This user’s guide describes the operation, and use of the TPS63805EVM-026 evaluation module (EVM). The TPS63805EVM-026 is designed to help the users easily evaluate and test the operation and functionality of the TPS63805 buck-boost converter. The TPS63805EVM-026 has the output voltage set to 3.3V. The EVM operates from 1.3V to 5.5V input voltage. Output current can go up to 2A in buck mode and boost mode. This document includes setup instructions for the hardware, a schematic diagram, a bill of materials (BOM), and printed-circuit board (PCB) layout drawings for the evaluation module. Throughout this document, the abbreviations EVM, TPS63805EVM-026, and the term evaluation module are synonymous with the TPS63805, unless otherwise noted.

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1 Introduction

The Texas Instruments TPS63805 is a highly efficient, single-inductor, internally compensated, buck-boost converter in a 15-pin, 2.3-mm × 1.4-mm WCSP package. Both fixed and adjustable output voltage units are available.

1.1 Background

The TPS63805EVM-026 uses the TPS63805 integrated circuit (IC) and is set to a 3.3V output and operates with an input voltage between 1.3V and 5.5V.
1.2 Performance Specification

Table 1 provides a summary of the TPS63805EVM-026 performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1. Performance Specification Summary

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td></td>
<td>1.3</td>
<td>5.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Start-up input voltage</td>
<td></td>
<td>1.8</td>
<td>5.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Output voltage</td>
<td>VIN ≥ 2.2V , Vout=3.3V</td>
<td>1.8</td>
<td>5.5</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Output current</td>
<td></td>
<td>0</td>
<td>2000</td>
<td></td>
<td>mA</td>
</tr>
</tbody>
</table>

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate the TPS63805. Extra positions are available for additional input and output capacitor and feed forward capacitor.

1.3.1 IC U1 Operation

U1 is configured for evaluation of the adjustable-output version. This EVM is set to 3.3 V. Resistors R1 and R2 can be used to set the output voltage between 1.8V and 5.5 V. See the datasheet for recommended values.

1.3.2 Precise Device Enable Evaluation

Components R3, R4 and C11 can be populated to evaluate the precise device enable feature of this IC. For further details please refer to the datasheet.

2 Setup

This section describes how to properly use the TPS63805EVM-026.

2.1 Input/Output Connector and Header Descriptions

2.1.1 J1, Pin 1 and 2 – VIN

Positive input connection from the input supply for the EVM.

2.1.2 J1, Pin 3 and 4 – S+/S-

Input voltage sense connections. Measure the input voltage at this point.

2.1.3 J1, Pin 5 and 6 – GND

Vin GND return connection from the input supply for the EVM, common with J2, pin 5 and 6.

2.1.4 J2, Pin 1 and 2 – VOUT

Output voltage connection.

2.1.5 J2, Pin 3 and 4 – S+/S-

Vout Sense and GND Sense low-current sense lines for sampling the output voltage at the output capacitor.

2.1.6 J2, Pin 5 and 6 – GND

Vout GND return connection for the output voltage, common with J1 pin 5 and 6.
2.1.7 J5 – PG GND
Power Good (PG) test point and GND connection.

2.1.8 JP1 – MODE
Shorting jumper between the center pin MODE and PFM enables automatic transition to power-saving mode at light-load currents as described in the data sheet; shorting jumper between the center pin MODE and PWM enables forced PWM mode.

2.1.9 JP2 – ENABLE
Shorting jumper between the center pin EN and ON turns on the unit. Shorting jumper between the center pin EN and OFF turns the unit off.

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 ON (pins 2 and 3) of JP2 with a shorting jumper.
3 Board Layout

This section provides the TPS63805EVM-026 board layout and illustrations.

3.1 Layout

Figure 1 through Figure 5 show the board layout for the TPS63805EVM-026 PCB.

Figure 1. Assembly Layer

Figure 2. Top Layer Routing
Figure 3. Signal layer 1

Figure 4. Signal Layer 2
Figure 5. Bottom Layer Routing
4 Schematic and Bill of Materials

This section provides the TPS63805EVM-026 schematic and bill of materials.

4.1 Schematic

Figure 6. Schematic
## 4.2 Bill of Materials

### Table 2. TPS63805EVM-026 Bill of Materials

<table>
<thead>
<tr>
<th>Count</th>
<th>RefDes</th>
<th>Value</th>
<th>Description</th>
<th>Size</th>
<th>Part Number</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1</td>
<td>10µF</td>
<td>CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0603</td>
<td>603</td>
<td>GRM188R60J106ME84</td>
<td>Murata</td>
</tr>
<tr>
<td>1</td>
<td>C5</td>
<td>68µF</td>
<td>CAP, TA, 68 µF, 20 V, +/- 10%, 0.15ohm</td>
<td>7343-31</td>
<td>T495D686K020ATE150</td>
<td>Kemet</td>
</tr>
<tr>
<td>1</td>
<td>C6</td>
<td>22µF</td>
<td>CAP, CERM, 22 µF, 6.3 V, +/- 20%, X5R, 0603</td>
<td>805</td>
<td>GRM188R60J226MEA0D</td>
<td>Murata</td>
</tr>
<tr>
<td>1</td>
<td>L1</td>
<td>470nH</td>
<td>Inductor, Shielded, Composite, 470 nH, 3.5A, 76mohm</td>
<td>4x4x1.5mm</td>
<td>XFL4015-471MEC</td>
<td>Coilcraft</td>
</tr>
<tr>
<td>1</td>
<td>R1</td>
<td>511k</td>
<td>RES, 511 k, 1%, 0.1 W, 0603</td>
<td>603</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R2</td>
<td>91.0k</td>
<td>RES, 91.0 k, 1%, 0.1 W, 0603</td>
<td>603</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R5</td>
<td>100k</td>
<td>RES, 100 k, 1%, 0.1 W, 0603</td>
<td>603</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>U1</td>
<td>-</td>
<td>IC, Single Inductor Buck-Boost Converter</td>
<td>RNM0015A</td>
<td>TPS63805YFF</td>
<td>TI</td>
</tr>
</tbody>
</table>
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