Evaluation Board for Step-Up DC-DC Converter

ADP1611-EVAL

FEATURES

Fully integrated 1.2 A, 0.23 Ω power switch
Pin-selectable 700 kHz or 1.2 MHz PWM frequency
90% efficiency
Adjustable output voltage up to 20 V
3% output regulation accuracy
Adjustable soft start
Input undervoltage lockout
MSOP 8-lead package

APPLICATIONS

TFT LC bias supplies
Portable applications
Industrial/instrumentation equipment

GENERAL DESCRIPTION

The ADP1611 is a step-up dc-to-dc switching regulator capable of providing up to 20 V and operates from input voltage range of 2.5 V to 5.5 V. The features an internal MOSFET switch, programmable soft-start, and fast transient response. The ADP1611's frequency can be user-selected to operate at either 700 kHz to optimize the regulator for high efficiency or to 1.2 MHz to allow the use of a small surface-mount inductor.

The ADP1611-EVAL provides a 15 V output voltage from an input as low as 3.5 V. It delivers up to 350 mA output current. The ADP1611-EVAL is supplied fully operational with the following specifications:

Input Voltage Range	3.5 V to 5.5 V
Output Voltage	15 V ± 3%
Output Current	up to 350 mA

For more information regarding the operation of the ADP1611, please refer to the product data sheet included with the evaluation board, or download the document at www.analog.com.

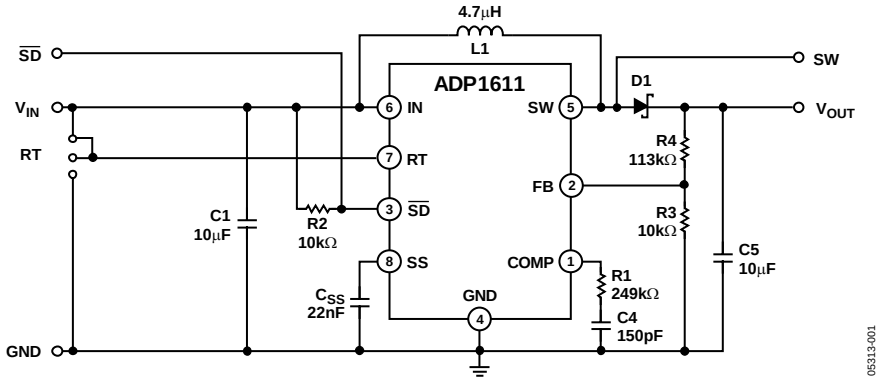

Figure 1. ADP1611 Schematic Evaluation Board

Rev. 0

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EVALUATION BOARD HARDWARE

TEST EQUIPMENT

The following is a list of suggested equipment for testing the ADP1611 evaluation board:

- 1 ea. 0 V to 5.5 V, 3 A Power Supply
- 3 ea. Digital Multimeter
- 1 ea. 100 MHz Oscilloscope
- 1 ea. Electronic Load

TEST INSTRUCTIONS

1. Make sure the jumper J1 (RT) is connected to V_{IN} for 1.2 MHz operation. Do this by placing the jumper on the right two pins of J1.
2. Connect an external power supply in series with an ammeter to the ADP1611-EVAL with the positive connection at input (V_{IN}) and the negative connection at GND. Monitor the voltage at V_{IN} with a voltmeter. Adjust the supply voltage to correct for any voltage drop on the wires and ammeter.
3. Verify that the ADP1611-EVAL is operating properly by checking that the input and output (V_{OUT}) voltages are within their normal operating range.
4. Monitor the voltage at V_{OUT} with a voltmeter.
5. Apply a 0 mA to 350 mA load current between V_{OUT} and GND. You can use an active or a passive load. When using an active load, make sure the positive input is connected to V_{OUT} and the negative input is connected to GND. Make sure, too, that the input current doesn't exceed the rated current of the 1.2 A switch.
6. Monitor the switching waveform by connecting an oscilloscope probe on the SW test point.

CONFIGURING THE BOARD

To set the output to some voltage other than the original 15V setting, the feedback resistors R3 and R4 should be changed. Use the following equation to calculate R1 for the desired output voltage:

$$R4 = 10\,\text{k} \times [(V_{OUT} / 1.23) - 1]$$

Use resistors with at least 1% accuracy for better output voltage accuracy.

Changing R4 affects the loop dynamics of the regulator. When the output voltage is changed, adjust the compensation and the power components accordingly. See the Inductor and Compensation Selection section of the ADP1611 data sheet.

The shutdown pin, $\overline{SD}$, of the ADP1611-EVAL is pulled up by the 10 kΩ resistor. To turn off the converter, short $\overline{SD}$ to GND. To disconnect the output voltage from the input voltage at shutdown, use the circuit in Figure 30 of the ADP1611 data sheet.

The ADP1611-EVAL has a pin-selectable frequency setting. Connect the jumper, J1, to V_{IN} for 1.2 MHz frequency operations; connect the jumper to ground or 700 kHz operations. The ADP1611-EVAL is optimized for 1.2 MHz frequency operations. For 700 kHz operations, change the inductor to a higher value to avoid instability and higher output ripple. Use a 10 µH value inductor for 700 kHz operations.

If the power source is high impedance or if the connection is made using long wires, use additional input capacitance at C2. To lower the output ripple or to handle large load transients, an additional output capacitor can be added at C6. The capacitor, C3, is chosen to cancel the zero introduced by output capacitance ESR. For low ESR output capacitance with, for example, a ceramic capacitor, C3 is optional.

PC BOARD LAYOUT

The circuit board layout for the ADP1611-EVAL board is shown below. The board is designed to obtain optimal performance from the ADP1611-EVAL. Place the high power components L1, D1, C2, and C5 close to ADP1611-EVAL. See the data sheet for more complete layout guidelines. Gerber files for the ADP1611 evaluation board are available on request.

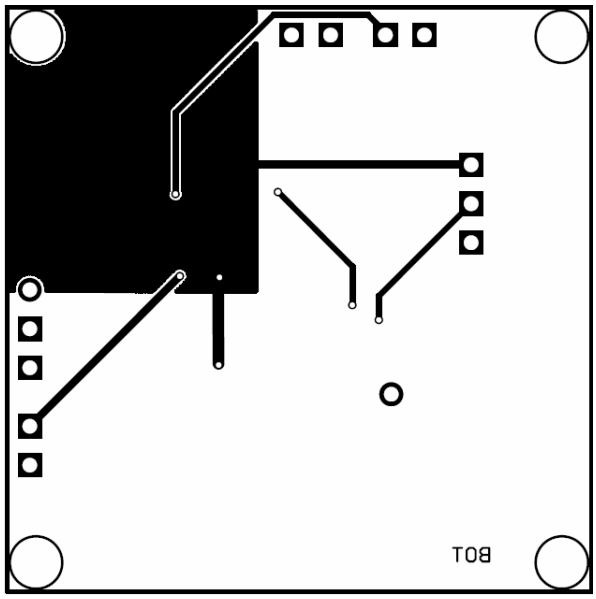

Figure 2. Bottom Layer

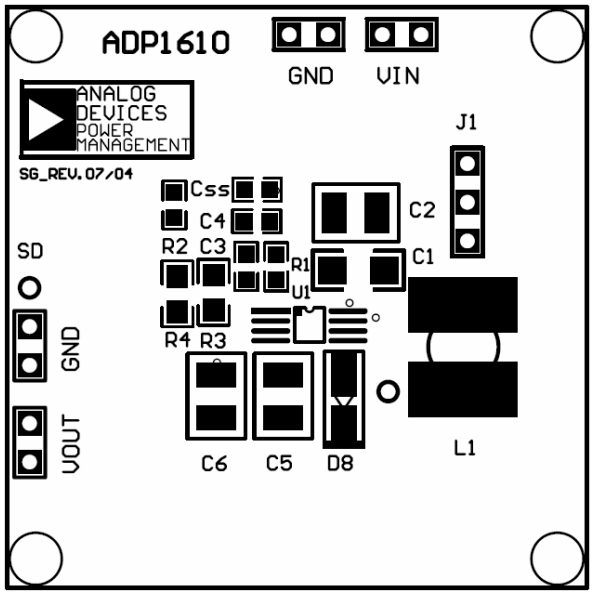

Figure 3. Silkscreen

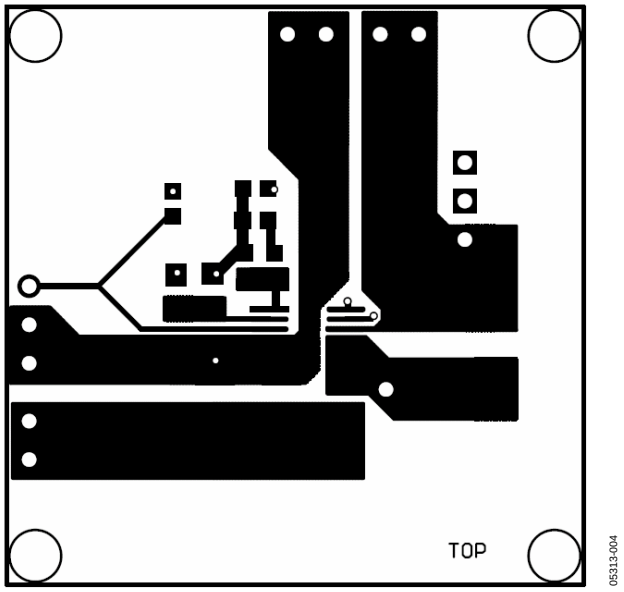

Figure 4. Top Layer

ORDERING INFORMATION

Table 1. Parts List

Description	Designator	Qty.	Manufacturer	Product Number
Capacitor, MLCC, 10 uF, 16 V, 20%, X5R, 1210, SMD	C1,C2,C5,C6	4	Murata, Taiyo-Yuden	GRM32DR71C106KA01B, EMK325BJ106MN
Capacitor, MLCC, 10 nF, 16 V, 0603, SMD	Css	1	Vishay Vitramon	VJ0603Y103KXXMB
Capacitor, MLCC, 150 pF, 16 V, 0603, SMD	C4	1	Vishay Vitramon	VJ0603Y151KXXMB
Capacitor, MLCC, 20 pF, 16 V, 0603, SMD	C3	1	Vishay Vitramon	VJ0603Y200KXXMB
Diode, Schottky, 1 A, 30 V, SMB	D8	1	Diodes Inc.	1N5818M
Inductor, 4.7 µH, SMD	L1	1	Sumida, TDK	CDRH4D28C-4R7, SLF6025T-4R7M1R5
Resistor, 249 kΩ, 1%, 0603, SMD	R1	1	Vishay Dale	CRCW0603 2493F
Resistor, 10 kΩ, 1%, 0603, SMD	R2	1	Vishay Dale	CRCW0603 1002F
Resistor, 10 kΩ, 1%, 0805, SMD	R3	1	Vishay Dale	CRCW0805 1002F
Resistor, 113 kΩ, 1%, 0805, SMD	R4	1	Vishay Dale	CRCW08051133F
Integrated Circuit, ADP1611 Boost Switching Regulator, MSOP-8	U1	1	Analog Devices, Inc.	ADP1611

VENDOR LIST

Contact the suppliers listed below for information about the components used on the evaluation board.

1. Murata Manufacturing Co., Ltd.; 770-436-1300; www.murata.com
2. Taiyo-Yuden Inc.; 408-573-4151; www.t-yuden.com
3. Vishay Dale; 402-563-6866; www.vishay.com
4. Sumida Corp.; 847-545-6700; www.sumida.com
5. TDK; 408-437-9585; www.tdk.com
6. Diodes Inc.; 818-880-6480; www.diodes.com

ORDERING GUIDE

Model	Description
ADP1611-EVAL	Step-Up DC-DC Converter Evaluation Board

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

REVISION HISTORY

1/05—Revision 0: Initial Version

EB05313-0-1/05(0)