

NUD3124, SZNUD3124

Automotive 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 Volts
- 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



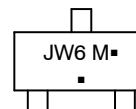
ON Semiconductor®

<http://onsemi.com>

MARKING DIAGRAMS



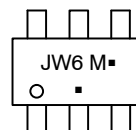
**SOT-23
CASE 318
STYLE 21**



JW6 = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)



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



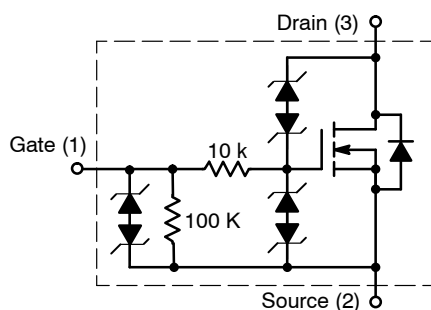
JW6 = Specific Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

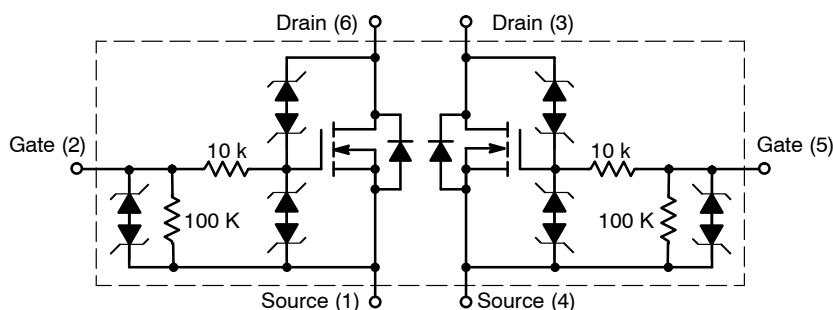
Device	Package	Shipping†
NUD3124LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
SZNUD3124LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NUD3124DMT1G	SC-74 (Pb-Free)	3000 / Tape & Reel
SZNUD3124DMT1G	SC-74 (Pb-Free)	3000 / Tape & Reel

†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.

INTERNAL CIRCUIT DIAGRAMS



CASE 318



CASE 318F

NUD3124, SZNUD3124

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

Symbol	Rating	Value	Unit
V_{DSS}	Drain-to-Source Voltage – Continuous ($T_J = 125^{\circ}\text{C}$)	28	V
V_{GSS}	Gate-to-Source Voltage – Continuous ($T_J = 125^{\circ}\text{C}$)	12	V
I_{D}	Drain Current – Continuous ($T_J = 125^{\circ}\text{C}$)	150	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)	250	mJ
P_{PK}	Peak Power Dissipation, Drain-to-Source (Notes 1 and 2) (T_J Initial = 85°C)	20	W
E_{LD1}	Load Dump Suppressed Pulse, Drain-to-Source (Notes 3 and 4) (Suppressed Waveform: $V_s = 45\text{ V}$, $R_{\text{SOURCE}} = 0.5\ \Omega$, $T = 200\text{ ms}$) (For Relay's Coils/Inductive Loads of 80 Ω or Higher) (T_J Initial = 85°C)	80	V
E_{LD2}	Inductive Switching Transient 1, Drain-to-Source (Waveform: $R_{\text{SOURCE}} = 10\ \Omega$, $T = 2.0\text{ ms}$) (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: $R_{\text{SOURCE}} = 4.0\ \Omega$, $T = 50\ \mu\text{s}$) (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	2,000	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.

1. Nonrepetitive current square pulse 1.0 ms duration.
2. For different square pulse durations, see Figure 2.
3. Nonrepetitive load dump suppressed pulse per Figure 3.
4. For relay's coils/inductive loads higher than 80 Ω , see Figure 4.

NUD3124, SZNUD3124

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 5) Derating above 25°C	SOT–23 225 1.8	mW
			mW/°C
P _D	Total Power Dissipation (Note 5) Derating above 25°C	SC–74 380 3.0	mW
			mW/°C
R _{θJA}	Thermal Resistance Junction–to–Ambient (Note 5)	SOT–23 556	°C/W
		SC–74 329	

5. Mounted onto minimum pad board.

NUD3124, SZNUD3124

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

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

OFF CHARACTERISTICS

Drain to Source Sustaining Voltage ($I_D = 10\text{ mA}$)	V_{BRDSS}	28	34	38	V
Drain to Source Leakage Current ($V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$) ($V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$) ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$) ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	– – – –	– – – –	0.5 1.0 50 80	μA
Gate Body Leakage Current ($V_{GS} = 3.0\text{ V}$, $V_{DS} = 0\text{ V}$) ($V_{GS} = 3.0\text{ V}$, $V_{DS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$) ($V_{GS} = 5.0\text{ V}$, $V_{DS} = 0\text{ V}$) ($V_{GS} = 5.0\text{ V}$, $V_{DS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$)	I_{GSS}	– – – –	– – – –	60 80 90 110	μA

ON CHARACTERISTICS

Gate Threshold Voltage ($V_{GS} = V_{DS}$, $I_D = 1.0\text{ mA}$) ($V_{GS} = V_{DS}$, $I_D = 1.0\text{ mA}$, $T_J = 125^\circ\text{C}$)	$V_{GS(th)}$	1.3 1.3	1.8 –	2.0 2.0	V
Drain to Source On-Resistance ($I_D = 150\text{ mA}$, $V_{GS} = 3.0\text{ V}$) ($I_D = 150\text{ mA}$, $V_{GS} = 3.0\text{ V}$, $T_J = 125^\circ\text{C}$) ($I_D = 150\text{ mA}$, $V_{GS} = 5.0\text{ V}$) ($I_D = 150\text{ mA}$, $V_{GS} = 5.0\text{ V}$, $T_J = 125^\circ\text{C}$)	$R_{DS(on)}$	– – – –	– – – –	1.4 1.7 0.8 1.1	Ω
Output Continuous Current ($V_{DS} = 0.25\text{ V}$, $V_{GS} = 3.0\text{ V}$) ($V_{DS} = 0.25\text{ V}$, $V_{GS} = 3.0\text{ V}$, $T_J = 125^\circ\text{C}$)	$I_{DS(on)}$	150 140	200 –	– –	mA
Forward Transconductance ($V_{DS} = 12\text{ V}$, $I_D = 150\text{ mA}$)	g_{FS}	–	500	–	mmho

DYNAMIC CHARACTERISTICS

Input Capacitance ($V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 10\text{ kHz}$)	C_{iss}	–	32	–	pf
Output Capacitance ($V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 10\text{ kHz}$)	C_{oss}	–	21	–	pf
Transfer Capacitance ($V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 10\text{ kHz}$)	C_{rss}	–	8.0	–	pf

SWITCHING CHARACTERISTICS

Propagation Delay Times: High to Low Propagation Delay; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 3.0\text{ V}$) Low to High Propagation Delay; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 3.0\text{ V}$) High to Low Propagation Delay; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 5.0\text{ V}$) Low to High Propagation Delay; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 5.0\text{ V}$)	t_{PHL} t_{PLH} t_{PHL} t_{PLH}	– – – –	890 912 324 1280	– – – –	ns
Transition Times: Fall Time; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 3.0\text{ V}$) Rise Time; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 3.0\text{ V}$) Fall Time; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 5.0\text{ V}$) Rise Time; Figure 1, ($V_{DS} = 12\text{ V}$, $V_{GS} = 5.0\text{ V}$)	t_f t_r t_f t_r	– – – –	2086 708 556 725	– – – –	ns

NUD3124, SZNUD3124

TYPICAL PERFORMANCE CURVES

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

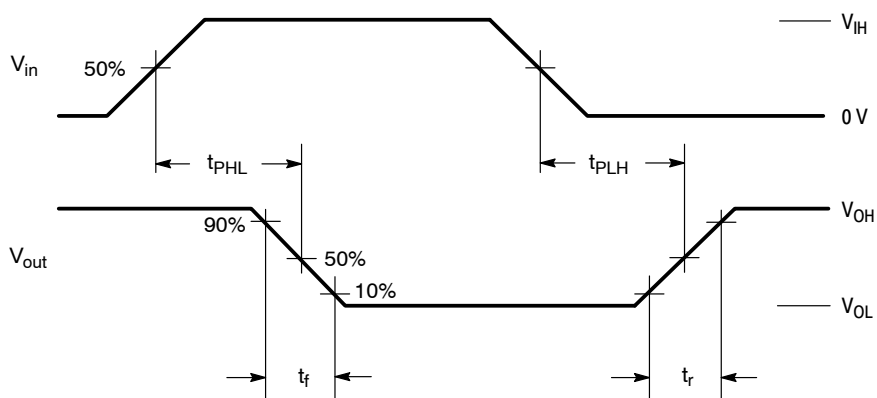


Figure 1. Switching Waveforms

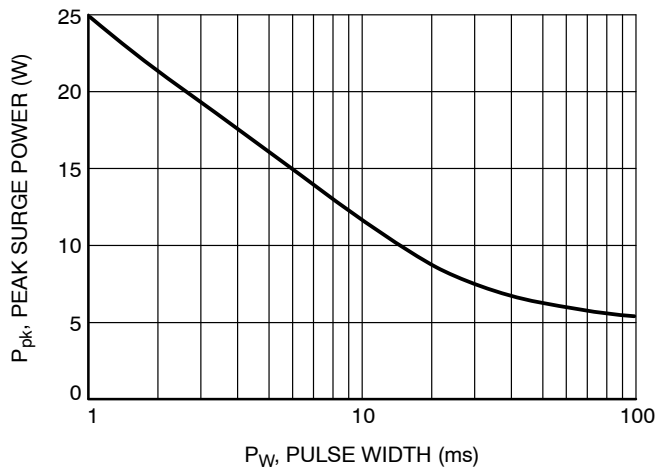


Figure 2. Maximum Non-repetitive Surge Power versus Pulse Width

Load Dump Pulse Not Suppressed:

$V_R = 13.5\text{ V Nominal } \pm 10\%$

$V_S = 60\text{ V Nominal } \pm 10\%$

$T = 300\text{ ms Nominal } \pm 10\%$

$T_R = 1 - 10\text{ ms } \pm 10\%$

Load Dump Pulse Suppressed:

NOTE: Max. Voltage DUT is exposed to is approximately 45 V.

$V_S = 30\text{ V } \pm 20\%$

$T = 150\text{ ms } \pm 20\%$

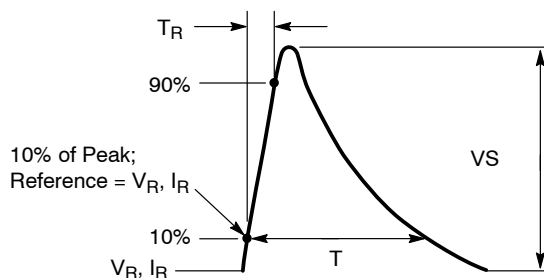


Figure 3. Load Dump Waveform Definition

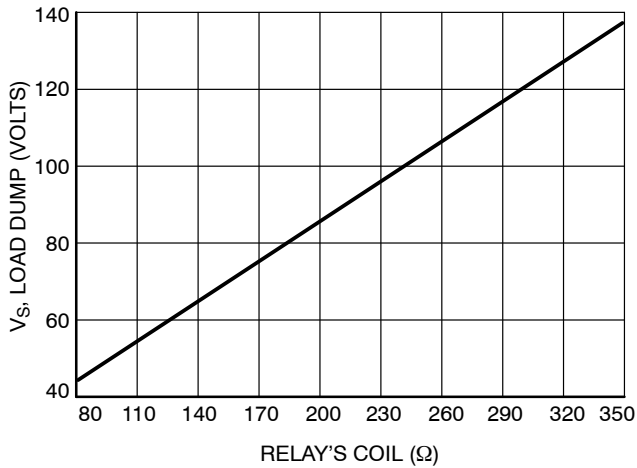


Figure 4. Load Dump Capability versus Relay's Coil dc Resistance

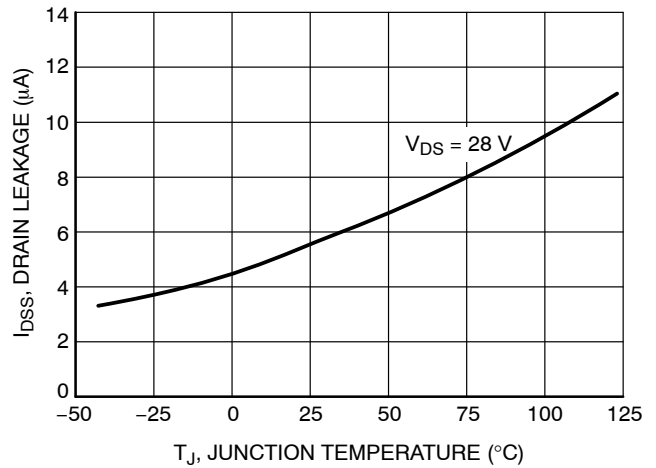


Figure 5. Drain-to-Source Leakage versus Junction Temperature

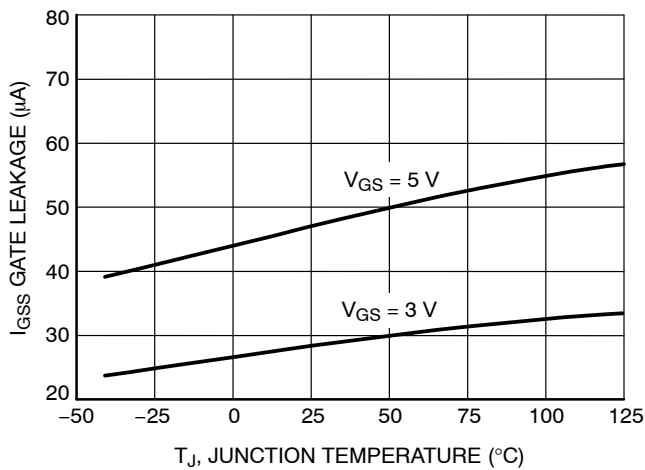


Figure 6. Gate-to-Source Leakage versus Junction Temperature

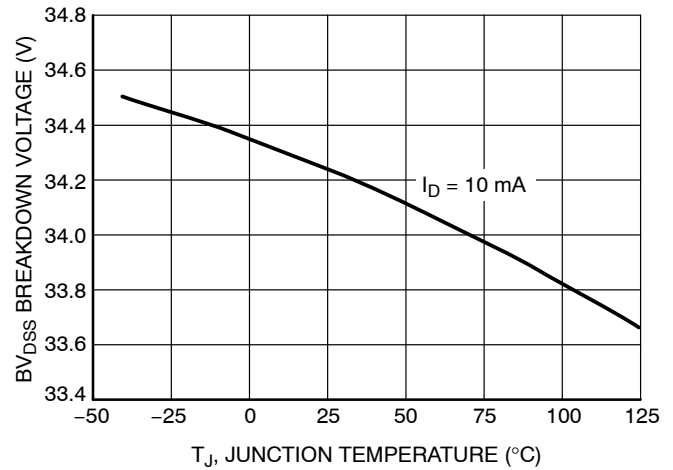


Figure 7. Breakdown Voltage versus Junction Temperature

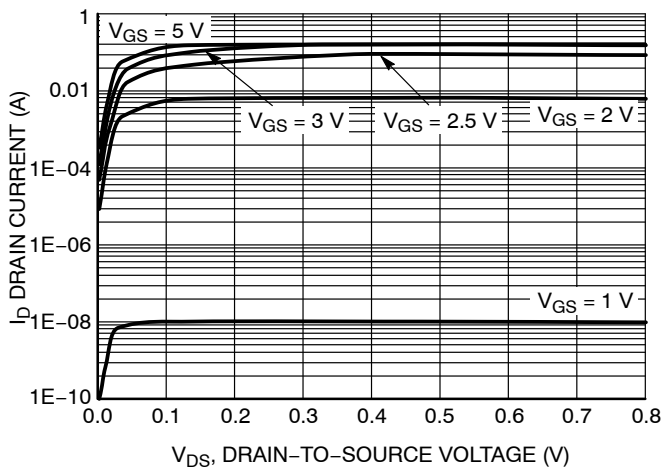


Figure 8. Output Characteristics

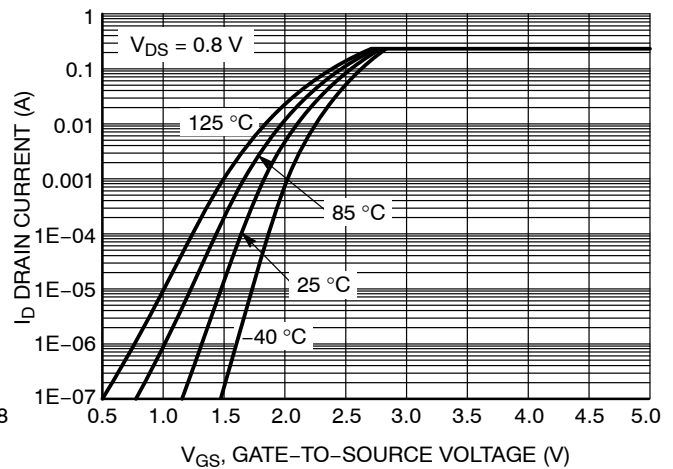
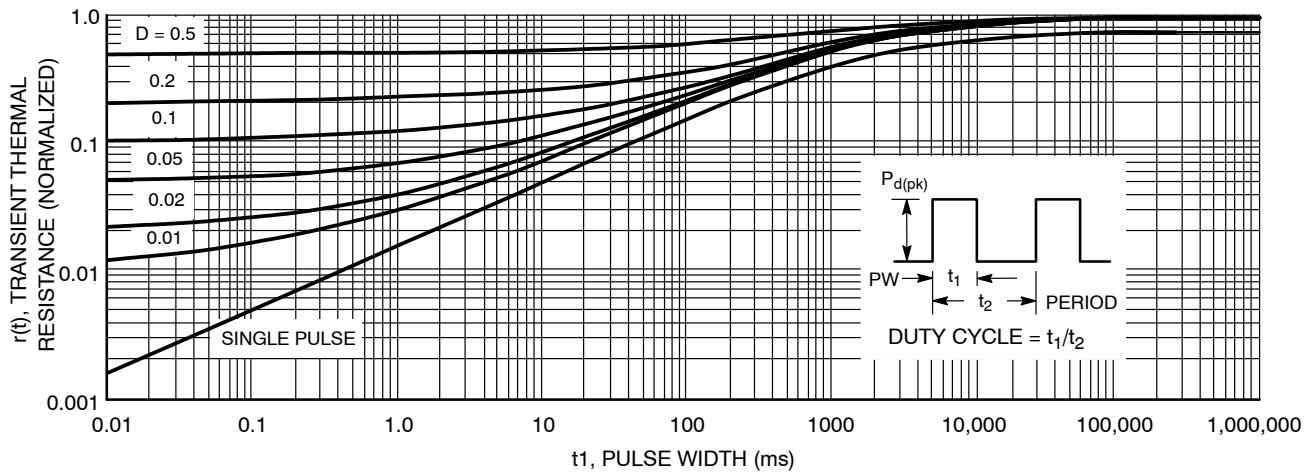
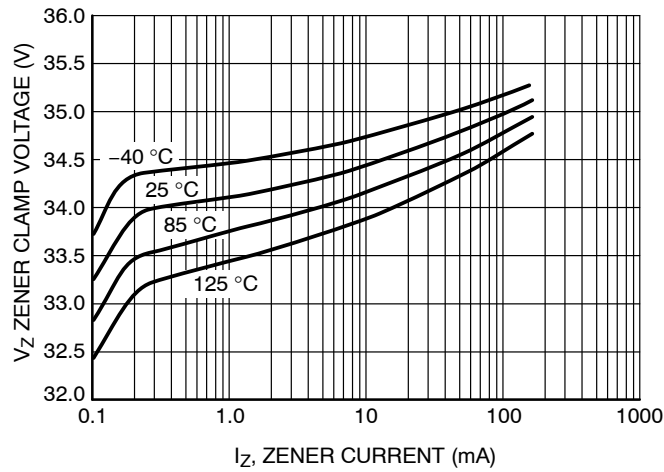
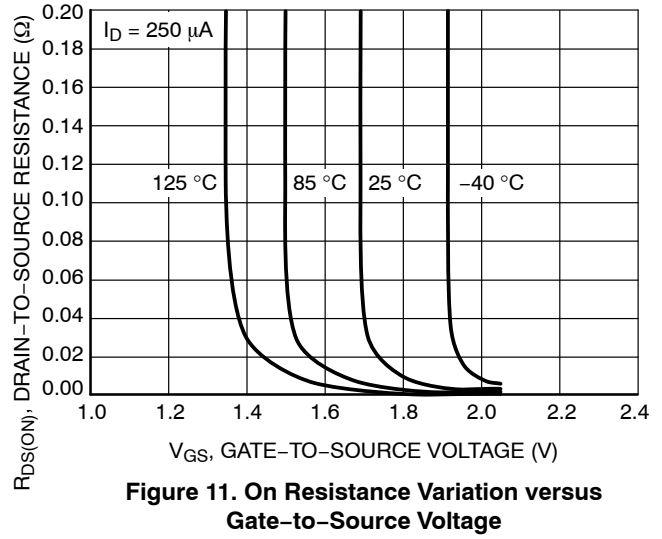
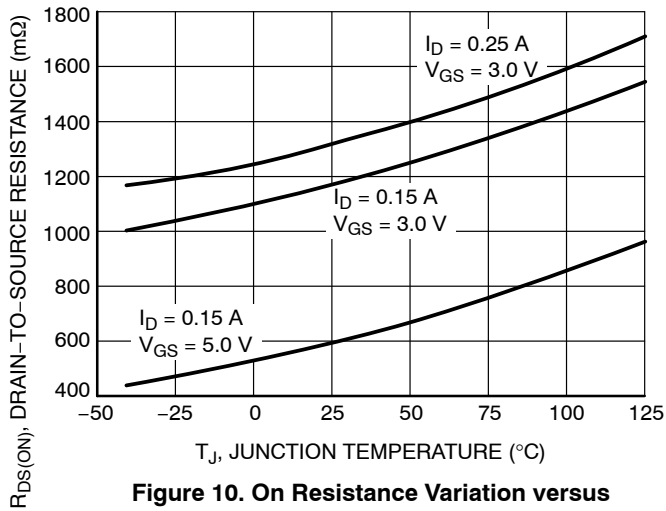


Figure 9. Transfer Function

NUD3124, SZNUD3124



NUD3124, SZNUD3124

APPLICATIONS INFORMATION

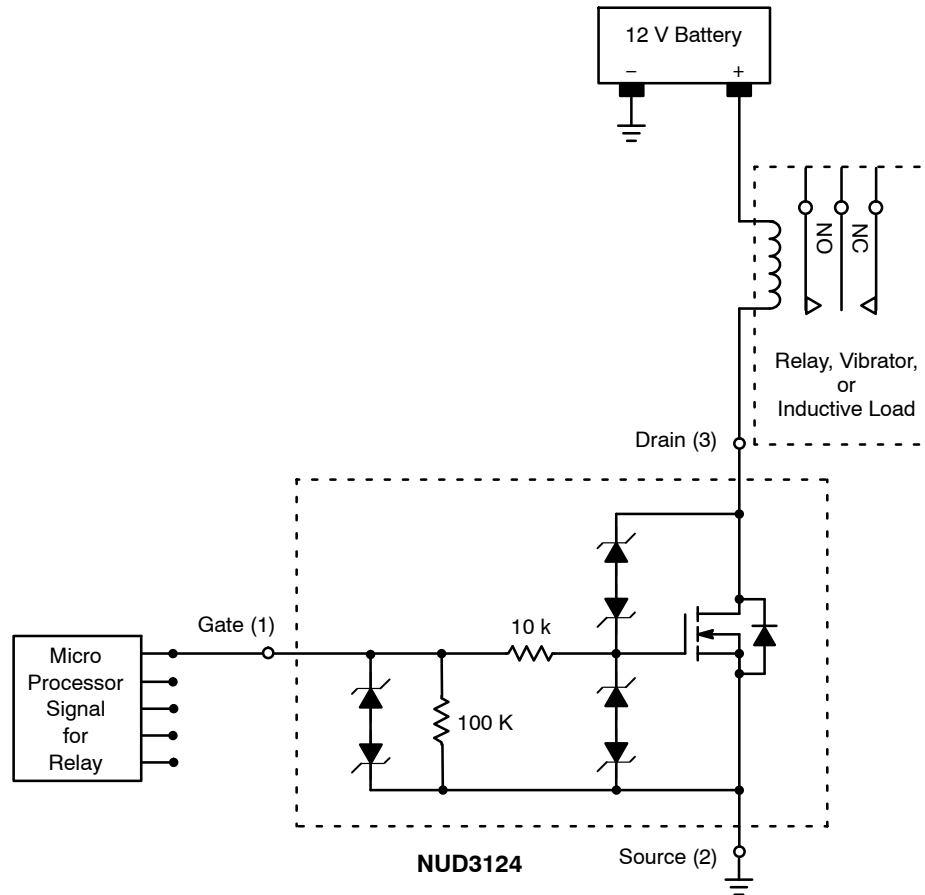
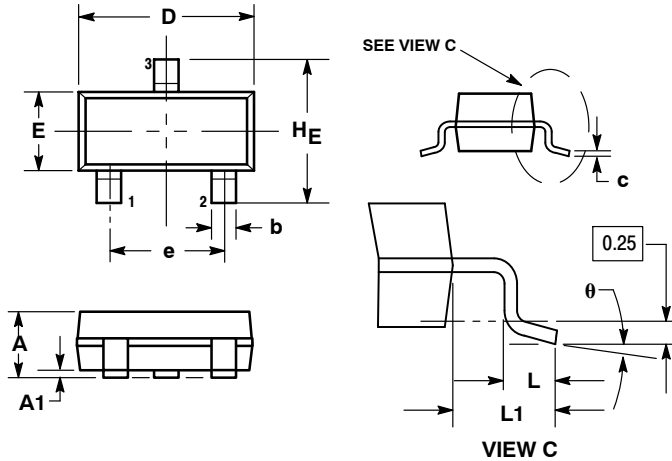


Figure 14. Applications Diagram

NUD3124, SZNUD3124

PACKAGE DIMENSIONS

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

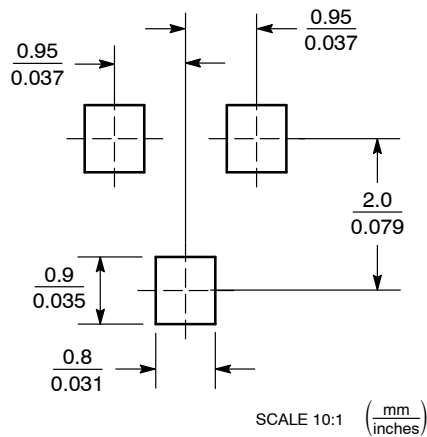


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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*

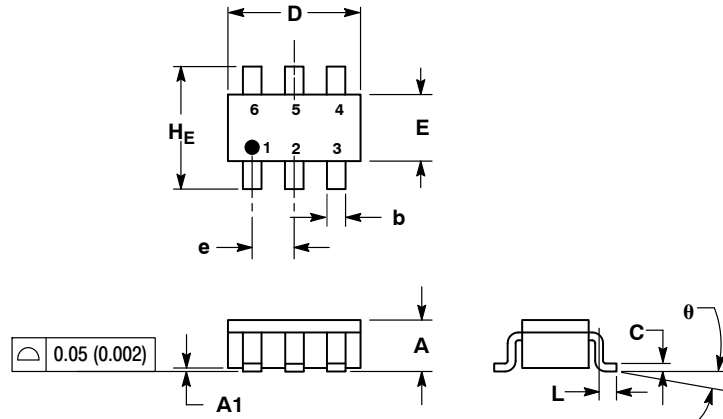


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NUD3124, SZNUD3124

PACKAGE DIMENSIONS

SC-74 CASE 318F-05 ISSUE M



NOTES:

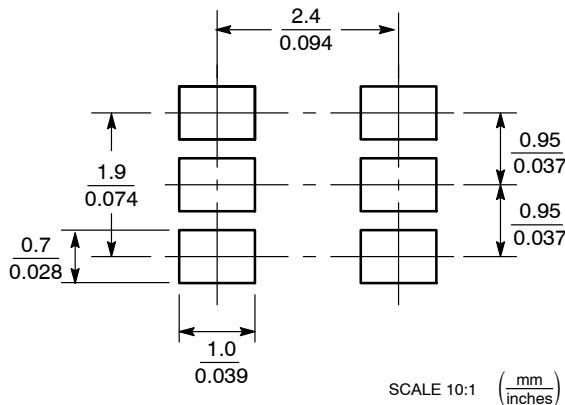
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318F-01, -02, -03, -04 OBSOLETE. NEW STANDARD 318F-05.

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:

- PIN 1. SOURCE 1
- GATE 1
- DRAIN 2
- SOURCE 2
- GATE 2
- 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

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9