User's Guide

LM2651 Step-Down Converter Evaluation Module User's Guide

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Trademarks

1 Introduction

The LM2651 switching regulator provides high efficiency power conversion over a 100:1 load range (1.5 A to 15 mA). This feature makes the LM2651 an ideal fit in battery powered applications.

Synchronous rectification and 75-mΩ internal switches provide up to 97% efficiency. At light loads, the LM2651 enters a low power hysteretic or sleep mode to keep the efficiency high. In many applications, the efficiency still exceeds 80% at 15-mA load.

A shutdown pin is available to disable the LM2651 and reduce the supply current to 7 µA. The IC contains patented current sensing circuitry for current mode control. This feature eliminates the external current sensing required by other current mode DC to DC converters. The IC has a 300-kHz fixed frequency internal oscillator. The high oscillator frequency allows the use of extremely small, low profile components.

The evaluation board can be obtained by ordering part number LM2651_3.3V_EVAL from your local TI sales office, or TI's website at www.ti.com.

2 Evaluation Board Design

The evaluation board is designed to supply 3.3 V at 15 mA up to 1.5 A. The input voltage range is 4 V to 14 V. Components were selected based on the design procedure in the *LM2651 1.5A High Efficiency Synchronous Switching Regulator* data sheet. PCB layout is critical to reduce noise and ensure specified performance for any power supply design. To minimize the parasitic inductance in the loop of input capacitors and the internal MOSFETs, connect the capacitors to V_{IN} and PGND pins with short and wide traces. This is important because the rapidly switching current, together with wiring inductance, can generate large voltage spikes that can cause noise problems. The feedback trace from the output to the feedback pin should be wide, short and kept away from the flux field of the inductor. The artwork for the evaluation board is shown at the end of this application report and the schematic shown in Figure 2-1. The parts list is given in Table 2-1. The pictorial representations of the top, bottom, and silkscreen layers are shown at the end of this document.

When an undervoltage situation occurs, the output voltage can be pulled below ground as the inductor current is reversed through the synchronous FET. For applications that need to be protected from a negative voltage, a clamping diode D2 is recommended. When used, D2 should be connected cathode to V_{OUT} and anode to ground. A diode rated for a minimum of 2 A is recommended.

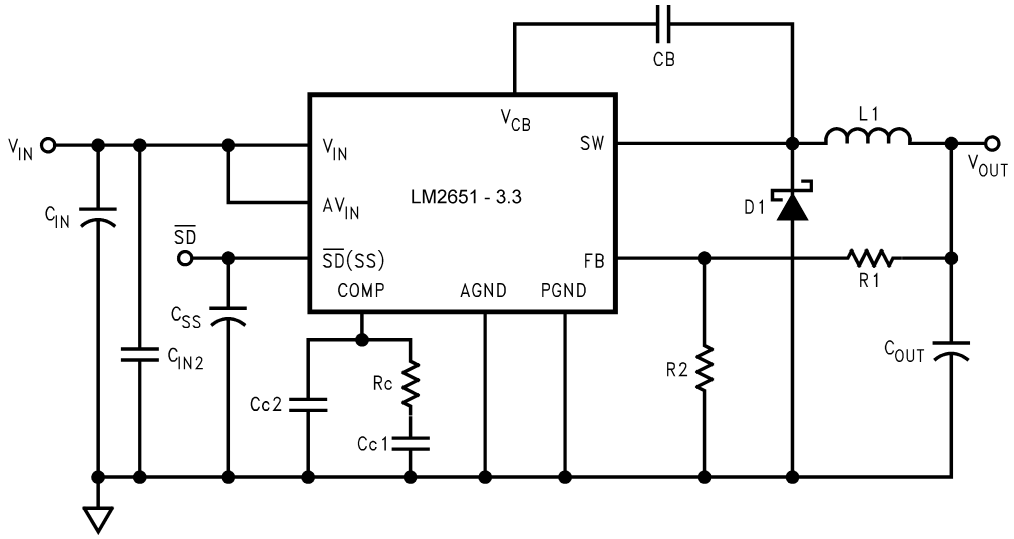

Figure 2-1. LM2651_EVAL Schematic for Adjustable Voltage

Table 2-1. Bill of Materials

Ref Designator	Part Description	Part Number
U1	IC LM2651MTC-3.3	LM2651MTC-3.3
L1	Inductor	Coilcraft DO3316P-223
CIN	Tan Cap 100 µF 16 V 10% Size = D	Vishay 594D107X0016D2T
CSS	Cer Cap 4.7 nF 50 V X7R 10% 1206	Vishay VJ1206Y472KXAMB
CC2	Cer Cap 100 pF 50 V NPO 1206	Vishay VJ1206A101JXAMB
CC1	Cer Cap 2.2 nF 50 V X7R 10% 1206	Vishay VJ1206Y222KXAMB
COUT	Tant Cap 120 µF 6.3 V 10% Size = D	Vishay 594D127X06R3C2T
CIN2	Cer Cap 0.1 µF 50 V X7R 10% 0805	Vishay VJ0805Y104KXAMB
CB	Cer Cap 0.1 µF 50 V X7R 10% 0805	Vishay VJ0805Y104KXAMB
R1	Res 0.1 Ω ⅛W 5% LR series 0805	Vishay CRCW0805R100JTGLR
R2	Open	
RC	Res 30.0 kΩ ⅛W 5% 0805	Vishay CRCW0805303J
D1	Schottky Diode 1-A SMA	Motorola MBRA130LT3

3 Operating the Evaluation Board

3.1 Setup

The LM2651_3.3V_EVAL evaluation board comes ready to be tested. The only setup needed is connecting the input voltage to the V_{IN} and GND posts. The load and output are connected to the V_{OUT} post.

3.2 Operating Conditions

The input voltage to the LM2651-3.3 regulator must be within the range of 4 V to 14 V DC for proper operation. The device will not function properly with voltages below 4 V and damage may occur if any voltage greater than 16 V is applied.

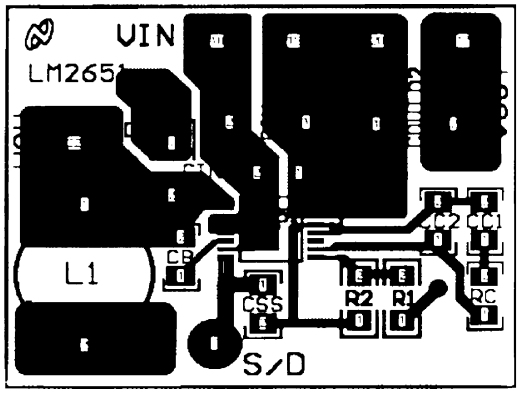

Figure 3-1. Layout Top Layer

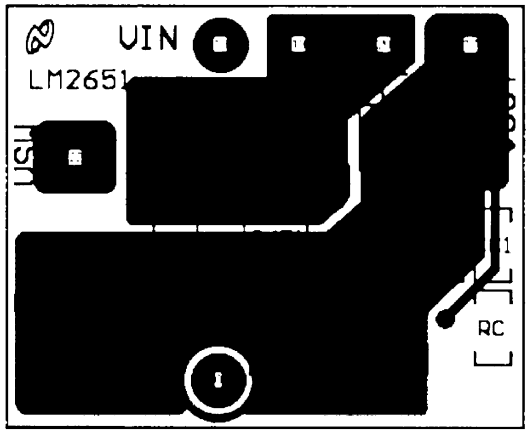

Figure 3-2. Layout Bottom Layer

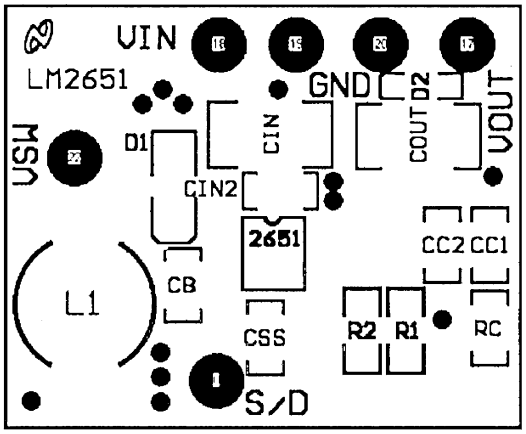

Figure 3-3. Layout Silkscreen

4 Revision History

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

Changes from Revision C (April 2013) to Revision D (January 2022)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document.	2
• Updated the user's guide title.	2

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