

TPS6103x EVM-208 For High Efficient Output Current Boost Converter

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1 Introduction

The Texas Instruments TPS61030, TPS61031, and TPS61032 evaluation modules (EVM) for high-efficiency boost converters help designers evaluate the different operating modes and the performance of the device. See [Table 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 device versions can be easily evaluated using the EVM. Refer to the [SLUS534](#) data sheet for the 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.

Table 1. EVMS You Can Order

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

2 Setting Up the EVMs

It is important to establish all connections for the EVM before power is applied to the EVM.

- ☐ Connect a power supply (1.8 V to VOUT, 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 the correct value (EN, SYNC). Default value for EN for V_{BAT} and SYNC for GND.
- ☐ Turn on the power supply and verify the output voltage is within limits described in the **EVM Warnings and Restrictions** section. It is important to operate this EVM within the input voltage range of 1.8 V to 5.0 V and the output voltage range of 2.5 V to 5.5 V at the dc-dc output.

2.1 Introduction—Evaluation with the TPS6103x EVM

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

CAUTION

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.

2.2 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 about the Enable Jumper, refer to the [SLUS534](#) data sheet.

2.3 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 VBAT, 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 synchronization frequency range, refer to the [SLUS534](#) data sheet.

2.4 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 [SLUS534](#) 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 [SLUS534](#) data sheet.

3 Bill of Materials, PCB Layout, and Schematic

Section contents:

- [Section 3.1](#) Bill of Materials
- [Section 3.2](#) PCB Layout
- [Section 3.3](#) Schematic

3.1 Bill of Materials

The TPS6103x EVM Bill of Materials is shown in [Table 2](#) 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 [SLUS534](#) data sheet.

Table 2. TPS6103x EVM Bill of Materials

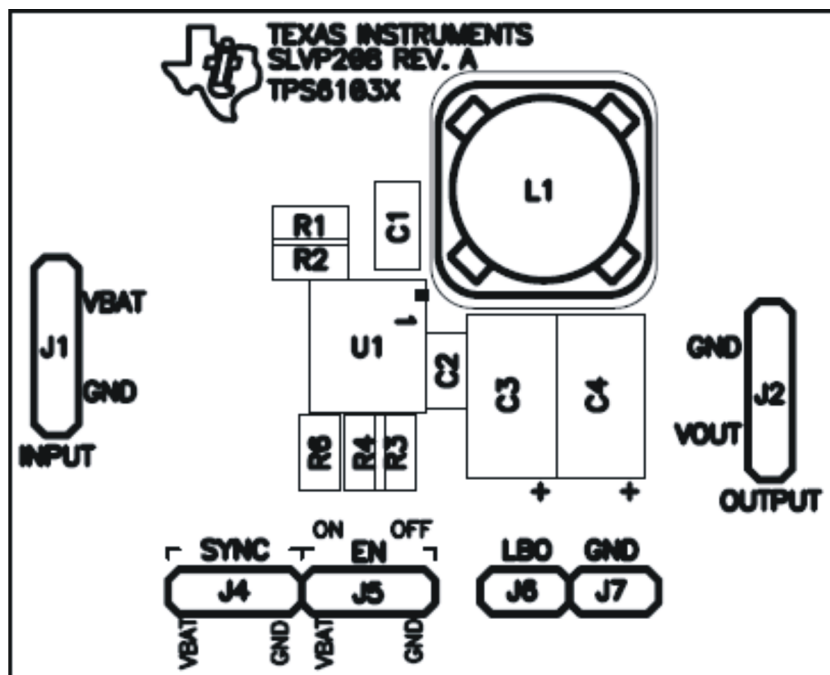
Reference	Description	Manufacturer	Comments
C3, C4	100 μ F 10 V, Low ESR tantalum size D	Vishay	594D–107X0016C2T or 594D–107X0010C2T
C1	10 μ F X5R 6.3 V, capacitor SMD1206	TDK	C3216X5R0J106M
C2	2.2 μ F X5R 10 V, capacitor SMD0805	TDK	C2012X5R1A225M
L1	6.8 μ H, CDRH124-6R8	Sumida	SUMIDA CDRH104R–7R0, CDRH104R–100, or EPCOS B82464–G4682-M
R4	200 k Ω , 1%, resistor SMD0805		TPS61030EVM, not used on the fixed output voltage versions
R3	1.8 M Ω , 1%, resistor SMD0805		TPS61030EVM, not used on the fixed output voltage versions
R6	1 M Ω , 1%, resistor SMD0805		
R1	560 k Ω , 1%, resistor SMD0805		
R2	180 k Ω , 1%, resistor SMD0805		
J1, J2	Header 1 $\times$ 4, 0.1" pitch		
J6, J7	Header 1 $\times$ 2, 0.1" pitch		
J5	Header 1 $\times$ 3, 0.1" pitch		With jumper set to V_{BAT}
J4	Header 1 $\times$ 3, 0.1" pitch		With jumper set to GND
U1	TPS61030PW, TSSOP16 PowerPAD	TI	TPS61030EVM–208
	TPS61031PW, TSSOP16 PowerPAD		TPS61031EVM–208
	TPS61032PW, TSSOP16 PowerPAD		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. [Figure 1](#), [Figure 2](#), [Figure 3](#), and [Figure 4](#) show the layout for the adjustable and fixed output voltage EVMs. Please refer to the [SLUS534](#) data sheet for further layout guidelines.

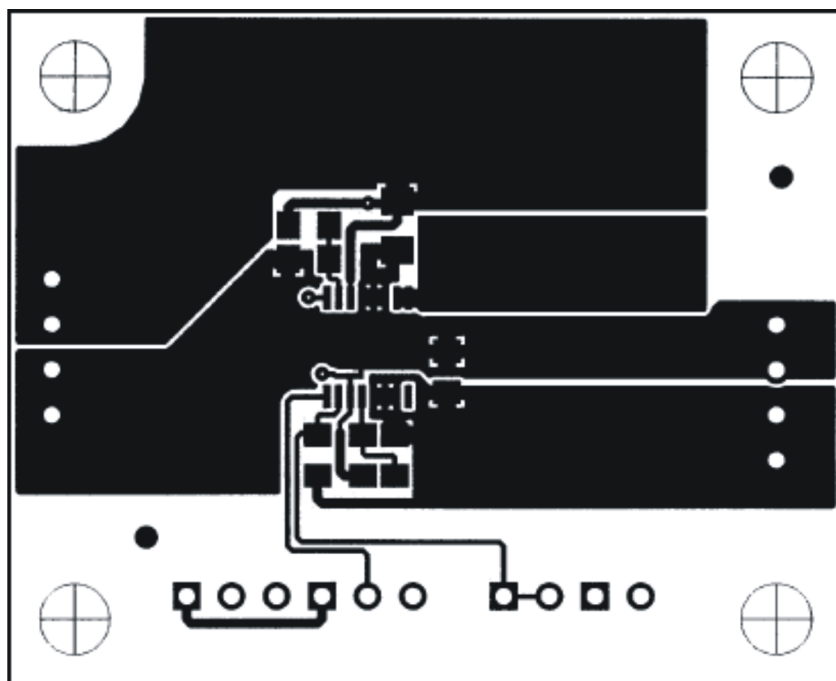
The required board area for the complete dc-to-dc converter solution takes up less than 494 mm² (19 mm $\times$ 26 mm) on a double-sided PCB, as it is indicated by the [Figure 1](#) component placement.

Figure 1. Component Placement



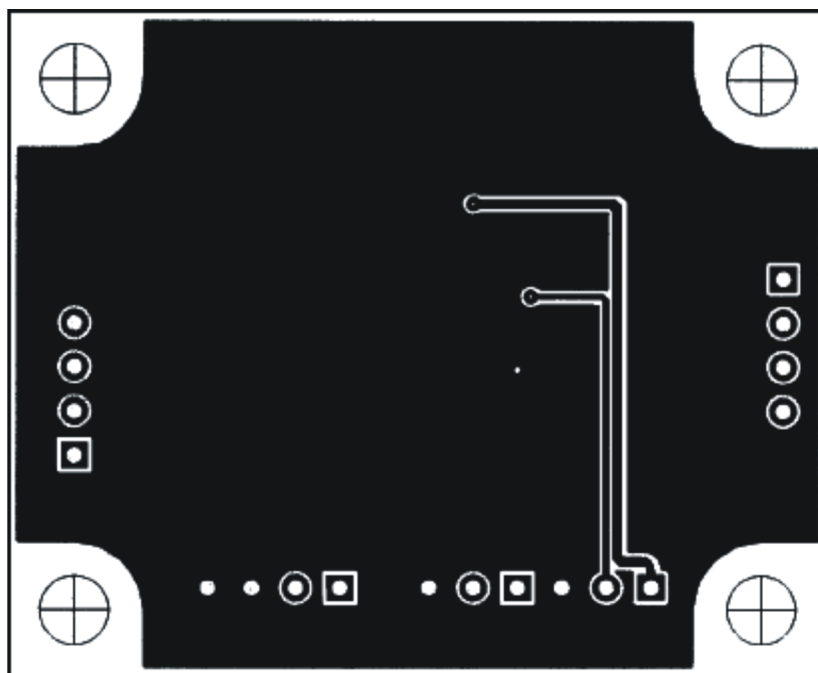
C001

Figure 2. PCB Top Layer



C002

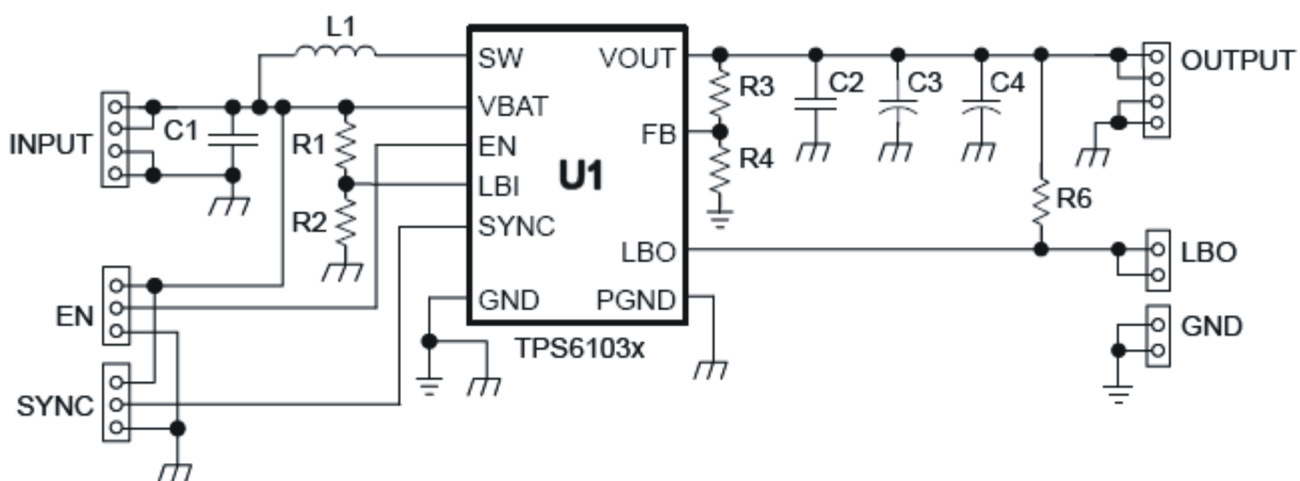
Figure 3. PCB Bottom Layer



C003

3.3 Schematic

Figure 4. TPS6103x EVM Circuit Diagram



C004

Revision History

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

Changes from A Revision (October 2007) to B Revision	Page
Deleted 1000 mA maximum output current statement in <i>Introduction</i>.....	1

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- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
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http://www.tij.co.jp/llds/ti_ja/general/eStore/notice_01.page

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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