

# LM3410X LED Driver 5-Pin SOT-23 Demo Board

National Semiconductor  
 Application Note 1773  
 Matthew Reynolds  
 January 31, 2008



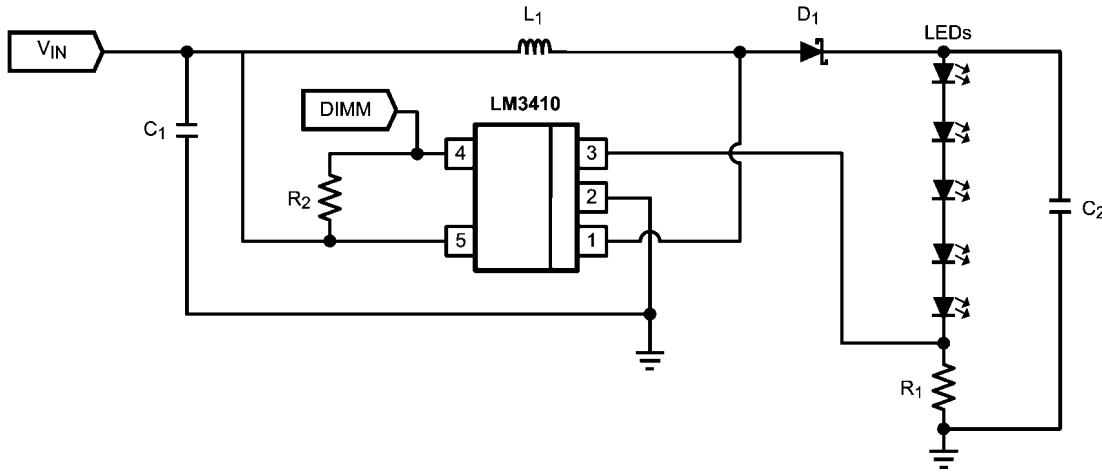
## Introduction

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 below 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.

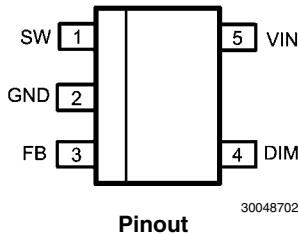
### Operating Conditions

$V_{IN} = 2.7V$  to  $5.5V$   
 $V_O \approx V_F \times 4 + V_{FB} \approx 3.6V \times 4 + 0.198V \approx 14.4V$   
 $I_O = 50mA$



LM3410X 5-Pin SOT23 Schematic

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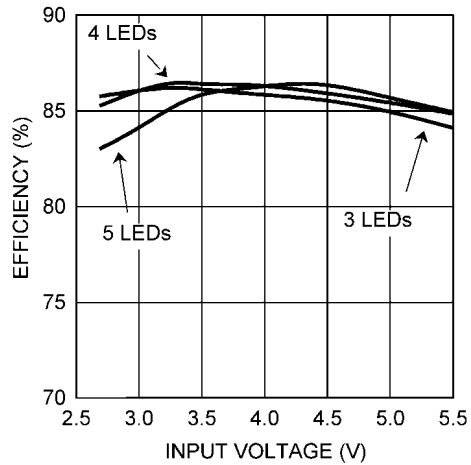
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## Pin Descriptions - 5-Pin SOT23

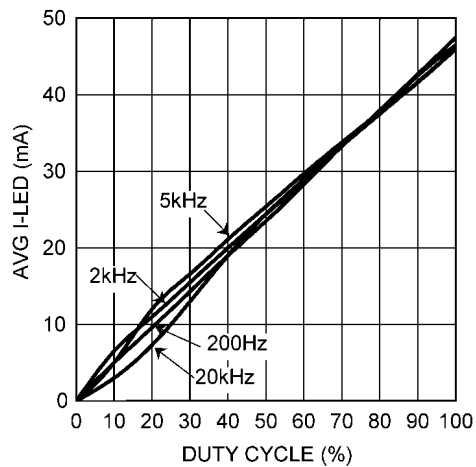
Pin	Name	Function
1	SW	Output switch. Connect to the inductor, output diode.
2	GND	Signal and power ground pin. Place the bottom resistor of the feedback network as close as possible to this pin.
3	FB	Feedback pin. Connect FB to external resistor divider to set output voltage.
4	DIM	Dimming & shutdown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

## Bill of Materials LM3410X

Part ID	Part Value	Manufacturer	Part Number
U1	2.8A $I_{SW}$ LED Driver	NSC	LM3410XMF
C1, Input Cap	10 $\mu$ F, 6.3V, X5R	TDK	C2012X5R0J106M
C2 Output Cap	2.2 $\mu$ F, 25V, X5R	TDK	C2012X5R1E225M
D1, Catch Diode	0.4V <sub>f</sub> Schottky 500mA, 30VR	Diodes Inc	MBR0530
L1	10 $\mu$ H 1.2A	Coilcraft	DO1608C-103
R1	4.02 $\Omega$ , 1% $\Omega$	Vishay	CRCW08054R02FRT1
R2	100k $\Omega$ , 1%	Vishay	CRCW06031003F
LED's	SMD-1206, 50mA, V <sub>f</sub> $\approx$ 3.6V	Lite-On	LTW-150k

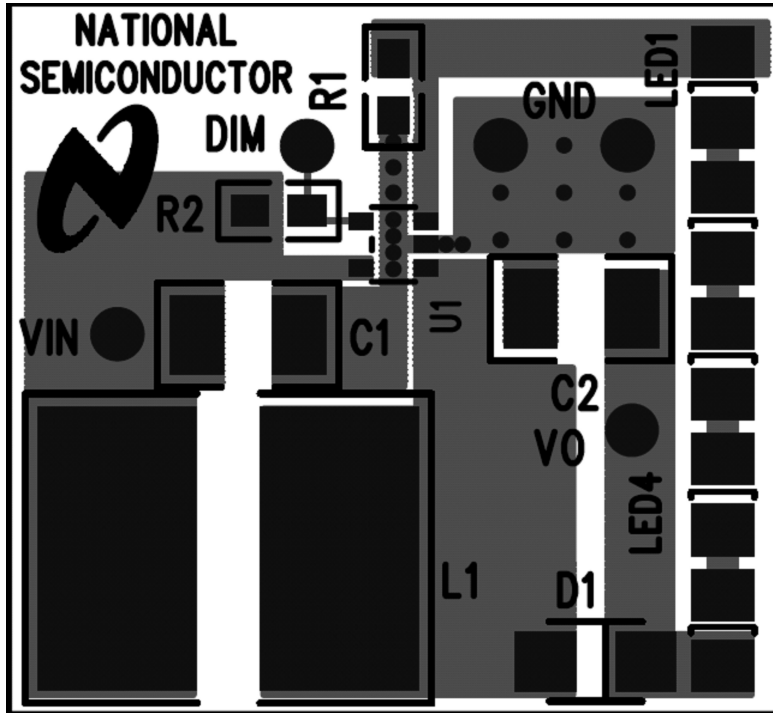


<sup>30048703</sup>  
LM3410X Efficiency vs Input Voltage Series LEDs @ 50mA



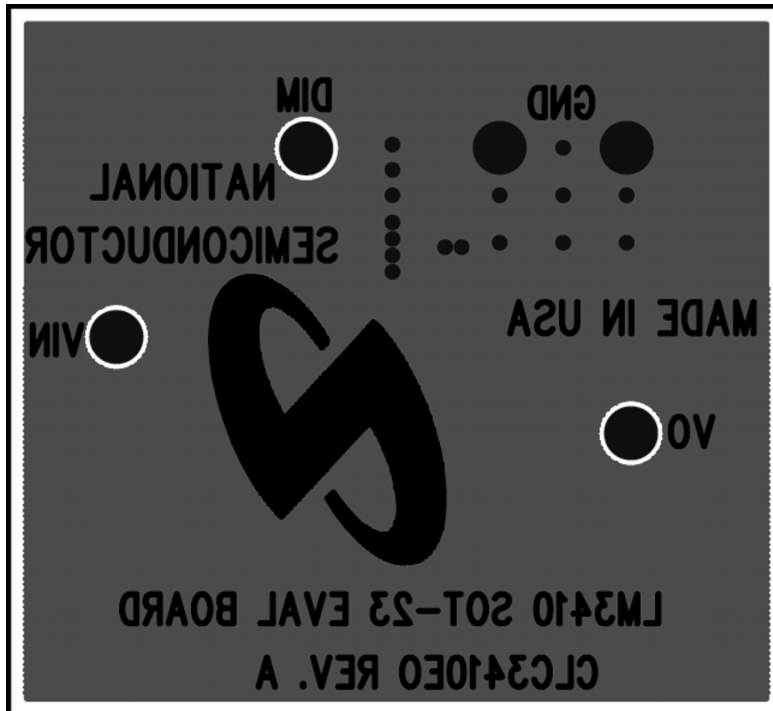
<sup>30048704</sup>  
LM3410X Average LED Current vs Duty-Cycle & Dimming Frequency

# PCB Layout



Demonstration Board Top Layer

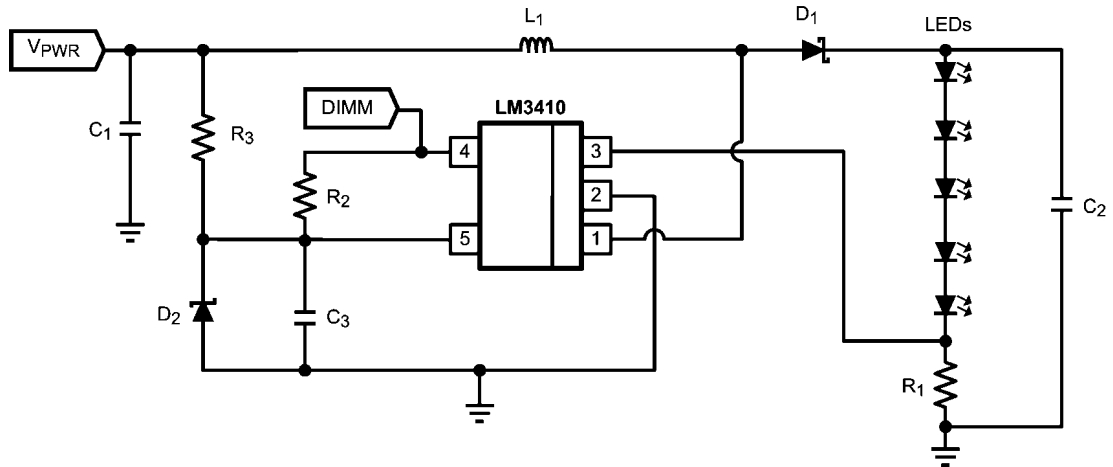
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Demonstration Board Bottom Layer

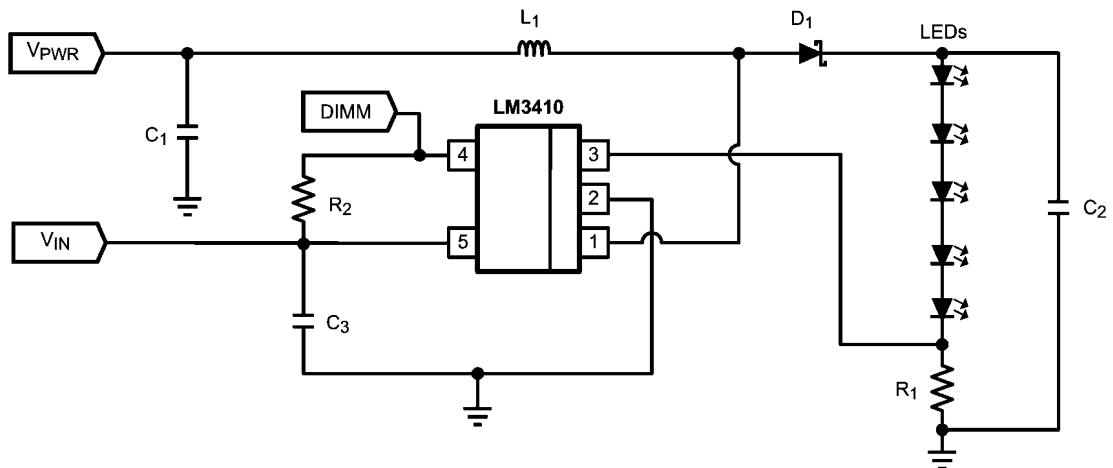
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## 16V > $V_{PWR}$ > 5.5V Application Circuit



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FIGURE 1.



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FIGURE 2.

The circuit shown in *Figure 1* allows for a single supply to be used with a simple zener diode regulation circuit to provide the LM3410 with a housekeeping and driver voltage that is below 5.5V.

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 2* 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 LM3410  $V_{IN}$  supply will draw approximately 7 mA while it is switching. Zener 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	LM3410XMF
C1 $V_{PWR}$ Input Cap	10 $\mu$ F, 6.3V, X5R	TDK	C1608X5R0J106K
C2 Output Cap	1 $\mu$ F, 25V, X5R	TDK	C2012X5R1E105K
C3 $V_{IN}$ Input Cap	0.1 $\mu$ F, 6.3V, X5R	TDK	C1005X5R1C104K
D1, Catch Diode	0.43V <sub>f</sub> , Schotky, 0.5A, 30V <sub>R</sub>	Diodes Inc	B0530W
L1	6.8 $\mu$ H 2.7A	Coilcraft	MOS6020-682
R1	4.02 $\Omega$ , 1%	Vishay	CRCW08054R02FRT1
R2	100k $\Omega$ , 1%	Vishay	CRCW08051003F
R3	576 $\Omega$ , 1%	Vishay	CRCW08055760F
D2	3.3V Zener, SOT23	Diodes Inc	BZX84C3V3
LEDs	SMD-1206, 50mA, $V_f \approx 3.6V$		

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Data Converters	<a href="http://www.national.com/adc">www.national.com/adc</a>	Distributors	<a href="http://www.national.com/contacts">www.national.com/contacts</a>
Displays	<a href="http://www.national.com/displays">www.national.com/displays</a>	Green Compliance	<a href="http://www.national.com/quality/green">www.national.com/quality/green</a>
Ethernet	<a href="http://www.national.com/ethernet">www.national.com/ethernet</a>	Packaging	<a href="http://www.national.com/packaging">www.national.com/packaging</a>
Interface	<a href="http://www.national.com/interface">www.national.com/interface</a>	Quality and Reliability	<a href="http://www.national.com/quality">www.national.com/quality</a>
LVDS	<a href="http://www.national.com/lvds">www.national.com/lvds</a>	Reference Designs	<a href="http://www.national.com/refdesigns">www.national.com/refdesigns</a>
Power Management	<a href="http://www.national.com/power">www.national.com/power</a>	Feedback	<a href="http://www.national.com/feedback">www.national.com/feedback</a>
Switching Regulators	<a href="http://www.national.com/switchers">www.national.com/switchers</a>		
LDOs	<a href="http://www.national.com/ldo">www.national.com/ldo</a>		
LED Lighting	<a href="http://www.national.com/led">www.national.com/led</a>		
PowerWise	<a href="http://www.national.com/powerwise">www.national.com/powerwise</a>		
Serial Digital Interface (SDI)	<a href="http://www.national.com/sdi">www.national.com/sdi</a>		
Temperature Sensors	<a href="http://www.national.com/tempsensors">www.national.com/tempsensors</a>		
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