Using the TPS22961EVM-067 Single Channel Load Switch IC

The TPS22961EVM-067 evaluation module (EVM) allows the user to connect power to and control the 8pin SON package load switch. Parameters such as the On State resistance, Output Slew Rate and Output Discharge properties can be easily evaluated. Table 1 lists a short description of the load switch performance specifications; refer to the datasheet SLVSCI4 for more details.

Table 1. TPS22961 Slew Rate, Output Current Rating, Enable, and Output Discharge Options

EVM	Device	Slew Rate Typical	VIN (V)	Max. Continuous Current	Enable (ON Pin)	Quick Output Discharge
HVL067	TPS22961	5µs with VBIAS = 5V	1.05	6A	Active High	Yes

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1 Introduction

The TPS22961EVM-067 evaluation module (EVM) allows the user to connect power to and control the 8-pin SON package load switch. Parameters such as the On-resistance, output rise time and output discharge resistance can be easily evaluated. Table 1 lists a short description of the load switch performance specifications; refer to the datasheet SLVSCI4 for more details.

1.1 Description

The TPS22961EVM is a two sided PCB containing the TPS22961 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 RON measurements.

1.2 Features

- EVM allows access to the Input, Output and Control pins of the TPS22961 Load Switch Device.
- On board CIN and COUT capacitors.
- On Board Output loading resistor 10Ω.
- VIN input voltage range: 0.8V to 3.0V.
- VBIAS voltage range: 3.0 to 5.5V
- 6A max continuous current.

2 Electrical Performance

Refer to the datasheet SLVSCI4 for detailed electrical characteristics of the TPS22961.

3 Schematic

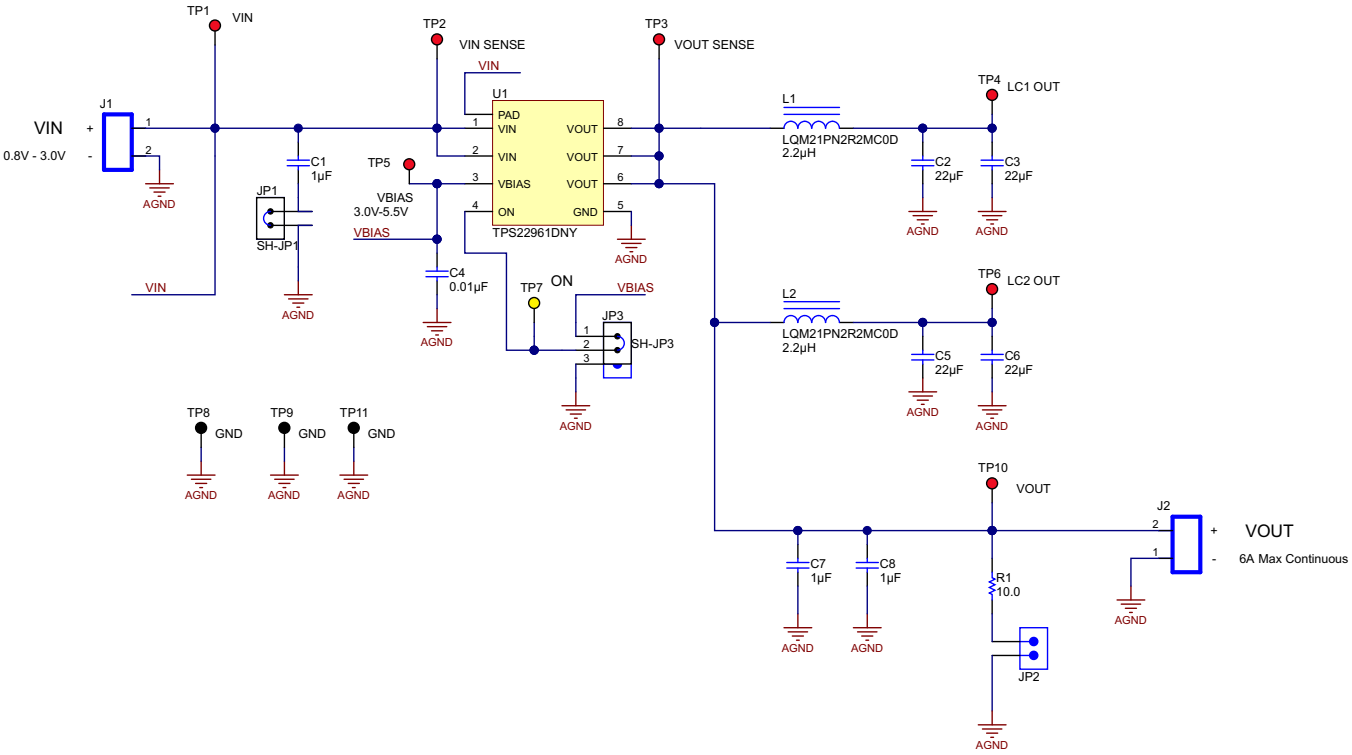

Figure 1. TPS22961EVM-067 Schematic

4 Layouts

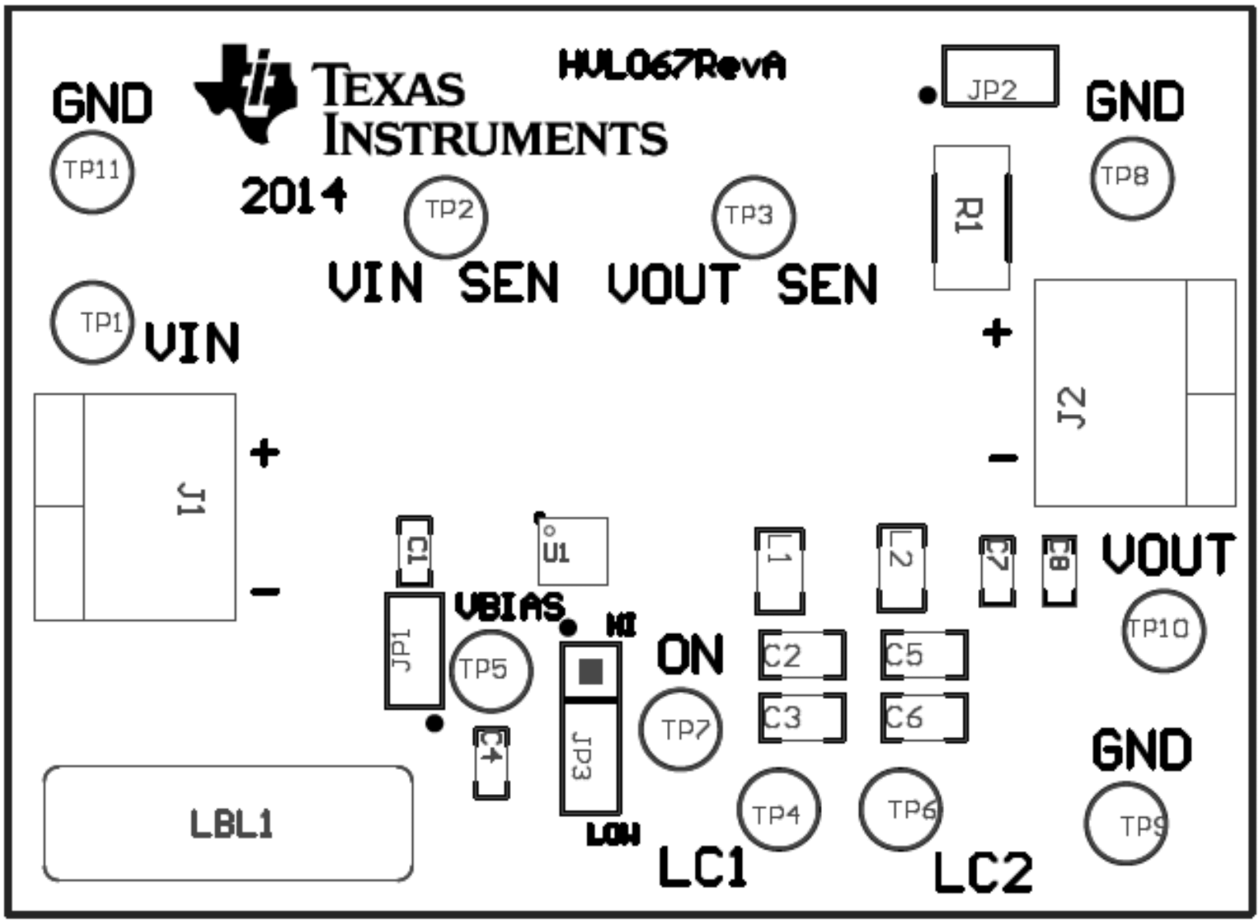

Figure 2. TPS22961EVM-067 Top Assembly

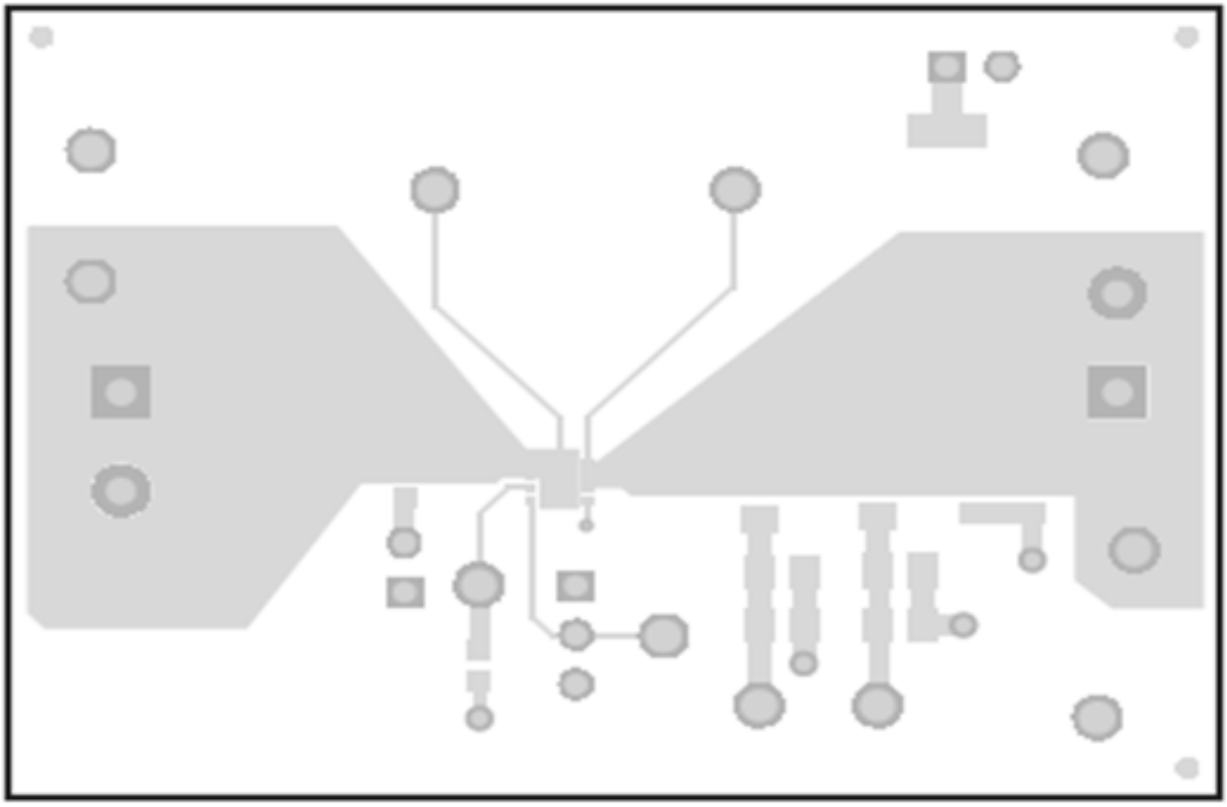

Figure 3. TPS22961EVM-067 Top Layout

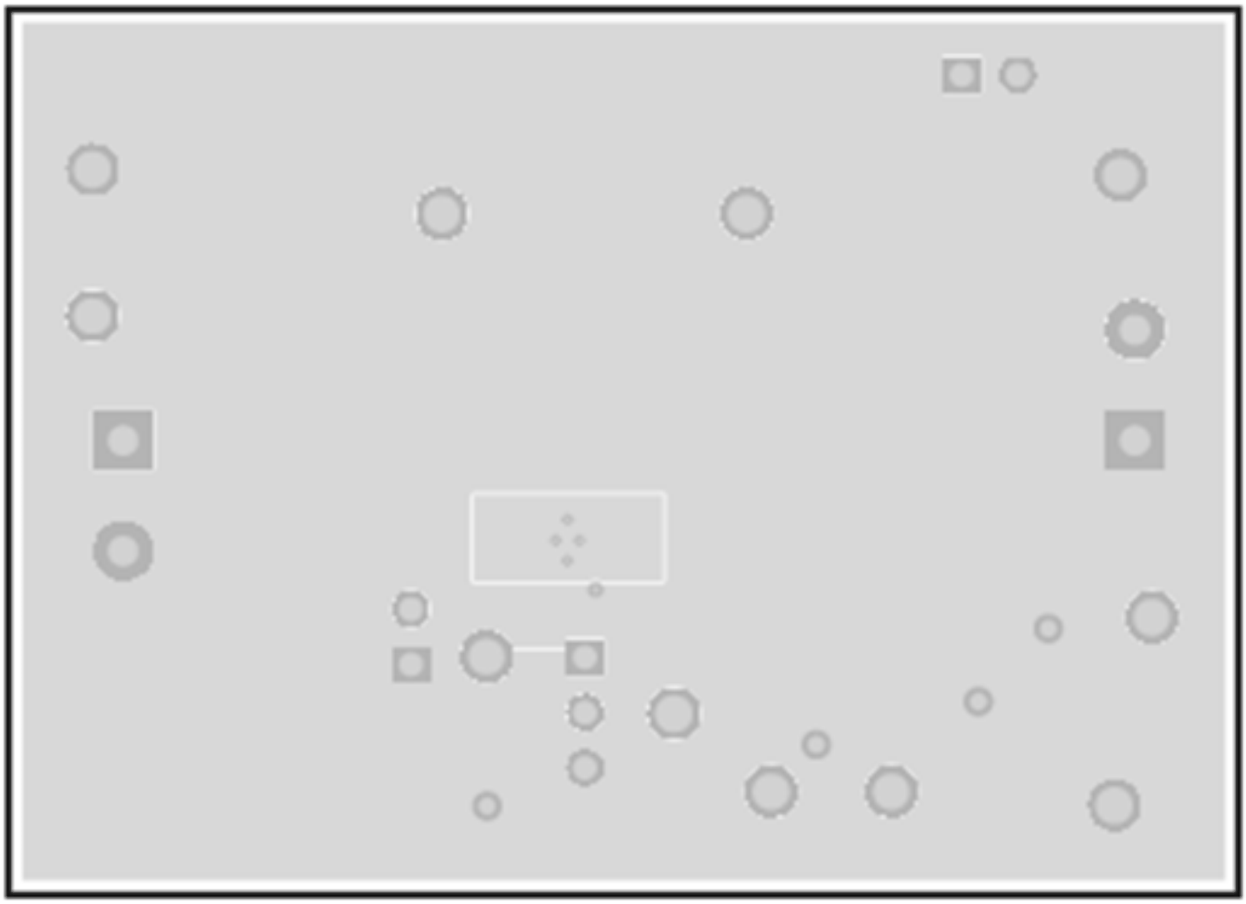

Figure 4. TPS22961EVM-067 Bottom Layout

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.

4.1.1 J1 – Input Connection

This is the connection for the leads from the input source. Connect the positive lead to J1-1 (+) terminal and the negative lead to J1-2 (–) terminal (GND). TP1 is also available for connecting to the input. J1 Connector is rated for currents of 15A, use the J1 input connection point when operating the EVM in the High current mode (IIN > 3A).

4.1.2 J2 – Output Connection

This is the connection for the output of the EVM. Connect the positive lead to J2-2 (+) terminal and the negative lead to J2-1 (–) terminal (GND). TP10 is also available for connecting to the output. J2 Connector is rated for currents of 15A, use the J2 input connection point when operating the EVM in the High current mode (IOUT > 3A).

4.1.3 JP3 – ON

This is the enable input for the device. A shorting jumper must be installed on JP3 in either the High or Low Position. The TPS22961 is active High. ON must not be left floating. An external enable source can be applied to the EVM by removing the shunt and connecting a signal to TP7. Refer to the datasheet for proper ON and OFF voltage level settings. A switching signal may also be used and connected at this point.

4.1.4 TP2 –VIN Sense, TP3 - VOUT Sense

These two connections are used when very accurate measurements of the input or output are required. RON measurements should be made using these sense connections when measuring the voltage drop from VIN to VOUT and then calculating the resistance.

4.1.5 JP1 – Input Capacitor

During normal operation a shorting jumper is placed on JP1 this connects C1 capacitor from the input of the device to ground. Refer to the Applications Section of the Datasheet for additional information on selecting the input capacitor..

4.1.6 C7 and C8 – Output Capacitors

During normal operation C7 and C8 capacitors are connected from the output of the device to ground. Refer to the Applications Section of the Datasheet for additional information on selecting the output capacitors.

4.1.7 JP2 – Output Resistor

During normal operation no shorting jumper is placed on JP2. A shorting jumper may be used on JP2 to connect R1 10Ω load resistor from the output of the device to ground. R1 is sized for a 2512 1.5W power resistor.

4.1.8 TP4 – VBIAS

This connection to the device is used for applying VBIAS voltage, VBIAS voltage range is from 3.0V to 5.5V, VBIAS voltage must be applied for the device to operate.

4.1.9 TP6 – Filtered Outputs

These output connections are low current output that can be used as additional loads for the device.

4.1.10 TP8/TP9/TP11 – GND

These are connections to GND.

5 Operation

Connect the positive input of the VIN power supply to VIN at J1-1 for currents greater than 3A, or connect the positive input of the VIN power supply to VIN at TP1 for currents less than 3A. Connect the negative lead of the power supply to GND at J1-2. The input voltage range of the TPS22961EVM-067 is 0.8V to 3.0V.

The VBIAS voltage range of the TPS22961EVM-067 is 3.0V to 5.5V. Connect the positive input of the VBIAS power supply to VBIAS at TP5. Connect the negative lead of the VBIAS power supply to GND at TP8, TP9 or TP11.

External output loads can be applied to the switch by connecting between J2-2 VOUT and J2-1 GND for currents greater than 3A. For currents less than 3A, connect the output load between TP10 and GND (TP8, TP9 or TP11). The TPS22961EVM-067 is rated for a maximum continuous current of 6A. Configure JP3 as required. JP3 must be installed for proper operation. When the ON pin is asserted high, the output of the TPS22961 will be enabled.

6 Test Configuraions

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

Figure 5 shows a typical setup for measuring On-Resistance. The voltage drop across the switch is measured using the sense connections then divided by the current into the load yielding the R_{ON} resistance.

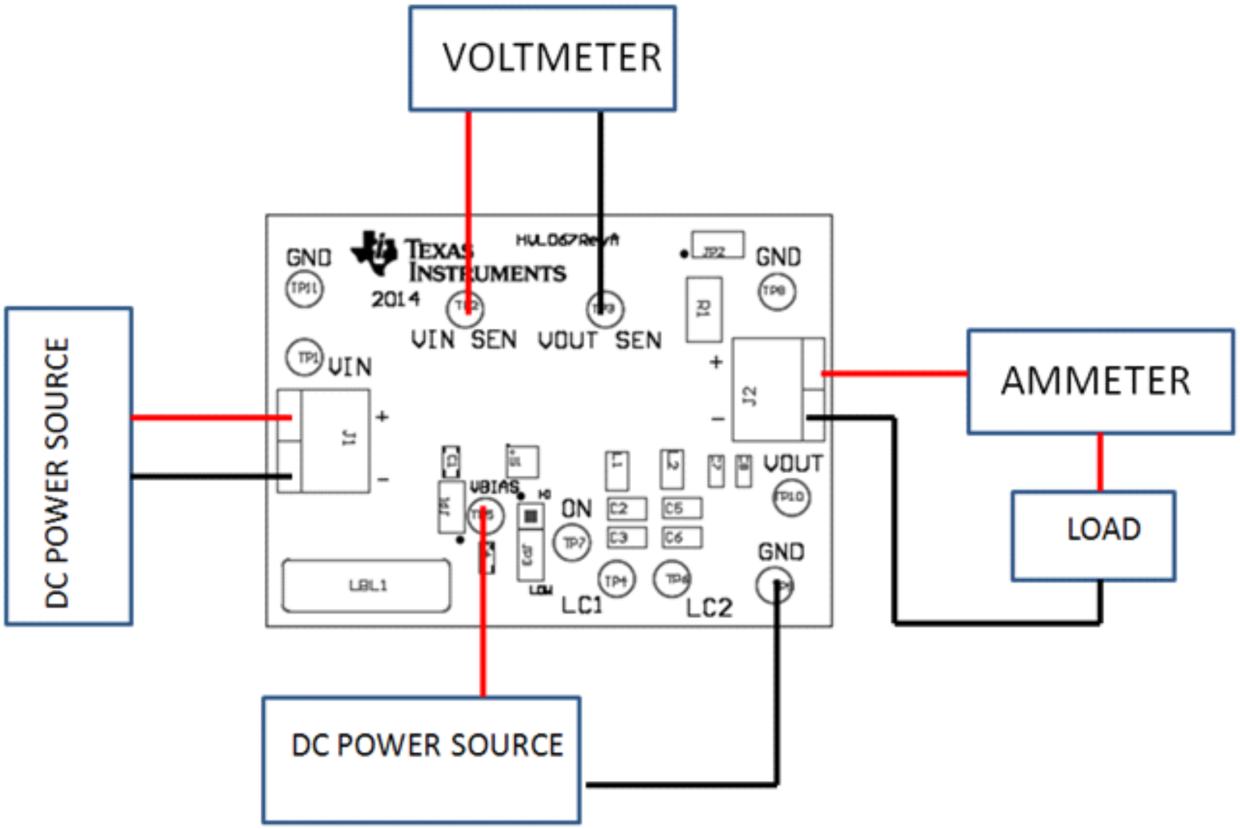

Figure 5. R_{ON} Setup

6.2 Slew Rate Test Setup

Figure 6shows a test setup for measuring the Slew Rate of the Load Switch. Controlling the ON pin of the switch with a signal source and then measuring the outputs with a scope shows the switches ability to have a controlled VOUT ramp.

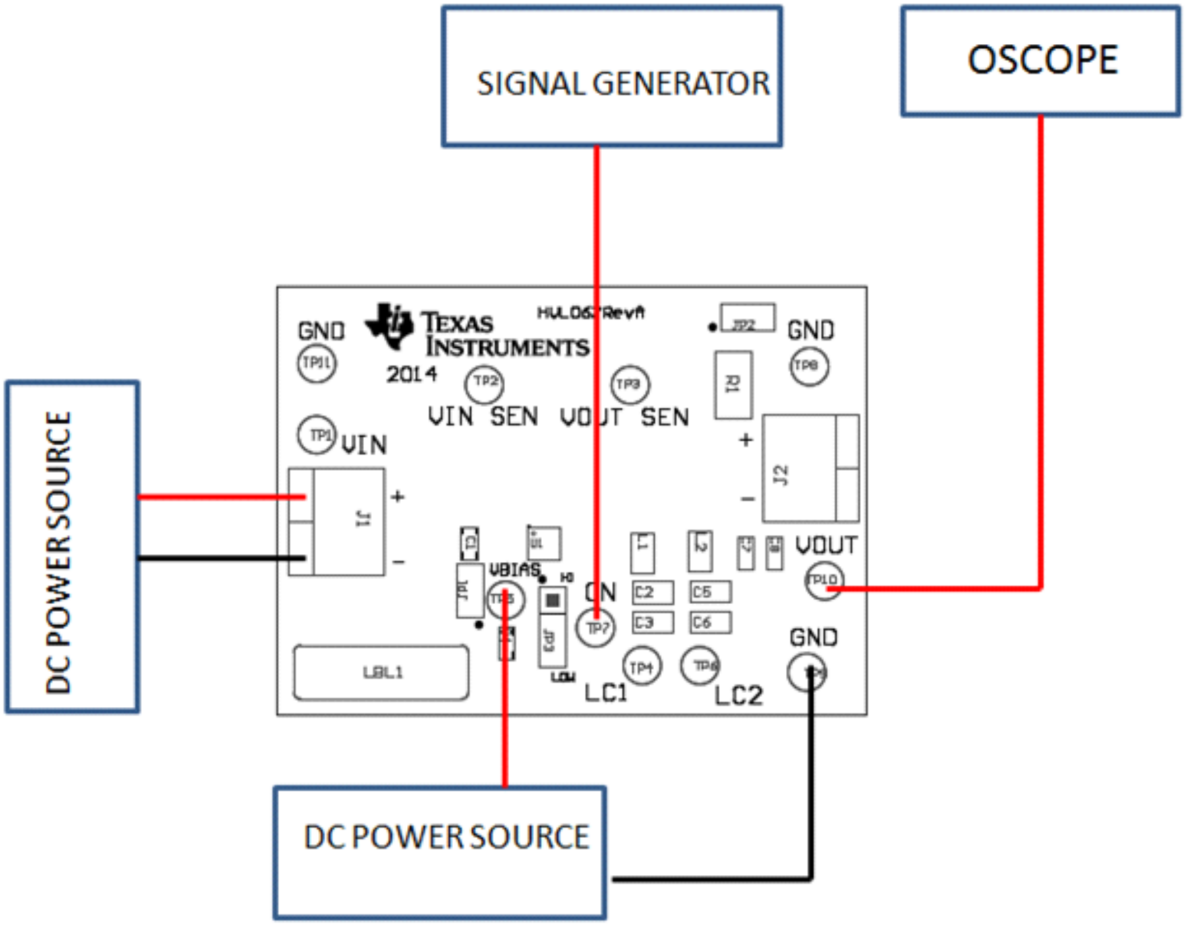

Figure 6. Slew Rate Setup

6.3 VOUT Slew Rate Examples

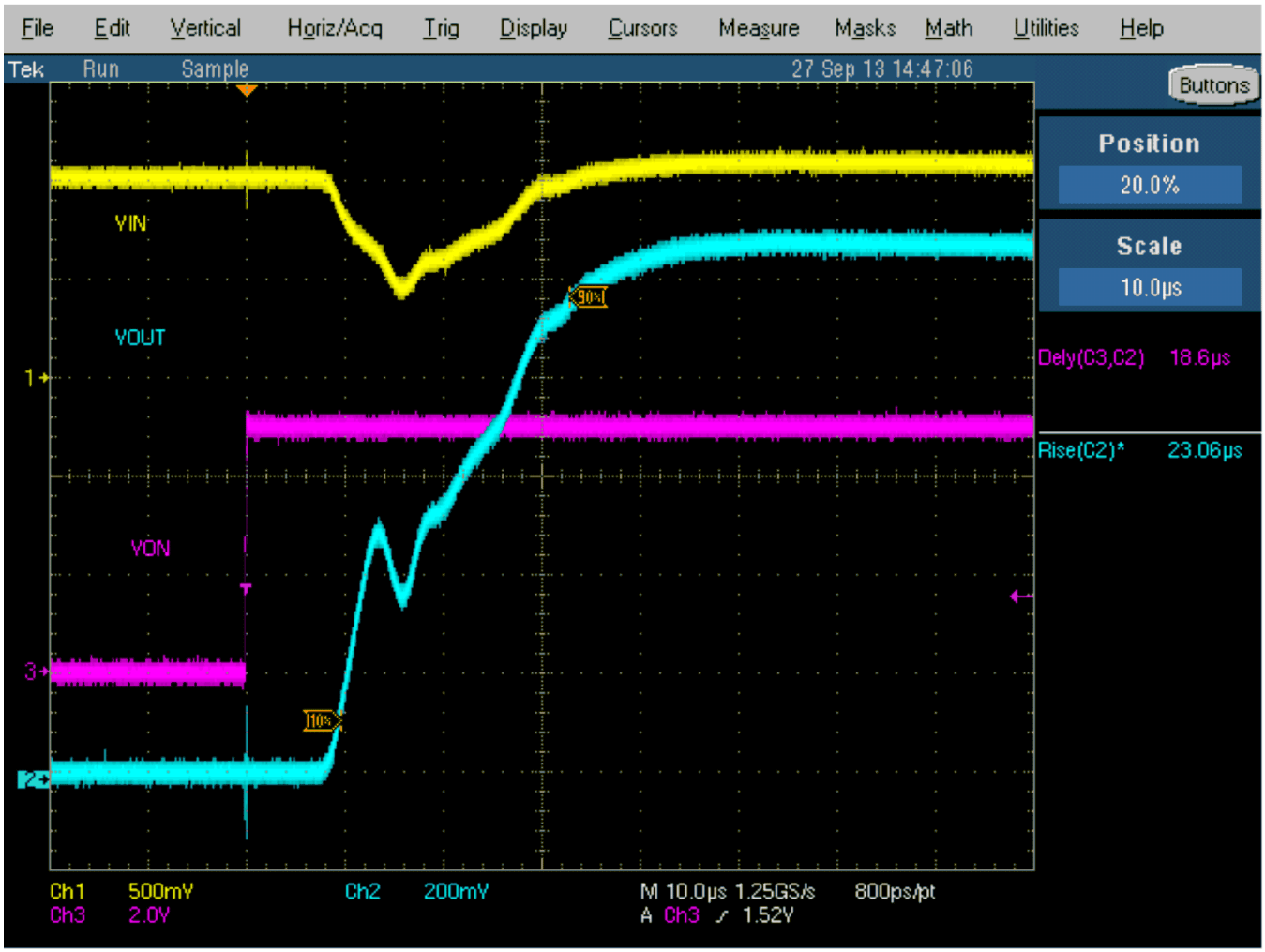

Figure 7. TPS22961 V_{out} t_R Example (V_{BIAS} = 5V, V_{IN} = 1.05V, R_L = Open)

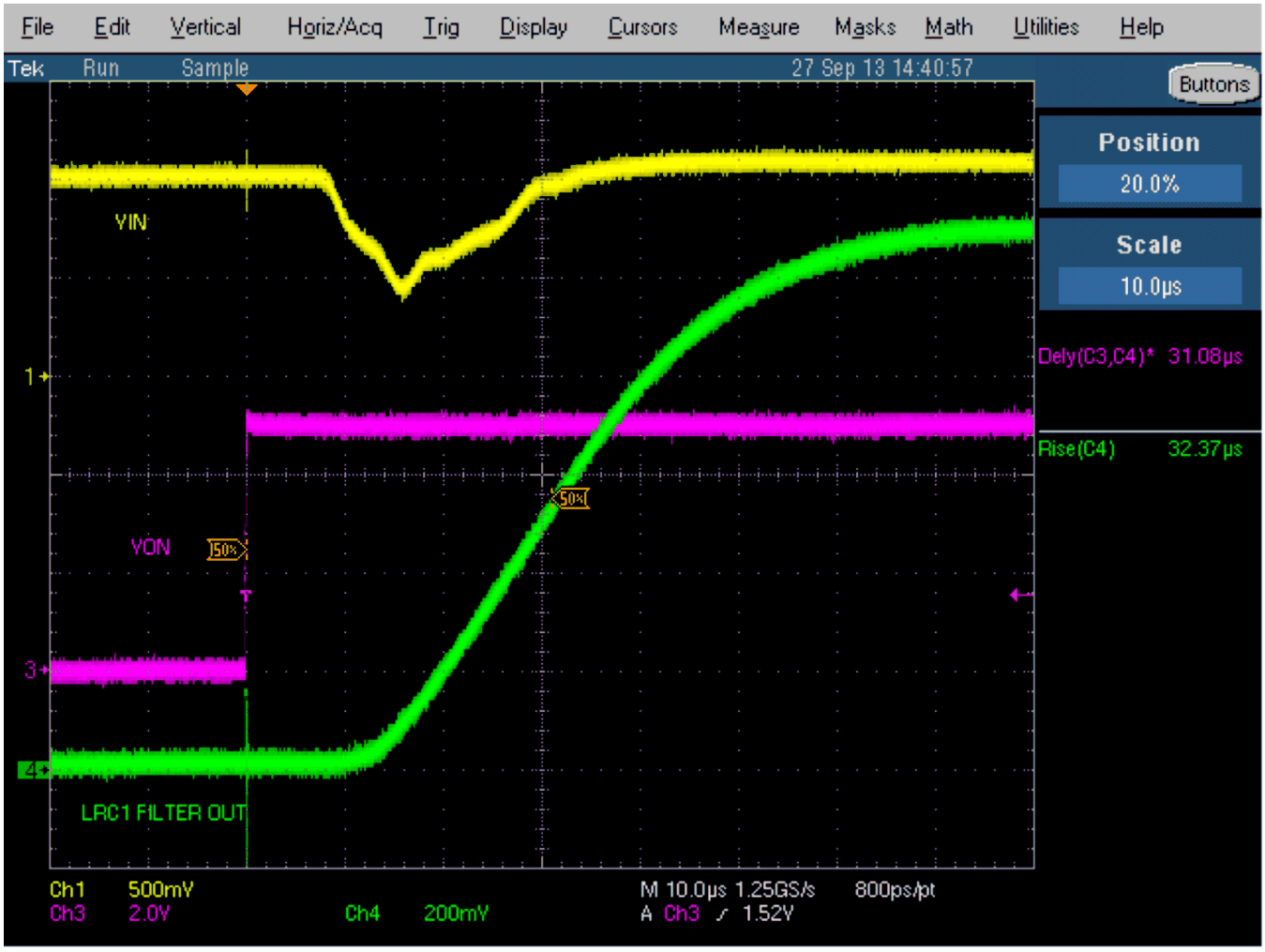

Figure 8. TPS22961 V_{out} t_R Example (V_{BIAS} = 5V, V_{IN} = 1.05V, R_L = Open)

7 Bill of Materials (BOM)

Table 2. Bill of Materials[1]

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
PCB	1		Printed Circuit Board		HVL067	Any	–	–
C1, C7, C8	3	1µF	CAP, CERM, 1µF, 16V, ±10%, X5R, 0603	0603	C0603C105K4PACTU	Kemet		
C2, C3, C5, C6	4	22µF	CAP, CERM, 22µF, 10V, ±10%, X5R, 0805	0805	CL21R226KQQNNNE	Samsung		
C4	1	0.01µF	CAP, CERM, 0.01µF, 50V, ±5%, X7R, 0603	0603	C0603C103J5RACTU	Kemet		
FID1, FID2, FID3	3		Fiducial mark. This is nothing to buy or mount	Fiducial	N/A	N/A		
J1, J2	2	ED120/2DS	Terminal Block, 2-pin, 15-A, 5.1mm		ED120/2DS	OST		
JP1, JP2	2		Header, 100mil, 2x1, Tin plated, TH		PEC02SAN	Sullins Connector Solutions		
JP3	1		Header, 100mil, 3x1, Tin plated, TH		PEC0SAAN	Sullins Connector Solutions		
L1, L2	2	2.2µH	Inductor, Shielded, Ferrite, 2.2µH, 0.8A, 0.23Ω, SMD	0805	LQM21PN2R2NGC	Murata		
LBL1	1		Thermal Transfer Printable Labels, 0.650' W x 0.200" H -10,000 per roll	PCB Label 0.650"H x 0.200"W	THT-14-423-10	Brady		
R1	1	10.0	RES, 10.0Ω, 5%, 1.5W, 2512	2512	RPC2512JT10R0	Stackpole Electronics Inc.		
SH-JP1, SH-JP3	2	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec
TP1–TP6, TP10	7	Red	Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone		
TP7	1	Yellow	Test Point, Compact, Yellow, TH	Yellow Compact Testpoint	5009	Keystone		
TP8, TP9, TP11	3	Black	Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone		
U1	1		IC, Ultra- Low on Resistance, 6A Single Chan-Load SW with Controlled Turn-On	DNY0008A	TPS22961DNY	Texas Instruments		None

(1) Unless otherwise noted in the Alternative Part Number and/or Alternative Manufacturer columns, all parts may be substituted with equivalents.

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