User's Guide

TPS7A94EVM-046 Evaluation Module

ABSTRACT

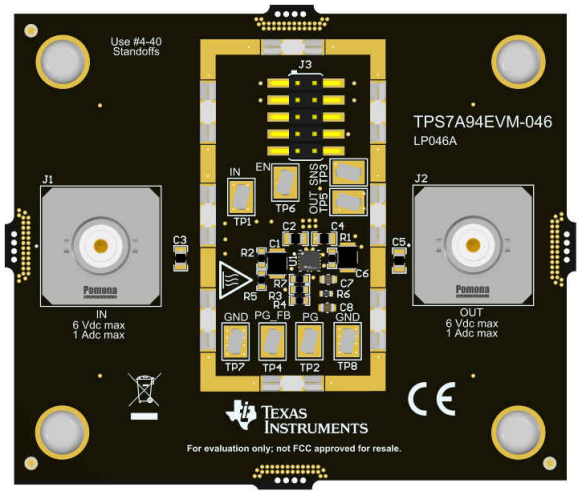

Figure 1-1. TPS7A94EVM-046 Evaluation Module

This user's guide describes the operational use of the TPS7A94EVM-046 evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the TPS7A9401DSC, an ultra-low noise, ultra-high PSRR, RF low-dropout (LDO) linear regulator. Included in this user's guide are setup and operating instructions, thermal and layout guidelines, a printed circuit board (PCB) layout, a schematic diagram, and a bill of materials (BOM).

Throughout this document the terms *demonstration kit*, *evaluation board*, and *evaluation module* are synonymous with the TPS7A94EVM-046.

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1 Introduction

Texas Instruments' TPS7A94EVM-046 helps design engineers evaluate the operation and performance of the TPS7A94 linear regulator for possible use in their own circuit application. This particular EVM configuration contains a single high-accuracy, small size, adjustable linear regulator for a wide range of applications. The regulator is capable of delivering up to 1 A to the load with low V_{IN} to V_{OUT} dropout voltage. For stability, use a minimum capacitor of 4.7 µF at the input and output.

Table 1-1 lists the related documentation available through the Texas Instrument web site at www.ti.com.

Table 1-1. Related Documentation

Device	Literature Number
TPS7A94	SBVS336

1.1 Before You Begin

The following warnings and cautions are noted for the safety of anyone using or working close to the TPS7A94EVM-046. Observe all safety precautions.

Warning Warning Hot surface. Contact may cause burns. Do not touch.

CAUTION

The circuit module can be damaged by overtemperature. To avoid damage, monitor the temperature during evaluation and provide cooling, as needed, for your system environment.

CAUTION

Some power supplies can be damaged by application of external voltages. If you are using more than one power supply, check your equipment requirements and use blocking diodes or other isolation techniques, as needed, to prevent damage to your equipment.

CAUTION

The circuit module is not a finished product or electrical appliance. The module does not contain current or voltage thresholds for circuit protection. It must be used by qualified personnel with additional equipment for evaluation only.

2 EVM Setup

This section describes how to properly connect and set up the TPS7A94EVM-046, including the jumpers and connectors on the EVM board.

2.1 Inputs/Outputs Connectors and Jumper Descriptions

2.1.1 J1 – IN

Input power-supply voltage connector with ground connection.

2.1.2 J2 – OUT

Regulated output voltage with ground connection.

2.1.3 J3

10-pin header connector with all input and output signals.

2.1.4 TP1 – IN

Input power-supply sense.

2.1.5 TP2 – PG

Power-good sense connection.

Note

If the EVM is implemented as described in Section 5 with R3 and R7 set to 10 kΩ, the PG pin is not operational. See the TPS7A94 data sheet for to set the PG_FB resistor divider.

2.1.6 TP3 – SNS

Sense pin test-point connection.

2.1.7 TP4 – PG_FB

Feedback pin test-point connection.

Note

As implemented in Section 5, with R3 and R7 set to 10 kΩ, the programmable current limit is set to 100% of I_{LIMIT} and the PG pin is not operational.

For a complete implementation of both the PG pin and the current limit, see the TPS7A94 data sheet.

2.1.8 TP5 – OUT

Regulated output test-point connection.

2.1.9 TP6 – EN

Enable voltage test-point connection.

2.1.10 TP7 – GND

Ground pin test-point connection.

2.1.11 TP8 – GND

Ground pin test-point connection.

2.2 Soldering Guidelines

To avoid damaging the device, use a hot-air system for any solder rework to modify the EVM for the purpose of repair or other application reasons.

2.3 Equipment Connections

Connect the equipment in the following steps:

1. Set the input power supply to 6 V (maximum), and turn the power supply off
2. Connect a BNC connector jack from the input power supply to the J1 V_{IN} connector on the EVM
3. Connect a 0-A to 1-A load between OUT and GND

3 Operation

Operate the equipment using the following steps:

1. Turn on the power supply
2. Vary the respective loads and input voltages, as necessary, for test purposes

4 PCB Layout

Figure 4-1 to Figure 4-5 illustrate the PCB layout for this EVM.

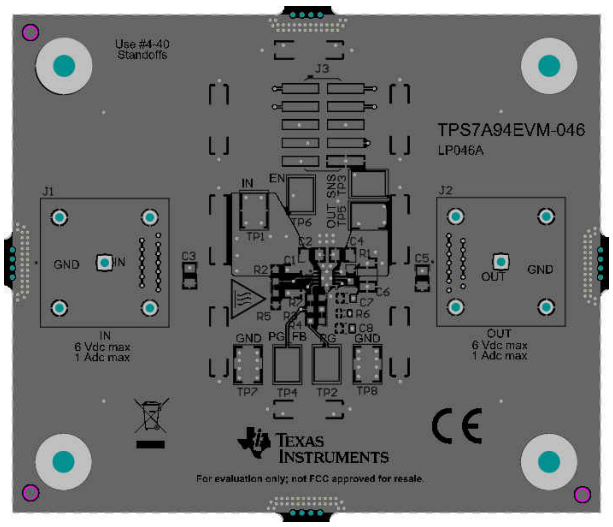

Figure 4-1. Assembly Layer

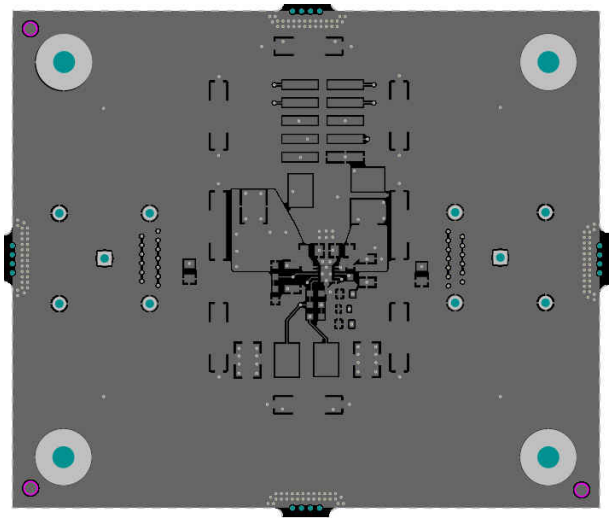

Figure 4-2. Top Layer Routing

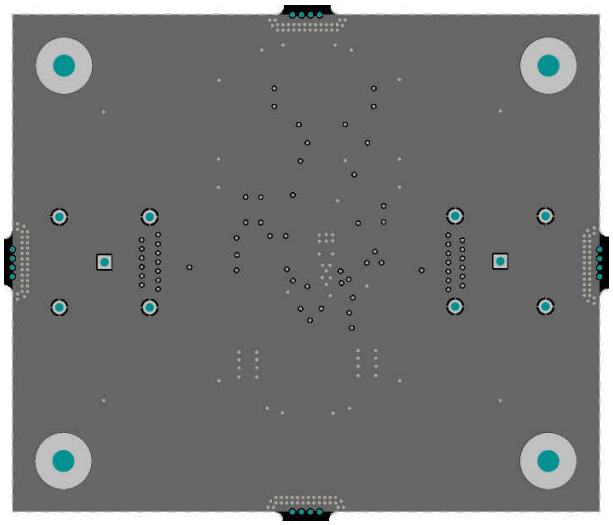

Figure 4-3. First Middle Layer

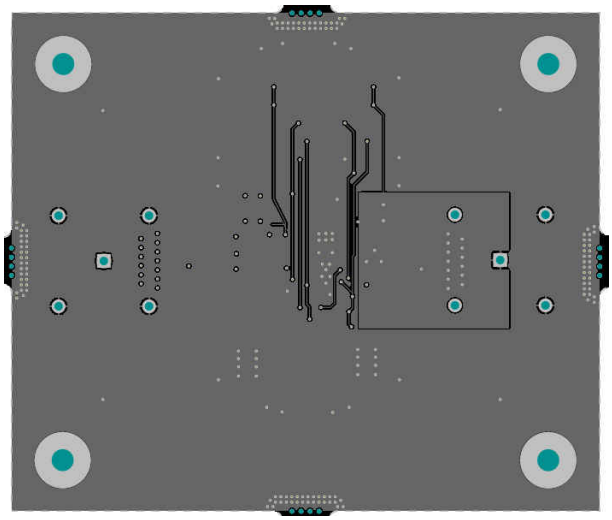

Figure 4-4. Second Middle Layer

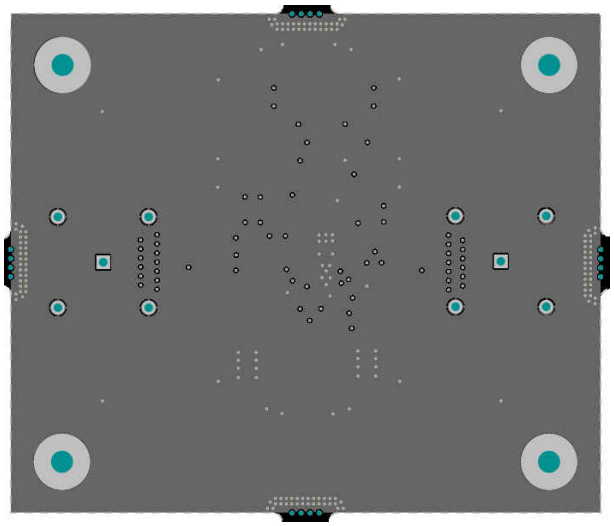

Figure 4-5. Bottom Layer Routing

5 Schematic

Figure 5-1 shows the schematic for this EVM.

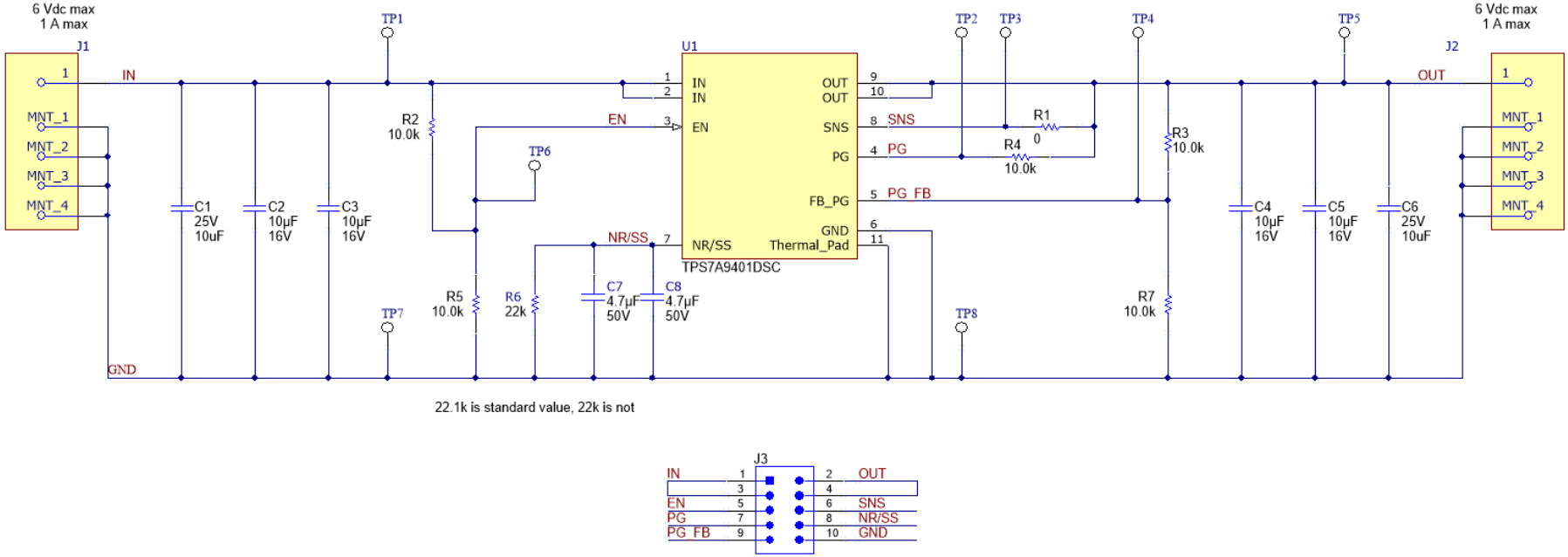

Figure 5-1. TPS7A94EVM-046 Schematic

6 Bill of Materials

Table 6-1 shows the bill of materials (BOM) for this EVM.

Table 6-1. TPS7A94EVM-046 BOM1234

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURER	ALTERNATE PART NUMBER	ALTERNATE MANUFACTURER
!PCB1	1		Printed Circuit Board		TPS7A9401DSC	Any		
C1, C6	2	10 µF	CAP, CERM, 10 uF, 25 V, +/- 20%, X7R, 1210	1210	C3225X7R1E106M250AC	TDK		
C2, C3, C4, C5	4	10 µF	CAP, CERM, 10 µF, 16 V,+/- 10%, X7R, 0805	0805	EMK212BB7106KG-T	Taiyo Yuden		
C7, C8	2	4.7µF	Cap Ceramic 4.7uF 50V X7R 10% Pad SMD 0805 +125°C Automotive T/R	0805	CGA4J1X7R1H475K125AC	TDK Corporation		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply		
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone		
H9, H10, H11, H12	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
H13, H14, H15, H16, H17, H18, H19, H20	8		RFI SHIELD CLIP TIN SMD	RFI SHIELD CLIP TIN SMD	S2711-46R	Harwin		
J1, J2	2		BNC Connector Jack, Female Socket 50Ohm Through Hole Solder	PTH_BNC_JACK_VERT	4578	Pomona Electronics		
J3	1		Header, 2.54mm, 5x2, Gold, Black, SMT	Header, 2.54mm, 5x2, SMT	GBC05DABN-M30	Sullins Connector Solutions		
MP1	1			SMT_RF-SHIELD	S01-50250500	Harwin		
R1	1	0	RES, 0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603ZT0R00	Stackpole Electronics Inc		
R2, R3, R4, R5, R7	5	10.0k	RES, 10.0k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603FT10K0	Stackpole Electronics Inc		
R6	1	22k	RES, 22k Ohms, 1% 0.1W, 1/10W Chip Resistor 0603 Thick Film	0603	CRCW060322K0FKEAC	Vishay		
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8		Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone		
U1	1		1-A, Ultra-Low Noise, Ultra-High PSRR, RF Voltage Regulator	WSON10	TPS7A9401DSC	Texas Instruments		

1. This assembly is ESD sensitive; observe ESD precautions.
2. This assembly must be clean and free from flux and all contaminants. Use of no-clean flux is not acceptable.
3. This assembly must comply with workmanship standards IPC-A-610 Class 2.
4. Unless otherwise noted in the *Alternate Part Number* or *Alternate Manufacturer* columns, all parts can be substituted with equivalents.

7 Revision History

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

Changes from Revision * (September 2021) to Revision A (April 2022)	Page
• Added note to *TP2 – PG* section	4
• Added note to *TP4 – PG_FB* section	4

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