AN–1133 LM2653EVAL 1.5A Synchronous Switching Regulator Evaluation Board

1 Introduction

The LM2653 switching regulator provides high efficiency power conversion over a 100:1 load range (1.5A to 15 mA). This feature makes the LM2653 an ideal fit in battery-powered applications.

Synchronous rectification and 75 mΩ internal switches provide up to 97% efficiency. At light loads, the LM2653 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 LM2653 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-DC converters.

The IC has a 300kHz 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 LM2653EVAL from your local Texas Instruments sales office, or TI's website at http://www.ti.com.

2 Evaluation Board Design

The evaluation board is designed to supply 2.5 V at up to 1.5A. The input voltage range is 4 V to 14 V. Components were selected based on the design procedure in the *LM2653 1.5A High Efficiency Synchronous Switching Regulator Data Sheet* (SNVS050). The feedback resistors can be adjusted to achieve a different output voltage:

$$V_{OUT} = 1.238\ V \times [1+ (R_1/R_2)] \quad (1)$$

Choose 1% resistors between 10 kΩ to 100 kΩ for R1 and R2.

PCB layout is critical to reduce noises and ensure specified performance. For layout guidelines, see the *LM2653 1.5A High Efficiency Synchronous Switching Regulator Data Sheet* (SNVS050). The artwork for the evaluation board is shown at the end of this application report.

The schematic for the evaluation board is shown in Figure 1, and the parts list is given in Table 1.

When the undervoltage protection 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.

The PGOOD flag goes low whenever the overvoltage or undervoltage latch protection is enabled. The overvoltage protection will be enabled immediately when the output voltage exceeds 110% of its nominal. While the undervoltage latch protection will wait for a period of time set by the LDELAY capacitor. If the output voltage is still below 80% of its nominal after this waiting period, the latch protection will be enabled.

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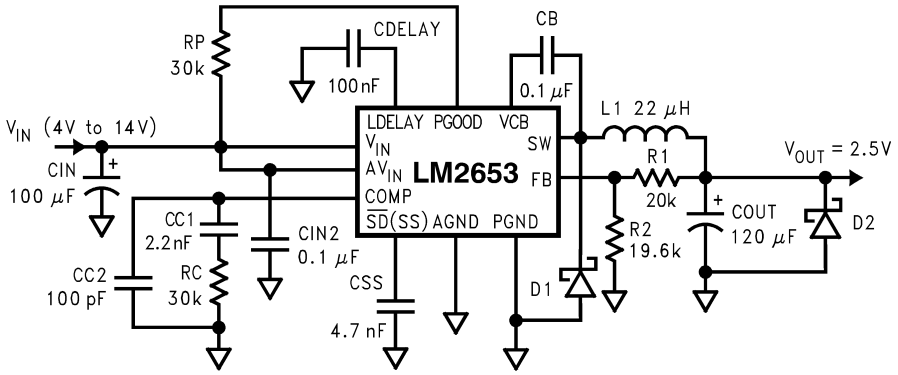


Figure 1. LM2653 EVAL Schematic

Table 1. Parts List (Bill Of Materials)

Designation	Description
L1	22 µH, Coilcraft DO3316P-223
CIN (input capacitor)	100 µF, 16 V, Sprague 594D107X0016D2T
CIN2 (input capacitor)	0.1 µF ceramic capacitor
CB (bootstrap capacitor)	0.1 µF ceramic capacitor
CSS (softstart capacitor)	4.7 nF ceramic capacitor
COUT (output capacitor)	120 µF, 6.3 V, Sprague 594D127X06R3C2T
CC1 (compensation)	2.2 nF ceramic capacitor
CC2 (compensation)	100 pF ceramic capacitor
RC (compensation)	30 kΩ, 5% resistor
D1	1A Schottky diode, Motorola MBRA130LT3
R1	20.0k, 1% resistor
R2	19.6k, 1% resistor
CDELAY	100 nF ceramic capacitor
RP	50K, 5% resistor
D2	Open

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3 Typical PC Board Layout: (2X Size)

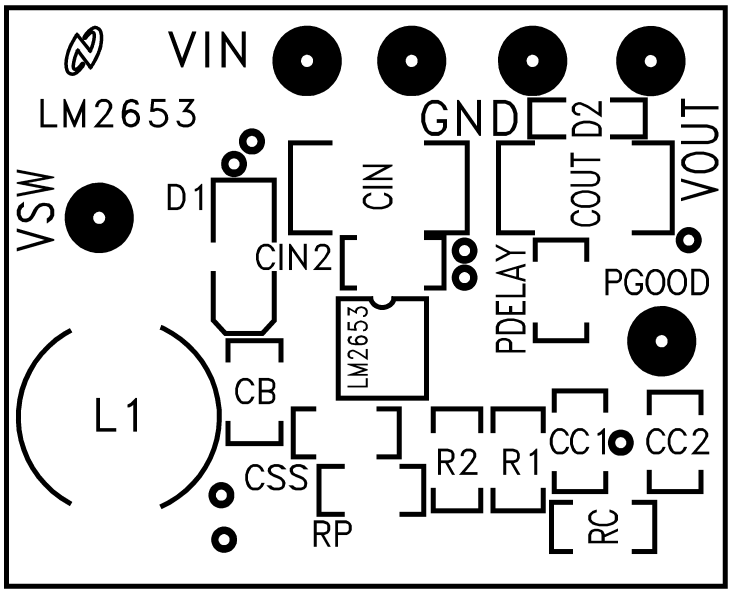


Figure 2. Component Placement Guide

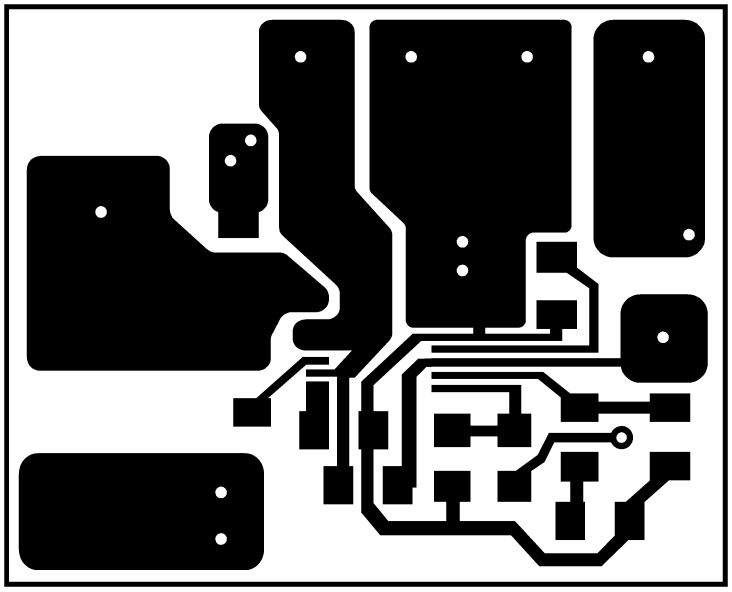


Figure 3. Component Side PC Board Layout

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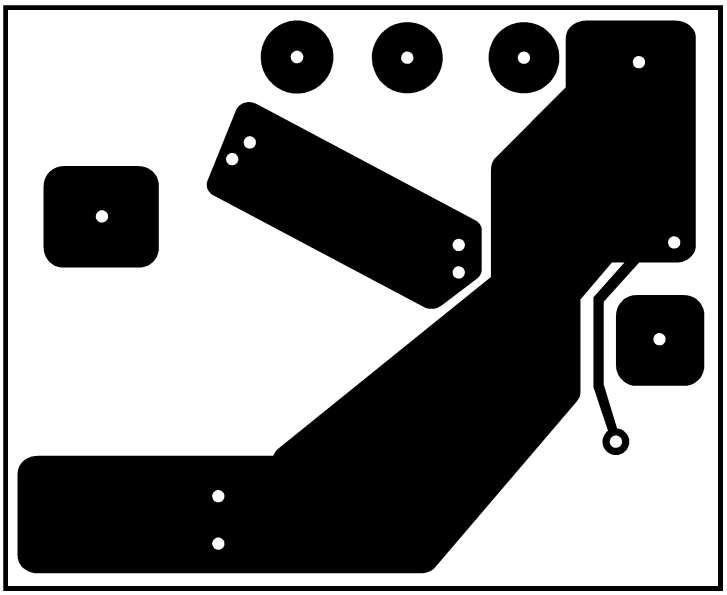


Figure 4. Solder Side PC Board Layout

4 References

LM2653 1.5A High Efficiency Synchronous Switching Regulator Data Sheet (SNVS050)

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