User's Guide

TPS22998 Evaluation Module User's Guide

ABSTRACT

This user's guide describes the characteristics, operation, and use of the TPS22998 adjustable rise time load switch Evaluation Module (EVM). This document contains the complete EVM schematic diagram, printed-circuit board layouts, bill of materials, and necessary instructions on how to operate the EVM.

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1 Introduction

The TPS22998 EVM is a two-layer PCB containing the TPS22998 load switch device. The VIN and VOUT connections to the device and the PCB layout routing are capable of handling high continuous currents and provide a low-resistance pathway into and out of the device under test. Test point connections allow the EVM user to control the device with user-defined test conditions and make accurate R_{ON} measurements.

1.1 Description

Table 1-1 lists a short description of the TPS22998 load switch performance specification. For additional details on load switch performance, application notes, and data sheet, see www.ti.com/loadswitch.

Table 1-1. TPS22998 Characteristics

EVM	Device	Rise Time Typical (µs)	Vin (V)	V_{BIAS} (V)	Enable (ON Pin)	Quick Output Discharge
PSIL156	TPS22998	Adjustable	0.2 V to 5.5 V	2.2 V to 5.5 V	Active High	Fixed

1.2 Features

This EVM has the following features:

- Vin input voltage range: 0.2 V to 5.5 V
- Access to the VIN, VOUT, ON, and CT pins of the TPS22998 load switch
- Onboard CIN and COUT capacitors
- Adjustable rise timing

2 Electrical Performance

See the *TPS22998 5-V, 4-mΩ, 10-A Load Switch With Adjustable Rise Time* data sheet for detailed electrical characteristics of the TPS22998.

3 Schematic

Figure 3-1 illustrates the TPS22998EVM schematic.

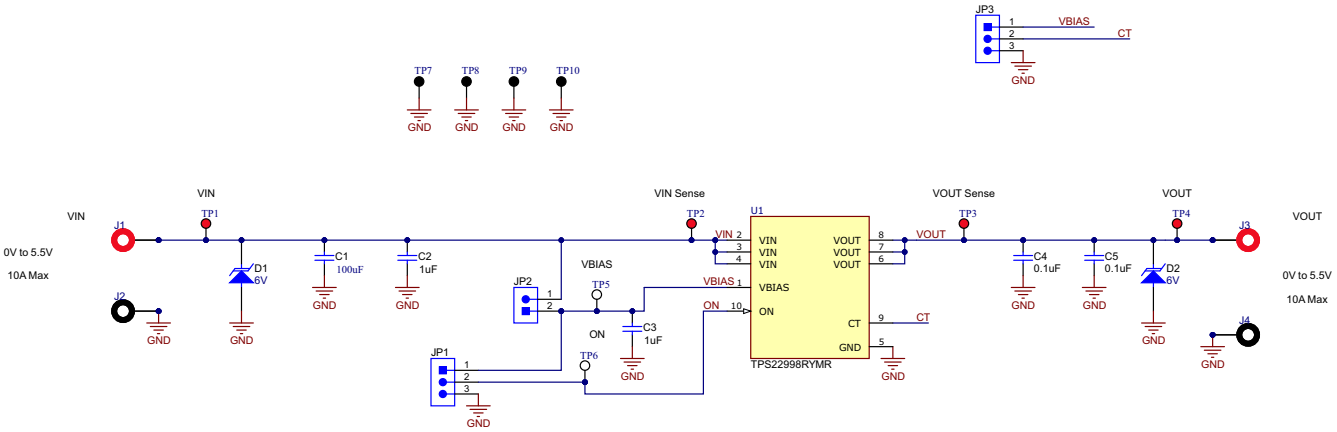

Figure 3-1. TPS22998EVM Schematic

4 PCB Layout

Figure 4-1 and Figure 4-2 show the PCB layout images.

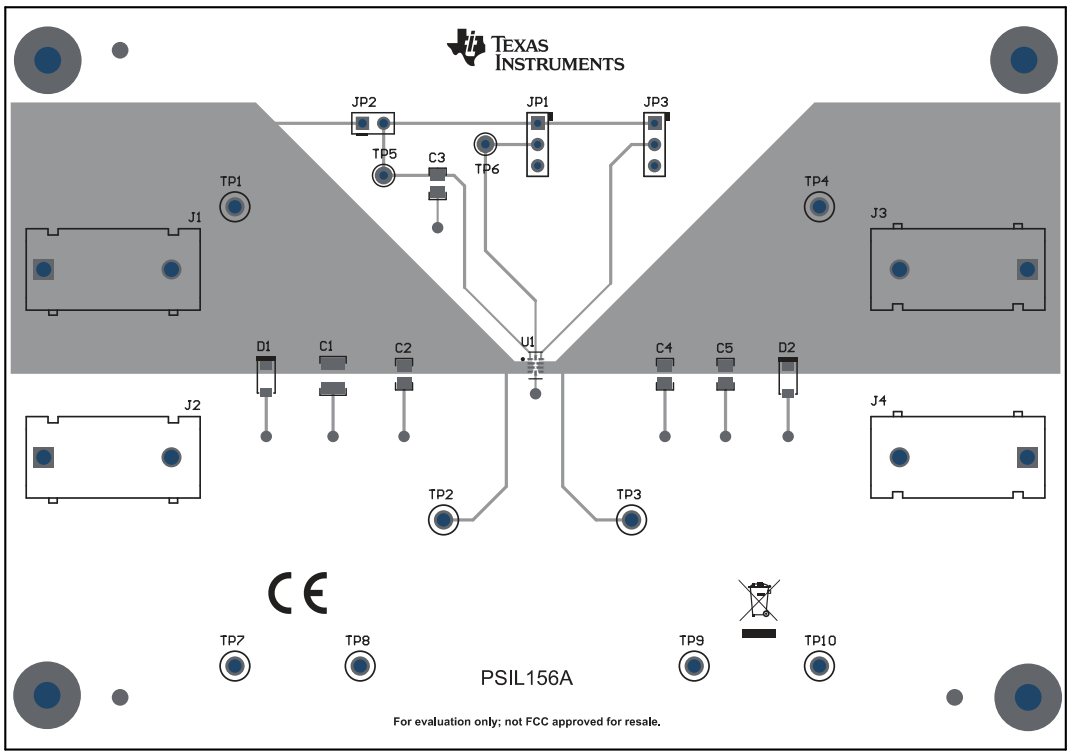

Figure 4-1. TPS22998EVM Top Layout

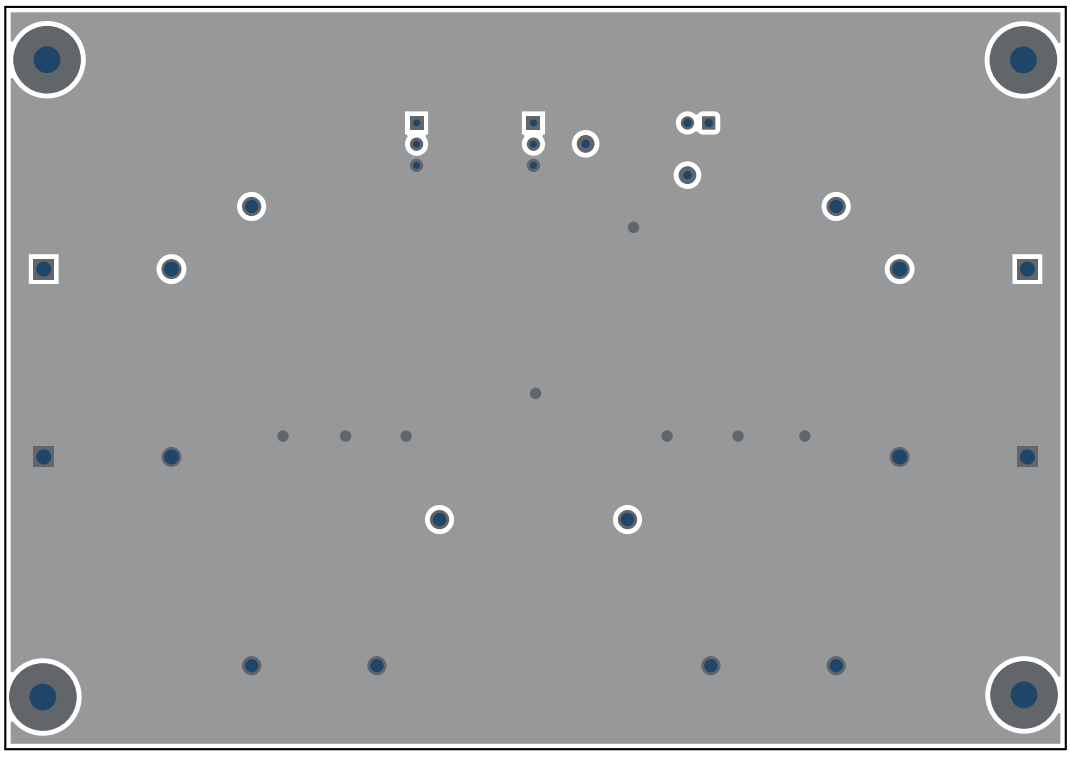

Figure 4-2. TPS22998EVM Bottom Layout

4.1 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the EVM. Table 4-1 describes the input and output connectors and jumpers. Table 4-2 describes the different test points and functionality. Table 4-3 describes the jumper functionality and configurations.

Table 4-1. TPS22998EVM Input and Output Connector Functionality

Input	Connector and Test Point	Label	Description
VIN	J1	J1	Input banana connector for VIN
	TP1	VIN	Input test point for VIN
	TP2	VIN SNS	Sense test point for VIN
VOUT	J3	J3	Output banana connector for VOUT
	TP3	VOUT Sense	Sense test point for VOUT
	TP4	VOUT	Output test point for VOUT
GND	TP7, TP8, TP9, TP10	GND	Test point for GND
	J2, J4	J2, J4	Banana connector for GND

Table 4-2. TPS22998EVM Test Point Description

Pin	Test Point	Label	Description
ON	TP6	ON	Enable signal test point
VBIAS	TP5	VBIAS	Bias Voltage test point

Table 4-3. TPS22998EVM Jumper Configuration

Input	Jumper	Label	Description
VIN	JP1	ON	• Position 1 and 2 sets ON-pin HI • Position 2 and 3 sets ON-pin LO
	JP2	VBIAS	BIAS voltage pull up to VIN
CT	JP3	CT	• Position 1 and 2 sets CT-pin HI • Position 2 and 3 sets CT-pin LO

5 Operation

Connect the VIN power supply to the J1 terminal. The input voltage range of the TPS22998EVM is 0.2 V to 5.5 V. Connect an acceptable bias voltage to TP5 or populate JP2 to use VIN as VBIAS. The bias voltage range of the TPS22998EVM is 2.2 V to 5.5 V. Note that VIN cannot be greater than VBIAS for correct operation of the device.

External output loads can be applied to the switch by using the J3 terminal. When the ON pin is asserted high, the output of the TPS22998 is enabled.

6 Test Configurations

6.1 On-Resistance (R_{on}) Test Setup

Figure 6-1 shows the typical setup for measuring on-resistance. The voltage drop across the switch is measured using the sense connections, and this can be divided by the load current to calculate the R_{on} resistance.

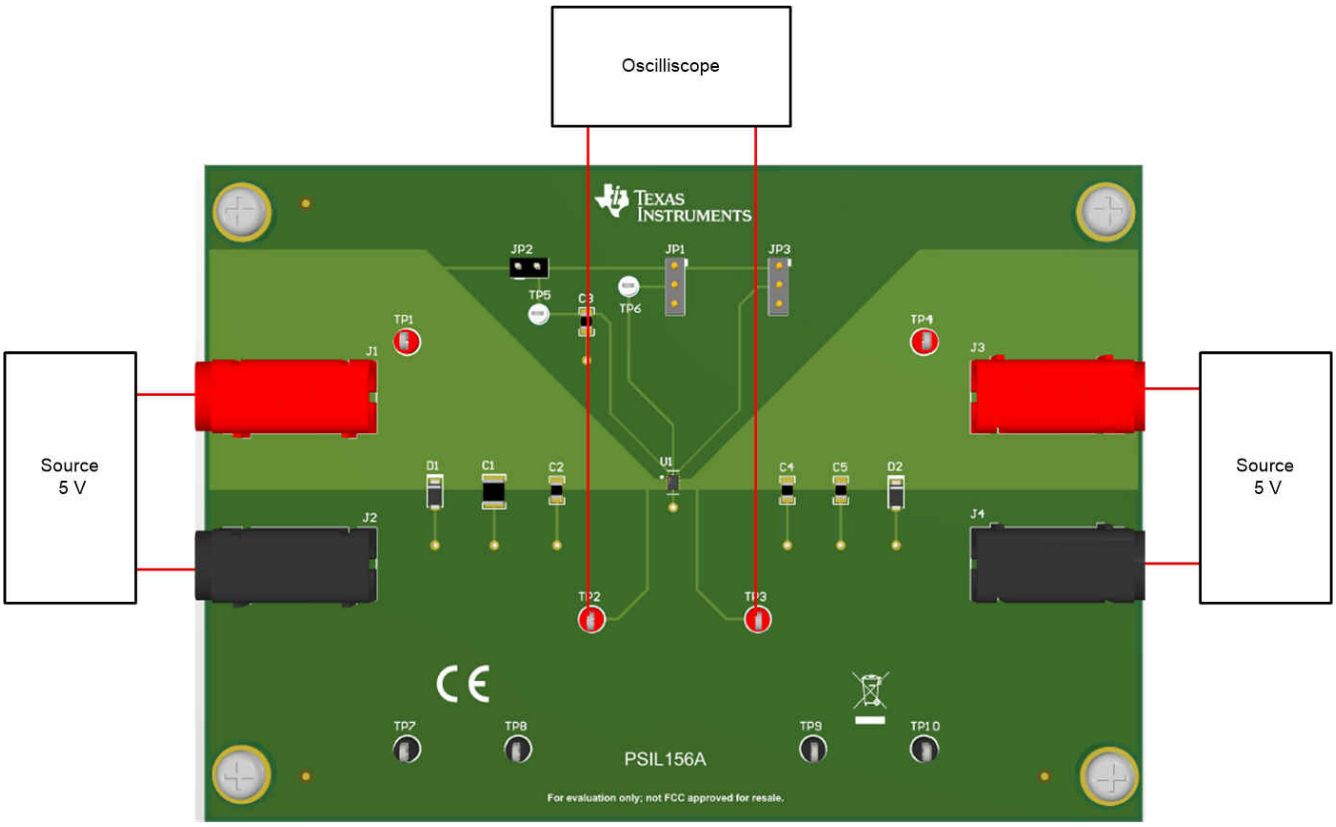

Figure 6-1. R_{on} Test Setup

6.2 Rise Time Test Setup

Figure 6-2 shows the test setup for measuring the rise time of the TPS22998. Apply a squarewave to the ON pin of the switch using a function generator and apply a voltage to the VIN terminal using a power supply. Observe the waveform at VOUT Sense with an oscilloscope to measure the slew rate and rise time of the switch with a given input voltage.

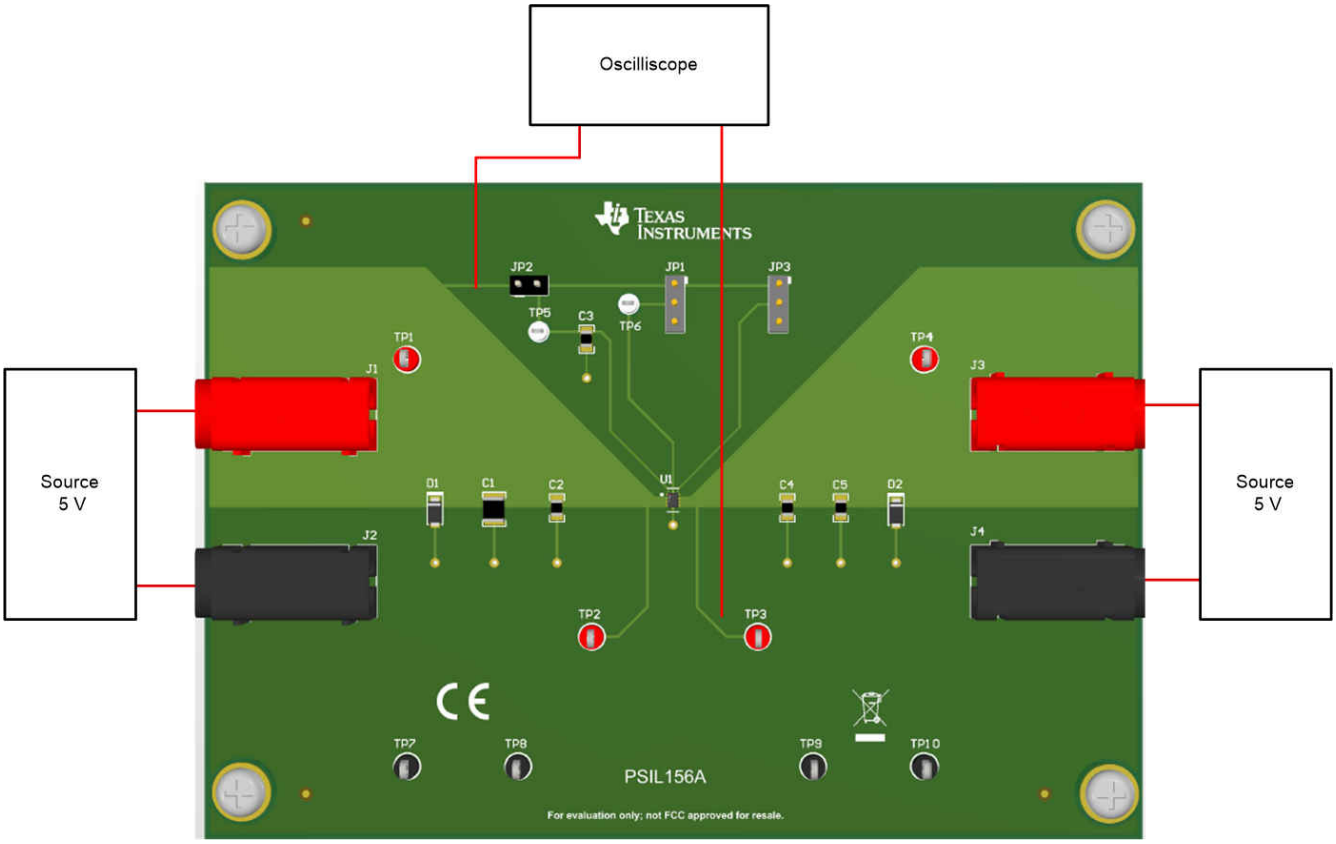

Figure 6-2. Rise Time Test Setup

7 Bill of Materials (BOM)

Table 7-1 lists the TPS22998EVM BOM

Table 7-1. TPS22998EVM BOM

Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
!PCB	1		PSIL156	Any	Printed Circuit Board	
C1	1	100uF	C1210C107M4PAC7800	Kemet	CAP, CERM, 100 uF, 16 V, +/- 20%, X5R, 1210	1210
C2, C3	2	1uF	C0805C105K5RACTU	Kemet	CAP, CERM, 1 uF, 50 V, +/- 10%, X7R, 0805	805
C4, C5	2	0.1uF	08053C104JAT2A	AVX	CAP, CERM, 0.1 uF, 25 V, +/- 5%, X7R, 0805	805
D1, D2	2	6V	SMF6.0A	Littelfuse	Diode, TVS, Uni, 6 V, 10.3 Vc, SOD-123FL	SOD-123FL
H1, H2, H3, H4	4		NY PMS 440 0025 PH	B&F Fastener Supply	Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw
H5, H6, H7, H8	4		1902C	Keystone	Standoff, Hex, 0.5"L #4-40 Nylon	Standoff
J1, J3	2		571-0500	DEM Manufacturing	Standard Banana Jack, insulated, 10A, red	571-0500
J2, J4	2		571-0100	DEM Manufacturing	Standard Banana Jack, insulated, 10A, black	571-0100
JP1, JP3	2		800-10-003-10-001000	Mill-Max	Header, 100mil, 3x1, TH	Header, 3x1, 100mil, TH
JP2	1		PEC02SAAN	Sullins Connector Solutions	Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin
LBL1	1		THT-14-423-10	Brady	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch
TP1, TP2, TP3, TP4	4		5010	Keystone	Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint
TP5, TP6	2		5002	Keystone	Test Point, Miniature, White, TH	White Miniature Testpoint

Table 7-1. TPS22998EVM BOM (continued)

Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
TP7, TP8, TP9, TP10	4		5011	Keystone	Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint
U1	1		TPS22998RYMR	Texas Instruments	5V, 4mΩ, 10A Load Switch with Adjustable Rise Time	WQFN10

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