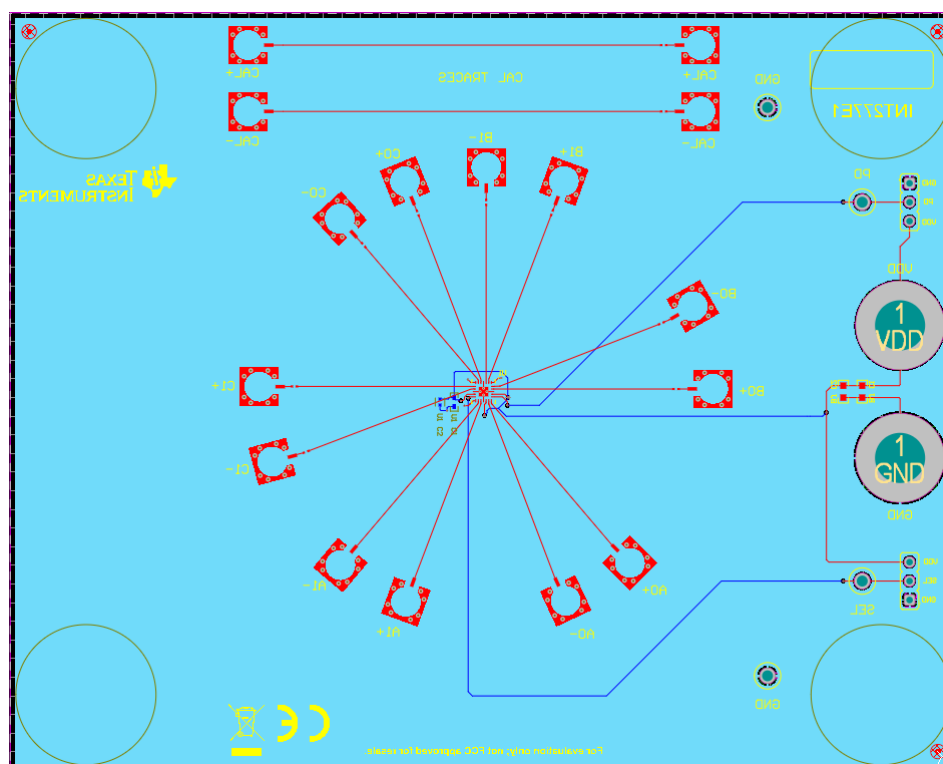


Figure 3-3. TMUXHS5212-EVM Bottom Layer Layout

3.3 Bill of Materials (BOM)

Table 3-1. Bill of Materials

Designator	Qty	Value	Description	Manufacturer	Part Number
A0-, A0+, A1-, A1+, B0-, B0+, B1-, B1+, C0-, C0+, C1-, C1+, CALn In, CALn Out, CALp In, CALp Out	16		Connector, RF 50Ω, SMT	Rosenberger	19S101-40ML5
B0- C, B0+ C, B1- C, B1+ C, C0- C, C0+ C, C1- C, C1+ C, CALn C, CALp C	10	0.22μF	CAP, CERM, 0.22uF, 6.3V, +/- 20%, X5R, 0201	MuRata	GRM033R60J224ME90
B1, B2, B3, B4	4		Bumper Cylindrical, Dome 0.720" Dia (18.30mm) Polyurethane Black	Essentra Components	RBS-37BK
BJ C1	1	10μF	CAP, CERM, 10μF, 10V, +/- 10%, X5R, 0603	MuRata	GRM188R61A106KE69D
BJ C2	1	1μF	CAP, CERM, 1μF, 10V, +/- 10%, X7R, 0603	Taiyo Yuden	LMK107B7105KA-T
GND TP 1, GND TP 2	2		Test Point, Compact, Black, TH	Keystone Electronics	5006
GND, VDD	2		Standard Banana Jack, Uninsulated	Pomona Electronics	3267
J1, J2	2		CONN JUMPER S2 (1 × 2) Position Shunt Connector Black Open Top 0.100" (2.54mm) GoldHORTING .100" GOLD	Sullins	QPC02SXGN-RC
PD J, SEL J	2		Header, 2.54mm, 3x1, Tin, TH	Molex	22284030
PD TP, SEL TP	2		Test Point, Compact, Orange, TH	Keystone Electronics	5008
TMUXHS5212-EVM	1		Thermal Transfer Printable Labels, 0.650" W × 0.200" H - 10,000 per roll	Brady	THT-14-423-10
U1	1		Two-Channel Differential 2:1 Mux or 1:2 Demux	Texas Instruments	TMUXHS5212DTY
U1 C1	1	0.1μF	CAP, CERM, 0.1uF, 16V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	Kemet	C0402C104K4RACAUTO
U1 C2	1	10nF	Cap Ceramic 0.01uF 25V X7R 10% SMD 1.0 × 0.5mm 125 C Paper T/R	KEMET	C0402C103K3RACTU

4 Additional Information

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NOTE:

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3 Regulatory Notices:

3.1 United States

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.

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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 instructions, 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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<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

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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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