TPS613221AEVM-019 Evaluation Module

This user's guide describes the characteristics, operation, and use of the TPS613221AEVM-019 evaluation module (EVM). The EVM contains the TPS613221A device, which is a high performance, high efficiency, synchronous boost converter with only 6-µA quiescent current. The user's guide includes the EVM specifications, recommended test setup, test results, schematic diagram, bill of materials, and the board layout.

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1 Introduction

1.1 Performance Specification

Table 1 lists the TPS613221A EVM performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1. Performance Specification Summary

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
VIN	–		1.5		V
VOUT	TPS613221A EVM, VIN = 1.5 V, Io ≤ 0.1 A		3.3		V

1.2 Modification

The printed-circuit board (PCB) for this EVM is designed to accommodate some modifications by the user. The external component can be changed according to the real application.

1.3 Input Capacitor

A 150-µF tantalum capacitor, C1, is added as the input capacitor in the EVM. The ESR of the tantalum capacitor is 0.1 Ω, which helps to damp the ringing of the input voltage when the EVM is powered by a power supply with a long cable. The capacitor is not required for proper operation and can be removed in a real application.

1.4 Output Capacitor Selection

A 22-µF ceramic capacitor, C3, is added as the output capacitors. This capacitor can ensure the low output ripple at a heavy load condition.

1.5 Schottky Diode Selection

TI recommends adding a Schottky type diode (D1 in Figure 1) with low forward voltage (VF) and low capacitance, to improve efficiency in heavy load conditions. If the diode is used, a snubber circuit of a resistor and a capacitor should be used in parallel to the diode, to stabilize the system operation. The recommended capacitance of the capacitor of the snubber circuit is 3x that of the diode capacitance. The typical values are 5 Ω for the resistor and 120 pF for the capacitor.

2 Test Setup

This section describes how to properly connect, set up, and use the TPS613221AEVM-019 device.

2.1 Input/Output Connector Descriptions

This section describes the input/output connector descriptions.

- J1-VIN: Positive input connection from the input supply for the EVM
- J3-GND: Return connection from the input supply for the EVM
- J4-VOUT: Positive connection for the output voltage
- J6-GND: Return connection for the output voltage

3 Schematic

This section provides the TPS613221AEVM-019 device schematic.

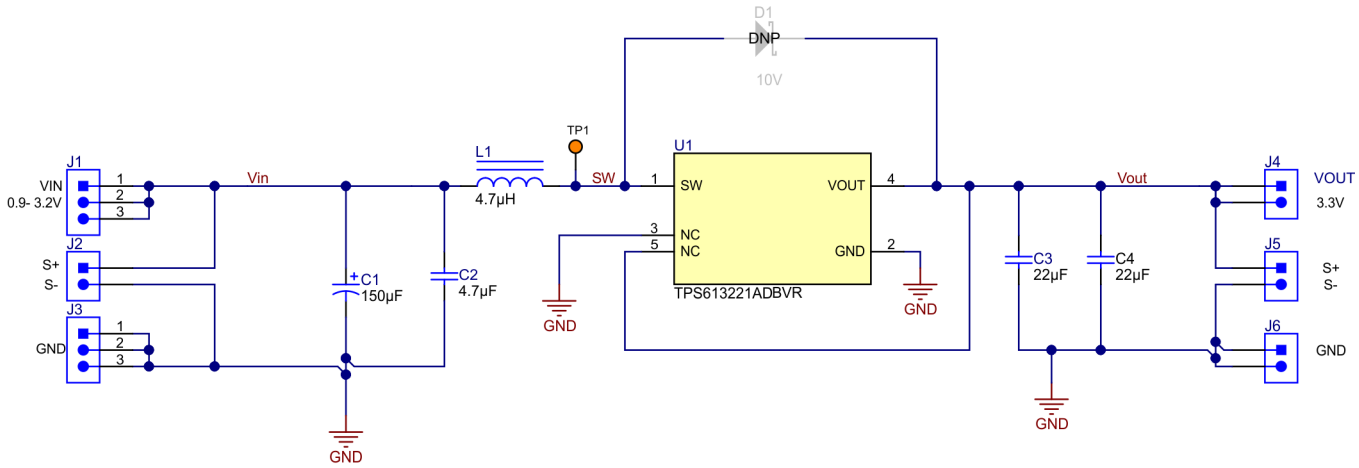

Figure 1. TPS613221AEVM-019 Schematic

4 Bill of Materials

Table 2 lists the bill of materials (BOM).

Table 2. Bill of Materials

Designator	QTY	Value	Part Number	Manufacturer	Description	Package
C1	1	150 µF	T520B157M006ATE070	Kemet	Capacitor, TA, 150 µF, 6.3 V, ± 20%, 0.07 Ω, SMD	3528-21
C3	1	22 µF	GRM188R60J226MEA0D	MuRata	Capacitor, ceramic, 22 µF, 6.3 V, ± 20%, X5R, 0603	0603
C4	1	22 µF	GRM21BR61C226ME44L	MuRata	Capacitor, ceramic, 22 µF, 16 V, ± 20%, X5R, 0805	0805
J1, J3	2		TSW-103-07-G-S	Samtec	Header, 100 mil, 3 × 1, gold, TH	3 × 1 header
J2, J4, J5, J6	4		TSW-102-07-G-S	Samtec	Header, 100 mil, 2 × 1, gold, TH	2 × 1 header
L1	1	4.7 µH	DFE252012F-4R7M=P2	MuRata Toko	Inductor, shielded, powdered iron, 4.7 µH, 0.15 A, 0.19 Ω, SMD	2.5 × 1.2 × 2 mm
TP1	1	Orange	5003	Keystone	Test point, miniature, orange, TH	Orange miniature test point
U1	1		TPS613221ADBVR	Texas Instruments	6.5-µA quiescent current, 1.8-A switch current boost converter, DBV0005A (SOT-23-5)	DBV0005A
C2	0	4.7 µF	GRM155R61A475MEAAD	MuRata	Capacitor, ceramic, 4.7 µF, 10 V, ± 20%, X5R, 0402	0402
D1	0	10 V	ZLLS410TA	Diodes Inc.	Diode, Schottky, 10 V, 0.75 A, SOD-323	SOD-323

5 Board Layout

Figure 2 and Figure 3 show the board layout.

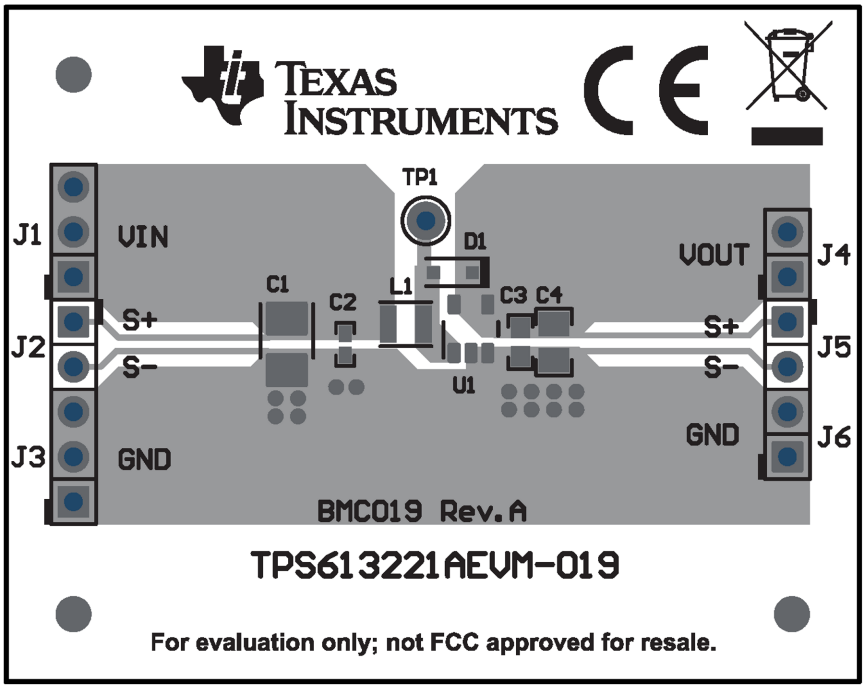

Figure 2. TPS613221AEVM-019 Top-Side Layout

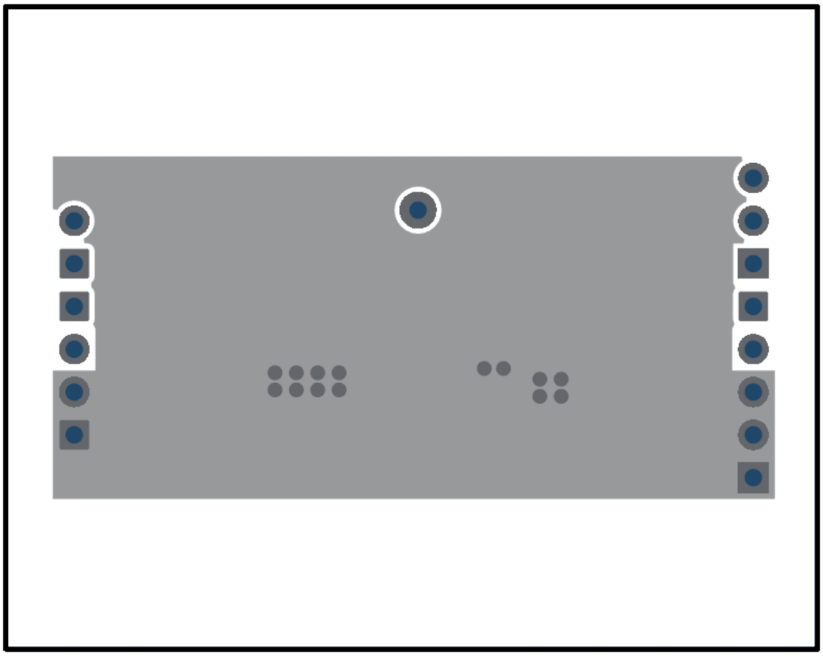

Figure 3. TPS613221AEVM-019 Bottom-Side Layout

Revision History

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

Changes from Original (January 2018) to A Revision	Page
• Added *Schottky Diode Selection* section	2
• Changed TPS613221AEVM-019 Top-Side Layout image	5

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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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- *Reorient or relocate the receiving antenna.*
- *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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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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