

# TPS5402 Step-Down Converter Evaluation Module User's Guide



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## Trademarks

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## 1 Introduction

This document presents the information required to operate the TPS5402 as well as the support documentation including schematic and bill of materials.

## 2 Background

The TPS5402 is designed to provide 1.7-A continuous current with an operational range of 4.5 V to 28 V and an external set switching frequency ranging from 50 kHz to 1.1 MHz.

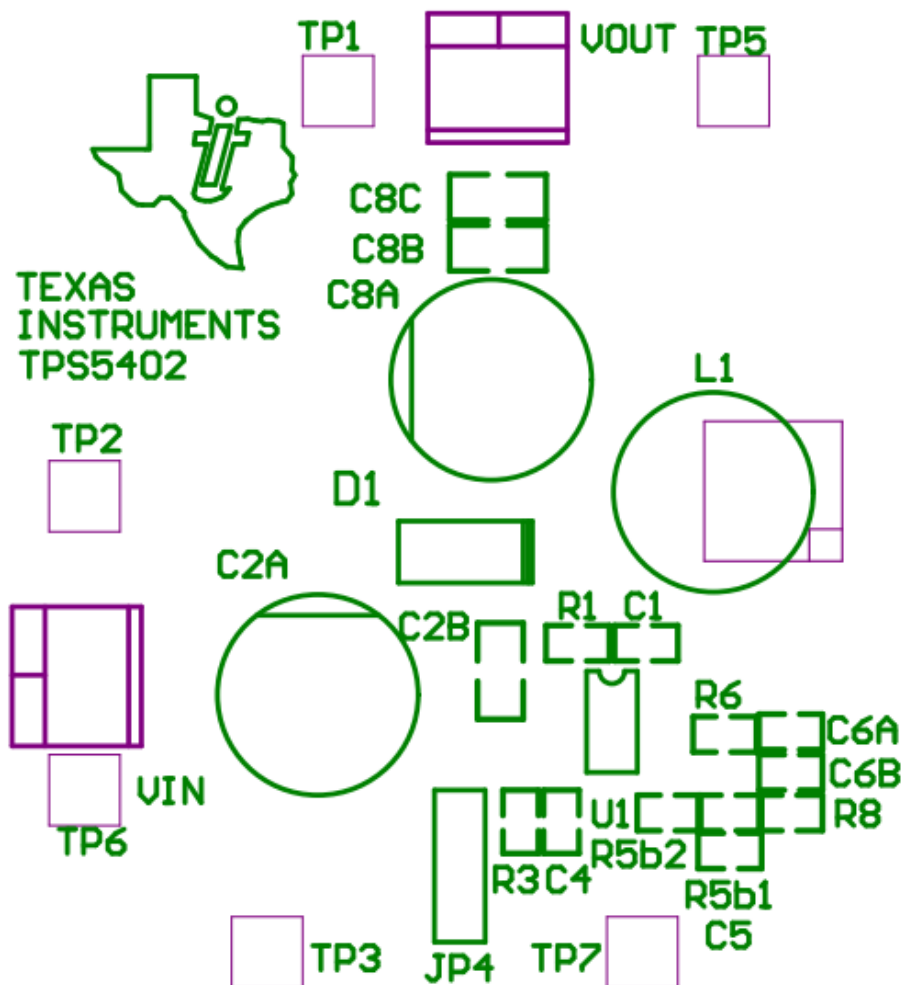
As there are many possible options to set the converters, [Table 2-1](#) presents the performance specification summary for the EVM.

**Table 2-1. Summary of Performance**

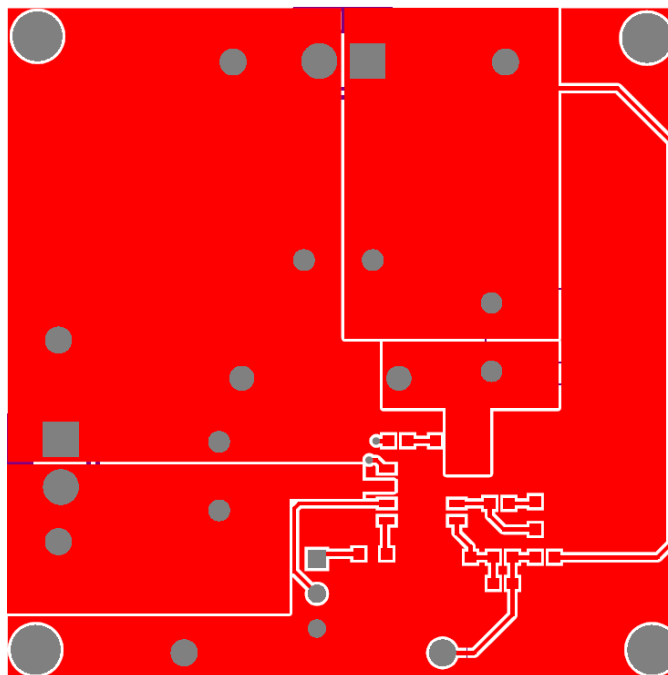
| TEST CONDITIONS   | PERFORMANCE              |
|---|--------------------------|
| $V_{IN} = 3.5 \text{ V to } 28 \text{ V}$<br>$f_{SW} = 300 \text{ kHz}$<br>(25°C ambient) | Buck: 3.3 V, up to 1.7 A |

The evaluation module is designed to provide access to the features of the TPS5402. Some modifications can be made to this module to test performance at different input and output voltages, current and switching frequency. Please contact TI Field Applications Group for advice on these matters.

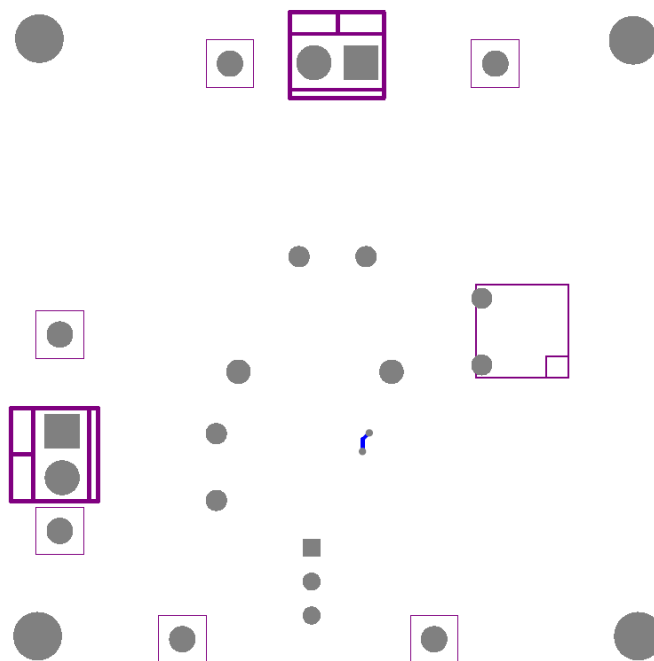
## 3 Board Layout



**Figure 3-1. Placement (Top Layer)**



**Figure 3-2. Board Layout (Top Layer)**



**Figure 3-3. Board Layout (Bottom Layer)**

## 4 Bench Test Setup Conditions

### 4.1 Headers Description and Jumper Placement

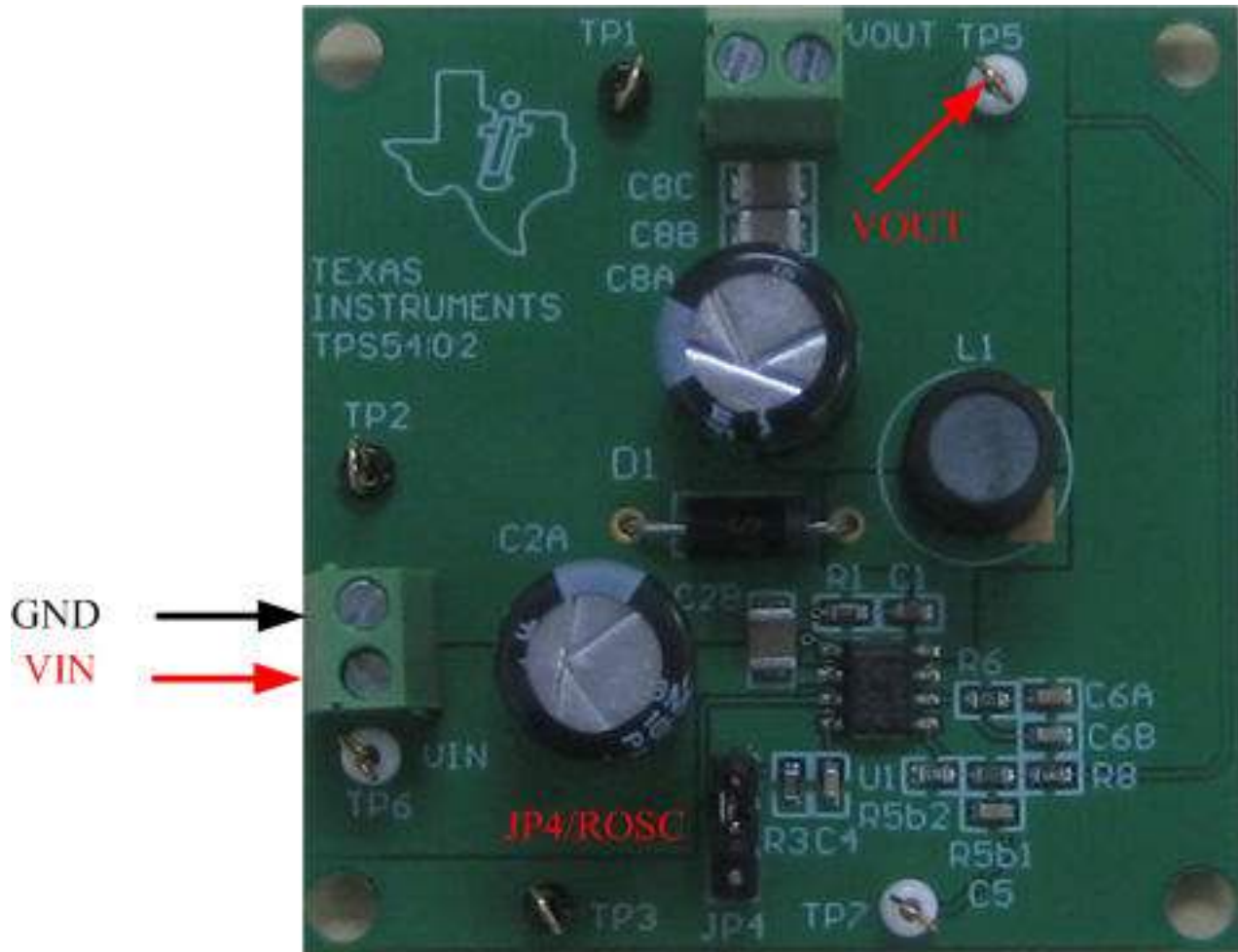


Figure 4-1. Headers Description and Jumper Placement

Test points:

1. LX, VIN, VOUT

### 4.2 Jumpers and Switches

Table 4-1. Jumpers and Switches

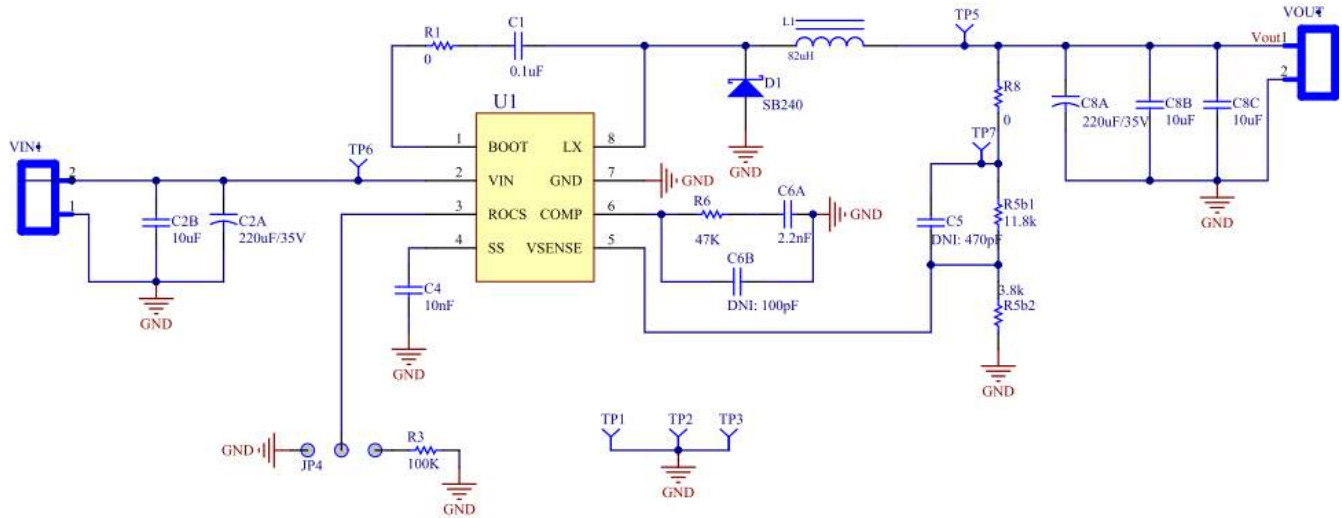
| NO. | FUNCTION            | PLACEMENT   | COMMENT   |
|-----|---------------------|---|---|
| JP4 | Switching Frequency | Connect JP4 to GND and set the switching frequency to 50 kHz; Leave it open and set switching frequency to 120 kHz; Connect a resistor to set the switching frequency | See datasheet ( <a href="#">SLVSBF7</a> ) for the resistor value corresponding to specific switching frequency. |

## 5 Power-Up Procedure

1. Apply 4.5 V – 28 V to JP1.
2. Apply load to the output connector.

## 6 Schematic and Bill of Materials

The following pages contain the TPS5402EVM schematic and bill of materials.



**Figure 6-1. TPS5402EVM Schematic**

**Table 6-1. TPS5402EVM Bill of Materials**

| ITEM NO.          | QTY | DESIGNATOR    | VALUE       | MANUFACTURER                 | PART NO.             | DESCRIPTION                                      |
|-------------------|-----|---------------|-------------|------------------------------|----------------------|--|
| 1                 | 1   | C1            | 0.1 $\mu$ F | Generic                      |                      | Capacitor, 0.1 $\mu$ F, 35 V, Ceramic, X7R, 0603 |
| 2                 | 3   | C2, C8B, C8C  | 10 $\mu$ F  | Generic                      |                      | Capacitor, 10 $\mu$ F, 35 V, Ceramic, X5R, 0805  |
| 3                 | 2   | C2A, C8A      | 220 $\mu$ F | Rubycon                      | 5YXF220MEFC          | 220 $\mu$ F/35 V 10x12.5                         |
| 4                 | 1   | C4            | 10 nF       | Generic                      |                      | Capacitor, 10 nF, 35 V, Ceramic, X7R, 0603       |
| 5                 |     | C5            | 470 pF      | Generic                      |                      | Capacitor, 470 pF, 50 V, Ceramic, X7R, 0603      |
| 6                 | 1   | C6A           | 2.2 nF      | Generic                      |                      | Capacitor, 2.2 nF, 50 V, Ceramic, X7R, 0603      |
| 7                 | DNI | C6B           | 100 pF      | Generic                      |                      | Capacitor, 100 pF, 50 V, Ceramic, X7R, 0603      |
| 8                 | 1   | D1            |             | Comchip                      | SB240E               | Comchip SB240E 2-A/40-V Schottky Rectifier       |
| 9                 | 1   | JP4           |             | Mill-Max Manufacturing Corp. | 800-10-064-10-001000 | Three Pin Jumper, SIP HEADER 64 POS STRAIGHT PCB |
| 10                | 1   | L1            | 82 $\mu$ H  | Bourns                       | RL622-820K-RC        | Magnetic-Core Inductor                           |
| 11                | 2   | R1, R8        | 0           | Generic                      |                      | Resistor, 1%, 1/10W, 0603, SMD                   |
| 12                | 1   | R3            | 100 K       | Generic                      |                      | Resistor, 1%, 1/10W, 0603, SMD                   |
| 13                | 1   | R6            | 30 K        | Generic                      |                      | Resistor, 1%, 1/10W, 0603, SMD                   |
| 14                | 1   | R5b1          | 11.8 k      | Generic                      |                      | Resistor, 1%, 1/10W, 0603, SMD                   |
| 15                | 1   | R5b2          | 3.8 k       | Generic                      |                      | Resistor, 1%, 1/10W, 0603, SMD                   |
| 16                | 2   | TP1, TP2      | 5001        | Generic                      | 5001                 | Keystone Electronics, Test Point, Black          |
| 17                | 3   | TP5, TP6, TP7 | 5002        | Generic                      | 5002                 | Keystone Electronics, Test Point, White          |
| 18                | 1   | U1            |             | Texas Instruments            | TPS5402              | SOIC8  |
| 19 <sup>(1)</sup> | 1   |               |             | Sullins Connector Solutions  | SPC02SYAN            | SPC02SYAN, CONN JUMPER SHORTING GOLD FLASH       |

(1) Install item 19 on item 8 to the inner side.

## 7 Revision History

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

| <b>Changes from Revision * (September 2012) to Revision A (November 2021)</b>                          | <b>Page</b> |
|--|-------------|
| • Updated the numbering format for tables, figures, and cross-references throughout the document. .... | 2           |
| • Updated the user's guide title.....  | 2           |

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