



ON Semiconductor®

<http://onsemi.com>

Automotive LED Driver with On/Off and Dimming Control

DESIGN NOTE

Circuit Description

This Design Note features a combination of two integrated circuits (NCV7680 and NCV7608) for driving automotive LEDs, combining the best features of both ICs.

The NCV7680 creates the current source necessary to drive 8 strings of LEDs, while the NCV7608 allows the outputs to be segmented resulting in control of individual strings for On/Off control or dimming purposes.

The NCV7680 provides the DC current programming via the R_{STOP} programming resistor. A chart is available in the datasheet for programming the current up to 75 mA.

The NCV7608 On/OFF dimming control can be employed using either the SPI inputs or using the 4 parallel inputs.

Key Features

- Control of 8 Strings of LEDs
- Individual On/Off Control
- Individual Dimming Control
- Open Circuit Detection
- Short Circuit Detection

Table 1. DEVICE DETAILS

Device	Application	Load Dump	Channel Count	Output LED Current per Channel	Miscellaneous
NCV7680, NCV7608	Automotive Lighting	40 V	8	75 mA	Waveshaping

Table 2. OTHER SPECIFICATIONS

NCV7608 Output Current	800 mA	Max
NCV7608 SPI Frequency	5 MHz	Max
NCV7608 Frame Length	16	Bits

Open Load Detection	Yes, via NCV7608
Parallel Input for PWM	Yes, via NCV7608
Slew Rate Control	Yes, via NCV7608 & NCV7680
Current Programming	Yes, via NCV7680
3.3 V/5 V Compatible Logic	Yes, on the NCV7608
Daisy Chain Compatible	Yes, on the NCV7608
AEC Q10X-12-REV A Compatible	Yes, on the NCV7608

Others	When less than 8 strings of LEDs are utilized, the additional outputs on the NCV7608 can be used as either high-side or low-side drivers.
--------	---

SCHEMATIC

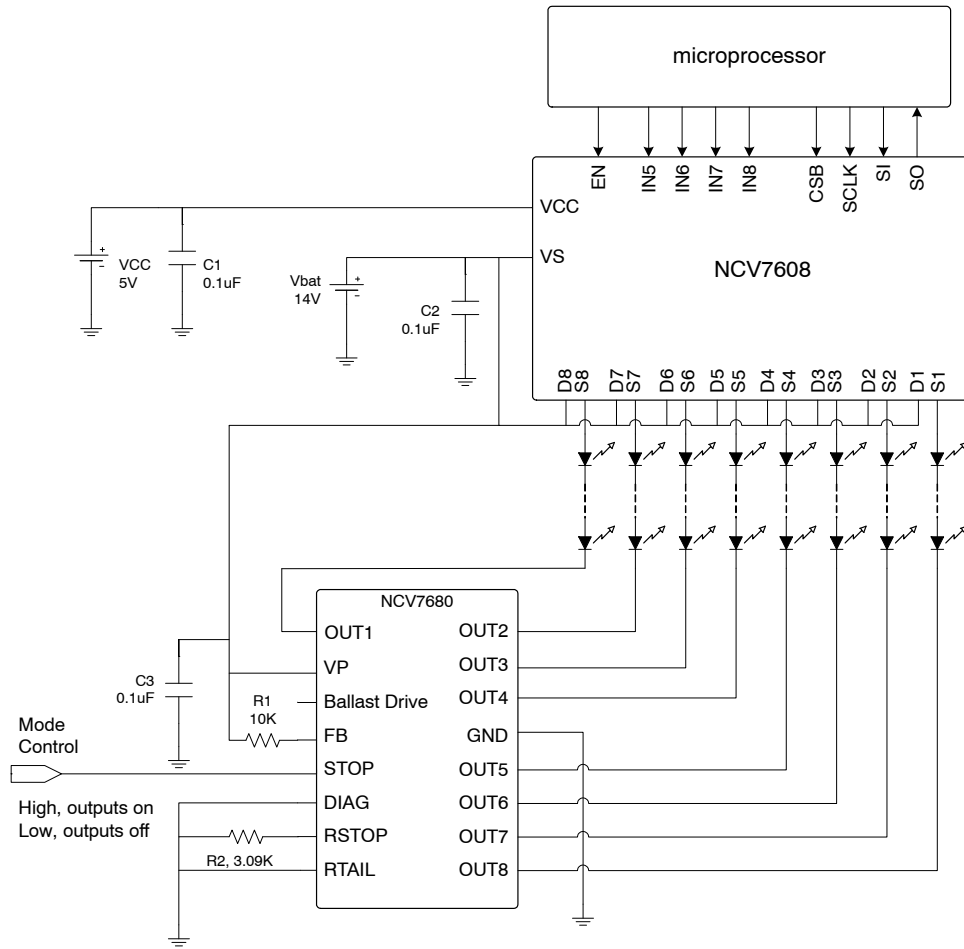


Figure 1. Complete Schematic

1. The number of diodes in each string is determined by the users choice of component and current used.
2. Mode Control can also be used as a modulating source for contiguous usage of LEDs.
3. Power supply capacitors may need to be increased depending on the current level and duty cycle used.

NCV7680 DC Current Programming

The DC current of each LED string is determined by the programming resistor on R_{STOP} (3.09K in Figure 1) of the NCV7680.

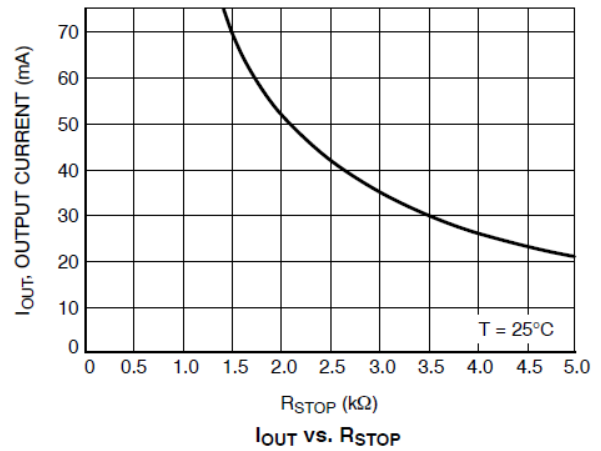


Figure 2. NCV7680 I_{OUT} vs R_{STOP}

NCV7608 SPI Frame

The NCV7608 SPI frame consists of input control for each individual output and control for open load diagnostic enable.

The output frame presents the output status for each individual driver, the parallel input state, and the battery supply status.

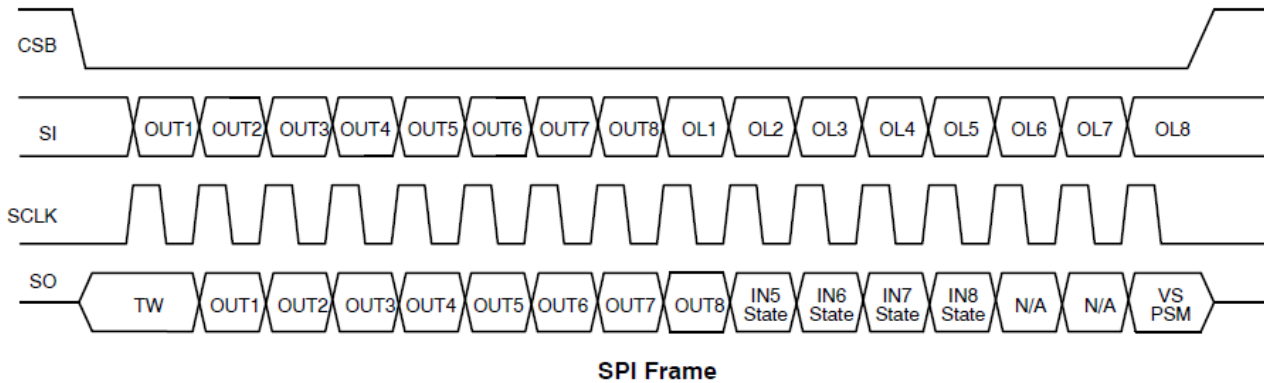



Figure 3. NCV7608 SPI Frame

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. 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 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative