

LP5899 SPI-Compatible Connectivity Evaluation Module for LP589x Device Family

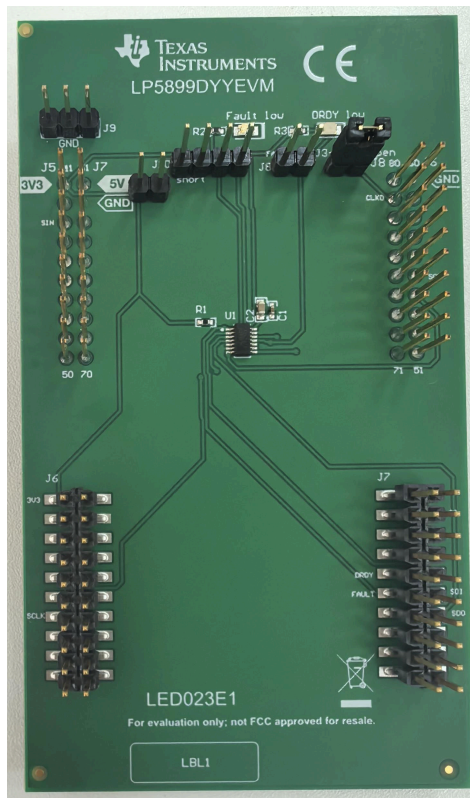


Description

The LP5899 SPI-compatible connectivity evaluation module enables the LP589x device family to be controlled using a standard SPI controller. The device features an internal oscillator to generate the continuous clock required by the LP589x device family. Jitter can be added to the continuous clock for EMI enhancement. The transmitted data is aligned to the continuous clock to maintain the timing requirements of the CCSI interface. LP5899 incorporates reporting of faults in both the LP589x daisy chain and LP5899 internal. Data transmission of register and VSYNC commands to the LP589x daisy chain is CRC protected by LP5899. In addition, the data line is guarded by LP5899 for stuck-at faults.

Features

- Operating voltage VCC range: 2.5V to 5.5V
- SPI peripheral
 - Data transfer rate up to 20MHz
 - Support multiple peripherals with one controller
- Continuous Clock Serial Interface (CCSI) Controller
 - Data transfer rate up to 20MHz
 - Programmable clock jitter for EMI enhancement
- Diagnostics
 - Open-drain FAULT pin
 - SPI communication loss detection
 - CRC for SPI communication
- Data ready interrupt for availability of data



LP5899DYEEVM (Top View)

1 Evaluation Module Overview

1.1 Introduction

This user's guide provides detailed testing instructions for the LP5899 evaluation module (EVM). Also included are descriptions of the necessary equipment, equipment setup, procedures, the printed-circuit board layouts, schematics, and the bill of materials (BOM). Throughout this user's guide, the abbreviation EVM, LP5899EVM, and the term evaluation module are synonymous with the BQ25188 evaluation module, unless otherwise noted.

Figure 1-1 shows the bottom side of the LP5899EVM board.

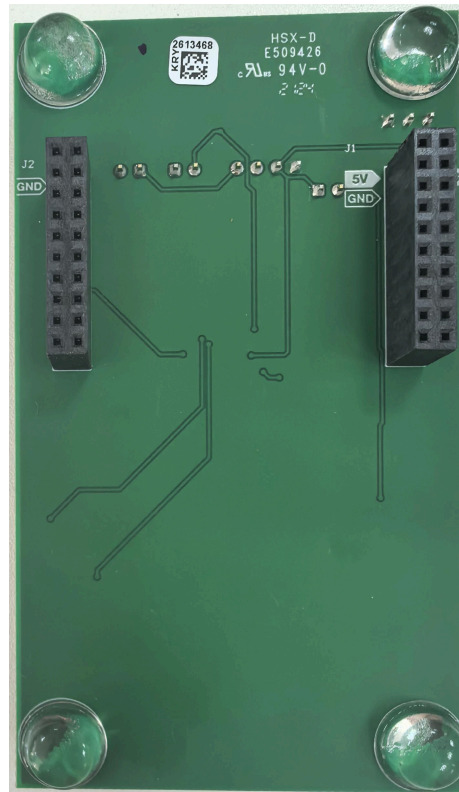


Figure 1-1. LP5899DYEEVM (Bottom View)

1.2 Kit Contents

Table 1-1 provides kit contents.

Table 1-1. List of Kit Contents

Item	Kit Content
1	LP5899EVM Board

1.3 Specification

Figure 1-2 shows the simplified hardware connection between LAUNCHXL-F280039C, LP5899EVM and LP5891Q1EVM.

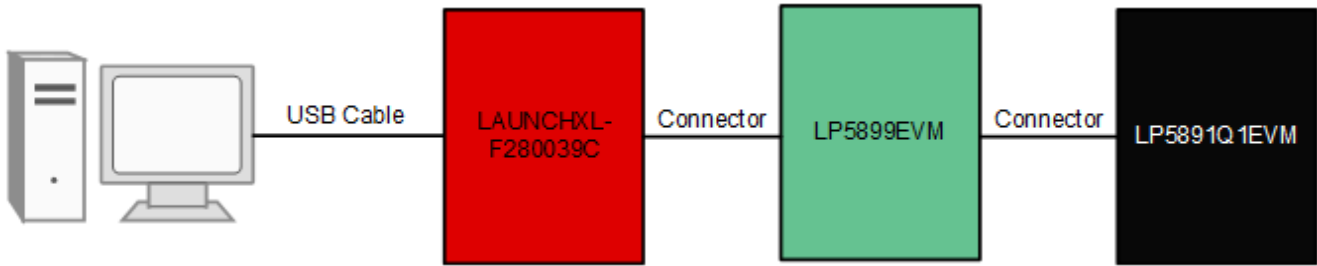


Figure 1-2. Simplified Hardware Connection

Figure 1-3 shows the communication diagram and LP5899EVM is the connectivity IC between LAUNCHXL-F280039C and LP5891Q1EVM.

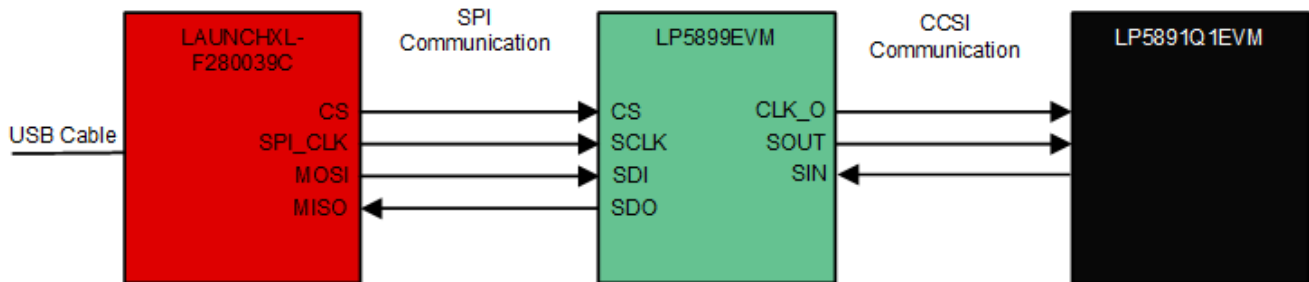


Figure 1-3. Communication Diagram

1.4 Device Information

Table 1-2 provides the list of devices on the EVM board and describe the function.

Table 1-2. Device information

Item	Details	Function
1	LP5899	SPI compatible connectivity for LP589x Device Family
2	Red LED	Display Fault
3	Yellow LED	Display Readback data ready

2 Hardware

2.1 Power Requirements

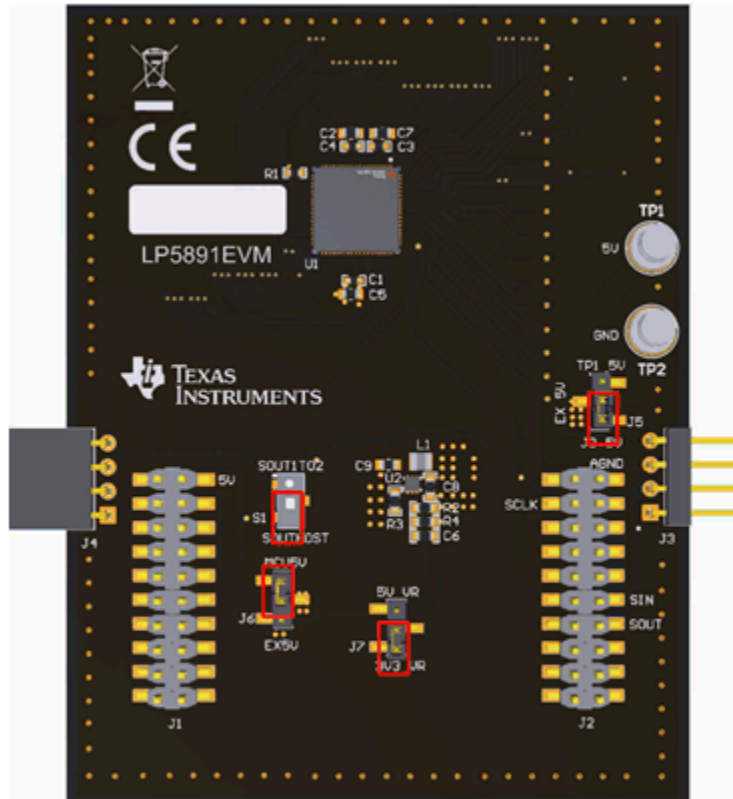
3V3 power supply is request to power on the LP5899, and can be supplied by LAUNCHXL-F280039C board by connector.

2.2 Setup

LP5899EVM is the connectivity IC between MCU and LP589x Family LED Driver. This section provides the guidance to use LP5899EVM to control LP5891Q1EVM by SPI.

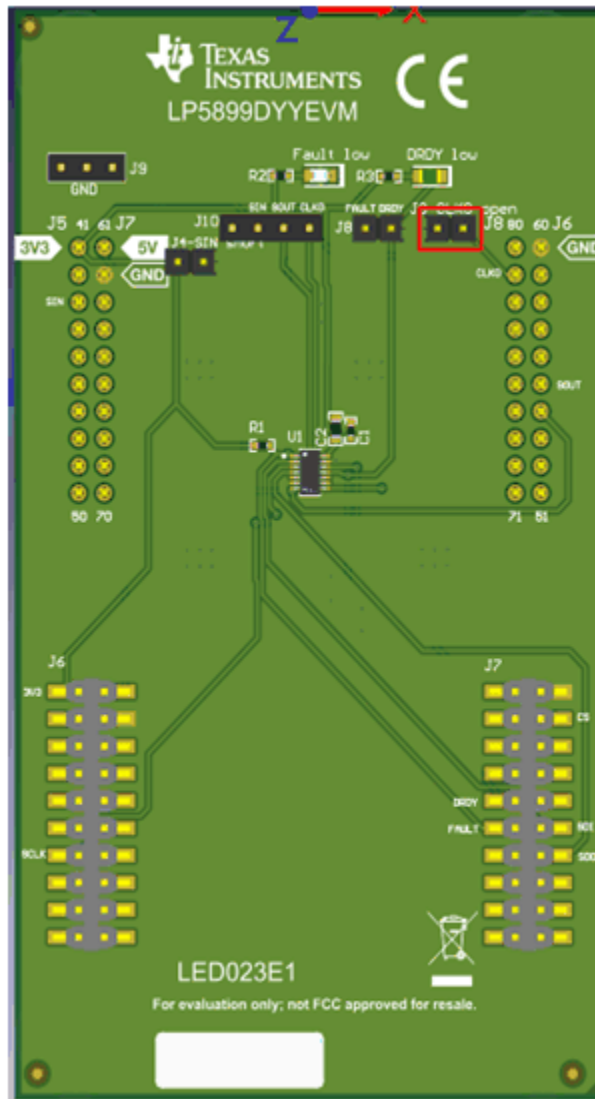
Following the suggested jumper setting, the board can be evaluated by USB power directly and does not need an external power supply. Single LP5891EVM can be quickly set up and tested by following these steps:

1. Following the jumper setting in [Figure 2-1](#) and [Figure 2-2](#) .



2.  Connect the Jumper

Figure 2-1. LP5891EVM Jumper Connection



 Connect the Jumper

Figure 2-2. LP5899EVM Jumper Connection

3. Connect the BoosterPack™ connectors (J5, J6, J7, J8) on the LP5899EVM with the BoosterPack connectors (J1, J2) on the LP5891Q1EVM as shown in the [Figure 2-3](#).

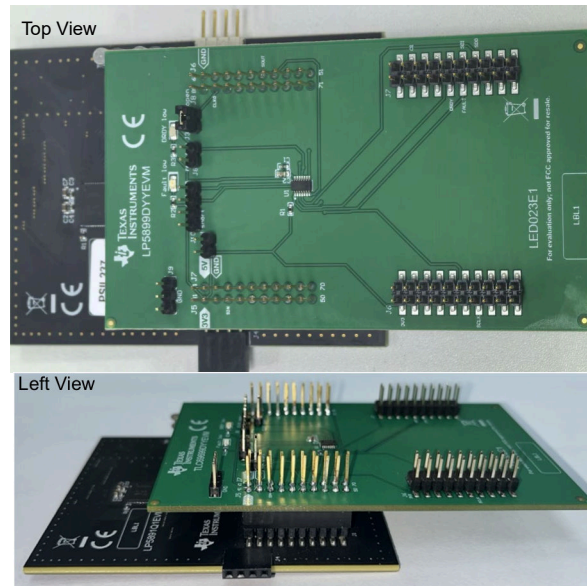


Figure 2-3. LP5899EVM and LP5891EVM Connection

4. Connect BoosterPack connectors (J1, J2, J3, J4) on the LAUNCHXL-F280039C with the BoosterPack connectors (J3, J4) on the LP5899EVM as shown in the [Figure 2-4](#).

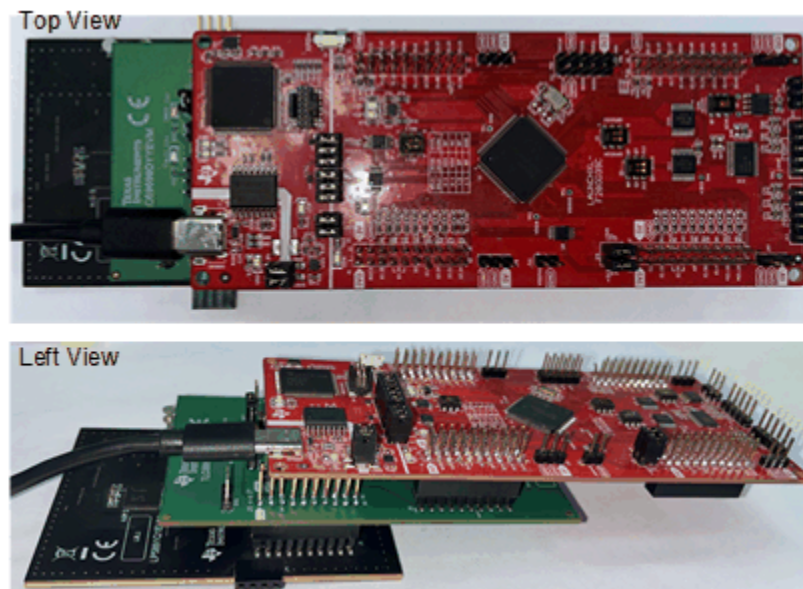


Figure 2-4. LAUNCHXL-F280039C and LP5899EVM Connection

5. Power the LAUNCHXL-F280039C through the USB cable.
6. Download the code into the LAUNCHXL-F280039C with TI Code Composer Studio™ software.

3 Software

3.1 Software Description

To set up the software for the TMS320F280039C LaunchPad, follow the steps documented in the sample code user's guide which can be downloaded from [LP589x\(-Q1\)/TLC698x Sample Code User's Guide](#). This user's guide also provides guidance on software setup for LED fault diagnostics, multiple CCSI buses, cascading devices, and animation control.

4 Hardware Design Files

4.1 Schematics

Figure 4-1 and Figure 4-2 show the EVM schematic.

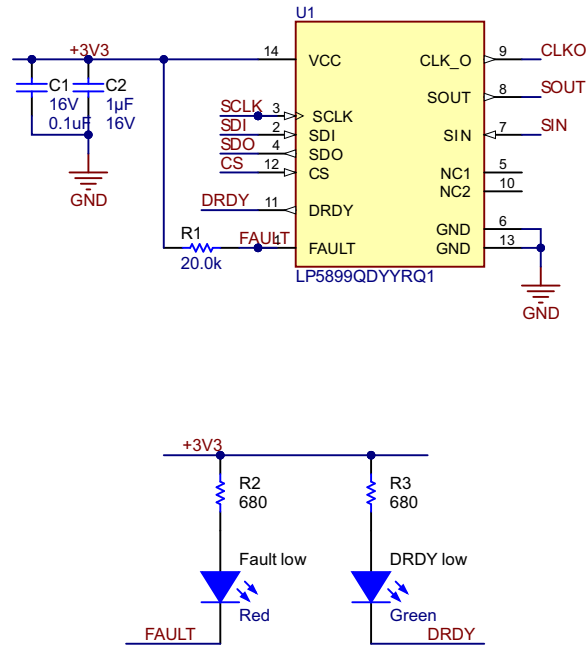


Figure 4-1. LP5899EVM - Schematic 1

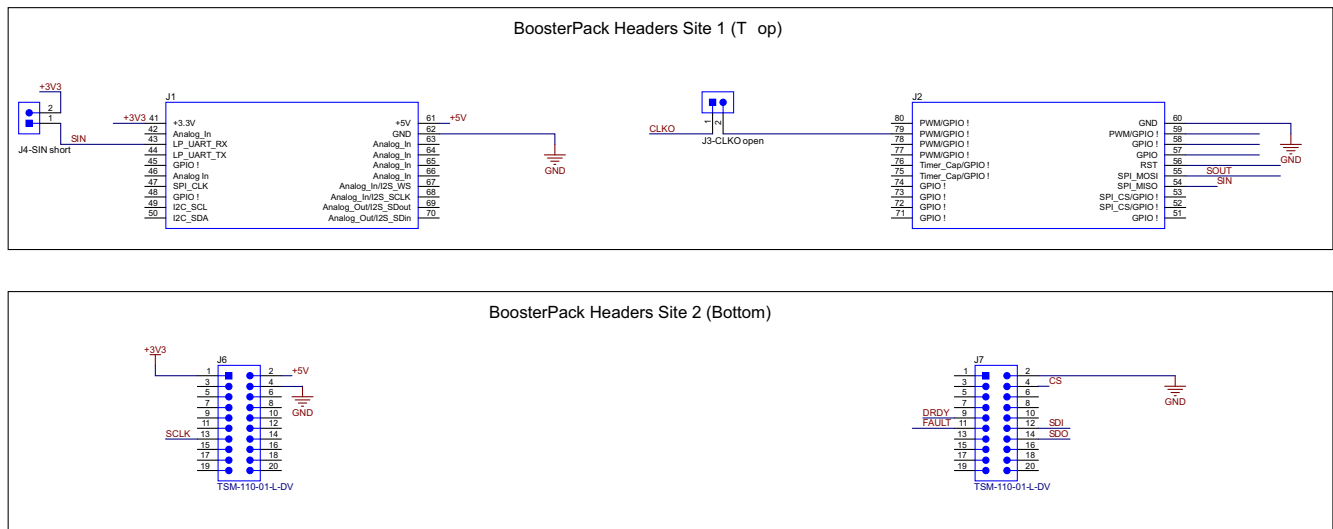


Figure 4-2. LP5899EVM - Schematic 2

4.2 PCB Layouts

Figure 4-3 and Figure 4-4 show the EVM board layout.

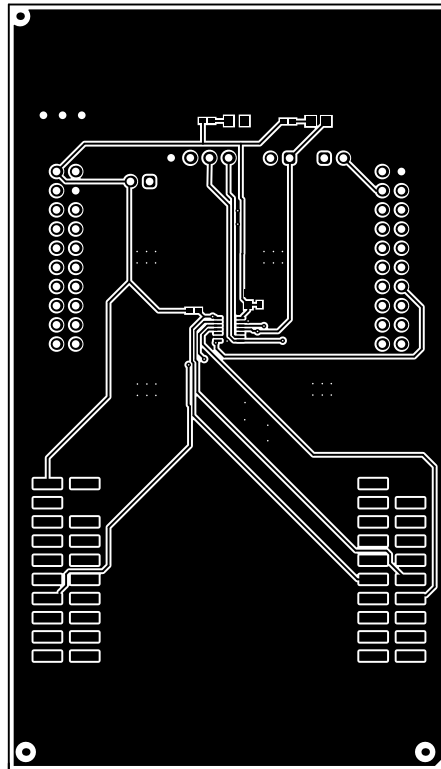


Figure 4-3. LP5899EVM Layout (Top View)

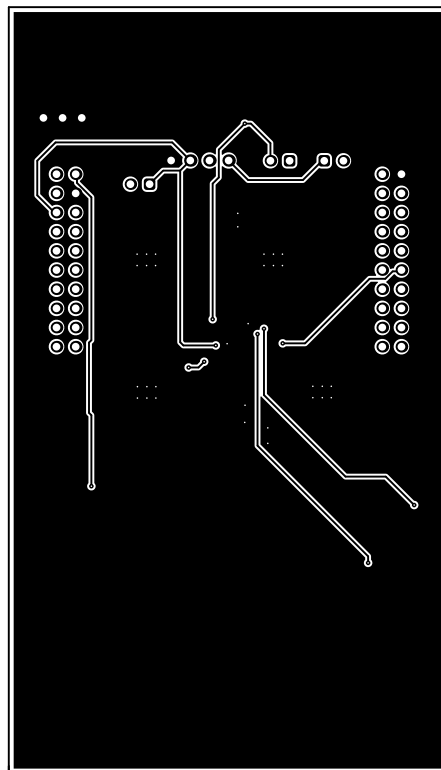


Figure 4-4. LP5899EVM Layout (Bottom View)

4.3 Bill of Materials (BOM)

Table 4-1 lists the bill of materials for LP5899EVM.

Table 4-1. Bill of Materials

Designator	Qty	Description	Manufacturer	Part Number
C1	1	Capacitor, Ceramic, 0.1µF, 16V, ±10%, X7R, 0402	AVX	0402YC104KAT2A
C2	1	Capacitor, Ceramic, 1µF, 16V, ±10%, X5R, 0603	AVX	0603YD105KAT2A
DRDY low	1	LED, Green, SMD	Lite-On	LTST-C171GKT
Fault low	1	LED, Red, SMD	Würth Elektronik	150080SS75000
H1, H2, H3, H4	4	Bumpon, Hemisphere, 0.44 x 0.20, Clear	3M	SJ-5303 (CLEAR)
J1, J2	2	Receptacle, 2.54mm, 10x2, Tin, TH	Samtec	SSQ-110-03-T-D
J3-CLKO open, J4-SIN short, J8	3	Header, 2.54mm, 2x1, Tin, TH	Samtec	TSW-102-23-T-S
J6, J7	2	Header, 2.54mm, 10x2, Gold, SMT	Samtec	TSM-110-01-L-DV
J9	1	Header, 100mil, 3x1, Gold, TH	Sullins Connector Solutions	PBC03SAAN
J10	1	Header, 100mil, 4x1, Gold, TH	Samtec	TSW-104-07-G-S
LBL1	1	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	Brady	THT-14-423-10
R1	1	Resistor, 20.0kΩ, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	Vishay-Dale	CRCW040220K0FKED
R2, R3	2	Resistor, 680Ω, 5%, 0.063W, AEC-Q200 Grade 0, 0402	Vishay-Dale	CRCW0402680RJNED
U1	1	Automotive SPI-Compatible Connectivity for LP589x-Q1 Device Family	Texas Instruments	LP5899QDYRQ1

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NOTE:

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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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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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