User's Guide

TPS22995H-Q1 Evaluation Module User's Guide

ABSTRACT

This user's guide describes the characteristics, operation, and use of the TPS22995H-Q1 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 TPS22995H-Q1 EVM is a two-layer PCB containing the TPS22995H-Q1 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 TPS22995H-Q1 load switch performance specification. For additional details on load switch performance, application notes, and data sheet, see www.ti.com/loadswitch.

Table 1-1. TPS22995H-Q1 Characteristics

EVM	Device	Rise Time Typical (µs)	V_{IN} (V)	V_{BIAS} (V)	Enable (ON Pin)	Quick Output Discharge
PSIL186	TPS22995H-Q1	Adjustable	0.8 V to 5.5 V	2.5 V to 5.5 V	Active High	Fixed

1.2 Features

This EVM has the following features:

- V_{IN} input voltage range: 0.8 V to 5.5 V
- Access to the VIN, VOUT, ON, and RT pins of the TPS22995H-Q1 load switch
- On-board C_{IN} and C_{OUT} capacitors
- Adjustable rise timing

2 Electrical Performance

See the *TPS22995H-Q1 5-V, 25-mΩ, 3-A Load Switch With Adjustable Rise Time* data sheet for detailed electrical characteristics of the TPS22995H-Q1.

3 Schematic

Figure 3-1 illustrates the TPS22995HQ1EVM schematic.

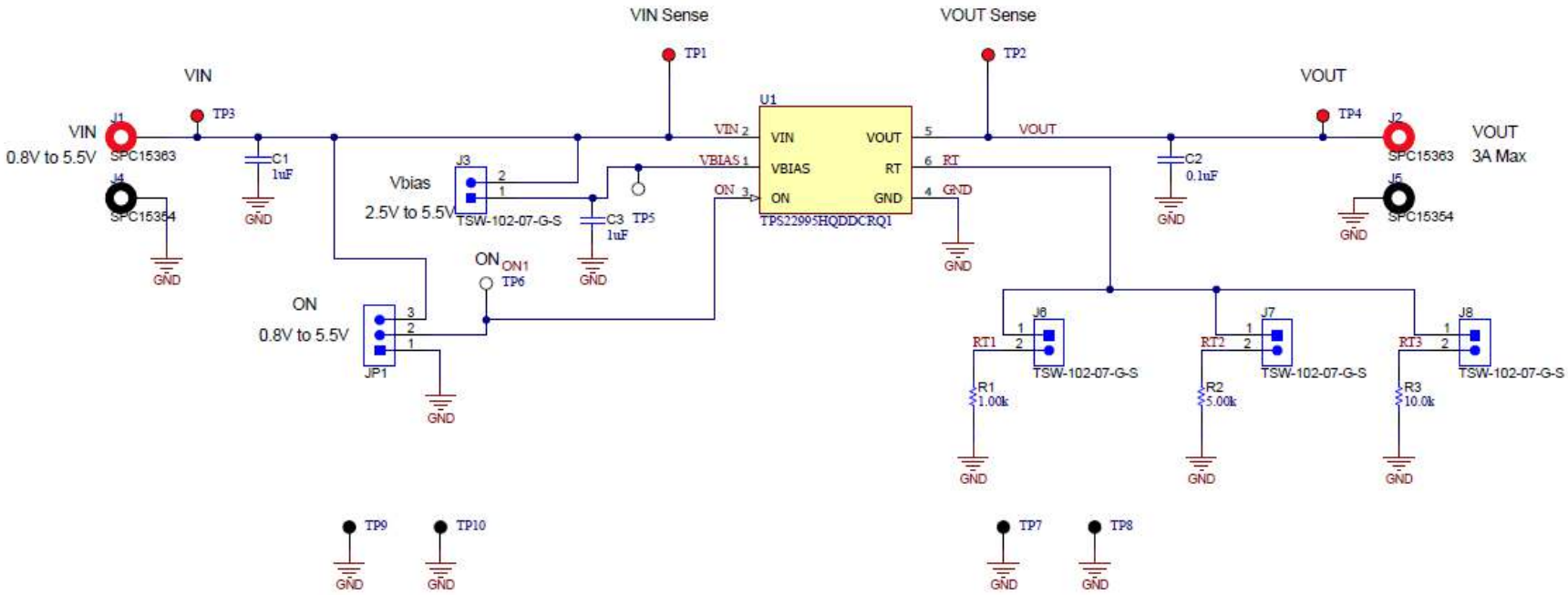

Figure 3-1. TPS22995HQ1EVM Schematic

4 PCB Layout

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

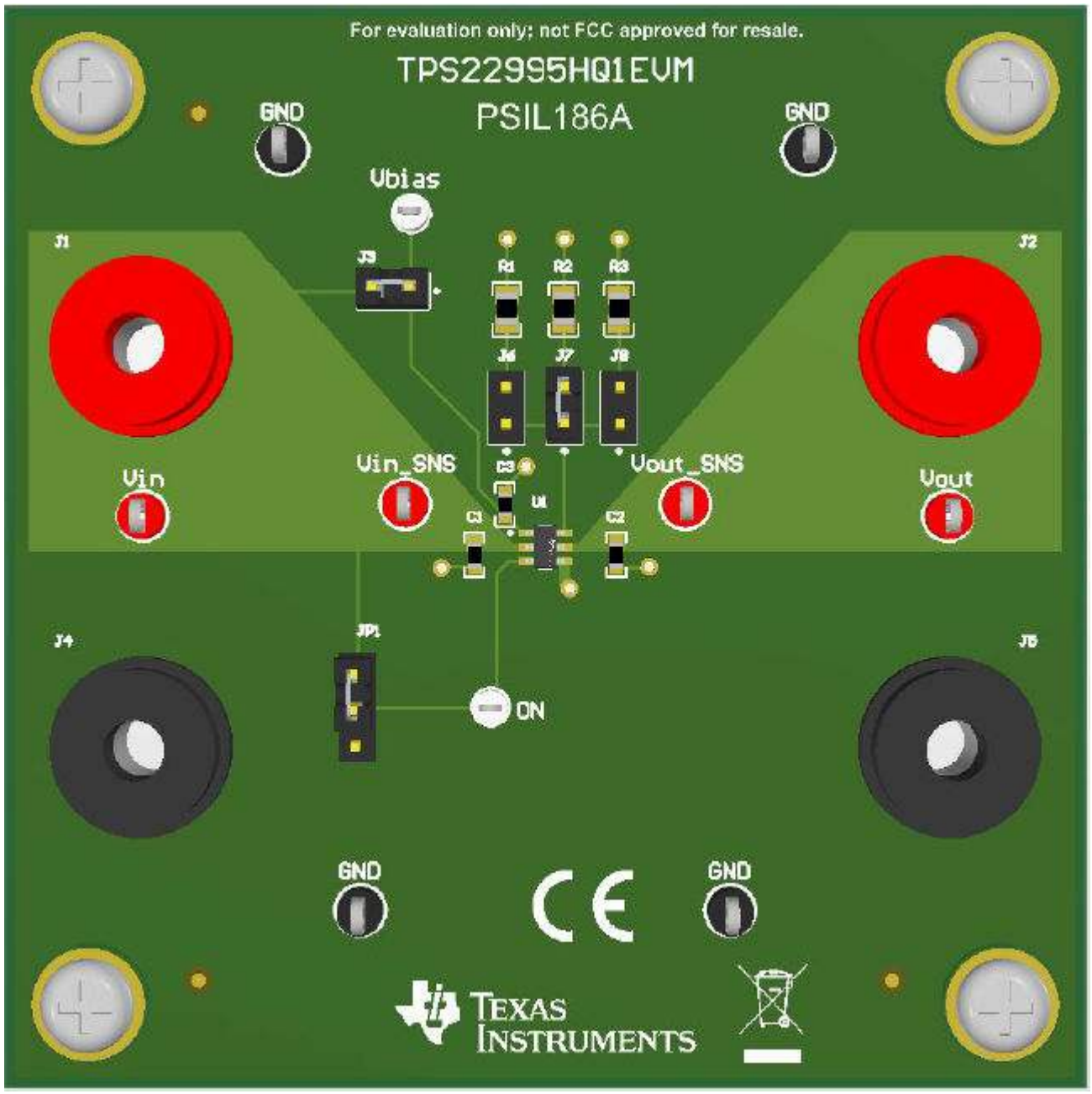

Figure 4-1. TPS22995HQ1EVM Top Layout

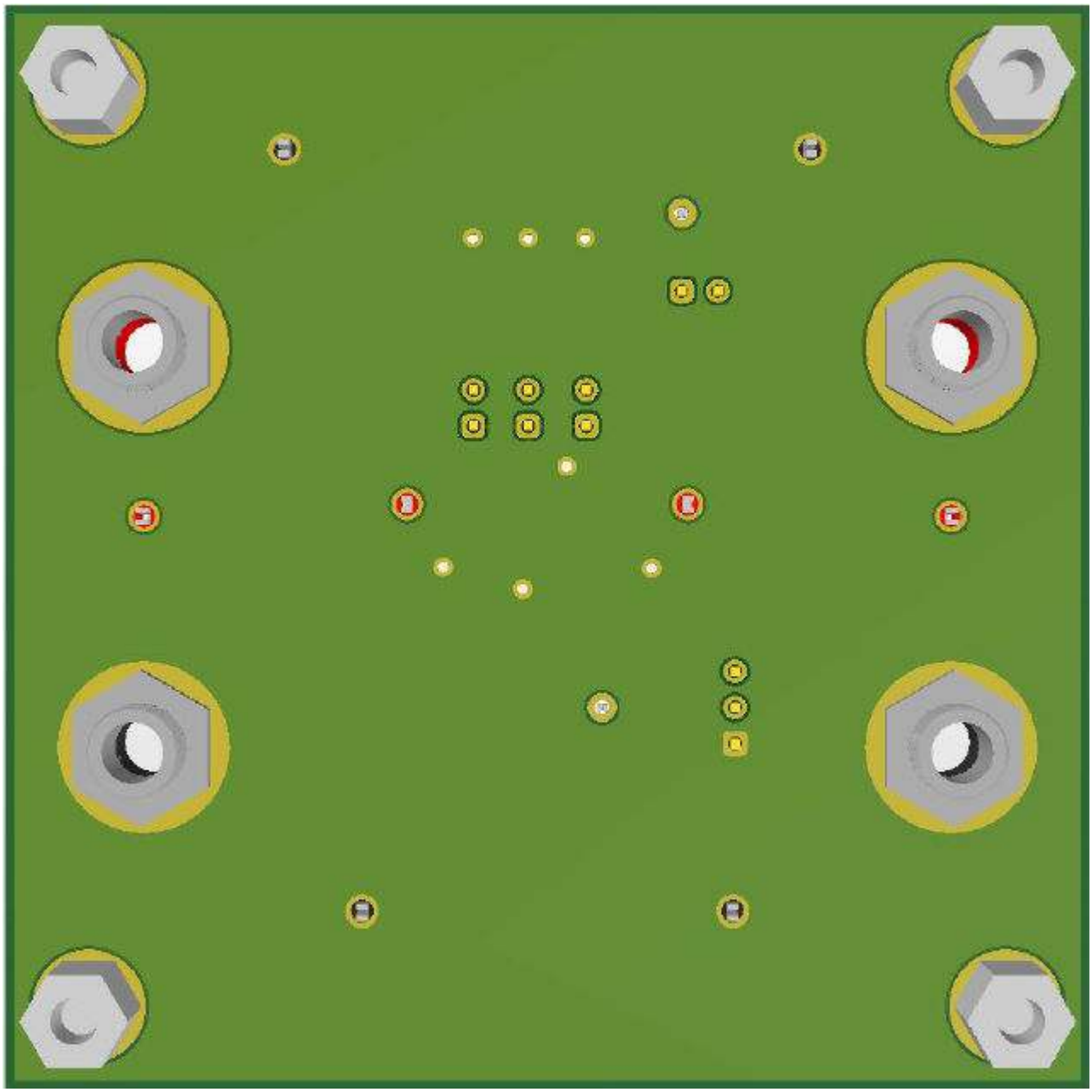

Figure 4-2. TPS22995HQ1EVM Bottom Layout

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. TPS22995HQ1EVM Input and Output Connector Functionality

Input	Connector and Test Point	Label	Description
VIN	J1	J1	Input banana connector for VIN
	TP1	VIN SNS	Sense test point for VIN
	TP3	VIN	Input test point for VIN

Table 4-1. TPS22995HQ1EVM Input and Output Connector Functionality (continued)

Input	Connector and Test Point	Label	Description
VOUT	J2	J2	Output banana connector for VOUT
	TP2	VOUT SNS	Sense test point for VOUT
	TP4	VOUT	Output test point for VOUT
GND	TP7, TP8, TP9, TP10	GND	Test point for GND
	J4, J5	J4, J5	Banana connector for GND

Table 4-2. TPS22995HQ1EVM 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. TPS22995HQ1EVM 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
	J3	VBIAS	BIAS voltage pullup to VIN
RT	J6, J7, J8	J6, J7, J8	• J6 sets RT to 1kΩ • J7 sets RT to 5kΩ • J8 sets RT to 10kΩ

5 Operation

Connect the VIN power supply to the J1 terminal. The input voltage range of the TPS22995HQ1EVM is 0.8 V to 5.5 V. Connect an acceptable bias voltage to TP5 (VBIAS) or populate J3 to use VIN as VBIAS. The bias voltage range of the TPS22995HQ1EVM is 2.5 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 J2 terminal. When the ON pin is asserted high, the output of the TPS22995H-Q1 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.

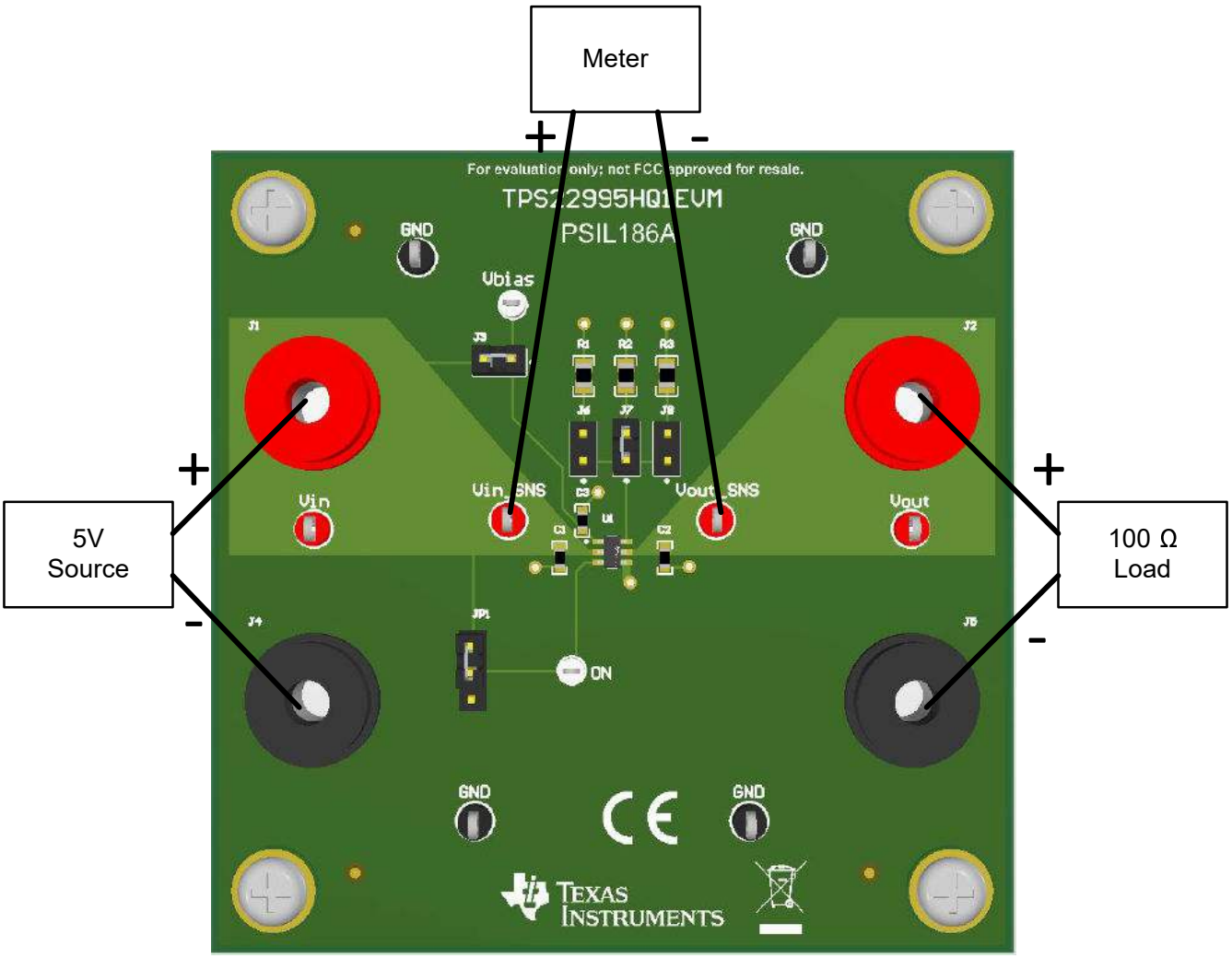

Figure 6-1. R_{on} Test Setup

6.2 Rise Time Test Setup

Figure 6-2 shows the test setup for measuring the rise time of the TPS22995H-Q1. 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.

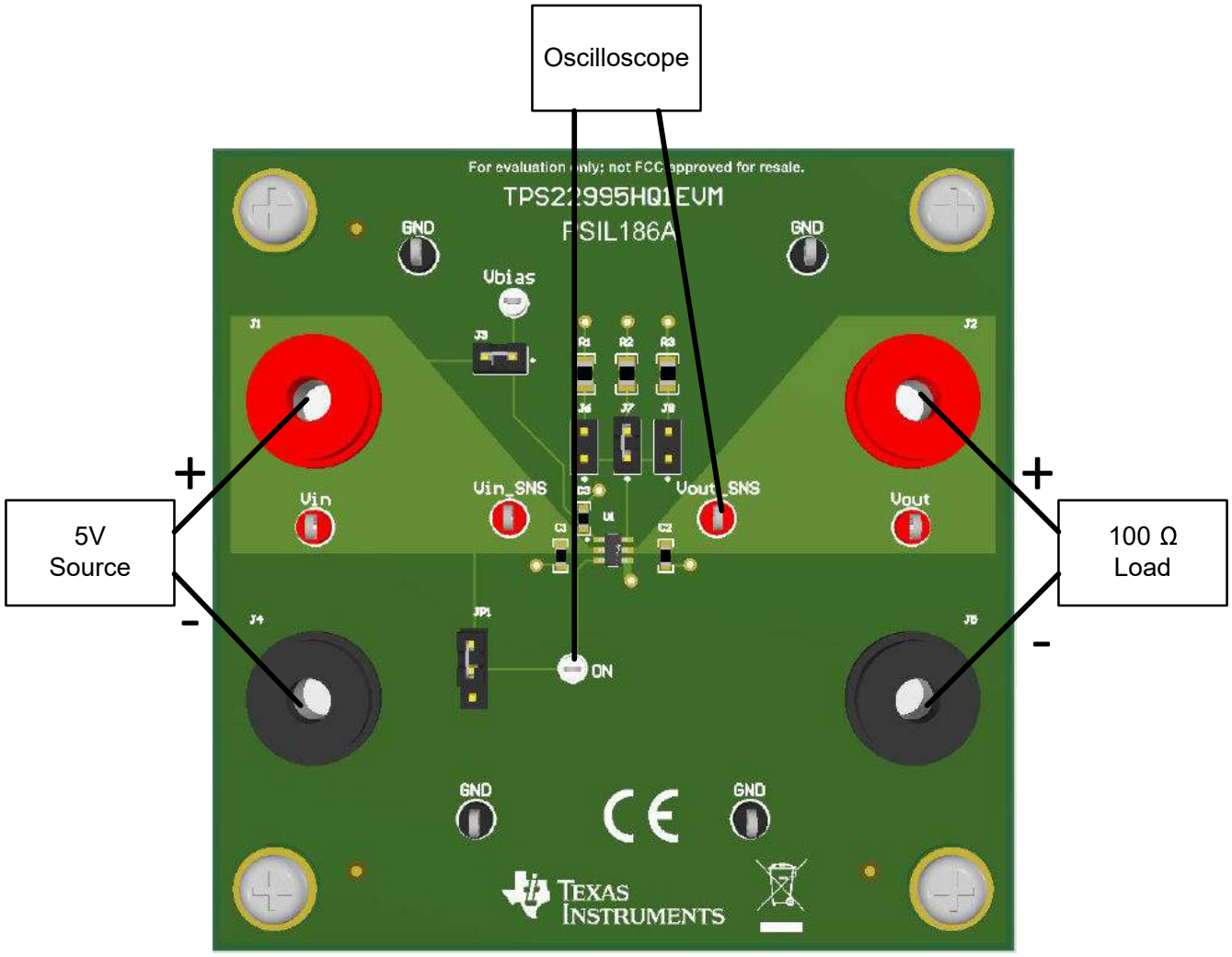

Figure 6-2. Rise Time Test Setup

7 Bill of Materials (BOM)

Table 7-1 lists the TPS22995HQ1EVM BOM

Table 7-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number
!PCB	1		Printed Circuit Board		PSIL186
C1, C3	2	1 µF	CAP, CERM, 1 µF, 25 V, ±10%, X7R, 0603	603	06033C105KAT2A
C2	1	0.1 µF	CAP, CERM, 0.1 µF, 16 V, ±5%, X7R, 0603	603	0603YC104JAT2A
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 × 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C
J1, J2	2		BANANA JACK, SOLDER LUG, RED, TH	Red Insulated Banana Jack	SPC15363
J3, J6, J7, J8	4		Header, 100mil, 2 × 1, Gold, TH	2 × 1 Header	TSW-102-07-G-S
J4, J5	2		BANANA JACK, SOLDER LUG, BLACK, TH	Black Insulated Banana Jack	SPC15354
JP1	1		Header, 100mil, 3 × 1, Gold, TH	3 × 1 Header	TSW-103-07-G-S
R1	1	1.00 k	RES, 1.00 k, 0.1%, 0.125 W, 0805	805	RG2012P-102-B-T5
R2	1	5.00 k	RES, 5.00 k, 0.1%, 0.2 W, 0805	805	PNM0805E5001BST5
R3	1	10.0 k	RES, 10.0 k, 0.1%, 0.125 W, 0805	805	RT0805BRD0710KL
SH-J1, SH-J2, SH-J3	3		Shunt, 2.54 mm, Gold, Black	Shunt, 2.54mm, Black	60900213421
TP1, TP2, TP3, TP4	4		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010
TP5, TP6	2		Test Point, Miniature, White, TH	White Miniature Testpoint	5002
TP7, TP8, TP9, TP10	4		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011
U1	1		5-V, 25-mΩ, 3-A Load Switch with Adjustable Rise Time and Humidity Resistance	SOT6	TPS22995HQDDCRQ1

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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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- *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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(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.

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