TPS22920EVM-002/TPS22920L

This user's guide describes the characteristics, operation, and use of the TPS22920EVM-002 and the TPS22920L evaluation modules (EVM). This EVM demonstrates the Texas Instruments TPS22920 load switch with controlled turn on. The input voltage range of the TPS22920 is 0.75 V to 3.6 V. An integrated charge pump biases the NMOS switch to achieve a minimum switch ON resistance. The switch is controlled by an on/off input (EN), which is capable of interfacing directly with low-voltage control signals. This user's guide includes setup instructions, schematic diagram, bill of materials, and printed-circuit board layout drawings for the EVM.

1 Introduction

The TPS22920EVM-002 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS22920 load switch. The board features the small 6-pin CSP package for a small solution size.

Table 1. TPS22920 VOUT Rise Time Options

EVM	DEVICE	Rise Time (µS) Typ.	VIN(V)	Max. Continuous Current	Enable (ON Pin)	Quick Output Discharge
HVL002-001	TPS22920	880	3.6	4-A	Active High	Yes
HVL002-002	TPS22920L	880	3.6	4-A	Active Low	Yes

1.1 Related Documentation From Texas Instruments

TPS22920 (SLVSAY8), *ULTRA-LOW ON-RESISTANCE, 4-A INTEGRATED LOAD SWITCH WITH CONTROLLED TURN-ON* data sheet

TPS22920L (SLVSBT9), *ULTRA-LOW ON-RESISTANCE, 4-A INTEGRATED LOAD SWITCH WITH CONTROLLED TURN-ON* data sheet

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the TPS22920EVM-002.

2.1 J1/J3 – Input Connections

This is the connection for the leads from the input source. Connect the positive connection to the VIN J1 and the negative connection to the GND J3.

2.2 J4/J6 – Output Connections

This is the connection for the output of the TPS22920EVM. Connect the positive connection of the load to the VOUT J4 and the negative connection to the GND J6.

2.3 JP3 – EN

This is the enable input for the device. Place a shorting jumper across the pins of JP3 to enable or disable the integrated circuit (IC). Refer to Table 1 for the correct Enabled state for the device type you are using. A shorting jumper must be installed on JP3 in either the ON or OFF positions, and EN must not be left unconnected. An external enable source can be applied to the TPS22920 by removing the shunt and connecting a signal to the center pin of JP3. A switching signal may also be used and connected at this point.

2.4 J2/J5 – V_{IN} Sense and V_{OUT} Sense

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

3 Operation

Connect the positive input of the power supply to the VIN J1 and the negative lead of the power supply to GND J3. The input voltage range of the TPS22920 is 0.75 V to 3.6 V.

Output load can be applied by connecting between J4 VOUT and J6 GND. The TPS22920 is rated for a maximum continuous current of 4A. Additional output load can be selected using JP6 and JP7. Shorting across JP7 selects R2 an 18 ohm on board resistor. JP6 selects R1 which is open for customer selection. R1 and R2 are intended for light loads of the output, observe the 1/2W(R1) and 3/4W(R2) power rating for these parts. R2 was selected as 18 ohms to give a 200mA load at 3.6V VIN. Configure jumper JP3 as required. JP3 must be installed for proper operation. ON is normal operation. While operating in the ON state the rise time of the device is internally controlled to avoid inrush current. In the OFF position, the device is shut down and a 1250-Ω on-chip load resistor is added for output quick discharge.

4 Test Results

See the *Typical Characteristics* section of the TPS22920 or TPS22920L data sheet.

5 Board Layout, Schematic, and Bill of Materials

This section provides the TPS22920EVM-002 board layout, schematic, and bill of materials.

5.1 Board Layout

For best performance, all traces should be as short as possible. To be most effective, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. Using wide traces for V_{IN}, V_{OUT}, and GND helps minimize the parasitic electrical effects along with minimizing the case to ambient thermal impedance Figure 1, Figure 2, and Figure 3 show the board layout for the TPS22920EVM-002 PCB.

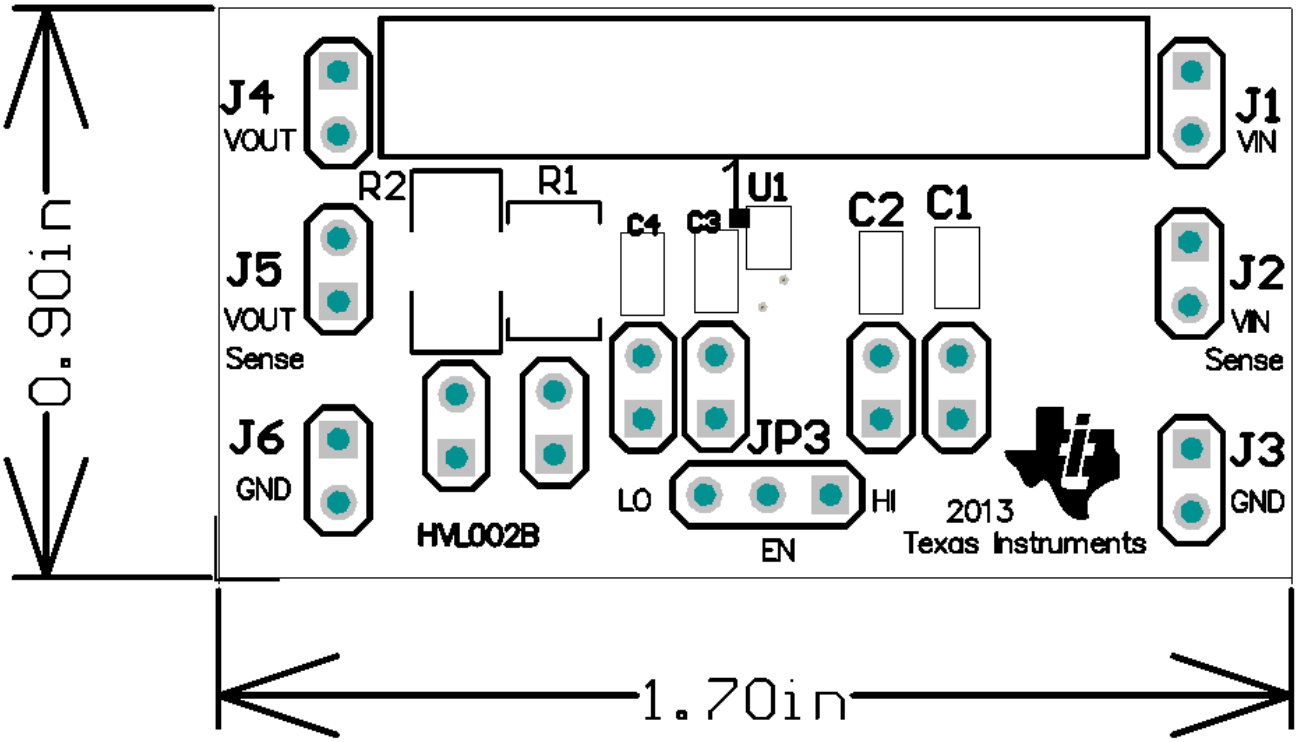

Figure 1. Top Assembly Layer

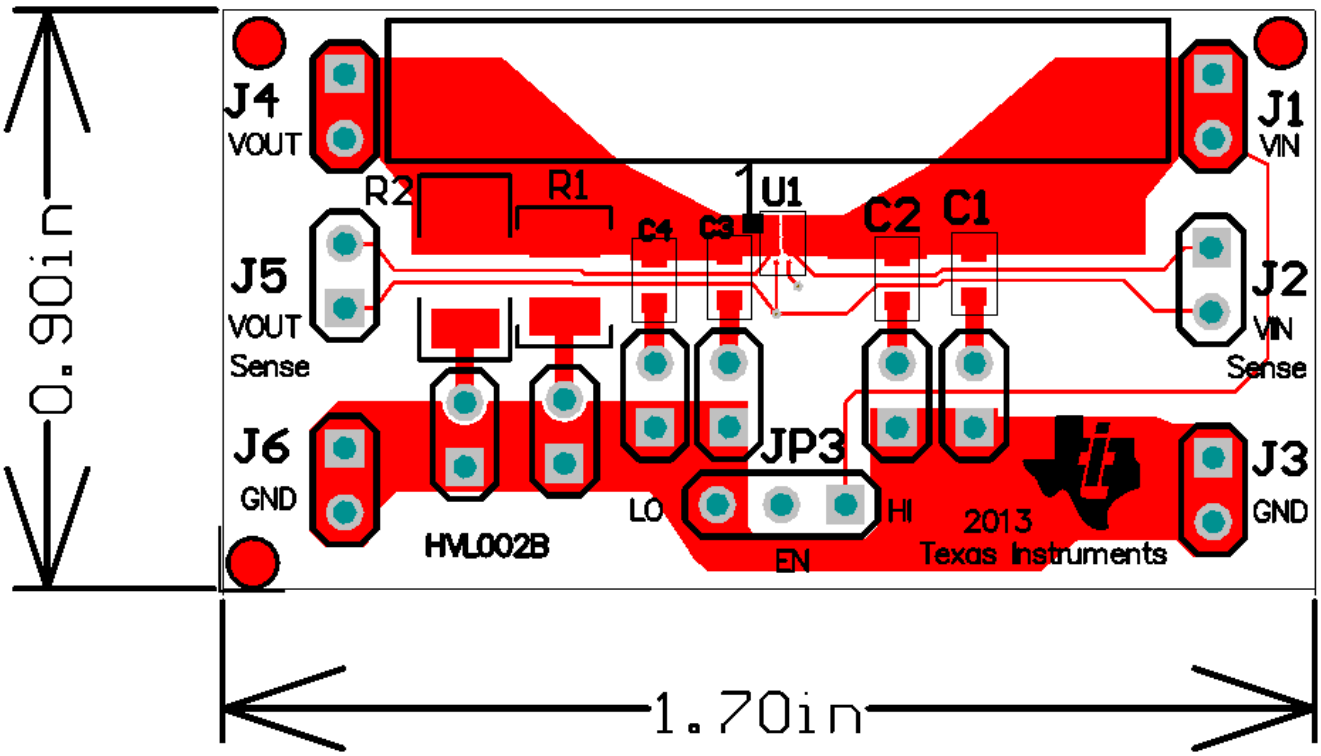

Figure 2. Top Layer

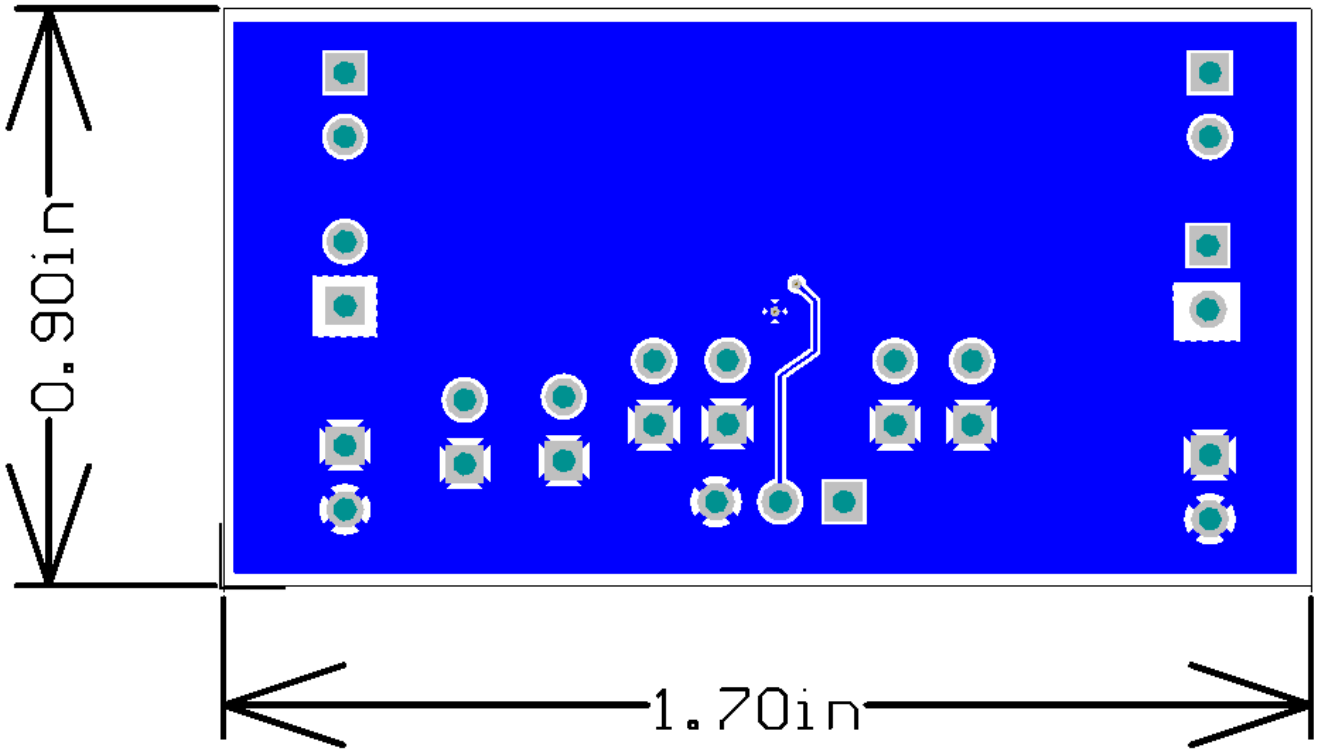

Figure 3. Bottom Layer

5.2 Schematic and Bill of Materials

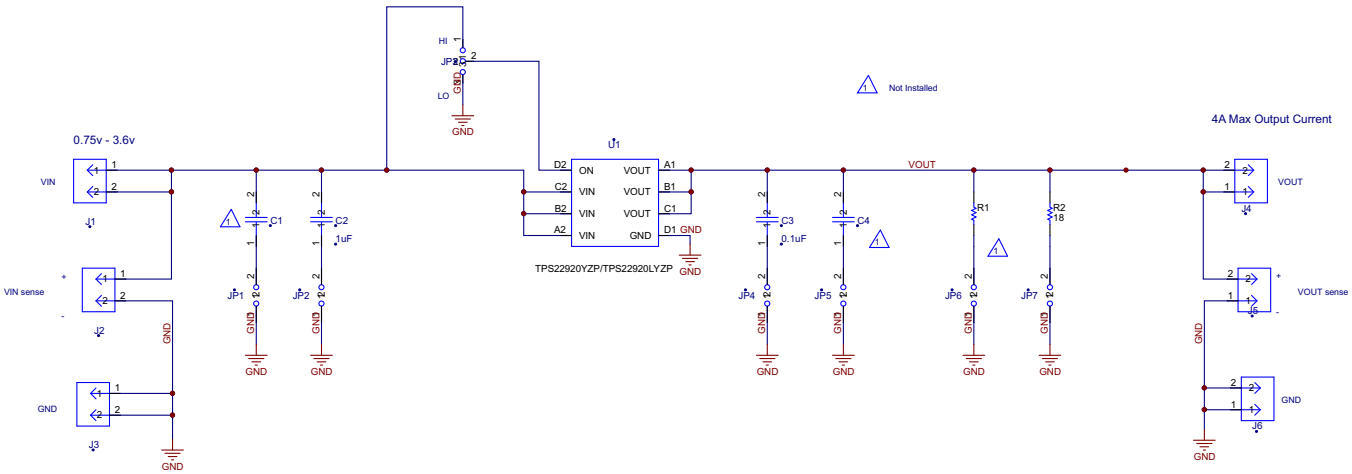

Figure 4. TPS22920EVM-002 Schematic

Table 2. Bill of Materials

-001 Count	-002 Count	RefDes	Value	Description	Size	Part Number	MFR
		–		PCB, 0.9 In x 1.7 In x 0.062 In		HVL002	Any
1	1	C3	0.1 µF	Capacitor, Ceramic,16-V, X7R	603	GRM188F51H104ZA01D	MuRata
1	1	C2	1 µF	Capacitor, Ceramic,6.3-V, X5R 10%	603	GRM188F51E105A12D	MuRata
0	0	C1, C4	OPEN	Capacitor, Ceramic	603	Std	Std
0	0	R1	OPEN	Resistor, 5% 1/8W	1210	Std	Std
1	1	R2	18 Ω	Resistor, 5% 1/2W	2010	ERJ-12ZYJ180U	Std
12	12	J1 – J6, JP1–2, JP4–8	PEC02SAAN	Header, 2pin, 100mil spacing	0.100 inch x 2	PEC02SAAN	Sullins
1	1	JP3	PEC03SAAN	Header, 3pin, 100mil spacing IC,	0.100 inch x 3	PEC03SAAN	Sullins
1	0	U1	TPS22920YZP	Single Chip, Low Input Voltage Current-Limited Load Switch with Shut Off Auto-Restart	YZP	TPS22920YZP	TI
0	1	U1	TPS22920LYZP	Single Chip, Low Input Voltage Current-Limited Load Switch with Shut Off Auto-Restart	YZP	TPS22920LYZP	TI
3	3	N/A	N/A	Shunt, 100-mil, Black	0.100	929950-00	3M

5.3 VOUT Rise Time and TON Response

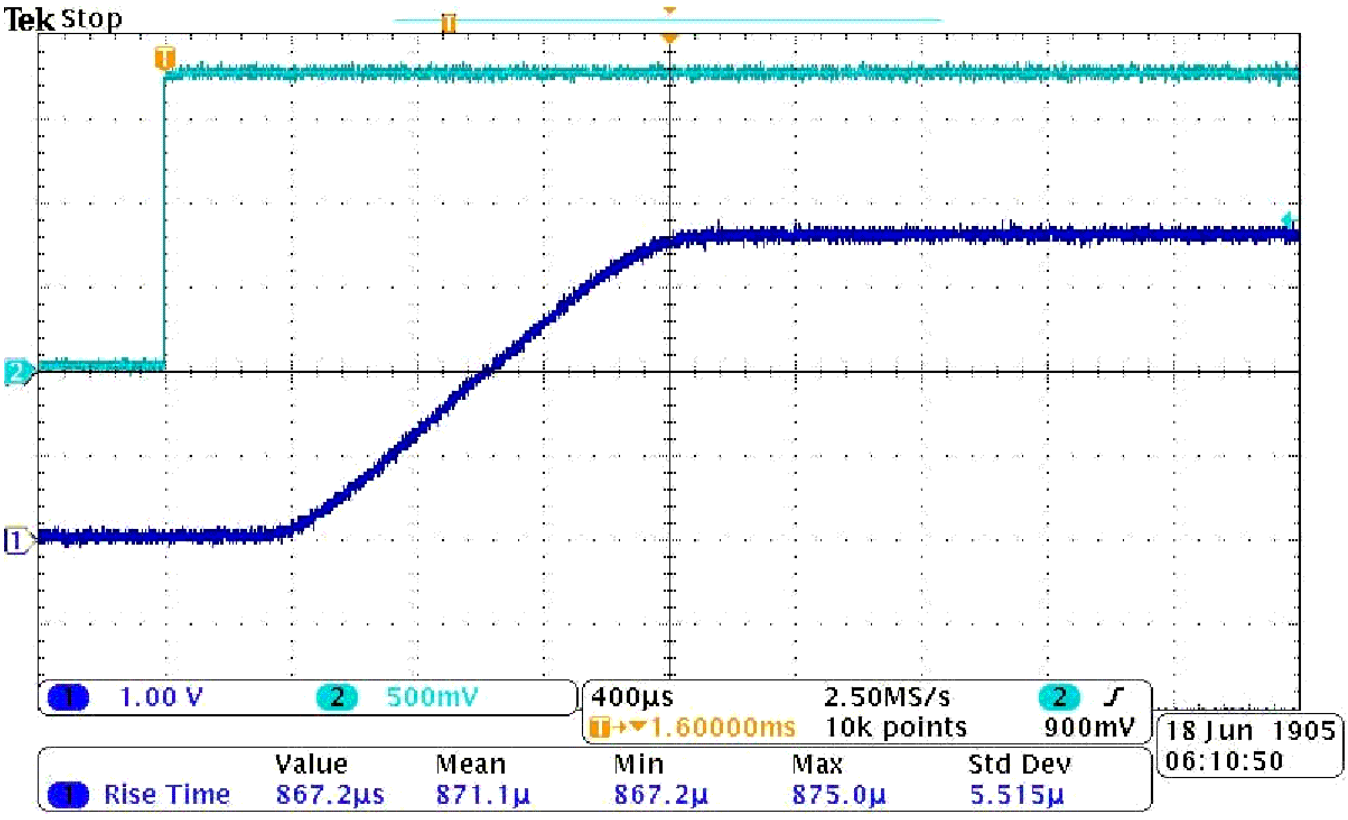

Figure 5. TPS22920 Trise Example

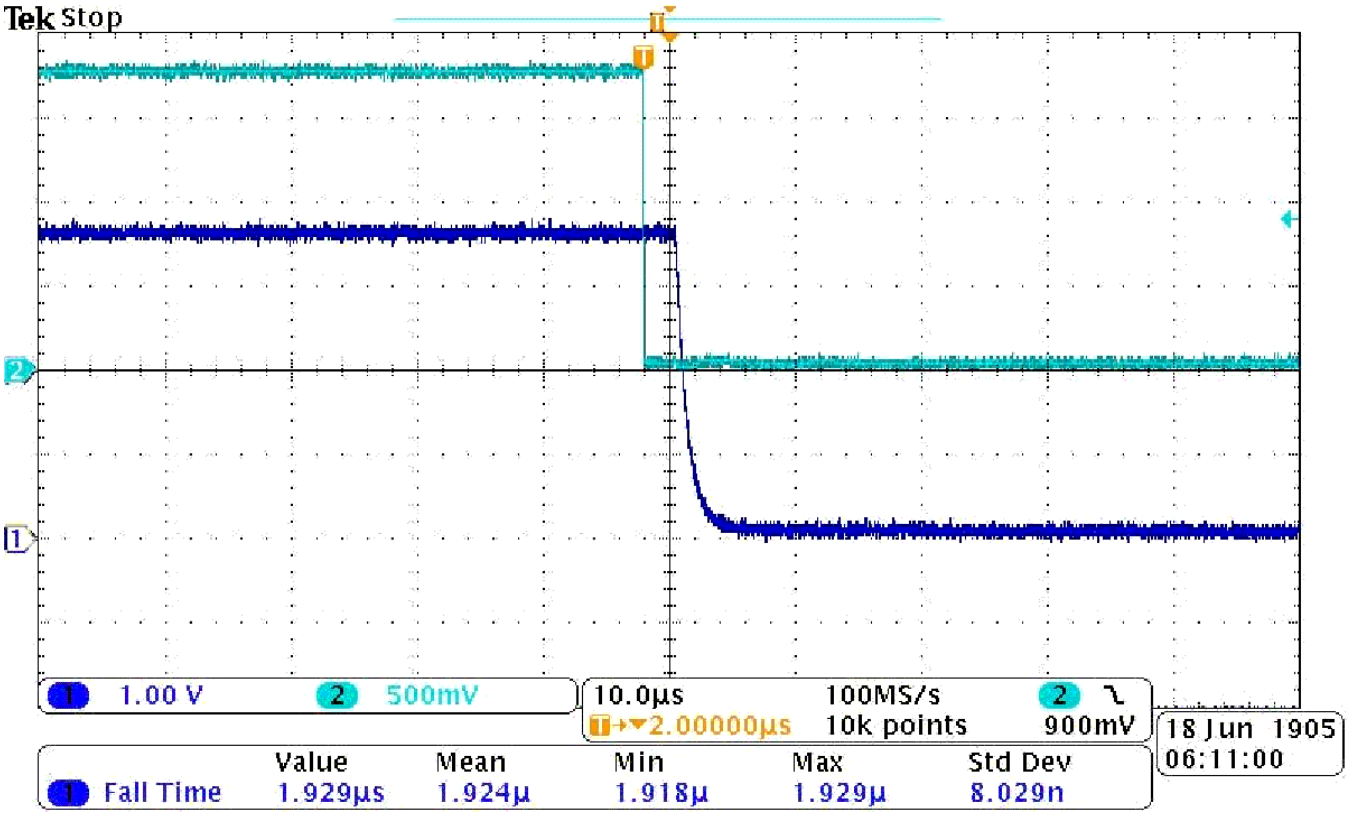

Figure 6. TPS22920 Tfall Example

Revision History

Changes from Original (June 2011) to A Revision	Page
• Updated document to include TPS22920L information.	1

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

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 0.75 V to 3.6 V and the output voltage range of unspecified.

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 50°C. The EVM is designed to operate properly with certain components above 60°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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