NUD4001

Product Preview

High Current LED Driver

This device is designed to replace discrete solutions for driving LEDs in low voltage DC applications 5V, 12V or 24V. 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 350 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: Low Voltage 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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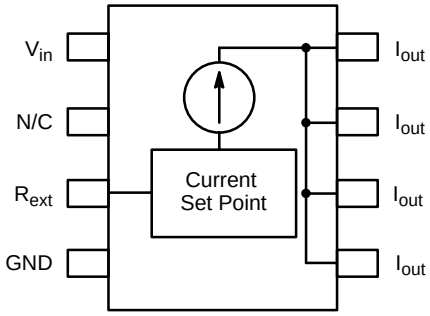
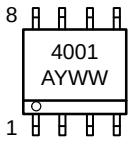
PIN CONFIGURATION AND SCHEMATIC



SO−8
CASE 751

MARKING DIAGRAM



4001 = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NUD4001DR2	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}	60	V
Output Current (For $V_{drop} \leq 3.0$ V), (Note 1)	I_{out}	350	mA
Output Voltage	V_{out}	58	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} = 2.0 Ω, V_{LEDs} = 10 V)	I_{out1}	−	350	−	mA
Output Current2 (V_{in} = 60 V, R_{ext} = 70 Ω, V_{LEDs} = 10 V)	I_{out2}	−	10	−	mA
Bias Current (V_{in} = 12 V, R_{ext} = Open, V_{LEDs} = 10 V)	I_{Bias}	−	5.0	−	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)

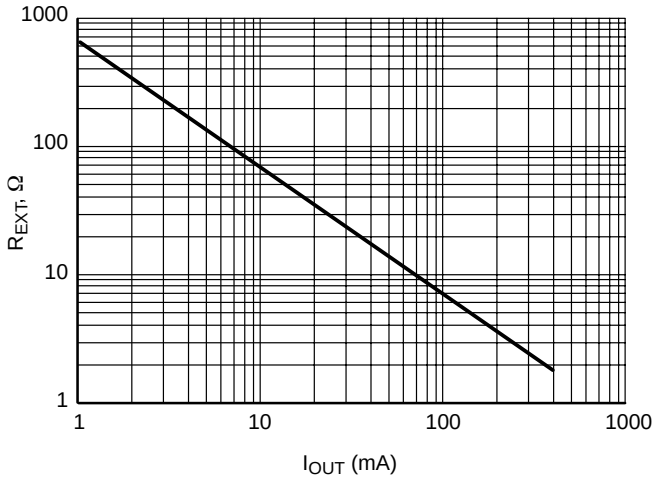


Figure 1. Output Current (I_{OUT}) vs. External Resistor (R_{EXT})

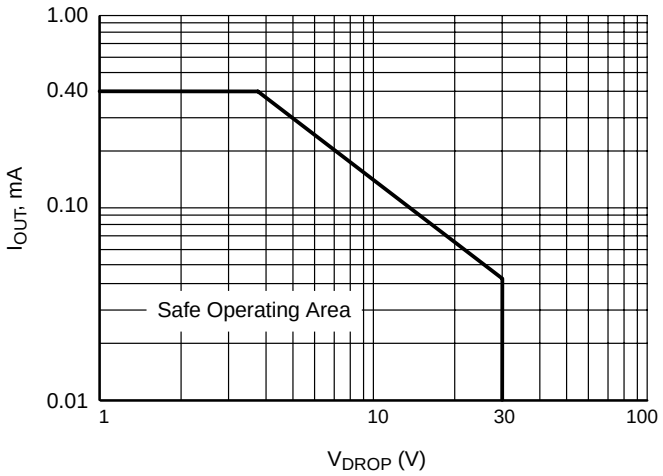


Figure 2. Voltage Across Driver (V_{DROP}) vs. Output Current (I_{OUT})

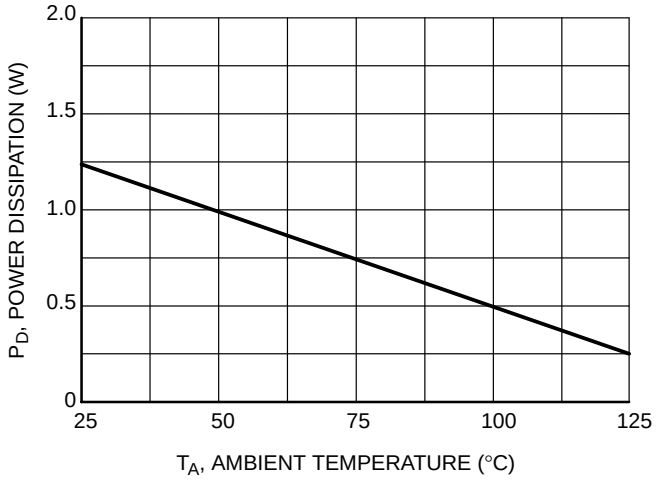


Figure 3. Max Power Dissipation (P_D) vs. Ambient Temperature (T_A)

APPLICATION INFORMATION

Design Guide

1. Determine I_{out} – LED's current:
   a. I_{LED} = 350 mA

2. Calculate Resistor Value for R_{ext}:
   a. R_{ext} = 0.7 V / I_{out}
   b. R_{ext} = 0.7/0.350 = 2 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 NUD4001:
   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 * 0.350 A
   c. P_D = 280 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}

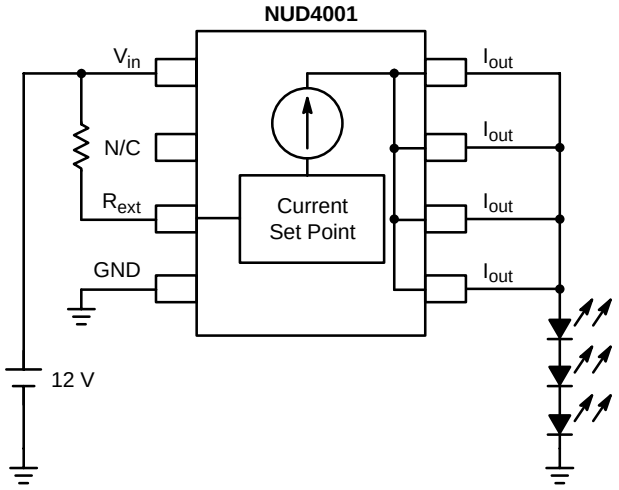
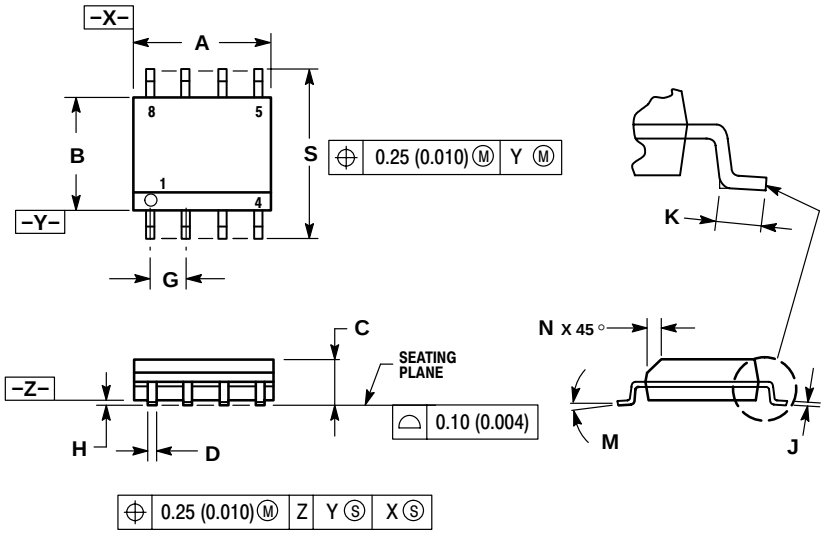


Figure 4. 12 V Application (Series LED's Array)

PACKAGE DIMENSIONS

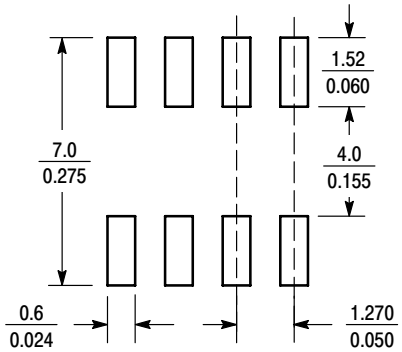
SO−8
CASE 751−07
ISSUE AA



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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