EVM User's Guide: DP83TD555EVM

DP83TD555EVM 用户指南

TEXAS INSTRUMENTS

说明

DP83TD555EVM 通过螺丝端子连接，在媒体相关接口上支持 10BASE-T1S 以太网协议。该 EVM 在 SPI 接口上配备了 MikroBUS 连接器，可直接插入并支持市场中的多种 TI EP 生态系统、Rapberry PI 和其他 MCU 生态系统。

开始使用

1. 根据应用情况配置电路板接头。
2. 使用 MikroBUS 连接器将 DP83TD555EVM 插入 MCU 板
3. 加载器件驱动程序。
4. 如有问题，请在 TI E2E 论坛上与我们联系。

特性

- 符合 DP83TD555、IEEE802.3cg 和 10BASE-T1S 标准
- 10BASE-T1S 接口通过 SPI 接口 MikroBUS 连接器实现
  - 支持所有 TI EP、Microchip、Raspberry PI 等
- 板载晶体
- 通过 MCU 板提供单电源

- 状态 LED
  - 电源轨 LED
  - 低功率 LED
  - PLCA 链路和流量 LED
- 可通过跳线配置 MDI 端接，使器件可用作终端节点或分支节点
- Strap 配置选项

  - 节点 ID
  - 隔离或工作模式
- 适用于 TC10 应用的唤醒按钮
- 复位按钮

术语

| 首字母缩写词	定义
PHY	物理层收发器
MAC	介质访问控制器
SMI	串行管理接口
MDIO	管理数据 I/O
MDC	管理数据时钟
VBAT	电池电源导轨
VCC	模拟电源导轨
VDDIO	数字电源导轨
OA-SPI	Open Alliance 3-SPI 接口
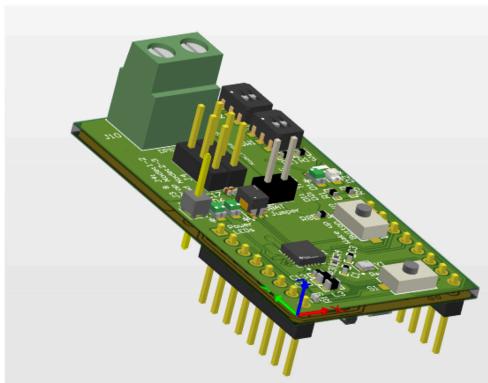
图 1-1. DP83TD555EVM 外设

1 评估模块概述

1.1 简介

DP83TD555EVM 通过螺丝端子连接，在媒体相关接口上支持 10BASE-T1S 以太网协议。该 EVM 在 SPI 接口上配备了 MikroBUS 连接器，可直接插入并支持市场中的多种 TI EP 生态系统、Rapberry PI 和其他 MCU 生态系统。

1.2 套件内容

DP83TD555EVM 套件包括以下项目：

- DP83TD555EVM

未提供：

- MicroBus 连接器
- 非双绞线电缆

1.3 规格

此 EVM 旨在对该器件的基本功能进行评估，此布局并非作为目标电路的模型使用，也不针对电磁兼容性 (EMC) 测试进行设计。
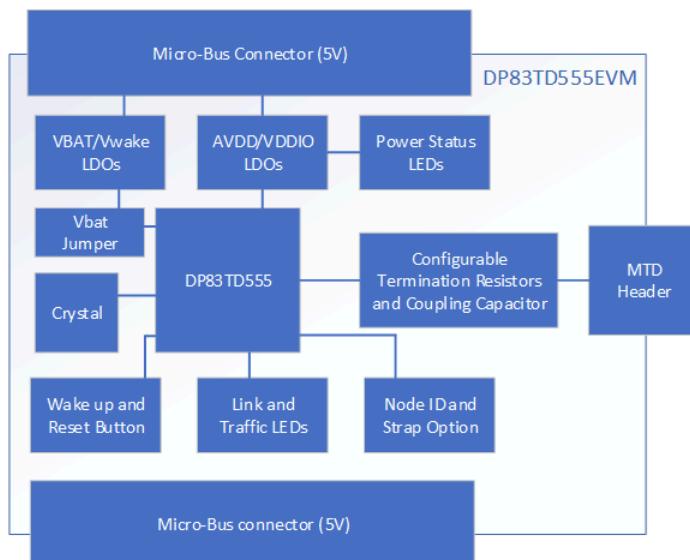

图 1-1. DP83TD555EVM 方框图

提交文档反馈
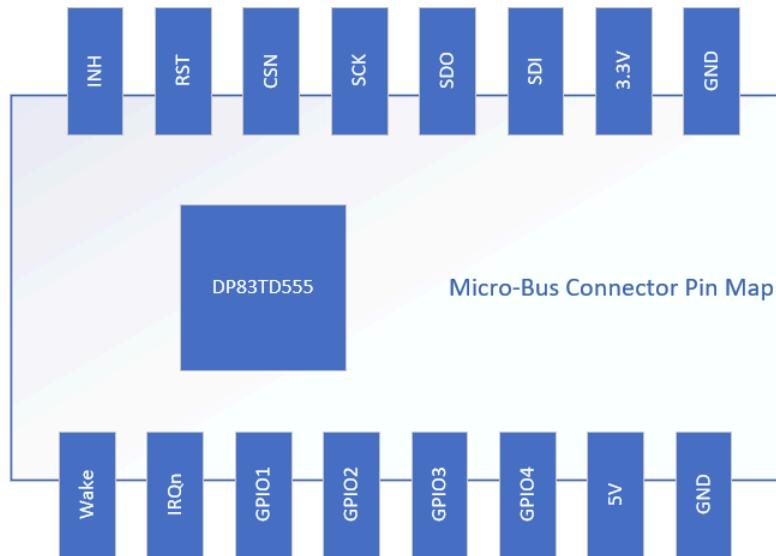
图 1-2. DP83TD555EVM MikroBUS 连接器引脚映射

EVM 版本 B 具有标准化 MikroBUS 连接器

1.4 器件信息

DP83TD555-Q1 集成了 IEEE802.3 介质访问控制器 (MAC) 和 IEEE802.1 作为时间戳，支持使用 10BASE-T1S 总线通过 SPI 接口连接到以太网的各种微控制器。该器件还集成了 IEEE 1588v2/802.1AS，可为各种应用提供精确的时间同步 (< 100ns) 和硬件时间戳。

DP83TD555-Q1 支持 TC10 唤醒/睡眠要求，可借此实现高效的系统级电池电流消耗。这可实现低电流睡眠状态，其中电源由 DP83TD555-Q1 选通到系统元件。检测到唤醒事件时，DP83TD555-Q1 通过将 INH 驱动至高电平来启动系统。DP83TD555-Q1 支持在宽 VBAT 工作范围内连接 12V、24V 或者 48V 电池系统。

DP83TD555-Q1 配备诊断功能，例如电缆故障检测和欠压检测，以加速根本原因分析。

2 硬件
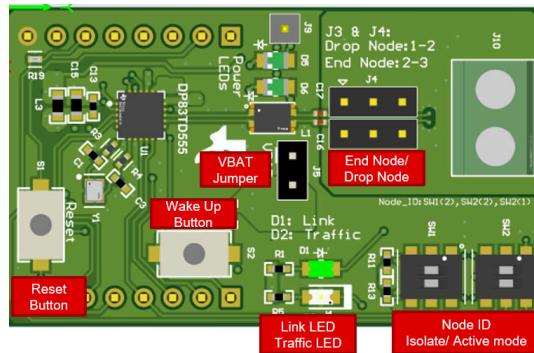
图 2-1. DP83TD555EVM 外设

2.1 开箱即用的电路板设置

1. 如果不为 VBAT 使用外部电源，请确保 J5 通过分流器连接。如果 VBAT（高达 48V）使用外部电源，请断开 J5 上的分流器，并在 J5 的引脚 1 上提供所需的 VBAT 电压（下图中的左侧）
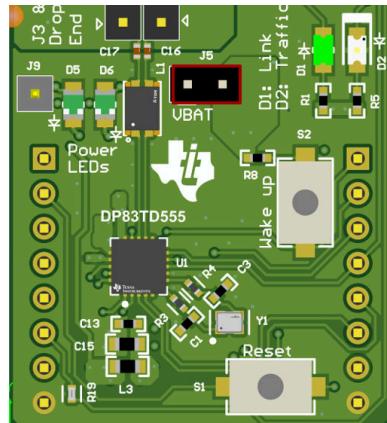

图 2-2. VBAT 的 J5 跳线

2. 将 J3 和 J4 跳线配置成断开节点或终端节点

   a. 放置节点：连接引脚 1 到 2
    b. 终端节点：连接引脚 2 到 3
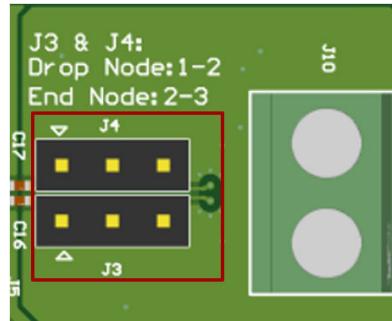
图 2-3. 放置/终端节点的 J3/J4 跳线

3. 将 555EVM 配置为正确的搭接设置

a. 丝印中提供的节点 ID 不正确。正确的节点 ID 开关分别为 SW2(2)、SW1(2) 及 SW1(1)。下表显示了不同搭接配置组合的节点 ID。

节点 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. 有源/隔离模式：SW2(1)

器件模式	SW2(1)
工作模式	0
隔离模式	1

c.
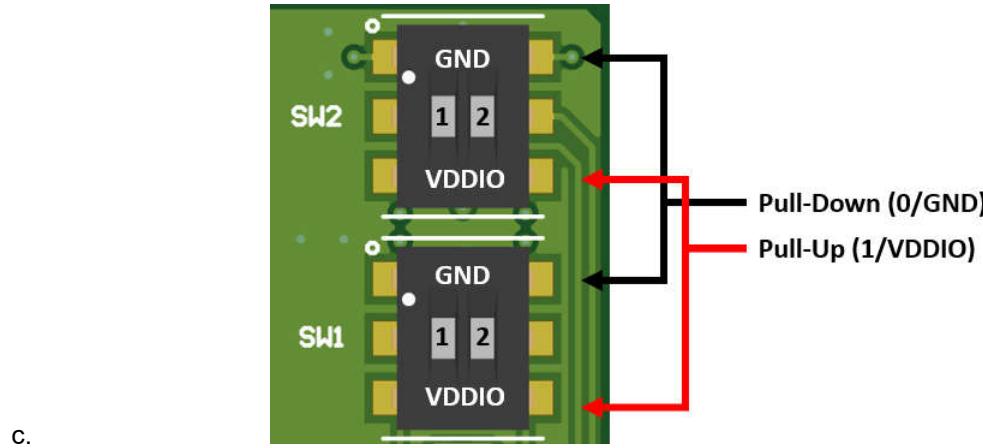
图 2-4. 搭接开关功能

4. 使用 SPI 接口将 EVM 连接至控制器。所需的连接如下所示，此外还可以根据需要连接其他引脚，如 RST、INH、WAKE 和 GPIO。

a. Vin 必须以 5V 供电。然后，板载 LDO 使用此输入电压生成为 EVM 各部分供电所需的电压
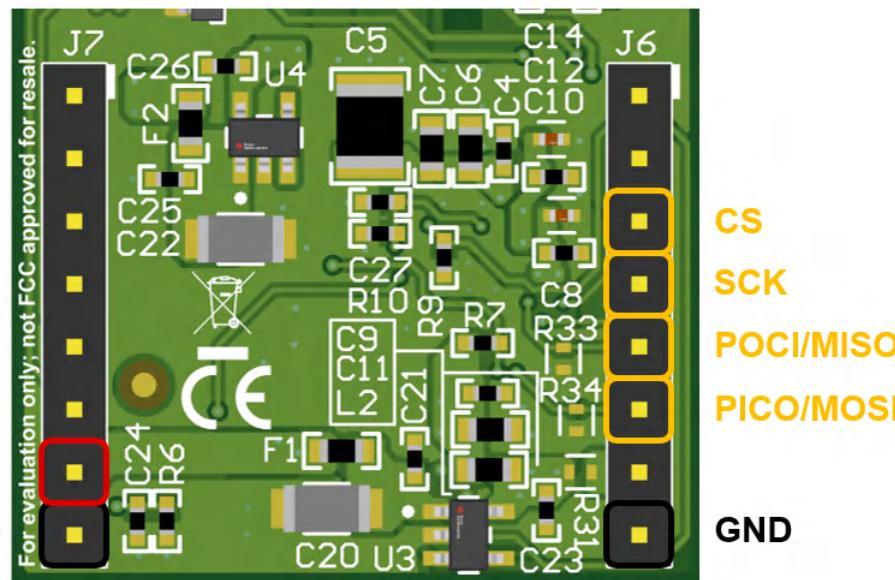
图 2-5. 所需的连接

5. 使用螺丝端子 (J10) 来进行 10Base-T1S 连接

## 2.2 电源选择

DP83TD555EVM 的电源选项包括：

1.来自 MikroBUS 连接器的单个 5V 电源

DP83TD555EVM 电源由下面图像中的 5V 输入连接供电。单电源运行使用板载 LDO 生成运行 EVM 各部分所需的电压。
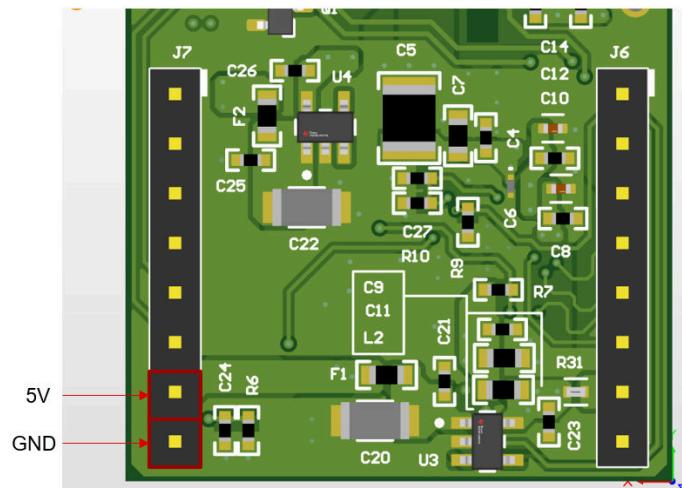
图 2-6. DP83TD555 EVM 在 MikroBUS 中的电源引脚

在为 5V 输入供电之前，请确保在相应的接头上添加了正确的分流器，以便正确操作板载 LDO，如下图所示。
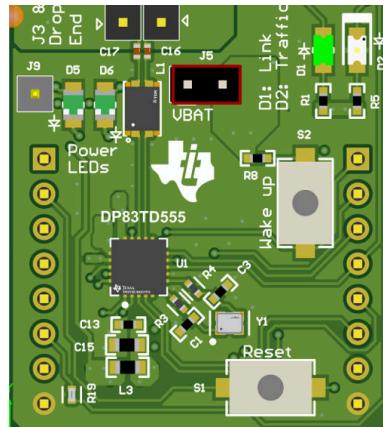
图 **2-7.** 在上电之前分流 **J5**

2.可选外部 VBAT：在没有 J5 分流器的情况下，来自 MikroBUS 连接器的 5V 电源为 VDDA/VDDIO 供电。外部电源可用于 J5 的左侧引脚，用于高达 48V 的 VBAT。

2.3 特性功能及设置

DP83TD555 包含：

-
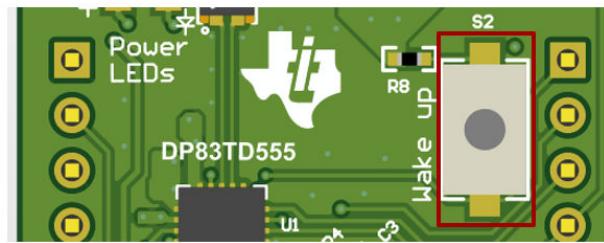
图 **2-8.** 唤醒按钮

  – TC-10 板载唤醒功能，通过 S2 唤醒按钮实现

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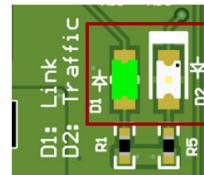
图 **2-9.** 链路和流量 **LED**

  – D1 和 D2 上的链路和流量 LED 分别亮起

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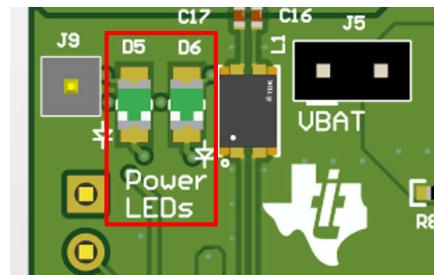
图 **2-10.** 电源 **LED**

  – 电源 LED D5 和 D6 表示 AVDD/VDDIO 及 Vwake 电压轨。两者都应在正常运行期间导通，D5 在睡眠模式下可能关断。
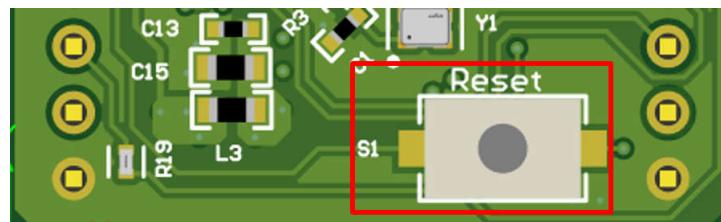
图 2-11. 复位按钮

– 复位按钮可用于执行硬件复位，这会将器件的状态和寄存器复位回默认值，并再次对搭接引脚进行采样。

2.4 建议装置

本节介绍了含有 2 个器件的基本 2 节点端到端设置。

为确保器件正常运行，器件必须处于工作模式。上电后，可通过寄存器配置来选择此模式，也可以使用 SW2(1) 对其进行搭接配置以在工作模式下自动启动。

该器件还可以通过搭接配置在上电时隔离模式，这有助于在 MDI 线路上发生以太网活动之前配置 PHY。然后，可以使用 SPI 写入寄存器，以将状态从隔离更改为工作模式。

由于此设置中只有 2 个节点，因此我们可以为每个器件使用节点 ID 0 和 1。

表 2-1. 建议的 2 节点搭接设置

器件	SW1(1)	SW1(2)	SW2(1)	SW2(2)
1	0	0	0	0
2	1	0	0	0

3 其他信息

3.1 已知硬件或软件问题

在 DP83TD555EVM 的修订版 A 中，MikroBUS 连接器上的 SDO/SDI 引脚排列存在已知问题。与标准 MikroBUS 连接器相比，这些引脚被交换，因此不能通过直接插入 MikroBUS 连接器来使用。相反，建议使用跳线或类似方式来连接这些引脚。

此外，有关器件搭接的丝印信息不正确。本用户指南的开箱即用的电路板设置中提供了正确的搭接配置选项

3.2 商标

所有商标均为其各自所有者的财产。

3.3 术语

表 3-1. 术语

首字母缩写词	定义
PHY	物理层收发器
MAC	介质访问控制器
SMI	串行管理接口
MDIO	管理数据 I/O
MDC	管理数据时钟
MII	媒体独立接口
RMII	简化媒体独立接口
SFD	起始帧检测
VDDA	模拟内核电源轨
VDDIO	数字电源轨
PD	下拉
PU	上拉
MCU	微控制器
PMD	物理媒体相关
PRBS	假随机二进制序列

4 参考资料

OA SPI MACPHY 规格

PMD 收发器规格

5 修订历史记录

注：以前版本的页码可能与当前版本的页码不同

日期	修订版本	注释
December 2025	*	初始发行版

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

    1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

    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*:

    2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

    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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けて

いないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの

措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。

2. 実験局の免許を取得後ご使用いただく。

3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。
        上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・イ

ンスツルメンツ株式会社

東京都新宿区西新宿６丁目２４番１号

西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

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:*

        4.3.1   User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

        4.3.2   EVMs 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 assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

    4.4   User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5.   *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6.   *Disclaimers:*

    6.1   EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

    6.2   EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7.   *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

   8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

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.