NUD4011

Product Preview

Low Current LED Driver

This device is designed to replace discrete solutions for driving LEDs in AC/DC applications. An external resistor allows the circuit designer to set the drive current for different LED arrays. This discrete integration technology eliminates individual components by combining them into a single package, which results in a significant reduction of both system cost & board space. The device is a small surface mount package (SO–8).

Features

- Supplies Constant LED Current for Varying Input Voltages.
- External Resistor Allows Designer to Set Current – up to 100 mA.
- Offered in Surface Mount Package Technology (SO−8).

Benefits

- Maintains a Constant Light Output During Battery Drain.
- One Device Can Be Used for Many Different LED Products.
- Reduces Board Space & Component Count.
- Simplifies Circuit and System Designs.

Typical Applications

- Portables: For Battery Back−up Applications, also Simple Ni−CAD Battery Charging.
- Industrial: General Lighting Applications and Small Appliances.
- Automotive: Tail Lights, Directional Lights, Back−up Light, Dome Light.

PIN FUNCTION DESCRIPTIONS

Pin	Symbol	Description
1	V_{in}	Positive input voltage to the device
2	N/C	No connection
3	R_{ext}	An external resistor between R_{ext} and V_{in} pins sets different current levels for different application needs
4	GND	Ground
5, 6, 7, 8	I_{out}	The LEDs are connected from these pins to ground

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

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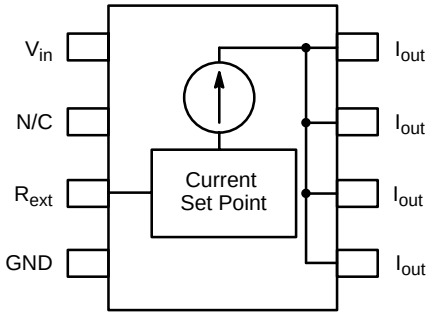
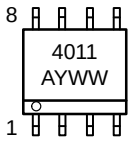
PIN CONFIGURATION AND SCHEMATIC



SO−8
CASE 751

MARKING DIAGRAM



4011 = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NUD4011DR2	SO−8	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Input Voltage	V_{in}	200	V
Output Current (For $V_{drop} \le 12$ V), (Note 1)	I_{out}	100	mA
Output Voltage	V_{out}	198	V
Human Body Model (HBM)	ESD	2000	V

1. $V_{drop} = V_{in} – 0.7\ V – V_{LEDs}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Operating Ambient Temperature	T_A	−40 to +125	°C
Maximum Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	−55 to +150	°C
Total Power Dissipation (Note 2) Derating above 25°C (Fig. 3)	P_D	1.25 10	W mW/°C
Thermal Resistance Junction–to–Ambient (Note 2)	$R_{\theta JA}$	100	°C/W

2. Mounted onto FR−4, 1” pad, 1 oz coverage.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Current1 (V_{in} = 12 V, R_{ext} = 7.0 Ω, V_{LEDs} = 7.0 V)	I_{out1}	−	100	−	mA
Output Current2 (V_{in} = 200 V, R_{ext} = 140 Ω, V_{LEDs} = 7.0 V)	I_{out2}	−	5.0	−	mA
Bias Current (V_{in} = 12 V, R_{ext} = Open, V_{LEDs} = 7.0 V)	I_{Bias}	−	0.5	−	mA
Voltage Overhead (Note 3)	V_{over}	1.4	−	–	V

3. $V_{over} = V_{in} – V_{LEDs}$

TYPICAL PERFORMANCE CURVES

(T_J = 25°C unless otherwise noted)

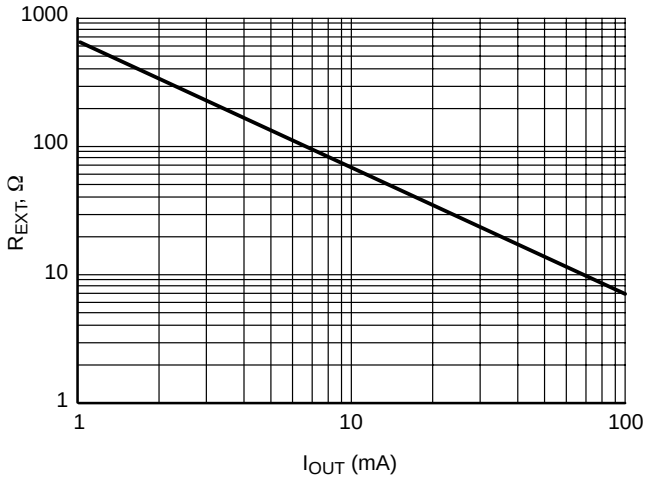


Figure 1. Output Current (I_{OUT}) vs. External Resistor (R_{EXT})

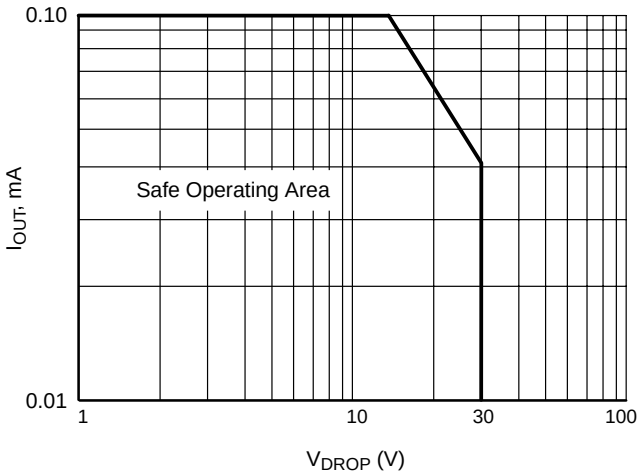


Figure 2. Voltage Across Driver (V_{DROP}) vs. Output Current (I_{OUT})

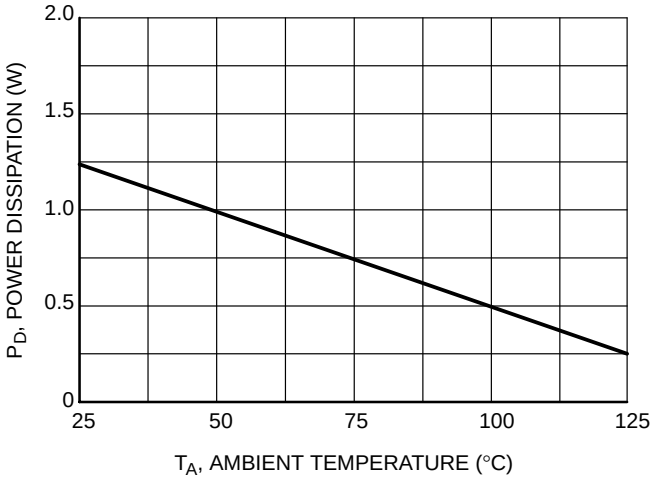


Figure 3. Max Power Dissipation (P_D) vs. Ambient Temperature (T_A)

APPLICATION INFORMATION

Design Guide

1. Determine I_{out} – LED's current:
   a. I_{LED} = 100 mA

2. Calculate Resistor Value for R_{ext}:
   a. R_{ext} = 0.7 V / I_{out}
   b. R_{ext} = 0.7/0.100 = 7 ohms

3. Define V_{in}:
   a. Per Example in Fig 4, V_{in} = 12 V

4. Define V_{LED} @ I_{LED} per LED supplier's data sheet:
   b. Per Example in Fig. 4,
   V_{LED} = 3.5 V + 3.5 V + 3.5 V = 10.5 V

5. Calculate V_{drop} across NUD4011:
   a. V_{drop} = Vin – 0.7V – VLED
   b. V_{drop} = 12.0 V – 0.7 V – 10.5 V
   c. V_{drop} = 0.8 V

6. Calculate Power Dissipation (P_D):
   a. $P_D = V_{drop} * I_{out}$
   b. P_D = 0.8 V * 0.100 A
   c. P_D = 80 mW

7. If P_D > 1.25 W (or derated value based on ambient temperature, Fig. 3), then select the most appropriate recourse and repeat steps 1−6:
   a. Reduce V_{in}
   b. Reconfigure LED array to reduce V_{drop}
   c. Reduce I_{out} by increasing R_{ext}

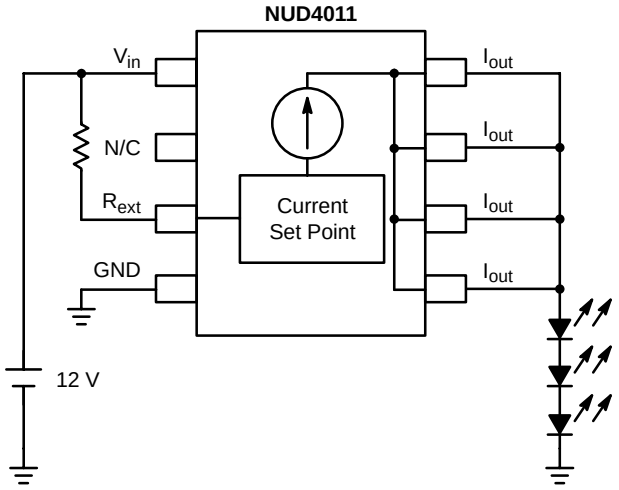
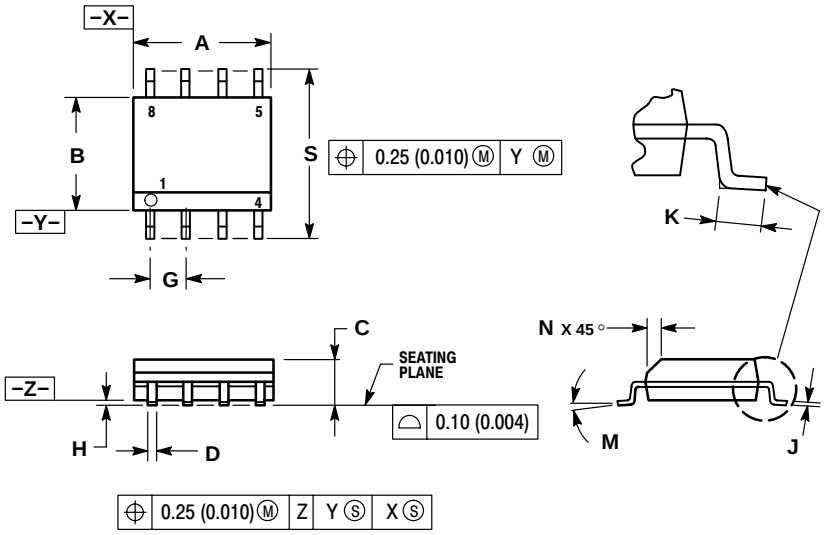


Figure 4. 12 V Application (Series LED's Array)

PACKAGE DIMENSIONS

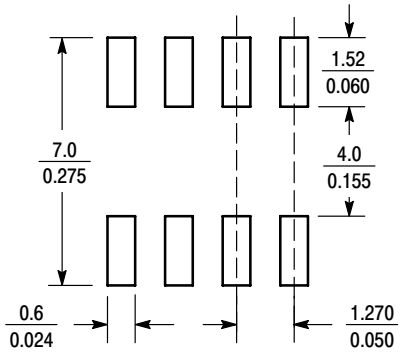
SO−8
CASE 751−07
ISSUE AA



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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P.O. Box 5163, Denver, Colorado 80217 USA
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