

NUD3160, SZNUD3160

Industrial Inductive Load Driver

This micro-integrated part provides a single component solution to switch inductive loads such as relays, solenoids, and small DC motors without the need of a free-wheeling diode. It accepts logic level inputs, thus allowing it to be driven by a large variety of devices including logic gates, inverters, and microcontrollers.

Features

- Provides Robust Interface between D.C. Relay Coils and Sensitive Logic
- Capable of Driving Relay Coils Rated up to 150 mA at 12 V, 24 V or 48 V
- Replaces 3 or 4 Discrete Components for Lower Cost
- Internal Zener Eliminates Need for Free-Wheeling Diode
- Meets Load Dump and other Automotive Specs
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Devices

Typical Applications

- Automotive and Industrial Environment
- Drives Window, Latch, Door, and Antenna Relays

Benefits

- Reduced PCB Space
- Standardized Driver for Wide Range of Relays
- Simplifies Circuit Design and PCB Layout
- Compliance with Automotive Specifications



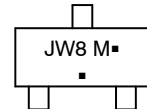
ON Semiconductor®

<http://onsemi.com>

MARKING DIAGRAMS



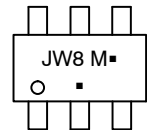
**SOT-23
CASE 318
STYLE 21**



JW8 = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)



**SC-74
CASE 318F
STYLE 7**

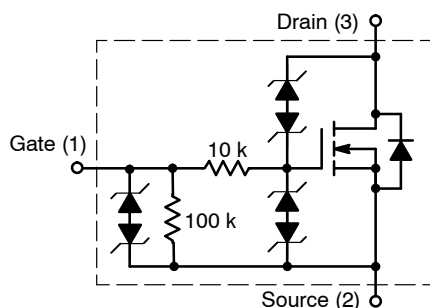


JW8 = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

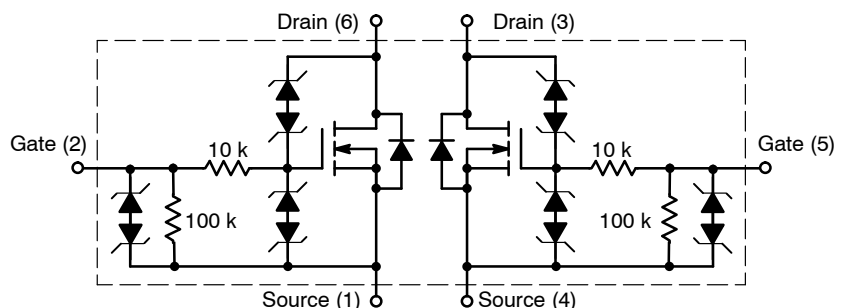
ORDERING INFORMATION

Device	Package	Shipping†
NUD3160LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
SZNUD3160LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NUD3160DMT1G	SC-74 (Pb-Free)	3000 / Tape & Reel
SZNUD3160DMT1G	SC-74 (Pb-Free)	3000 / 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.



CASE 318



CASE 318F

Figure 1. Internal Circuit Diagrams

NUD3160, SZNUD3160

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

Symbol	Rating	Value	Unit
V _{DSS}	Drain-to-Source Voltage – Continuous (T _J = 125°C)	60	V
V _{GSS}	Gate-to-Source Voltage – Continuous (T _J = 125°C)	12	V
I _D	Drain Current – Continuous (T _J = 125°C) Minimum copper, double sided board, T _A = 80°C SOT-23 SC74 Single device driven SC74 Both devices driven 1 in ² copper, double sided board, T _A = 25°C SOT-23 SC74 Single device driven SC74 Both devices driven	158 157 132 ea 272 263 230 ea	mA
E _Z	Single Pulse Drain-to-Source Avalanche Energy (For Relay's Coils/Inductive Loads of 80 Ω or Higher) (T _J Initial = 85°C)	200	mJ
P _{PK}	Peak Power Dissipation, Drain-to-Source (Notes 1 and 2) (T _J Initial = 85°C)	20	W
E _{LD1}	Load Dump Pulse, Drain-to-Source (Note 3) R _{SOURCE} = 0.5 Ω, T = 300 ms (For Relay's Coils/Inductive Loads of 80 Ω or Higher) (T _J Initial = 85°C)	60	V
E _{LD2}	Inductive Switching Transient 1, Drain-to-Source (Waveform: R _{SOURCE} = 10 Ω, T = 2.0 ms) (For Relay's Coils/Inductive Loads of 80 Ω or Higher) (T _J Initial = 85°C)	100	V
E _{LD3}	Inductive Switching Transient 2, Drain-to-Source (Waveform: R _{SOURCE} = 4.0 Ω, T = 50 μs) (For Relay's Coils/Inductive Loads of 80 Ω or Higher) (T _J Initial = 85°C)	300	V
Rev-Bat	Reverse Battery, 10 Minutes (Drain-to-Source) (For Relay's Coils/Inductive Loads of 80 Ω or more)	-14	V
Dual-Volt	Dual Voltage Jump Start, 10 Minutes (Drain-to-Source)	28	V
ESD	Human Body Model (HBM) According to EIA/JESD22/A114 Specification	2000	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

NUD3160, SZNUD3160

THERMAL CHARACTERISTICS

Symbol	Rating	Value	Unit	
T_A	Operating Ambient Temperature	-40 to 125	°C	
T_J	Maximum Junction Temperature	150	°C	
T_{STG}	Storage Temperature Range	-65 to 150	°C	
P_D	Total Power Dissipation (Note 4) Derating above 25°C	SOT-23	225	mW
			1.8	mW/°C
P_D	Total Power Dissipation (Note 4) Derating above 25°C	SC-74	380	mW
			3.0	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient Minimum Copper	SOT-23	556	°C/W
		SC-74 One Device Powered	556	
		SC-74 Both Devices Equally Powered	398	
	300 mm ² Copper	SOT-23	395	
		SC-74 One Device Powered	420	
		SC-74 Both Devices Equally Powered	270	

1. Nonrepetitive current square pulse 1.0 ms duration.
2. For different square pulse durations, see Figure 12.
3. Nonrepetitive load dump pulse per Figure 3.
4. Mounted onto minimum pad board.

NUD3160, SZNUD3160

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain to Source Sustaining Voltage (I _D = 10 mA)	V _{BRDSS}	61	66	70	V
Drain to Source Leakage Current (V _{DS} = 12 V, V _{GS} = 0 V) (V _{DS} = 12 V, V _{GS} = 0 V, T _J = 125°C) (V _{DS} = 60 V, V _{GS} = 0 V) (V _{DS} = 60 V, V _{GS} = 0 V, T _J = 125°C)	I _{DSS}	–	–	0.5 1.0 50 80	μA
Gate Body Leakage Current (V _{GS} = 3.0 V, V _{DS} = 0 V) (V _{GS} = 3.0 V, V _{DS} = 0 V, T _J = 125°C) (V _{GS} = 5.0 V, V _{DS} = 0 V) (V _{GS} = 5.0 V, V _{DS} = 0 V, T _J = 125°C)	I _{GSS}	–	–	60 80 90 110	μA

ON CHARACTERISTICS

Gate Threshold Voltage (V _{GS} = V _{DS} , I _D = 1.0 mA) (V _{GS} = V _{DS} , I _D = 1.0 mA, T _J = 125°C)	V _{GS(th)}	1.3 1.3	1.8 –	2.0 2.0	V
Drain to Source On-Resistance (I _D = 150 mA, V _{GS} = 3.0 V) (I _D = 150 mA, V _{GS} = 3.0 V, T _J = 125°C) (I _D = 150 mA, V _{GS} = 5.0 V) (I _D = 150 mA, V _{GS} = 5.0 V, T _J = 125°C)	R _{DS(on)}	–	–	2.4 3.7 1.8 2.9	Ω
Output Continuous Current (V _{DS} = 0.3 V, V _{GS} = 5.0 V) (V _{DS} = 0.3 V, V _{GS} = 5.0 V, T _J = 125°C)	I _{DS(on)}	150 100	200 –	– –	mA
Forward Transconductance (V _{DS} = 12 V, I _D = 150 mA)	g _{FS}	–	400	–	mmho

DYNAMIC CHARACTERISTICS

Input Capacitance (V _{DS} = 12 V, V _{GS} = 0 V, f = 10 kHz)	C _{iss}	–	30	–	pf
Output Capacitance (V _{DS} = 12 V, V _{GS} = 0 V, f = 10 kHz)	C _{oss}	–	14	–	pf
Transfer Capacitance (V _{DS} = 12 V, V _{GS} = 0 V, f = 10 kHz)	C _{rss}	–	6.0	–	pf

SWITCHING CHARACTERISTICS

Propagation Delay Times: High to Low Propagation Delay; Figure 2, (V _{DS} = 12 V, V _{GS} = 3.0 V) Low to High Propagation Delay; Figure 2, (V _{DS} = 12 V, V _{GS} = 3.0 V)	t _{PHL} t _{PLH}	– –	918 798	– –	ns
High to Low Propagation Delay; Figure 2, (V _{DS} = 12 V, V _{GS} = 5.0 V) Low to High Propagation Delay; Figure 2, (V _{DS} = 12 V, V _{GS} = 5.0 V)	t _{PHL} t _{PLH}	– –	331 1160	– –	ns
Transition Times: Fall Time; Figure 2, (V _{DS} = 12 V, V _{GS} = 3.0 V) Rise Time; Figure 2, (V _{DS} = 12 V, V _{GS} = 3.0 V)	t _f t _r	– –	2290 618	– –	ns
Fall Time; Figure 2, (V _{DS} = 12 V, V _{GS} = 5.0 V) Rise Time; Figure 2, (V _{DS} = 12 V, V _{GS} = 5.0 V)	t _f t _r	– –	622 600	– –	ns

NUD3160, SZNUD3160

TYPICAL WAVEFORMS

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

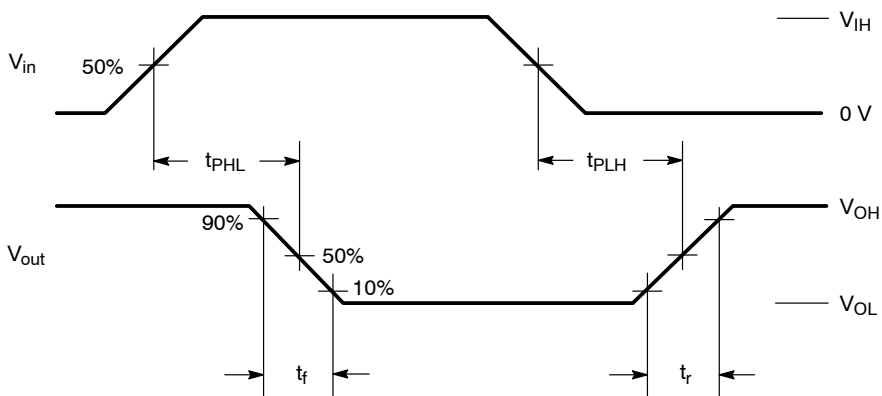


Figure 2. Switching Waveforms

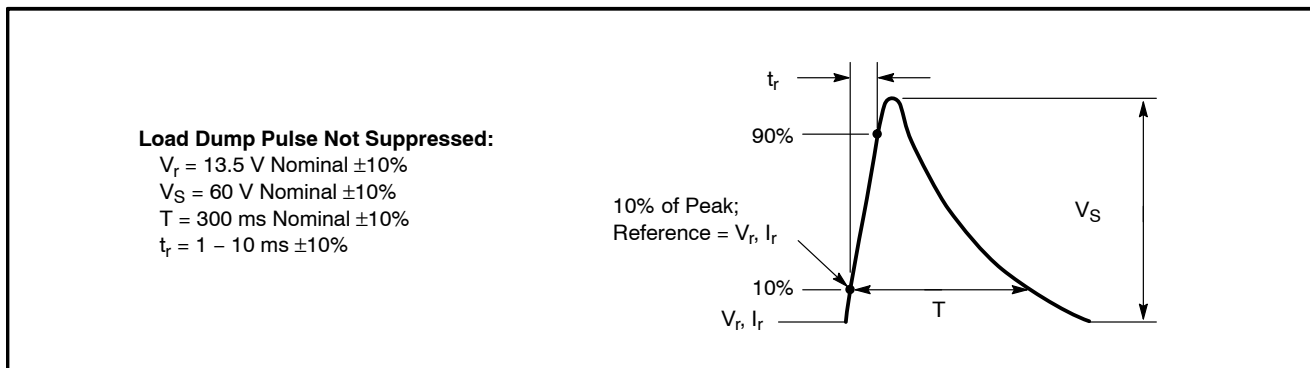


Figure 3. Load Dump Waveform Definition

NUD3160, SZNUD3160

TYPICAL PERFORMANCE CURVES

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

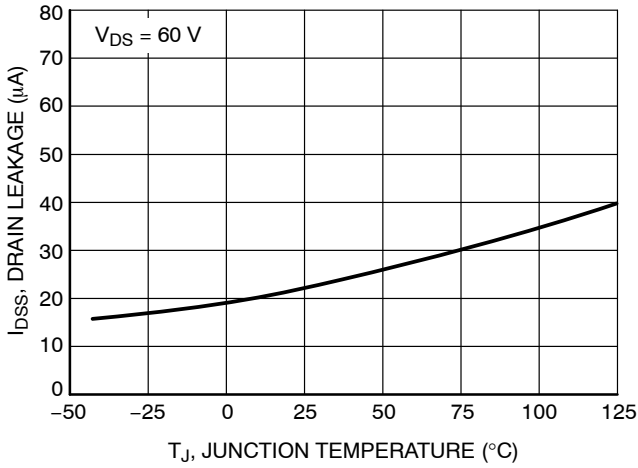


Figure 4. Drain-to-Source Leakage vs. Junction Temperature

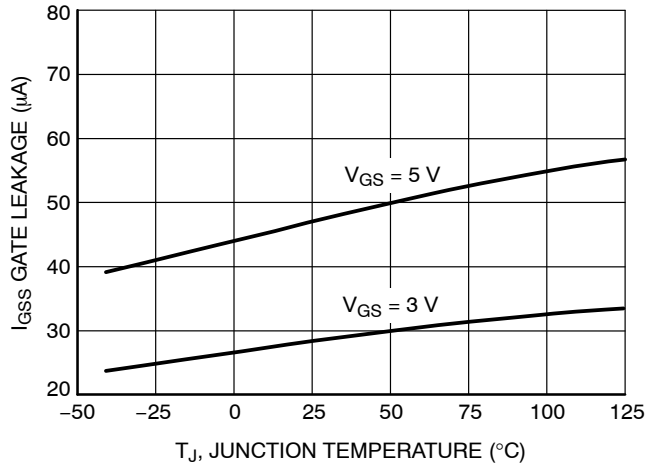


Figure 5. Gate-to-Source Leakage vs. Junction Temperature

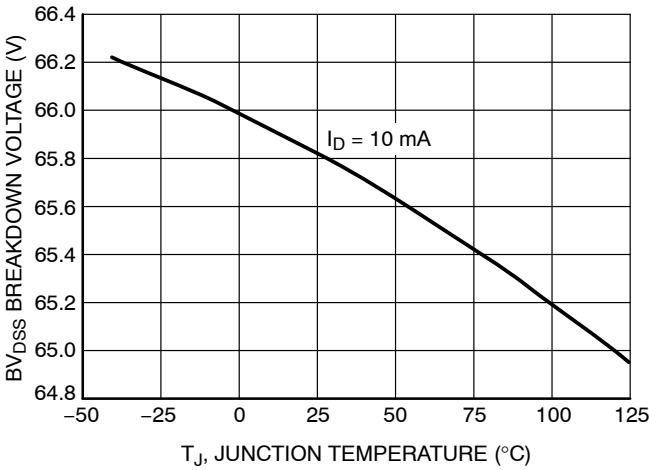


Figure 6. Breakdown Voltage vs. Junction Temperature

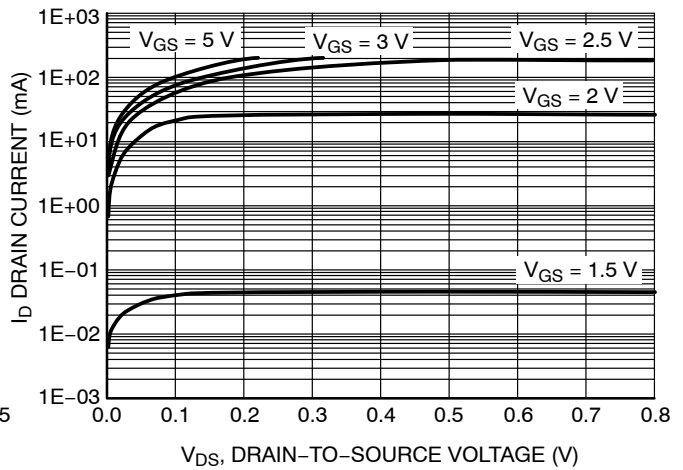


Figure 7. Output Characteristics

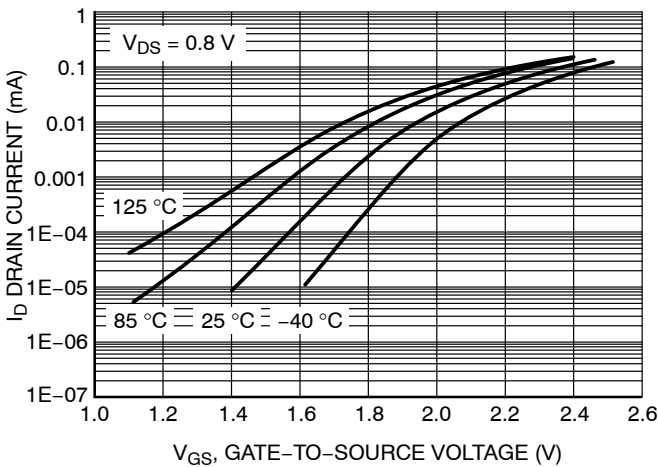


Figure 8. Transfer Function

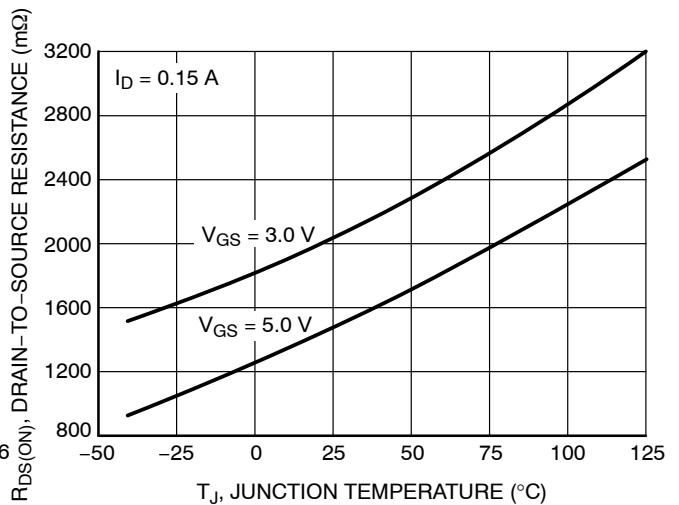


Figure 9. On Resistance Variation vs. Junction Temperature

NUD3160, SZNUD3160

TYPICAL PERFORMANCE CURVES

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

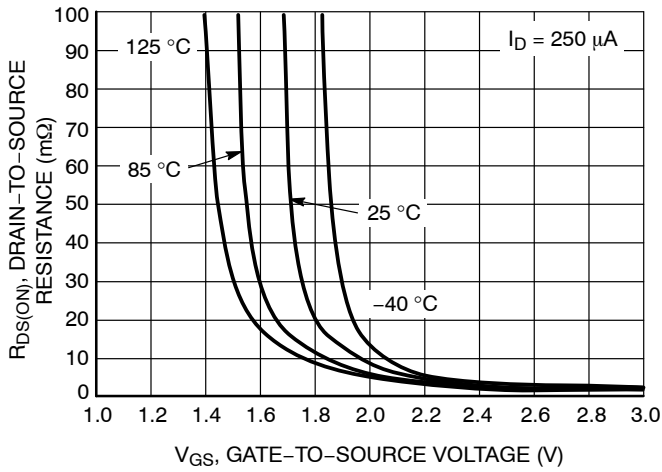


Figure 10. On Resistance Variation vs. Gate-to-Source Voltage

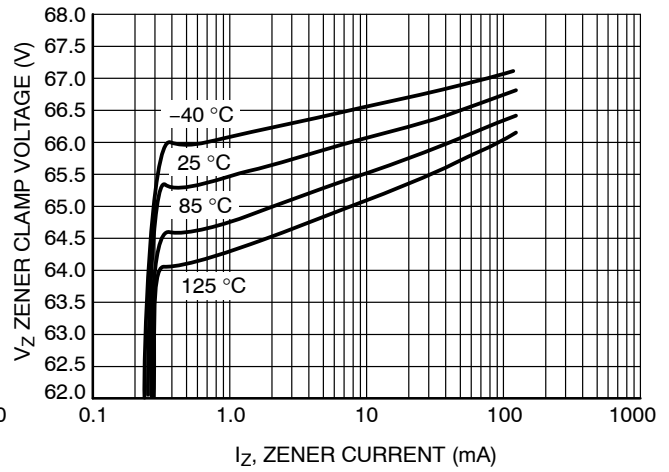


Figure 11. Zener Clamp Voltage vs. Zener Current

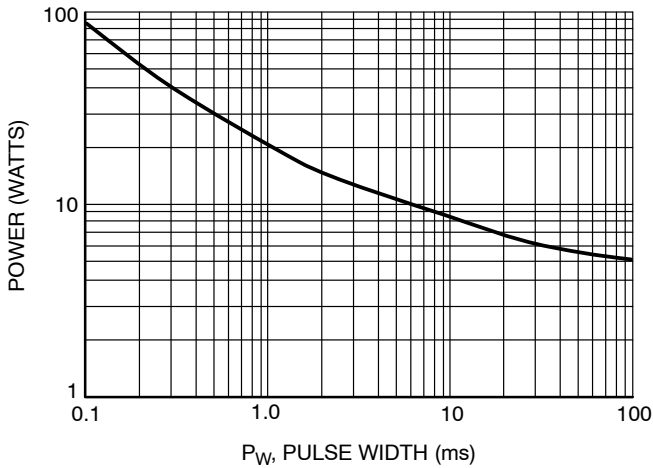


Figure 12. Maximum Non-repetitive Surge Power vs. Pulse Width

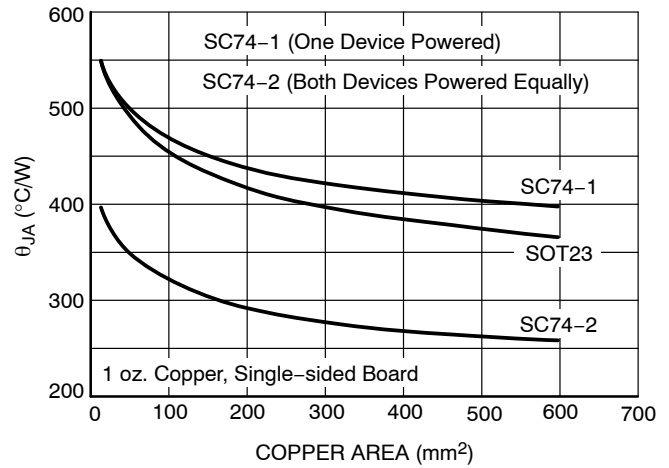


Figure 13. Thermal Performance vs. Board Copper Area

NUD3160, SZNUD3160

APPLICATIONS INFORMATION

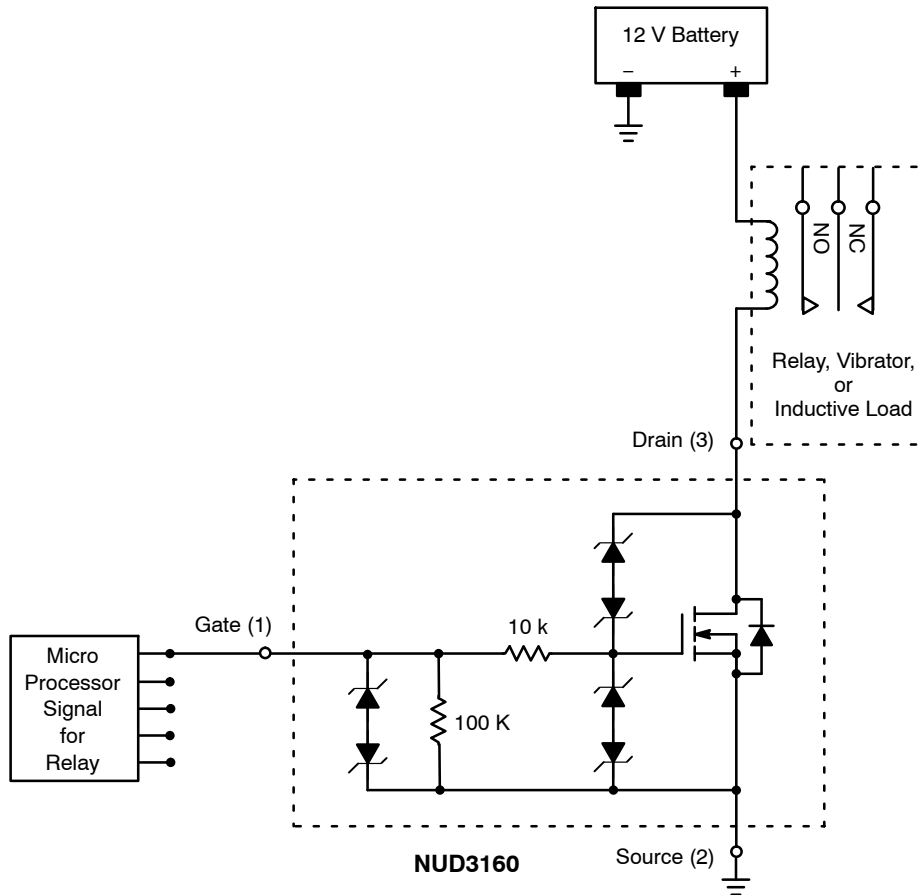
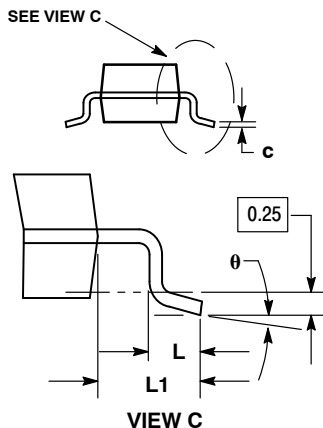
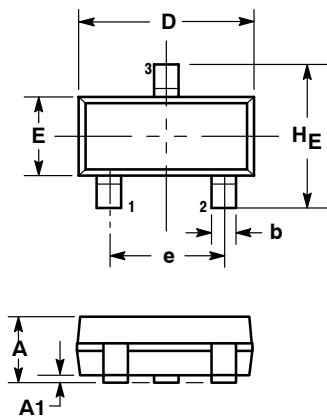


Figure 14. Applications Diagram

NUD3160, SZNUD3160

PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AP

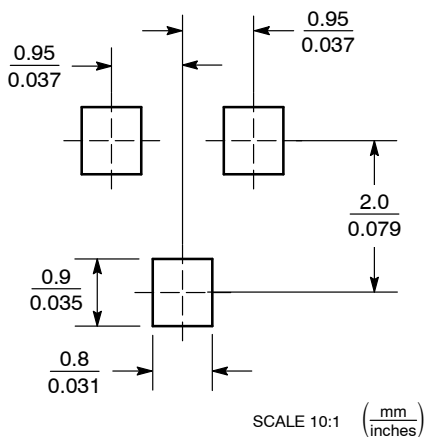


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	---	10°	0°	---	10°

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

SOLDERING FOOTPRINT*



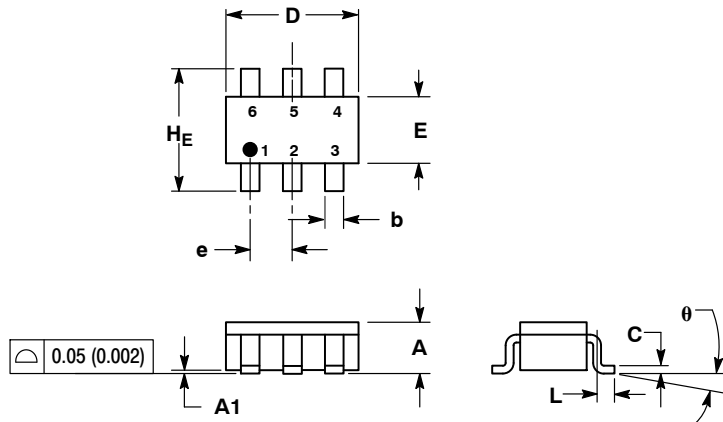
SCALE 10:1 ($\frac{\text{mm}}{\text{inches}}$)

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

NUD3160, SZNUD3160

PACKAGE DIMENSIONS

SC-74 CASE 318F-05 ISSUE M



NOTES:

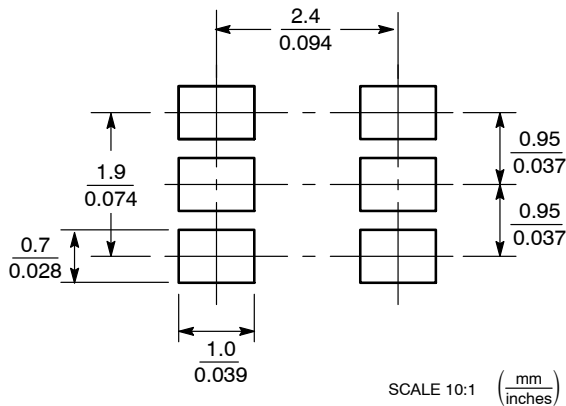
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318F-01, -02, -03, -04 OBSOLETE. NEW STANDARD 318F-05.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.00	1.10	0.035	0.039	0.043
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.25	0.37	0.50	0.010	0.015	0.020
c	0.10	0.18	0.26	0.004	0.007	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	0.85	0.95	1.05	0.034	0.037	0.041
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.75	3.00	0.099	0.108	0.118
theta	0°	-	10°	0°	-	10°

STYLE 7:

1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

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.

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 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

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А