

EVM User's Guide: DP83TD535EVM

DP83TD535 评估模块



说明

DP83TD53x-Q1 是符合 IEEE802.3cg 规范的 10BASE-T1S 收发器。该器件支持通过非屏蔽双绞线进行 10Mbps 多点或点对点半双工通信，具有 $\pm 40V$ 的共模容差。该器件通过 OA-3 引脚接口与主机通信。

DP83TD53x-Q1 支持 TC10 唤醒和睡眠要求，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 DP83TD535-Q1 选通到系统元件。检测到唤醒事件时，DP83TD535-Q1 通过将 INH 驱动至高电平来启动系统。

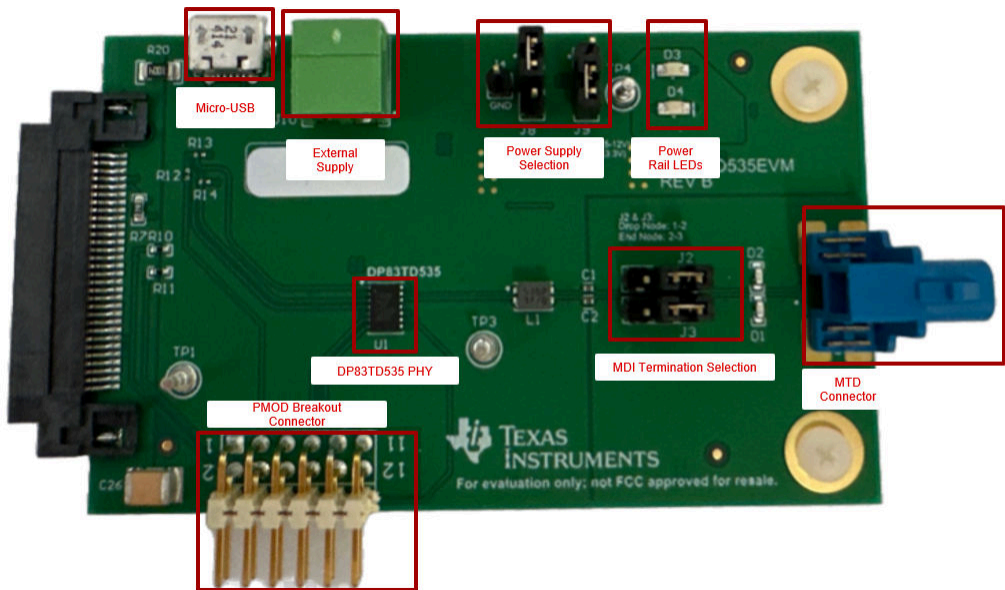
开始使用

1. 配置电路板接头，以实现所需的电源配置或 MDI 终端匹配。

2. 使用 3 引脚接口，将 DP83TD535EVM 连接到 MCU 板。
3. 如有任何问题，请在 TI E2E™ 论坛上与我们联系。

特性

- 符合 DP83TD535、IEEE802.3cg 和 10BASE-T1S 标准
- 10BASE-T1S 接口通过 Rosenberger MTD® 菊花链适配器和电缆进行连接
- VBAT/VCC/VDDIO 电源轨的状态 LED
- 可变 I/O 电压范围：1.8V、2.5V 和 3.3V
- 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



DP83TD535EVM 关键接口

1 评估模块概述

1.1 简介

DP83TD535EVM 支持 10Mbps 半双工速度，且符合 IEEE 802.3cg 和 10BASE-T1S 标准。该 EVM 提供板载接口选项，可连接至 SMI 总线，并通过外部 MCU (如 [MSP430F5529 LaunchPad™](#) 及 [USB-2-MDIO GUI](#)) 访问 PHY 寄存器。可通过外部 5V-12V 电源或 microUSB 电缆为 EVM 供电。提供了板载 TC10 和 OA-3 引脚接口选项，可通过兼容的 SoC 与 PHY 进行通信。

本文档讨论了如何正确操作和配置 DP83TD535EVM。同时，本文档还包含最佳布局实践、原理图文件和物料清单。

1.2 套件内容

DP83TD535EVM 套件包括以下项目：

- DP83TD535EVM
- 1 根非双绞线对电缆 (LAQ-116-1000Z-Z)

未提供：

- Micro-USB 电缆
- Rosenberger 多点连接器 (E7C10T-900X5Z)

1.3 规格

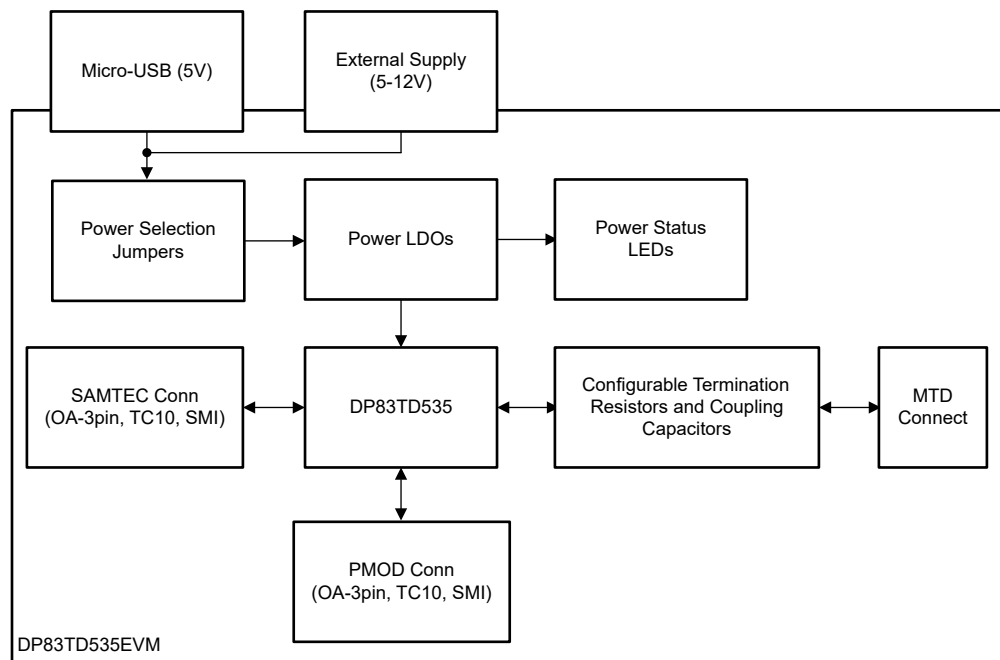


图 1-1. DP83TD535EVM 方框图

2 硬件

2.1 设置

2.1.1 开箱即用的电路板设置

请遵循 DP83TD535EVM 的以下快速设置说明：

- 在引脚 1-2 上连接跳线 J8
- 在引脚 2-3 上连接跳线 J9
- 将 J2 与 J3 跳线配置为分支节点或终端节点
 - 分支节点：连接引脚 1 和 2
 - 终端节点：连接引脚 2 和 3
- 将外部主机连接到 J7 的 TX/RX/ED 引脚
- 将 micro-USB 连接到 J14，以提供 5V 电源

2.1.2 电源选择

2.1.2.1 USB 电源选项

DP838TD535 块由 USB 供电。

- 在引脚 1-2 上连接跳线 J8
- 在引脚 2-3 上连接跳线 J9
- 将 micro-USB 连接到 J11，以提供 5V 电源

2.1.2.2 外部电源运行

- DP83TD535EVM 外部电源
 - 在引脚 2-3 上连接跳线 J8 和 J9
 - 在 J10 接口输入 5-12V 电压 (引脚 2 = GND)

2.1.2.3 VDDIO 电源轨选择

DP83TD535EVM 的 VDDIO 电源轨默认工作电压为 3.3V。若需将 VDDIO 电源轨调整为 2.5V 或 1.8V 工作电压，请按以下说明修改电阻配置：

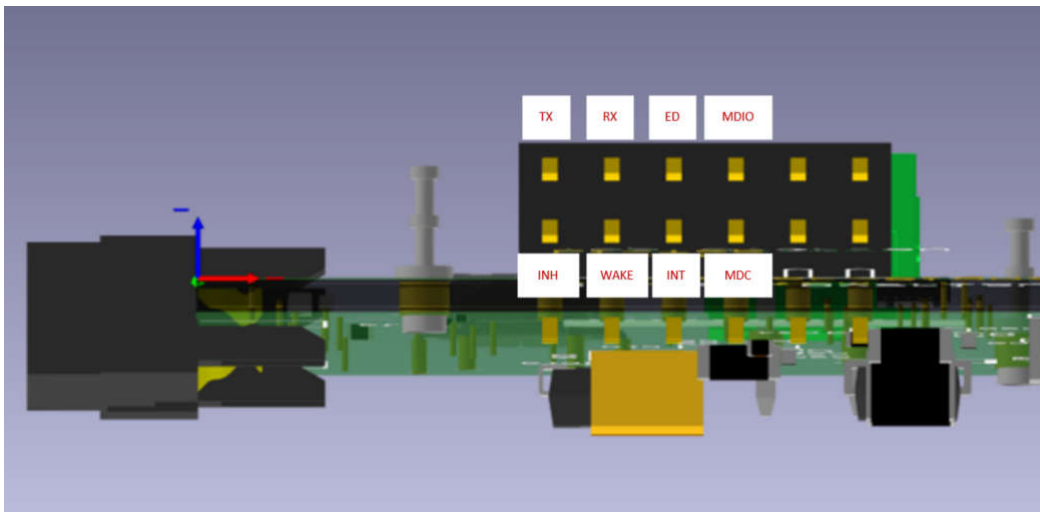
表 2-1. VDDIO 选择

VDDIO 电源轨	R15	R17	R18
3.3V	0 Ω	DNP	不适用
2.5V	DNP	0 Ω	2.87k Ω
1.8V	DNP	0 Ω	1.78k Ω

2.1.3 接口连接

2.1.3.1 PMOD 接口连接

PMOD 分线连接器 J7 可用于访问 OA-3 引脚 (TX/RX/ED)、SMI (MDC/MDIO) 和 TC10 (WAKE/INH) 接口：



支持 OA-3 引脚的外部主机连接到 TX/RX/ED 引脚，需在 PHY 上电时或上电前，通过开启复位脉冲驱动 TX 引脚，从而激活 DP83TD535 发送模式。

2.1.3.2 MDI 接口连接

Rosenberger 的菊花链适配器 (E7C10T-900X5Y) 和 MTD 布线用于连接 J1 上的 PHY MDI 接口。如果无法获取该电缆组件，MDI 也可直接连接任意单对以太网电缆至 J1 引脚，或连接到 J2 (Line+) 和 J3 (Line-) 的引脚 2。

3 硬件设计文件

3.1 原理图

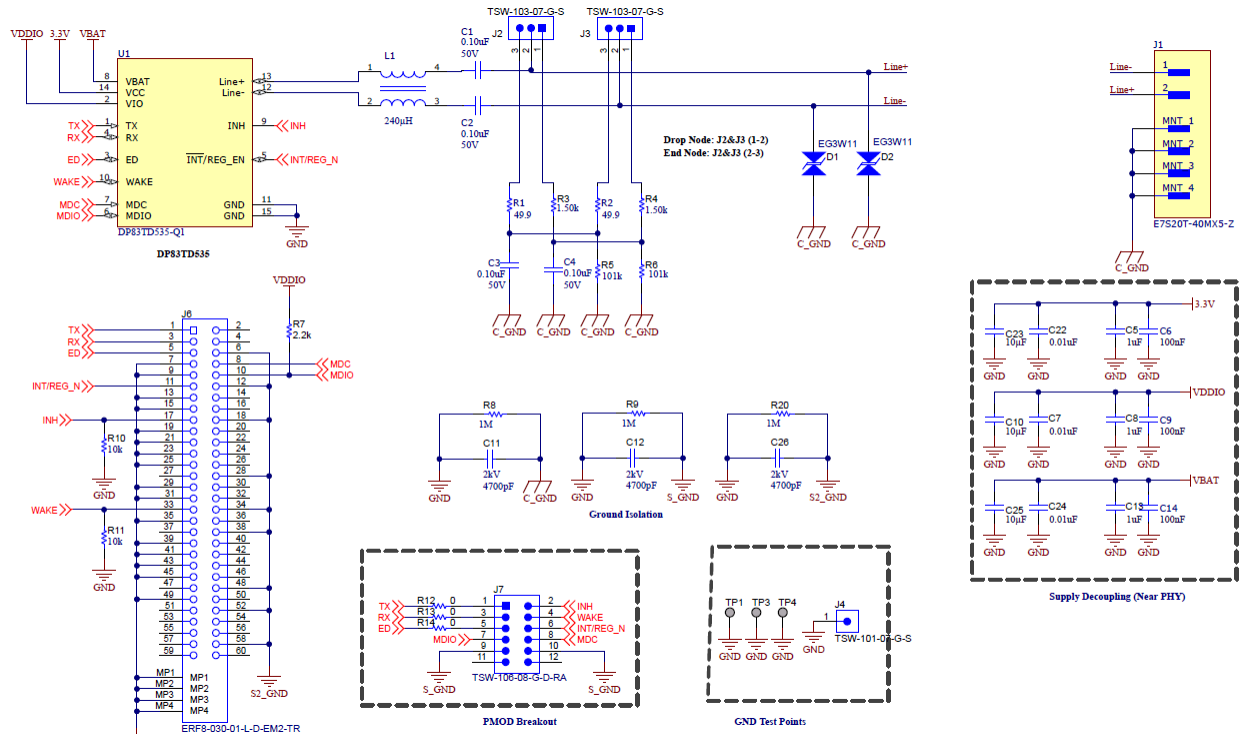


图 3-1. DP83TD535EVM 主原理图模块

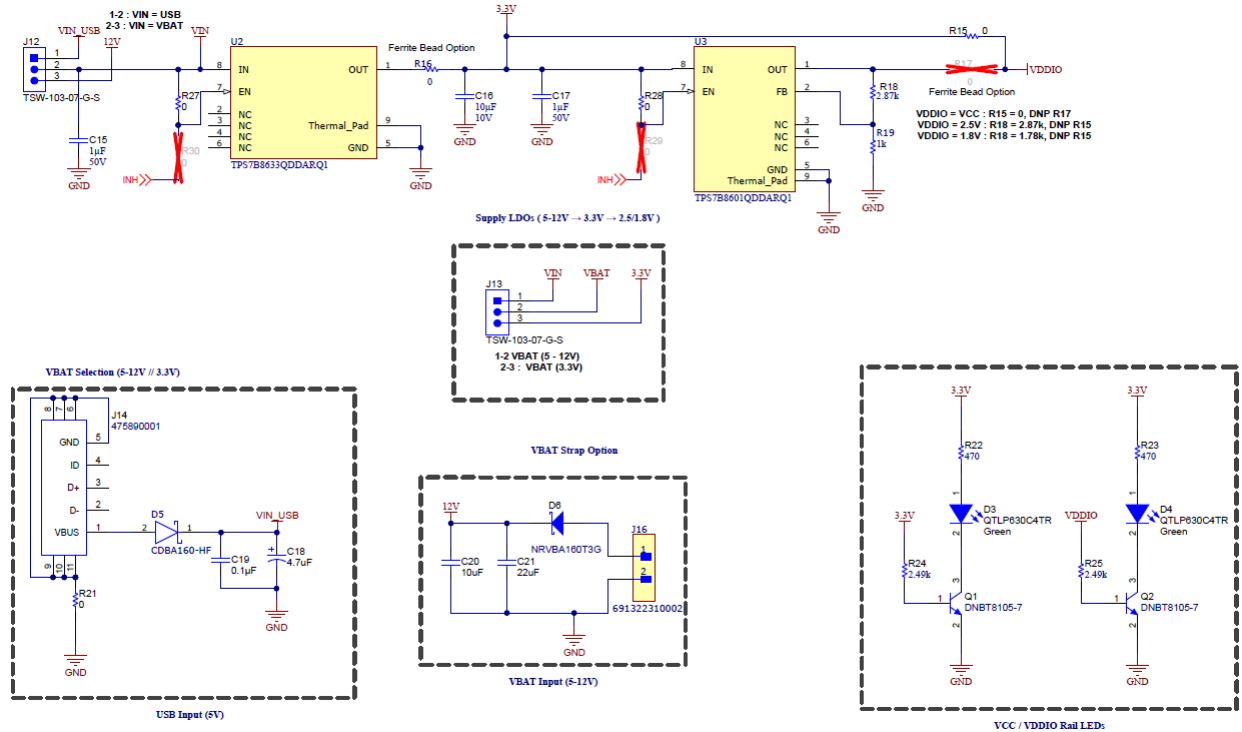


图 3-2. DP83TD535EVM 电源模块

3.2 PCB 布局

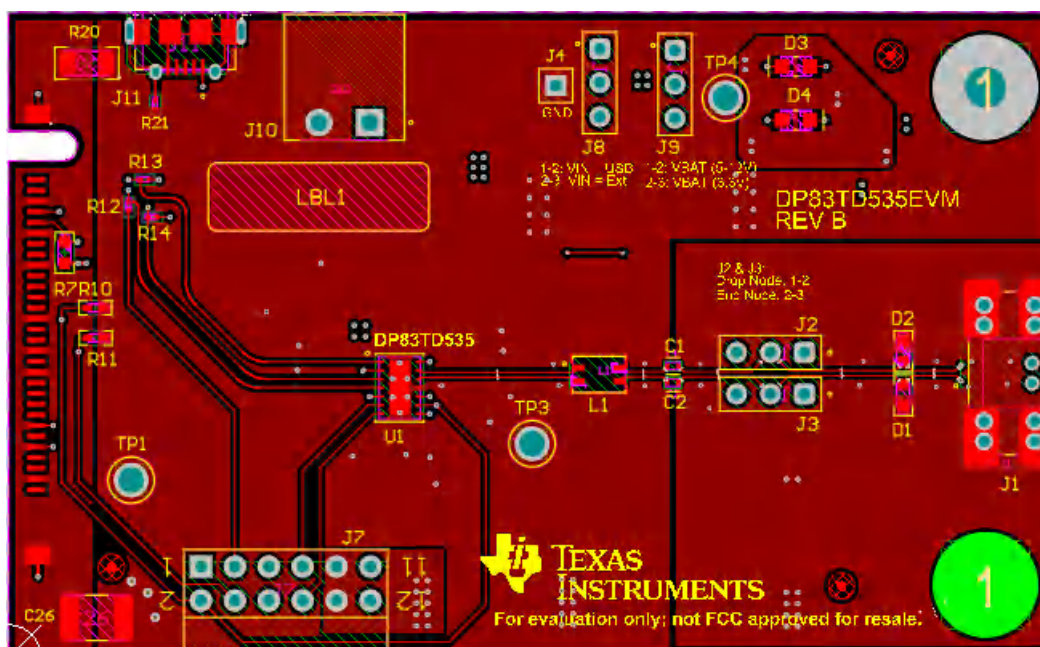


图 3-3. 顶层

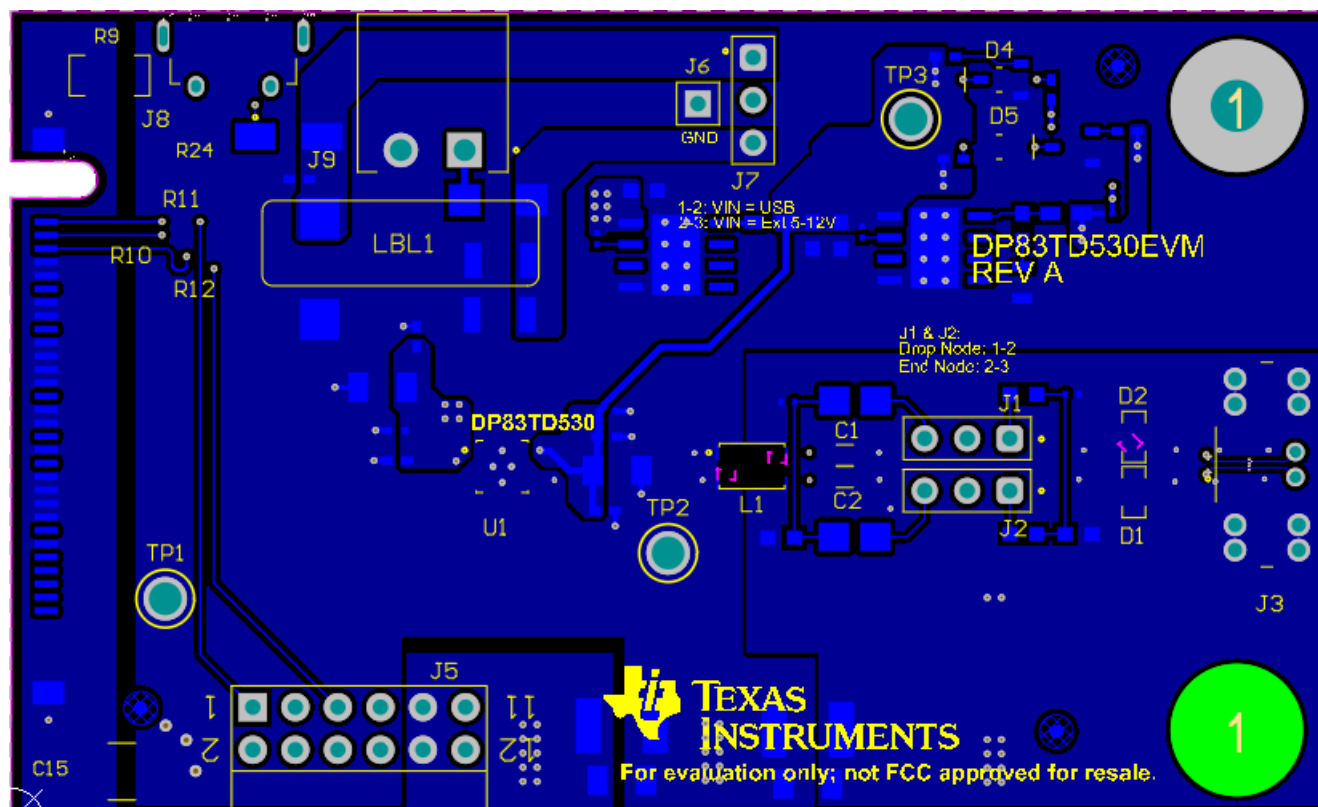


图 3-4. 底层

3.3 物料清单 (BOM)

项目编号	位号	数量	值	器件型号	制造商	说明	封装参考
1	IPCB	1		DP83TD535EVM	不限	印刷电路板	
2	C1、C2、 C3、C4	4	100nF	GRM155R71H104KE14D	Murata	通用片状多层陶瓷电容器， 0402，0.10uF，X7R，15%， 10%，50V	0402
3	C5、C8、 C13	3	1uF	GRM155R6YA105KE11D	MuRata	电容，陶瓷，1uF，35V， +/-10%，X5R，0402	0402
4	C6、C9、 C14	3	100nF	CC0402KRX5R6BB104	YAGEO	0402 0.1uF 10V ±10% 容差 X5R 表面贴装多层陶瓷电容器	0402
5	C7、C22、 C24	3	0.01uF	CGA2B3X7R1H103K050BB	TDK	电容，陶瓷，0.01uF，50V， ± 10%，X7R，AEC-Q200 1 级，0402	0402
6	C10、C23、 C25	3	10uF	GRM31CR71E106MA12L	MuRata	电容，陶瓷，10uF，25V， +/-20%，X7R，AEC-Q200 1 级，1206	1206
7	C11、C12	2	4700pF	1812GC472KAT1A	AVX	电容，陶瓷，4700pF， 2000V，+/-10%，X7R，1812	1812
8	C15、C17	2	1uF	UMK107AB7105KA-T	Taiyo Yuden	电容，陶瓷，1uF，50V， +/-10%，X7R，0603	0603
9	C16	1	10uF	GRM188Z71A106MA73D	MuRata	电容，陶瓷，10uF，10V， +/-20%，X7R，0603	0603
10	C18	1	4.7uF	293D475X9035D2TE3	Vishay- Sprague	电容，钽，4.7uF，35V，+/- 10%，1.3ohm，SMD	7343-31
11	C19	1	0.1uF	C0402C104K8RACTU	Kemet	电容，陶瓷，0.1uF，10V， +/-10%，X7R，0402	0402
12	C20	1	10uF	CGA6P1X7R1E106M250AC	TDK	电容，陶瓷，10uF，25V，± 20%，X7R，AEC-Q200 1 级，1210	1210
13	C21	1	22uF	CGA6P1X7R1C226M250AC	TDK	电容，陶瓷，22uF，16V，± 20%，X7R，AEC-Q200 1 级，1210	1210
14	D1、D2	2		EZA-EG3W11AV	Panasonic	二极管，TVS，双向，AEC- Q101，0603	0603
15	D3、D4	2	绿色	QTLP630C4TR	Everlight	LED，绿色，SMD	2x1.25mm
16	D5	1		CDBA160-HF	Comchip Technology	二极管，肖特基，60V，1A， 表面贴装，DO-214AC (SMA)	SMA
17	D6	1	60V	NRVBA160T3G	ON Semiconductor	二极管，肖特基，60V，1A， AEC-Q101，SMA	SMA
18	FID4、FID5、 FID6	3		不适用	不适用	基准标记。没有需要购买或安 装的元件。	不适用
19	H1、H2	2		NY PMS 440 0025 PH	B&F Fastener Supply	机械螺钉，圆头，#4-40 x 1/4，尼龙，飞利浦盘形头	螺钉
20	H3、H5	2		1902C	Keystone	六角螺柱，0.5"L #4-40，尼龙	螺柱
21	J1	1		E7S20T-40MX5Z	Rosenberger	MTD® 直角插头 PCB	CONN_MTD2

项目编号	位号	数量	值	器件型号	制造商	说明	封装参考
22	J2、J3、J12、J13、J15	5		TSW-103-07G-S	Samtec	接头，100mil，3x1，金，TH	3x1 接头
23	J6	1		ERF8-030-01L-D-EM2-TR	Samtec	插座，0.8mm，30x2，金，边缘安装	插座，0.8mm，30x2，边缘安装
24	J7	1		TSW-106-08G-D-RA	Samtec	接头，100mil，6x2，金，R/A，TH	6x2 R/A 接头
25	J14	1		475890001	Molex	连接器，插座，Micro-USB Type AB，R/A，底部安装 SMT	5.6mm x 2.5mm x 8.2mm
26	J16	1		691322310002	Würth Electronics		CONN_TERM_BLOCK_HD R2
27	L1	1		ACT1210E-241-2P-TL00	TDK	共模滤波器/扼流圈，L = 240 μ H、L x W x T：	SMD4
28	LBL1	1		THT-14-423-10	Brady	热转印打印标签，0.650" (宽) x 0.200" (高) - 10,000/卷	PCB 标签 0.650x 0.200 英寸
29	Q1、Q2	2	60V	DNBT8105-7	Diodes Inc.	晶体管，NPN，60V，1A，AEC-Q101，SOT-23	SOT-23
30	R1、R2	2	49.9	PHP01206E49R9BST5	Vishay 薄膜	电阻薄膜，1206，49.9 Ω ，0.1%，1W， \pm 25ppm/°C，模制 SMD，T/R	1206
31	R3、R4	2	1.50k	RT0603BRD071K5L	Yageo America	电阻，1.50k，0.1%，0.1W，0603	0603
32	R5、R6	2	101k	RT0603DRE07101KL	Yageo America	电阻，101k，0.5%，0.1W，0603	0603
33	R7	1	2.2k	ERJ-3GEYJ222V	Panasonic	电阻，2.2k，5%，0.1W，AEC-Q200 0 级，0603	0603
34	R8、R9	2	1.0Meg	RC1206FR-071ML	Yageo America	电阻器，1M OHM，1%，1/4W，1206	1206
35	R10、R11、R20	3	50	FC0402E50R0BTBST1	Vishay 薄膜	电阻，50，0.1%，0.5W，0402	0402
36	R12、R13、R14、R15、R27、R28	6	0	CRCW02010000Z0ED	Vishay-Dale	电阻，0，5%，0.05W，0201	0201
37	R16	1	0	HCJ0603ZT0R00	Stackpole Electronics	电阻 0 Ω 跳线 1/4W 0603	0603
38	R18	1	2.87k	RG1608P-2871B-T5	Susumu Co Ltd	电阻，2.87k，0.1%，0.1W，0603	0603
39	R19	1		TNPU08051K00BZEN00	Vishay Dale	1k Ω \pm 0.1% 0.125W，1/8W 片上电阻 0805 (公制 2012)，抗硫化，汽车 AEC-Q200，防潮薄膜	0805

项目编号	位号	数量	值	器件型号	制造商	说明	封装参考
40	R21	1	98.8	RT0603BRD0798R8L	Yageo America	电阻, 98.8, 0.1%, 0.1W, 0603	0603
41	R22、R23	2	470	CRCW0402470RJNED	Vishay-Dale	电阻, 470, 5%, 0.063W, AEC-Q200 0 级, 0402	0402
42	R24、R25	2	2.49k	CRCW04022K49FKED	Vishay-Dale	电阻, 2.49k, 1%, 0.063W, AEC-Q200 0 级, 0402	0402
43	R26	1	33	CRCW040233R0JNED	Vishay-Dale	电阻, 33, 5%, 0.063W, AEC-Q200 0 级, 0402	0402
44	TP1、TP2、TP3、TP4	4		1573-2	Keystone	引脚, 双转塔, TH	Keystone1573-2
45	U1	1		DP83TD535-Q1	德州仪器 (TI)	DP83TD535-Q1	VSON14
46	U2	1		TPS7B8633QDDARQ1	德州仪器 (TI)	汽车级 500mA、40V 超低 IQ 低压降 (LDO) 线性稳压器, 具有电源正常指示功能, 8-SO PowerPAD 封装, 工作温度范围 -40°C 至 150°C	SO8
47	U3	1		TPS7B8601QDDARQ1	德州仪器 (TI)	450mA、宽 VIN、低 IQ、可调节输出、低压降稳压器	SOIC8
48	FID1、FID2、FID3	0		不适用	不适用	基准标记。没有需要购买或安装的元件。	不适用
49	R29、R30	0	0	CRCW02010000Z0ED	Vishay-Dale	电阻, 0, 5%, 0.05W, 0201	0201

4 其他信息

4.1 商标

E2E™ and LaunchPad™ are trademarks of Texas Instruments.

Rosenberger MTD® is a registered trademark of Rosenberger Hochfrequenztechnik GmbH & Co. KG.

所有商标均为其各自所有者的财产。

4.2 术语

ED	能量检测
MTD	模块化双绞线
MAC	介质访问控制器
MDC	管理数据时钟
MDIO	管理数据 I/O
OA-3pin	Open Alliance 3 引脚接口
PHY	物理层收发器
SMI	串行管理接口
VBAT	电池供电电源轨
VCC	模拟供电电源轨
VDDIO	数字电源轨

4.3 第三方产品免责声明

TI 发布的与第三方产品或服务有关的信息，不能构成与此类产品或服务或保修的适用性有关的认可，不能构成此类产品或服务单独或与任何 TI 产品或服务一起的表示或认可。

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 DEGRADATION 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/sds/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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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。

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東京都新宿区西新宿 6 丁目 2 4 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/sds/ti_ja/general/eStore/notice_02.page

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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:*

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:*

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8. *Limitations on Damages and Liability:*

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