

TPSM82480EVM-002 Evaluation Module

The TPSM82480EVM-002 evaluation module (EVM) facilitates the evaluation of the TPSM82480 power module. The module converts a 2.4-V to 5.5-V input voltage to a regulated 1.8-V or 2.5-V output voltage at up to 6 A. This user guide includes setup instructions for the hardware, a printed-circuit board (PCB) layout, a schematic diagram, a bill of materials (BOM), and test results for the EVM.

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1 Introduction

The TPSM82480 is a 6-A, dual-phase, synchronous, step-down converter module in a 7.9-mm × 3.6-mm, 24-pin, open frame package. The inductors and IC are included in the module.

1.1 Performance Specification

[Table 1](#) provides a summary of the TPSM82480EVM-002 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
Input voltage			2.4		5.5	V
Output voltage set point	VSEL = High			2.5		V
	VSEL = Low			1.8		V
Output current			0		6	A
Soft-start time		Ramp time of V_{OUT}		370		μs

1.2 Thermal Data

[Table 2](#) shows the thermal data of the TPSM82480EVM-002 evaluation module.

Table 2. TPSM82480EVM-002 EVM Thermal Data

Thermal Metric		TPSM82480EVM-002	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	31.4	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	-	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	10.9	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	0.33	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	10.9	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	-	°C/W

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate additional input and output capacitors.

1.3.1 Input and Output Capacitors

C13 and C14 are provided for additional input capacitors. These capacitors are not required for proper operation but can be used to reduce the input voltage ripple.

C9, C10, C11, and C12 are provided for additional output capacitors. These capacitors are not required for proper operation but can be used to reduce the output voltage ripple and to improve the load transient response. The total output capacitance must remain within the recommended range in the TPSM82480 data sheet ([SLVSDT1](#)) for proper operation.

1.3.2 Configurable Tracking Voltage

R11 and R12 can be installed to set a user-selectable tracking voltage. See the equations in the TPSM82480 data sheet ([SLVSDT1](#)) for details of calculating the resistor values.

2 Setup

This section describes how to properly use the TPSM82480EVM-002 evaluation module.

2.1 Connector Descriptions

J1, Pin 1 and 2 – VIN	Positive input voltage connection from the input supply for the EVM. Use when the steady-state input current is less than 2 A. Otherwise, use J2.
J1, Pin 3 and 4 – S+ and S-	Input voltage sense connections. Measure the input voltage at this point.
J1, Pin 5 and 6 – GND	Input return connection from the input supply for the EVM.
J2 – VIN and GND	Pin 2 is the positive input connection with pin 1 serving as the input return connection. Use this terminal block if the steady-state input current is greater than 2 A.
J3 – VOUT and GND	Pin 1 is the positive output connection with pin 2 serving as the output return connection. Use this terminal block if the steady-state output current is greater than 2 A.
J4, Pin 1 and 2 – VOUT	Positive output voltage connections. Use when the steady-state output current is less than 2 A; otherwise, use J3.
J4, Pin 3 and 4 – S+ and S-	Output voltage sense connections. Measure the output voltage at this point.
J4, Pin 5 and 6 – GND	Output return connections.
JP4, Pin 1 and 3 – SS/TR and GND	The SS/TR pin voltage appears on pin 1 of this header with a convenient ground on pin 3.
JP4, Pin 2 TR-IN	The TR-IN pin can be used to scale down a tracking-voltage.
J6 – PG and GND	The PG output appears on pin 1 of this header with a convenient ground on pin 2.
J5 – TG and GND	The TG output appears on pin 1 of this header with a convenient ground on pin 2.
JP1 – ON, EN, OFF	EN pin jumper. Place the supplied jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC.
JP2 – HIGH, VSEL, LOW	VSEL pin jumper. Place the supplied jumper across LOW and VSEL for 1.8-V output. Place the jumper across HIGH and VSEL for 2.5-V output.
JP3 – PWM, MODE, PSM	Mode pin jumper. Place the supplied jumper across PWM and MODE to operate the converter in a forced PWM mode. Placed the jumper across MODE and PSM to operate the converter in power-saving (PSM) mode.
JP5 – PG Pullup Voltage	PG pin pullup voltage jumper. Place the supplied jumper on JP5 to connect the PG pin pullup resistor to the output voltage. Alternatively, the jumper can be removed and a different voltage can be supplied on pin 1 to pull up the PG pin to a different level. This externally applied voltage must remain below 6 V.
JP6 – TG Pullup Voltage	TG pin pullup voltage jumper. Place the supplied jumper on JP6 to connect the TG pin pullup resistor to the output voltage. Alternatively, the jumper can be removed and a different voltage can be supplied on pin 1 to pull up the TG pin to a different level. This externally applied voltage must remain below 6 V.

2.2 Operation

To operate the EVM, set jumpers JP1, JP2, and JP3 to the desired positions per [Section 2.1](#). Connect the input supply to J1 or J2 and connect the load to J4 or J3.

3 TPSM82480EVM-002 Test Results

The TPSM82480EVM-002 evaluation module was used to take the data in the TPSM82480 data sheet. See the data sheet ([SLVSDT1](#)) for the performance of this EVM.

4 Board Layout

This section provides the TPSM82480EVM-002 board layout and illustrations. The Gerber files are available on the EVM product page: [TPSM82480EVM-002](#).

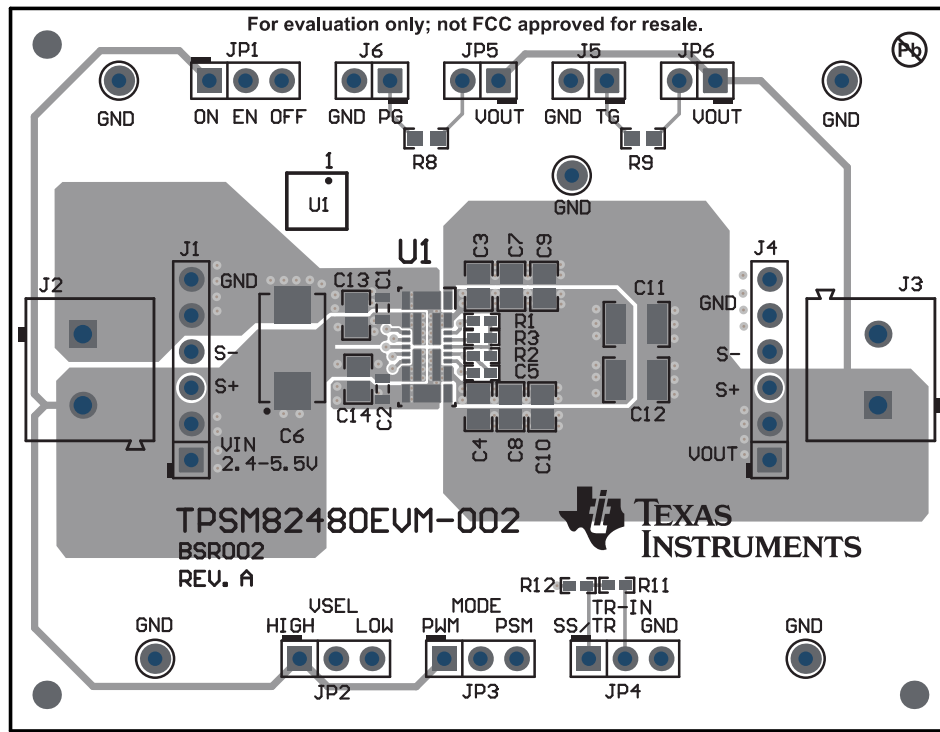


Figure 1. Assembly Layer

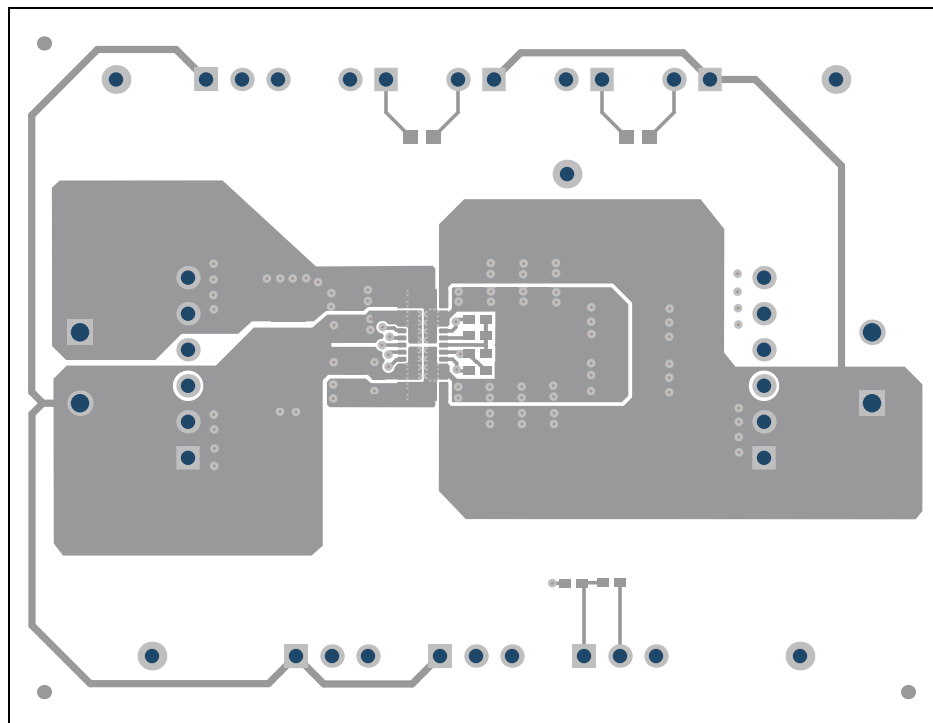


Figure 2. Top Layer

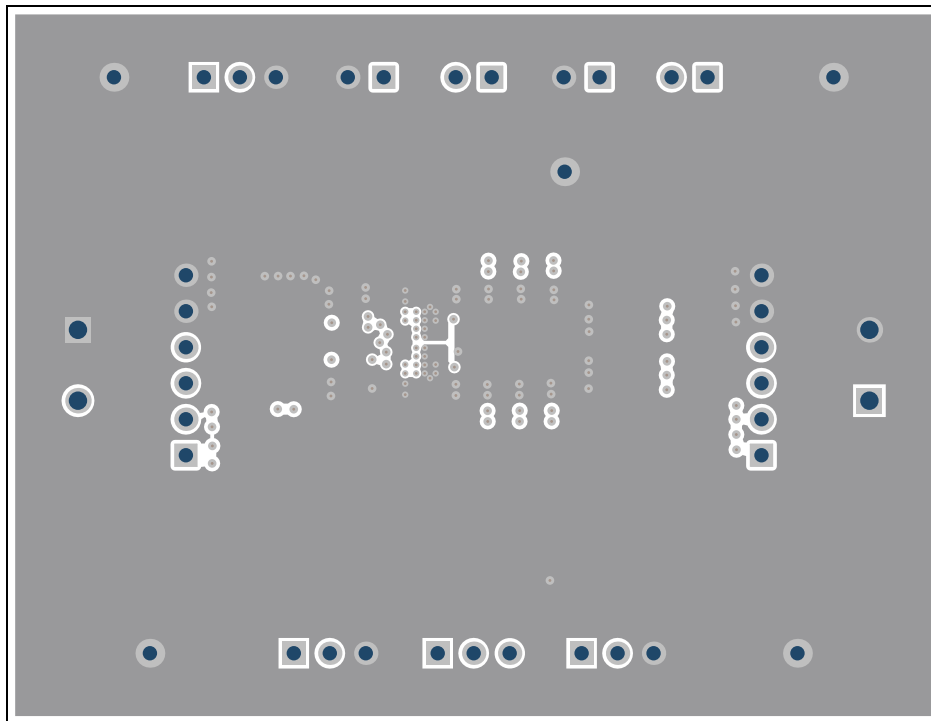


Figure 3. Internal Layer 1

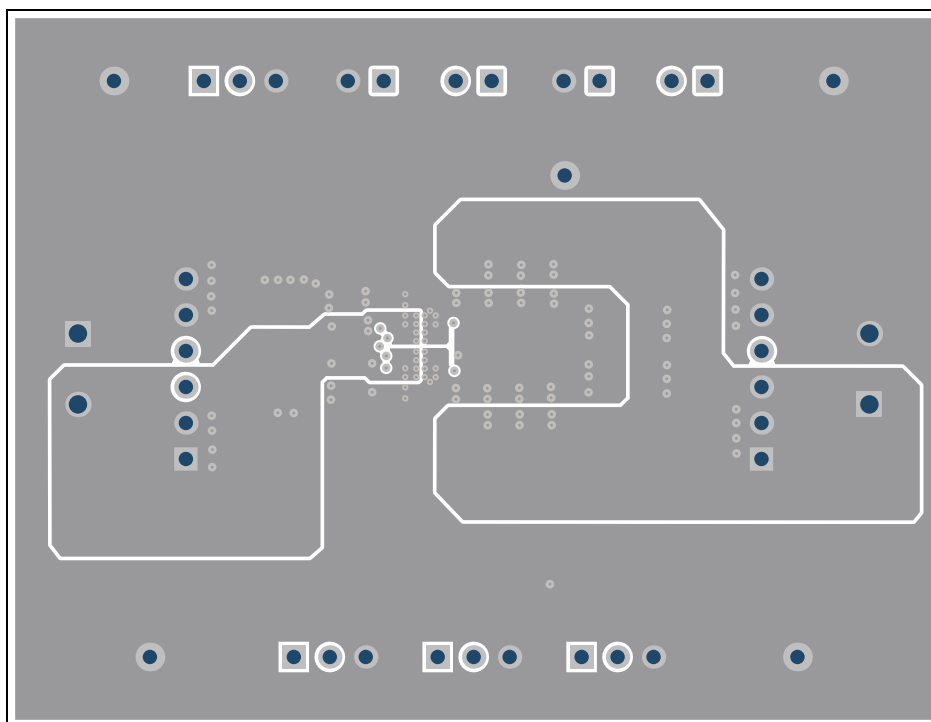


Figure 4. Internal Layer 2

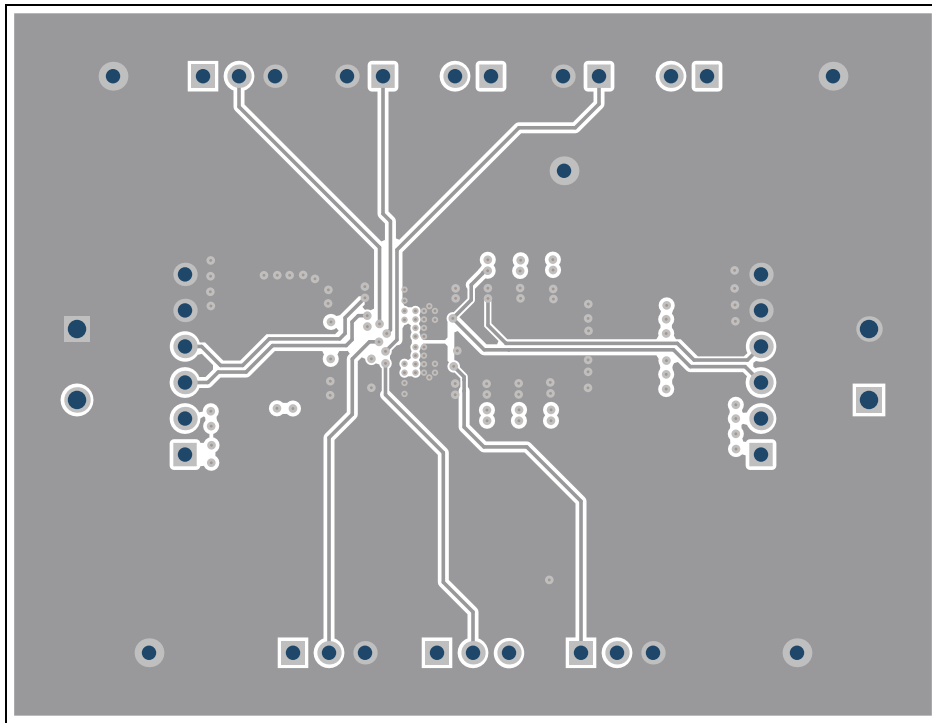


Figure 5. Bottom Layer

5.2 Bill of Materials

Table 3 lists the TPSM82480EVM-002 bill of materials.

Table 3. TPSM82480EVM-002 Bill of Materials

Quantity	Ref Des	Value	Description	Size	Part Number	Manufacturer
2	C1, C2	22uF	CAP, CERM, 22uF, 10V, ±20%, X5R, 0603	0603	GRM188R61A226ME15D	Murata
4	C3, C4, C7, C8	22uF	CAP, CERM, 22uF, 25V, ±20%, X5R, 0805	0805	GRM21BR61E226ME44	Murata
1	C5	3300pF	CAP, CERM, 3300 pF, 50 V, ±10%, X7R, 0402	0402	GRM155R71H332KA01D	Murata
1	C6	100uF	CAP, TA, 100uF, 20V, ±10%, 0.5 ohm, SMD	7343-43	293D107X9020E2TE3	Vishay-Sprague
1	R1	240k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R2	120k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R3	205k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
2	R8, R9	470k	Resistor, Chip, 0.1W, 1%	0603	Std	Std
1	U1	TPSM82480	2.4 - 5.5V, 6A, 2-Phase Step-Down Converter Module with Integrated Inductors	7.9 mm x 3.6 mm	TPSM82480MOP	Texas Instruments

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CAUTION

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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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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NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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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3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

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This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(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.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

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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http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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