![Texas Instruments logo]

AN-1774 LM3410X LED Driver 6-Pin LLP Demo Board

1   Introduction

The demo board included in this shipment converts 2.7V to 5.5V input, and illuminates four 50mA LED's in series using the LM3410X 1.6MHz LED driver switching converter. This is a 2-layer board using the bottom layer as a Ground plane.

A bill of materials (see Section 2) describes the parts used on this demo board. A schematic and layout have also been included below along with measured performance characteristics. The above restrictions for the input voltage are valid only for the demo board as shipped with the demo board schematic below.

Operatiing Conditions

V_{IN} = 2.7V to 5.5V

$V_O \approx V_F$ x 4 + $V_{FB} \approx$ 3.6V x 4 + 0.198V $\approx$ 14.4V

I_O = 50mA
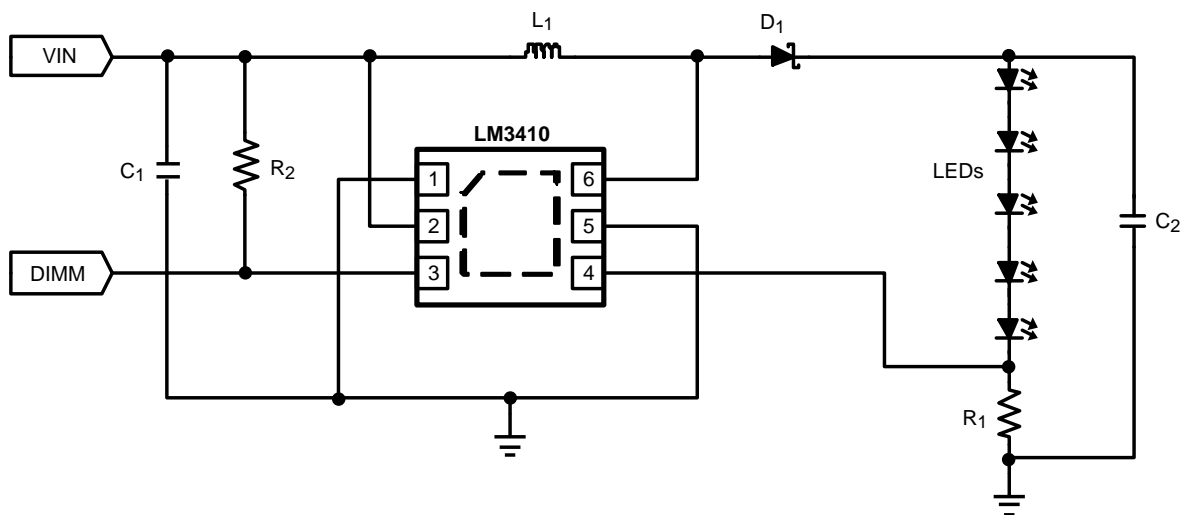
Figure 1. LM3410X 6-Pin LLP Schematic

All trademarks are the property of their respective owners.

Submit Documentation Feedback
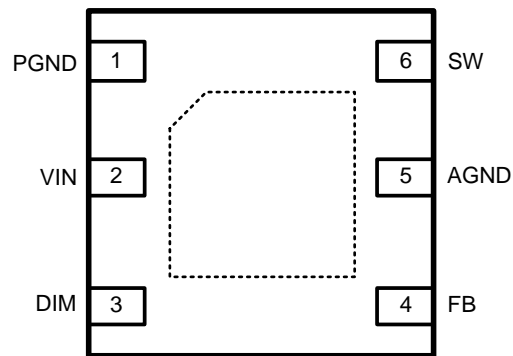
Figure 2. Pinout

Table 1. Pin Descriptions - 6 Pin LLP

Pin	Name	Function
1	PGND	Power ground pin. Place PGND and output capacitor GND close together.
2	VIN	Supply voltage for power stage, and input supply voltage.
3	DIM	Dimming & shutdown control input. Logic high enables operation. Duty Cycle from 0 to 100%. Do not allow this pin to float or be greater than VIN + 0.3V.
4	FB	Feedback pin. Connect FB to external resistor divider to set output voltage.
5	AGND	Signal ground pin. Place the bottom resistor of the feedback network as close as possible to this pin & pin 4.
6	SW	Output switch. Connect to the inductor, output diode.
DAP	GND	Signal & Power ground. Connect to pin 1 & pin 5 on top layer. Place 4-6 vias from DAP to bottom layer GND plane.

2   Bill of Materials LM3410X

| Part ID	Part Value	Manufacturer	Part Number
U1	2.8A I_{SW} LED Driver	NSC	LM3410XSD
C1, Input Cap	10µF, 6.3V, X5R	TDK	C2012X5R0J106M
C2 Output Cap	2.2µF, 25V, X5R	TDK	C2012X5R1E225M
D1, Catch Diode	0.4V_f Schottky 500mA, 30V_R	Diodes Inc	MBR0530
L1	10µH 1.5A	Coilcraft	DO1608C-103
R1	4.02Ω, 1%	Vishay	CRCW08054R02F
R2	100kΩ, 1%	Vishay	CRCW06031003F
LED's	SMD-1206, 50mA, V_f ≅ 3 .6V	Lite-On	LTW-150k

3   Performance Characteristics
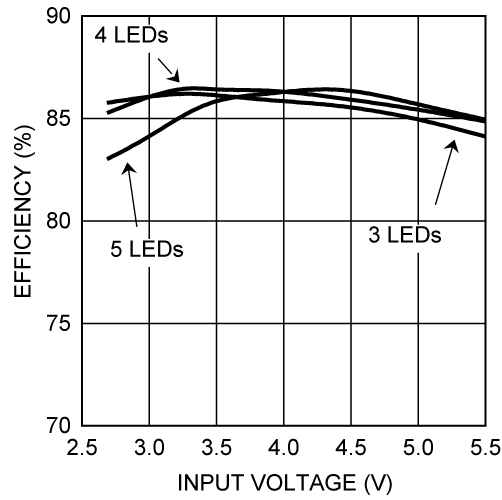
Figure 3. LM3410X Efficiency vs Input Voltage Series LEDs @ 50mA
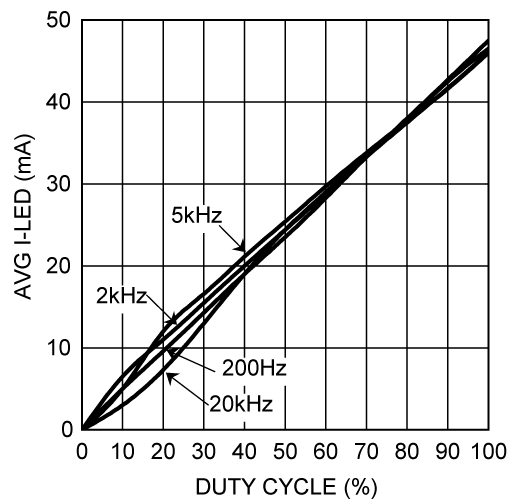

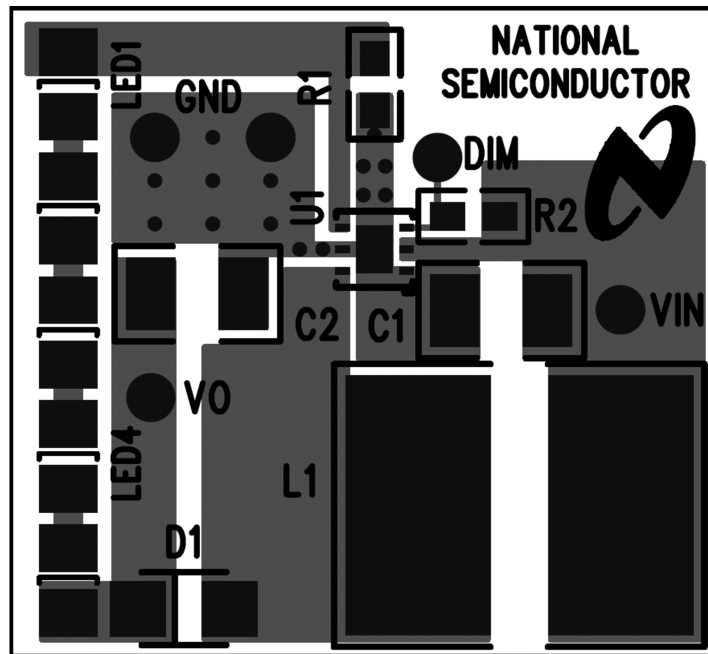**Figure 4. LM3410X Average LED Current vs Duty-Cycle & Dimming Frequency**

4   PCB Layout
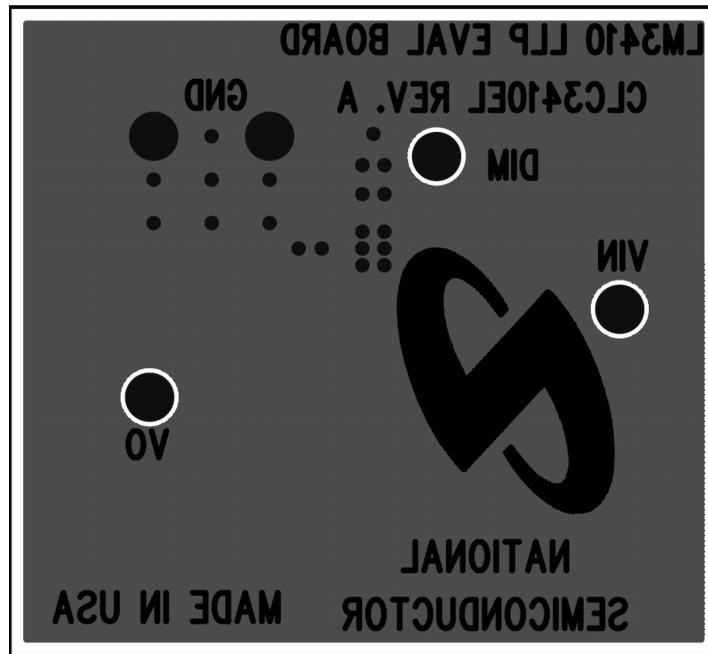

Figure 5. Demonstration Board Top Layer

Figure 6. Demonstration Board Bottom Layer

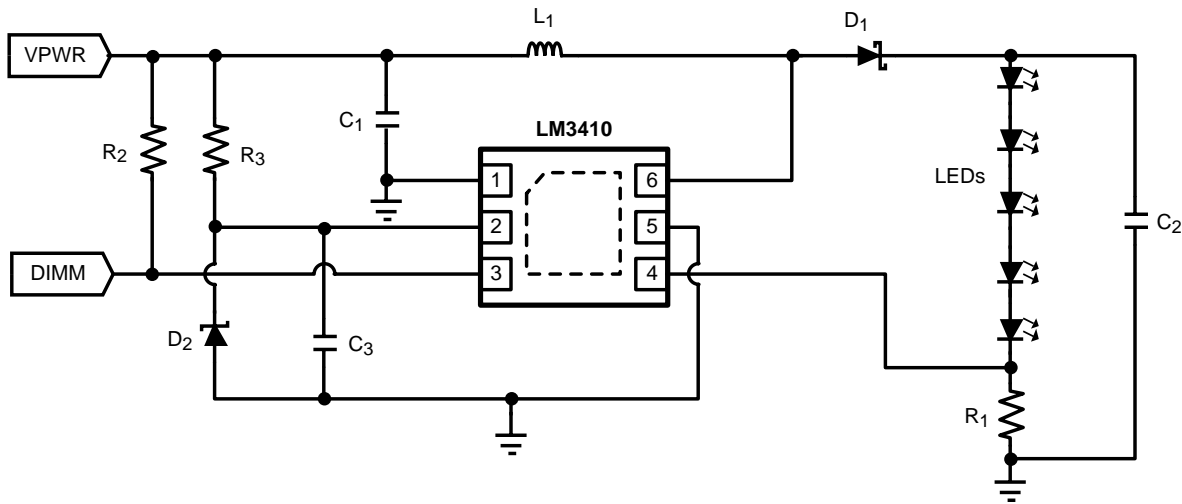## 5 16V > V_{PWR} > 5.5V Application Circuit

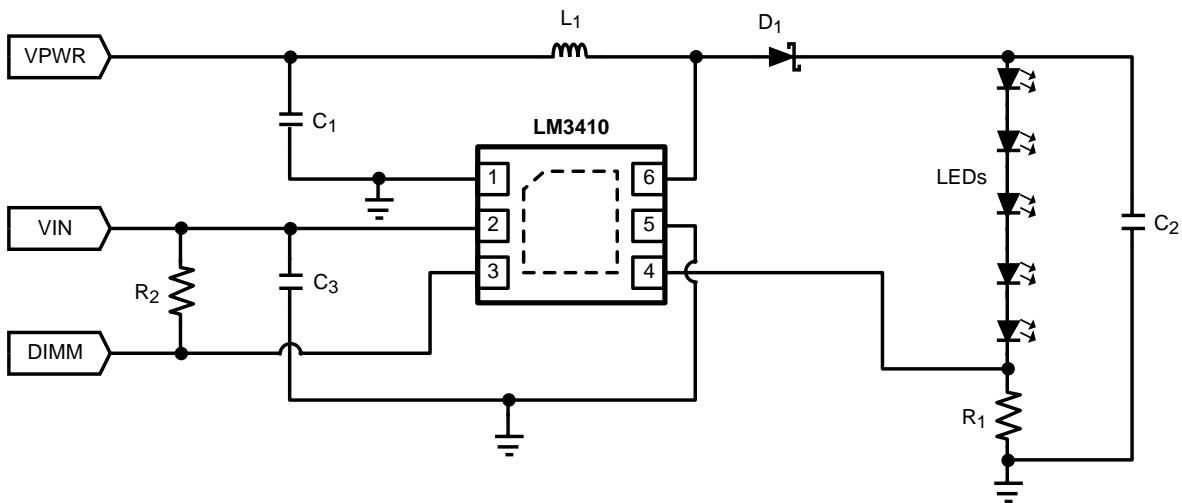**Figure 7. Circuit Needs Two Separate Supplies**

Figure 8. Circuit Allows Single Supply

The demonstration board provided can easily be modified to allow the user to derive the power from an input supply that is larger than 5.5V. In Figure 7 two separate supplies are needed. V_{IN} must be between 2.7V minimum to 5.5V maximum, but V_{PWR} can be as great as 16V.

The circuit shown in Figure 8 allows for a single supply to be used with a simple zenner diode regulation circuit to provide the LM3410 with a housekeeping and driver voltage that is below 5.5V.

The LM3410 VIN supply will draw approximately 7 mA while it is switching. Zenner diode should have a breakdown voltage lower than 5V, and size R3 to allow for 7 mA of current draw.

Part ID	Part Value	Manufacturer	Part Number
U1	2.8A I_{SW} LED Driver	NSC	LM3410XSD
C1 V_{PWR} Input Cap	10µF, 6.3V, X5R	TDK	C1608X5R0J106K
C2 Output Cap	1µF, 25V, X5R	TDK	C2012X5R1E105K
C3 V_{IN} Input Cap	0.1µF,16V, X5R	TDK	C1005X5R1C104K
D1, Catch Diode	0.43V_f, Schoty, 0.5A, 30V_R	Diodes Inc	B0530W
L1	6.8µH 2.7A	Coilcraft	MOS6020-682

Part ID	Part Value	Manufacturer	Part Number
R1	4.02Ω, 1%	Vishay	CRCW08054R02FRT1
R2	100kΩ, 1%	Vishay	CRCW08051003F
R3	576Ω, 1%	Vishay	CRCW08055760F
D2	3.3V Zener, SOT23	Diodes Inc	BZX84C3V3
LEDs	SMD-1206, 50mA, $V_f \cong 3.6V$		

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		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated