TPS6125xEVM

This user's guide describes the characteristics, operation, and use of the TPS6125x evaluation module (EVM). This EVM enables test and evaluation of the Texas Instruments' TPS61254 and TPS61256 (TPS6125x) devices, a series of 3.5-MHz, up to 5.5-V, step-up dc-dc converters. This user's guide includes EVM specifications, the schematic diagram, bill of materials, and board layout.

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1 Introduction

The TPS6125x device provides a power-supply solution for products powered by either a three-cell alkaline, NiCd or NiMH battery, or a single-cell Li-Ion or Li-polymer battery. The wide input voltage range is ideal for portable power applications such as mobile phones or computer peripherals. In addition, the TPS6125x can also maintain its output biased at the input voltage level. In this mode, the synchronous rectifier is current-limited, and allows external loads (for example, an audio amplifier) to be powered with a restricted supply. In this mode, quiescent current is reduced to 18 µA. Input current in shutdown mode is less than 5 µA in order to maximize battery life.

1.1 Requirements

The TPS6125xEVM is designed to operate over the full input voltage range and produces a fixed output voltage. Refer to Table 1 for fixed output voltage version options.

In order to operate this EVM, only a dc power supply able to deliver between 2.3 V and 5.5 V is required.

1.2 Applications

- USB Host Supplies from a Single Li-Ion Battery
- USB Dedicated Charging Port Supply
- Li-Ion Applications
- Audio Applications
- RF-PA Buffers

1.3 Features

- Up to 92% Efficiency
- V_{IN} Range from 2.3 V to 5.5 V
- 18-µA Quiescent Current in Standby Mode
- 30-µA Quiescent Current in Normal Operation
- 100% Duty-Cycle Mode when $V_{IN} > V_{OUT}$
- Selectable Standby Mode or True Load Disconnect During Shutdown
- Double-sided, two-active-layer printed circuit board (PCB) with all components on top side
- Active converter area of approximately 25 mm^2

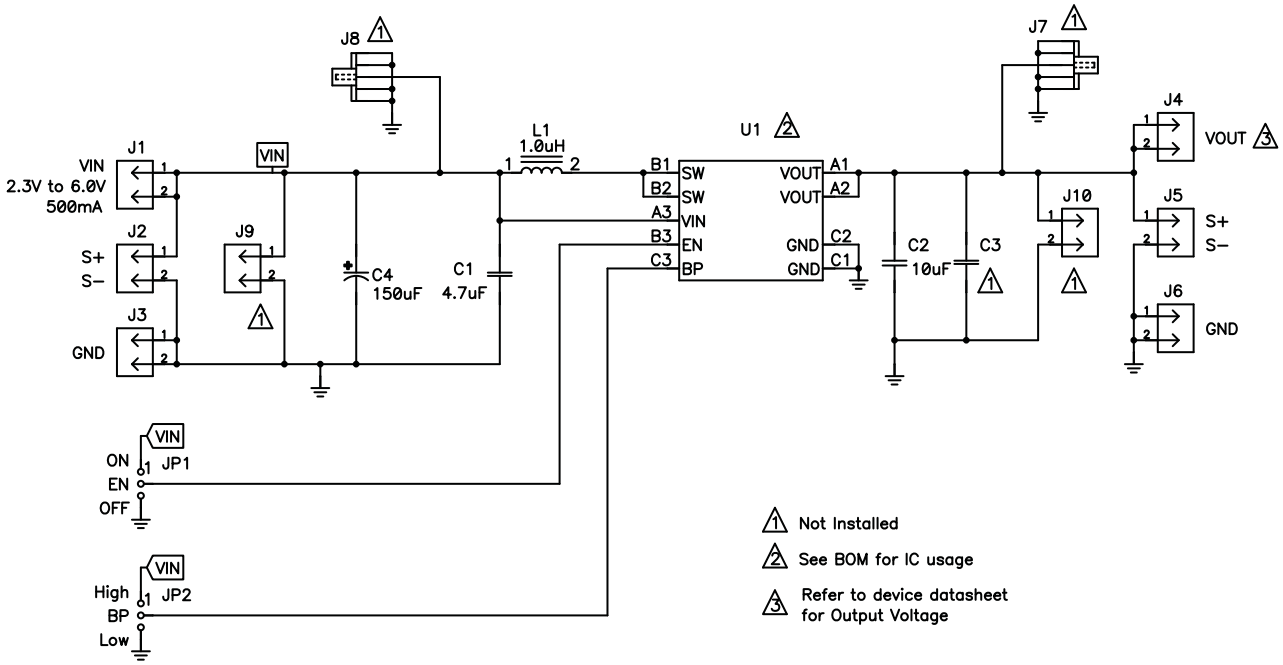
1.4 EVM Ordering Options

Table 1 provides the ordering Information for the various EVM options.

Table 1. TPS6125x Output Voltage Options and Ordering Information

Orderable EVM Number	Device Part Number	Output Voltage
HPA711-001	TPS61254	4.5 V
HPA711-002	TPS61256	5.0 V

2 TPS6125xEVM Schematic



For reference only; see Table 2 for specific values.

Figure 1. TPS6125xEVM Schematic

3 Connector and Test Point Descriptions

3.1 Input Connectors

3.1.1 J1: VIN

This header is the positive connection to the input power supply. The power supply must be connected between these pins and J3 (GND). Twist the leads to the input supply and keep them as short as possible. The input voltage must be between 2.3 V and 5.5 V.

3.1.2 J2: Input Sense Connector

This header is intended to measure the input voltage directly on the input capacitor. Therefore, a four-wire power and sense supply can be connected. Twist the leads to the sensing connector.

3.1.3 J3: GND

This header is the return connection to the input power supply. Connect the power supply between these pins and J1 (VIN). Twist the leads to the input supply and keep them as short as possible. The input voltage must be between 2.3 V and 5.5 V.

3.2 Output Connectors

3.2.1 J4: VOUT

This header is the positive connection of the output voltage. Connect the load between these pins and J6 (GND).

3.2.2 J5: Output Sense Connector

This header is intended to measure the output voltage directly on the output capacitors.

3.2.3 J6: GND

This header is the return connection of the output voltage. Connect the load between these pins and J4 (VOUT).

3.3 Other Connectors

3.3.1 J7: SMA Output Connector

This SMA connector is connected to the output voltage of the converter. It can be used to easily analyze the noise spectrum of the output voltage with a spectrum analyzer. By default, J7 is not assembled on the EVM.

3.3.2 J8 SMA Input Connector

This SMA connector is connected to the input voltage of the converter. It can be used to easily analyze the noise spectrum of the input voltage with a spectrum analyzer. By default, J8 is not assembled on the EVM.

3.4 Jumpers

3.4.1 JP1: Enable Jumper

Placing a jumper across pins EN and ON ties the EN pin to VIN, and enables the device. Placing a jumper across pins EN and OFF ties the EN pin to GND, which disables the device.

3.4.2 JP2 Bypass

JP2 is the operating mode selection pin of the device and is only of relevance when the device is disabled (EN = low). Placing a jumper between BP and Low selects shutdown (that is, true load disconnect mode); thus, the device is in shutdown mode when EN is pulled low.

Placing a jumper between BP and High selects bypass mode. The output is biased at the input voltage level with a maximum load current capability of approximately 150 mA when EN is pulled low. In this mode, the device consumes only a standby current of 18 µA (typ).

4 TPS6125xEVM Assembly Drawings and Layout

Figure 2 through Figure 6 show the design of the TPS6125xEVM-711 PCBs. The EVM has been designed using a four-layer, 1-ounce copper-clad PCB with all components in an active area on the top side of the board. Moving components to both sides of the PCB can offer additional size reduction for space-constrained systems.

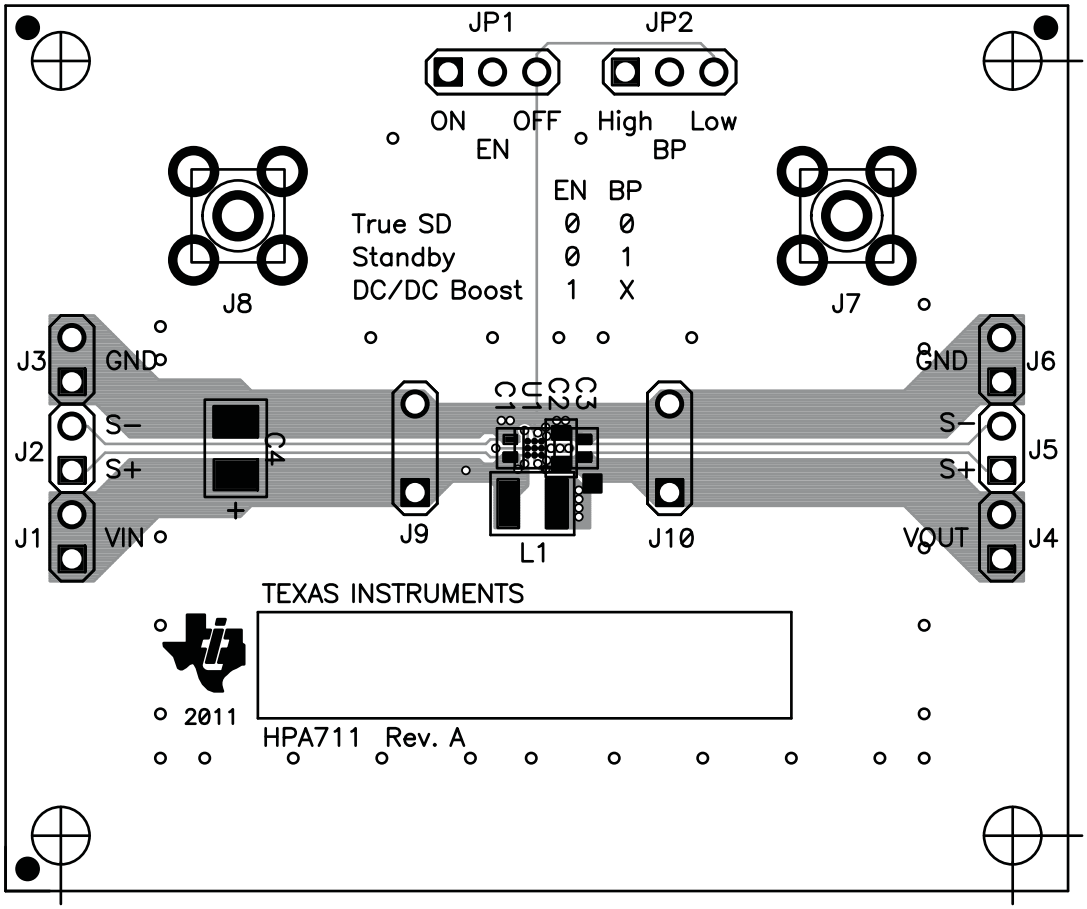


Figure 2. TPS6125xEVM Component Placement (Viewed from Top)

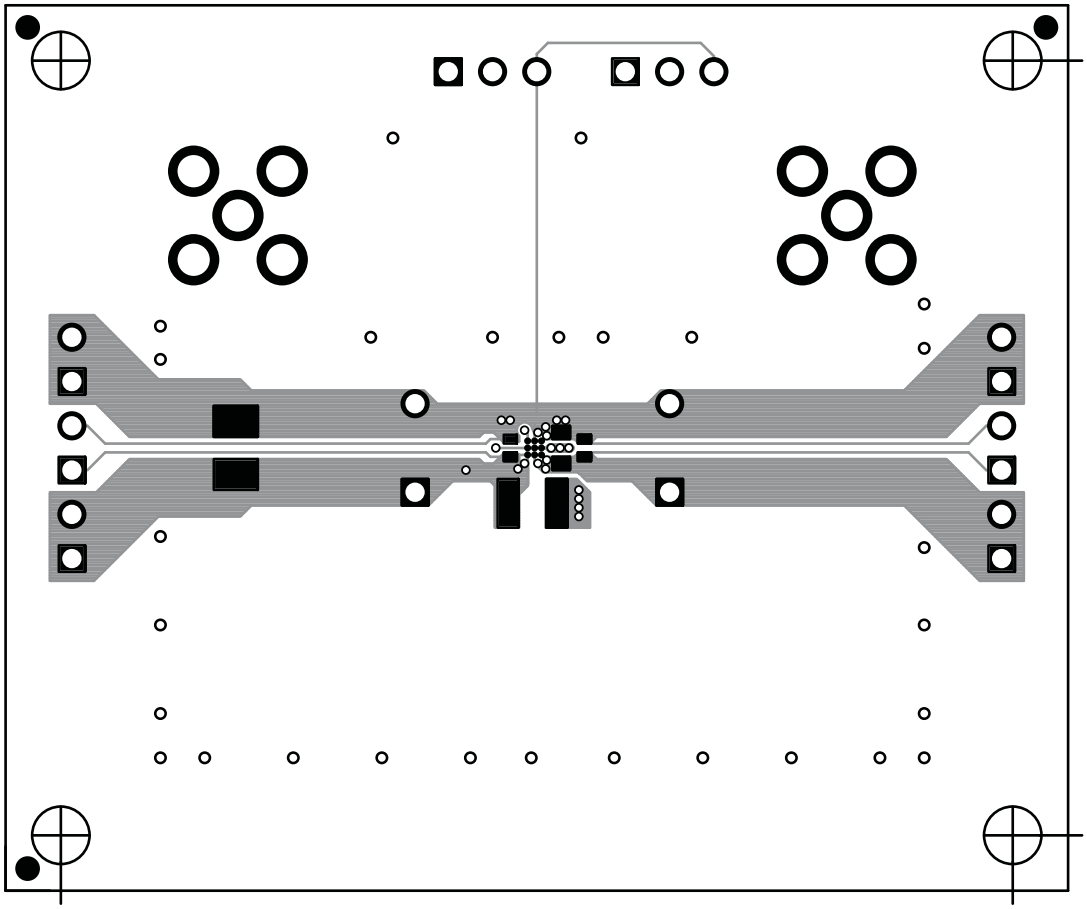


Figure 3. TPS6125xEVM Top Copper (Viewed from Top)

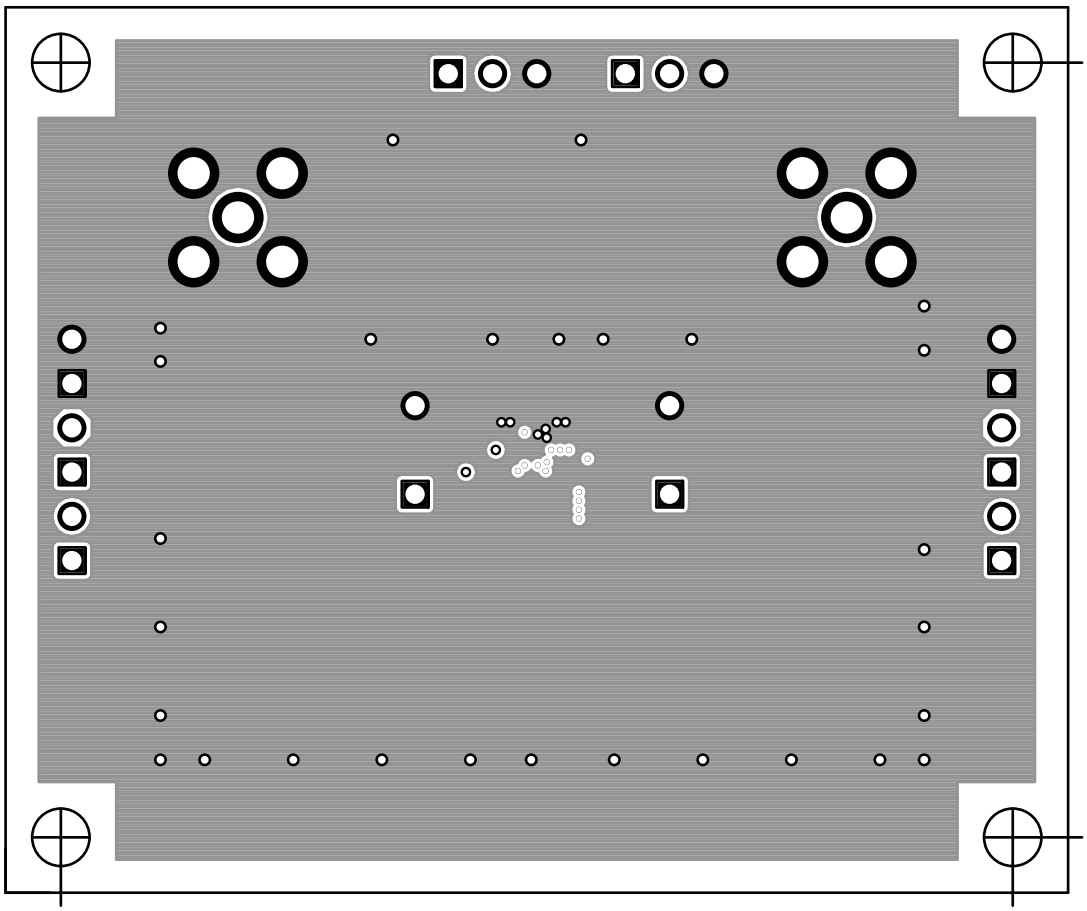


Figure 4. TPS6125xEVM Inner Layer 1 (Viewed from Top)

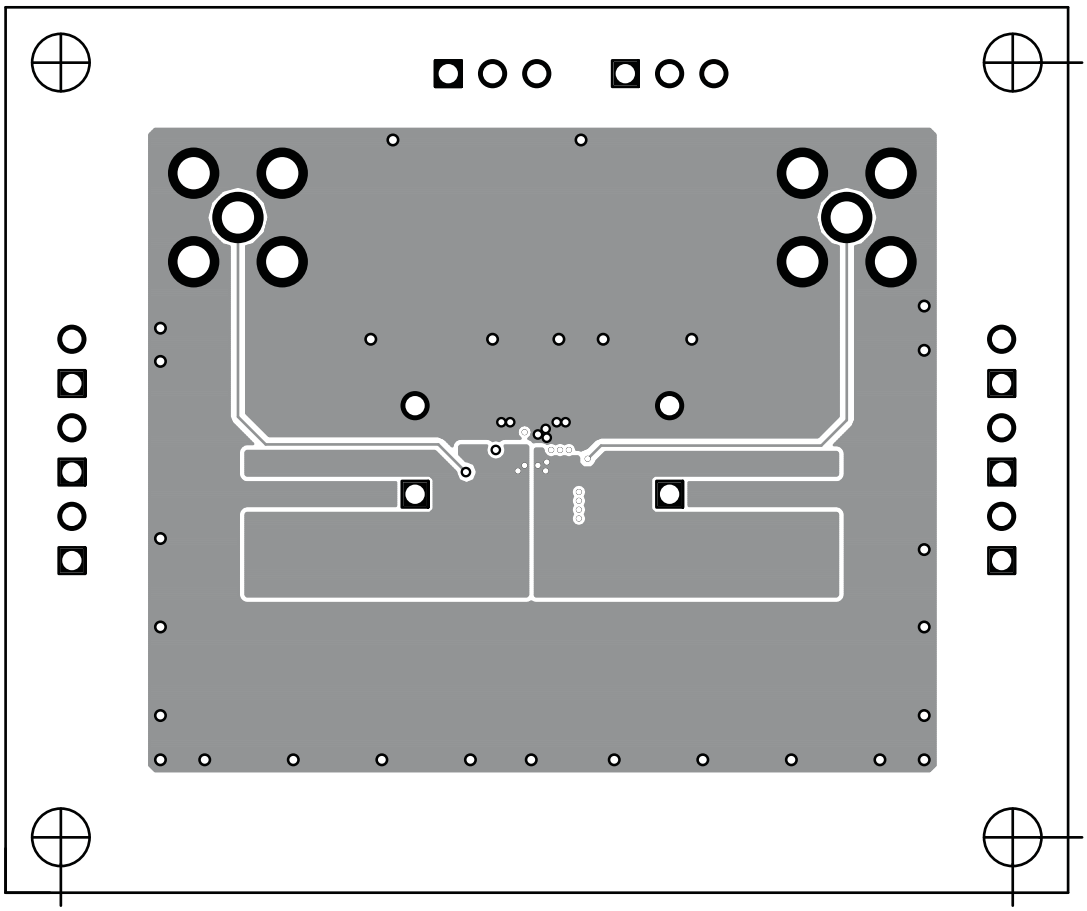


Figure 5. TPS6125xEVM Inner Layer 2 (Viewed from Top)

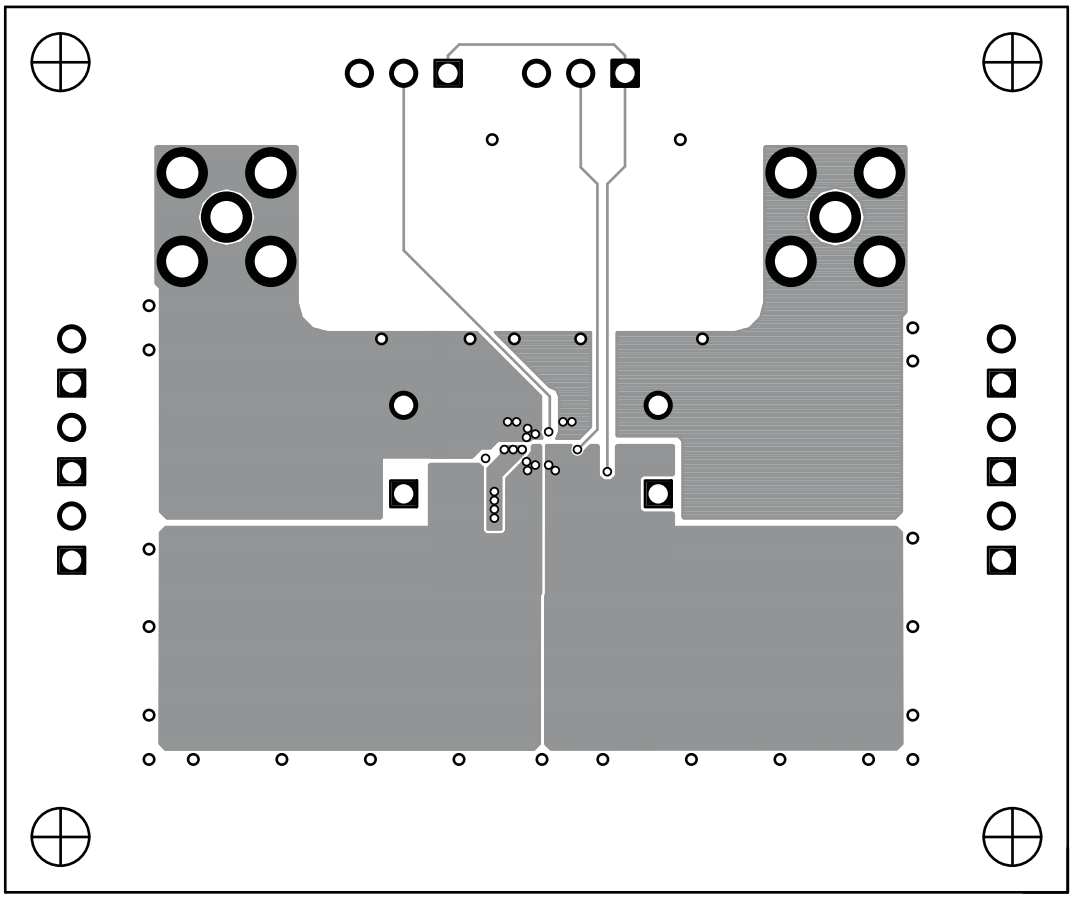


Figure 6. TPS6125xEVM Bottom Copper (Viewed from Bottom)

5 List of Materials

Table 2 lists the EVM components as configured according to the schematic shown in Figure 1.

Table 2. TPS6125xEVM Bill of Materials

Count		RefDes	Value	Description	Size	Part Number	MFR
-001	-002						
1	1	C1	4.7 µF	Capacitor, ceramic, 10 V, X7R, 20%	0402	GRM155R60J475U	Murata
1	1	C2	100 µF	Capacitor, ceramic, 50 V, X7R, 20%	0603	GRM188R60J106ME84D	Murata
0	0	C3	—	Not installed	0605		
1	1	C4	150 µF	Capacitor, Tantalum, 6.3 V, ±20%, 70 mΩ	3528(B)	T520B157M006ATE070	Kemet
1	1	L1	1.0 µH	Inductor, SMT Multi-layer, 1.8 A, 50 mΩ	0.118 x 0.118 inch	LQM32PN1R0MGOL	Murata
1	0	U1	TPS61254YFF	IC, Tiny Boost Converter, 4.5 V	BGA	TPS61254YFF	TI
0	1	U1	TPS61256YFF	IC, Tiny Boost Converter, 5.0 V	BGA	TPS61256YFF	TI

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 2.3 V to 6 V and the output voltage range of 3.0 V to 6.5 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 +60° 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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