

## NCP101x LED Flasher with Luxeon V Star LED

Prepared by: Jan Grulich  
ON Semiconductor



ON Semiconductor®

<http://onsemi.com>

### APPLICATION NOTE

This application note describes how to easily design simple, isolated AC-DC converter for powering Luxeon V Star LED in flashing mode. Some examples are: warning lamps, emergency signs, beacon and so on. In comparison with resistive or capacitive dropper with electronic chopper is this solution more comfortable and features some advantages such as:

- Wide Input Voltage Range: 85 – 265 Vac
- Smaller Size, Lower Weight, Lower Total Cost
- Good Line Regulation, No Need of Additional Linear Regulators
- Efficient Design with up to 80% Efficiency
- Overload, Short Circuit and Thermal Protected
- Simple for Mass Production Thanks to SMD Devices
- Universal Design for Variety of LEDs – 1 W, 3 W, 5 W

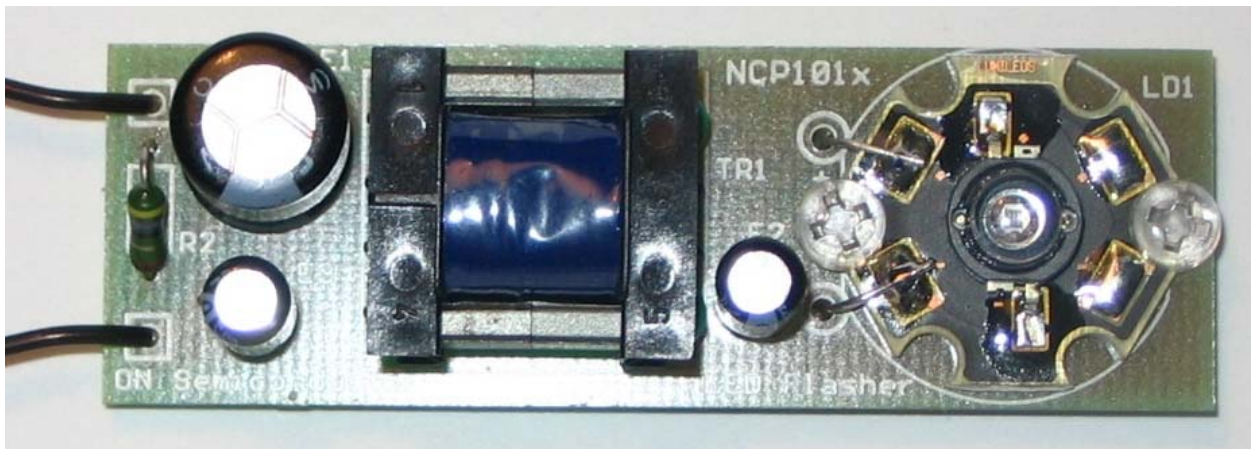


Figure 1. NCP101x LED Flasher

The monolithic power switcher, used in this application, greatly simplifies the total design and reduces time to production. The new line of the Power Switchers NCP1010 – 1014 is ideal for this purpose. This IC in the SOT-223 package reduces size and is suitable for mass production. The output power is given only by proper selection of this Switcher. The design consists of safety resistor, rectifier with filtering capacitor, power stage with switcher and transformer, output ultrafast rectifier, output filtering capacitor and high power Luxeon LED. The only component necessary for proper powering of the IC is the  $V_{CC}$  capacitor. The IC is directly powered from the HV Drain circuit via internal voltage regulator. To eliminate the noise at the feedback input, some small ceramic capacitor

with value of around 1 nF is necessary to be connected as close to the FB pin, as possible. As the flash function is used special part of the safety circuitry of the NCP101x Switcher. The timing of the flashing period is given by the  $V_{CC}$  capacitor E3. The duty cycle is fixed and is given by the internal consumption of the IC.

#### LED and Switcher Selection

Switcher IC	LED selection
NCP1011ST65	Luxeon Star
NCP1012ST65	Luxeon III Star
NCP1013ST65	Luxeon V Star

# AND8224/D

## SCHEMATIC DIAGRAM

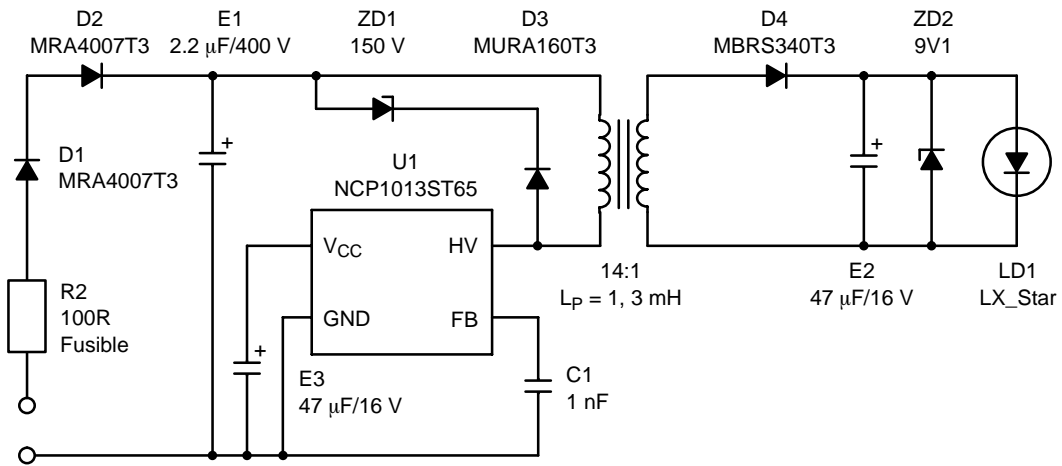


Figure 2. Complete Schematic Diagram of the LED Flasher

## COMPONENT LAYOUT

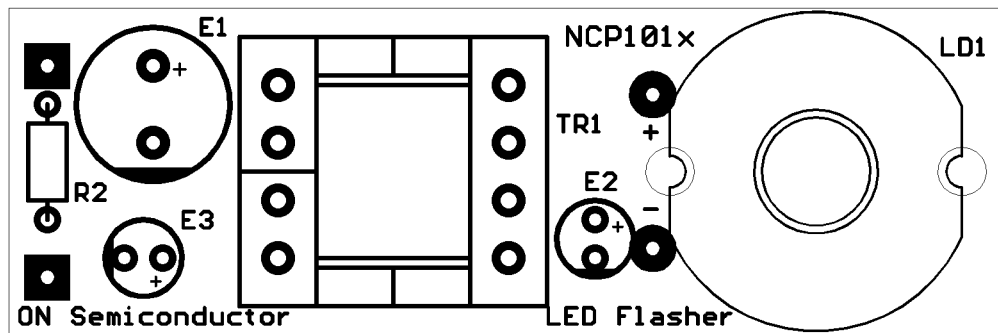


Figure 3. Component Layout – Top Side

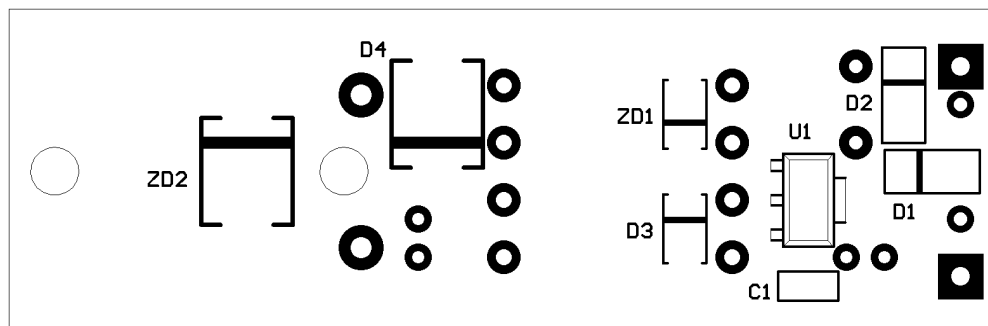


Figure 4. Component Layout – Bottom Side

# AND8224/D

## PCB LAYOUT

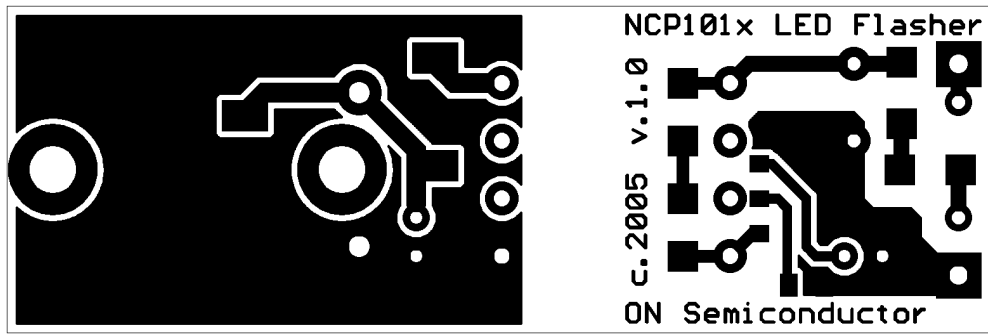


Figure 5. PCB Layout

### Bill of Materials

Part	Value	Package
C1	Ceramic 1 nF/50 V	C0805
D1	MRA4007T3	SMA
D2	MRA4007T3	SMA
D3	MURA160T3	SMA
D4	MBRS340T3	SMC
E1	2.2 $\mu$ F/400 V	E5/10
E2	47 $\mu$ F/16 V	E2,5/5
E3	47 $\mu$ F/16 V	E2,5/5
LD1	LXHL-LH3C	LUX-STAR
R2	100 $\Omega$ Fusible	R RM7,5
TR1	UNI-EE16	EF16
U1	NCP1013ST65	SOT-223
ZD1	BZG03C150	SMA
ZD2	1.5SMC9.1AT3	SMC

### Contact Address of the Transformer Manufacturer:

**Order number:** Transformer for NCP101x LED Flasher

### Manufacturer: P&V Elektronik

Mr. Josef Viktora


Kasejovice 389

335 44 Kasejovice

Czech Republic, Europe

e-mail: [pvelektronic@atlas.cz](mailto:pvelektronic@atlas.cz)

Tel./Fax: 371 595 412 / 371 595 280

**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 61312, Phoenix, Arizona 85082-1312 USA  
**Phone:** 480-829-7710 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 480-829-7709 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada

**Japan:** ON Semiconductor, Japan Customer Focus Center  
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051  
**Phone:** 81-3-5773-3850

**ON Semiconductor Website:** <http://onsemi.com>

**Order Literature:** <http://www.onsemi.com/litorder>

For additional information, please contact your  
local Sales Representative.