

# LM2675-5.0EVAL 1 Amp Step-Down High-Efficiency SIMPLE SWITCHER Evaluation Board

National Semiconductor  
Application Note 1120  
Wanda Garrett  
February 1999



LM2675-5.0EVAL 1 Amp Step-Down High-Efficiency SIMPLE SWITCHER Evaluation Board

## INTRODUCTION

The LM2675 SIMPLE SWITCHER step-down regulator provides all the active functions for a step-down regulator capable of driving a 1A load with excellent line and load regulation. Switching frequency is internally set to 260 kHz, allowing smaller-sized filter components than would be needed with lower-frequency switching regulators. The internal switch is an 0.25Ω DMOS device, providing very high-efficiency power conversion. With this high efficiency, the copper traces on the printed circuit board are the only heat sinking needed.

The LM2675-5.0EVAL evaluation board is a fully-assembled and tested surface-mount regulator that provides a 5V±1.5% output at up to 1A, from an input of 8V to 40V. The overall efficiency is typically as high as 90%. The operating temperature range is 0°C to +85°C.

## EVALUATION BOARD DESIGN

This evaluation board is designed for supplying 5V at up to 1 Amp to a load. The input voltage range is 8V to 40V. Components, shown in the schematic of Figure 1, were selected based on the design procedure in the LM2675 datasheet.

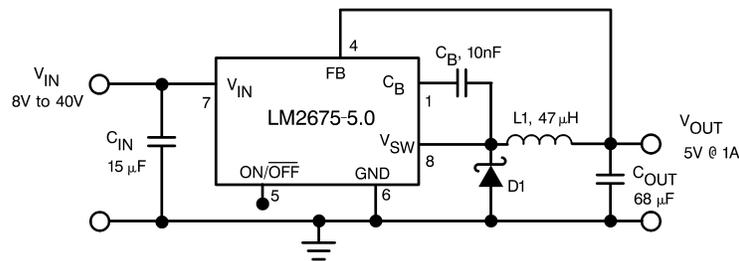
Layout is very important in switching regulator designs. Rapidly switching currents associated with wiring inductance can

generate voltage transients which can cause problems. For minimal inductance and ground loops, the traces which carry the highest currents (input, ground, switch, and output signals) are relatively wide and short. The external components are located physically close to the IC.

Components in this design were selected according to the design procedure in the LM2675 datasheet. The input capacitor  $C_{IN}$  was chosen for its voltage rating and RMS current rating. A 40V maximum input requires a capacitor with voltage rating of at least 1.25x40, or 50V. A conservative estimate of RMS input current is approximately 1/2 the DC load current. The input capacitor chosen for this application has a voltage rating of 50V and an RMS current rating of 900 mA. The inductor and output capacitor were selected for a combination of good regulator stability and compact size, according to the design tables in the datasheet.

While the LM2675 has an ON/OFF control, this has not been provided on the evaluation board.

The parts list for this board is given in Table 1, while contact information for the component manufacturers is given in Table 2.



AN101048-1

FIGURE 1. LM2675-5.0EVAL Schematic

TABLE 1. Parts List (Bill of Materials)

Designator	Description	Quantity
U1	LM2675M-5.0 National Semiconductor SIMPLE SWITCHER voltage converter	1
$C_{IN}$	15 $\mu$ F, 50V Solid Tantalum, Sprague type 594D	1
$C_{OUT}$	68 $\mu$ F, 16V Solid Tantalum, Sprague type 595D	1
D1	1A, 40V Schottky rectifier	1
L1	47 $\mu$ H Power Inductor, Coilcraft D03316-473	1
$C_B$	0.01 $\mu$ F, 50V Ceramic	1

SIMPLE SWITCHER® is a registered trademark of National Semiconductor Corporation

**TABLE 2. Component Manufacturers**

Manufacturer	Phone	FAX	Internet
National Semiconductor	(800) 272-9959	(800) 737-7018	www.national.com
Coilcraft Inc.	(800) 322-2645	(708) 639-1469	www.coilcraft.com
Coilcraft Inc., Europe	+44 1236 730 595	+44 1236 730 627	www.coilcraft.com
Sprague/Vishay	(207) 324-7223	(207) 324-4140	www.vishay.com

**OPERATING THE EVALUATION BOARD**

The input source for the LM2675-5.0 evaluation board must be greater than 8V for proper startup and operation. The maximum input voltage is 40V, including transients. During startup, the LM2675 may be left unloaded. If a load is connected, the peak current drawn from the source may be as great as 2.2A (for a full 1A load). A source with a lower current limit will slow down the startup of the regulator. If its current limit is sufficiently low, typically at or near the steady-state input current level, the regulator may not start up at all. The load for the evaluation board can be from 0 Amps (an open-circuit) to 1 Amp. Higher load currents can activate the LM2675 current limit, which will shut the regulator down until the load is reduced.

**DESIGNING WITH THE LM2675**

The LM2675 SIMPLE SWITCHER step-down converters are available in fixed output voltages of 3.3V, 5.0V, 12V, and an adjustable output version, each rated for a 1A load.

A family of standard inductors for use with the LM2675 are available from several manufacturers, which greatly simplifies the design of switch-mode power supplies. The datasheet also includes selection guides for diodes and capacitors designed to work in these switching regulator designs.

While the LM2675 product datasheet contains an easy, straight-forward design procedure, design software is also available, which further simplifies the system design. "LM267X Made Simple" is available from the Power Management Products section of National Semiconductor's web site at [www.national.com/appinfo/power/index.html](http://www.national.com/appinfo/power/index.html).

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



**National Semiconductor Corporation**  
Americas  
Tel: 1-800-272-9959  
Fax: 1-800-737-7018  
Email: [support@nsc.com](mailto:support@nsc.com)

[www.national.com](http://www.national.com)

**National Semiconductor Europe**  
Fax: +49 (0) 1 80-530 85 86  
Email: [europe.support@nsc.com](mailto:europe.support@nsc.com)  
Deutsch Tel: +49 (0) 1 80-530 85 85  
English Tel: +49 (0) 1 80-532 78 32  
Français Tel: +49 (0) 1 80-532 93 58  
Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
Tel: 65-2544466  
Fax: 65-2504466  
Email: [sea.support@nsc.com](mailto:sea.support@nsc.com)

**National Semiconductor Japan Ltd.**  
Tel: 81-3-5639-7560  
Fax: 81-3-5639-7507