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TPS92613-Q1 Evaluation Module

The TPS92613-Q1 evaluation module (EVM) user's guide describes the characteristics and operation of the TPS92613-Q1 EVM. A complete schematic diagram, printed-circuit board (PCB) layout, and bill of materials (BOM) are also included.

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Trademarks

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1 Introduction

The TPS92613-Q1 EVM helps designers evaluate the operation and performance of the TPS92613-Q1 device, a linear single-channel LED driver for automotive lighting applications. It is a simple and elegant solution to deliver constant current for a single LED string with full LED diagnostics. The *TPS92613-Q1 Typical Application to Achieve High Immunity to BCI (Bulk Current Injection) Application Report* introduces TPS92613-Q1 BCI immunity design methods.

1.1 Features

The EVM has the following features:

- Single-channel constant-current LED driver with PWM dimming
- LED short-circuit and open-circuit detection with auto-recovery
- Open-fault detection mask for low-dropout operation

1.2   *Typical Applications*

The EVM is used in the following applications:

*   Automotive convenience lighting: dome light, door handles, reading lamp, and miscellaneous lamps
*   Automotive rear lamp, center high-mounted stop lamp, side markers, blind-spot detection indicator, charging inlet indicator
*   General-purpose LED driver application

2   TPS92613EVM Description

This section describes the TPS92613EVM connectors, test points, and jumpers.

2.1   *TPS92613EVM Board*

WARNING

Hot surface. Contact may cause burns. Do not touch.

Figure 1 displays the EVM board.
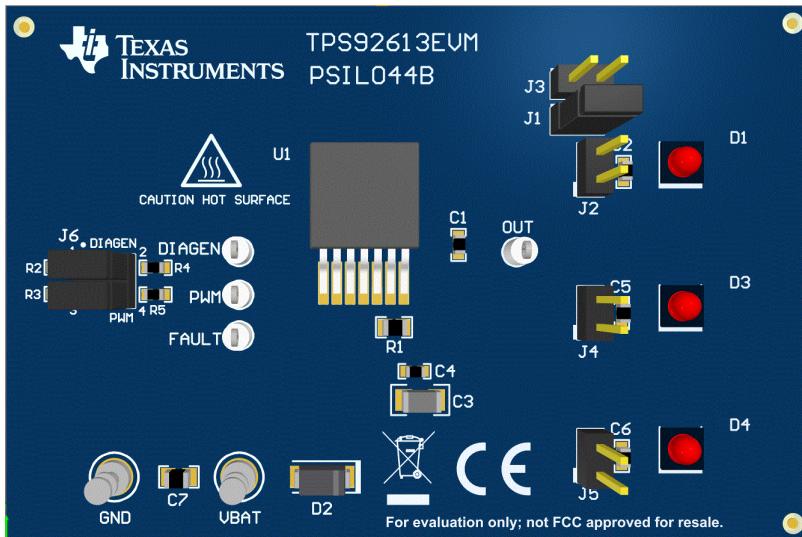
Figure 1. TPS92613EVM Board

2.2   *Connectors*

The EVM has the following connectors:

*   TP1 (VBAT): Input power supply
*   TP2 (GND): Supply ground

2.3 Test Points

All the pins on the TPS92613-Q1 device have test points on the EVM, helping users observe the waveform on the pins, including DIAGEN, PWM, FAULT, GND, VBAT and OUT.

2.4 Jumpers

2.4.1 LED Connection Configuration Jumpers – J1, J2, J3, J4, J5

Jumpers J1–J5 are used to configure the connection of the LED string, including LED open, LED short to GND, and single-LED short.

Table 1. Jumpers J1–J5

Designator	Attached Function	With Shunt	Without Shunt
J1	LED open	LED string connected to OUT	LED string open
J3	LED short	LED string short to GND	Normal operation
J2	Single-LED short	Short LED D1	Normal operation
J4	Single-LED short	Short LED D3	Normal operation
J5	Single-LED short	Short LED D4	Normal operation

2.4.2 Control Signal Input Jumper – J6

Jumper J6 is used to configure the control signals, including DIAGEN and PWM.

Table 2. Jumper J6

Designator	Attached Function	Jumper Position	Result
J6 (pins 1–2)	DIAGEN	With shunt	Enable LED open-circuit detection when SUPPLY > 9 V (DIAGEN connected to SUPPLY via a resistor divider)
		Without shunt	Disable LED open-circuit detection (DIAGEN connected to GND via R4)
J6 (pins 3–4)	PWM	With shunt	Enable PWM when SUPPLY > 6 V (PWM connected to SUPPLY via a resistor divider)
		Without shunt	Disable PWM or use external control signal (PWM connected to GND via R5)

3   Test Setup

Table 3 shows the typical parameters for the TPS92613EVM. The typical input voltage range is from 9 V to 16 V. The full-scale output current of the TPS92613EVM is 210 mA. Users can adjust the output current by changing the sensing resistor.

Table 3. TPS92613EVM Parameters

Parameter	Value
Input voltage	9 V–16 V typical
Output current	210 mA
LED	3s1p LED string

Follow these steps for the EVM test setup:

1. Set the voltage of the dc power supply to 12 V and set the current limit to 300 mA.

2. Connect the positive and negative outputs of the power supply to connectors VBAT and GND on the EVM board.

3. With the default jumper connections, the board should begin operating as soon as the power supply is turned on. Modify the jumpers for other operating modes.

4   Board Layout

Figure 2 and Figure 3 illustrate the EVM board layout.
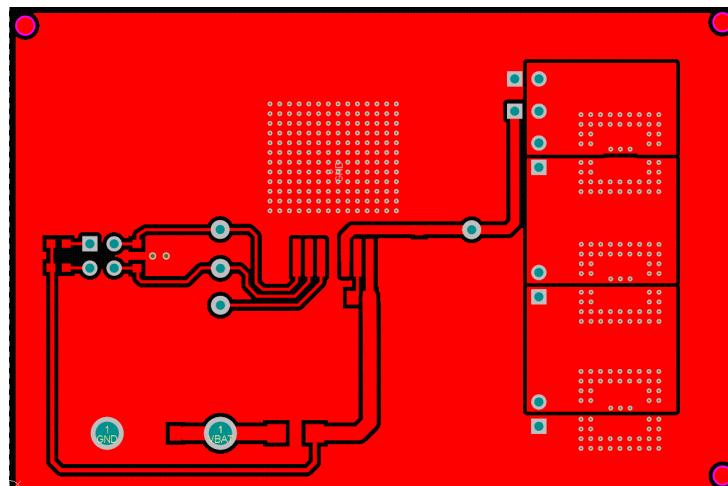

Figure 2. TPS92613EVM Layout - Top Layer
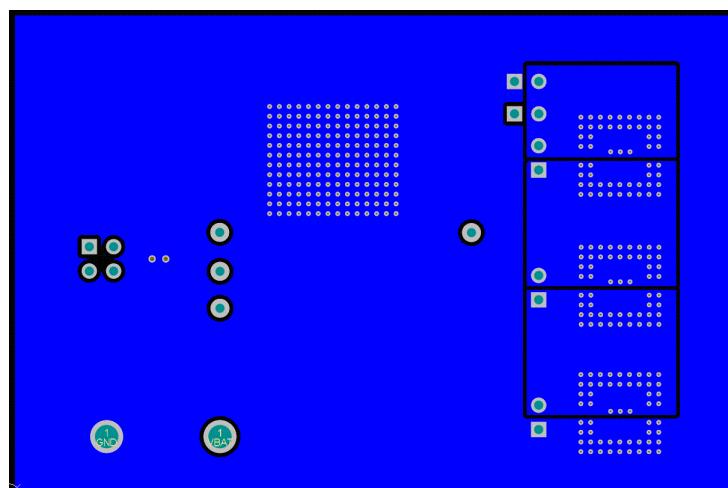
Figure 3. TPS92613EVM Layout - Bottom Layer

5 Schematic and Bill of Materials

5.1 Schematic

Figure 4 shows the EVM schematic.
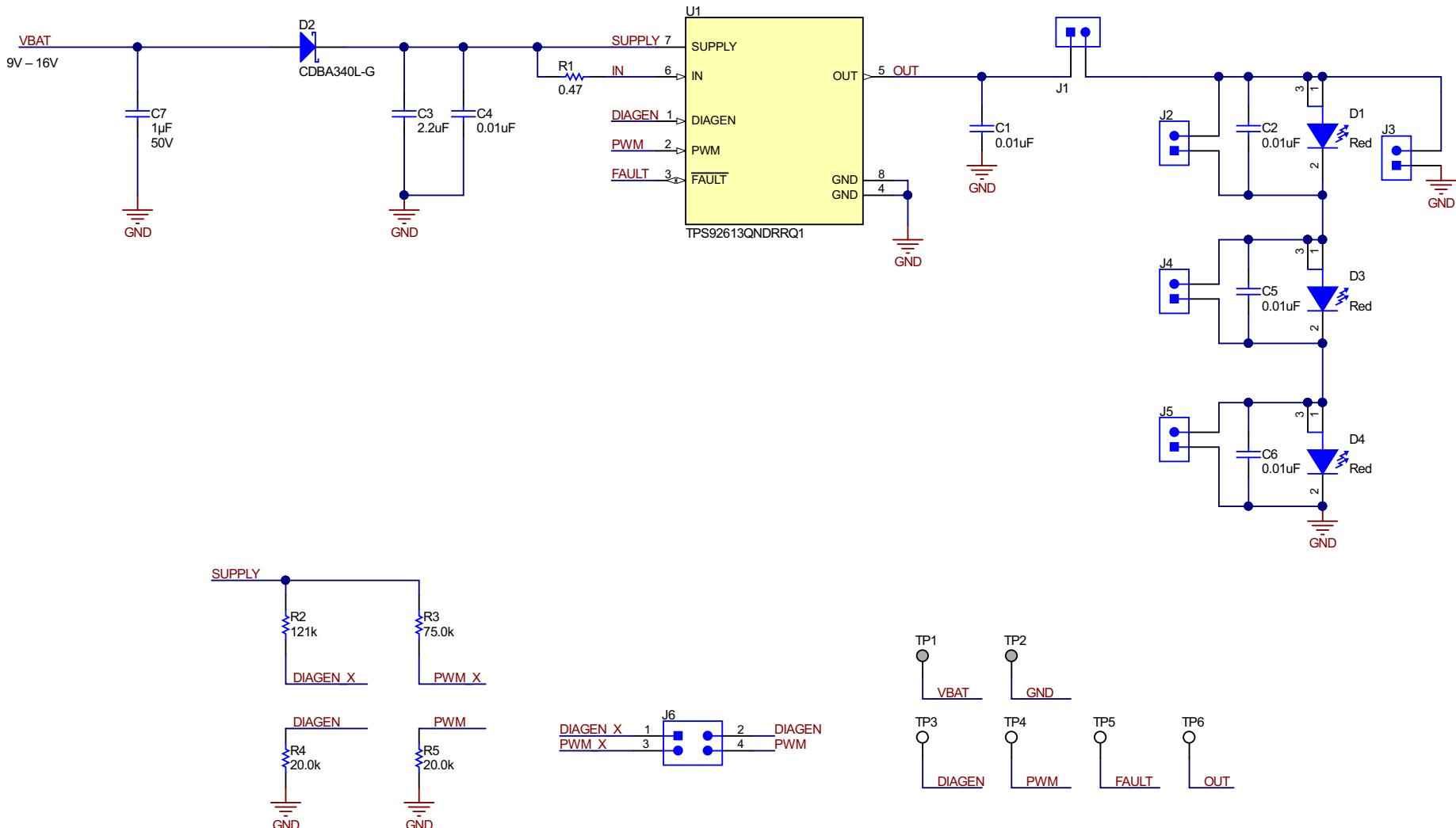
Figure 4. TPS92613EVM Schematic

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5.2 Bill of Materials

Table 4 lists the TPS92613EVM BOM.

Table 4. TPS92613EVM Bill of Materials

Item No.	Designator	QTY	Value	Part Number	Manufacturer	Description	Package Reference
1	C1, C2, C4, C5, C6	5	0.01 µF	C0603X103K5RACTU	Kemet	CAP, CERM, 0.01 µF, 50 V, ±10%, X7R, 0603	0603
2	C3	1	2.2 µF	C3216X7R1H225K160AB	TDK	CAP, CERM, 2.2 µF, 50 V, ±10%, X7R, 1206	1206
3	C7	1	1 µF	C2012X7R1H105K125AB	TDK	CAP, CERM, 1 µF, 50 V, ±10%, X7R, 0805	0805
4	D1, D3, D4	3	Red	LR H9GP-HZKX-1-1-Z	OSRAM	LED, Red, SMD	3.85 × 3.85 mm
5	D2	1	40 V	CDBA340L-G	Comchip Technology	Diode, Schottky, 40 V, 3 A, SMA	SMA
6	J1, J2, J3, J4, J5	5		TSW-102-07-G-S	Samtec	Header, 100mil, 2x1, Gold, TH	2x1 Header
7	J6	1		TSW-102-07-G-D	Samtec	Header, 100mil, 2x2, Gold, TH	2x2 Header
8	R1	1	0.47 Ω	ERJ-6RQFR47V	Panasonic	RES, 0.47 Ω, 1%, 0.125 W, 0805	0805
9	R2	1	121 kΩ	CRCW0603121KFKEA	Vishay-Dale	RES, 121 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
10	R3	1	75.0 kΩ	RC0603FR-0775KL	Yageo America	RES, 75.0 kΩ, 1%, 0.1 W, 0603	0603
11	R4, R5	2	20.0 kΩ	RC0603FR-0720KL	Yageo America	RES, 20.0 kΩ, 1%, 0.1 W, 0603	0603
12	SH-J1, SH-J2, SH-J3	3	1x2	SPC02SYAN	Sullins Connector Solutions	Shunt, 100mil, Flash Gold, Black	Closed Top 100mil Shunt
13	TP1, TP2	2		1502-2	Keystone	Terminal, Turret, TH, Double	Keystone1502-2
14	TP3, TP4, TP5, TP6	4		5002	Keystone	Test Point, Miniature, White, TH	White Miniature Testpoint
15	U1	1		TPS92613QNDRRQ1	Texas Instruments	Automotive Single Channel LED Driver, NDR0007A (TO-263-7)	NDR0007A

Revision History

Changes from Original (April 2018) to A Revision   **Page**

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