EVM User's Guide: ISOW3080DWEEVM

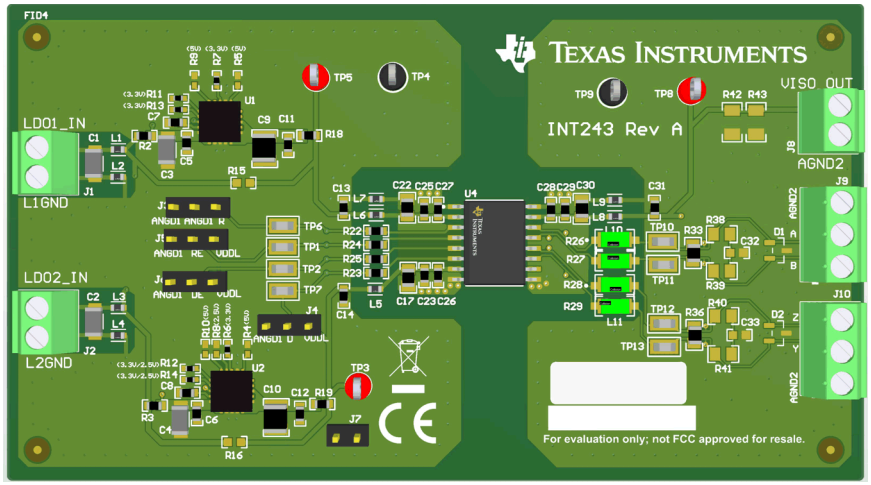
ISOW3080 具有集成直流/直流转换器的隔离式 RS-485/ RS-422 收发器评估模块

说明

ISOW308x(P) 系列器件是电隔离 RS-485、RS-422 收发器，内置隔离式直流/直流转换器，无需在空间受限的隔离式设计中使用单独的隔离式电源。该 EVM 可帮助设计人员评估器件的性能，从而快速开发和分析隔离系统。EVM 支持评估 16 引脚 WB SOIC 封装 (DWE-16) 中 ISOW308x 和 ISOW308xP 系列的任何器件型号。

特性

- 用于全面评估 ISOW308x(P) 系列器件的平台。
- 板载 LDO，为器件电源提供可配置的电压输出。
- 用于 VDD1 引脚及 VDDL 引脚的两个独立可配置 LDO。
- 板载振荡器选项，用于为初级侧输入通道提供动态数据输入。
- 用于探测数据线路和电源电压的测试点。
- RS485 总线提供共模扼流圈选项。
- 其他电阻器和跳线选项，用于配置数据速率和器件电源电压。



ISOW3080DWEEVM

1 评估模块概述

1.1 简介

ISOW3080DWEEVM 用户指南描述了带有集成直流/直流转换器的 ISOW3080 隔离式 RS-485/RS-422 收发器的功能。本用户指南介绍了在 VDD1 = 3.3V 和 VDDL = 3.3V 配置下评估 ISOW3080 器件的 EVM 操作。对于 ISOW3080，VISOOUT 在内部设置为 3.3V。然而，可以重新配置 EVM，以便在特定型号所需的电压条件下评估 16 引脚 WB SOIC 封装 (DWE-16) 中 ISOW308x 和 ISOW308xP 系列的任何器件型号。请参见器件信息中有关每个型号的详细信息。本指南还介绍了 EVM BOM、EVM 原理图、EVM PCB 布局和典型的实验室设置。

小心

此评估模块仅用于隔离器参数性能评估，不适用于隔离电压测试。为防止损坏此 EVM，任何用作电源或数字输入/输出的电压都必须保持在该器件的建议工作条件内。

1.2 套件内容

该评估模块包含一个 PCB 评估板，其中包含一个 ISOW3080 器件。ISOW3080 评估板的主要元件包括：

- ISOW3080DWER 隔离式 RS-485/RS-422 收发器，带集成电源。
- TPS7A4701RGWR 36V、1A、4.17 μVRMS 射频低压降 (LDO) 稳压器，RGW0020A (VQFN-20)。
- 多个测试点。

若要演示 ISOW3080DWER 的功能，TI 建议使用以下器件（另售）：

- 用于提供电源输入的 9V 或 12V 电池。
- 用于提供外部动态数据输入的信号发生器。
- 用于探测数据通道的示波器。

1.3 规格

在将 ISOW3080 器件用于设计前，EVM 可帮助用户全面地评估该器件。为便于通过稳压电源、标准直流适配器和电池等各种电源为 EVM 供电，EVM 包括两个可调节输出 LDO (TPS7A4701)，这两者连接到 VDD1 和 VDDL 引脚。EVM 上的 VDD1 及 VDDL 默认设置为 3.3V。此设置使得 LDO 输入端可以连接到更宽范围的电源电压，而 EVM 正常工作的最佳电压为 9V 至 12V。该 EVM 还包括一个板载振荡器 (LTC6908-1)，该振荡器可通过 0Ω 电阻器连接到 ISOW3080 的 D 输入端。该振荡器帮助提供一个快速测试信号来验证器件工作情况。该 EVM 可以配置为采用各种电源电压和测试配置工作，相关详细信息将在后续几节中介绍。

1.4 器件信息

ISOW308x(P) 系列器件是电隔离 RS-485、RS-422 收发器，内置隔离式直流/直流转换器，无需在空间受限的隔离式设计中使用单独的隔离式电源。集成电源转换器后的高效率有助于在 –55°C 至 125°C 的宽工作环境温度范围内运行。ISOW308x(P) 系列器件在设计时考虑了增强的保护功能，包括限制浪涌电流的软启动、过压和欠压锁定、过载和短路保护以及热关断。

提供了两个数据速率选项：ISOW3080(P) 针对最大 500kbps 进行了优化，ISOW3086(P) 则针对最大 12Mbps 的数据速率进行了设计。请参见表 1-1 中所有变体和可订购产品的详细信息。ISOW308x(P) 通过将 VDDL 和 VDD1 一同连接到 PCB 上，可在 3V 至 5.5V 的单一电源下运行。如果需要较低的逻辑电平，可以分离 2.25V 至 5.5V 的逻辑电源 (VDDL)，并独立于 3V 至 5.5V 的电源转换器电源 (VDD) 供电。

表 1-1. 器件比较表

器件型号	隔离	通信协议	数据速率	VISOOUT（在内部设置）	封装	封装尺寸（标称值）	封装尺寸
ISOW3080	增强型	RS485	500kbps	3.3V	DWE（SOIC，16）	10.30mm × 7.50mm	10.30mm × 10.30mm
ISOW3080P	增强型	Profibus	500kbps	5V	DWE（SOIC，16）		
ISOW3086	增强型	RS485	12Mbps	3.3V	DWE（SOIC，16）		
ISOW3086P	增强型	Profibus	12Mbps	5V	DWE（SOIC，16）		

2 硬件

2.1 ISOW308x 具有集成直流/直流转换器的隔离式 RS-485/RS-422 收发器评估模块的引脚配置

图 2-1 示出了 ISOW308x 和 ISOW308xP 系列器件的引脚配置。ISOW308x 的 VISOOUT 固定为 3.3V，ISOW308xP 的 VISOOUT 固定为 5V。请参阅表 1-1

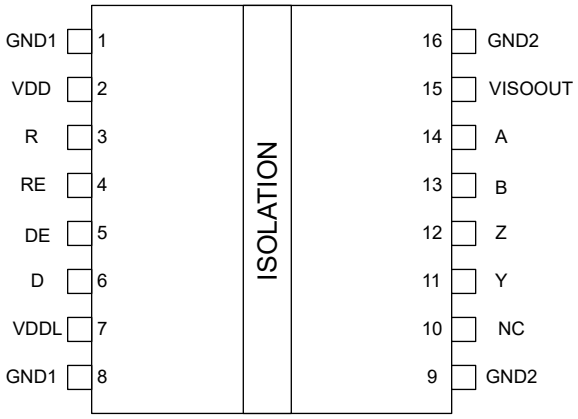


图 2-1. ISOW308x(P) 引脚配置

2.2 EVM 设置和操作

2.2.1 EVM 设置

本节介绍了用于器件评估的 EVM 的典型设置和操作。EVM 典型测试设置 显示了使用两个电源运行 ISOW3080DWEEVM 的典型测试配置。

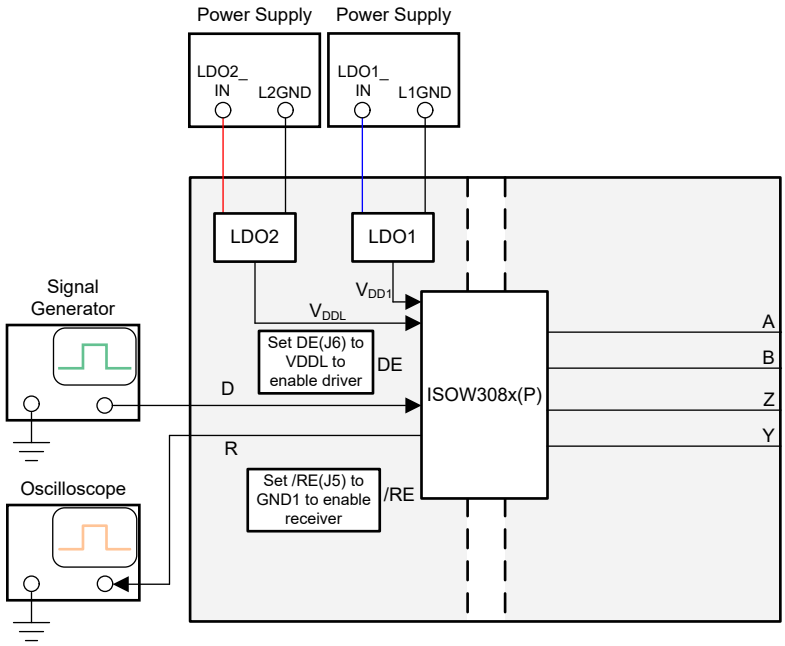


图 2-2. EVM 典型测试设置

ISOW3080DWEEVM 具有很多 DNP 电阻器，为了将 EVM 设置为所需的运行测试条件，用户可以选择连同 3 引脚跳线选件组装或不组装这些电阻器。元件配置 列出并介绍了可通过组装各种电阻器和跳线选项实现的所有测试配置。

表 2-1. 元件配置

元件	说明
R1	该电阻器将 LDO 的 U1、U2 输入连接到一起，从而仅允许使用一个电源而不是两个电源。
R2、R15、R18	组装 R15 会绕过 LDO U1，从而能够直接从外部电源为 VDD 供电。组装 R15 时，R2 和 R18 需要保持拆下状态，以断开 LDO。未旁路 LDO 时，LDO 的建议输入电压在 9V 和 12V 之间
R5、R7、R9、R11、R13	将 LDO U1 输出电压设为 5V 或 3.3V，用于 VDD1。仅使用 0Ω 电阻器组装 R5 和 R9， 以将 LDO U1 输出电压设置为 5V。仅使用 0Ω 电阻器组装 R7、R11 和 R13，以将 LDO U1 输出电压设置为 3.3V（默认配置）。
R3、R16、R19	组装 R16 会绕过 LDO U2，从而能够直接从外部电源为 VDDL 供电。组装 R16 时，R3 和 R19 需要保持拆下状态，以断开 LDO。未旁路 LDO 时，LDO 的建议输入电压在 9V 和 12V 之间。
R4、R6、R8、R10、R12、R14	将 LDO U2 输出电压设为 5V 或 3.3V 或 2.5V，用于 VDDL。仅使用 0Ω 电阻器组装 R4 和 R10， 以将 LDO U2 输出电压设置为 5V。仅使用 0Ω 电阻器组装 R6、R12 和 R14，以将 LDO U2 输出电压设置为 3.3V（默认配置）。仅使用 0Ω 电阻器组装 R8、R12 和 R14， 以将 LDO U2 输出电压设置为 2.5V。
R17	该电阻器将振荡器 U3 输出信号连接到 ISOW3080 的 U4 输入端 D，从而允许使用测试信号来测试 EVM，而无需任何外部测试信号输入。
R20、R21	组装 R20 会将 U3 输出信号速率设置为 500Kbps（默认配置），而组装 R21 会将该速率设置为 12Mbps。
R30、R31	这些电阻器允许短接 EVM 上的 Y/Z 和 A/B，以启用全双工器件的半双工配置。
L10、L11	RS485 总线上的共模扼流圈 (CMC)。如果组装 L10，则移除 R26 和 R27。如果组装 L11，则移除 R28 和 R29。
R26、R27、R28、R29	组装 R26 和 R27 会绕过 A/B 上的 CMC L10，而组装 R28 和 R29 会绕过 Y/Z 上的 CMC L11
R32、R34、R35、R37	用于外部失效防护偏置的可选封装。ISOW3080 启用了内部失效防护偏置，因此是 DNP。
R38、R39、R40、R41	组装这些元件以在 A/B 和 Y/Z 上实现分裂终端配置。
C32、C33	组装这些元件以在 A/B 和 Y/Z 上实现分裂终端配置。
D1、D2	用于安装 TVS 二极管的可选 SOT-23 封装。
R42、R43	未使用 RS485 时，可以组装可选电阻器以从 VISOOUT 提取 ILOAD。使用 RS485 功能时不组装。
C18。C19、C20、C21	可选电容器，用于在 Side1 的数字信号线路上进行噪声滤波。
J3	请勿使用跳线连接任何引脚。这仅用作额外的探测点，用于探测 ISOW3080 的输出 R
J4	在中间引脚和 GND1 之间连接此跳线，以输入 D 引脚连接至低电平。在中间引脚和 VDDL 之间连接此跳线，以输入 D 引脚连接至高电平。
J5	在中间引脚和 GND1 之间连接此跳线，将 DE 引脚连接到低电平。当 DE 引脚为低电平时，驱动器输入被禁用。在中间引脚和 VDDL 之间连接此跳线，将 DE 引脚连接到高电平。当 DE 引脚为高电平时，驱动器输入被启用。
J6	在中间引脚和 GND1 之间连接此跳线，将 RE 引脚连接到低电平。当 RE 引脚为低电平时，接收器被启用。在中间引脚和 VDDL 之间连接此跳线，将 RE 引脚连接到高电平。当 RE 引脚为高电平时，接收器被禁用
J7	跳线选项，用于向 U3 振荡器上电或断电。

3 硬件设计文件

3.1 原理图

ISOW3080DWEEVM 旨在评估采用 16 引脚 WB SOIC 封装 (DWE-16) 的任何 ISOW308x(P) 器件。若要评估采用 16 引脚 WB SOIC 封装 (DWE-16) 的任何 ISOW308x(P) 器件，请在 ISOW3080DWEEVM 板上将 ISOW3080 替换为相关器件。其他元件不需要针对 ISOW308x 器件进行任何修改。要评估任何 ISOW308xP 器件，需要通过更改 U1 上的电阻器选项，将引脚 2 (VDD1) 从默认设置 3.3V 更改为 5V。图 3-1 展示了 ISOW3080DWEEVM 原理图。

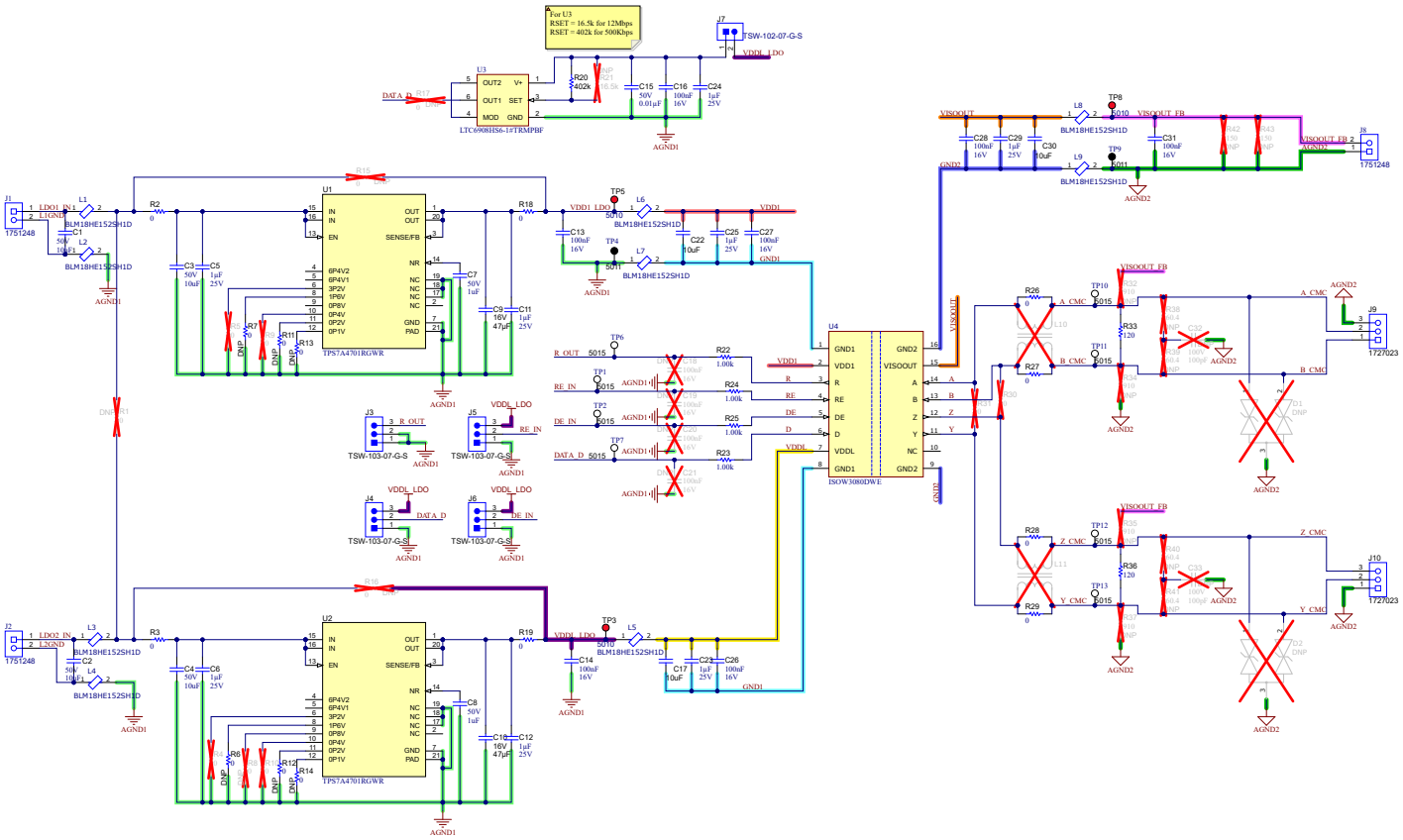


图 3-1. ISOW3080DWEEVM 原理图

3.2 PCB 布局和 3D 图

图 3-2 和图 3-3 分别显示了印刷电路板 (PCB) 布局的顶层和底层。图 3-4 和图 3-5 显示了 PCB 的 3D 图，其中指示了成品电路板的外观。

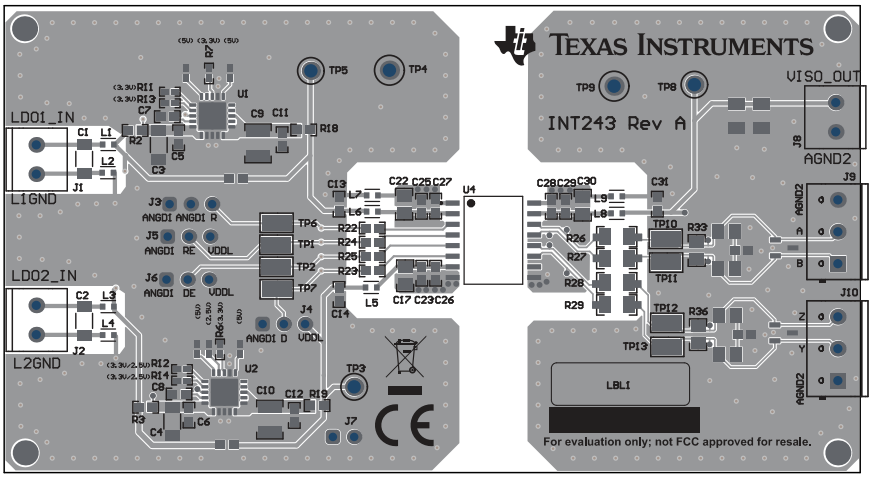


图 3-2. ISOW3080DWEEVM PCB 布局 - 顶层

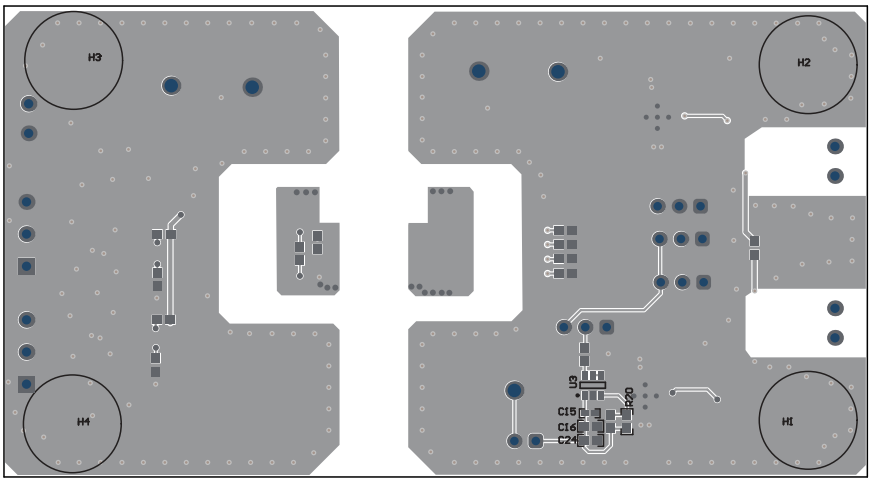


图 3-3. ISOW3080DWEEVM PCB 布局 - 底层

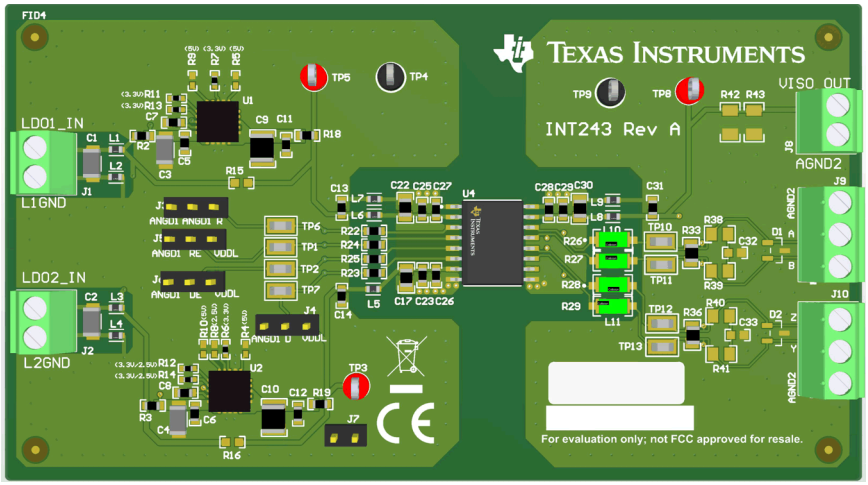


图 3-4. ISOW3080DWEEVM PCB 3D 视图 - 顶层

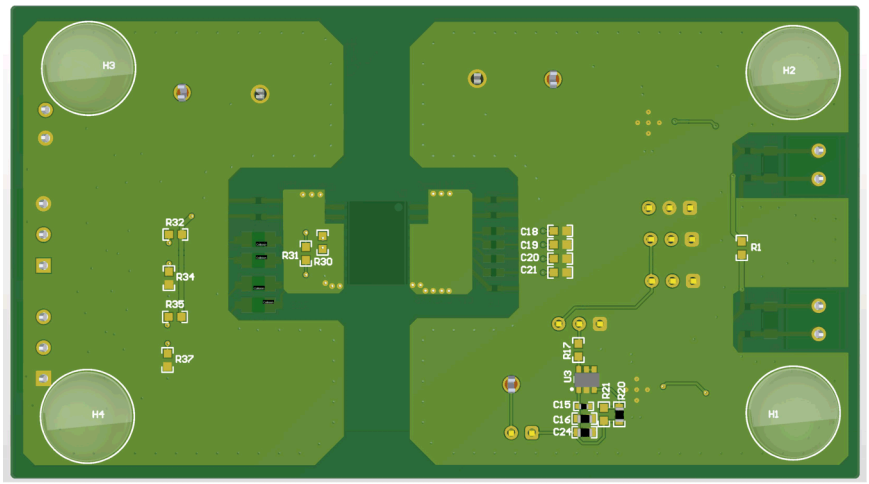


图 3-5. ISOW3080DWEEVM PCB 3D 视图 - 底层

3.3 物料清单 (BOM)

表 3-1 列出了此 EVM 的物料清单 (BOM)。

表 3-1. 物料清单

条目	位号	说明	制造商	器件型号
1	C1、C2、C3、C4	CAP，CERM，10µF，50V，+/-10%，X5R，1206	TDK	C3216X5R1H106K160AB
2	C5、C6、C11、C12、C23、C24、C25、C29	CAP，CERM，1uF，25V，+/-10%，X7R，AEC-Q200 1 级，0603	MuRata	GCM188R71E105KA64D
3	C7、C8	CAP，CERM，1µF，50V，+/-10%，X5R，0603	TDK	C1608X5R1H105K080AB
4	C9、C10	CAP，CERM，47µF，16V，+/-10%，X5R，1210	Samsung Electro-Mechanics	CL32A476KOJNNNE
5	C13、C14、C16、C26、C27、C28、C31	CAP，CERM，0.1uF，16V，+/-10%，X7R，0603	Samsung Electro-Mechanics	CL10B104KO8NNNC
6	C15	CAP，CERM，0.01µF，50V，+/-10%，X7R，0402	Walsin	0402B103K500CT
7	C17、C22、C30	CAP，CERM，10µF，35V，+/-10%，X5R，0805	MuRata	GRM21BR6YA106KE43L
8	H1、H2、H3、H4	Bumpon，半球形，0.44 × 0.20，透明	3M	SJ-5303 (CLEAR)
9	J1、J2、J8	连接端子块，2 位，3.5mm，TH	Phoenix Contact	1751248
10	J3、J4、J5、J6	接头，100mil，3x1，金，TH	Samtec	TSW-103-07G-S
11	J7	接头，100mil，2x1，金，TH	Samtec	TSW-102-07G-S
12	J9、J10	接线端子插座，3x1，3.81mm，R/A，TH	Phoenix Contact	1727023
13	L1、L2、L3、L4、L5、L6、L7、L8、L9	芯片铁氧体磁珠，0603，1500Ω (100MHz)，0.5Ω，25%，500mA	Murata	BLM18HE152SH1D
14	LBL1	热转印打印标签，0.650" (宽) x 0.200" (高) - 10,000/卷	Brady	THT-14-423-10
15	R2、R3、R18、R19	电阻，0，5%，0.1W，0603	Yageo	RC0603JR-070RL
16	R6、R7、R11、R12、R13、R14	电阻，0，5%，0.063W，0402	Vishay-Dale	CRCW04020000Z0ED
17	R20	电阻，402k，1%，0.1W，0603	Yageo	RC0603FR-07402KL
18	R22、R23、R24、R25	电阻，1.00k，1%，0.1W，0603	Yageo	RC0603FR-071KL
19	R26、R27、R28、R29	电阻，0，5%，0.25W，1206	Vishay-Dale	CRCW12060000Z0EA
20	R33、R36	电阻，120，1%，0.4W，0805	Rohm	ESR10EZPF1200
21	TP1、TP2、TP6、TP7、TP10、TP11、TP12、TP13	测试点，微型，SMT	Keystone	5015
22	TP3、TP5、TP8	测试点，红色，穿孔，RoHS，大容量	Keystone	5010
23	TP4、TP9	测试点，多用途，黑色，TH	Keystone	5011
24	U1、U2	36V、1A、4.17 µ VRMS 射频低压降 (LDO) 稳压器，RGW0020A (VQFN-20)	德州仪器 (TI)	TPS7A4701RGWR
25	U3	电阻器 Set SOT-23 振荡器，2.7V 至 5.5V，6 引脚 SOT23 (S6-6)，-40°C 至 85°C，无铅	Linear Technology	LTC6908HS6-1#TRMPBF
26	U4	ISOW3080DWE	德州仪器 (TI)	ISOW3080DWE
27	C18、C19、C20、C21	CAP，CERM，0.1uF，16V，+/-10%，X7R，0603	Samsung Electro-Mechanics	CL10B104KO8NNNC
28	C32、C33	CAP，CERM，100pF，100V，+/-5%，C0G/NP0，0603	MuRata	GRM1885C2A101JA01D

表 3-1. 物料清单（续）

条目	位号	说明	制造商	器件型号
29	D1、D2	双通道双向 12V ESD 保护二极管 3-SOT-23 -40 至 125	德州仪器 (TI)	选择任何 2 通道 SOT-23 封装 TVS
31	L10、L11	100µH @ 100kHz 2 路共模扼流圈，表面贴装，5.8kΩ @ 10MHz 150mA DCR 2Ω	TDK	ACT45B-101-2P-TL003
32	R1、R15、R16、R17、R30、R31	电阻，0，5%，0.1W，0603	Yageo	RC0603JR-070RL
33	R4、R5、R8、R9、R10	电阻，0，5%，0.063W，0402	Vishay-Dale	CRCW04020000Z0ED
34	R21	电阻，16.5k，1%，0.1W，0603	Yageo	RC0603FR-0716K5L
35	R32、R34、R35、R37	电阻，910，1%，0.1W，0603	Yageo	RC0603FR-07910RL
36	R38、R39、R40、R41	电阻，60.4，1%，0.125W，AEC-Q200 0 级，0805	Vishay-Dale	CRCW080560R4FKEA
37	R42、R43	电阻，0，5%，0.25W，1206	Yageo America	RC1206JR-070RL

4 其他信息

4.1 商标

所有商标均为其各自所有者的财产。

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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

重要通知和免责声明

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TI 反对并拒绝您可能提出的任何其他或不同的条款。

最后更新日期：2025 年 10 月