User's Guide

TLC6C5748EVM User's Guide

ABSTRACT

The Texas Instruments TLC6C5748EVM evaluation module (EVM) helps the users to evaluate the features and performance of the TLC6C5748-Q1 device. This document includes hardware setup instructions, software instructions, a complete schematic diagram, printed-circuit board (PCB) layout drawings and bill of materials (BOM) of the TLC6C5748EVM.

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Trademarks

1 Introduction

The TLC6C5748EVM helps users to evaluate the characteristics, operation, and use of the TLC6C5748-Q1 device, a 48-channel, 16-bit, PWM LED driver with internal current settings mainly designed for automotive local dimming backlight. Each channel has an individually adjustable, pulse width modulation (PWM), grayscale (GS) brightness control with 65,536 steps and 128 steps of constant-current dot correction (DC). DC adjusts brightness deviation between channels. All channels have a 128-step global brightness control (BC). BC adjusts brightness deviation between the R, G, B color group. The eight-step maximum current control (MC) selects the maximum output current range for all channels of each color group. GS, DC, BC, and MC data are accessible with a serial interface port.

1.1 Features

The EVM has the following features:

- 48 outputs with 7-bit DC for each output
- 16-bit PWM constant-current with 7bit brightness control (BC) and 3-bit max current control (MC) for 31.9 mA, no external RIREF resister
- Precise constant current regulation
- Low headroom voltage
- LED open/short detection
- Over temperature detection
- 7-uA consumption at power save mode

1.2 Applications

- Automotive Local Dimming Backlight
- Automotive Center Information Display
- Automotive Cluster Display
- Head-Up Display
- Automotive Lighting
- Automotive RGB Display

2 Test Setup

This section describes how to properly connect and setup the TLC6C5748EVM.

2.1 The TLC6C5748EVM Kit

The TLC6C5748EVM kit contains (see Figure 2-1):

- TLC6C5748EVM

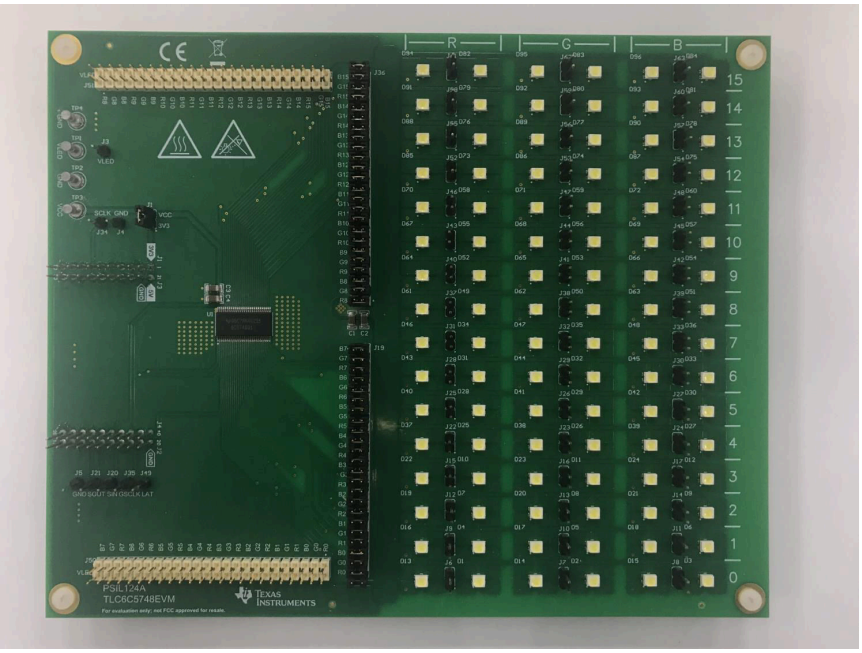

Figure 2-1. The TLC6C5748EVM Kit

2.2 System/Equipment Requirements

- Power supply: A dc power supply capable of supplying 12 V/5 A
- Test Leads and other cabling: banana to clip test leads × 2
- MSP-EXP432P401 Launchpad kit(see Figure 2-2): MSP-EXP432P401 Launchpad & Micro USB cable
- PC with Windows 10 OS
- Software: CCS IDE

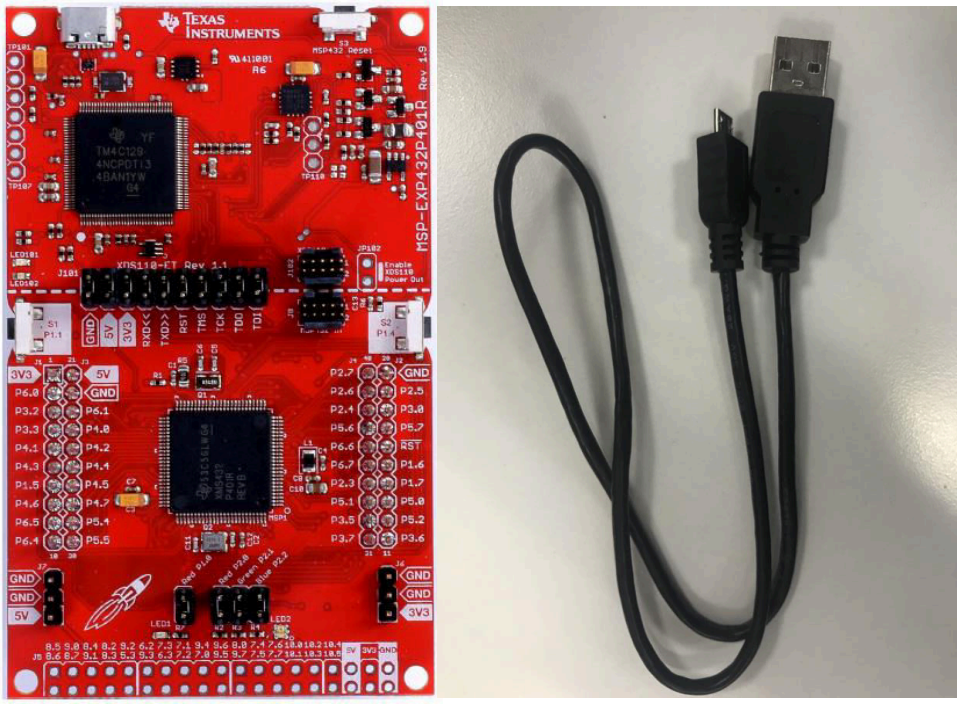

Figure 2-2. MSP-EXP432P401 Launchpad Kit

2.3 Software Setup

Step 1: Download the CCS IDE and follow the installation instructions. Choose "SimpleLink MSP432 low power + performance MCUs components" when choosing support device if custom installation is selected, as shown in Figure 2-3.

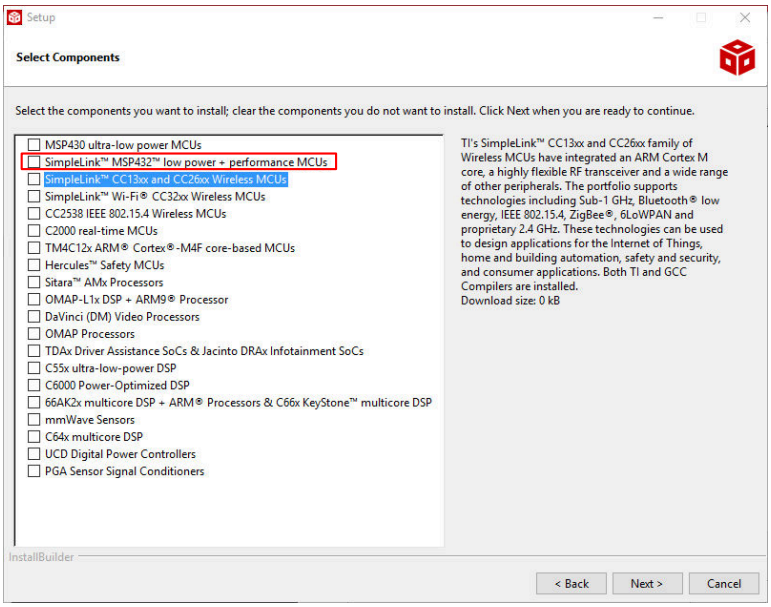

Figure 2-3. Select components when install CCS IDE

Step 2: Download and install the MSP432 SDK.

Step 3: Download the sample code from the TLC6C5748EVM tools folder and import the sample code according to the Importing a CCS Project steps.

Step 4: If the project can't be imported, please try to install the latest version of ti-cgt.

Step 5: Power on the MSP-EXP432P401 Launchpad. The Launchpad should be connected to the PC as shown in Figure 2-5 using the Micro USB cable provided in the Launchpad kit. Debug the project and download the sample code to MSP-EXP432P401 Launchpad according to the Building and Running Your Project steps. Pressing the button shown in Figure 2-4 can also compile and debug the sample code. There will be no errors if all the previous steps are correct.

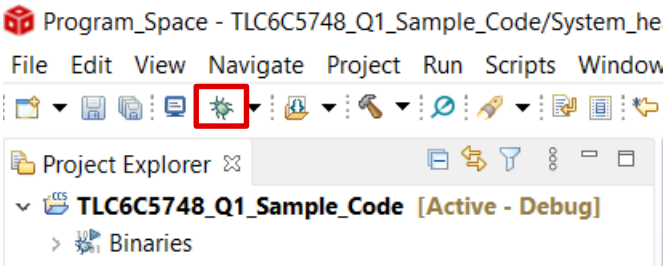

Figure 2-4. Compile and Debug Project in CCS IDE

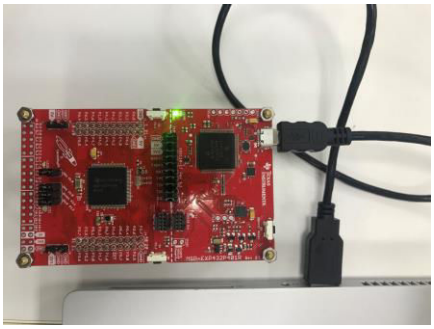

Figure 2-5. Download the Sample Code to MCU

Step 6: Terminate the project and then power down the MCU.

2.4 Hardware Setup

Connect the computer, DC power supply, MSP-EXP432P401 Launchpad and TLC6C5748EVM as shown in Figure 2-6.

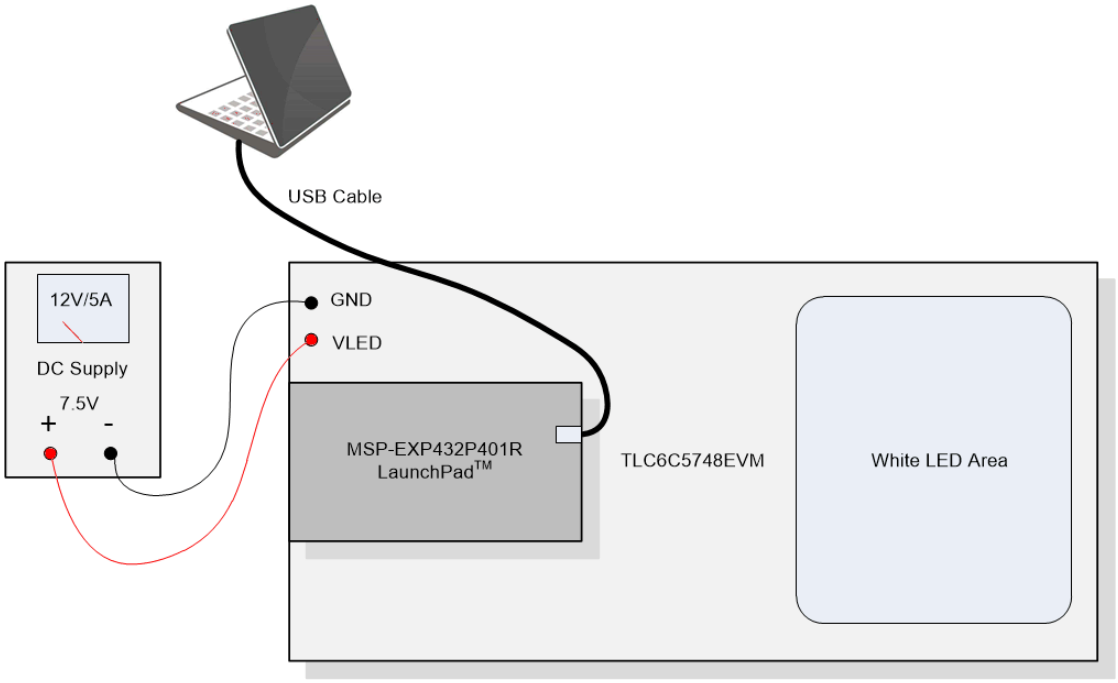

Figure 2-6. TLC6C5748EVM Hardware Setup

The detailed steps are listed as follows.

Step 1: With the 12-V DC power supply disconnected from the TLC6C5748EVM, set the DC power supply to 7.5-V DC. Set current limit to 3 A.

Step 2: Use banana to clip test leads to connect the DC power supply between the VLED and GND terminals on TLC6C5748EVM board.

Step 3: EVM testing requires MSP-EXP432P401 Launchpad, which can be ordered from TI store. Plug MSP-EXP432P401 Launchpad into TLC6C5748EVM using BoosterPack Headers in the direction as shown in Figure 2-7.

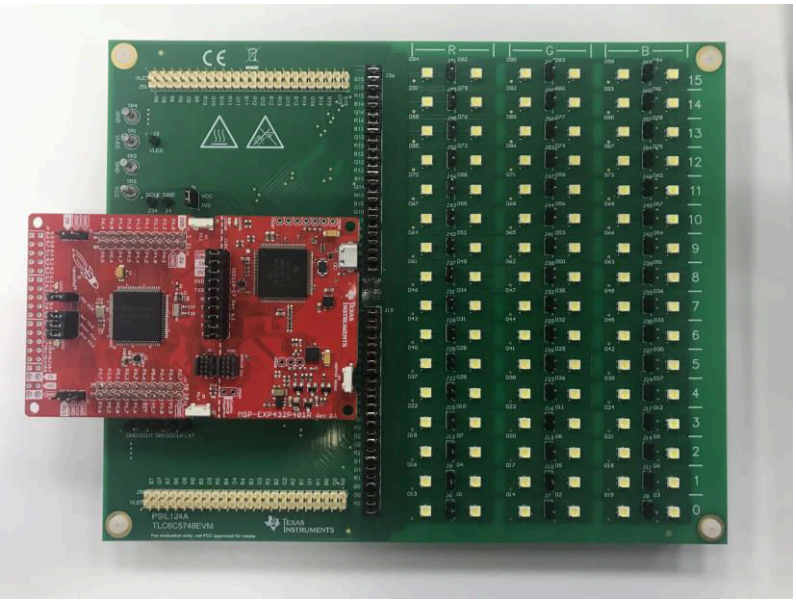

Figure 2-7. The direction of BoosterPack

Step 4: The Launchpad is connected to the PC as shown in Figure 2-8 using the Micro USB cable provided in Launchpad kit.

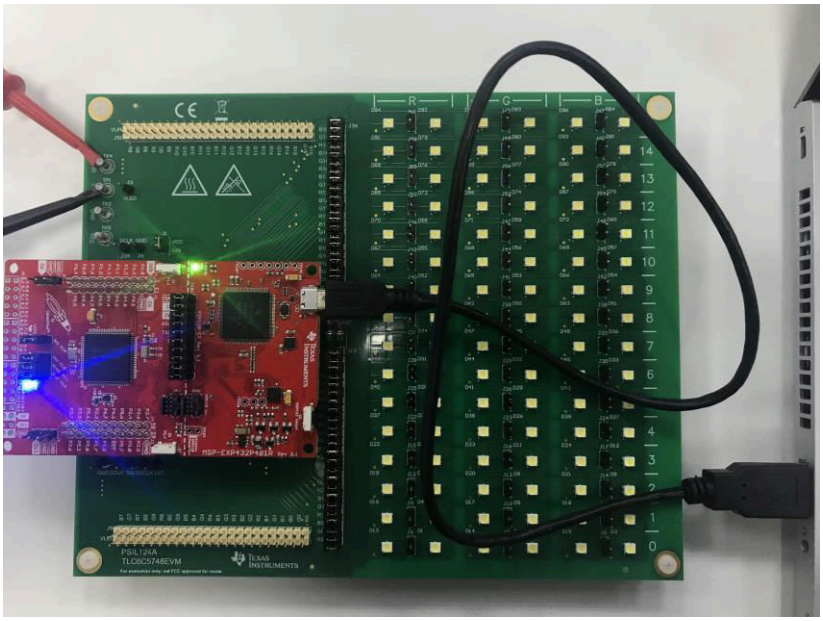

Figure 2-8. Connect MCU Launchpad to PC

2.5 Test Procedure

Step 1: Power on the DC power supply and reset MSP-EXP432P401 Launchpad. The reset button is shown in Figure 2-9.

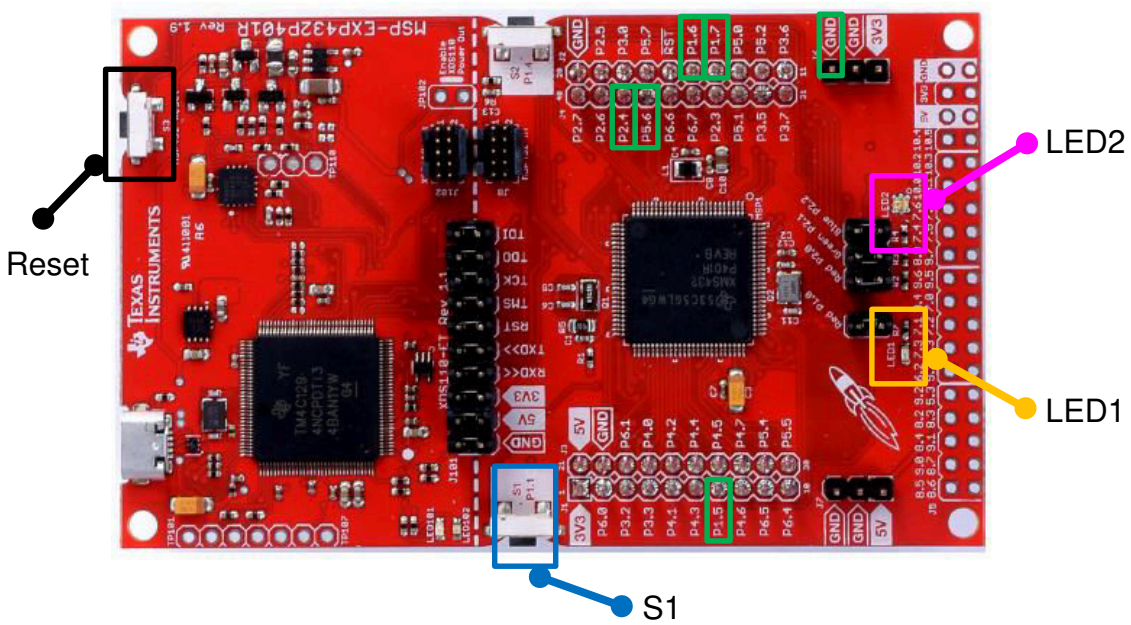

Figure 2-9. Input and Output Interface of MCU Launchpad

Step 2: All white LEDs of TLC6C5748EVM board will be on and LED2 is on with green color if there are no problems. Otherwise, The LED1 and LED2 shown in Figure 2-9 will be on with red, blue or purple color to indicate the specific fault. The control signals of TLC6C5748-Q1 and the meanings of different status of LED1 and LED2 are summarized in Table 3-1. The number of LED short and LED open fault can be read back respectively through expressions in CCS along with the location of fault pins. Please refer to the concrete steps for adding watching expressions in CCS IDE. The meaning of fault data can be found from the comments in User_Param_Config.h file in the project of the sample code.

Step 3: Press S1 of MSP-EXP432P401 Launchpad shown in Figure 2-9 will switch the brightness of all The LEDs.

Step 4: Turn off the power supply and disconnect the MSP-EXP432P401 Launchpad from the PC. Then disconnect the MSP-EXP432P401 Launchpad from the TLC6C5748EVM.

3 Configuration of MCU Launchpad

Table 3-1. Hardware Configuration of MCU Launchpad

Pin Number	Signal	Description
P1.5	SCLK	Control signal of TLC6C5748-Q1
P1.6	TCON-SOUT	Control signal of TLC6C5748-Q1
P1.7	TCON-SIN	Control signal of TLC6C5748-Q1
P5.6	LATCH	Control signal of TLC6C5748-Q1
P2.4	GSCLK	Control signal of TLC6C5748-Q1
S1	LED brightness switch	Switch between two user-defined brightness
LED1	Coummunication fault	Red color for coummunication fault
RGB LED2	LED open and short fault	Green color for no fault, blue color for LED open fault, red color for LED short fault, purple color for LED open and short fault
S3	Reset button of MCU	Reset MCU after powering up when all the hardware setup has been finished

4 TLC6C5748EVM Board Layout

Figure 4-1, Figure 4-2 and Figure 4-3 illustrate the EVM board layout.

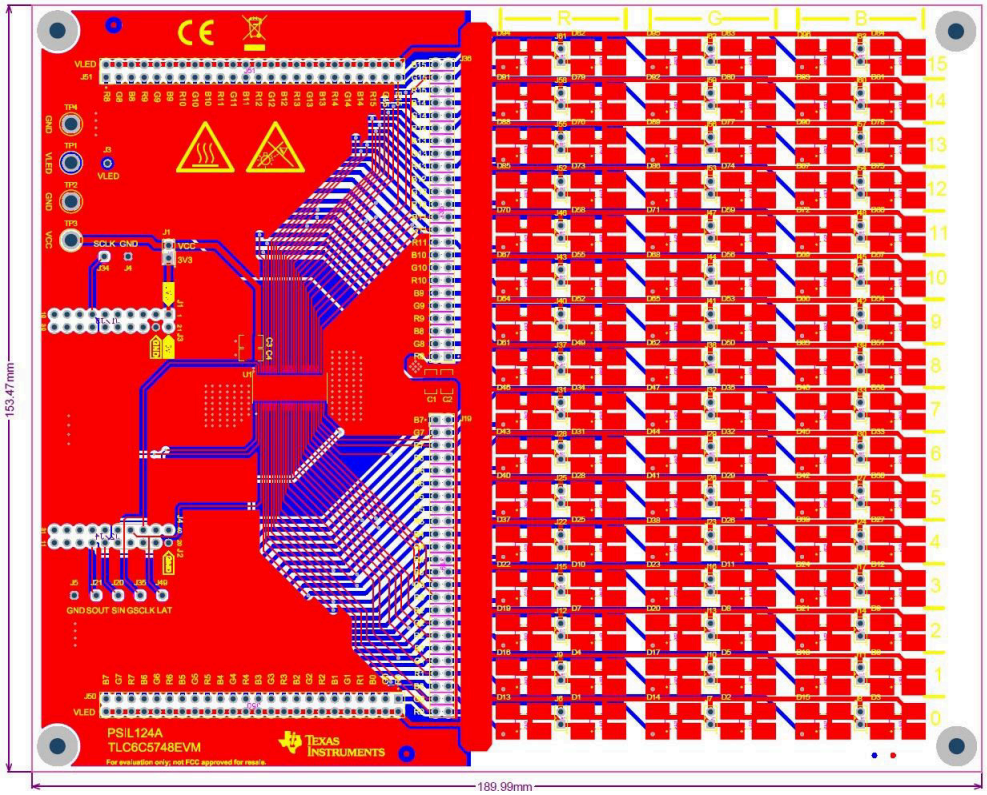

Figure 4-1. TLC6C5748EVM Layout

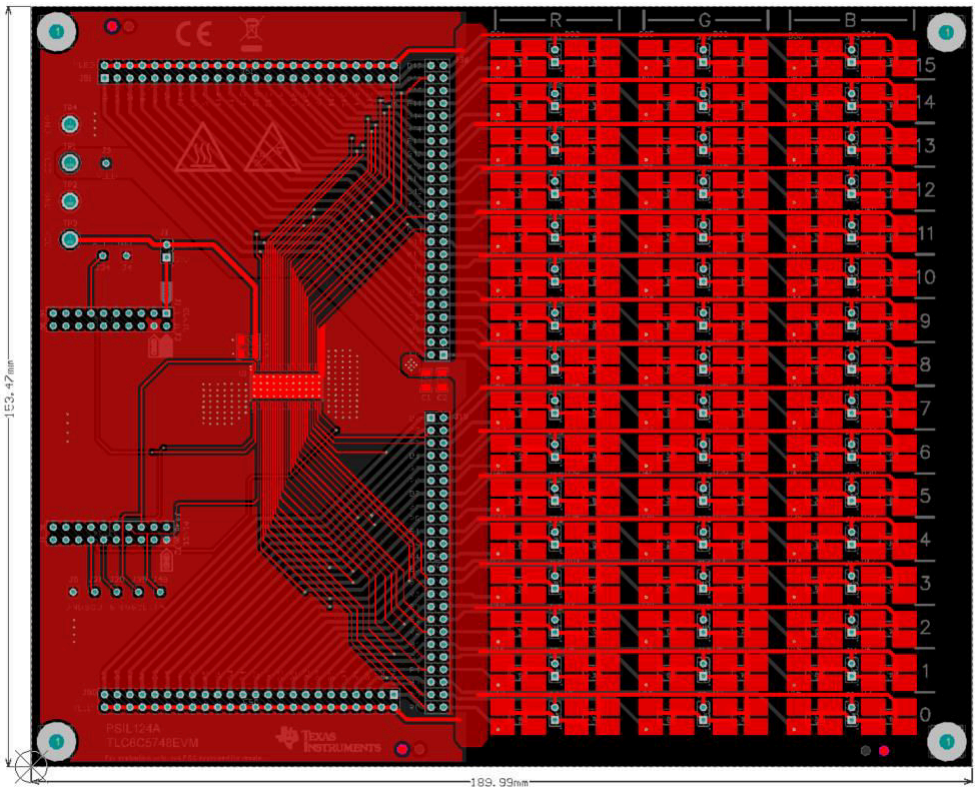

Figure 4-2. TLC6C5748EVM Layout - Top

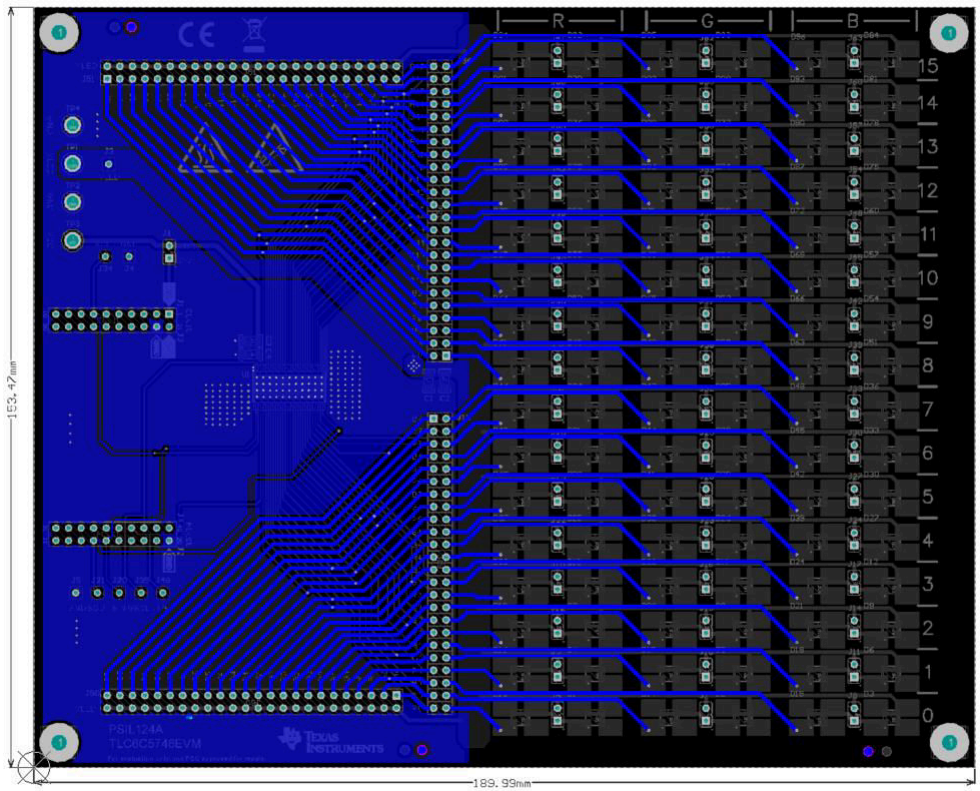

Figure 4-3. TLC6C5748EVM Layout - Bottom

5 TLC6C5748EVM Schematic

Figure 5-1 shows the TLC6C5748EVM schematic.

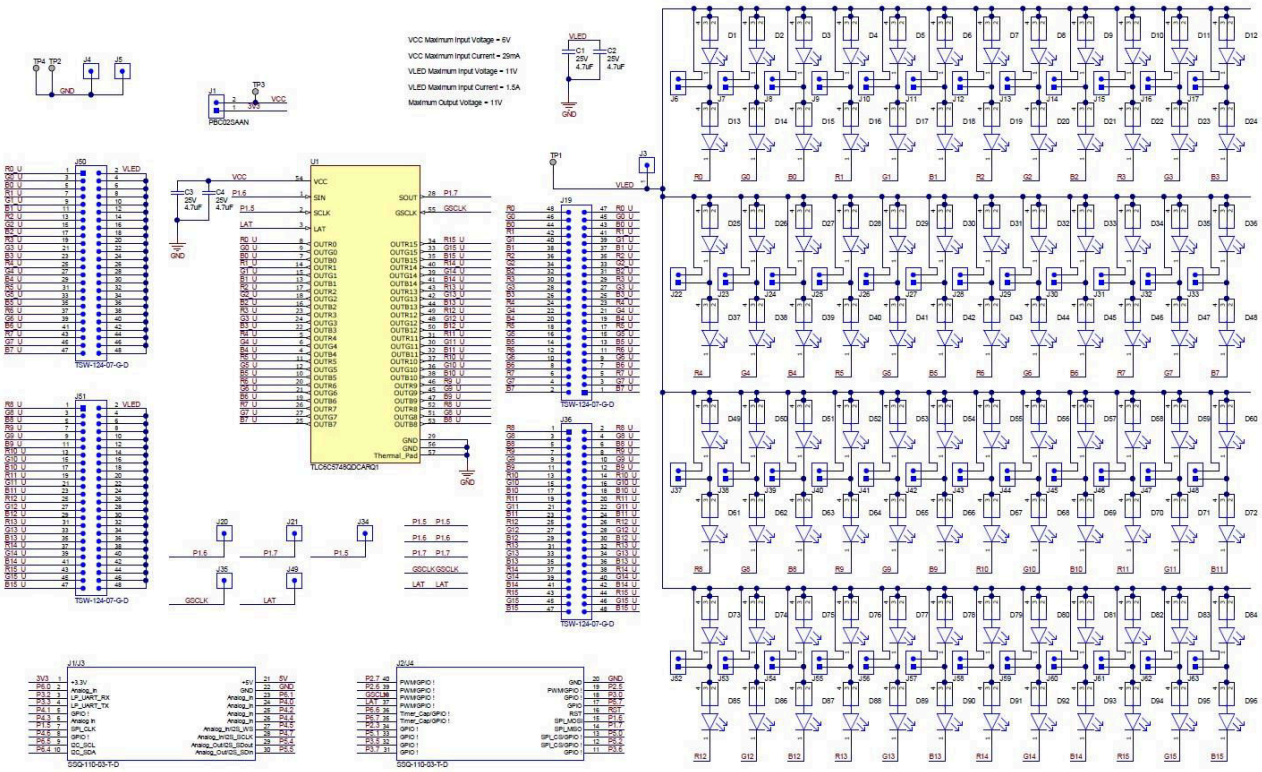

Figure 5-1. TLC6C5748EVM Schematic

6 TLC6C5748EVM Bill of Materials

Table 6-1 lists the bill of materials of the TLC6C5748EVM.

Table 6-1. TLC6C5748EVM Bill of Materials

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		PSIL124	Any
C1, C2, C3, C4	4	4.7 uF	CAP, CERM, 4.7 uF, 25 V, +/- 10%, X7R, 1206	1206	C3216X7R1E475K085AB	TDK
D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, D29, D30, D31, D32, D33, D34, D35, D36, D37, D38, D39, D40, D41, D42, D43, D44, D45, D46, D47, D48, D49, D50, D51, D52, D53, D54, D55, D56, D57, D58, D59, D60, D61, D62, D63, D64, D65, D66, D67, D68, D69, D70, D71, D72, D73, D74, D75, D76, D77, D78, D79, D80, D81, D82, D83, D84, D85, D86, D87, D88, D89, D90, D91, D92, D93, D94, D95, D96	96		White LED Indication - Discrete 3.3 V 4-PLCC	PLCC4	LW E6SG-AABA-JKPL-1-30-R18-Z	OSRAM
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone

Table 6-1. TLC6C5748EVM Bill of Materials (continued)

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
J1, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16, J17, J22, J23, J24, J25, J26, J27, J28, J29, J30, J31, J32, J33, J37, J38, J39, J40, J41, J42, J43, J44, J45, J46, J47, J48, J52, J53, J54, J55, J56, J57, J58, J59, J60, J61, J62, J63	49		Header, 100 mil, 2 x 1, Gold, TH	Sullins 100 mil, 1 x 2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions
J1/J3, J2/J4	2		Receptacle, 2.54 mm, 10 x 2, Tin, TH	10 x 2 Receptacle	SSQ-110-03-T-D	Samtec
J3, J4, J5, J20, J21, J34, J35, J49	8		Header, 2.54 mm, 1 x 1, Gold, TH	Header, 2.54 mm, 1 x 1, TH	TSW-101-08-G-S	Samtec
J19, J36, J50, J51	4		Header, 100 mil, 24 x 2, Gold, TH	60.96 x 8.38 x 5.08 mm	TSW-124-07-G-D	Samtec
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11, SH-J12, SH-J13, SH-J14, SH-J15, SH-J16, SH-J17, SH-J18, SH-J19, SH-J20, SH-J21, SH-J22, SH-J23, SH-J24, SH-J25, SH-J26, SH-J27, SH-J28, SH-J29, SH-J30, SH-J31, SH-J32, SH-J33, SH-J34, SH-J35, SH-J36, SH-J37, SH-J38, SH-J39, SH-J40, SH-J41, SH-J42, SH-J43, SH-J44, SH-J45, SH-J46, SH-J47, SH-J48, SH-J49	49	1 x 2	Shunt, 100 mil, Flash Gold, Black	Closed Top 100-mil Shunt	SPC02SYAN	Sullins Connector Solutions
TP1, TP2, TP3, TP4	4		Terminal, Turret, TH, Double	Keystone1502-2	1502-2	Keystone
U1	1		Light emitting diode (LED) driver	HTSSOP56	TLC6C5748QDCARQ1	Texas Instruments

7 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
October 2020	*	Initial Release

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