TPS6227xEVM-306

The TPS6227xEVM-306 user's guide describes the characteristics, operation, and use of the TPS6227xEVM-306 evaluation module (EVM). This EVM demonstrates the Texas Instruments TPS62270, a 2.25 MHz, synchronous step-down converter that provides up to 400 mA of output current. See the TPS62270 data sheet (SLVS799), *2.25 MHz 400-mA Step Down Converter With Selectable VOUT* for device specifications and recommended operating conditions. This user's guide includes setup instructions, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module.

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1 Introduction

The TPS6227xEVM-306 EVM helps designers evaluate the operation and performance of the TPS62270 DC/DC converter. This converter is a 2.25 MHz, synchronous, step-down converter capable of providing 400 mA of output current.

Related Documentation From Texas Instruments

TPS62270 data sheet (SLVS799), *2.25 MHz 400-mA Step Down Converter With Selectable VOUT*.

2 Setup

Table 1 describes the jumpers and connectors on the EVM, as well as how to properly connect, setup, and use the TPS6227xEVM-306.

Table 1. TPS6227xEVM-306 Jumpers and Connections

Jumper	Connection Description	Connection Instructions
J1 – VIN	Positive input supply voltage	Leads to the input supply should be twisted and kept as short as possible to minimize EMI transmission.
J2 – GND	Return connection for converter input power supply	
J3 – VOUT	Output positive connection	Connect this pin to the positive input of the load.
J4 – GND	Output return connection	
JP1(1) **– ENABLE**	This jumper enables or disables the converter.	Connect the shorting jumper between pin 1 and 2 (ENA and the center pin) enables the converter.(2) Connecting the shorting jumper between pin 2 and 3 (the center pin and DIS) disables the converter. This jumper should never be left floating.
JP2 – VSEL	This jumper is a digital input to the TPS62270 to set the output voltage.	Connecting the shorting jumper between pin 1 and 2 (VSEL and H) sets the output voltage to 1.15V. Connecting the shorting jumper between pin 2 and 3 (VSEL and L) sets the output voltage to 0.9V. Pin 2 of JP2 can be driven by an external logic signal or function generator if desired. This jumper should never be left floating.

(1) The center pin for the JP1 jumper was not labeled when the EVM was constructed. The center pin is referenced in this document as "**the center pin**."
(2) See TPS6227XEVM-306 Schematic and Figure 8 for jumper and pin names.

3 Operation

Connect the positive input power supply to J1. Connect the input power return (ground) to J2. The TPS6227XEVM-306 has an absolute maximum input voltage of 7.0 V. The recommended maximum operating voltage is 6.0 V.

Connect the desired load between J3 and J4. The TPS6227XEVM-306 can supply up to 400 mA of output current.

Configure Jumpers JP1 and JP2 according to TPS6227xEVM-306 Jumpers and Connections (Table 1) and as required for your application.

4 Test Results

This section provides typical performance waveforms (Figure 1 through Figure 7) using the TPS6227XEVM-306 printed circuit board.

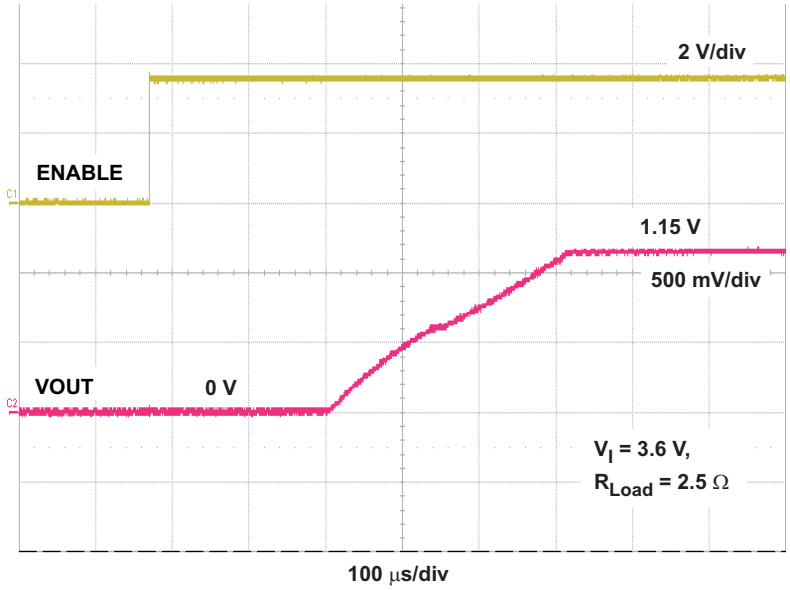

Figure 1. Start up from Enable, V_I = 3.6 V, VOUT = 1.15 V, R_{Load}= 2.5 Ω

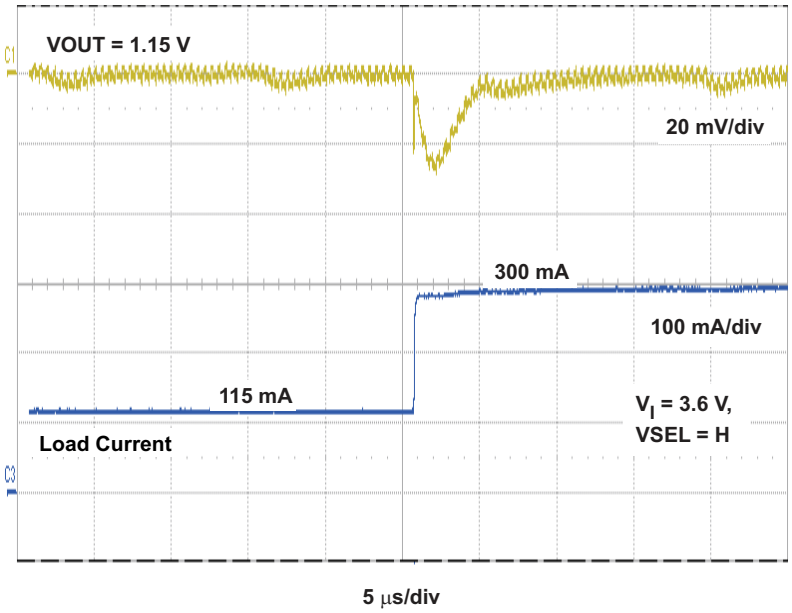

Figure 2. Load Transient, 115 mA to 300 mA step, V_I = 3.6 V, VOUT = 1.15 V

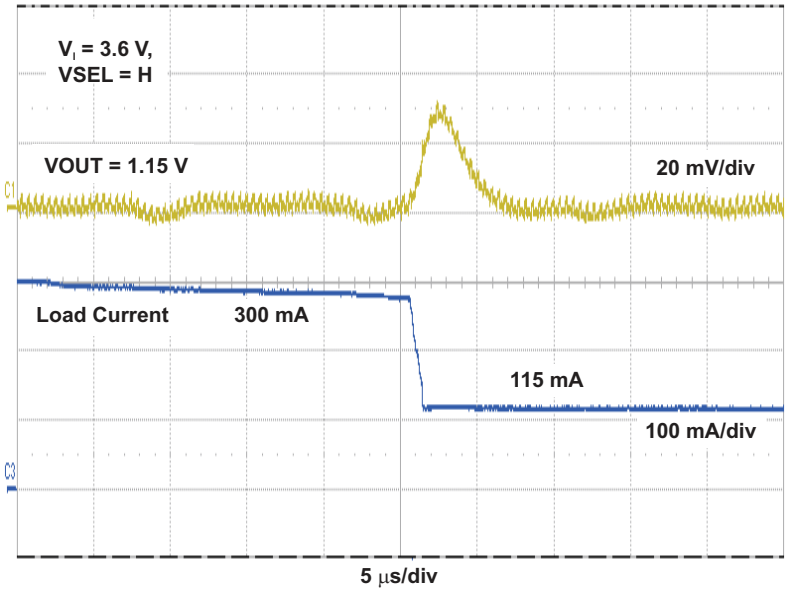

Figure 3. Load Transient, 300 mA to 115 mA step, V_I = 3.6 V, VOUT = 1.15 V

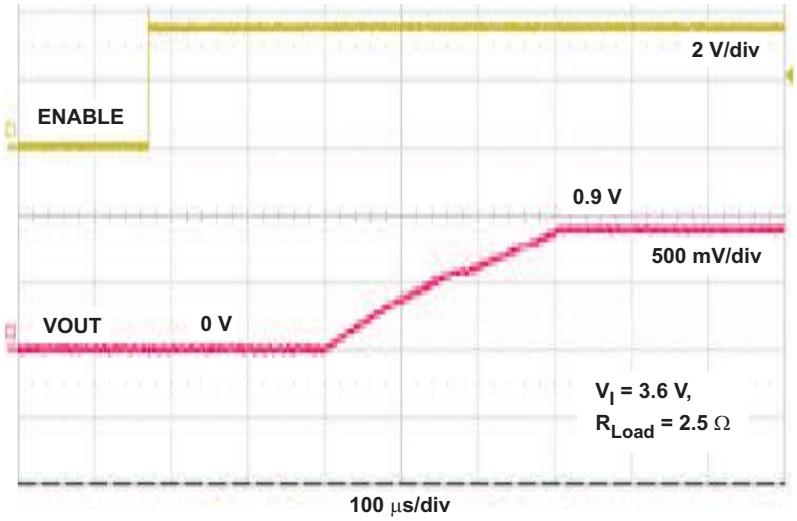

Figure 4. Start up from Enable, V_I = 3.6 V, VOUT = 0.9 V, R_{Load} = 2.5 Ω

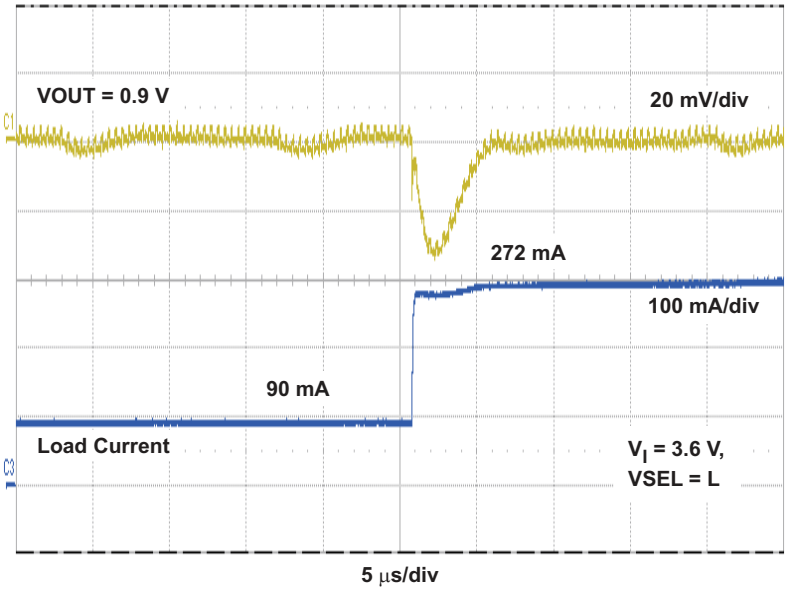

Figure 5. Load Transient, 90 mA to 272 mA step, V_I = 3.6 V, VOUT = 0.9 V

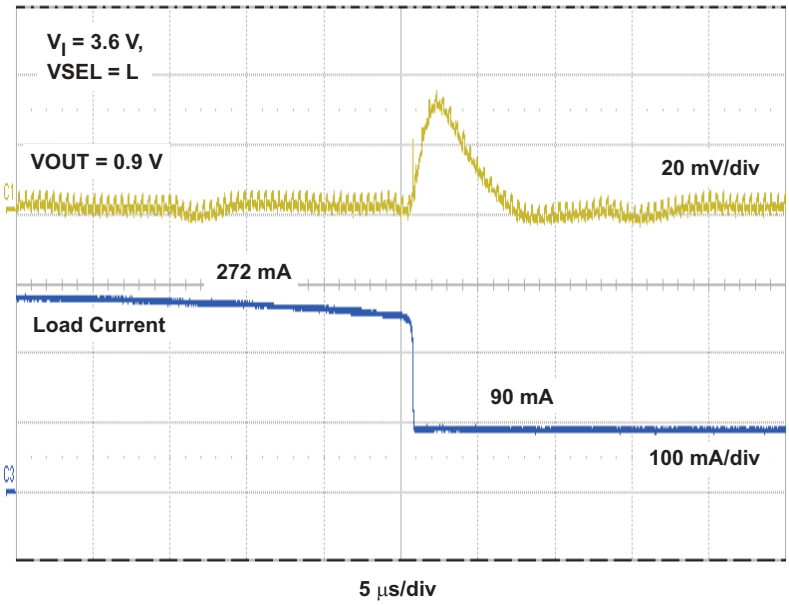

Figure 6. Load Transient, 272 mA to 90 mA step, V_I = 3.6 V, VOUT = 0.9 V

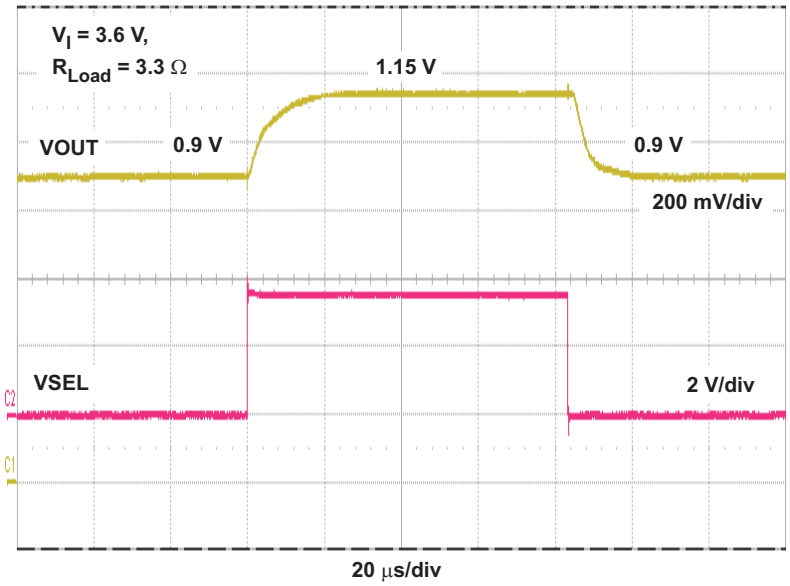

Figure 7. VSEL Output Voltage Response, V_I = 3.6 V, R_{Load} = 3.3 Ω

5 Board Layout

This section provides the TPS6227XEVM-306 board layout and illustrations.

Board layout is critical for all high frequency switch mode power supplies. Figure 8 through Figure 10 show the board layout for the TPS6227XEVM-306 printed wire board (PWB). The nodes with high switching frequencies and currents are kept as short as possible to minimize trace inductance. Careful attention has been given to the routing of high frequency current loops and a single point grounding scheme is used. See the TPS62270 data sheet (SLVS799), *2.25 MHz 400-mA Step Down Converter With Selectable VOUT*, for specific layout guidelines.

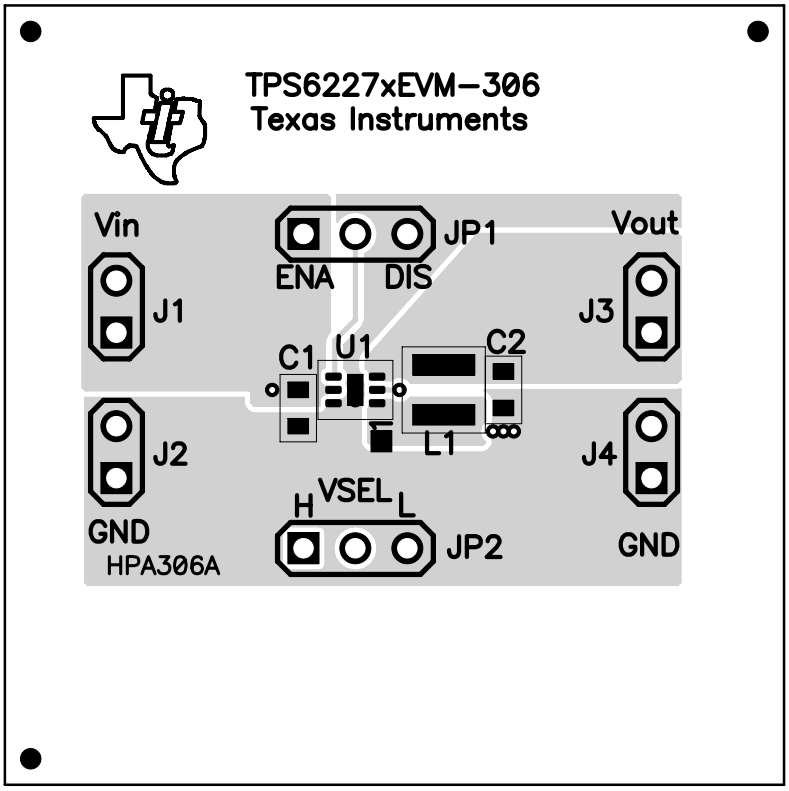

Figure 8. Assembly Layer

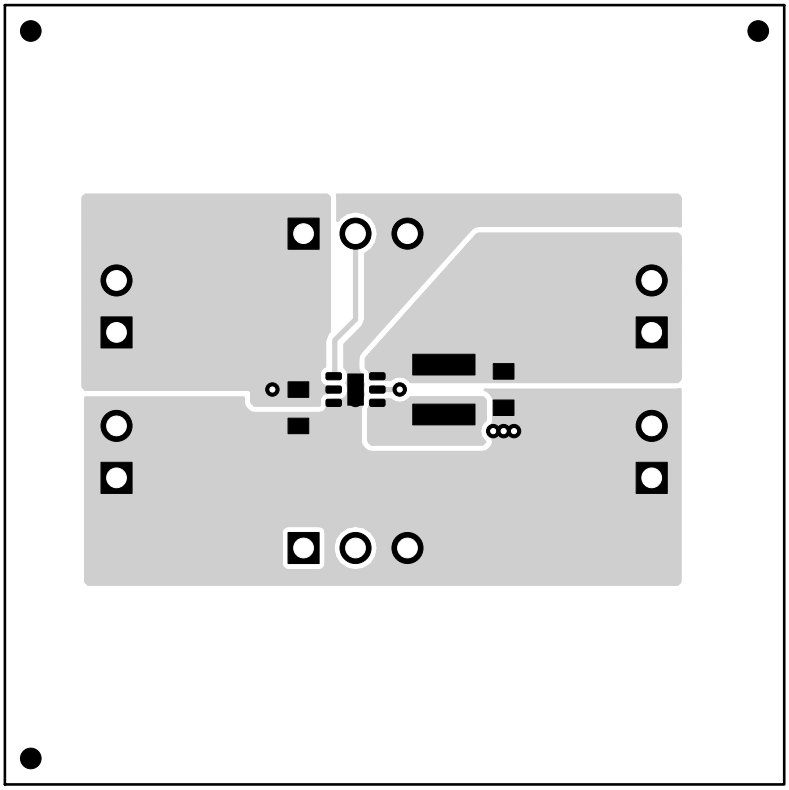

Figure 9. Top Layer Routing

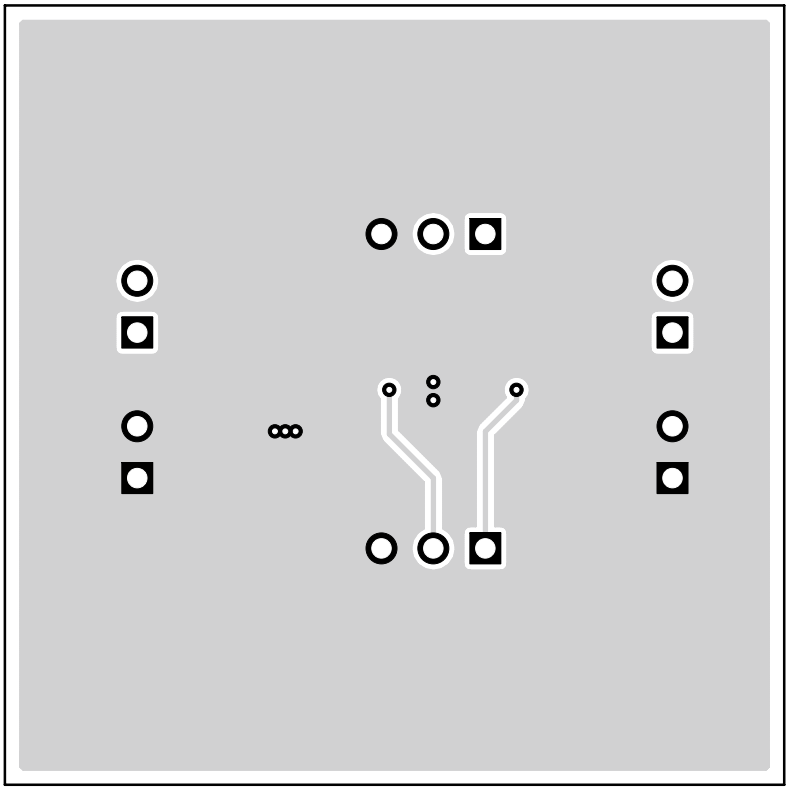

Figure 10. Bottom Layer Routing

6 Schematic and Bill of Materials

This section provides the TPS6227XEVM-306 schematic and bill of materials.

6.1 Schematic

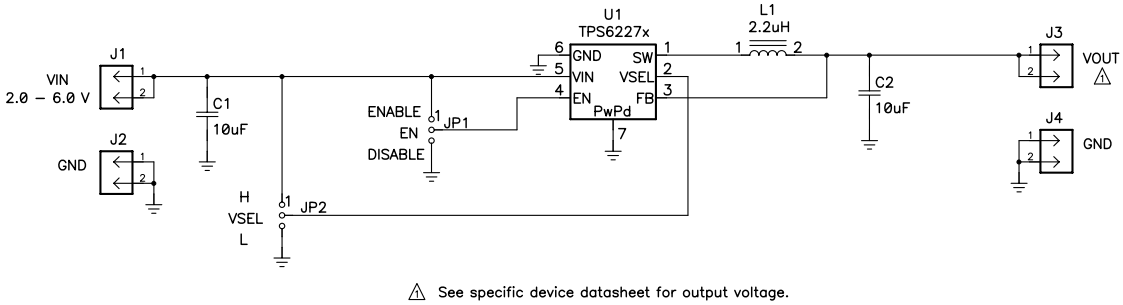

Figure 11. TPS6227XEVM-306 Schematic

6.2 Bill of Materials

Table 2. TPS6227XEVM-306 Bill of Materials(1)(2)(3)(4)

Count	Reference Description	Value	Description	Size	Part Number	MFR
2	C1, C2	10 µF	Capacitor, Ceramic, 6.3 V, X5R, 20%	0603	GRM188R60J106ME47D	muRata
4	J1, J2, J3, J4	PTC36SAAN	Header, 2 pin, 100 mil spacing, (36-pin strip)	0.100 x 2	PTC36SAAN	Sullins
2	JP1, JP2	PTC36SAAN	Header, 3 pin, 100mil spacing, (36-pin strip)	0.100 x 3	PTC36SAAN	Sullins
1	L1	2.2 µH	Inductor, SMT, 1.5 A, 110 mΩ	0.118 x 0.118 inch	LPS3010-222ML	Coilcraft
1	U1	TPS62270DRV	IC, 2.25 MHz 400 mA Step-Down Converter w/ selectable VOUT	SON-6[DRV]	TPS62270DRV	TI
2	—	—	Shunt, 100-mil, Black	0.1	929950-00	3M
1	—	—	PCB	1.50 x 1.50 inch	HPA306	ANY

(1) These assemblies are ESD sensitive, ESD precautions shall be observed.
(2) These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.
(3) These assemblies must comply with workmanship standards IPC-A-610 Class 2.
(4) Reference designators marked with an asterisk ('**') cannot be substituted. All other components can be substituted with equivalent manufacturer's components.

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2.0 V to 6.0 V and the output voltage range of 0.6 V to 6.0 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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