EVM User's Guide: TPS552852EVM

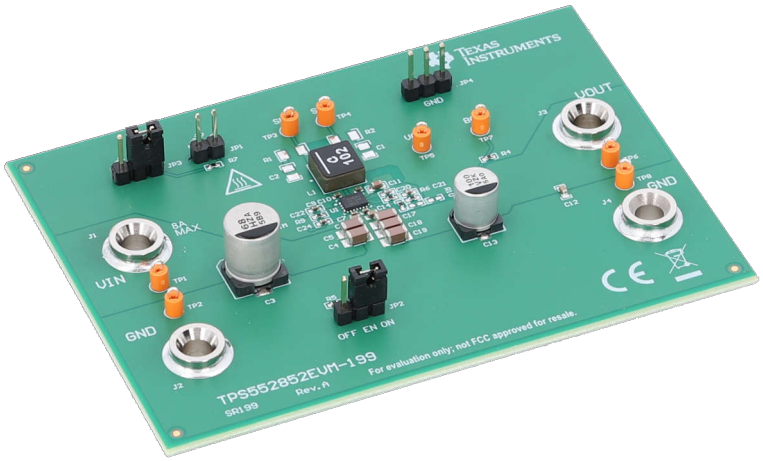
TPS552852 评估模块

说明

TPS552852EVM 有助于评估 TPS552852 在不同输入电压、输出电压和负载条件下的行为和性能。该 EVM 专为 2.4V 至 22V 输入电压和 12V 默认输出电压应用而设计。此 EVM 具有 Vin、Vout、SW1、SW2、VCC 及波德图测试的测试点，并配有用于设置轻载模式和 PG 功能的跳线。

特性

- 宽输入和输出电压范围
- ±1% 基准电压精度
- 可编程输出电流限制
- 在整个负载范围内具有高效率
- 外部可调节补偿网络
- 丰富的保护特性



1 评估模块概述

本用户指南描述了 TPS552852EVM 评估模块 (EVM) 的特性、运行和使用情况。该 EVM 包含 TPS552852 器件，后者是一款集成了四个 MOSFET 的高性能、高效率同步降压/升压转换器。本用户指南涵盖 EVM 规格、推荐测试设置、测试结果、原理图、物料清单以及电路板布局。

1.1 简介

1.2 套件内容

表 1-1. TPS552852EVM 套件内容

位号	数量	说明	器件型号	制造商	重量	长度	宽度	高度	材料类型	封装
PCB1	1	TPS552852EVM-199；电路板；CDDS 6656116	SR199	德州仪器 (TI)	50.00	3.62	2.60	1.00	EEE	塑料袋，ESD
BOX1	1	盒子，纸板	TIBX011	Leaman	57.00	5.75	4.50	2.00	纸板	盒
FM1	2	泡沫，防静电	TIFM004	Leaman	13.00	5.63	4.38	1.00	塑料	泡沫
LBL1	1	标签，小号和大号标准标签（除非另有说明，否则均使用标准规格）	SLLF003/SLLF002	按需打印	2.0				纸张/卡纸	纸
LIT1	1	文档资料，EVM 免责声明自述文件 – （放入所有套件中）	SZZC019	按需打印	7.0				纸张/卡纸	纸

1.3 性能规格

表 1-2 提供了 TPS552852EVM 性能规格的汇总。所有规格均为在 25°C 环境温度下的值。

表 1-2. 性能规格汇总

参数	测试条件	值	单位
输入电压	不适用	2.4 - 22	V
输出电压	不适用	12	V
最大输出电流	V_{IN} ≥ 6V	3	A
	V_{IN} ≥ 9V	4	
	V_{IN} ≥ 12V	5	
默认开关频率	不适用	2.1	MHz

1.4 器件信息

TPS552852 全集成式同步降压/升压转换器经优化，可将电池电压或适配器电压转换为电源轨。TPS552852 集成了四个 15mΩ MOSFET，以提供高效率和小尺寸解决方案。它具有 8A 平均电感器电流限制，并可在降压模式下提供高达 7A 的输出电流。在升压模式下，输入电压为 12V 时可提供 60W 的功率，输入电压为 5V 时可提供 30W 的功率。TPS552852 提供输入和输出过压保护、平均电感器电流限值、逐周期峰值电流限值和输出短路保护。TPS552852 还确保了在持续过载情况下，可通过输出电流限制安全运行，而无需外部输出电流检测电阻器和断续模式保护。

TPS552852EVM 的出厂默认设置支持在 2.4V 至 22V 的输入电压范围内工作，并提供 12V 的输出电压。客户可以通过更改 FB 分压器电阻来调节输出电压，并通过更改 ILIM 电阻来调节输出电流限制。

2 硬件

2.1 修改

此 EVM 的印刷电路板 (PCB) 设计用于适应用户所做的一些更改。可根据实际应用更改外部元件。

2.2 连接器和测试点说明

如表 2-1 中所示，此 EVM 包含 I/O 连接器和测试点。电源必须连接到输入连接器 J1 和 J2。负载必须连接到输出连接器 J3 和 J4。

表 2-1. 连接器和测试点

参考指示符	说明
J1	输入电压正连接
J2	输入电压回路连接
J3	输出电压连接
J4	输出电压回路连接

2.3 连接器、测试点和跳线说明

本节介绍了如何正确连接、设置和使用 TPS552852EVM。

2.3.1 跳线配置

2.3.1.1 JP2 (使能)

JP2 跳线可启用器件。默认情况下此跳线置于 OFF 位置。如果 Vin > 5.1V，则将本跳线置于“导通”位置，以便启用输出。将跳线置于 OFF 位置可禁用输出。如果 Vin < 5.1V，则将 EN 连接至外部 3V 电源，或根据数据表 EV/UVLO 功能说明调整 R3、R5 电阻值，以便启用输出，请注意：EN/UVLO 引脚的最大电压为 6V。

2.3.1.2 JP3 (模式)

MODE 引脚输入跳线。在 MODE 和 FPWM 之间放置一根跳线以设置为强制 PWM 模式，在 MODE 和 PFM 之间放置一根跳线以设置为自动 PFM 模式。应用外部时钟信号来同步开关频率。

2.4 测试程序

请按照以下步骤操作来执行测试程序：

1. 将电源电流限值设为 10A。将电源设为约 12V。关闭电源。将电源的正输出连接到 J1，负输出连接到 J2。
2. 将负载连接到 J3 实现正连接，连接到 J4 实现负连接。
3. 打开电源。
4. 缓慢增大负载，同时监控 J3 和 J4 之间的输出电压。负载电流小于 4A 时必须保持稳定。
5. 将输入电压从 9V 缓慢增加至 20V。如果负载电流低于 表 1-2 中指定的负载电流上限，输出电压必须保持稳定。
6. 关闭负载，关闭电源。然后打开负载，使输出电容器放电。

3 硬件设计文件

此部分提供了 TPS552852EVM 原理图、物料清单 (BOM) 和电路板布局布线。

3.1 原理图

图 3-1 显示了 EVM 原理图。

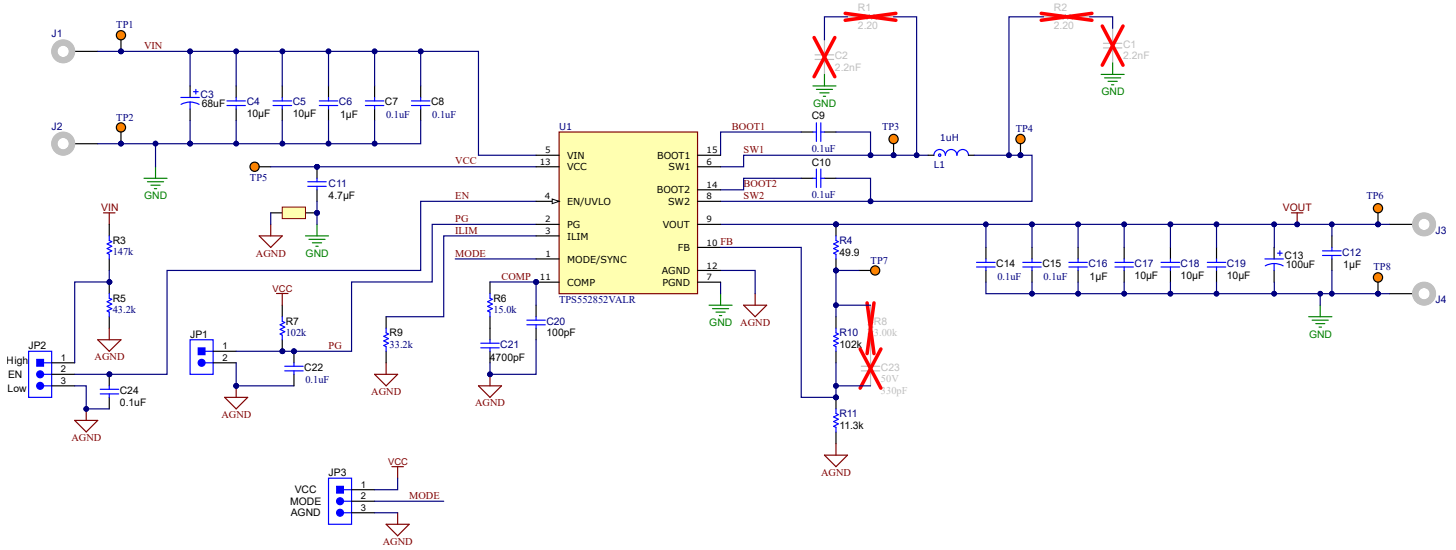


图 3-1. TPS552852EVM 原理图

3.2 电路板布局

图 3-2 至图 3-5 展示了 EVM 电路板布局。

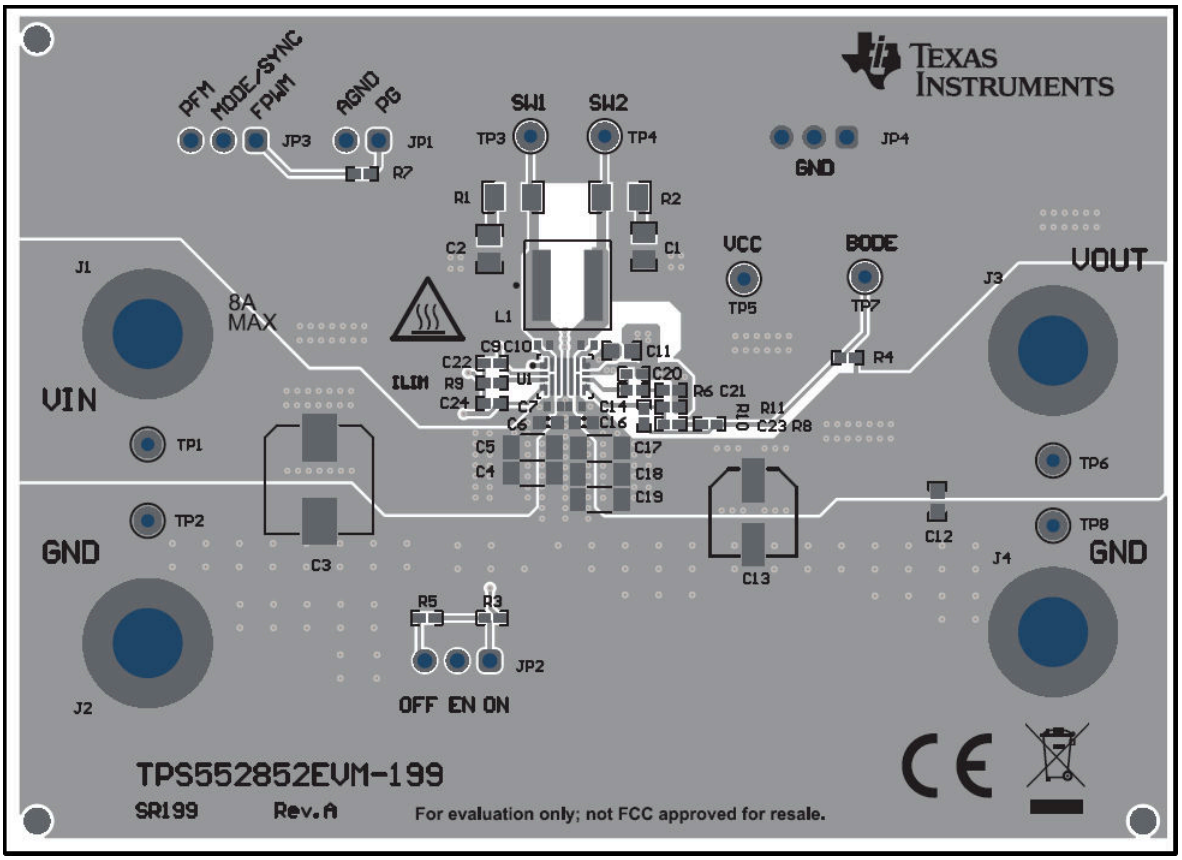


图 3-2. TPS552852EVM 顶面布局

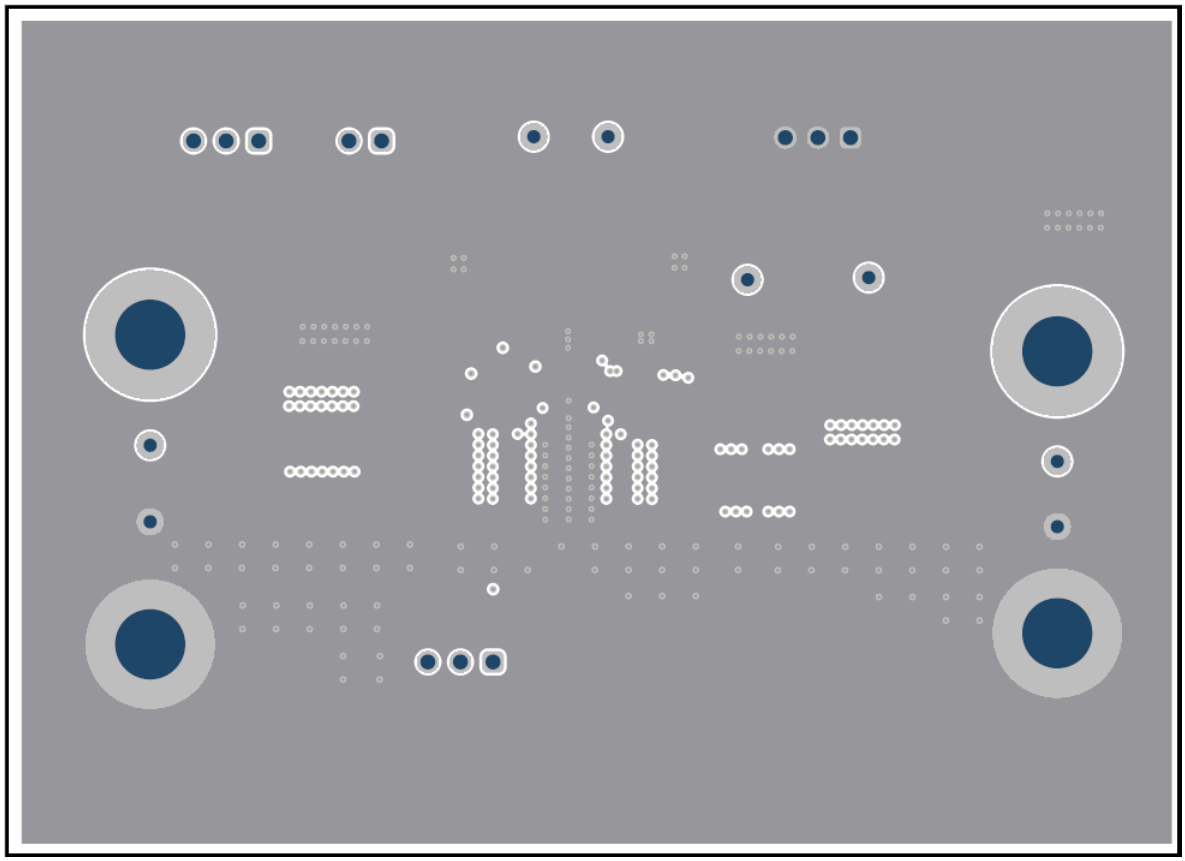


图 3-3. TPS552852EVM 内层 1

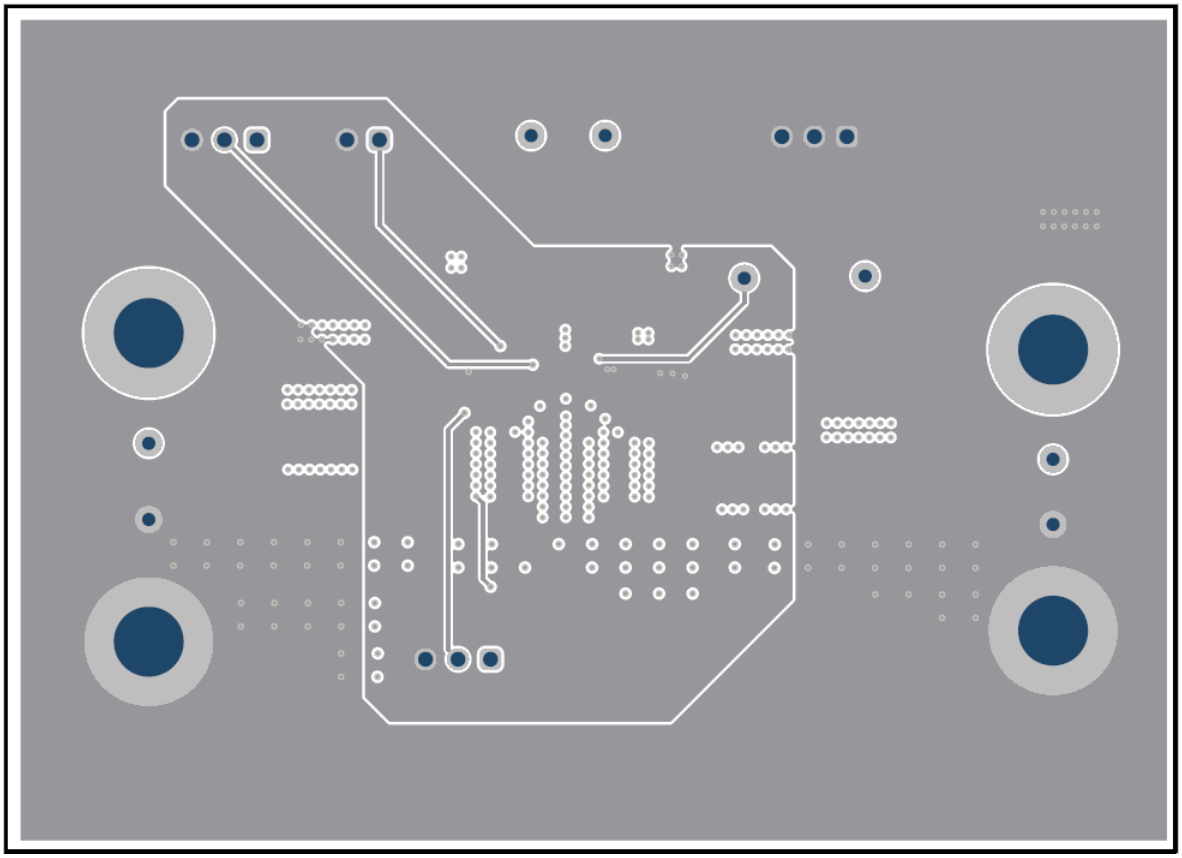


图 3-4. TPS552852EVM 内层 2

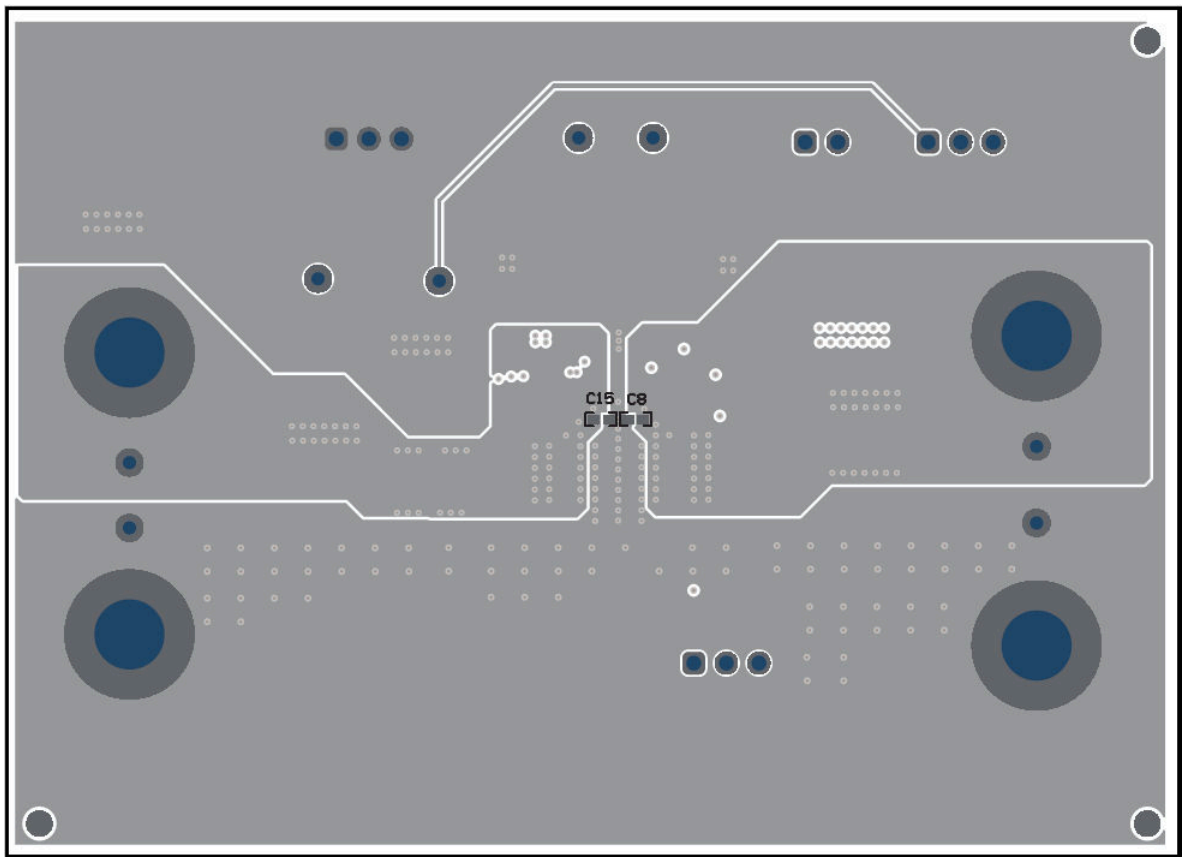


图 3-5. TPS552852EVM 底面布局

3.3 物料清单

表 3-1 列出了 EVM 物料清单。

表 3-1. 物料清单

位号	数量	值	说明	封装参考	器件型号	制造商
C3	1	68uF	电容，混合聚合物，68uF，50V，+/-20%，30Ω，8x10 SMD	8x10	EEHZA1H680P	Panasonic
C4、C5、C17、C18、C19	5	10uF	电容，陶瓷，10µF，50V，+/-10%，X7R，AEC-Q200 1 级，1206	1206	CGA5L1X7R1H106K160AC	TDK
C6、C12、C16	3	1uF	电容，陶瓷，1µF，50V，+/-20%，X5R，AEC-Q200 3 级，0603	0603	GRT188R61H105ME13D	MuRata
C7、C8、C9、C10、C14、C15、C22	7	0.1uF	电容器，陶瓷，0.1µF，50V，+/-20%，X7R，0402	0402	GRM155R71H104ME14D	MuRata
C11	1	4.7uF	电容，陶瓷，4.7µF，16V，+/-10%，X5R，AEC-Q200 3 级，0603	0603	GRT188R61C475KE13D	MuRata
C13	1	100uF	电容，铝，100µF，35V，AEC-Q200 2 级，SMD	D6.3xL5.8mm	EEHZK1V101XP	Panasonic
C20	1	100pF	电容，陶瓷，100pF，50V，+/-5%，C0G/NP0，AEC-Q200 1 级，0402	0402	CGA2B2C0G1H101J050BA	TDK
C21	1	4700pF	电容，陶瓷，4700pF，50V，+/-10%，X7R，AEC-Q200 1 级，0402	0402	CGA2B2X7R1H472K050BA	TDK
C24	1	0.1uF	电容，陶瓷，0.1 µ F，50V，+/-10%，X7R，AEC-Q200 1 级，0402	0402	CGA2B3X7R1H104K050BB	TDK
J1、J2、J3、J4	4		标准香蕉插头，非绝缘，6.73mm	标准香蕉插头，非绝缘，6.73mm	575-6	Keystone
JP1	1		接头，2.54mm，2x1，金，TH	接头，2.54mm，2x1，TH	61300211121	Wurth Elektronik
JP2、JP3、JP4	3		接头，2.54mm，3x1，金，TH	接头，2.54mm，3x1，TH	61300311121	Wurth Elektronik
L1	1	1µH	1µH 屏蔽模压电感器，18.1A，4.9mΩ（最大值，非标准）	SMT2_6MM51_6MM71	XGL6030-102MEC	Coilcraft
R3	1	147k	电阻，147k，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW0402147KFKED	Vishay-Dale
R4	1	49.9	电阻，49.9，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW040249R9FKED	Vishay-Dale
R5	1	43.2k	电阻，43.2k，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW040243K2FKED	Vishay-Dale
R6	1	15.0k	电阻，15.0k，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW040215K0FKED	Vishay-Dale
R7、R10	2	102k	电阻，102k，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW0402102KFKED	Vishay-Dale
R9	1	33.2k	电阻，33.2kΩ，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW040233K2FKED	Vishay-Dale
R11	1	11.3k	电阻，11.3k，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW040211K3FKED	Vishay-Dale
SH-JP1、SH-JP2	2		分流器，2.54mm，金，黑色	分流器，2.54mm，黑色	60900213421	Wurth Elektronik

表 3-1. 物料清单（续）

位号	数量	值	说明	封装参考	器件型号	制造商
TP1、TP2、TP3、TP4、TP5、TP6、TP7、TP8	8		测试点，微型，橙色，TH	橙色微型测试点	5003	Keystone Electronics
U1	1		TPS552852VALR	WQFN-HR15	TPS552852VALR	德州仪器 (TI)
C1, C2	0	2200pF	电容，陶瓷，2200pF，250V，+/-10%，X7R，0805	0805	GRM21AR72E222KW01D	MuRata
C23	0	330pF	电容，陶瓷，330pF，50V，+/-10%，X7R，AEC-Q200 1 级，0402	0402	CGA2B2X7R1H331K050BA	TDK
FID1、FID2、FID3、FID4、FID5、FID6	0		基准标记。没有需要购买或安装的元件。	不适用	不适用	不适用
R1、R2	0	2.2	电阻，2.20，1%，0.25W，AEC-Q200 0 级，1206	1206	ERJ-8RQF2R2V	Panasonic
R8	0	3.00k	电阻，3.00k，1%，0.063W，AEC-Q200 0 级，0402	0402	CRCW04023K00FKED	Vishay-Dale

4 其他信息

商标

所有商标均为其各自所有者的财产。

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

Changes from MARCH 2, 2026 to MARCH 31, 2026 (from Revision * (March 2026) to Revision A (March 2026))	Page
• 根据 EVM 指南标准更新了文档。	2

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 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/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.

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