

EVM User's Guide: TPLD1201-RWS-EVM

TPLD1201-RWS 评估模块



说明

TPLD1201RWS 评估模块 (EVM) 属于 TI 可编程逻辑器件 (TPLD) 系列，该系列器件采用具有组合逻辑、时序逻辑和混合信号功能的多功能可编程逻辑 IC，可提供集成、紧凑的低功耗设计来实现常见系统功能（例如时序延迟、电压监测器、系统复位、电源序列发生器以及 I/O 扩展器等）。

借助 TPLD1201，用户无需将 TPLD1201RWS 器件焊接到电路板上即可对器件进行配置。用户可以使用 InterConnect Studio (ICS) 进行快速评估、开发、仿真和编程。编程完成后，即可从插座移除 TPLD 器件并将其置于用户的系统中。

开始使用

1. 订购 TPLD1201-RWS-EVM 和 TPLD-PROGRAM。
2. 下载最新版本的 [InterConnect Studio \(ICS\)](#)。
3. 使用 TPLD-PROGRAM 套件随附的电缆连接系统。

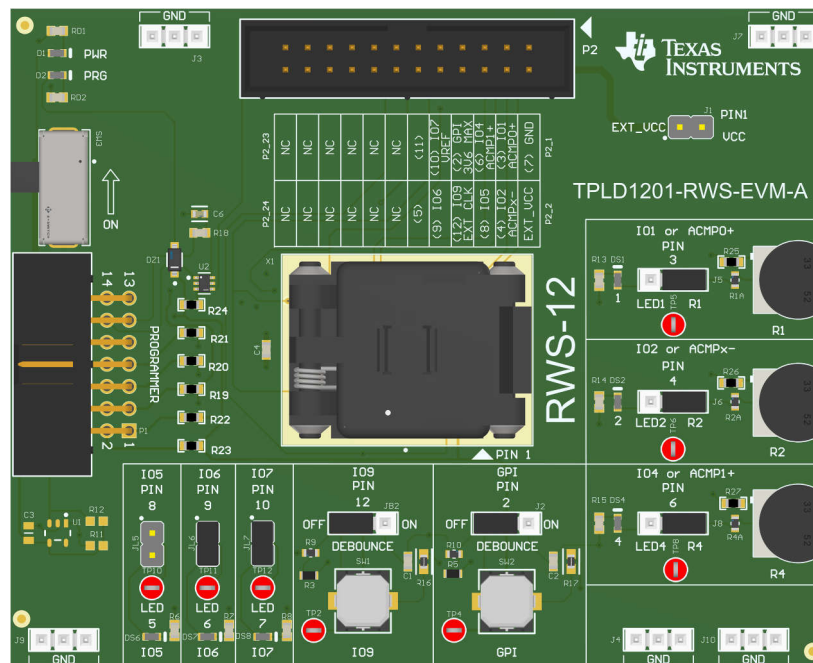
4. 将未编程的 TPLD1201RWS 插入插座中，并使用 ICS 进行配置。

特性

- 可使用 RWS 插座轻松对 TPLD1201RWS 进行编程和评估
- 通过输入按钮、电位器和输出 LED 可实现快速评估
- 可通过接头引脚和测试点来连接定制系统
- 使用标准键控 14 引脚电缆与 TPLD-PROGRAM 连接

应用

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1 评估模块概述

1.1 简介

本用户指南包含 TPLD1201RWS 评估模块 (EVM) 的支持文档。本指南介绍了如何设置和配置 EVM、如何将 EVM 与 TPLD-PROGRAM 板结合使用，以及如何使用 InterConnect Studio 配置 TPLD1201。此外，本指南还介绍了 TPLD1201-RWS-EVM 的印刷电路板 (PCB) 布局布线、原理图和物料清单 (BOM)。

备注

为了对器件进行编程，需要 TPLD-PROGRAM 板和 InterConnect Studio。

TI 仅支持使用 TPLD-PROGRAM 套件中提供的电缆连接 EVM 和编程器板。

1.2 套件内容

表 1-1. TPLD1201-RWS-EVM 套件内容

条目	说明	数量
TPLD1201-RWS-EVM	PCB	1
TPLD1201RWS	12 引脚 TI 可编程逻辑器件	5
快速入门指南	系统设置指南	1

1.3 规格

参数	条件	最小值	典型值	最大值	单位
V _{cc}	由编程器提供支持		3.3		V
V _{cc}	外部电源	1.71		5.5	V
V _i	每引脚输入	0		V _{cc}	V
V _o	每引脚输出	0		V _{cc}	V
GPI	输入	0		V _{cc}	V

1.4 器件信息

TPLD1201 属于 TI 可编程逻辑器件 (TPLD) 系列，该系列器件采用可配置的 I/O 结构，可扩展混合信号环境中的兼容性，从而减少所需的分立式元件数量。系统设计人员可以通过 InterConnect Studio 创建电路并配置宏蜂窝、I/O 引脚和互连，方法是临时模拟非易失性存储器或对一次性可编程 (OTP) 进行永久编程。

2 硬件

2.1 功能块

本节介绍了 TPLD1201-RWS-EVM 的不同功能块。

2.1.1 测试点

插槽式 TPLD1201RWS 器件的每个 GPIO 和 GPI 引脚均直接连接到测试点，方便用户使用器件的每个引脚进行探测和测试。各引脚按如下方式连接到测试点：

引脚编号	IO 名称	测试点
2	GPI	TP4
6	IO4	TP8
3	IO1	TP5
4	IO2	TP6
8	IO5	TP10
9	IO6	TP11
10	IO7	TP12
12	IO9	TP2

每个测试点均直接连接到相应的引脚，因此任何断开的接头引脚都不会从引脚断开测试点。

2.1.2 编程器接头块 (P1)

编程器接头块接受用于将 TPLD1201-RWS-EVM 连接到 TPLD-PROGRAM 的 14 位电缆。TI 建议使用此接头仅通过 TPLD-PROGRAM 套件随附的电缆连接到 TPLD-PROGRAM。该接头为键控接头，因此 14 位电缆只在键槽朝向正确方向时才能插入外壳。要将 TPLD1201-RWS-EVM 连接到 TPLD-PROGRAM，请按照节 3.2 中的步骤操作。

SW3 将编程器接头的 3V3 线路连接到 EVM 的 VCC 线路。通过 TPLD-PROGRAM 为 EVM 供电时，3V3 线路必须处于 ON 位置。

2.1.3 外部连接接头块

P2 接头块用于将 TPLD1201-RWS-EVM 与外部系统连接。根据 EVM 丝印上的指南，可以将 TPLD 引脚与外部系统连接，从而支持在客户系统中进行原型设计和测试。使用 P2 接头块为 TPLD 供电时，SW3 需要处于 OFF 位置，并在 J1 上放置一个分流器，将外部 VCC 电源从 P2 (VCC_EXT) 连接到 EVM 的 VCC 网络。TI 建议不要将电路板同时连接到外部系统和 TPLD-PROGRAM，以避免损坏 TPLD-PROGRAM 和外部系统的风险。

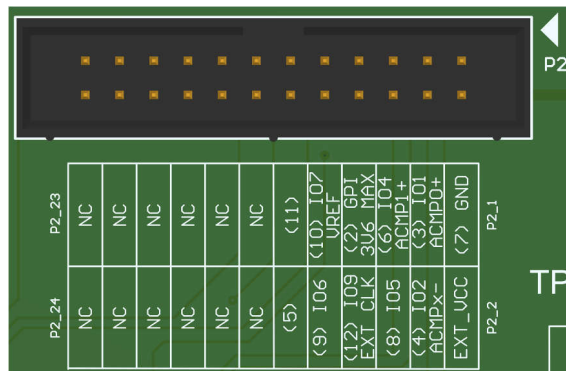


图 2-1. P2 和 J1 接头

2.1.4 GPI 保护块

在永久编程过程中，对 TPLD 的 GPI 引脚施加 8V 电压。该电路可防止 P2 上的电压超过 3.3V。

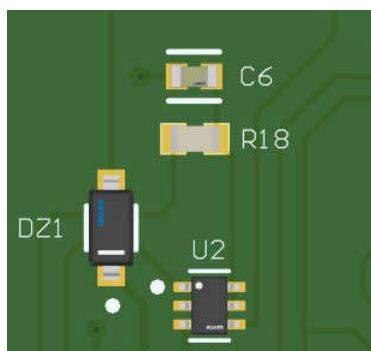


图 2-2. GPI 保护块

2.1.5 RWS 插座

RWS 插座用于测试 TPLD 器件以及对其进行编程，而无需将器件焊接到 EVM。

要将器件插入插座中，请按照节 3.2 中的步骤操作。

2.2 GPIO 测试块

该器件上的 8 个 GPIO 引脚连接到各种测试块，以进行原型设计。下表列出了这些连接。

引脚编号	IO 名称	测试块	测试块名称
8	IO5	LED	LED5
9	IO6	LED	LED6
10	IO7	LED	LED7
12	IO9	SW	SW1
2	GPI	SW	SW2
6	IO4	LED/POT	LED4/R4
4	IO2	LED/POT	LED2/R2
3	IO1	LED/POT	LED1/R1

2.2.1 LED 块

每个 LED 块包含一个 LED，该 LED 可以通过接头与 TPLD 引脚连接或断开。要将 LED 连接到相应引脚，请在两个接头引脚之间的相应接头上放置一个分流器。

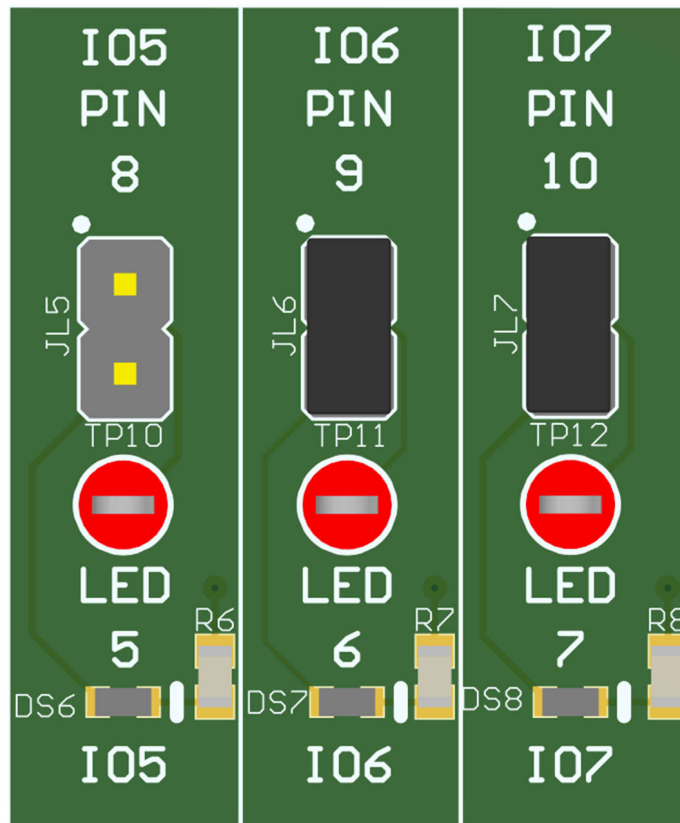


图 2-3. LED 块

2.2.2 开关块

每个 SW 模块均包含一个触控开关和一个可选的去抖电路。该开关可通过一个 3 位接头连接到相应的 TPLD 引脚。3 位接头的一侧 (标有 OFF) 直接连接到开关输出, 3 位接头的另一侧 (标有 ON) 连接到一个去抖电路, 然后再连接到开关输出。接头的中间引脚连接到相应的 TPLD 引脚。要直接连接到开关输出, 请在接头的中间引脚和 OFF 引脚之间放置一个分流器。要连接到去抖电路, 请在接头的中间引脚和 OFF 引脚之间放置一个分流器。如果未在任一组引脚之间放置分流器, 则开关不会连接到 TPLD 引脚。

备注

编程期间, 不得在 GPI 引脚上连接去抖电路。

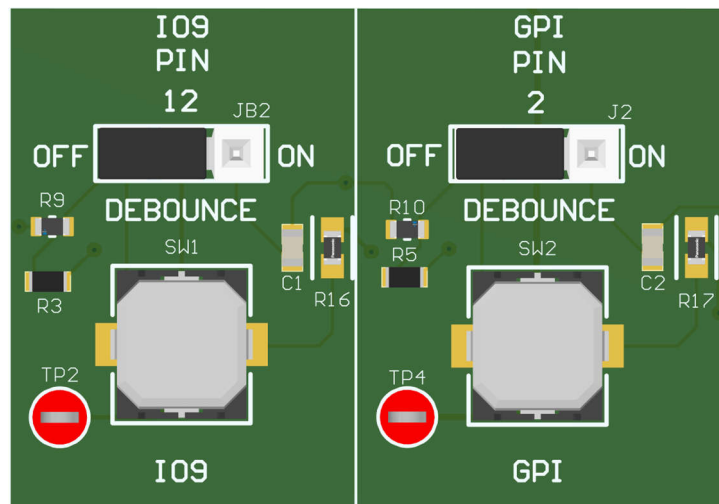


图 2-4. 开关块

2.2.3 LED/电位器块

每个 LED/POT 块均包含一个三态接头引脚，可用于将相应的 GPIO 引脚连接到模拟电压源或 LED。接头的中间引脚连接到 TPLD 的相应 GPIO 引脚。接头引脚的左侧（标有 LED）连接到 LED。接头引脚的右侧（标有 R）连接到模拟电压源。要将相应的 GPIO 连接到 LED，请在中间引脚和 LED 引脚之间放置一个分流器。要将 GPIO 连接到模拟电压源，请在中间引脚和 R 引脚之间放置一个分流器。

模拟电压源包含一个使用 POT 的分压器。当 POT 按顺时针旋转到底时，模拟电压源可输出最高 0.2V 的电压。当 POT 按逆时针方向旋转到底时，模拟电压源输出至少 $V_{CC} - 0.2V$ 的电压。

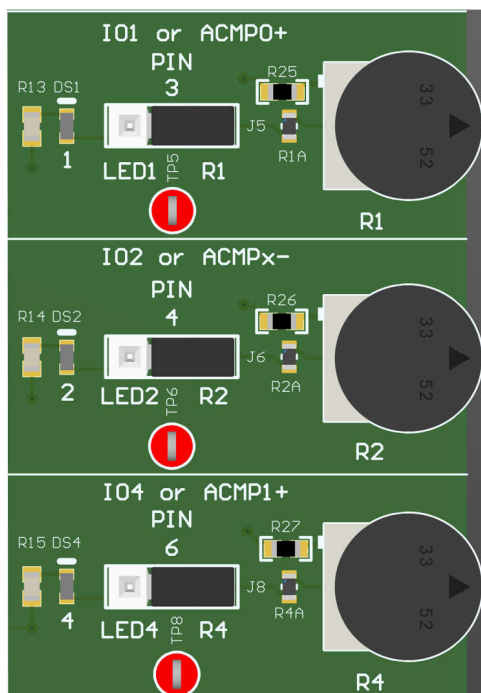


图 2-5. LED/POT 块

3 软件

3.1 使用 TPLD1201-RWS-EVM

本节以 TPLD1201 EVM 演示文件为例，介绍了如何使用 TPLD1201-RWS-EVM 来演示 TPLD1201 并对其进行编程。如需获取有关使用 InterConnect Studio (ICS) 自行创建电路的更多帮助，请参阅“InterConnect Studio 用户指南”。

3.1.1 编程所需的设备

要使用 TPLD1201-RWS-EVM 对 TPLD 器件进行编程，需要一个 TPLD-PROGRAM 套件和一台运行 InterConnect Studio 的计算机。TPLD-PROGRAM 套件包含将计算机连接到 TPLD1201-RWS-EVM 所需的一切。InterConnect Studio 可以按照节 3.1.2 中的说明从 TI.com 下载。

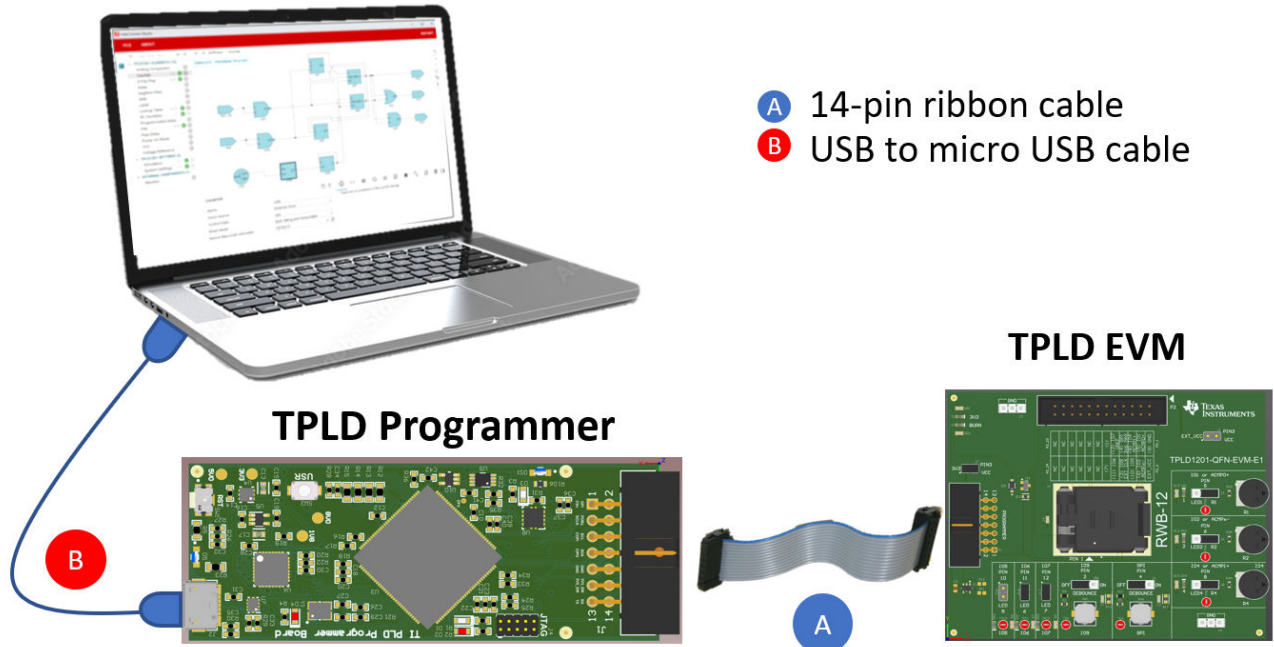


图 3-1. 连接 TPLD EVM 和编程器

3.1.2 安装软件

InterConnect Studio (ICS) 可从 interconnect_studio.itg.ti.com 免费获取

有关使用 InterConnect Studio (ICS) 的详细信息，请参阅“InterConnect Studio 用户指南”。

3.2 配置 TPLD 器件

本节介绍了使用 TPLD1201-RWS-EVM 和 TPLD-PROGRAM 套件对 TPLD1201RWS 进行编程的步骤。

3.2.1 用于编程的 TPLD1201-RWS-EVM 设置

确保满足以下条件：

1. 将 SW3 置于 ON 位置。
2. 将 GPI 引脚 2 跳线 (J2) 置于 OFF 位置或移除该跳线
3. 移除 EXT_VCC (J1) 跳线
4. 断开 P2 与任何外部系统的连接

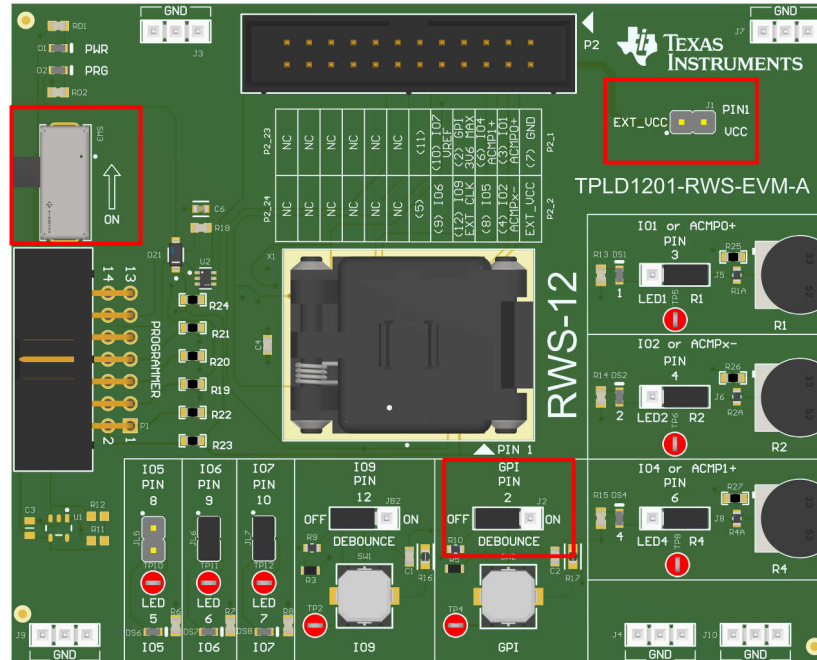


图 3-2. 编程设置中考虑的元素

3.2.2 将 TPLD1201RWS 插入 RWB 插座

请勿在通电电路板上移除、更换或添加 TPLD 器件。请勿将手指放在插座内或触摸插座底部的触点。TI 建议在处理 TPLD1201RWS 时遵循典型的 ESD 保护程序。

1. 轻轻拉动门锁以打开插座，直到盖板弹开。
2. 用干净的压缩空气吹净插座触点和器件焊盘，确保插座干净整洁。
3. 使用真空笔或防静电镊子将器件导入插座，将器件的引脚 1 对准插座的引脚 1，如下所示。
4. 合上插座盖，直至门锁卡入到位并将盖板固定到位。

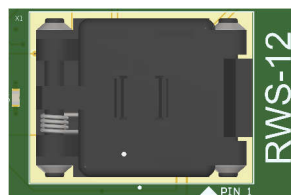


图 3-3. RWB 插座

3.2.3 将 TPLD1201-RWS-EVM 连接到 TPLD-PROGRAM 板

随附的所有电缆均为键控电缆，只有在朝向正确方向时才能插入。如果在轻微施力的情况下无法插入电缆，请尝试调换电缆的方向，并确保接头外壳未被阻塞，然后再次尝试。强制连接可能会导致电缆和电路板损坏。

1. 使用提供的 USB 电缆将编程器板连接到运行 InterConnect Studio 的计算机。确保 TPLD-PROGRAM 和计算机之间连接良好，即 TPLD-PROGRAM 上的两个蓝色 LED 都亮起。图 3-1 中显示了一个完全连接的 EVM 示例。
2. 使用提供的 14 位带状电缆将 TPLD-PROGRAM 与 TPLD1201-RWS-EVM 连接在一起。确保 TPLD1201-RWS-EVM 和 TPLD-PROGRAM 之间连接良好，即 EVM 左上方的 3V3 LED 指示亮起。

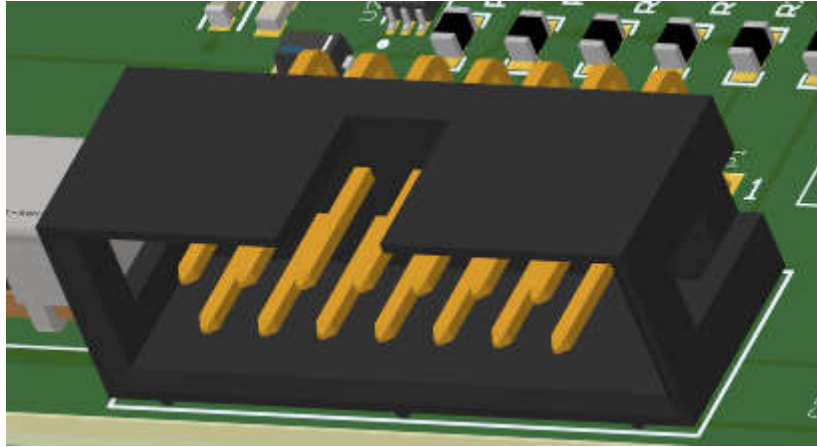


图 3-4. 键控接头插座

3.2.4 对 TPLD 器件进行临时配置

本节介绍了如何使用 InterConnect Studio 来通过预构建的演示电路来配置 TPLD1201。

如果对 TPLD 进行了临时配置，断开器件电源会导致 TPLD 复位并擦除配置的电路。TPLD 可以多次重新配置，而无需在两种配置之间复位。

1. 在 TPLD-PROGRAM 连接到的计算机上打开 InterConnect Studio。在 *Design* 下，选择 *TPLD1201*。在 *Package*: 下，选择 *RWS (X2QFN, 12)*。
2. 搜索 *TPLD1201 EVM Demo* 并从预先设计的电路列表中选择该演示，或选择 *Empty Design* 以构建定制电路。

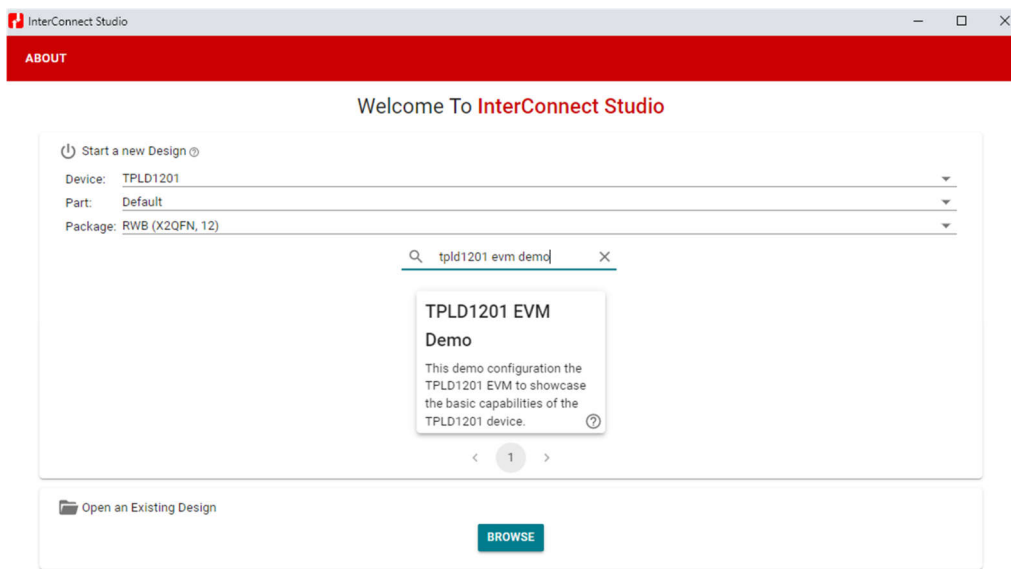


图 3-5. 在 ICS 中选择演示

有关该演示的更多详细信息，请参阅节 3.3。

- InterConnect Studio 会打开所选的电路。
- 选择 InterConnect Studio 左上角的 **CONFIGURE TPLD1201**，以使用 InterConnect Studio 所示的电路配置 EVM 插座中的 TPLD。选择连接到 TPLD-PROGRAM 的串行端口，然后选择 **OK**。

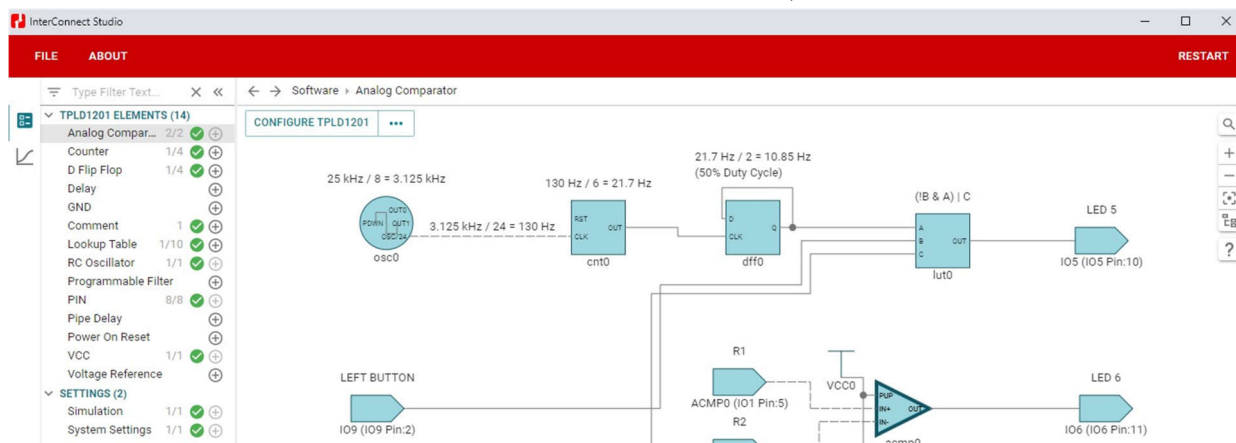


图 3-6. 在 ICS 中进行临时配置

- TPLD1201-RWS-EVM 上的某些 LED 会在编程序列期间闪烁，这是正常现象。
- 如果配置失败，请检查 EVM 和计算机之间的连接，确保 SW3 处于 ON 位置并检查 TPLD 器件和插座触点之间的连接，然后重试。

编程序列完成后，会使用 InterConnect Studio 中内置的电路临时配置电路板上的 TPLD 器件。配置的电路可以使用 EVM 上提供的按钮、电位器和 LED 进行测试。

3.2.5 对 TPLD 器件进行永久编程

本节介绍了如何使用 InterConnect Studio 对 TPLD1201 进行永久编程。永久编程的器件会在电源复位后保留已编程的配置。

不得再次对经过永久编程的器件进行永久编程，以避免损坏器件。

- 在 InterConnect Studio 中打开要在 TPLD1201 中永久编程的所需配置。
- 选择 **CONFIGURE TPLD1201** 按钮旁边的三点图标，以打开“Configure Settings”。
- 选择 **Permanently Configure Device**。如果使用 TPLD-PROGRAM 为 EVM 供电，则将“Power Source”保留为 **Programmer**。选择 **OK**。

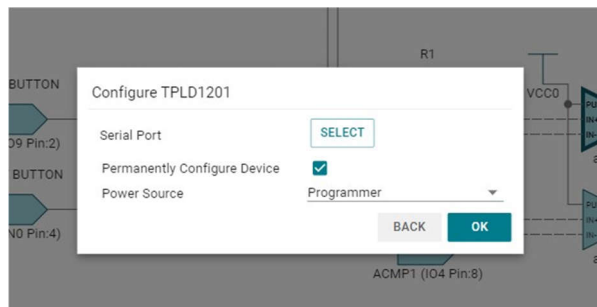


图 3-7. 在 ICS 中进行永久编程

- 选择连接到 TPLD-PROGRAM 的串行端口，然后再次选择 **OK**。
 - TPLD1201-RWS-EVM 上的某些 LED 可能会在编程序列期间闪烁，这是正常现象。
 - 如果配置失败，请检查 EVM 和计算机之间的连接，确保 SW3 处于 ON 位置并检查 TPLD 器件和插座触点之间的连接，然后重试。
- 在移除永久编程的 TPLD1201 之前，请先断开 EVM 的电源。

3.3 使用 TPLD1201-RWS-EVM 演示进行测试

本节提供了一个示例，介绍如何使用 TPLD1201-RWS-EVM 测试临时配置的电路。TPLD1201 演示旨在展示 TPLD1201 的主要功能，例如内部振荡器、触发器、计数器、门和模拟比较器。

3.3.1 TPLD1201 演示电路

TPLD1201 演示包含四个元素：模拟输入、数字输入、数字输出和内部模块。

该演示具有三个模拟输入：ACMP0 (IO1)、ACMPx (IO2) 和 ACMP1 (IO4)。这些输入馈送到一对模拟比较器 acmp0 和 acmp1 中，这两个比较器分别驱动数字输出 IO6 和 IO7。当 IO1 保持在高于 IO2 的电压时，acmp0 会将 IO6 驱动为高电平。当 IO4 保持在高于 IO2 的电压时，acmp1 会将 IO7 驱动为高电平。

该演示使用频率为 25kHz (八分频至 3.125kHz) 的内部振荡器 (osc0)。在将分频后的振荡器用作输入之前，一个二进制计数器 (cnt0) 会将频率进一步 24 分频到 130Hz。计数器计数到 6，然后输出一个高电平脉冲并复位计数，从而有效地将信号频率六分频至 21.7Hz。二进制计数器的输出用作触发器 (dff0) 的时钟输入，而反相输出作为数据输入，从而将信号频率降低到 10.85Hz 并将信号从脉冲更改为占空比为 50% 的信号。然后将触发器的输出用作查询表 (lut0) 的输入 A。

该演示使用以下两个数字输入：IO9 和 GPI。这两个数字输入分别馈入查询表 lut0 的输入 B 和 C。查询表使用公式 $(B \& A) | C$ ，因此当这两个数字输入都不为高电平时，查询表的输出将跟随输入 A，即触发器 (dff0) 的输出。当 GPI 输入为高电平时，查询表输出高电平，当 IO9 输入为高电平时，查询表输出低电平。查询表的输出驱动数字输出 IO5。

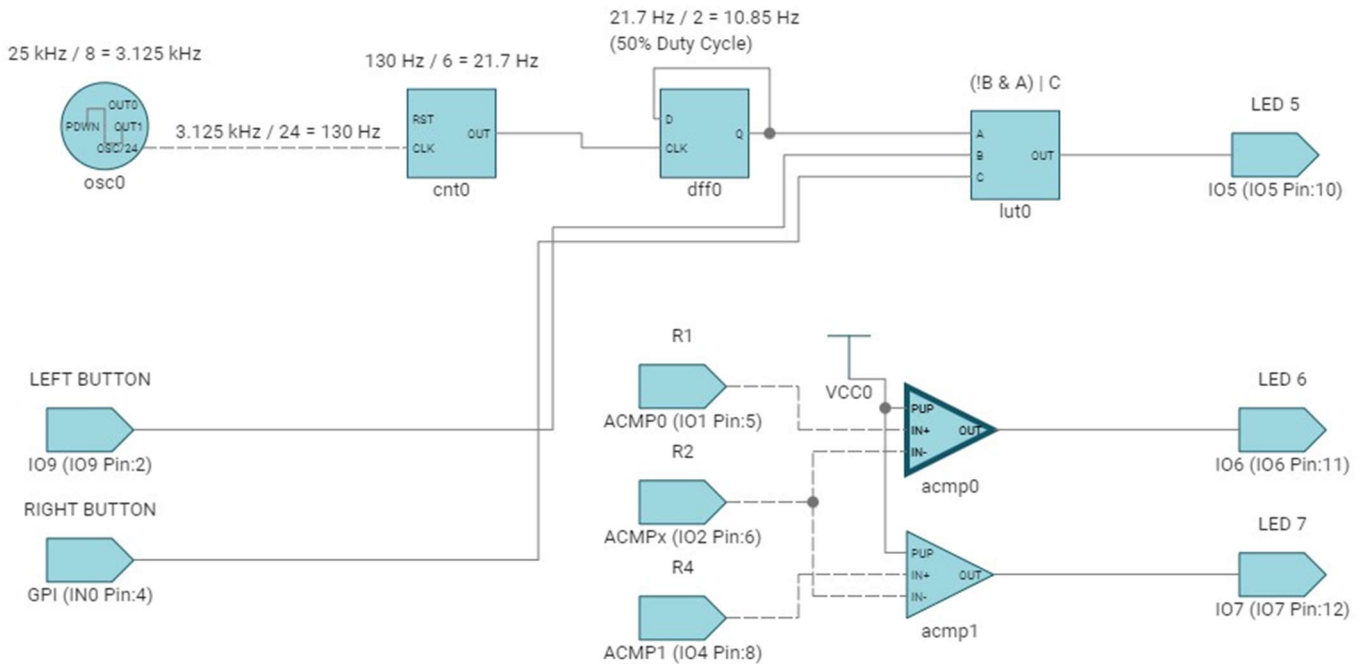


图 3-8. TPLD1201 EVM 演示

3.3.2 对演示进行测试

要按预期对演示进行测试，请使用以下接头连接设置 EVM：

1. 引脚 8 接头上的跳线 (JL5)、引脚 9 接头上的跳线 (JL6) 和引脚 10 接头上的跳线 (JL7)
2. 引脚 12 接头上的跳线 (JB2) (位于中间引脚和 OFF 之间)
3. 引脚 2 接头上的跳线 (J2) (位于中间引脚和 OFF 之间)
4. 引脚 6 接头上的跳线 (J8) (位于中间引脚和 R4 之间)
5. 引脚 4 接头上的跳线 (J6) (位于中间引脚和 R2 之间)

6. 引脚 3 接头上的跳线 (J5) (位于中间引脚和 R1 之间)
7. 处于 ON 位置的 SW3

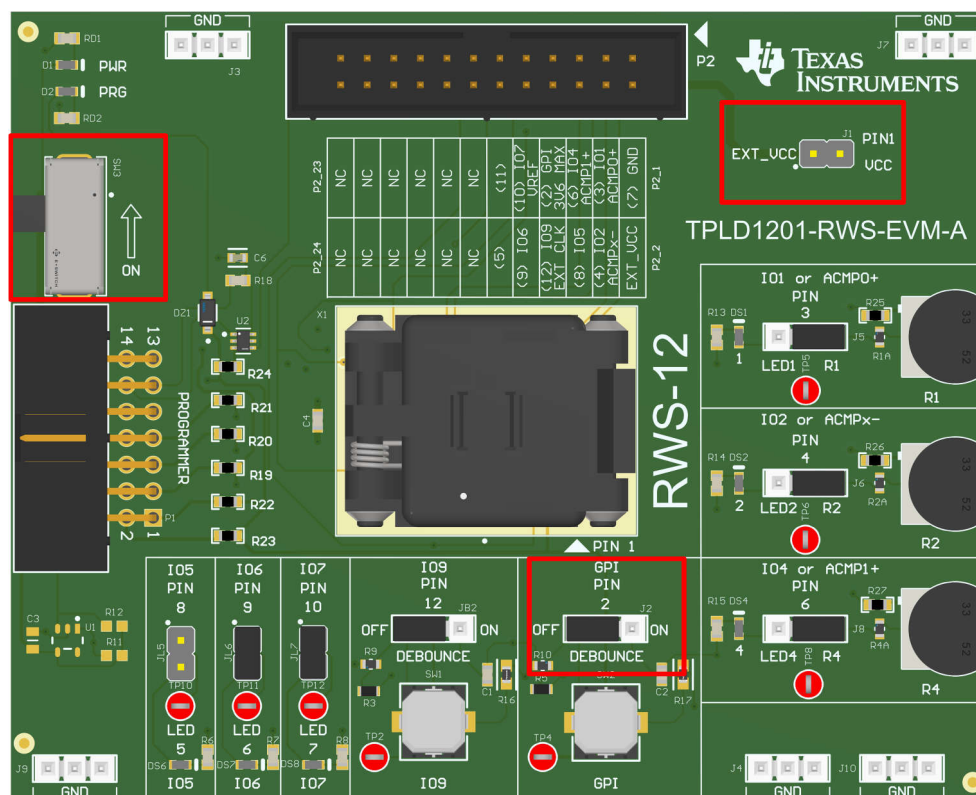


图 3-9. 演示配置中使用的接头和开关

设置 EVM 后，首先按照节 3.2 中的步骤使用演示配置空白 TPLD1201RWS。在 EVM 的 TPLD 上正确配置演示后，LED5 会开始闪烁。按下 SW1 按钮会熄灭 LED5。按下 SW2 按钮会点亮 LED5。

IO1、IO2 和 IO4 分别由电位器 R1、R2 和 R4 控制。顺时针转动电位器会增加提供给输入引脚的电压，而逆时针转动电位器会降低提供给输入引脚的电压。R2 控制器件上两个模拟比较器的负输入电压基准。将 R2 设置为中间值，然后移动 R1 以查看模拟比较器 ACMP0 的触发情况，其输出连接到 LED6。同样，可以转动 R4 来在 LED7 上查看模拟比较器 ACMP1 的触发情况。

4 硬件设计文件

4.1 原理图

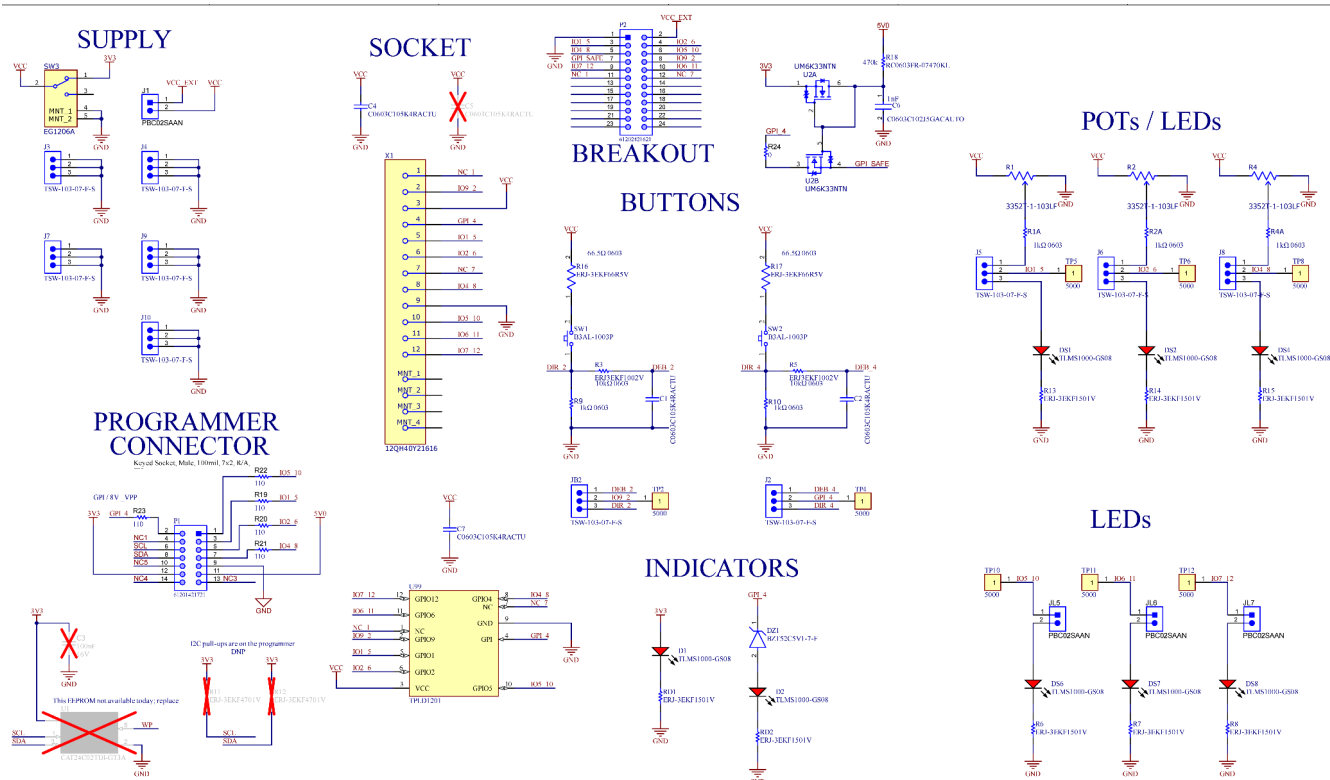


图 4-1. TPLD1201-RWS-EVM 原理图

4.2 PCB 布局

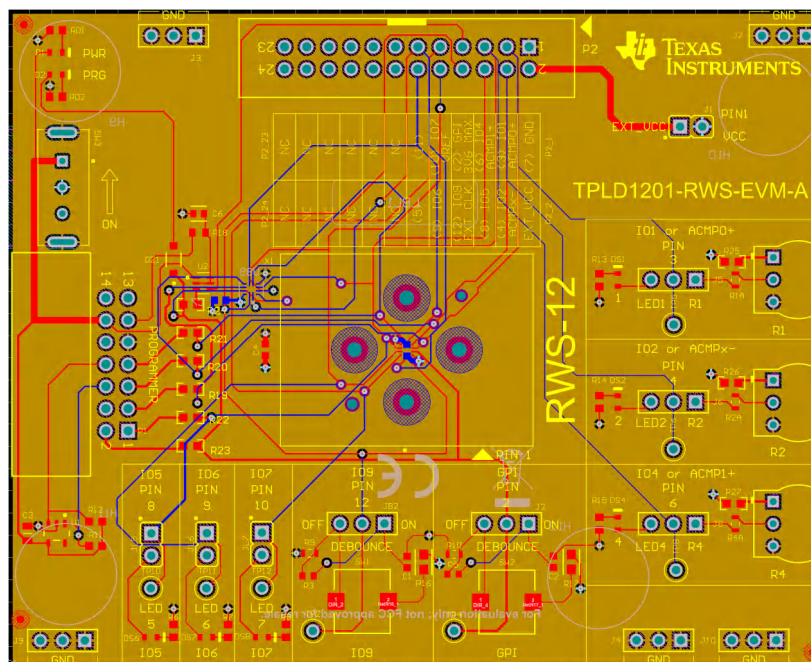


图 4-2. TPLD1201-RWS-EVM 布局

4.2.1 PCB 概述

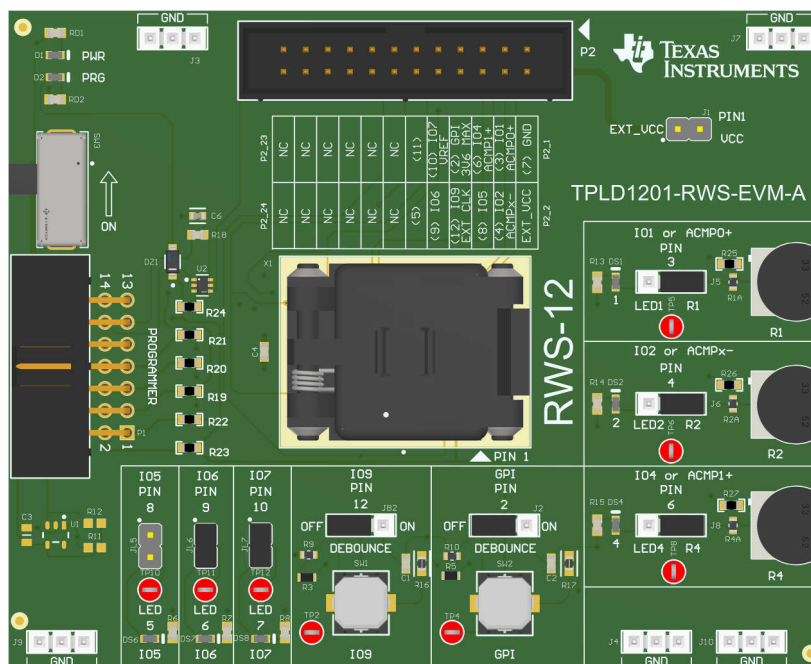


图 4-3. TPLD1201-RWS-EVM 电路板正面

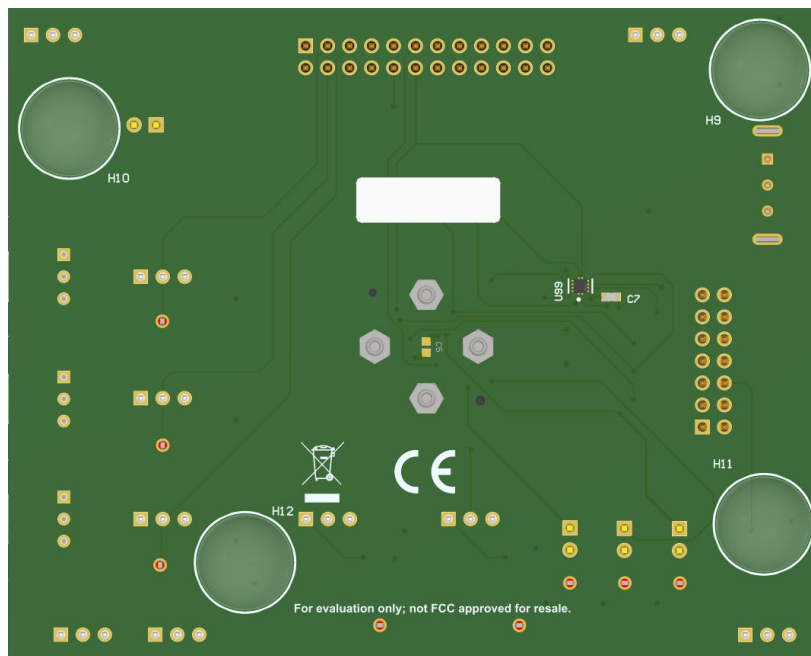


图 4-4. TPLD1201-RWS-EVM 电路板底层

4.3 物料清单

本节提供了有关可与 TPLD1201-RWS-EVM 一同使用的元件的信息。可以使用其他元件，只要这些元件适合提供的电镀孔和焊盘即可。

表 4-1. 物料清单

位号	条目	值	制造商	器件型号
C1、C2、C4、C5	电容器	1uF	Yageo	C0603C105K4RACTU
C3	电容器	DNP	Knowles Syfer	060330160104JXT
C6	电容器	1000pF	KEMET	C0603C102J5GACAUTO
D1、D2、DS1、DS2、DS4、DS6、DS7、DS8	LED	红色	Vishay	TLMS1000-GS08
DZ1	二极管	5.1V	二极管	BZT52C5V1-7F
H9、H10、H11、H12	Bumpon	清除	3M	SJ-5303 (CLEAR)
J1、JL5、JL6、JL7	接头	2x1	Sullins	PBC02SAAN
J2、J3、J4、J5、J6、J7、J8、J9、J10、JB2	接头	3x1	Samtec	TSW-103-07F-S
P1	接头	7x2	Würth Electronics	61201421721
P2	接头	12x2	Würth Electronics	61202421621
R1、R2、R4	电阻器	10k Ω	Bourns	3352T-1-103LF
R1A、R2A、R4A、R9、R10	电阻器	1k Ω	Vishay	CRCW06031K00FKEAC
R3、R5	电阻器	10k Ω	Bourns	ERJ3EKF1002V
R6、R7、R8、R13、R14、R15、RD1、RD2	电阻器	1.5k Ω	Panasonic	ERJ-3EKF1501V
R11、R12	电阻器	DNP	Yageo	ERJ-3EKF4701V
R16、R17	电阻器	66.5 Ω	Panasonic	ERJ-3EKF66R5V
R18	电阻器	470k Ω	Yageo	RC0603FR-07470KL
R24	电阻器	0 Ω	Stackpole Electronics Inc	RMCF0603ZT0R00
R19、R20、R21、R22、R23	电阻器	110 Ω	Vishay Dale	CRCW0603110RJNEA
SH-J1、SH-J2、SH-J3、SH-J4、SH-J5、SH-J6、SH-J7、SH-J8	分流器		Sullins Connector Solutions	SPC02SYAN
SW3	开关	滑动	E-Switch	EG1206A
SW1、SW2	开关	触控式	欧姆龙 (Omron)	B3AL-1003P
TP2、TP4、TP5、TP6、TP8、TP10、TP11、TP12	测试点	红色	Keystone Electronics	5000
U1	EEPROM	DNP	Microchip/Atmel	CAT24C02TDI-GT3A
U2	晶体管		Rohm	UM6K33NTN

表 4-1. 物料清单 (续)

位号	条目	值	制造商	器件型号
X1	插座	RWB	Plastronics	12QH40Y21616

5 其他信息

商标

所有商标均为其各自所有者的财产。

6 参考资料

- 德州仪器 (TI) , [CMOS 输入缓慢变化或悬空的影响应用报告](#)

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 - 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 instructions, 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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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.

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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.

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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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