EVM User's Guide: TPS92622SOPQ1EVM

TPS92622-Q1 (HVSSOP) Evaluation Module

Description

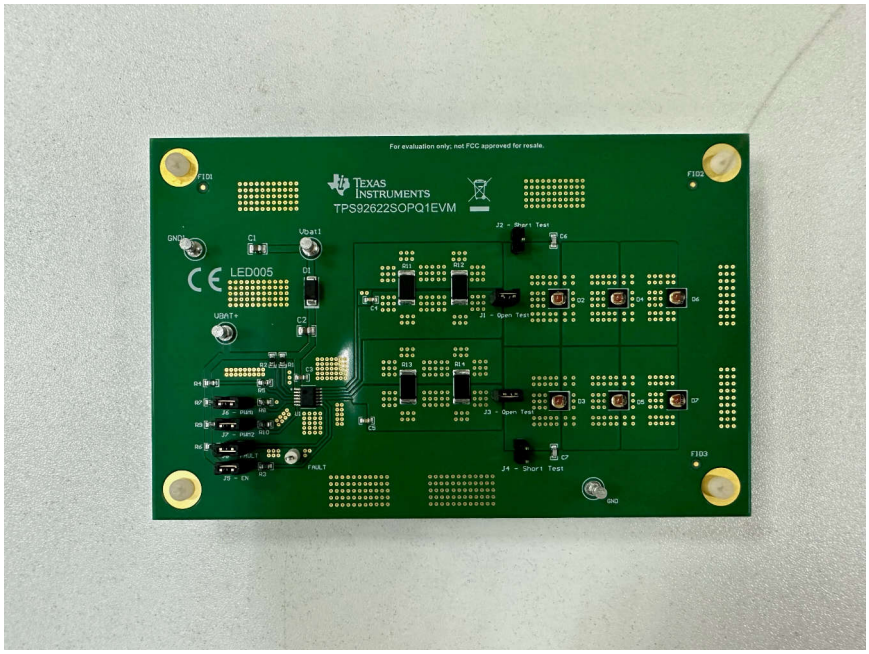
The TPS92622SOPQ1EVM is designed to provide a quick setup to evaluate TPS92622-Q1 (HVSSOP package) device and gain familiarity with the device. The printed circuit board (PCB) helps users easily verify various features of TPS92622-Q1 in the HVSSOP package.

Features

- LED short-to-GND, open-circuit detection and auto-recovery
- Open fault mask during low-dropout mode
- Thermal sharing with external resistors when supply voltage is high

Applications

- Automotive exterior rear light: rear lamp, center high mounted stop lamp (CHMSL), side marker
- Automotive interior light: dome lamp, glove box lamp, reading lamp
- Automotive exterior small light: door handle, blind spot detection indicator, charging inlet
- General-purpose LED driver applications



TPS92622SOPQ1EVM Board

1 Evaluation Module Overview

1.1 Introduction

The TPS92622SOPQ1EVM helps designers evaluate the operation and performance of the TPS92622-Q1 (HVSSOP package), a linear 2-channel LED driver with full LED diagnostic for automotive lighting applications. For linear LED drivers used in automotive lighting end equipments, thermal is a big design challenge. TPS92622-Q1 can help designers to easily deal with this challenge, and TPS92622SOPQ1EVM can help to validate those features.

The TPS92622-Q1 (HVSSOP package) Evaluation Module (EVM) user's guide describes the characteristics of the device and the operation of EVM. This user's guide includes a complete schematic diagram, printed-circuit board layout, and bill of materials (BOM).

1.2 Kit Contents

The TPS92622SOPQ1EVM kit includes the following materials and is illustrated in Figure 1-1.

Figure 1-1. TPS92622SOPQ1EVM Kit

1.3 Specification

The TPS92622SOPQ1EVM is set up for a default output current of 150 mA per channel. External shunt resistors on RES pin are leveraged to share output current and dissipate power out of the device. This EVM has an enable selection through EN pin, when the EN signal is low, the device is in sleep mode with ultra low quiescent current, which can help to save system-level current consumption in applications. By applying external voltage duty cycle signal on either SUPPLY or PWM pins, the device is able to operate in different dimming modes. This EVM can be used to verify diagnostic and protective functions. Additionally, the LED open detection can be disabled to avoid false open diagnostic during low-dropout operation.

1.4 Device Information

The TPS92622SOPQ1EVM is based on the device of TPS92622-Q1(HVSSOP package). This device is a 2-channel linear LED driver, has a unique thermal management design to reduce temperature rising on the device, and can be directly powered by automotive batteries with large voltage variation to output full current loads up to 150 mA. This device can also provide features, such as full diagnostics, wide voltage input, and PWM dimming.

2 Hardware

2.1 Test Setup

Table 2-1 shows the typical parameters for the TPS92622SOPQ1EVM. The typical input voltage range is from 9 V to 20 V. The full-scale output current of the TPS92622SOPQ1EVM is 150 mA per channel. Users can adjust the output current by changing the sensing resistor (Rsns).

Table 2-1. TPS92622SOPQ1EVM Parameters

Parameters	Value
Input voltage (V)	typical: 9-20
Output current per channel (mA)	150 mA
LED per channel	3s1p LED string
Rsns (Ω)	1
Rres (Ω)	41

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 1 A.
2. Connect the positive and negative outputs of the power supply to connectors VBAT and GND respectively on the EVM board.
3. With the default jumper connections, the board must begin operating after the power supply is turned on. Modify the jumpers for other operating modes.
4. For short-to-battery detection, set the voltage of dc power to 10.5V and the current limit to 2.5A to avoid the risk of damaging LEDs under long-term failure condition.

2.2 Connector Map

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

Table 2-2. Connector Map

Connector	Description
Vbat1	This connector is a power supply input.
GND	This connector is a device part ground.
VBAT+	SUPPLY. This connector shows the positive input supply voltage.
DIAGEN	DIAGEN. This connector shows the LED open diagnostic enable input.
FAULT	FAULT. This connector shows the fault status output of the LED driver.

2.3 Jumper Map

The EVM provides some jumpers for designers to conveniently validate the device. Table 2-3 shows the jumper map.

Table 2-3. 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
Short detect	J2	Single LED short	Short 3 LEDs in LED1 string	3 LED series in LED string
	J4	LED string short	Short 3 LEDs in LED2 string	3 LED series in LED string
Device enable	J5	EN	The device is enabled (EN connected to SUPPLY via a resistor)	The device is disabled (EN is floating)
PWM dimming input	J6	PWM1	Enable PWM1(PWM1 connected to SUPPLY through a resistor)	Disable PWM1 or use external control signal
	J7	PWM2	Enable PWM2(PWM2 connected to SUPPLY through a resistor)	Disable PWM2 or use external control signal
Fault option	J8	FAULT	One fails, others on	Use external control signal

3 Hardware Design Files

3.1 Schematics

Figure 3-1 shows the TPS92622SOPQ1EVM schematic.

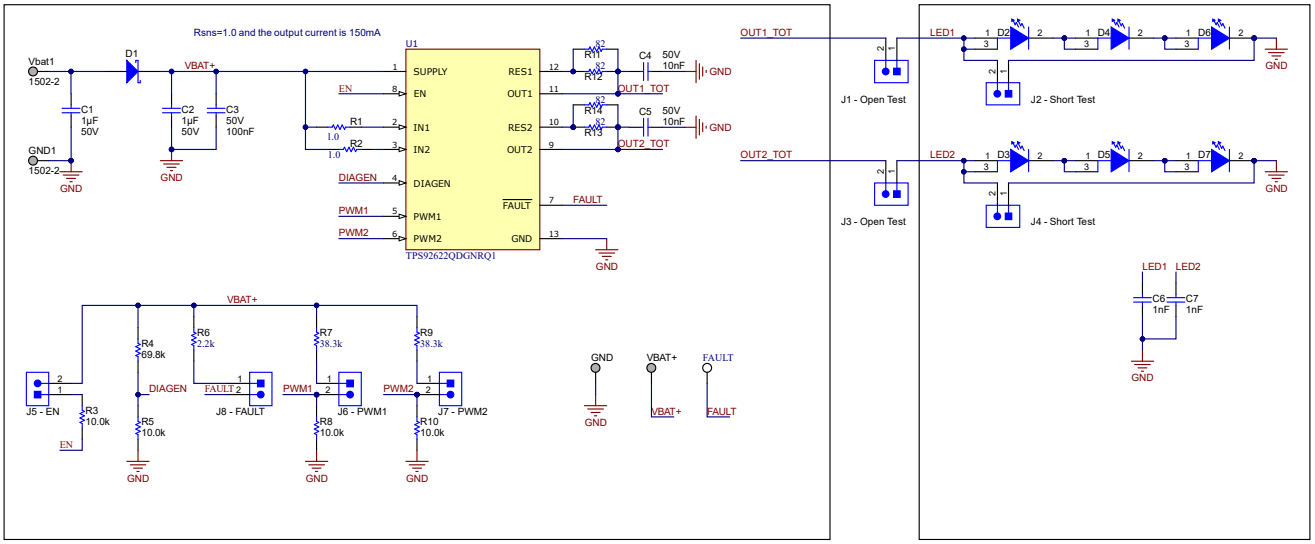


Figure 3-1. Schematic

3.2 PCB Layout

Figure 3-2 illustrates the EVM board layout.

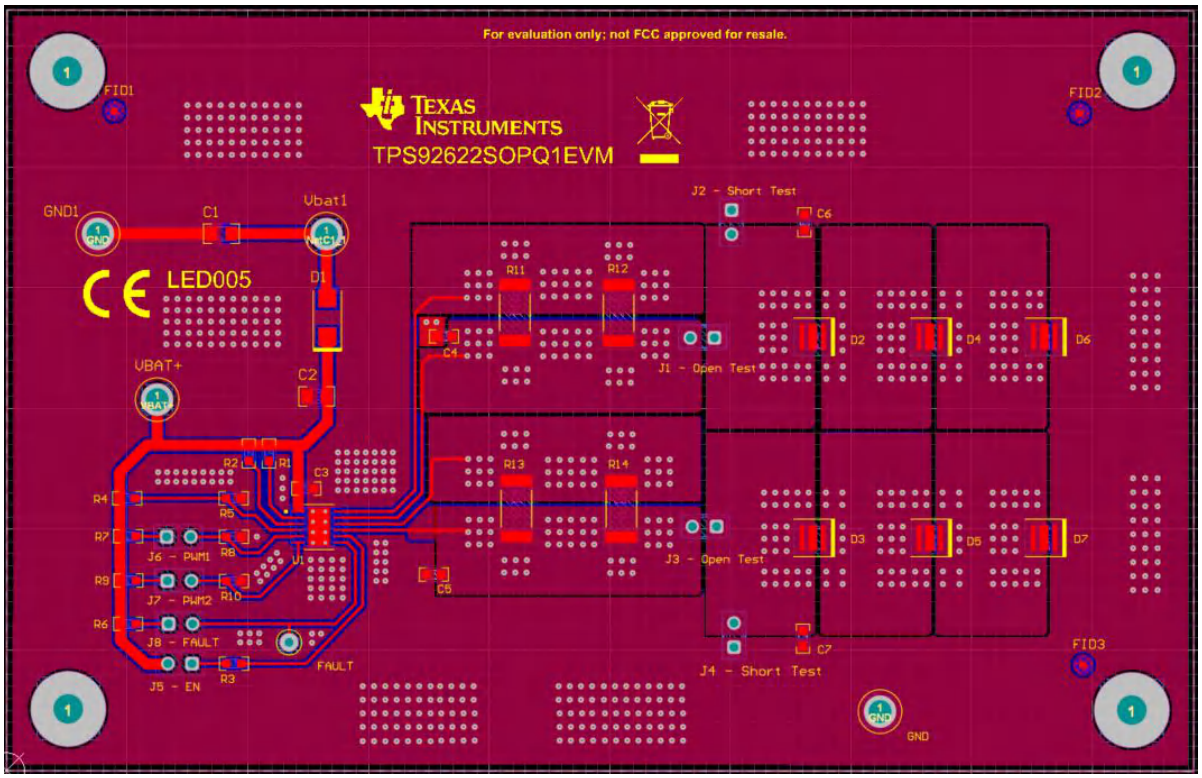


Figure 3-2. Layout

3.3 Bill of Materials (BOM)

Table 3-1 lists the TPS92622SOPQ1EVM BOM.

Table 3-1. Bill of Materials

Designator	Qty	Description	Part Number	Manufacturer
C1, C2	2	CAP, CERM, 1 µF, 50 V,+/- 10%, X7R, AEC-Q200 Grade 1, 0805	08055C105K4Z2A	AVX
C3	1	CAP, CERM, 0.1 µF, 50 V,+/- 10%, X7R, AEC-Q200 Grade 0, 0603	06035C104K4Z4A	AVX
C4, C5	2	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X7R, 0603	C1608X7R1H103K080AA	TDK
C6, C7	2	CAP, CERM, 1000 pF, 50 V, +/- 5%, X7R, AEC-Q200 Grade 1, 0603	C0603C102J5RACAUTO	Kemet
D1	1	DIODE, SCHOTTKY, 60 V, 3 A, DO214AC	SK36A-LTPMSCT-ND	Micro Commercial Co
D2, D3, D4, D5, D6, D7	6	LED, Red, SMD	LR H9GP-HZKX-1-1-Z	OSRAM
R1, R2	2	RES, 1.0, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	CRCW06031R00JNEA	Vishay-Dale
R3, R5, R8, R10	4	RES, 10.0 k, 1%, 0.1 W, 0603	RCG060310K0FKEA	Vishay Draloric
R4	1	RES, 69.8 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	CRCW060369K8FKEA	Vishay-Dale
R6	1	RES, 2.2 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	CRCW06032K20JNEA	Vishay-Dale
R7, R9	2	RES, 38.3 k, 0.1%, 0.1 W, 0603	RT0603BRD0738K3L	Yageo America
R11, R12, R13, R14	4	RES, 82, 5%, 1 W, AEC-Q200 Grade 0, 2512	CRCW251282R0JNEG	Vishay-Dale
J1 - Open Test, J2 - Short Test, J3 - Open Test, J4 - Short Test, J5 - EN, J6 - PWM1, J7 - PWM2, J8 - FAULT	8	Header, 2.54mm, 2x1, Tin, TH	TSW-102-23-T-S	Samtec
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8	8	Shunt, 100mil, Flash Gold, Black	SPC02SYAN	Sullins Connector Solutions
U1	1	TPS92622QDGNRQ1	TPS92622QDGNRQ1	Texas Instruments

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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.

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- *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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