

# Using the TPS61169 Evaluation Module

## User's Guide



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# TPS61169 User's Guide

## 1 Introduction

The Texas Instruments TPS61169EVM evaluation module, containing a TPS61169 integrated circuit (IC), helps designers evaluate the operation and performance of the TPS61169, which is a WLED driver providing highly integrated solutions for single-cell Li-ion battery powered backlight for small-to-medium form-factor LCD Display. The EVM contains one DC / DC converter (see [Table 1](#)).

**Table 1. Device and Package Configurations**

CONVERTER	IC	PACKAGE
U1	TPS61169	SC70 5L - DCK

### 1.1 1.1 Performance Specification Summary

The TPS61169EVM is designed to operate from an input voltage source ranging from 2.7 V to 5.5 V and provides a 20-mA output current for string LEDs. There can be 4 to 10 LEDs in series according to customer application. [Table 2](#) provides a summary of the TPS61169 performance specifications. All specifications are given for an ambient temperature of 25°C.

**Table 2. Typical Performance Specification Summary**

	CONDITION	MIN	TYP	MAX	UNITS
$V_{IN}$ supply		2.7		5.5	V
$I_{OUT}$			20		mA
Number of LEDs in series as the load	JP3 shorted		6		
	JP4 shorted		7		
	JP5 shorted		8		
	JP6 shorted		9		

## 2 Set-Up

This section describes the jumpers and connectors on the EVM as well and how to properly connect, set up, and use the TPS61169EVM.

### 2.1 Input/Output Connector Description

**J1,J2 – Input** are the power input terminals for the converter. The terminal blocks provide a power ( $V_{BAT}$ ) and ground (GND) connection to allow the user to attach the EVM to a cable harness.

**JP1 – Output** is the regulated output terminal for the converter. The terminal block provides a connection for LED load, and it allows the user to add a current meter between its two pins to measure the output current.

**JP2 – CTRL** is the jumper used to enable the device. Connecting pin 1 and pin 2 will toggle the CTRL high and enable the device. Connecting pin 2 and pin 3 will toggle the CTRL low and disable the device.

**JP3, JP4, JP5, JP6** function has been described in [Table 2](#).

## 2.2 Hardware Requirements

This EVM requires an external power supply capable of providing 2.7 V to 5.5 V at 0.5 A. To change the default current value (that is, implement dimming), the user can apply a PWM signal to JP2-pin 2.

### 2.2.1 Normal Operation without Dimming Control

No additional hardware is required.

### 2.2.2 PWM Dimming

A function generator capable of driving the PWM pin with 1.2 V to  $V_{IN}$  amplitude, and a 5-kHz to 100-kHz PWM signal is required for PWM-controlled dimming.

## 2.3 Set-Up

The input voltage range for the converter is 2.7 V to 5.5 V. A load should be applied to the output terminal for proper operation.

## 2.4 Operation

### 2.4.1 Non-Dimming Operation (Default Configuration)

For non-dimming operation of the TPS61169, JP1 and JP2 should be properly configured. The recommended settings using shorting blocks are shown in [Table 3](#). The configurations for JP3 to JP5 is determined by the specific application.

**Table 3. Final Jumper Settings**

REFERENCE DESIGNATOR	SETTING ON BOARD
JP1	Short pin 1 and pin 2
JP2	Short pin 1 and pin 2

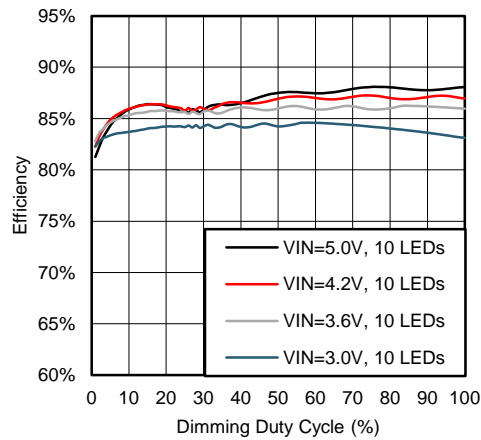
In this default configuration, the device will power up when power is applied

### 2.4.2 PWM-Dimming Operation

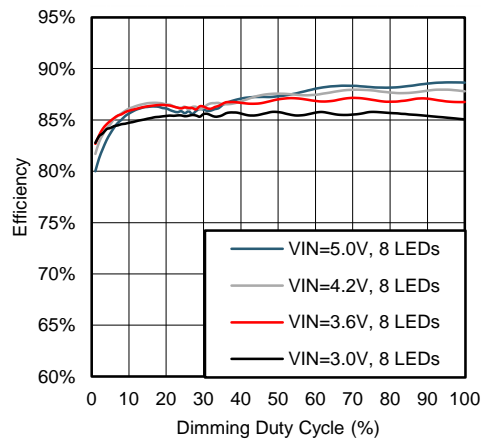
Remove the jumper on JP2 of default configuration, Connect the appropriately configured function generator output between pin 2 and pin 3 (for GND connection) of JP2. The device will power up when power is applied. Duty cycle of the PWM signal is directly proportional to the regulated current.

## 2.5 Test Results

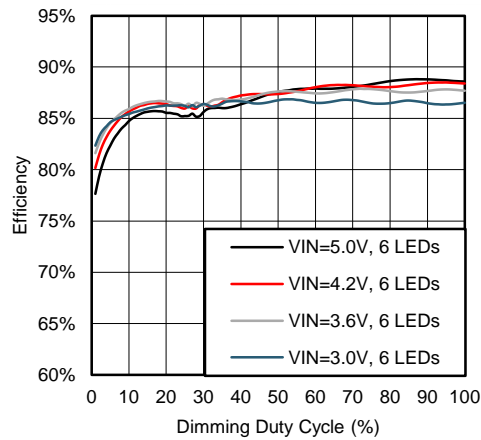
This section provides typical efficiency for the TPS61169EVM board.



**Figure 1. Efficiency of 10s1p**



**Figure 2. Efficiency of 8s1p**



**Figure 3. Efficiency of 6s1p**

### 3 Board Layout

Figure 4, Figure 5, and Figure 6 show the board layout for the TPS61169EVM. The EVM offers resistors, capacitors, and jumpers. Jumpers are provided to configure the device. The PCB provides 1-oz. copper planes on the top and bottom to dissipate heat.

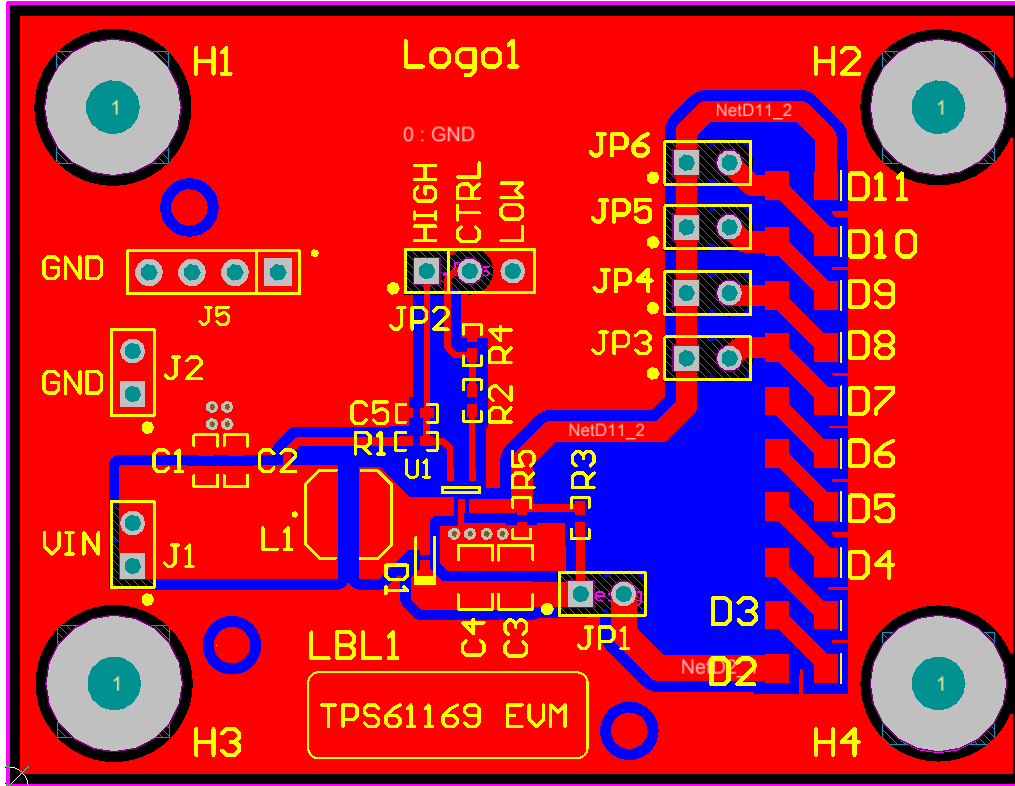


Figure 4. Top Assembly

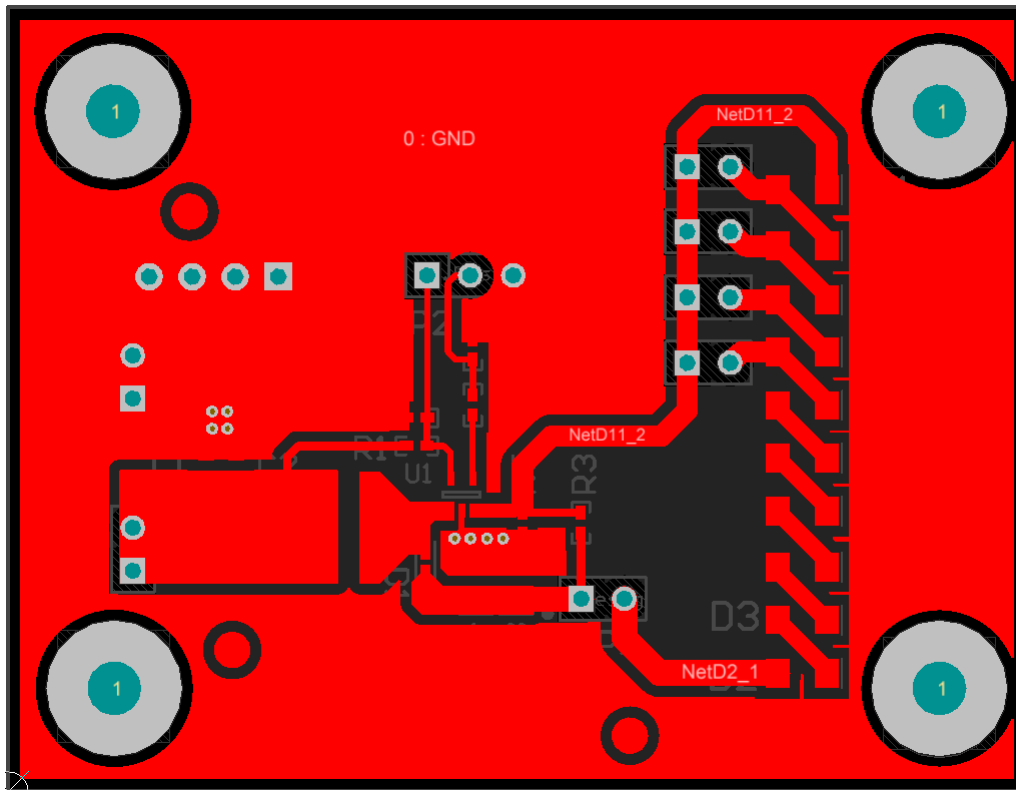


Figure 5. Top Layer Routing

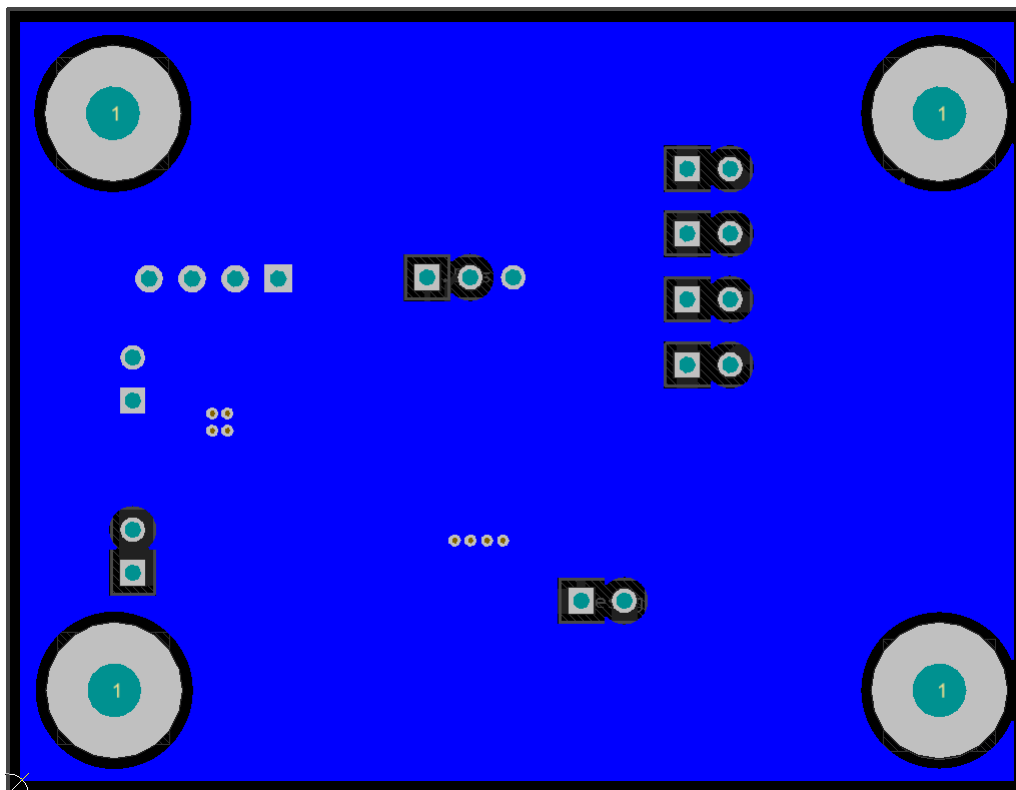
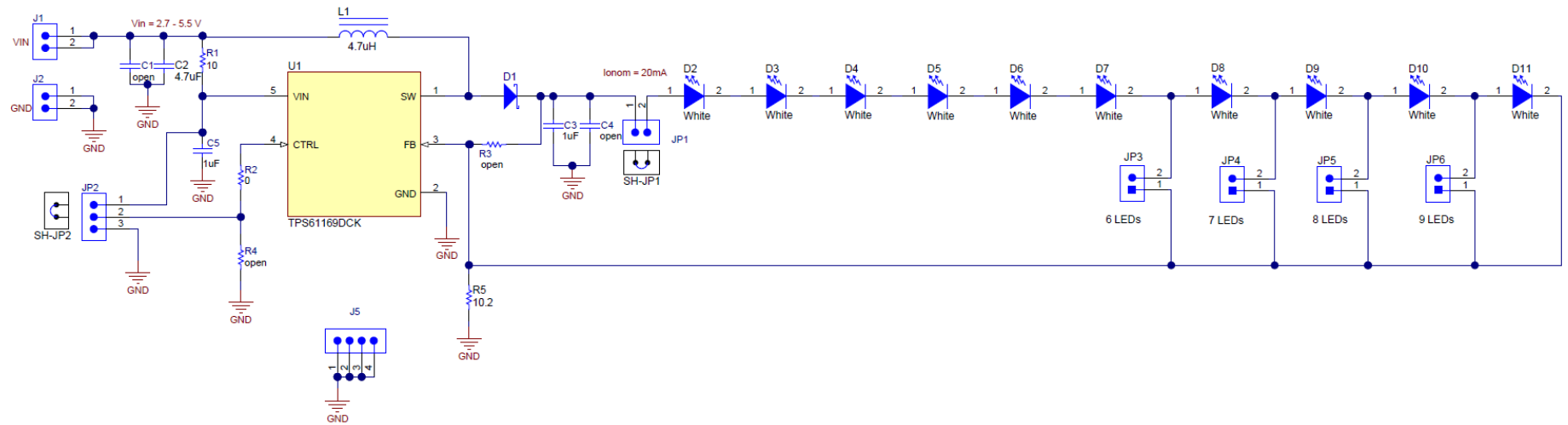


Figure 6. Bottom Layer Routing

### 4 Schematic



**5 Bill of Materials**

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCED	PART NUMBER	MANUFACTURER
C1	1	open	CAP, CERM, 1 $\mu$ F, 10 V, $\pm$ 10%, X5R, 0603	0603	C1608X5R1A105K	TDK
C2	1	4.7 $\mu$ F	CAP, CERM, 4.7 $\mu$ F, 16 V, $\pm$ 10%, X5R, 0603	0603	GRM188R61C475KAAJ	MuRata
C3, C4	2	1 $\mu$ F, open	CAP, CERM, 1 $\mu$ F, 50 V, $\pm$ 10%, X7R, 0805	0805	GRM21BR71H105KA12L	MuRata
C5	1	1 $\mu$ F	CAP, CERM, 1 $\mu$ F, 10 V, $\pm$ 10%, X5R, 0402	0402	GRM155R61A105KE15D	MuRata
D1	1	40 V	Diode, Schottky, 40 V, 0.25 A, SOD-523	SOD-523	NSR0240V2T1G	ON Semiconductor
D2, D3, D4, D5, D6, D7, D8, D9, D10, D11	10	white	LED, White, SMD	2x1 3x3 mm	ZSM-T3020-W	JKL Components
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
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 #40-40 Nylon	Standoff	1902C	Keystone
J1, J2, JP1, JP3, JP4, JP5, JP6	7		Header, 100 mil, 2 x 1, tin-plated, TH	Header, 2-pin, 100 mil, Tin	PEC02SAAN	Sullins Connector Solutions
J5	1		Header, TH, 100 mil, 4x1, gold-plated, 230 mil above insulator	4x1 header	TSW-104-07-G-S	Samtec, Inc.
JP2	1		Header, 100 mil, 2x1, tin-plated, TH	Header, 3-pin, 100 mil, tin	PEC03SAAN	Sullins Connector Solutions
L1	1	4.7 $\mu$ H	Inductor, shielded drum core, ferrite, 4.7 $\mu$ H, 1.8 A, 0.13 $\Omega$ , SMD	LPS4018	LPS4018-472MLB	Coilcraft
LBL1	1		Thermal transfer printable labels, 0.650" W x 0.200" H - 10,000 per roll	PCB label 0.650"H x 0.200"W	THT-14-423-10	Brady
R1, R3, R4	3	10, open, open	RES, 10 $\Omega$ , 5%, 0.063W, 0402	0402	CRCW040210R0JNED	Vashay-Dale
R2	1	0	RES, 0 $\Omega$ , 5%, 0.063W, 0402	0402	RC0402JR-070RL	Yageo America
R5	1	10.2	RES, 10.2 $\Omega$ , 1%, 0.063W, 0402	0402	CRCW040210R2FKED	Vishay-Dale
SH-JP1, SH-JP2	2	1 x 2	Shunt, 2 mm, gold-plated, black	2-mm shunt, closed top	2SN-BK-G	Samtec
U1	1		38-V High-Current Boost WLED driver with PWM control, DCK0005A	DCK0005A	TPS61159DCK	Texas Instruments



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