

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

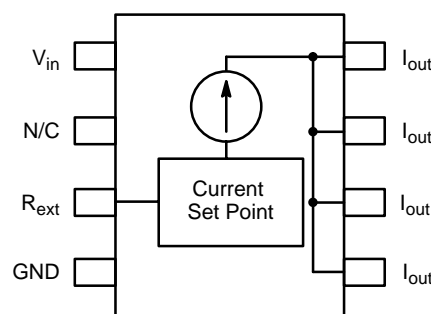
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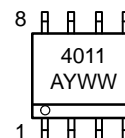
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PIN CONFIGURATION AND SCHEMATIC



**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.

NUD4011

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

Rating	Symbol	Value	Unit
Input Voltage	V _{in}	200	V
Output Current (For V _{drop} ≤ 12 V), (Note 1)	I _{out}	100	mA
Output Voltage	V _{out}	198	V
Human Body Model (HBM)	ESD	2000	V

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

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 _{θJA}	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

($T_J = 25^\circ\text{C}$ unless otherwise noted)

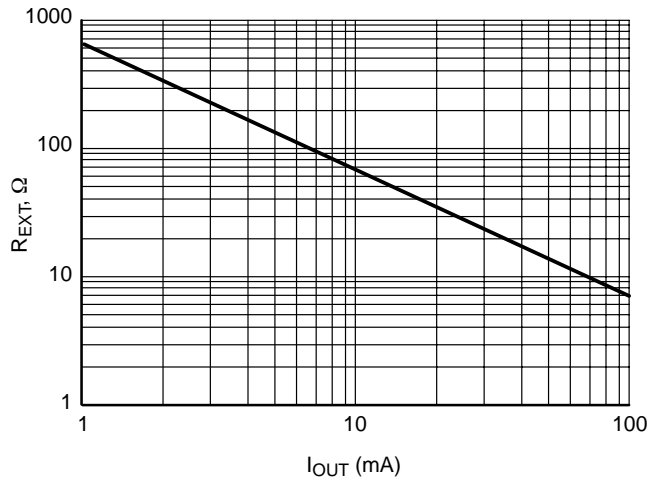


Figure 1. Output Current (I_{OUT}) vs. External Resistor (R_{EXT})

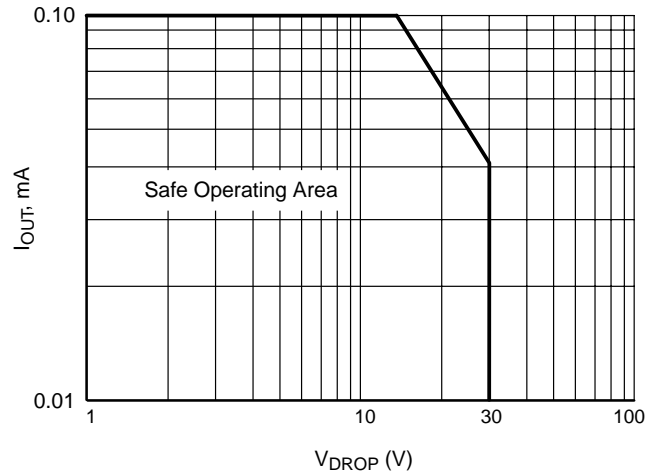


Figure 2. Voltage Across Driver (V_{DROP}) vs. Output Current (I_{OUT})

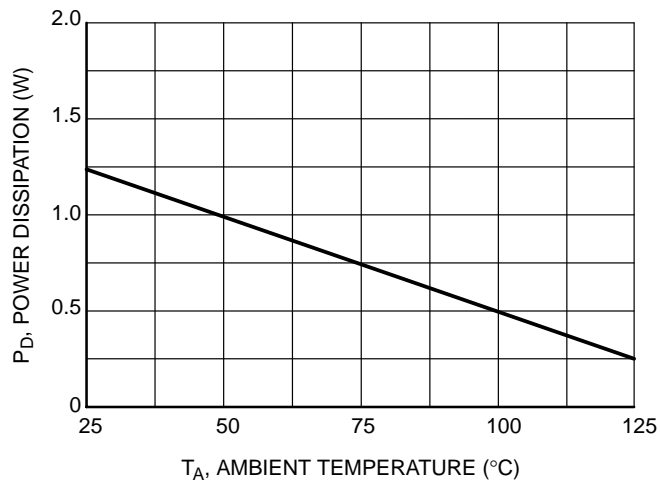
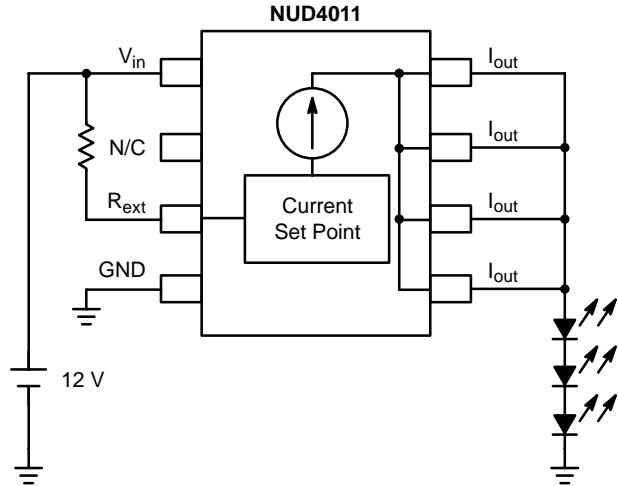


Figure 3. Max Power Dissipation (P_D) vs. Ambient Temperature (T_A)

APPLICATION INFORMATION

Design Guide

1. Determine I_{out} – LED's current:
 - a. $I_{LED} = 100 \text{ mA}$
2. Calculate Resistor Value for R_{ext} :
 - a. $R_{ext} = 0.7 \text{ V} / I_{out}$
 - b. $R_{ext} = 0.7/0.100 = 7 \text{ ohms}$
3. Define V_{in} :
 - a. Per Example in Fig 4, $V_{in} = 12 \text{ V}$
4. Define V_{LED} @ I_{LED} per LED supplier's data sheet:
 - b. Per Example in Fig. 4,
 $V_{LED} = 3.5 \text{ V} + 3.5 \text{ V} + 3.5 \text{ V} = 10.5 \text{ V}$
5. Calculate V_{drop} across NUD4011:
 - a. $V_{drop} = V_{in} - 0.7\text{V} - V_{LED}$
 - b. $V_{drop} = 12.0 \text{ V} - 0.7 \text{ V} - 10.5 \text{ V}$
 - c. $V_{drop} = 0.8 \text{ V}$
6. Calculate Power Dissipation (P_D):
 - a. $P_D = V_{drop} * I_{out}$
 - b. $P_D = 0.8 \text{ V} * 0.100 \text{ A}$
 - c. $P_D = 80 \text{ mW}$
7. If $P_D > 1.25 \text{ W}$ (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}

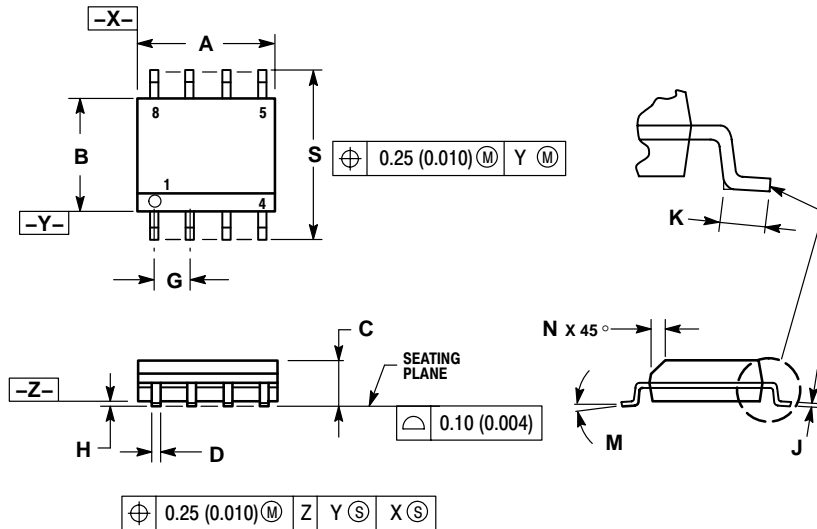


**Figure 4. 12 V Application
(Series LED's Array)**

NUD4011

PACKAGE DIMENSIONS

SO-8
CASE 751-07
ISSUE AA

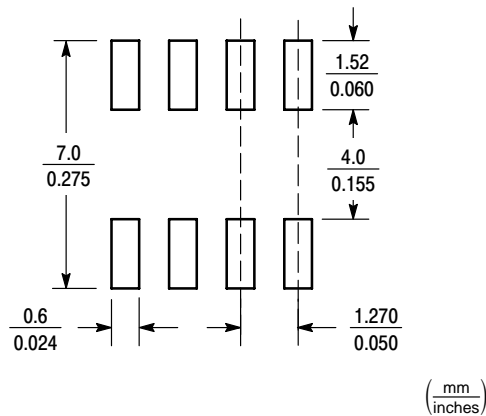


NOTES:


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.

DIM	MILLIMETERS		INCHES	
	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.

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