ADVANCE INFORMATION

User's Guide
SLVUBD7–May 2018

TLC6C5716-Q1 Evaluation Module

This document is a guide for using the TLC6C5716-Q1 EVM and GUI. The TLC6C5716EVM is designed to be controlled with the TLC65716EVM GUI via a USB2ANY communication tool. The TLC6C5716EVM can be powered by a micro-USB supply with a PC USB port. The TLC6C5716EVM GUI is designed to demonstrate the TLC6C5716-Q1 features.

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Trademarks

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1 Introduction

The TLC6C5716-Q1 device is a 16-channel, constant-current LED driver designed to support automotive LED applications.

1.1 Features

The EVM has the following features:

- 16 constant-current-sink output channels
- Excellent constant-current accuracy
- 7-bit individual dot correction
- 8-bit global brightness control
- 12-bit PWM dimming
- LED protection and diagnostics

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1.2 Applications

This EVM can be used in the following applications:

- Automotive cluster indicator
- Automotive HVAC panel
- Automotive E-shifter indicator
- Automotive local dimming display
- Automotive ambient lighting

1.3 Description

1.3.1 Kit Contents

The TLC6C5716EVM kit contains a USB2ANY, TLC6C5716EVM, and two connection cables, as Figure 1 shows.

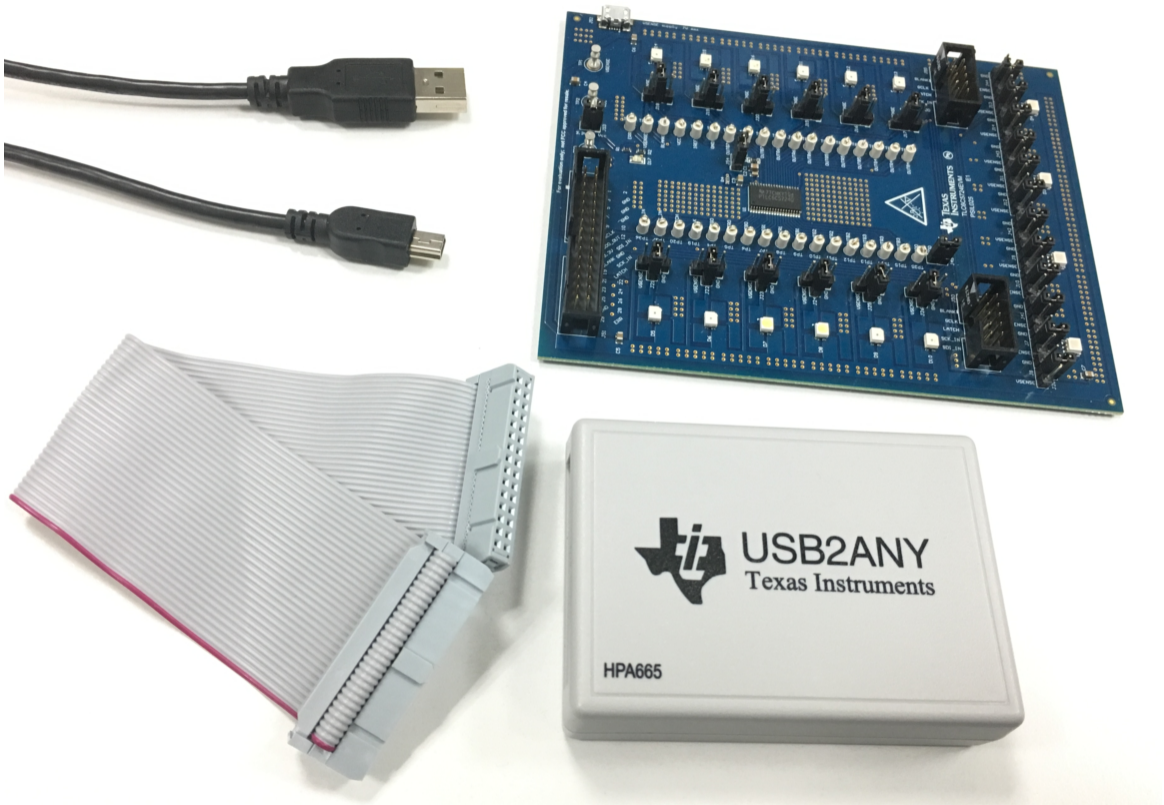

Figure 1. TLC6C5716EVM Kit

1.3.2 Additional Items Required

The following additional items are required to run the TLC6C5716EVM:

- PC with the TLC6C5716EVM GUI installed
- 5-V DC supply or USB port for LED supply

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2 Test Setup and Results

2.1 Hardware Setup

Figure 2 shows the hardware setup of the TLC6C5716-Q1 EVM.

- Connect the 5-V power supply to the LED board between TP1 (SENSE) and TP3 (GND), use the 5-V micro-USB supply connected to J36 to supply the LED.
- Put a shunt on J53 to connect the USB2ANY 3.3-V supply to VCC. In this case, extra DC supply is not needed to supply the VCC.
- Connect the host computer to the USB2ANY board via a USB cable.
- Connect the ribbon cable between the USB2ANY board and the TLC6C5716-Q1 EVM board.

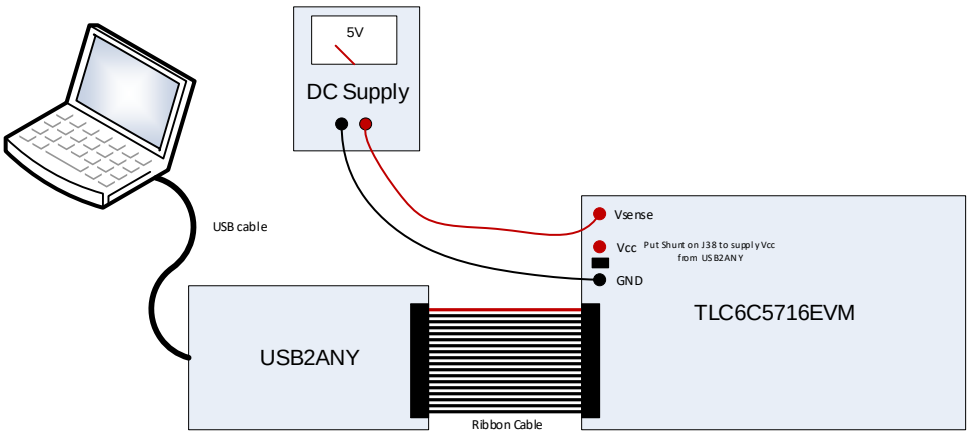

Figure 2. TLC6C5724-Q1EVM Hardware Setup

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2.2 Software Installation

Download the GUI software from the TLC6C5716-Q1 EVM tool folder and install on the PC. Once installed, a shortcut to the GUI is found on the desktop and also in the start-up menu under the Texas Instruments folder. Figure 3 shows the landing page of the TLC6C5716EVM GUI. A support document link is on bottom of the landing page.

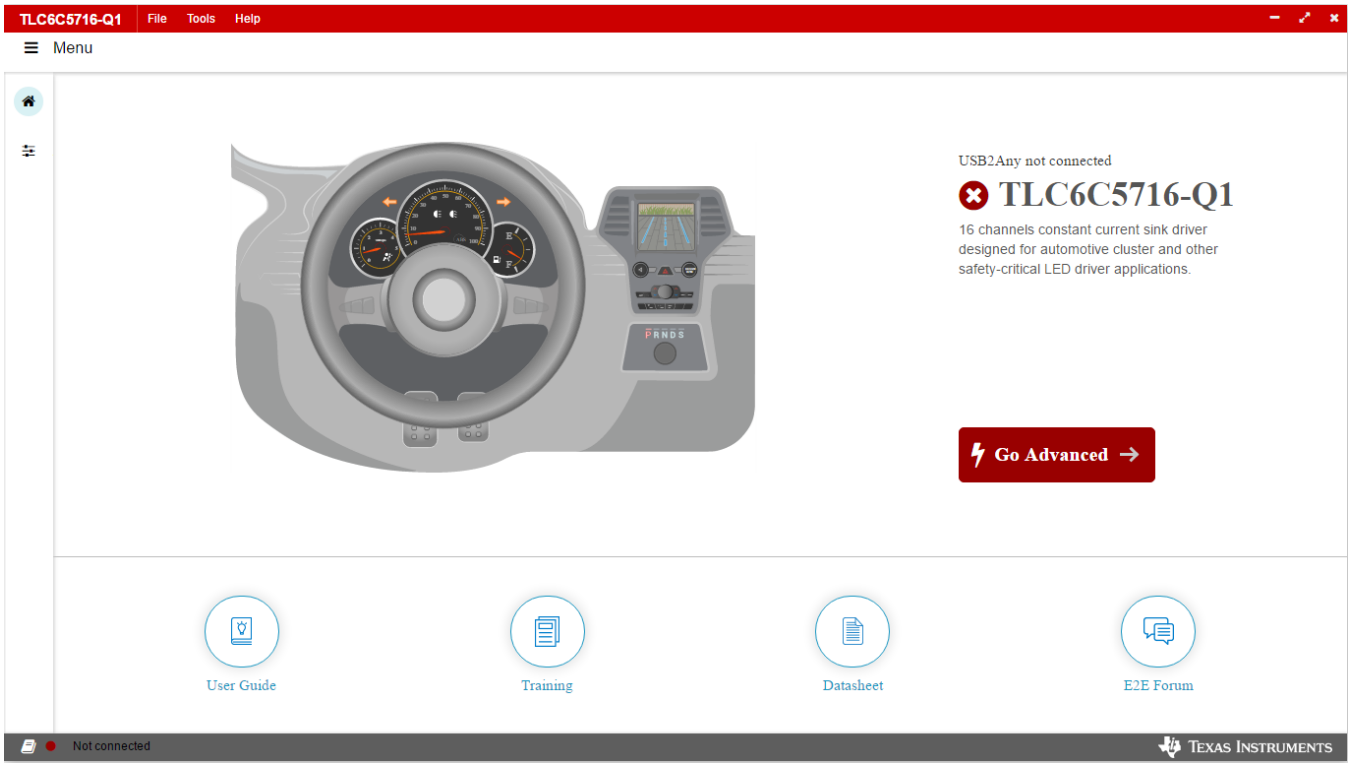

Figure 3. TLC6C5716EVM GUI Landing Page

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2.3 GUI Function

This section provides instructions to run the TLC6C5716EVM using the TLC6C5716EVM GUI.

2.3.1 Connection Status

The TLC6C5716EVM connection status appears on the GUI landing page. A red status indicator means *Device Not connected*, a green status indicator means *Device connected*. Click the *Go Advanced* button and a quick configuration page opens for control of the TLC6C5716EVM.

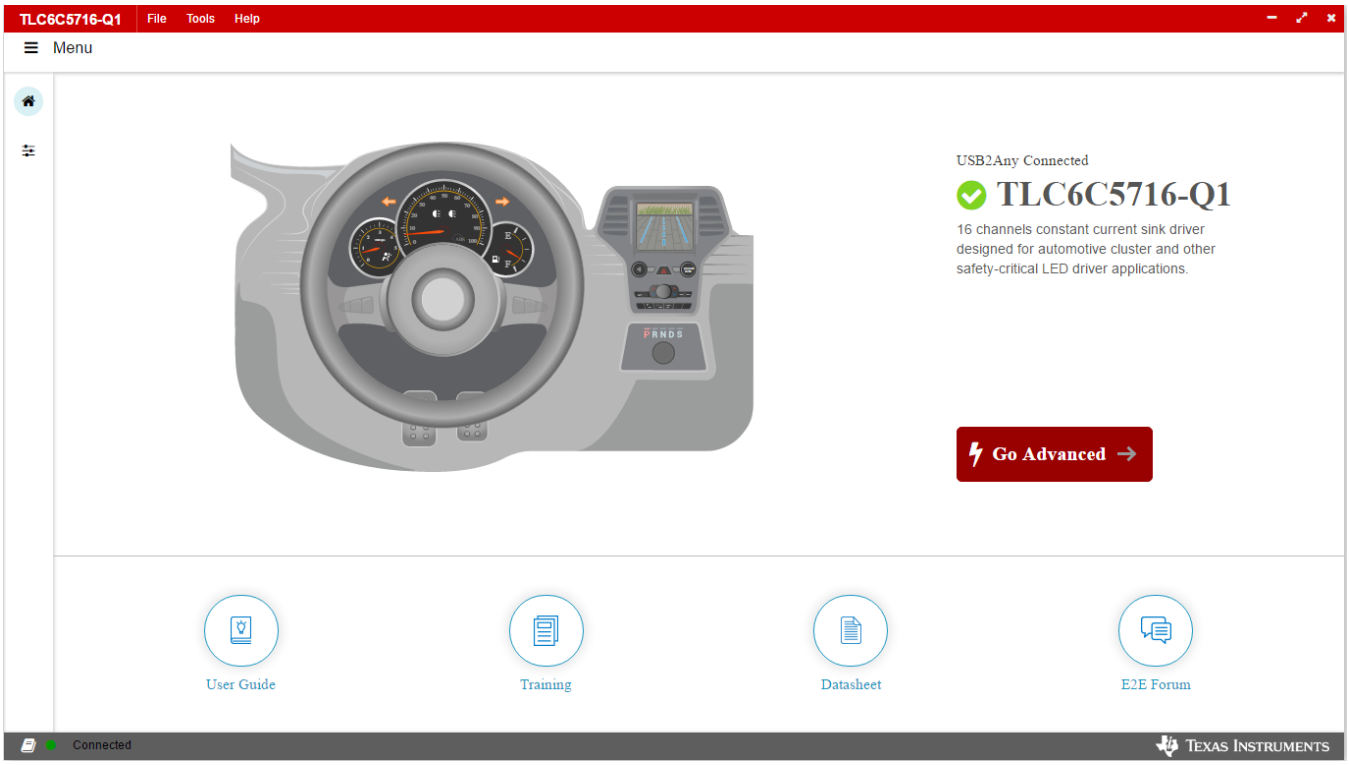

Figure 4. Connection Status

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2.3.2 Advanced Settings Page

The *Advanced Settings* page (Figure 5) provides more register configuration features. The GLOBAL RESET button resets the TLC6C5716-Q1 internal registers, meaning all registers values are set to 0, except the *Mask LED Error* bit is set to 1. The INITIALIZE ALL CH VALUES buttons turns on all channels with 50% grayscale (GS), dot correction, and brightness control values. GS and dot correction channels can be adjusted separately.

For APS TEST and LOD TEST, turn off all output channels first, then perform the test. For other configurations, refer to *TLC6C5716-Q1 16-Channel, Full Diagnostics, Constant-Current LED Driver With 7-Bit Dot Correction and 12-Bit PWM Dimming* for details.

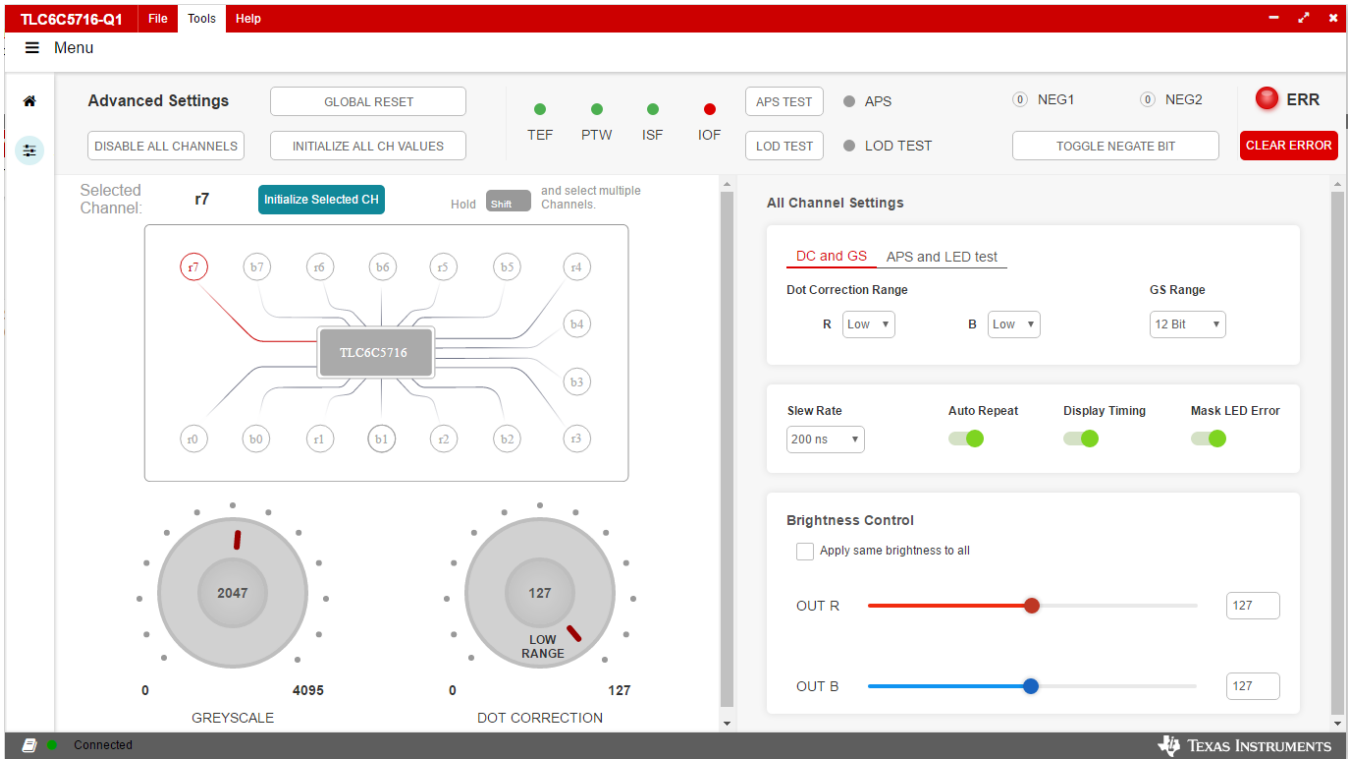

Figure 5. Advanced Settings Page

2.3.3 Device Cascading

Use J34 and J35 to connect two TLC6C5716-Q1 EVMs in cascading mode. Note that users should remove J34 shunt during the cascading mode.

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3 Board Layout

Figure 6 illustrates the PCB layout of TLC6C5716EVM.

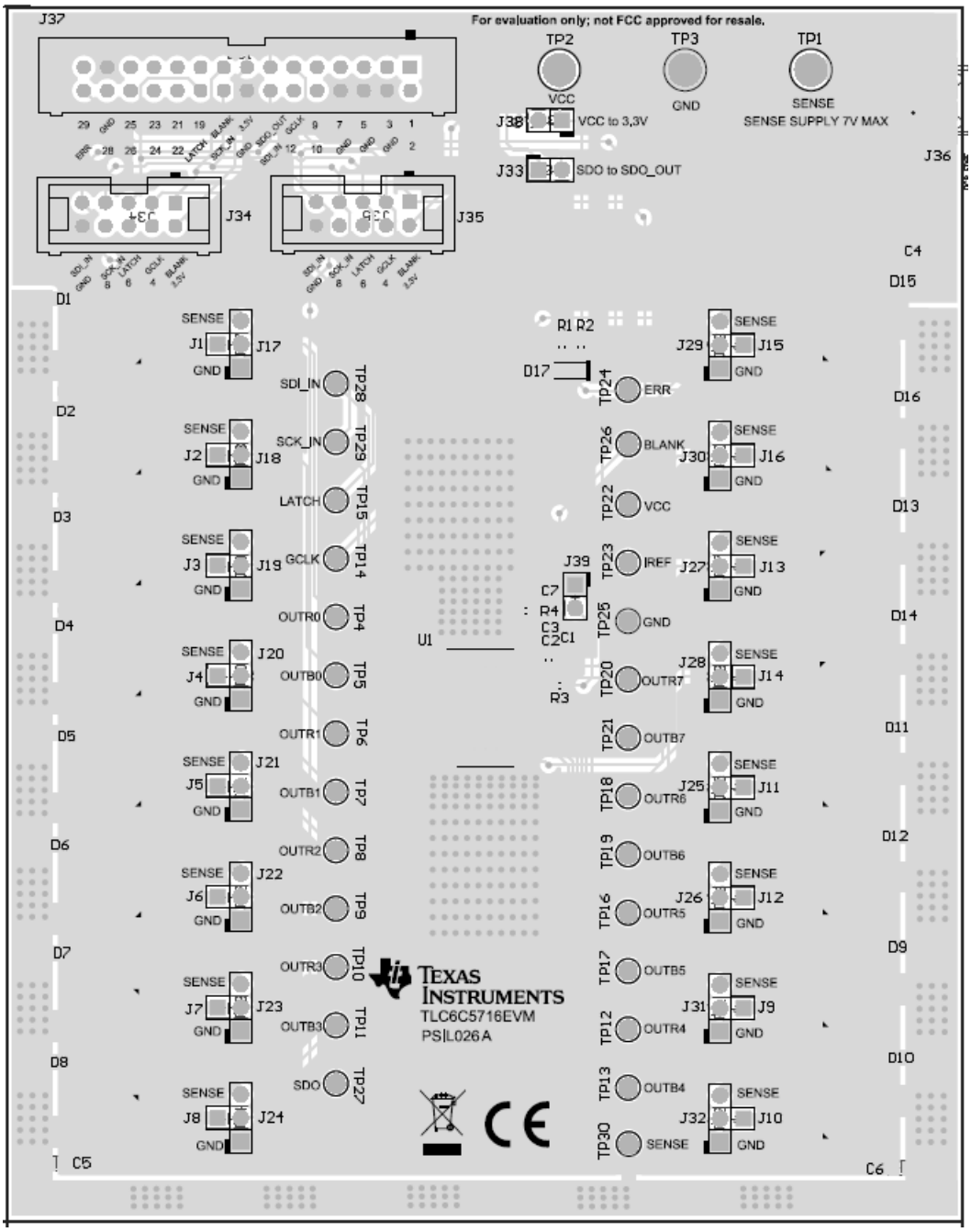

Figure 6. PCB Layout

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4 Schematic and Bill of Materials

4.1 Schematic

Figure 7 illustrates the TLC6C5716EVM schematic.

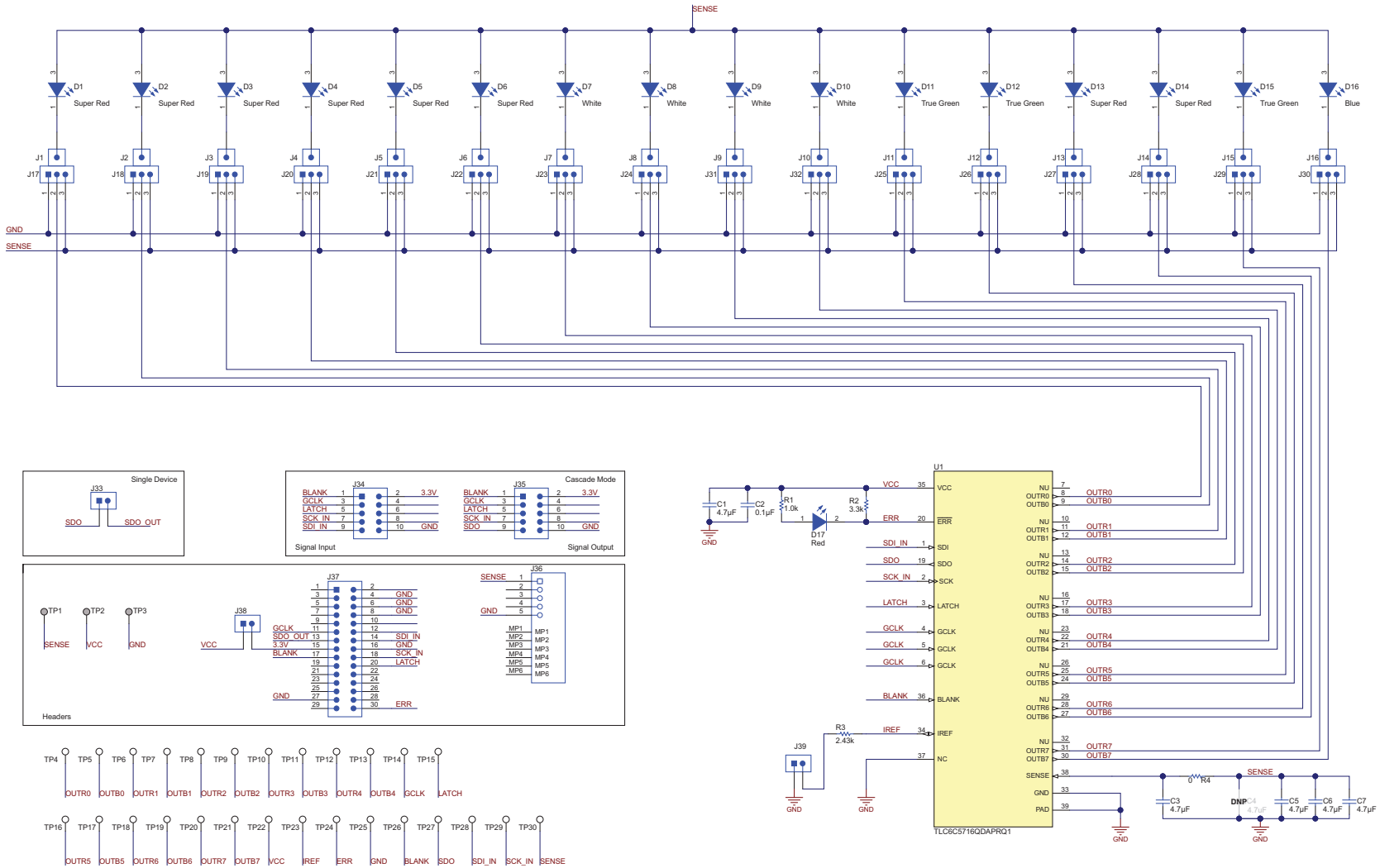

Figure 7. TLC6C5716EVM Schematic

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4.2 Bill of Materials

Table 1 lists the TLC6C5716EVM BOM.

Table 1. Bill of Materials

Designator	QTY	Value	Description	Package Reference	Part Number	Manufacturer
C1	1	4.7uF	CAP, CERM, 4.7 µF, 16 V, ±10%, X5R, 0805	0805	GRM21BR61C475KA88L	Murata
C2	1	0.1uF	CAP, CERM, 0.1 µF, 16 V, ±5%, X7R, 0603	0603	0603YC104JAT2A	AVX
C3, C5, C6, C7	4	4.7uF	CAP, CERM, 4.7 µF, 16 V,±10%, X5R, 0805	0805	EMK212BJ475KG-T	Taiyo Yuden
D1, D2, D3, D4, D5, D6, D13, D14	8	Super Red	LED, Super Red, SMD	2.8x3.2mm	LS E67B-S2U1-1-1	OSRAM
D7, D8, D9, D10	4	White	LED, White, SMD	2.8x3.2mm	LW E6SG-AABA-JKPL-1	OSRAM
D11, D12, D15	3	True Green	LED, True Green, SMD	2.8x3.2mm	LT E6SG-AABB-35-1	OSRAM
D16	1	Blue	LED, Blue, SMD	Power TOPLED	LB-E6SG	OSRAM
D17	1	Red	LED, Red, SMD	Red 0805 LED	LTST-C170KRKT	Lite-On
J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16	16		Header, 100mil, 1pos, Gold, TH	Testpoint	TSW-101-07-G-S	Samtec
J17, J18, J19, J20, J21, J22, J23, J24, J25, J26, J27, J28, J29, J30, J31, J32	16		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
J33, J38, J39	3		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
J34, J35	2		Header (shrouded), 100mil, 5x2, Gold, TH	TH, 10-Leads, Body 8.5x20mm, Pitch 2.54mm	XG4C-1031	Omron Electronic Components
J36	1		Receptacle, 0.65 mm, 5x1, Gold, R/A, SMT	SMD, 5-Leads, Body 7.9x5.57mm, Pitch 0.65mm	10118192-0001LF	FCI
J37	1		Connector, 15x2, 3A 300V STRT DIP, TH	Connector, 15x2, Pitch 2.54mm, TH	XG4C-3031	Omron Electronic Components
R1	1	1.0k	RES, 1.0 k, 5%, 0.1 W, 0603	0603	CRCW06031K00JNEA	Vishay-Dale
R2	1	3.3k	RES, 3.3 k, 5%, 0.1 W, 0603	0603	CRCW06033K30JNEA	Vishay-Dale
R3	1	2.43k	RES, 2.43 k, 0.5%, 0.1 W, 0603	0603	RT0603DRE072K43L	Yageo America
R4	1	0	RES, 0, 5%, 0.1 W, 0603	0603	ERJ-3GEY0R00V	Panasonic
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	19		Single Operation 2.54mm Pitch Open Top Jumper Socket	Single Operation 2.54mm Pitch Open Top Jumper Socket	M7582-05	Harwin
TP1, TP2, TP3	3		Terminal, Turret, TH, Double	Keystone1502-2	1502-2	Keystone
TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30	27		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone
U1	1		Automotive Grade 16-Channel, Full Diagnostics, Constant-Current LED Driver with 7-Bit Dot Correction and 12-Bit PWM Dimming, DAP0038E (TSSOP-38)	DAP0038E	TLC6C5716QDAPRQ1	Texas Instruments
C4	0	4.7uF	CAP, CERM, 4.7 µF, 16 V,±10%, X5R, 0805	0805	EMK212BJ475KG-T	Taiyo Yuden

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      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.

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      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.

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      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.*

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(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.

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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

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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.

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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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4.3.2 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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