EVM User's Guide: DP83TD555EVM

DP83TD555EVM User's Guide

Description

DP83TD555EVM supports the 10BASE-T1S Ethernet protocol on the media dependent interface through Screw terminal connection. This EVM is equipped with MikroBUS connector on the SPI interface that could directly plug in and support multiple TI EP Ecosystem, Rapberry PI, and other MCU Ecosystem in the market.

Get Started

1. Configure the board headers to fit your application.
2. Plug in DP83TD555EVM to MCU boards uing MikroBUS connector
3. Load the device drivers.
4. For issues, reach out to us on the TI E2E forum.

Features

- DP83TD555 IEEE802.3cg and 10BASE-T1S Compliant
- 10BASE-T1S Interface through SPI interface MikroBUS connector
  - Support All TI EP, Microchip, Raspberry PI, and more
- Onboard crystal
- Single power supply through MCU board
- Status LEDs
  - Power rail LEDs
  - Low Power LED
  - PLCA Link and Traffic LEDs
- Configurable MDI termination through jumpers for device ta act as End Node or Drop Node
- Strap Options
  - Node ID
  - Isolate or Active mode
- Wake up Button for TC10 application
- Reset Button

Terminology

ACRONYM	DEFINITION
PHY	Physical Layer Transceiver
MAC	Media Access Controller
SMI	Serial Management Interface
MDIO	Management Data I/O
MDC	Management Data Clock
VBAT	Battery Supply Rail
VCC	Analog Supply Rail
VDDIO	Digital Supply Rail
OA-SPI	Open Alliance 3-SPI Interface

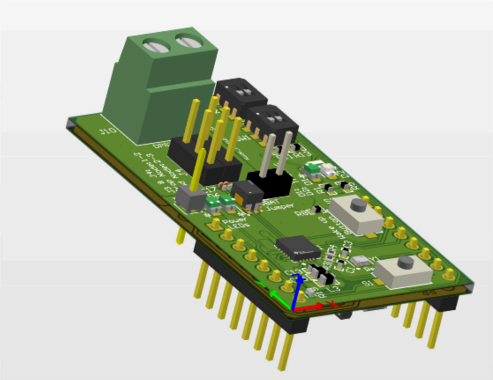


Figure 1-1. DP83TD555EVM Peripherals

1 Evaluation Module Overview

1.1 Introduction

DP83TD555EVM supports the 10BASE-T1S Ethernet protocol on the media dependent interface through Screw terminal connection. This EVM is equipped with MikroBUS connector on the SPI interface that could directly plug in and support multiple TI EP Ecosystem, Rapberry PI, and other MCU Ecosystem in the market.

1.2 Kit Contents

The DP83TD555EVM kit includes with the following:

- DP83TD555EVM

Not supplied:

- MicroBus Connector
- Untwisted Pair Cable

1.3 Specification

The EVM is intended to provide basic functional evaluation of the device. The layout is not intended to be a model for the target circuit, nor designed for electromagnetic compatibility (EMC) testing.

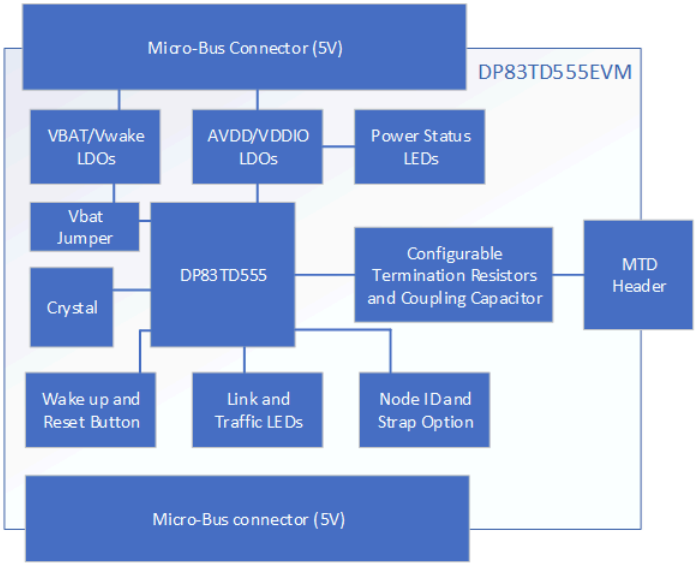


Figure 1-1. DP83TD555EVM Block Diagram

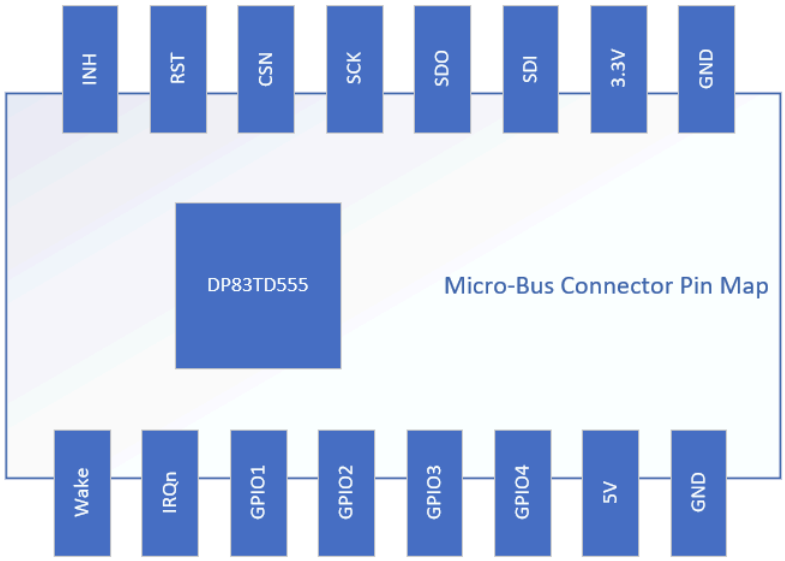


Figure 1-2. DP83TD555EVM MikroBUS Connector Pin Map

Revision B of the EVM has the standardized MikroBUS connector

1.4 Device Information

The DP83TD555-Q1 integrates IEEE802.3 Media Access Controller (MAC) and IEEE802.1 AS timestamp enables a variety of microcontrollers with SPI interface to connect to Ethernet networks using 10BASE-T1S bus. The device also integrates IEEE 1588v2/802.1AS to enable accurate time synchronization (< 100 ns) and hardware time-stamping for various applications.

The DP83TD555-Q1 allows for efficient system-level battery current consumption by supporting TC10 Wake/ Sleep requirements. This allows a low-current sleep state in which power is gated to system components by DP83TD555-Q1. When a wake-up even is detected, the DP83TD555-Q1 initiates system start-up by driving INH high. The wide VBAT operation range allows DP83TD555-Q1 to connect to 12 V, 24 V, or 48 V battery systems.

The DP83TD555-Q1 is equipped with diagnostic features such as cable fault detection and undervoltage detection to accelerate root cause analysis.

2 Hardware

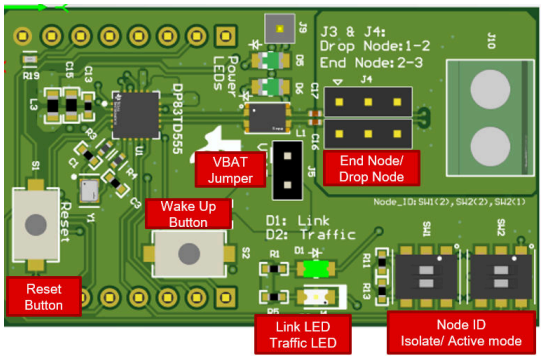


Figure 2-1. DP83TD555EVM Peripherals

2.1 Board Setup Out of Box

1. If not using external power supply for VBAT, ensure that J5 is connected with Shunt. If external power supply is being used for VBAT (Up to 48V), disconnect the shunt on J5, and supply the desired VBAT voltage on the pin 1 of J5 (left side in the figure below)

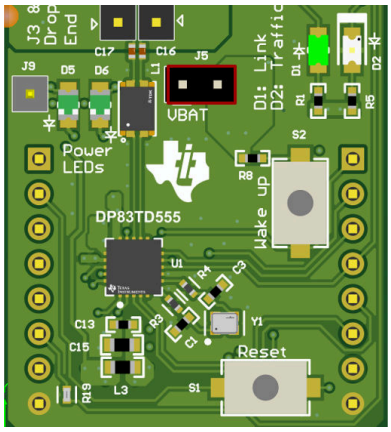


Figure 2-2. J5 Jumper for VBAT

2. Configure J3 and J4 jumper to Drop Node or End Node
   a. Drop Node: Connect pin 1 to 2
   b. End Node: Connect pin 2 to 3

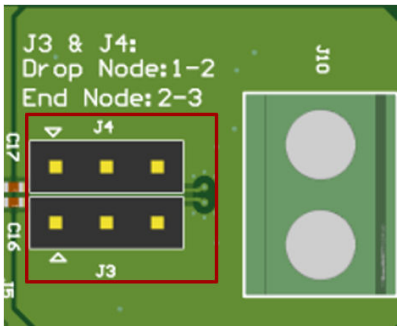


Figure 2-3. J3/J4 Jumpers for Drop/End Nodes

3. Configure the 555EVM into correct strap setting
   a. The Node ID given in the silkscreen is incorrect. The correct Node ID switches are SW2(2), SW1(2), SW1(1) respectively. The table given below shows the Node ID for different strap combinations.

Node ID	SW2(2)	SW1(2)	SW1(1)
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

b. Active/ Isolated Mode: SW2(1)

Device Mode	SW2(1)
Active Mode	0
Isolate Mode	1

c.

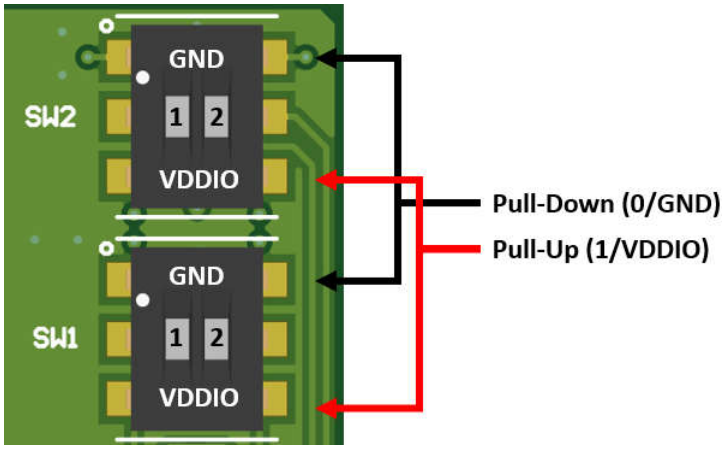


Figure 2-4. Strap Switches Functionality

4. Connect the EVM to the controller using the SPI interface. The required connections are shown below, additional pins, like RST, INH, WAKE, and GPIOs can also be connected as needed.
   a. Vin must be supplied with 5V. On-board LDOs then use this input voltage to generate voltages required to power various parts of the EVM

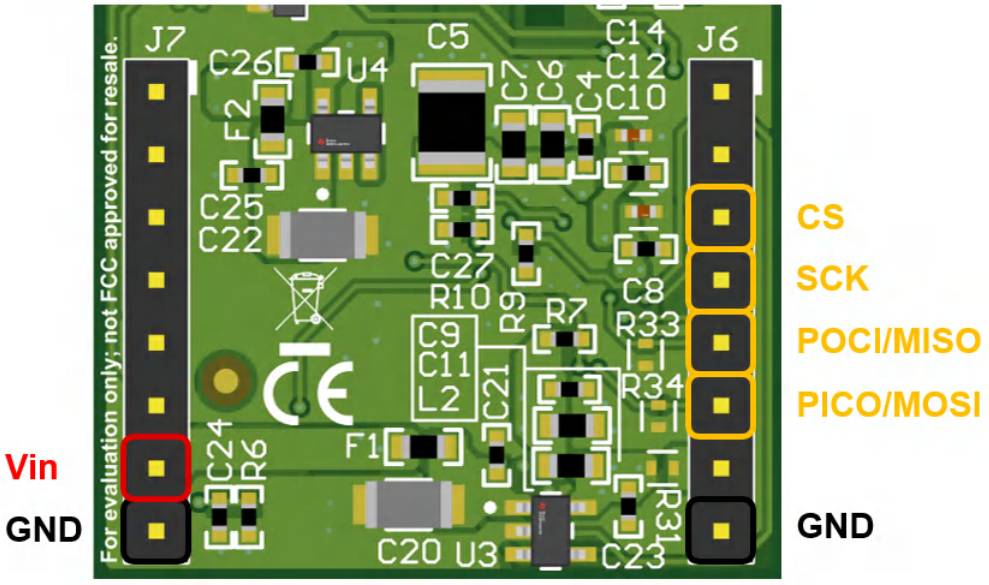


Figure 2-5. Required Connections

5. Use Screw Terminal (J10) for 10Base-T1S connection

2.2 Power Supply Selection

Power options for the DP83TD555EVM include:

1. Single 5V Power Supply coming from MikroBUS connector

The DP83TD555EVM power is supplied by the 5V input connection in the image below. Single supply operation uses on-board LDOs to generate the voltages required for operating various sections of the EVM.

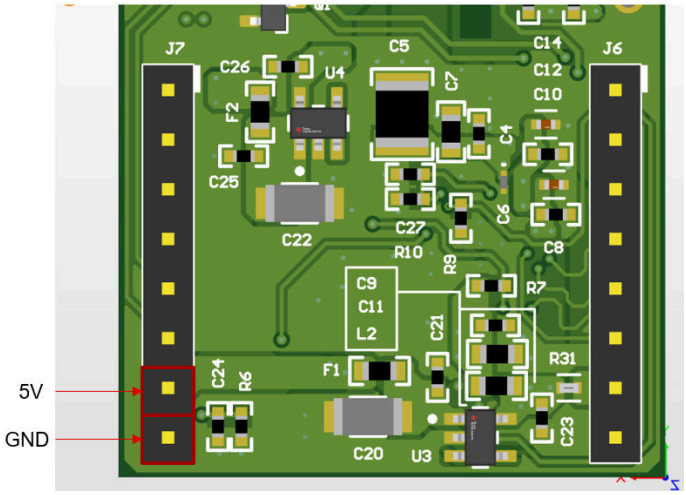


Figure 2-6. DP83TD555 EVM Power Pins in MikroBUS

Before supplying power at the 5V input, make sure the correct shunts are added to the appropriate headers to properly operate the on-board LDOs as seen in the figure below.

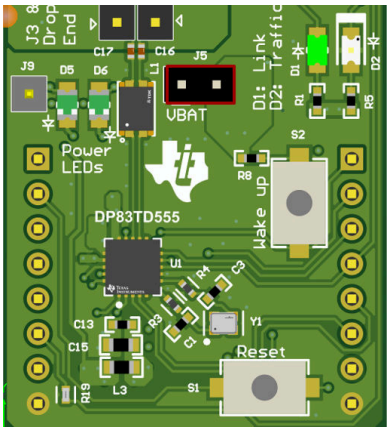


Figure 2-7. Shunt J5 before Power up

2. Optional External VBAT: Without the J5 shunt, 5V Power Supply coming from MikroBUS connector powers up VDDA/VDDIO. External Power supply can be used on the left pin of J5 for VBAT, up to 48V.

2.3 Feature Capability and Setup

DP83TD555 includes:

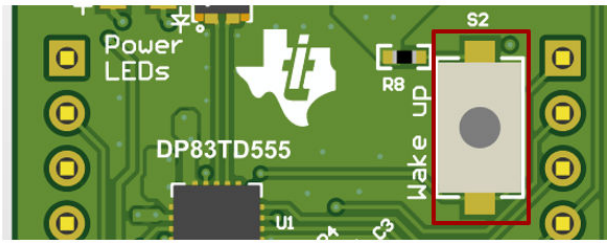
- 

Figure 2-8. Wake Up Button

  - TC-10 on board Wake up Functionality through S2 Wake button

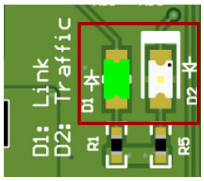
- 

Figure 2-9. Link and Traffic LEDs

  - Link and Traffic LEDs on D1 and D2 respectively

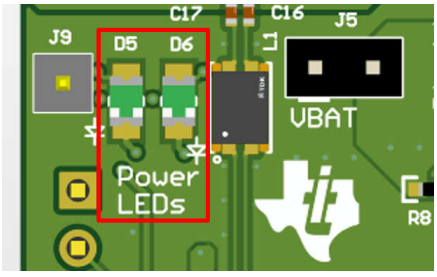
- 

Figure 2-10. Power LEDs

  - Power LEDs D5 and D6 represent both AVDD/VDDIO and Vwake voltage rails. Both should turn on during normal operation, D5 may be off during sleep mode.

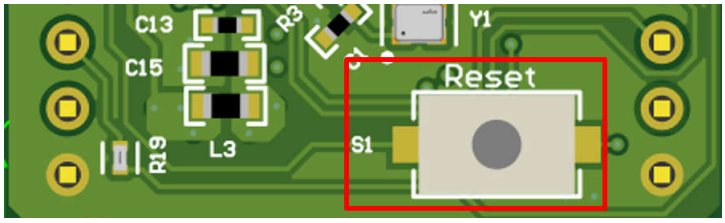
- 

Figure 2-11. Reset Button

  - Reset button can be used to perform a hardware reset, which resets the device's state and registers back to default, and samples the strap pins again.

2.4 Recommended Setup

This section goes over a basic 2-node end-to-end setup with 2 devices.

To ensure proper operation of the device, the device must be in active mode. This mode can be selected through register configuration after power-up, or it can be strapped to automatically boot up in active mode using SW2(1).

The device can also be strapped to Isolate Mode on power-up, which is useful to configure the PHY before Ethernet activity on the MDI line. Afterward, the SPI can be used to write the registers to change the state from isolate to active mode.

Since there are only 2 nodes in this setup, we can use Node IDs 0 and 1 for each device.

Table 2-1. Recommended 2-Node Strap Settings

Device	SW1(1)	SW1(2)	SW2(1)	SW2(2)
1	0	0	0	0
2	1	0	0	0

3 Additional Information

3.1 Known Hardware or Software Issues

In Rev A of the DP83TD555EVM there is a known issue with SDO/SDI pin out on the MikroBUS connector. These pins are swapped compared to the standard MikroBUS connector, and therefore, cannot be used by directly plugging into a MikroBUS connector. Instead, it is recommended to use jumper wires, or something similar to connect these pins.

Additionally, the silkscreen information about the device straps is incorrect. The correct strap options are given in this user guide in the Board Setup Out of Box Section

3.2 Trademarks

All trademarks are the property of their respective owners.

3.3 Terminology

Table 3-1. Terminology

ACRONYM	DEFINITION
PHY	Physical Layer Transceiver
MAC	Media Access Controller
SMI	Serial Management Interface
MDIO	Management Data I/O
MDC	Management Data Clock
MII	Media Independent Interface
RMII	Reduced Media Independent Interface
SFD	Start-of-Frame Detection
VDDA	Analog Core Supply Rail
VDDIO	Digital Supply Rail
PD	Pulldown
PU	Pullup
MCU	Microcontroller
PMD	Physical Medium Dependent
PRBS	Pseudo Random Binary Sequence

4 References

OA SPI MACPHY Specification

PMD Transceiver Specification

5 Revision History

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

DATE	REVISION	NOTES
December 2025	*	Initial Release

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   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

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   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

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.

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

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

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

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

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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西新宿三井ビル

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3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

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.

4.3 *Safety-Related Warnings and Restrictions:*

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