

AN-1400 LM1770 Evaluation Board

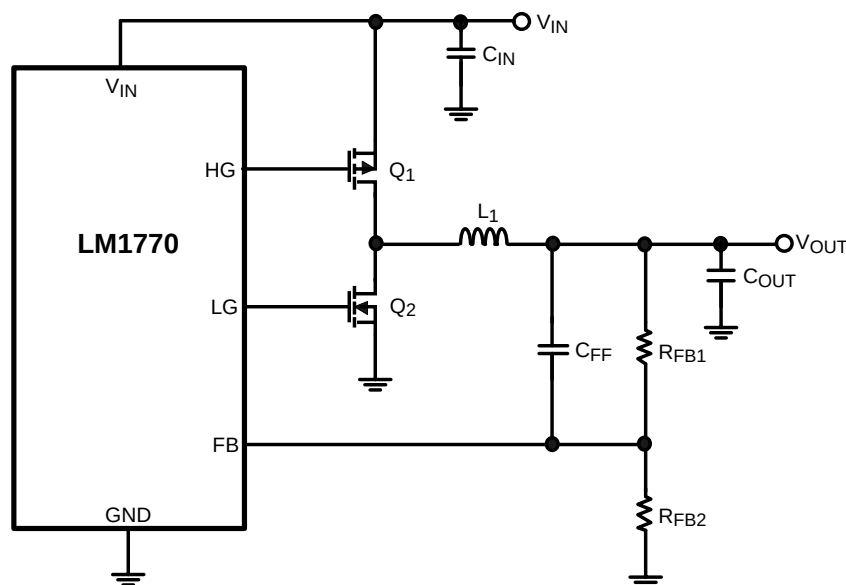
1 Introduction

The LM1770 is a synchronous buck switching controller that is capable of accepting an input voltage in the range of 2.8 V to 5.5 V and producing an output voltage as low as 0.8 V. By utilizing a constant on time control scheme it allows a power supply to be designed quickly without the need for external compensation components. The LM1770 is available in three different timing options to allow flexibility on switching frequency and is offered in a small SOT23-5 package. These features enable a power supply to be designed that occupies an extremely small footprint while maintaining high efficiency.

The LM1770 demo board was designed to illustrate what is possible when designing in space critical applications. It accepts a 5 V input rail and produces a 2.5 V output. Despite the small size (the board measures 0.7" v 0.68"), it is capable of delivering up to a maximum continuous current of 2A. At this load the efficiency is above 92%.

For testing of the board, the input voltage can be varied over the entire operating range of 2.8 V to 5.5 V. The timing option used for this design is the 2000 ns option (LM1770U), which sets the nominal switching frequency to 378 kHz. Modifications can easily be made to the board to adjust the output voltage, by changing one of the feedback resistors.

2 Schematic



3 Bill of Materials (BOM)

Designator	Description	Part No	Quantity	Manufacturer
U1	LM1770, 2000ns Option	LM1770	1	TI
Q2	NMOS	SI3460DV	1	Siliconix
Q1	PMOS	SI3867DV	1	Siliconix
Cout	47 μ F Cap, 4 V, 70 m Ω , B Case	4TPC47M	1	Sanyo
Rfb1	21 k Ω Resistor, 0603	CRCW06032102F	1	Vishay
Rfb2	10 k Ω Resistor, 0603	CRCW06031002	1	Vishay
L	5.0 μ H Inductor	MSS7341-502NLB	1	Coilcraft
Cff	10 nF Capacitor, 0603	VJ0603Y103KXAAT	1	Vishay
Cin	22 μ F Capacitor, 0805	GRM21BR60J226ME39B	1	muRata
Test Points	Individual test points	160-1026-02-05-00	3	Wearnes

4 Performance

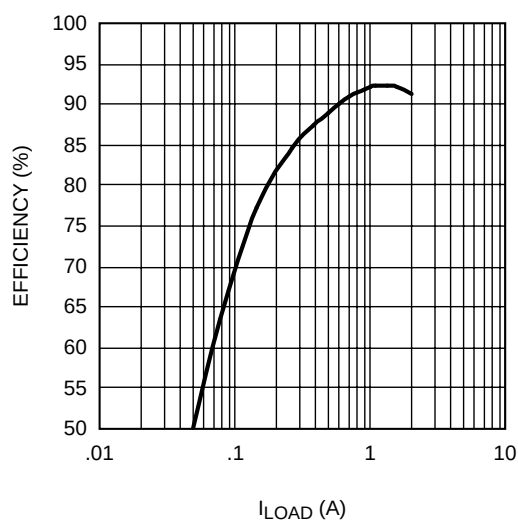


Figure 1. Efficiency vs I_{OUT}

5 PCB Layout

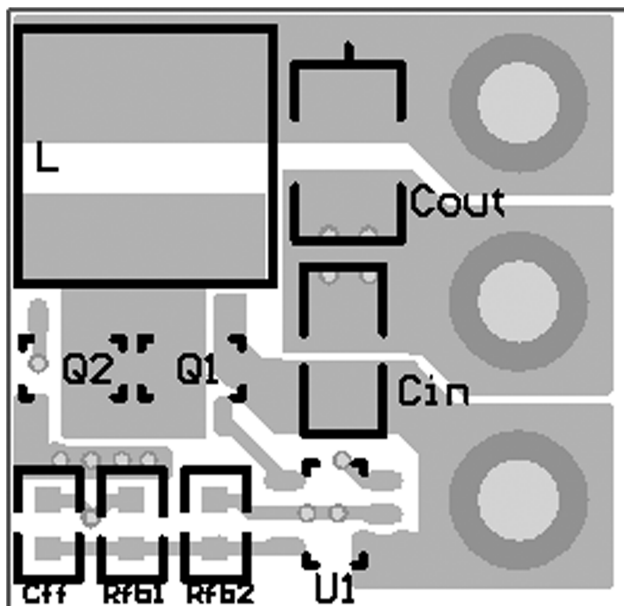


Figure 2. Top Layer

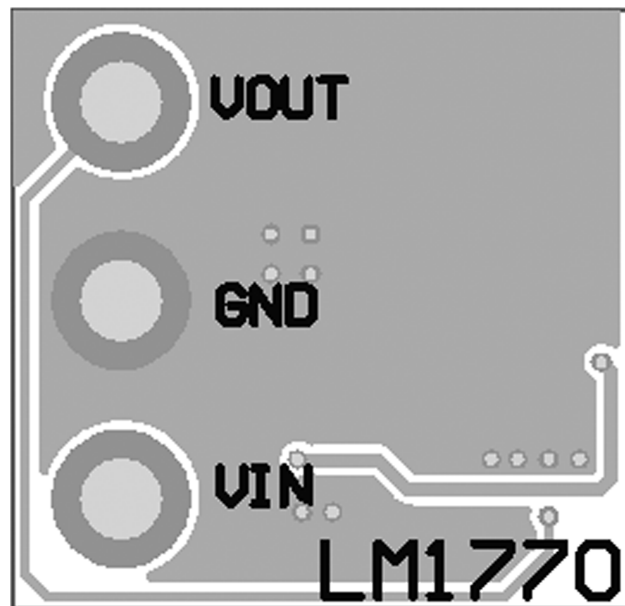


Figure 3. Bottom Layer

LM1770 Demo Board Information	
Board Material	FR4
Size	0.7" x 0.68"
Layers	2
Copper Thickness	1oz
Plating	HASL
Board Thickness	0.062"

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