TPS61030EVM-208
TPS61031EVM-208
TPS61032EVM-208
For High Efficient High Output Current Boost Converter

User's Guide

January 2003 Power Management Products

SLVU080

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 5.5 V and the output voltage range of 2.5 V to 5.5 V at the dc-dc output and 0.9 V to 5.5 V at the LDO output.

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 100°C. The EVM is designed to operate properly with certain components above 100°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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Chapter 1

Introduction

The Texas Instruments TPS61030 to TPS61032 evaluation modules (EVM) for high-efficiency boost converters help designers to evaluate the different operating modes and the performance of the device. Refer to Table 1–1 for the various EVMs available in this family.

If any other output voltage configuration is to be evaluated, the TPS61030 adjustable output voltage version can be set up to provide an output voltage between 2.5 V and 5.5 V at the output of the boost converter. Only the appropriate feedback resistor divider has to be adjusted. Also, other fixed output voltage versions of the devices can be easily evaluated using the EVM. Refer to the data sheet (SLVS534) for the various fixed output voltage options available in the TPS6103x device family. The TPS6103x has an input voltage range between 1.8 V and 5.5 V. For proper operation the maximum input voltage should not exceed the output voltage. The maximum output current is at least 1000 mA, depending on the input voltage.

Table 1–1. Orderable EVMs

EVM Number	Description
TPS61030EVM-208	Adjustable boost output voltage, set to 5 V
TPS61031EVM-208	Boost output voltage fixed at 3.3 V
TPS61032EVM-208	Boost output voltage fixed at 5 V

Chapter 2

Setup of the EVMs

It is important to establish all connections to the EVM before the power supply for the EVM is turned on.

- ❑ Connect a power supply (1.8 V to V_{OUT}, depending on the output voltage of the EVM) to the INPUT header.
- ❑ Connect a voltmeter to the OUTPUT header.
- ❑ Verify that all jumpers are set to their desired value (EN, SYNC). Default setting is EN to V_{BAT}, and SYNC to GND.
- ❑ Turn on the power supply and verify the output voltage.

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2.1 Evaluation With the TPS6103x EVM

This chapter details the evaluation process and features of the EVM. For detailed evaulation, a load must be connected to the output terminal in order to adjust the load current between 0 mA and 1600 mA.

For accurate output voltage and input voltage measurements, it is important to measure the voltage on the input and output voltage terminals with Kelvin contacts or with a voltmeter connected directly to the input voltage or output voltage terminals. This eliminates any measurement errors related to voltage drops along the input and output terminal wires connected to the power supply or load.

2.1.1 Enable (EN) Jumper

This jumper is used to enable the device. Connecting the enable pin (EN) to V_{BAT} enables the part. The device is disabled when EN is set to GND. For more details refer to the data sheet.

2.1.2 Power Save Mode Enable and Synchronization (SYNC) Jumper

This jumper enables the device to enter into power save mode at light load, when it is set to GND. The device automatically stops switching when the output voltage reached its upper threshold, and starts switching again, when the lower threshold of the output voltage is reached.

When disabling the power save function by setting the jumper to V_{BAT}, the device stays operating in fixed frequency mode, regardless of the load current value. In this mode, however reverse current flows back to the input during light load operation, increasing power losses. The operating frequency stays constant, which implies low output voltage ripple.

To synchronize the operating frequency to an external frequency, a clock signal can be applied to the SYNC pin. The device then operates at the applied operating frequency, with no Power Save Mode. For more details about the applied frequency and the synchronization frequency range, refer to the device data sheet.

2.1.3 LBI/LBO Comparator

The LBO terminal is an open drain output and has a pullup resistor, R6, connected to the output. The signal on this pins goes low as soon as the input voltage at LBI falls below the threshold of 500 mV. Refer to the more detailed description in the data sheet. The LBO output stays at high-impedance when the input voltage at LBI is above the appropriate threshold. A resistor divider (R1, R2) is used on the EVM to monitor the supply voltage.

More details about setting the low battery threshold voltage can be found in the data sheet (SLVS534).

Chapter 3

Bill of Materials, PCB Layout and Schematic

This chapter contains bill of materials, PCB layout of the EVM, and schematic.

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3.1 Bill of Materials

The bill of materials for the TPS6103x EVM is shown in Table 3–1 with adjustable and fixed output voltage versions.

More details about the design and component selection for the dc-dc converter can be found in the data sheet.

Table 3–1. Bill of Materials

Reference	Description	Manufacturer	Comments
C3, C4	100 µF 10 V, Low ESR tantalum size D	Vishay	594D–107X0016C2T
C1	10 µF X5R 6.3 V, capacitor SMD1206	TDK	C3216X5R0J106M
C2	2.2 µF X5R 10 V, capacitor SMD0805	TDK	C2012X5R1A225M
L1	6.8 µH, CDRH124-6R8	Sumida	Also possible: Sumida CDRH104R-7R0 or EPCOS B82464-G4682-M
R4	200 kΩ,1%, resistor SMD0805		TPS61030EVM, not used on the fixed output voltage versions
R3	1.8 MΩ,1%, resistor SMD0805		TPS61030EVM, not used on the fixed output voltage versions
R6	1 MΩ, 1%, resistor SMD0805		
R1	560 kΩ, 1%, resistor SMD0805		
R2	180 kΩ, 1%, resistor SMD0805		
J1, J2	Header 1×4, 0.1″ pitch		
J6, J7	Header 1×2, 0.1″ pitch		
J5	Header 1×3, 0.1″ pitch		With jumper set to VBAT
J4	Header 1×3, 0.1″ pitch		With jumper set to GND
U1	TPS61030PW, TSSOP16 PowerPAD	TI	TPS61030EVM–208
	TPS61031PW, TSSOP16 PowerPAD	TI	TPS61031EVM–208
	TPS61032PW, TSSOP16 PowerPAD	TI	TPS61032EVM–208

3.2 PCB Layout

For all switch mode power supplies the PCB layout is a critical step in the power supply design process. The figures below show the layout for the adjustable and fixed output voltage EVMs. Please refer to the data sheet for further layout guidelines. The required board area for the complete dc-to-dc converter solution takes up less than 494 mm^2 (19 mm $\times$ 26 mm) on a double sided PCB, as it is indicated by the rectangular on the component placement plot.

Figure 3–1. Component Placement

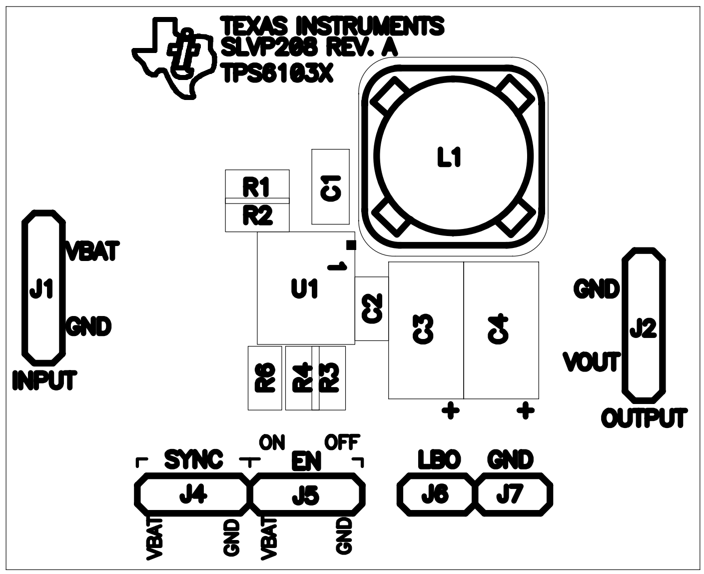


Figure 3–2. Top Layer

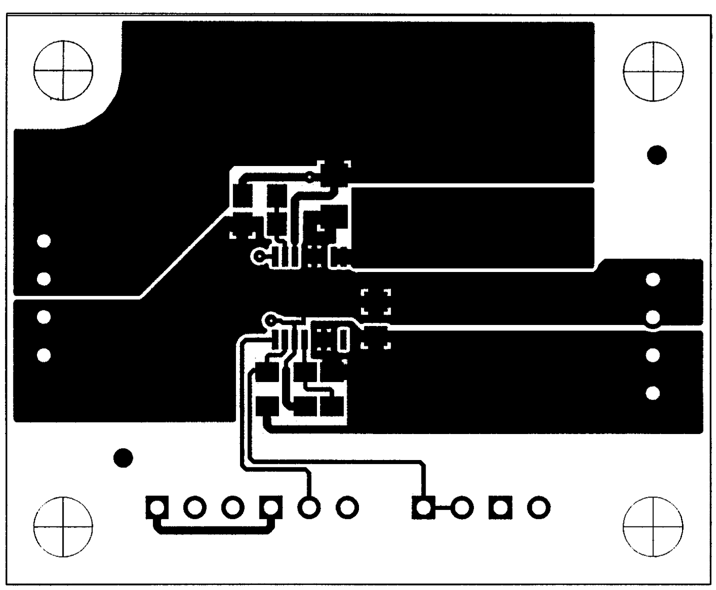
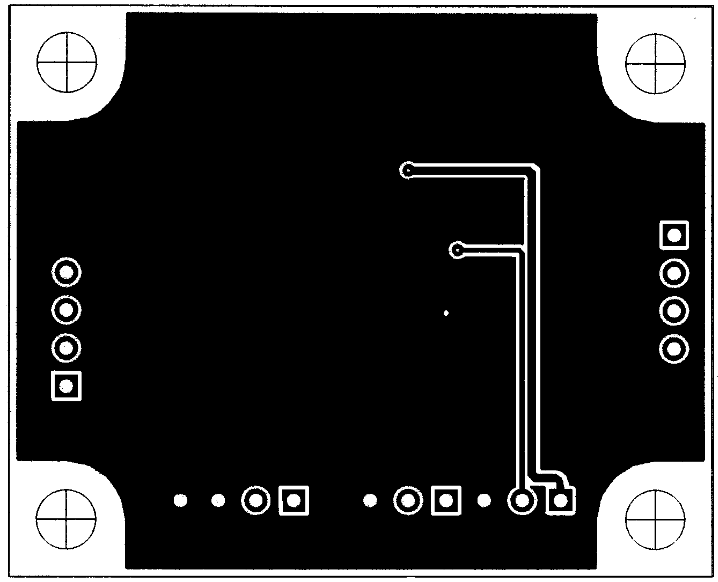


Figure 3–3. Bottom Layer



3.3 Schematic

Figure 3–4. TPS6103x EVM Circuit Diagram