User's Guide

TPS631000EVM-075 User's Guide

ABSTRACT

This user's guide describes the operation and use of the TPS631000EVM-075 evaluation module (EVM). The TPS631000EVM-075 is designed to help users easily evaluate and test the operation and functionality of the TPS631000 buck-boost converter. The TPS631000EVM-075 has the output voltage set to 3.3 V. The EVM operates from a 1.6-V to 5.5-V input voltage range. Output current can go up to 2 A in buck mode and 1.5 A in boost mode. This document includes the following:

- Setup instructions for the hardware
- Schematic diagram
- Bill of materials (BOM)
- Printed-circuit board (PCB) layout drawings for the evaluation module

Throughout this document, the abbreviations EVM, TPS631000EVM-075, and the term evaluation module are synonymous with the TPS631000, unless otherwise noted.

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Trademarks

1 Introduction

The Texas Instruments TPS631000 is a highly efficient, single-inductor, internally compensated, buck-boost converter in a 8-pin, 2.2-mm × 1.7-mm SOT583 package.

1.1 Background

The TPS631000EVM-075 uses the TPS631000 integrated circuit (IC), is set to a 3.3-V output, and operates with an input voltage between 1.6 V and 5.5 V.

1.2 Performance Specification

Table 1-1 provides a summary of the TPS631000EVM-075 performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1-1. Performance Specification Summary

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input voltage		1.5		5.5	V
Start-up input voltage		1.6		5.5	V
Output voltage		1.2		5.3	V
Output current	VIN ≥ 3 V, VOUT = 3.3 V	0		2000	mA

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate the TPS631000. Extra positions are available for additional input and output capacitors and a feedforward capacitor.

1.3.1 IC U1 Operation

U1 is configured for the evaluation of the adjustable-output version. This EVM is set to 3.3 V. Resistors R2 and R3 can be used to set the output voltage between 1.3 V and 5.5 V. See the data sheet for recommended values.

1.3.2 Device Enable Evaluation

Components J4 can be populated to evaluate the device enable feature of this IC. For further details, please refer to the data sheet.

2 Setup

This section describes how to properly use the TPS631000EVM-075.

2.1 Input/Output Connector and Header Descriptions

J1, Pin 1 and 2 – VIN	Positive input connection from the input supply for the EVM
J1, Pin 3 and 4 – S+/S– Input	Voltage sense connections. Measure the input voltage at this point.
J1, Pin 5 and 6 – GND	VIN GND return connection from the input supply for the EVM, common with J2, pin 5 and 6
J2, Pin 1 and 2 – VOUT	Output voltage connection
J2, Pin 3 and 4 – S+/S– VOUT	Output voltage connection
J2, Pin 5 and 6 – GND	VOUT GND return connection for the output voltage, common with J1 pin 5 and 6
J3 – Enable	Shorting the jumper between the center pin EN and HIGH turns on the unit. Shorting the jumper between the center EN and LOW turns the unit off.
J4 – MODE	Shorting the jumper between the center pin MODE and LOW enables automatic transition to power-saving mode at light-load currents as described in the data sheet. Shorting the jumper between the center pin MODE and HIGH enables forced PWM mode.

2.2 Setup

To operate the EVM, connect an input supply with the positive lead to J1, pins 1 and 2 and negative lead to J1, pins 5 and 6. Connect a load with the positive lead to J2, pins 1 and 2 and the negative lead to J2, pins 5 and 6. Short EN and HIGH (pins 1 and 2) of J3 with a shorting jumper.

3 Board Layout

This section provides the TPS631000EVM-075 board layout and illustrations.

3.1 Layout

Figure 3-1 and Figure 3-2 show the board layout for the TPS631000EVM-075 PCB.

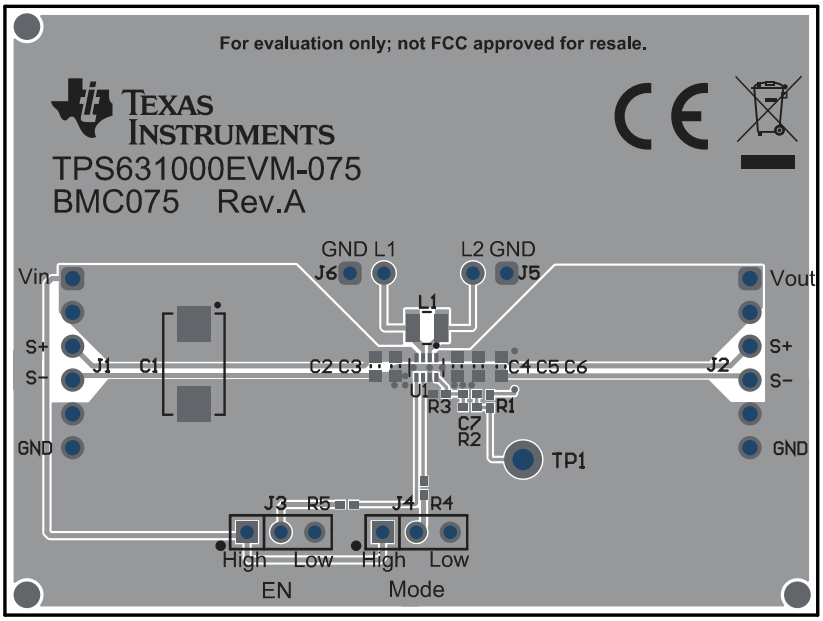

Figure 3-1. Top Layer Routing

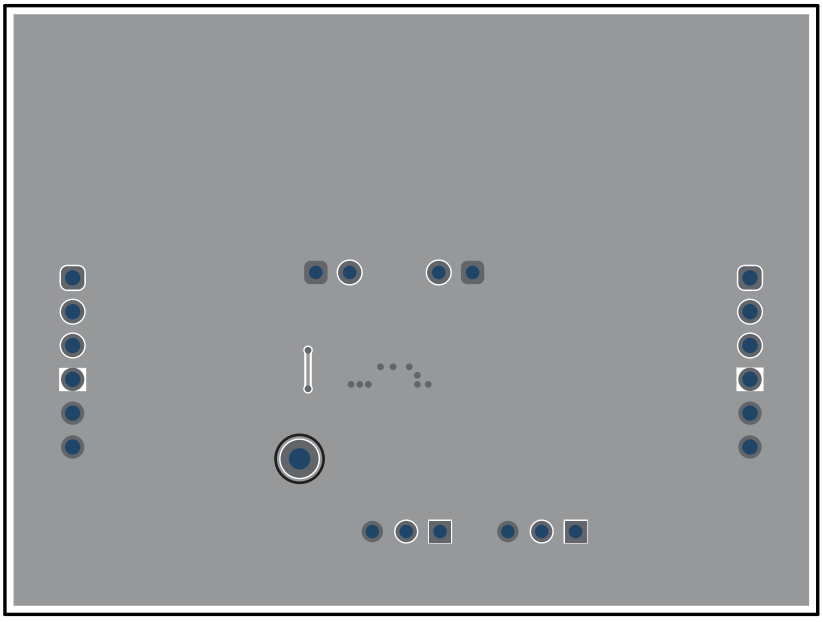

Figure 3-2. Bottom Layer Routing

4 Schematic and Bill of Materials

This section provides the TPS631000EVM-075 schematic and bill of materials.

4.1 Schematic

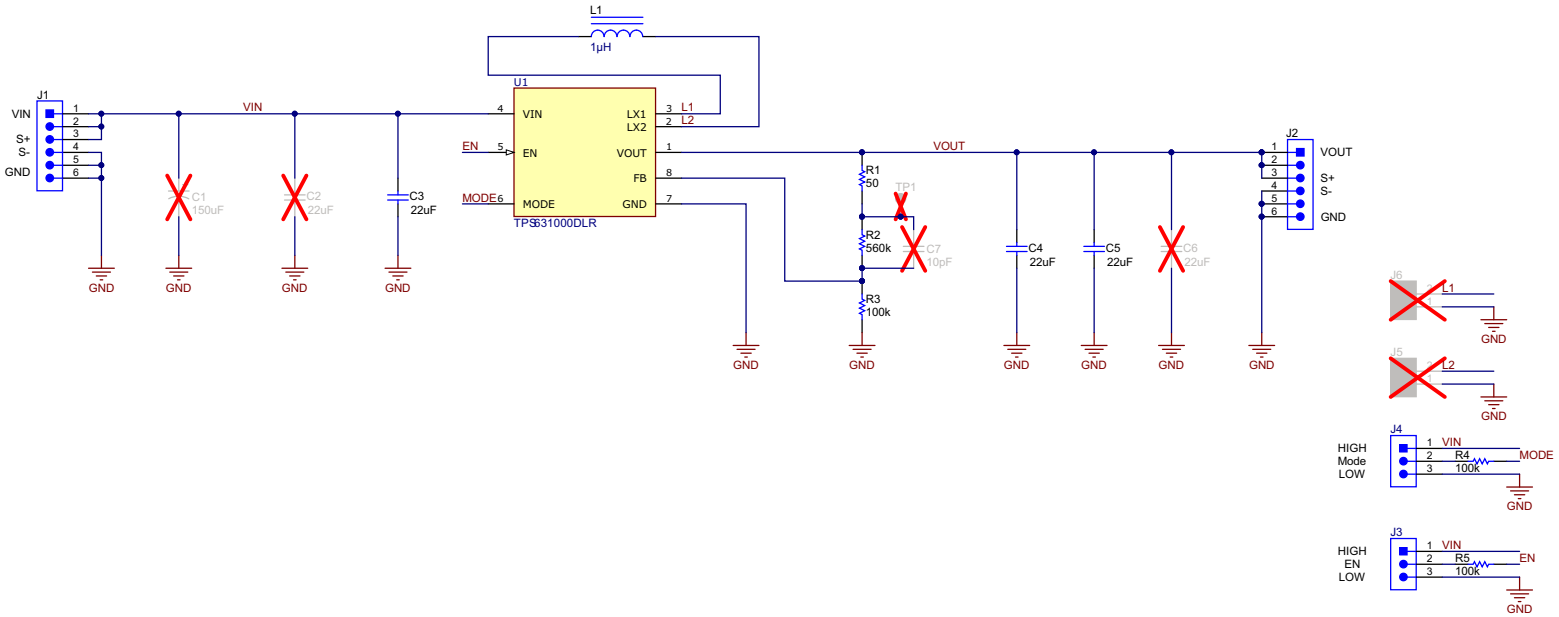

Figure 4-1. Schematic

4.2 Bill of Materials

Table 4-1. TPS631000EVM-075 Bill of Materials

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER
C3, C4, C5	3	22 µF	CAP, CERM, 22 µF, 10 V, ±20%, X5R, 0603	0603	GRM187R61A226ME15D	MuRata
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
J1, J2	2		Header, 2.54 mm, 6 × 1, Gold, TH	Header, 2.54 mm, 6 × 1, TH	61300611121	Wurth Elektronik
J3, J4	2		Header, 100 mil, 3 × 1, Tin, TH	Header, 3 pin, 100 mil, Tin	PEC03SAAN	Sullins Connector Solutions
L1	1	1 µH	Inductor, Shielded, Metal Composite, 1 µH, 3.2 A, 0.042 Ω, SMD	1008	DFE252012P-1R0M=P2	MuRata
R1	1	50	RES, 50, 0.1%, 0.05 W, 0402	0402	FC0402E50R0BTBST1	Vishay Thin Film
R2	1	560 k	RES, 560 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402560KJNED	Vishay-Dale
R3, R4, R5	3	100 k	RES, 100 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1003X	Panasonic
SH-JP1, SH-JP2	2		Shunt, 100 mil, Gold plated, Black	Shunt 2 pos. 100 mil	881545-2	TE Connectivity
U1	1		High-Power Density 1-A Buck-Boost Converter	SOT583	TPS631000DLR	Texas Instruments
C1	0	150 µF	CAP, TA, 150 uF, 10 V, ±10%, 0.1 Ω, SMD	7343-31	T495D157K010ATE100	Kemet
C2, C6	0	22 µF	CAP, CERM, 22 µF, 10 V, ±20%, X5R, 0603	0603	GRM187R61A226ME15D	MuRata
C7	0	10 pF	CAP, CERM, 10 pF, 16 V, ±10%, C0G, 0402	0402	C0402C100K4GACTU	Kemet
J5, J6	0		Header, 100 mil, 2x1, Gold, TH	2 × 1 Header	TSW-102-07-G-S	Samtec
TP1	0		Test Point, Compact, Grey, TH	TestPoint, Grey, 220 mil, TH	5123	Keystone

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