

AN–1120 LM2675-5.0EVAL 1A Step-Down High-Efficiency SIMPLE SWITCHER Evaluation Board

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

1 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 $0.25\ \Omega$ 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.

2 Evaluation Board Design

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

The layout is very important in switching regulator designs. Rapidly switching currents associated with wiring inductance can generate voltage transients that can cause problems. For minimal inductance and ground loops, the traces that 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 SIMPLE SWITCHER® Power Converter High Efficiency 1A Step-Down Voltage Regulator Data Sheet* ([SNVS129](#)). The input capacitor C_{IN} was chosen for its voltage rating and RMS current rating. A 40 V maximum input requires a capacitor with voltage rating of at least 1.25×40 , or 50 V. A conservative estimate of RMS input current is approximately $\frac{1}{2}$ the DC load current. The input capacitor chosen for this application has a voltage rating of 50 V 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 data sheet.

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](#).

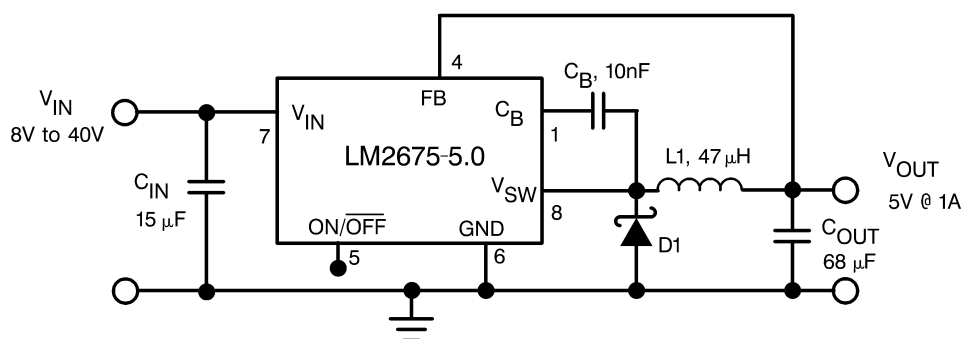


Figure 1. LM2675-5.0EVAL Schematic

Table 1. Parts List (Bill of Materials)

Designator	Description	Quantity
U1	LM2675M-5.0 Texas Instruments SIMPLE SWITCHER voltage converter	1
C _{IN}	15 µF, 50 V Solid Tantalum, Sprague type 594D	1
C _{OUT}	68 µF, 16 V Solid Tantalum, Sprague type 595D	1
D1	1A, 40 V Schottky rectifier	1
L1	47 µH Power Inductor, Coilcraft D03316-473	1
C _B	0.01 µF, 50 V Ceramic	1

Table 2. Component Manufacturers

Manufacturer	Phone	FAX	Internet
Texas Instruments	(800) 272-9959	(800) 737-7018	www.ti.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

3 Operating the Evaluation Board

The input source for the LM2675-5.0 evaluation board must be greater than 8 V for proper startup and operation. The maximum input voltage is 40 V, 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.

4 Designing with the LM2675

The LM2675 SIMPLE SWITCHER step-down converters are available in fixed output voltages of 3.3 V, 5.0 V, 12 V, 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 data sheet also includes selection guides for diodes and capacitors designed to work in these switching regulator designs.

While the *LM2675 SIMPLE SWITCHER® Power Converter High Efficiency 1A Step-Down Voltage Regulator Data Sheet* ([SNVS129](#)) 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 Texas Instruments web site at www.ti.com.

5 References

LM2675 SIMPLE SWITCHER® Power Converter High Efficiency 1A Step-Down Voltage Regulator Data Sheet ([SNVS129](#))

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com