TPS22931/31/32B Load Switch EVM

User's Guide

Literature Number: SLVU288
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TPS22931/32/32B Load Switch Evaluation Module (EVM)

This user guide describes the TPS22931/32/32B evaluation module (EVM). This guide contains the EVM schematics, bill of materials, assembly drawings, and top and bottom board layouts.

1.1 Introduction

The TPS22931/32/32B EVM is an evaluation module for the Texas Instruments family of low-input voltage, ultra-low r_{ON} load switches. This EVM operates over a 0.9 V to 3.6 V range and provides a continuous output current of up to ≈110 mA. Additional open resistor and capacitor footprints allow for the use of customer-selected input and output load values.

The TPS22931/32/32B EVM accepts a YFP-6 packaged load switch for any of three (3) possible devices: TPS22931, TPS22932, or TPS22932B. These switches have a low threshold enable input, internally controlled slew rate, and ultra-low quiescent/shutdown current. The TPS22932 and TPS22932B also incorporate a 120-Ω quick output discharge resistor internally.

Table 2-1 summarizes the available EVM options.

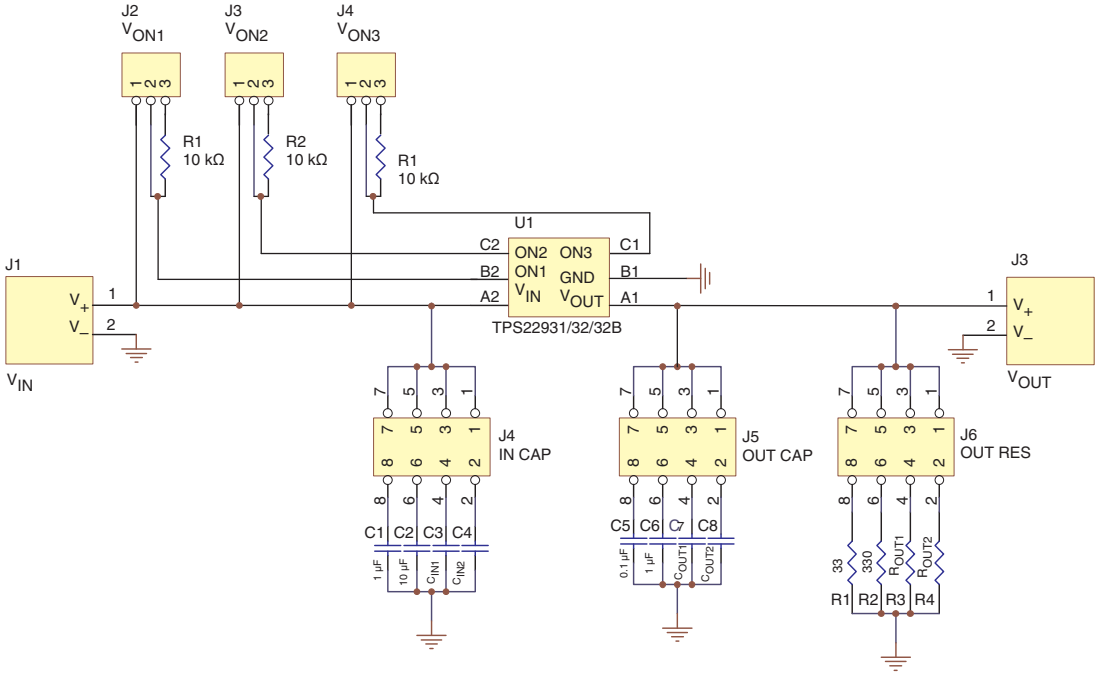
Schematics and Bill of Materials

2.1 EVM Options

Table 2-1. TPS22931/32/32B EVM Options

EVM	DEVICE	SLEW RATE	QUICK OUTPUT DISCHARGE	MAX OUTPUT CURRENT	ENABLE
HPA395-01	TPS22931	30 µs	No	500 mA	Active high
HPA395-02	TPS22932	30 µs	Yes	500 mA	Active high
HPA395-03	TPS22932B	220 µs	Yes	500 mA	Active high

2.2 Schematic



2.3 Bill of Materials

Table 2.4. Bill of Materials

QTY			REFDES	VALUE	DESCRIPTION	SIZE	PART NUMBER	MFR
-01	-02	-03						
1	1	1	–	–	Two-layer, 2420 × 2320 mil, PCB	2420 × 2320 mil	HPA395	Any
2	2	2	C1, C6	1 µF	Capacitor, ceramic, 25 V, X5R	805	GRM216R61E105KA12D	STD
1	1	1	C2	10 µF	Capacitor, ceramic, 16 V, X5R	805	GRM21BR61C106KE15L	STD
1	1	1	C5	0.1 µF	Capacitor, ceramic, 25 V, X7R	805	GRM21BR71E104KA01L	STD
0	0	0	C3, C4, C7, C8	–	Capacitor, ceramic, 16 V, X5R	805	–	STD
3	3	3	J2, J3, J4	–	Header, 3 × 1 pin, 100 mil spacing	0.100 × 0.100 in	PEC36SAAN	Sullins Connector Solutions
3	3	3	J6, J7, J8	–	Header, 4 x 2 pin, 100 mil spacing	0.100 × 0.100 in	PEC36DAAN	Sullins Connector Solutions
2	2	2	J1, J5	–	Terminal block, 6A, 125 V, 3.5-mm pitch	7 × 6.5 mm	ED555/2DS	OnShore Technology
3	3	3	R1, R2, R3	10 kΩ	Resistor, chip, 1/8 W, 5%	805	ERJ-6GEYJ103V	STD
1	1	1	R4	33 Ω	Resistor, chip, 1/8 W, 5%	805	ERJ-6GEYJ330V	STD
1	1	1	R5	330 Ω	Resistor, chip, 1/8 W, 5%	805	ERJ-6GEYJ331V	STD
0	0	0	R6, R7	–	Resistor, chip, 1/8 W, 5%	805	–	STD
1	0	0	U1	TPS22931	IC, ultra-small, low-input voltage, low r_{ON} load switch	YFP/0.4-mm pitch WCSP	TPS22931YFPR	TI
0	1	0	U1	TPS22932	IC, ultra-small, low-input voltage, low r_{ON} load switch	YFP/0.4-mm pitch WCSP	TPS22932YFPR	TI
0	0	1	U1	TPS22932B	IC, ultra-small, low-input voltage, low r_{ON} load switch	YFP/0.4-mm pitch WCSP	TPS22932BYFPR	TI
3	3	3	–	–	Conn. jumper, shorting, gold, flash	0.100 × 0.256 in	SPC02SYAN	Sullins Connector Solutions
4	4	4	–	–	Bumpon, hemisphere, .44X.20, clear	11.1 mm × 5.1 mm	SJ-5303	3M

Board Layout

This section contains three views of the TPS22931/32/32B EVM evaluation board as well as some layout considerations.

3.1 TPS22931/32/32B EVM Board

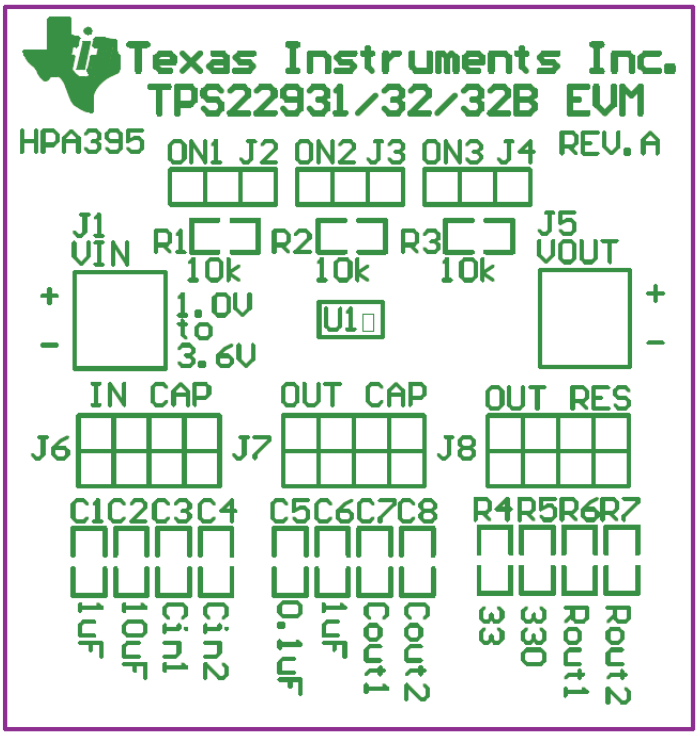


Figure 3-1. TPS22931/32/32B EVM Component Placement

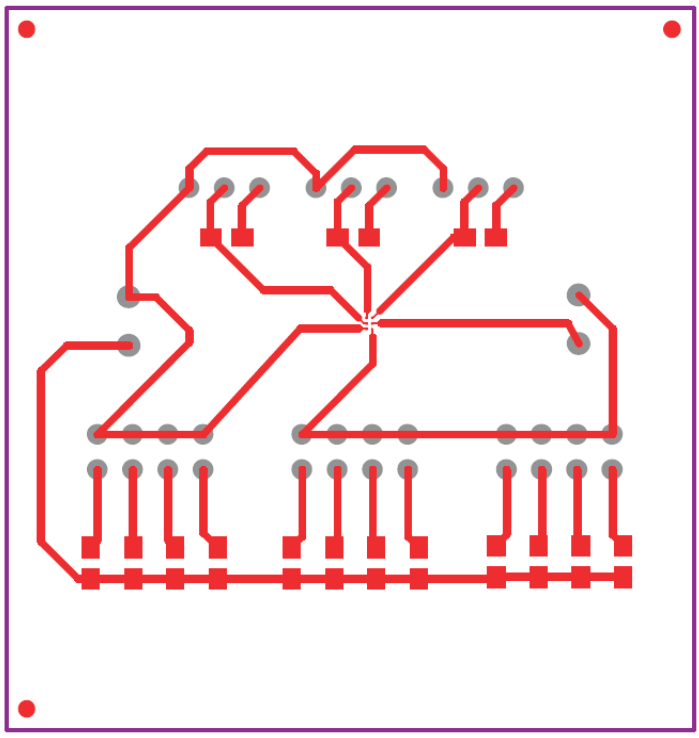


Figure 3-2. TPS22931/32/32B EVM Top-Side Layout

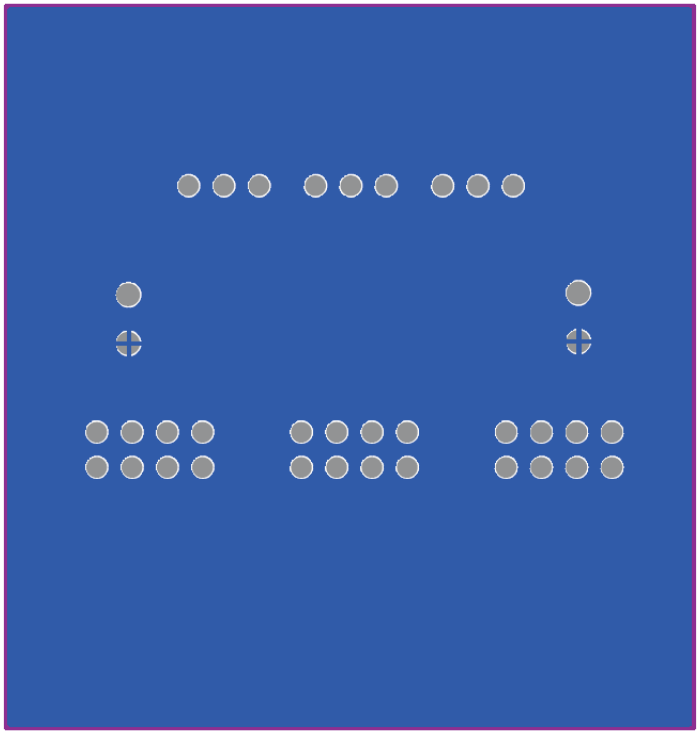


Figure 3-3. TPS22931/32/32B EVM Bottom-Side Layout

3.2 Layout Considerations

The V_{IN} and V_{OUT} pins of U1 can carry significant current; so, traces to these pins should be of suitable length and width to minimize voltage drop to the load. Locate the C_{IN} and C_{OUT} bypass capacitors close to the V_{IN} and V_{OUT} pins of U1.

EVM Setup

4.1 Recommended Test Equipment

The following test equipment is recommended:

- Two-channel storage oscilloscope
- Current probe
- Voltage probe
- 3.6-V at 500 mA power supply
- Volt-ohm meter

4.2 Calculating Voltage Drop and Load Current

The user should read the applicable data sheet before using the EVM.

Figure 4-1 shows the EVM test setup for measuring input and output voltage. The load switch is enabled into a passive on-board load for this measurement. After measuring the voltages at both V_{IN} and V_{OUT}, the voltage drop across the switch as well as the load current can be calculated from the following equations:

$V_{DROP} = V_{IN} – V_{OUT}$

$I_{LOAD} = V_{OUT} / R_{LOAD}$

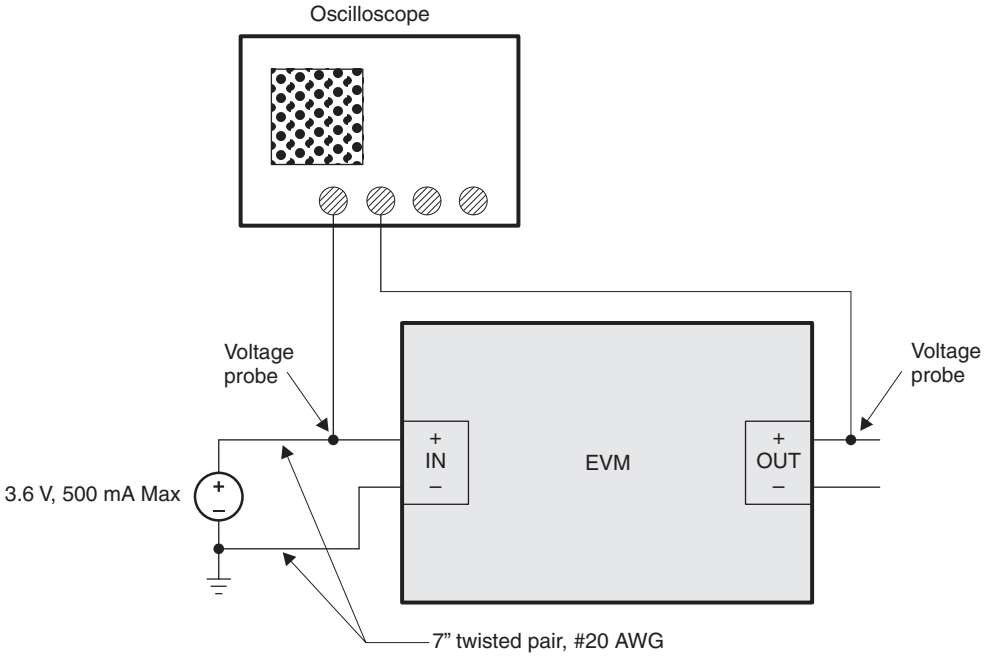


Figure 4-1. EVM Setup For Calculating Voltage Drop and Load Current

Related Documentation from Texas Instruments

- *TPS22931, TPS22932, TPS22932B, Low Input Voltage, Ultra Low r_{ON} Load Switches With Configurable Enable Logic* data sheet (SLVS802)

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 1.0 V to 3.6 V and the output voltage range of 1.0 V to 3.6 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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