



ABSTRACT

The TPS92633-Q1 Evaluation Module(EVM) user's guide describes the characteristics of the device and the operation of EVM. A complete schematic diagram, printed-circuit board layout, and bill of materials (BOM) are also included.

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1 Introduction

The TPS92633Q1EVM helps designers evaluate the operation and performance of the TPS92633-Q1, a linear triple-channels LED driver with full LED diagnostic for automotive lighting applications. For linear LED drivers used in automotive lighting end equipment, thermal and off-board driving are two design challenges. TPS92633-Q1 can help designers to easily deal with those challenges and TPS92633Q1EVM could help to validate those features.

1.1 Features

The EVM has the following features:

1. LED short/open and single LED short detection and auto-recover
2. Open fault mask during dropout mode
3. Thermal sharing with external resistor when supply voltage is high
4. Off-board bin resistor can be used to set the output current

1.2 Typical Application

The EVM is used in the following applications:

1. [Automotive exterior rear light](#): rear lamp, center high mounted stop lamp(CHMSL), side marker
2. [Automotive exterior small light](#): door handle, blind spot detection indicator, charging inlet
3. [Automotive interior light](#): overhead console, reading lamp
4. General-purpose LED driver applications

2 TPS92633Q1EVM Description

This section will describe the connectors and jumpers of TPS92633Q1EVM.

2.1 TPS92633Q1EVM Board

Figure 2-1 displays the TPS92610EVM Board.

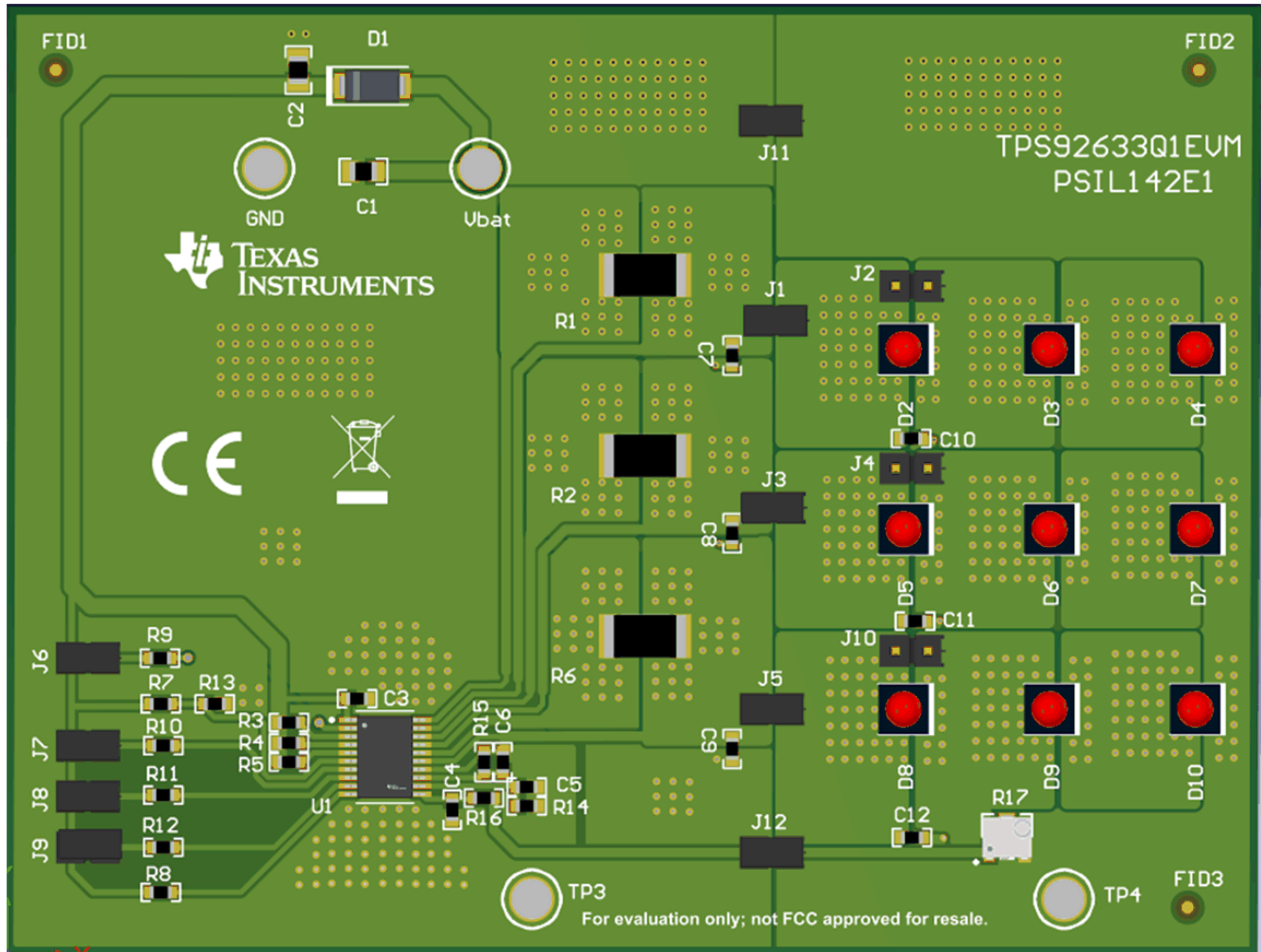


Figure 2-1. TPS92633Q1EVM Board

2.2 Connector Map

The EVM has the following connectors. Table 2-1 shows their functions.

Table 2-1. Connector Map

Connector	Describe
Vbat	Power Supply Input
GND	Device part ground
TP3	Device part ground
TP4	LED part ground

2.3 Jumper Map

The EVM provides some jumpers for designers to conveniently validate the device. Table 2-2 shows the jumper map.

Table 2-2. Jumper Map

Function	Designator	Attached Function	With Shunt	Without Shunt
Open detect	J1	LED1 open	LED1 string connect to Out1	LED1 string open
	J3	LED2 open	LED2 string connect to Out2	LED2 string open
	J5	LED3 open	LED3 string connect to Out2	LED3 string open
Single LED short detect	J2	LED1 string Single LED Short	Short one LED in LED1 string	3 LED series in LED1 string
	J4	LED2 string Single LED Short	Short one LED in LED2 string	3 LED series in LED2 string
	J6	LED3 string Single LED Short	Short one LED in LED3 string	3 LED series in LED3 string
PWM dimming input	J7	PWM1	Enable PWM1 (PWM1 connected to SUPPLY via a resistor)	Disable PWM1 or use external control signal
	J8	PWM2	Enable PWM2 (PWM2 connected to SUPPLY via a resistor)	Disable PWM2 or use external control signal
	J9	PWM3	Enable PWM3 (PWM3 connected to SUPPLY via a resistor)	Disable PWM3 or use external control signal
Device Enable	J6	EN	The device is enabled (EN connected to SUPPLY via R9)	The device is disabled (EN floating)
Off-board application	J1	GND and GND2 connection	LED board ground GND2 connects to LCM board ground GND1	Disconnect GND1 and GND2
	J2	Ictrl off-board	Ictrl connect to 544 ohm with 160-mV Vsns	Ictrl floating with 400-mV Vsns

3 Test Setup

Table 3-1 shows the typical parameters for the TPS92633Q1EVM. The typical input voltage range is from 9 V to 20 V. The full-scale output current of the TPS92633Q1EVM is 150 mA per channel. Users can adjust the output current by changing the sensing resistor or Ictrl resistor.

Table 3-1. TPS92633Q1EVM Parameters

Parameter	Value
Input Voltage[V]	typical: 9-20
Output Current Per channel[mA]	140
LED Per channel	3s1p LED string
R _{sns} [Ω]	1.15
R _{res} [Ω]	6.19 k
R _{ictrl} [Ω]	44.2 + 500
R _{sls} [Ω]	4.99 k

4 Schematic, Bill of Materials and Layout

4.1 Schematic

Figure 4-1 shows the TPS92633Q1EVM schematic. To simulate off-board LED driving condition, EVM uses individual ground for Light Control Module (LCM) board and LED board and uses J11 to connect them together. Designers can use Dupont Line to take the place of shunt for real off-board test.

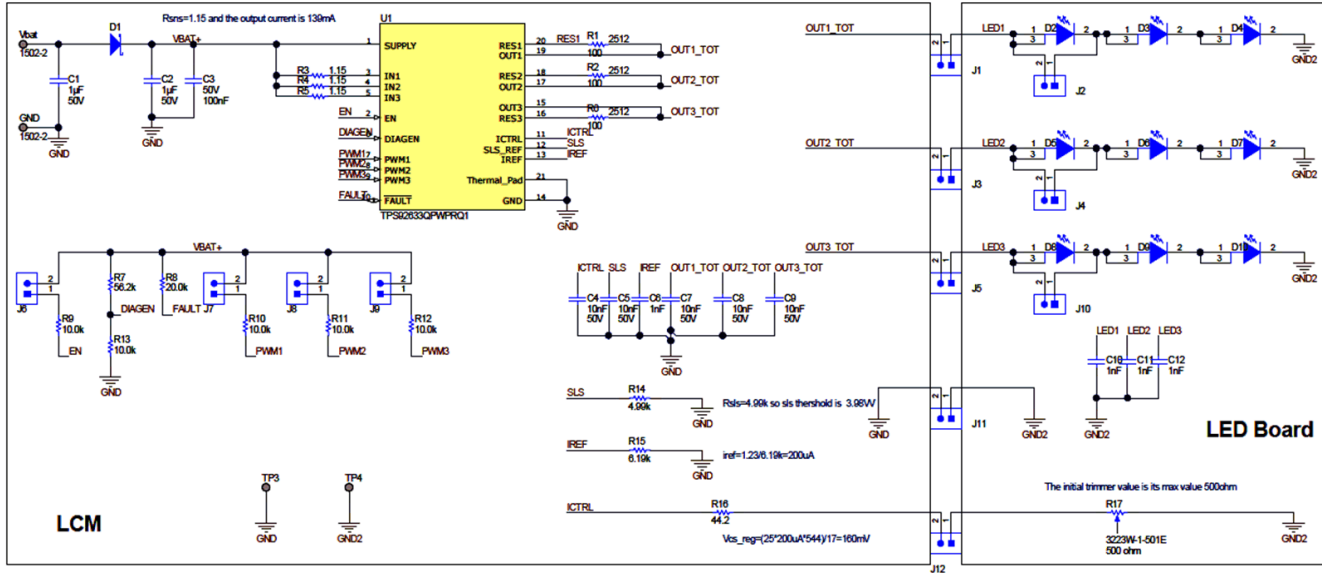


Figure 4-1. Schematic

4.2 Bill of Materials (BOM)

Table 4-1 lists the TPS92633Q1EVM BOM.

Table 4-1. Bill of Materials

Item Num	Designator	Value	QTY	Part Number	Manufacturer	Description	Package Reference
1	GND, TP3, TP4, Vbat		4	1502-2	Keystone	Terminal, Turret, TH, Double	Keystone1502-2
2	R17	500 ohm	1	3223W-1-501E	Bourns	TRIMMER 500 OHM 0.125 W SMD	3.52 x 4.16 x 3.94 mm
3	C3	0.1 uF	1	06035C104K4Z 4A	AVX	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 0, 0603	0603
4	C1, C2	1 uF	2	08055C105K4Z 2A	AVX	CAP, CERM, 1 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0805	0805
5	C6, C10, C11, C12	1000 pF	4	C0603C102J5R ACAUTO	Kemet	CAP, CERM, 1000 pF, 50 V, +/- 5%, X7R, AEC-Q200 Grade 1, 0603	0603
6	C4, C5, C7, C8, C9	0.01 uF	5	C1608X7R1H1 03K080AA	TDK	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X7R, 0603	0603

Table 4-1. Bill of Materials (continued)

Item Num	Designator	Value	QTY	Part Number	Manufacturer	Description	Package Reference
7	R3, R4, R5	1.15 Ω	3	CRCW06031R15FKEA	Vishay-Dale	RES, 1.15, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
8	R14	4.99 kΩ	1	CRCW06034K99FKEA	Vishay-Dale	RES, 4.99 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
9	R8	20.0 kΩ	1	CRCW060320K0FKEA	Vishay-Dale	RES, 20.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
10	R16	44.2 Ω	1	CRCW060344R2FKEA	Vishay-Dale	RES, 44.2, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
11	R7	56.2 kΩ	1	CRCW060356K2FKEA	Vishay-Dale	RES, 56.2 k, 1%, 0.1 W, 0603	0603
12	R1, R2, R6	100 Ω	3	CRCW2512100RFKEG	Vishay-Dale	RES, 100, 1%, 1 W, AEC-Q200 Grade 0, 2512	2512
13	D2, D3, D4, D5, D6, D7, D8, D9, D10	Red	9	LR H9GP-HZKX-1-1-Z	OSRAM	LED, Red, SMD	3.85 x 3.85 mm
14	R15	6.19 kΩ	1	RC0603FR-076K19L	Yageo	RES, 6.19 k, 1%, 0.1 W, 0603	0603
15	R9, R10, R11, R12, R13	10.0 kΩ	5	RCG060310K0FKEA	Vishay Draloric	RES, 10.0 k, 1%, 0.1 W, 0603	0603
16	SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9	1 x 2	9	SPC02SYAN	Sullins Connector Solutions	Shunt, 100 mil, Flash Gold, Black	Closed Top 100-mil Shunt
17	D1		1	SK36A-LTPMSCT-ND	Micro Commercial Co	Diode, Schottky, 60 V, 3 A, AEC-Q101, SMA	DO214AC
18	U1		1	TPS92633QPWPRQ1	Texas Instruments	Three-Channel, Automotive High-side LED Driver	TSSOP20
19	J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12		12	TSW-102-23-T-S	Samtec	Header, 2.54 mm, 2 x 1, Tin, TH	Header, 2.54 mm, 2 x 1, Tin, TH

4.3 Layout

Figure 4-2 illustrates the EVM board layout.

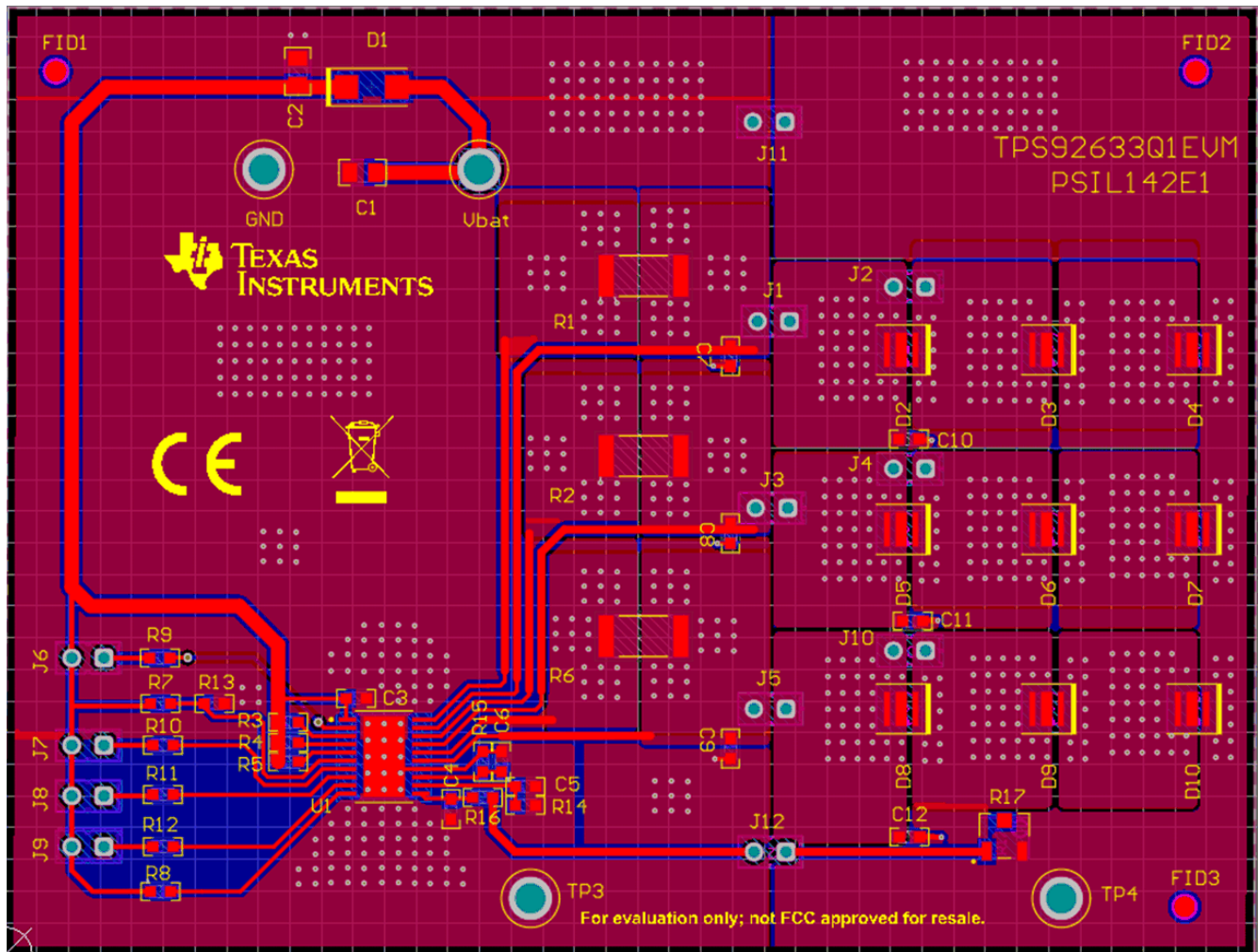


Figure 4-2. Layout

Revision History

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

DATE	REVISION	NOTES
November 2020	*	Initial Release

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