

EVM User's Guide: TPLD1201-DGS-EVM

TPLD1201-DGS-EVM Evaluation Module



Description

The TPLD1201DGS is part of the TI Programmable Logic Device (TPLD) family of devices that feature versatile programmable logic ICs with combinational logic, sequential logic and mixed-signal functions to provide an integrated, compact, low power design to implement common system functions, such as timing delays, voltage monitors, system resets, power sequencers, and I/O expanders.

The TPLD1201-DGS-EVM helps users to configure TPLD1201DGS devices without requiring the soldering of the devices to the board. Users can utilize InterConnect Studio (ICS) for fast evaluation, development, simulation, and programming. Once programmed, TPLD devices can be removed from the socket and placed in a user's system.

Get Started

1. Order the TPLD1201-DGS-EVM and TPLD-PROGRAM
2. Download the latest version of [InterConnect Studio \(ICS\)](#)

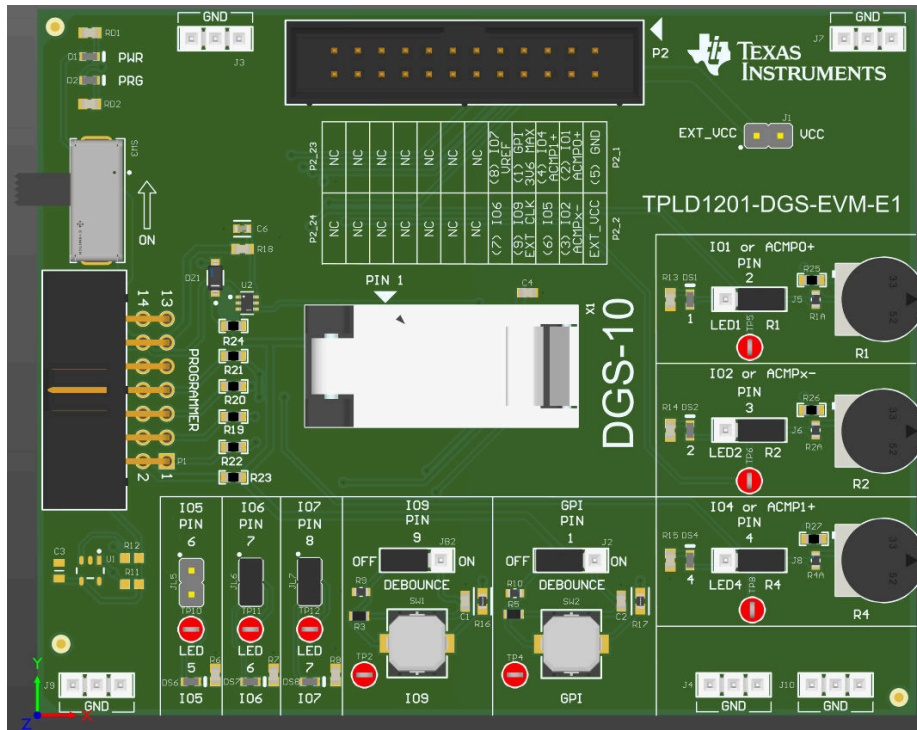
3. Use the cables included the TPLD-PROGRAM kit to connect the system
4. Place an unprogrammed TPLD1201DGS into the socket and configure using ICS

Features

- DGS socket for easy programming and evaluation of TPLD1201DGS
- Input buttons, potentiometers, and output LEDs for quick evaluation
- Header pins and test points for interfacing with custom systems
- Interfaces with TPLD-PROGRAM using a standard keyed 14-pin cable

Applications

- [Factory automation and control](#)
- [Communications equipment](#)
- [Retail automation and payment](#)
- [Test and measurement](#)
- [Pro audio, video and signage](#)
- [Personal electronics](#)



1 Evaluation Module Overview

1.1 Introduction

This user's guide contains support documentation for the TPLD1201DGS evaluation module (EVM). Included is a description of how to set up and configure the EVM, how to use the EVM in conjunction with a TPLD-PROGRAM board, and how to use InterConnect Studio to configure the TPLD1201. Also included are the printed circuit board (PCB) layout, the schematic, and the bill of materials (BOM) of the TPLD1201-DGS-EVM.

Note

To program devices, the TPLD-PROGRAM board and InterConnect Studio are required.

TI only supports the use of the cables provided in the TPLD-PROGRAM kit to interface between the EVM and the programmer board.

1.2 Kit Contents

Table 1-1. TPLD1201-DGS-EVM Kit Contents

Item	Description	Quantity
TPLD1201-DGS-EVM	PCB	1
TPLD1201DGS	10-pin TI Programmable Logic Device	5
Quick start guide	Guide to setup system	1

1.3 Specification

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
V _{cc}	Powered by programmer		3.3		V
V _{cc}	External Power	1.71		5.5	V
V _i	Per pin input	0		V _{cc}	V
V _o	Per pin output	0		V _{cc}	V
GPI	Input	0		V _{cc}	V

1.4 Device Information

The TPLD1201 is part of the TI programmable logic device (TPLD) family of devices that features configurable I/O structures that extends compatibility within mixed-signal environments, reducing the number of discrete components required. System designers can create circuits and configure the macro-cells, I/O pins, and interconnections by temporarily emulating the non-volatile memory or by permanently programming the one-time programmable (OTP) through InterConnect Studio.

2 Hardware

2.1 Functional Blocks

This section covers the different functional blocks of the TPLD1201-DGS-EVM.

2.1.1 Test Points

Each GPIO and GPI pin of an socketed TPLD1201DGS part is connected directly to a test point to allow a user to access each pin of the device for probing and testing. The pins are connected to test points as follows:

Pin Number	IO name	Test Point
1	GPI	TP4
2	IO1	TP5
3	IO2	TP6
4	IO4	TP8
6	IO5	TP10
7	IO6	TP11
8	IO7	TP12
9	IO9	TP2

Each test point is connected directly to the corresponding pin, so any disconnected header pins do not disconnect the test points from the pins.

2.1.2 Programmer Header Block (P1)

The programmer header block accepts the 14-position cable used to connect the TPLD1201-DGS-EVM to the TPLD-PROGRAM. TI recommends using this header to connect only to the TPLD-PROGRAM using the cables included in the TPLD-PROGRAM kit. The header is keyed, so the 14-position cable can only be inserted to the case with the key facing the correct direction. To connect the TPLD1201-DGS-EVM to a TPLD-PROGRAM, follow the steps in [Section 3.2](#).

SW3 connects the 3V3 line of the programmer header to the VCC line of the EVM. When powering the EVM from the TPLD-PROGRAM, the 3V3 line must be in the ON position.

2.1.3 External Connection Header Block

The P2 header block is intended to be used to interface the TPLD1201-DGS-EVM with an external system. Using the guide printed on the EVM silkscreen, the TPLD pins can be interfaced with an external system to allow for prototyping and testing in customer systems. When supplying power to the TPLD using the P2 header block, SW3 needs to be in the OFF position and a shunt placed on J1, connecting the external VCC supply from P2 (VCC_EXT) to the VCC net of the EVM. TI recommends not connecting the board to an external system and to the TPLD-PROGRAM at the same time to avoid the risk of damage to the TPLD-PROGRAM and the external system.

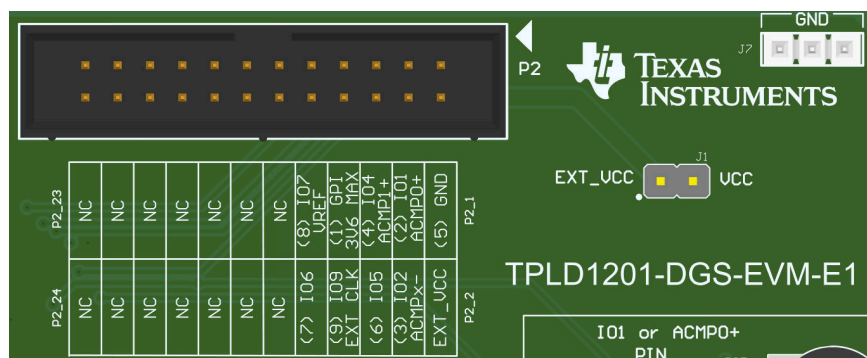


Figure 2-1. P2 and J1 Headers

2.1.4 GPI Protection Block

During the permanent programming process, 8V is applied to the GPI pin of the TPLD. This circuit prevents the voltage at P2 from exceeding 3.3V.

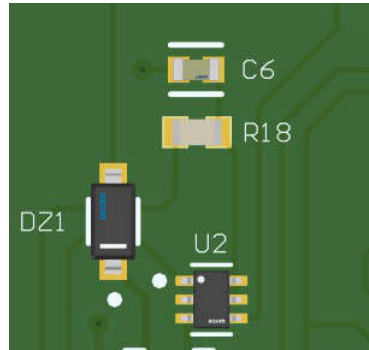


Figure 2-2. GPI Protection Block

2.1.5 DGS Socket

The DGS socket for testing and programming TPLD devices without soldering a device to the EVM.

To place a device in the socket, follow the steps in [Section 3.2](#).

2.2 GPIO Testing Blocks

The 8 GPIO pins on the device are connected to various testing blocks to allow for prototyping. These connections are indicated by the table below.

Pin Number	IO Name	Testing Block	Testing Block Name
1	GPI	SW	SW2
9	IO9	SW	SW1
2	IO1	LED/POT	LED1/R1
3	IO2	LED/POT	LED2/R2
4	IO4	LED/POT	LED4/R4
6	IO5	LED	LED5
7	IO6	LED	LED6
8	IO7	LED	LED7

2.2.1 LED Blocks

Each LED block consists of an LED that can be connected or disconnected from the TPLD pin via a header. To connect the LED to the corresponding pin, place a shunt on the corresponding header between the two header pins.

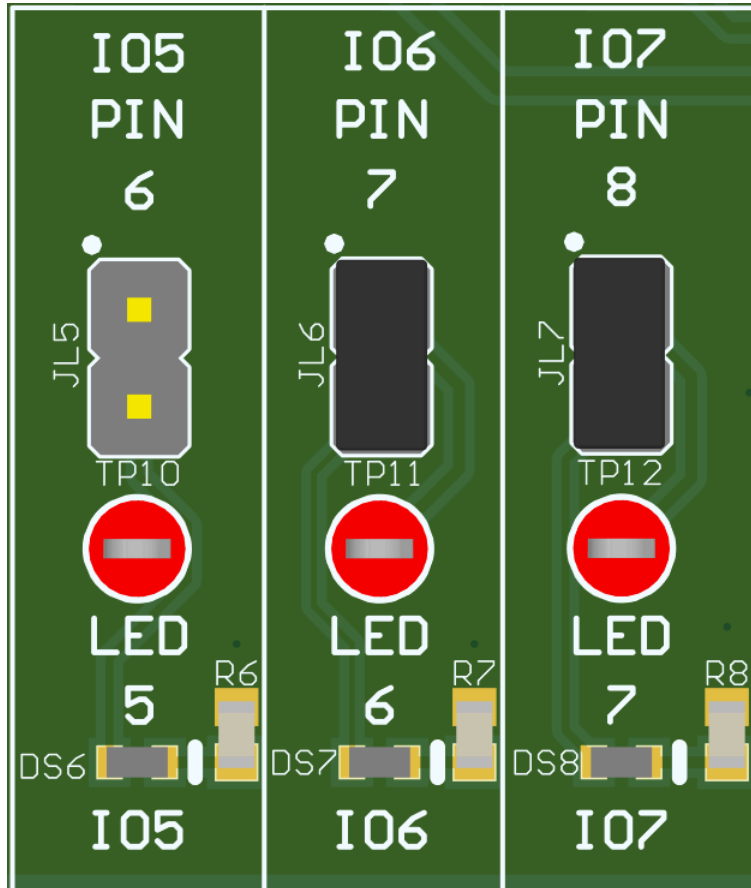


Figure 2-3. LED Blocks

2.2.2 Switch Blocks

Each SW block consists of a tactile switch and an optional debounce circuit. The switch can be connected to the corresponding TPLD pin via a 3-position header. One side of the 3-position header, labeled OFF, connects directly to the switch output, and the other side of the 3-position header, labeled ON, connects to a debounce circuit leading to the switch output. The middle pin of the header connects to the corresponding TPLD pin. To connect directly to the switch output, place a shunt between the middle pin of the header and the OFF pin. To connect to the debounce circuit, place a shunt between the middle pin of the header and the OFF pin. If no shunt is placed between either set of pins, the switch is not connected to the TPLD pin.

Note

The debounce circuit must not be connected on the GPI pin during programming.

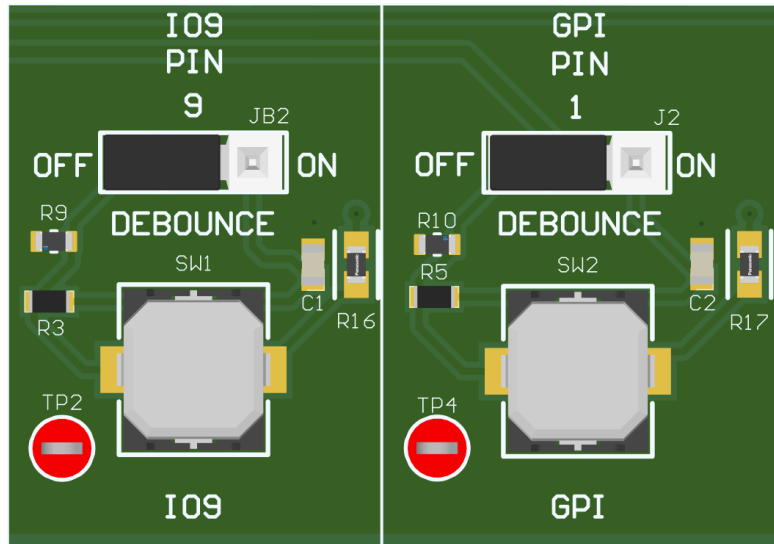


Figure 2-4. Switch Blocks

2.2.3 LED/Potentiometer Blocks

Each LED/POT block consists of a 3-state header pin that can be used to connect the corresponding GPIO pin to either an analog voltage source or an LED. The middle pin of the header connects to the corresponding GPIO pin of the TPLD. The left side of the header pin, marked LED, connects to the LED. The right side of the header pin, marked R, leads to the analog voltage source. To connect the corresponding GPIO to the LED, place a shunt between the middle pin and the LED pin. To connect the GPIO to the analog voltage source, place a shunt between the middle pin and the R pin.

The analog voltage source consists of a voltage divider using a POT. When the POT is turned fully clockwise, the analog voltage source outputs at most 0.2V. When the POT is turned fully counterclockwise, the analog voltage source outputs at least $VCC - 0.2V$.

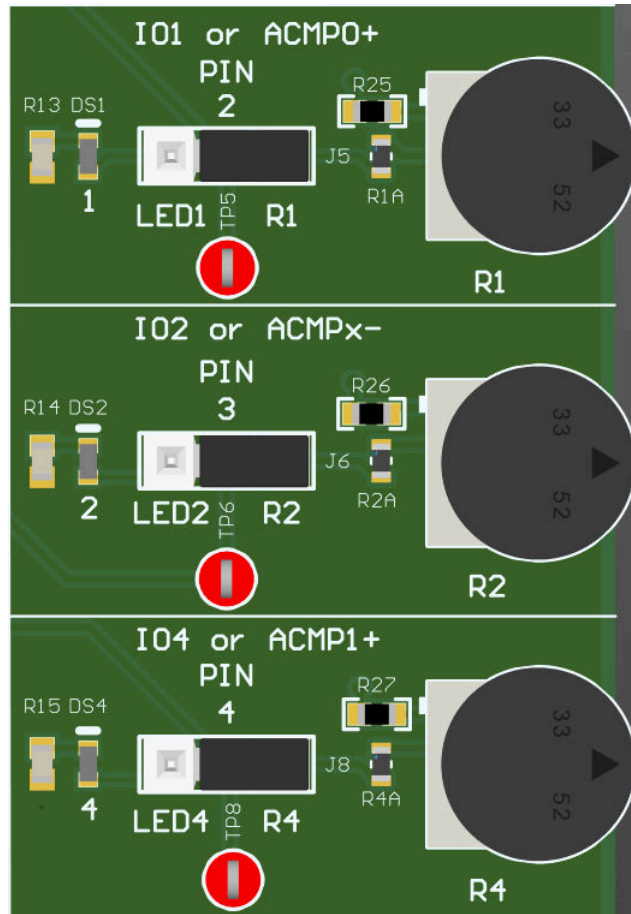


Figure 2-5. LED/POT Blocks

3 Software

3.1 Using the TPLD1201-DGS-EVM

This section covers using the TPLD1201-DGS-EVM to demo and program TPLD1201, using the TPLD1201 EVM Demo file as an example. For more help using InterConnect Studio (ICS) to create your own circuit, see the InterConnect Studio User's Guide.

3.1.1 Equipment Needed for Programming

To program a TPLD device with the TPLD1201-DGS-EVM, a TPLD-PROGRAM kit and a computer running InterConnect Studio are needed. The TPLD-PROGRAM kit includes everything required to interface a computer to the TPLD1201-DGS-EVM. InterConnect Studio can be downloaded from TI.com by following the instructions in [Section 3.1.2](#).

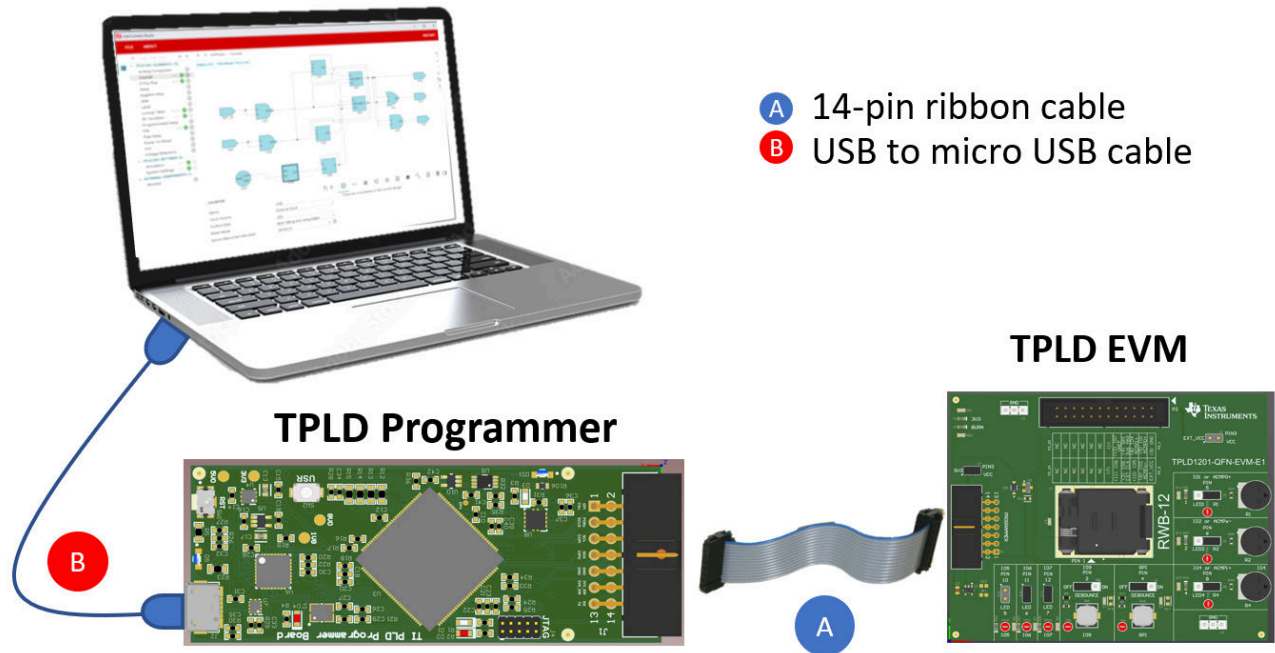


Figure 3-1. Connecting a TPLD EVM and Programmer

3.1.2 Installing Software

InterConnect Studio (ICS) is available free of charge at interconnect_studio.itg.ti.com

For more information on using InterConnect Studio (ICS), reference the InterConnect Studio User's Guide.

3.2 Configuring a TPLD Device

This section covers the steps to use the TPLD1201-DGS-EVM and a TPLD-PROGRAM kit to program a TPLD1201DGS.

3.2.1 TPLD1201-DGS-EVM Setup for Programming

Make sure that the following conditions are met:

1. Set SW3 to the ON position.
2. Set the GPI Pin 1 jumper (J2) to the OFF position or remove the jumper
3. Remove the EXT_VCC (J1) jumper
4. Disconnect P2 from any external system

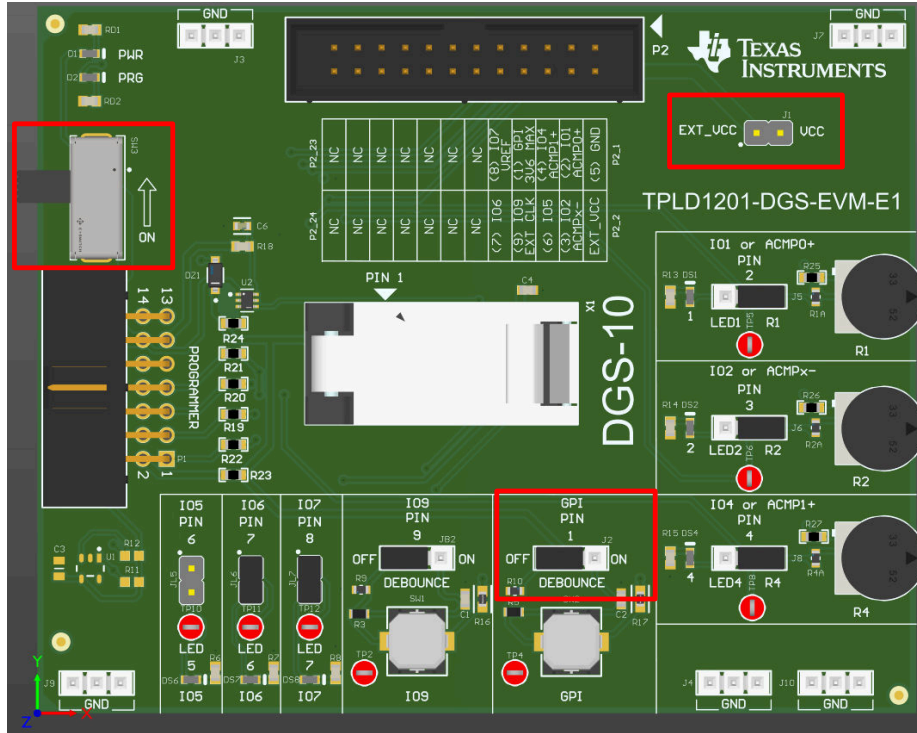


Figure 3-2. Components Considered in Programming Setup

3.2.2 Inserting a TPLD1201DGS into the DGS Socket

Do not remove, replace, or add a TPLD device to or from a powered board. Do not place fingers inside the socket or touch the contacts on the bottom of the socket. TI recommends following typical ESD protection procedures while handling the TPLD1201DGS.

1. Open the socket by gently pulling the latch until the lid snaps open.
2. Make sure that the socket is clean by blowing off socket contacts and device pads with clean compressed air.
3. Use a vacuum pen or antistatic tweezers to guide the part into the socket, aligning pin 1 of the part to pin 1 of the socket as shown below.
4. Close the socket lid until the latch snaps and holds the lid in place.

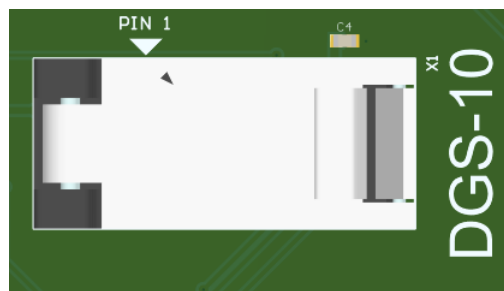


Figure 3-3. DGS Socket

3.2.3 Connecting the TPLD1201-DGS-EVM to a TPLD-PROGRAM Board

All cables included are keyed and can only be plugged in when facing the correct direction. If a cable cannot be inserted with the application of a gentle amount of force, try swapping the orientation of the cable and making sure that the header housings are unobstructed before trying again. Forcing the connections can cause damage to the cables and boards.

1. Connect the programmer board to a computer running InterConnect Studio using the provided USB cable. Make sure that a good connection is made between the TPLD-PROGRAM and the computer, indicated by the two blue LEDs on the TPLD-PROGRAM both being on. An example of a fully connected EVM can be seen in [Figure 3-4](#).
2. Connect the TPLD-PROGRAM to the TPLD1201-DGS-EVM using the provided 14-position ribbon cable. Make sure that a good connection is made between the TPLD1201-DGS-EVM and the TPLD-PROGRAM, indicated by the 3V3 LED in the top left of the EVM being on.

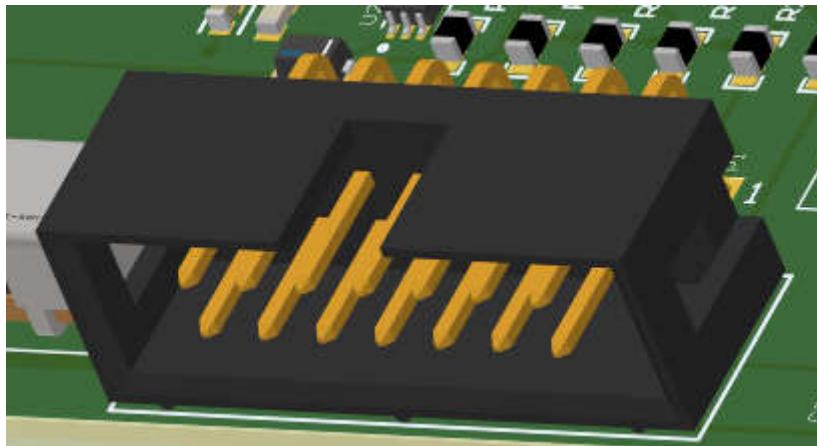


Figure 3-4. Keyed Header Socket

3.2.4 Temporarily Configuring a TPLD Device

This section covers using InterConnect Studio to configure a TPLD1201 using a pre-built demo circuit.

When the TPLD is temporarily configured, removing power from the device causes the TPLD to reset and the configured circuit to be erased. The TPLD can be reconfigured multiple times without needing to be reset between configurations.

1. Open InterConnect Studio on the computer to which the TPLD-PROGRAM is connected. Under *Device:*, select *TPLD1201*. Under *Package:*, select *DGS*.
2. Search for *TPLD1201 EVM Demo* and select the demo from the list of pre-designed circuits, or select *Empty Design* to build a custom circuit.

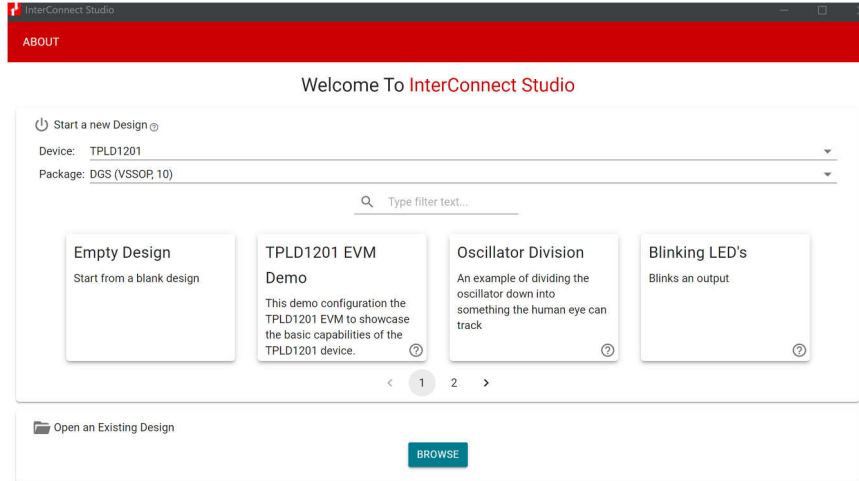


Figure 3-5. Selecting the Demo in ICS

See [Section 3.3](#) for more details about the demo.

3. InterConnect Studio opens the chosen circuit.
4. Select *CONFIGURE TPLD1201* in the top left corner of InterConnect Studio to configure the TPLD in the socket of the EVM with the circuit shown by InterConnect Studio. Select the serial port connected to the TPLD-PROGRAM, then select *OK*.

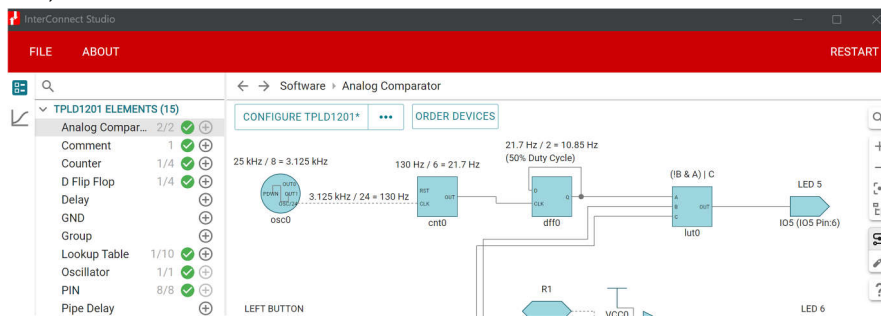


Figure 3-6. Temporarily Configuring in ICS

- a. Some LEDs on the TPLD1201-DGS-EVM flash during the programming sequence, which is normal.
- b. If the configuration fails, check the connections between the EVM and the computer, make sure SW3 is ON, check the connection between the TPLD device and the socket contacts, and retry.

Once the programming sequence is completed, the TPLD device on the board is temporarily configured with the circuit built in InterConnect Studio. The configured circuit can be tested using the buttons, potentiometers and LEDs provided on the EVM.

3.2.5 Permanently Programming a TPLD Device

This section covers using InterConnect Studio to permanently program a TPLD1201. Permanently programmed devices retain the configuration the devices are programmed with after power is reset.

Permanently programmed devices must not be permanently programmed again to avoid damaging the device.

1. Open the desired configuration to be permanently programmed in the TPLD1201 in InterConnect Studio.
2. Open the Configure Settings by selecting the three dots icon beside the *CONFIGURE TPLD1201* button.
3. Select *Permanently Configure Device*. If using a TPLD-PROGRAM to power the EVM, then leave the Power Source as *Programmer*. Select *OK*.

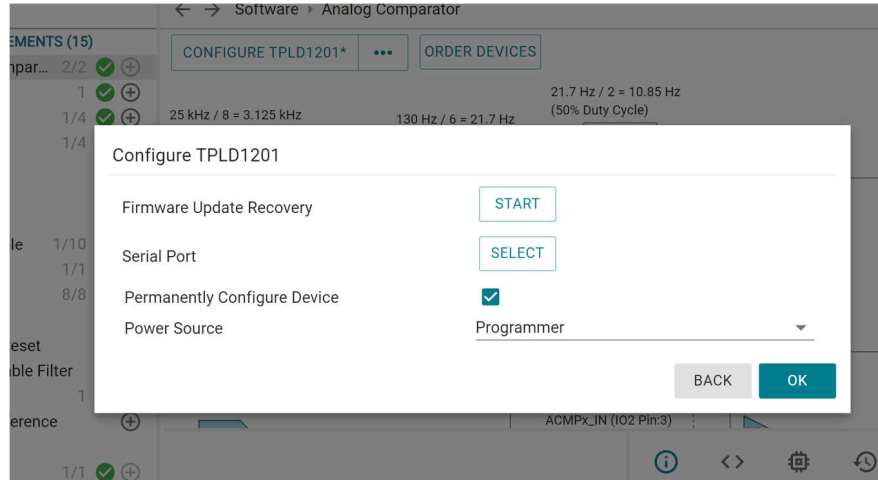


Figure 3-7. Permanent Programming in ICS

4. Select the serial port connected to the TPLD-PROGRAM, then select *OK* again.
 - a. Some LEDs on the TPLD1201-DGS-EVM can flash during the programming sequence, which is normal.
 - b. If the configuration fails, then check the connections between the EVM and the computer, make sure SW3 is ON, check the connection between the TPLD device and the socket contacts, and retry.
5. Remove power from the EVM before removing the permanently programmed TPLD1201.

3.3 Testing with the TPLD1201-DGS-EVM Demo

This section is intended to be an example on how to use the TPLD1201-DGS-EVM to test a temporarily configured circuit. The TPLD1201 demo is designed to show the key functions of the TPLD1201, such as the internal oscillators, flip-flops, counters, gates, and analog comparators.

3.3.1 TPLD1201 Demo Circuit

The TPLD1201 demo has four elements: analog inputs, digital inputs, digital outputs, and internal modules.

The demo has three analog inputs: ACMP0 (IO1), ACMPx (IO2) and ACMP1 (IO4). These inputs are fed into a pair of analog comparators, acmp0 and acmp1, which drive the digital outputs IO6 and IO7 respectively. When IO1 is held at a higher voltage than IO2, acmp0 drives IO6 high. When IO4 is held at a higher voltage than IO2, acmp1 drives IO7 high.

The demo uses an internal oscillator (osc0) with a frequency of 25kHz, which is divided by eight to 3.125kHz. A binary counter (cnt0) further divides the frequency by 24Hz to 130Hz, before using the divided oscillator as an input. The counter counts to 6, then outputs a high pulse and resets the count, effectively dividing the frequency of the signal by 6 to 21.7Hz. The output of the binary counter is used as the clock input of a flip-flop (dff0) with an inverted output that is used as the data input, reducing the frequency of the signal to 10.85Hz and changing the signal from being a pulse to a signal with a 50% duty cycle. The output of the flip-flop is then used as the A input of a look-up table (lut0).

The demo uses two digital inputs: IO9 and GPI. The two digital inputs are fed into the B and C inputs of the look-up table lut0, respectively. The look-up table uses the equation $(!B \& A) | C$, so when neither of the digital inputs are high, the output of the look-up table follows the A input, which is the output of the flip-flop (dff0). When the GPI input is high, the look-up table outputs high, and when the IO9 input is high, the look-up table outputs low. The output of the look-up table drives the digital output IO5.

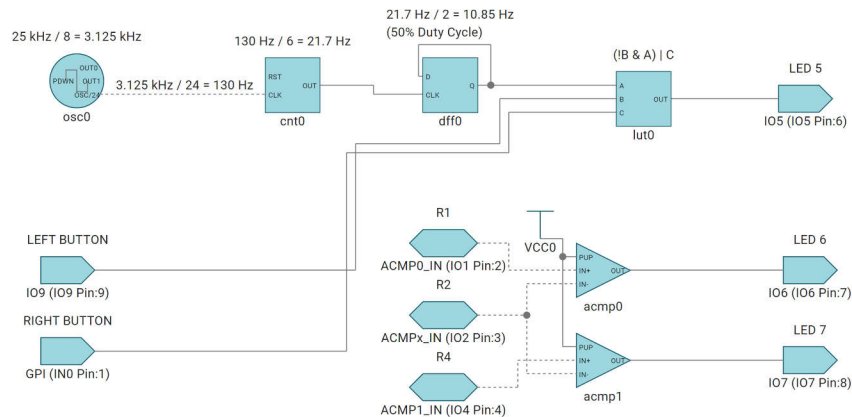


Figure 3-8. TPLD1201 EVM Demo

3.3.2 Testing the Demo

To test the demo as intended, set up the EVM with the following header connections:

1. Jumper on 6 header (JL5), pin 7 header (JL6), and pin 8 header (JL7)
2. Jumper on pin 9 header (JB2) between the middle pin and OFF
3. Jumper on pin 1 header (J2) between the middle pin and OFF
4. Jumper on pin 2 header (J5) between the middle pin and R1
5. Jumper on pin 3 header (J6) between the middle pin and R2
6. Jumper on pin 4 header (J8) between the middle pin and R4
7. SW3 in the ON position

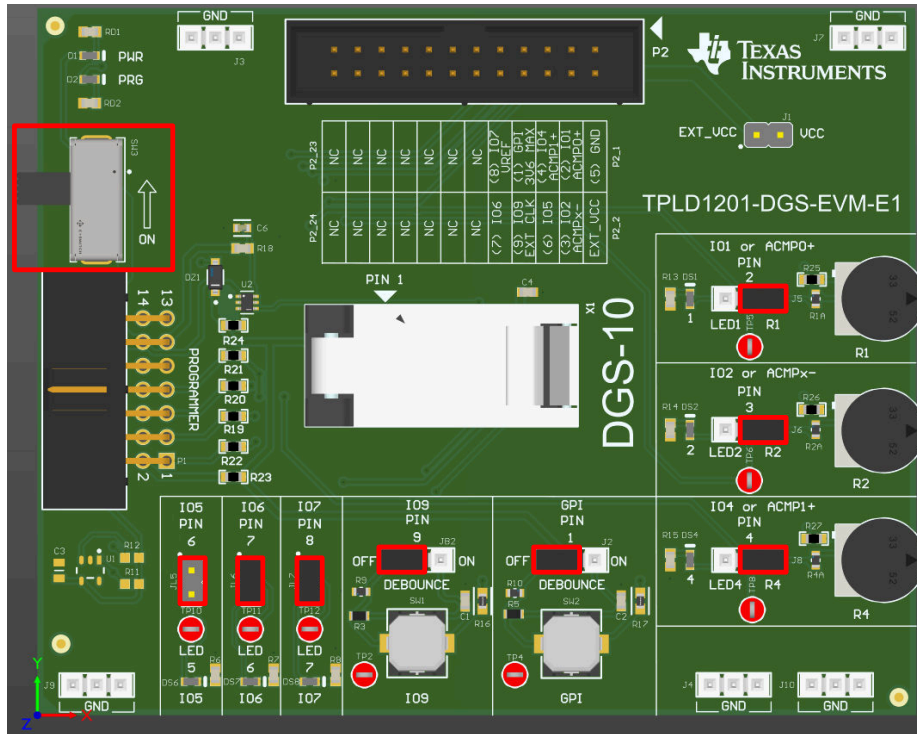


Figure 3-9. Headers and Switches used in Demo Configuration

Once the EVM is setup, first configure a blank TPLD1201DGS with the demo by following the steps in [Section 3.2](#). Once the demo is correctly configured onto the TPLD on the EVM, LED5 begins flashing. Pressing the SW1 button turns LED5 off. Pressing the SW2 button turns LED5 on.

IO1, IO2, and IO4 are controlled by the potentiometers R1, R2, and R4, respectively. Turning the potentiometers clockwise increases the voltage supplied to the input pins, and turning the potentiometers counterclockwise decreases the voltage supplied to the input pins. R2 controls the negative input voltage reference to both analog comparators of the device. Set R2 to a middle value, then move R1 to see the trigger of the analog comparator ACMP0, output to LED6. Similarly, R4 can be turned to see the trigger of the analog comparator ACMP1 on LED7.

4 Hardware Design Files

4.1 Schematics

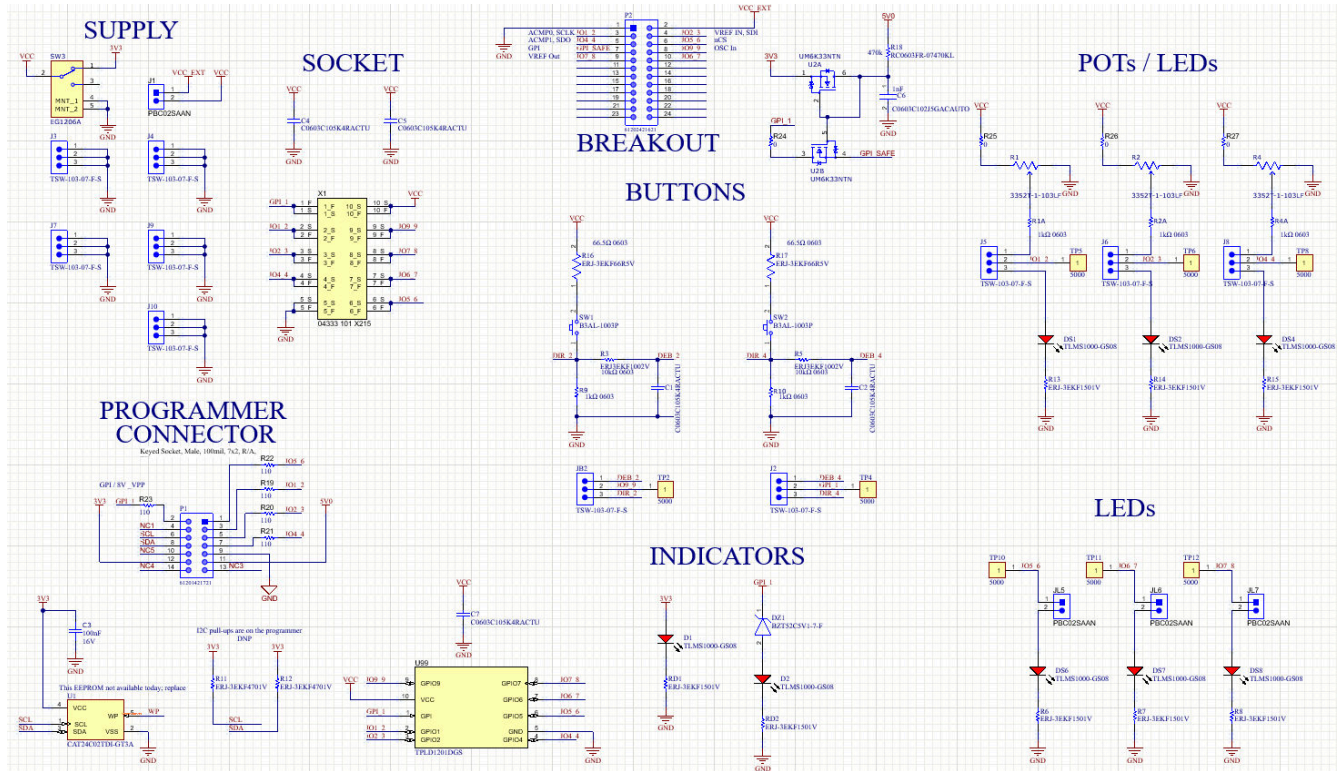


Figure 4-1. TPLD1201-DGS-EVM Schematic

4.2 PCB Layout

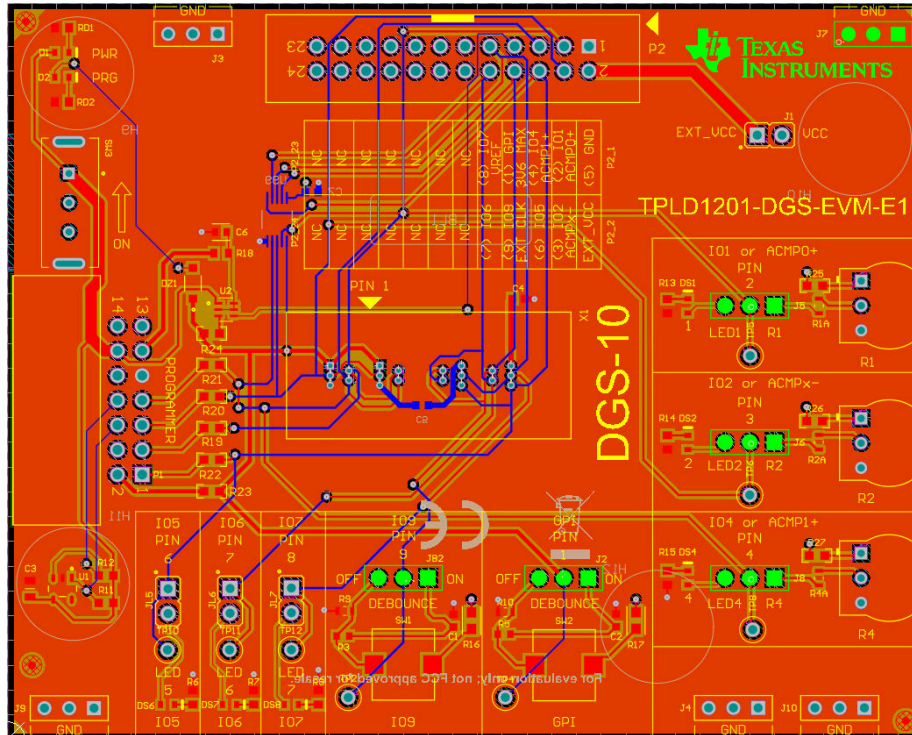


Figure 4-2. TPLD1201-DGS-EVM Layout

4.2.1 PCB Overview

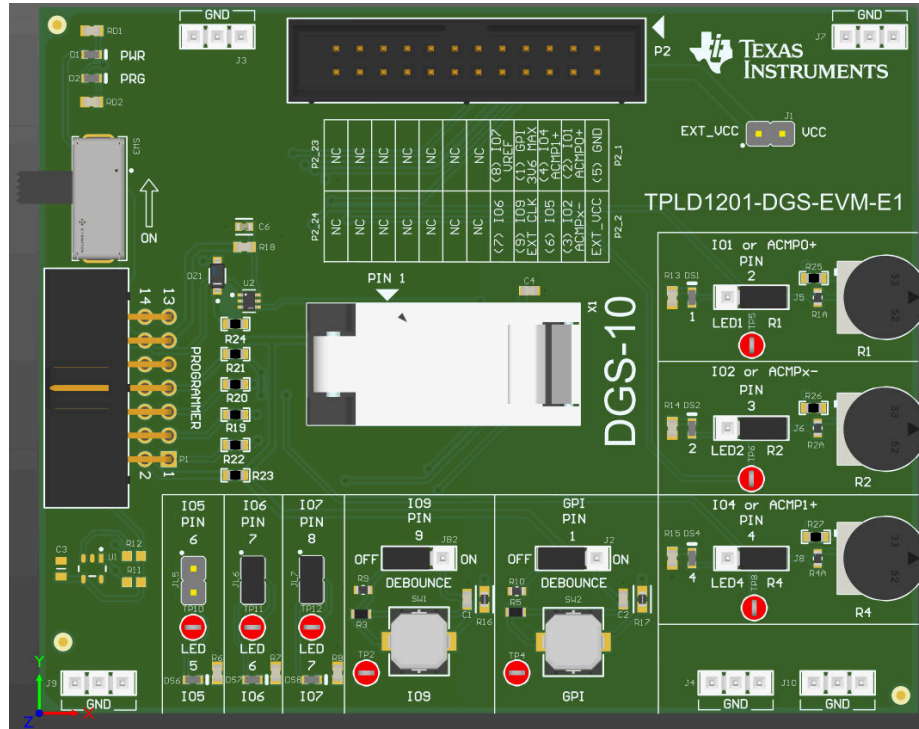


Figure 4-3. TPLD1201-DGS-EVM Board Front

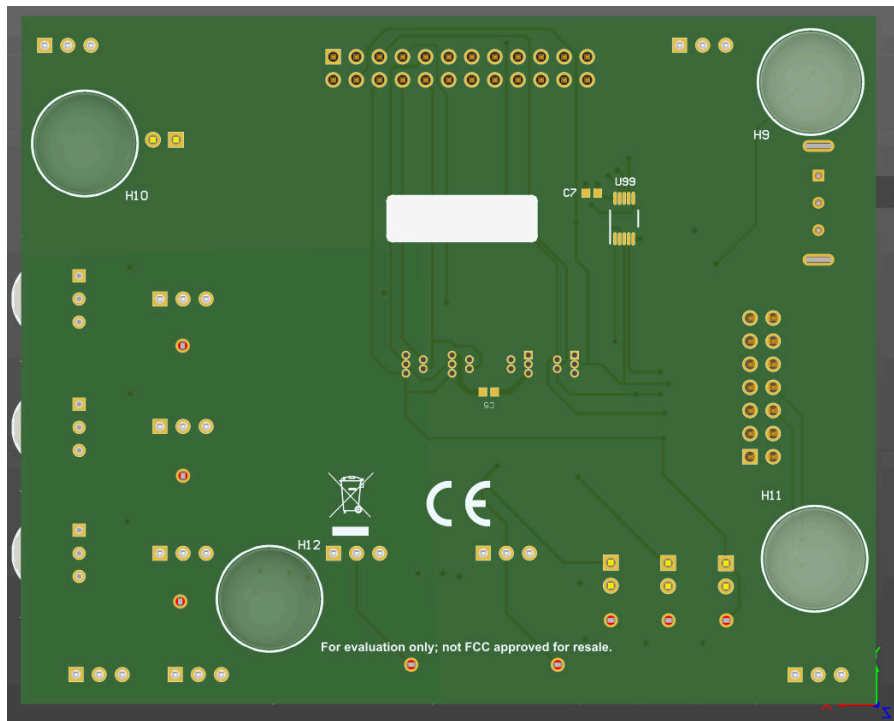


Figure 4-4. TPLD1201-DGS-EVM Board Bottom

4.3 Bill of Materials

This section provides information on the components that can be used with the TPLD1201-DGS-EVM. Other components can be used as long as the components are able to fit the provided plated holes and pads.

Table 4-1. Bill of Materials

Designator	Item	Value	Manufacture	Part Number
C1, C2, C4, C5	Capacitor	1 uF	Yageo	C0603C105K4RACTU
C3	Capacitor	DNP	Knowles Syfer	060330160104JXT
C6	Capacitor	1000pF	KEMET	C0603C102J5GACAUTO
D1, D2, DS1, DS2, DS4, DS6, DS7, DS8	LED	Red	Vishay	TLMS1000-GS08
DZ1	Diode	5.1V	Diodes	BZT52C5V1-7-F
H9, H10, H11, H12	Bumpon	Clear	3M	SJ-5303 (CLEAR)
J1, JL5, JL6, JL7	Header	2x1	Sullins	PBC02SAAN
J2, J3, J4, J5, J6, J7, J8, J9, J10, JB2	Header	3x1	Samtec	TSW-103-07-F-S
P1	Header	7x2	Würth Electronics	61201421721
P2	Header	12x2	Würth Electronics	61202421621
R1, R2, R4	Resistor	10k Ω	Bourns	3352T-1-103LF
R1A, R2A, R4A, R9, R10	Resistor	1k Ω	Vishay	CRCW06031K00FKEAC
R3, R5	Resistor	10k Ω	Bourns	ERJ3EKF1002V
R6, R7, R8, R13, R14, R15, RD1, RD2	Resistor	1.5k Ω	Panasonic	ERJ-3EKF1501V
R11, R12	Resistor	DNP	Yageo	ERJ-3EKF4701V
R16, R17	Resistor	66.5 Ω	Panasonic	ERJ-3EKF66R5V
R18	Resistor	470k Ω	Yageo	RC0603FR-07470KL
R24	Resistor	0 Ω	Stackpole Electronics Inc	RMCF0603ZT0R00
R19, R20, R21, R22, R23	Resistor	110 Ω	Vishay Dale	CRCW0603110RJNEA
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8	Shunt		Sullins Connector Solutions	SPC02SYAN
SW3	Switch	Slide	E-Switch	EG1206A
SW1, SW2	Switch	Tactile	Omron	B3AL-1003P
TP2, TP4, TP5, TP6, TP8, TP10, TP11, TP12	Test Point	Red	Keystone Electronics	5000
U1	EEPROM	DNP	Microchip / Atmel	CAT24C02TDI-GT3A
U2	Transistor		Rohm	UM6K33NTN
X1	Socket	DGS	Plastronics	04333 101 6215

5 Additional Information

5.1 Trademarks

All trademarks are the property of their respective owners.

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/llds/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/llds/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, INDEMNITY 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
Copyright © 2023, Texas Instruments Incorporated

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated