NVR5124PL

Power MOSFET

−60 V, −1.1 A, 230 mΩ, Single P−Channel SOT−23 Package

Features

- Trench Technology
- NVR Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	−60	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	T_A = 25°C	I_D	−1.1	A
		T_A = 100°C		−0.67	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		T_A = 25°C	P_D	−0.47	W
		T_A = 100°C		0.19	
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	−2.5	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to +150	°C
Source Current (Body Diode)			I_S	−0.6	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	268	°C/W

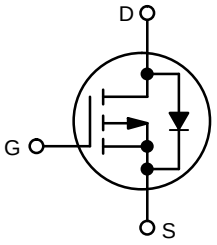
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface−mounted on FR4 board using a 650 mm^2, 2 oz. Cu pad.
3. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

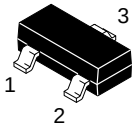
ON Semiconductor®

www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
−60 V	230 mΩ @ −10 V	−1.1 A
	365 mΩ @ −4.5 V	

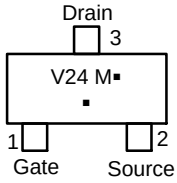
P−Channel





SOT−23
CASE 318
STYLE 21

MARKING DIAGRAM/ PIN ASSIGNMENT



V24 = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
NVR5124PLT1G	SOT−23 (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.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = −250 μA		−60			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −60 V	T_J = 25°C			−1.0	μA
			T_J = 125°C			−10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−1.5		−2.5	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −10 V, I_D = −3 A			183	230	mΩ
		V_{GS} = −4.5 V, I_D = −3 A			280	365	
Forward Transconductance	g_{FS}	V_{DS} = −15 V, I_D = −5 A		4			S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −25 V			240		pF
Output Capacitance	C_{oss}				27.6		
Reverse Transfer Capacitance	C_{rss}				18.5		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −48 V, I_D = −3 A			2.3		nC
Threshold Gate Charge	$Q_{G(TH)}$				0.5		
Gate−to−Source Charge	Q_{GS}				0.9		
Gate−to−Drain Charge	Q_{GD}				1.0		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −10 V, V_{DS} = −48 V, I_D = −3 A			4.3		
SWITCHING CHARACTERISTICS (Note 5)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = −4.5 V, V_{DS} = −48 V, I_D = −3 A, R_G = 2.5 Ω			6.6		ns
Rise Time	t_r				10.6		
Turn−Off Delay Time	$t_{d(off)}$				12.2		
Fall Time	t_f				3.5		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = −3 A	T_J = 25°C		−0.88	−1.0	V
			T_J = 125°C		−0.76		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = −3 A			15		ns
Charge Time	t_a				13		
Discharge Time	t_b				2.4		
Reverse Recovery Charge	Q_{RR}				10		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

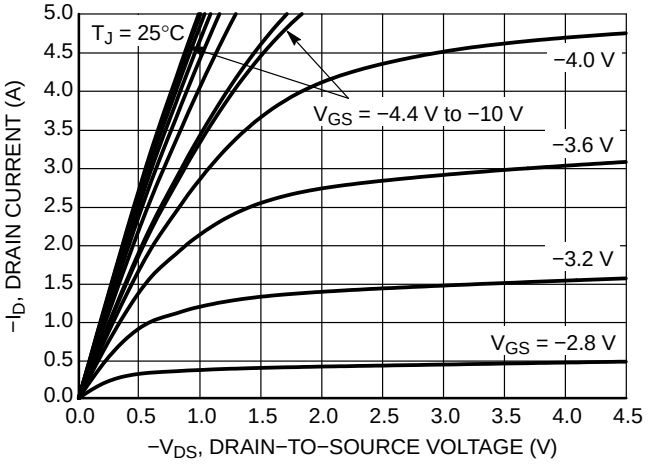


Figure 1. On−Region Characteristics

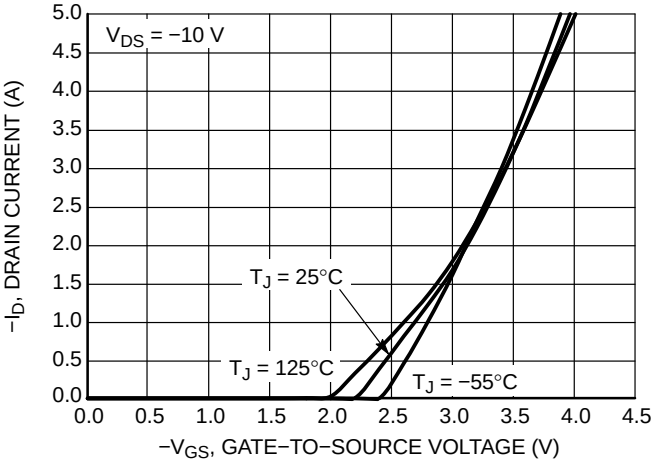


Figure 2. Transfer Characteristics

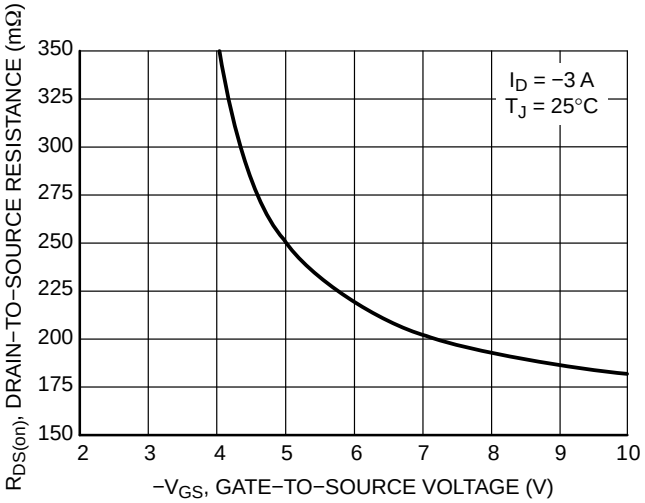


Figure 3. On−Resistance vs. Gate−to−Source Voltage

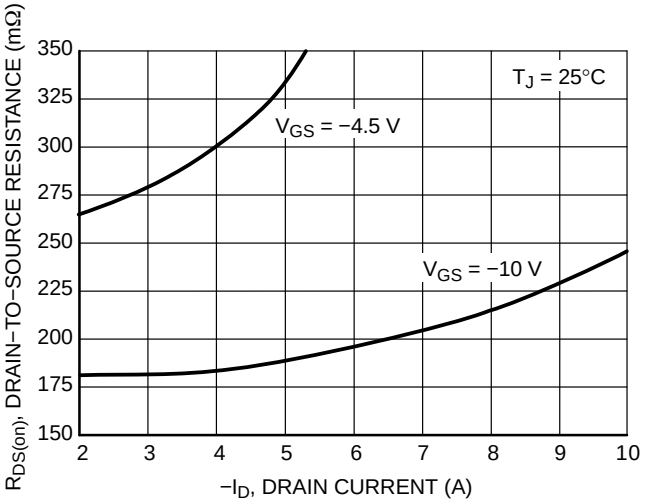


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

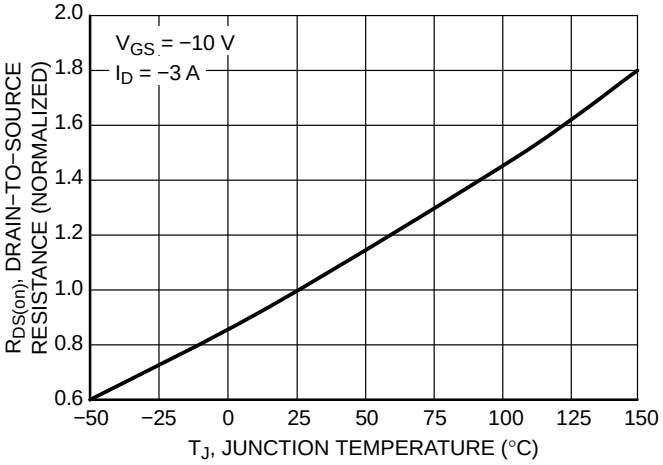


Figure 5. On−Resistance Variation with Temperature

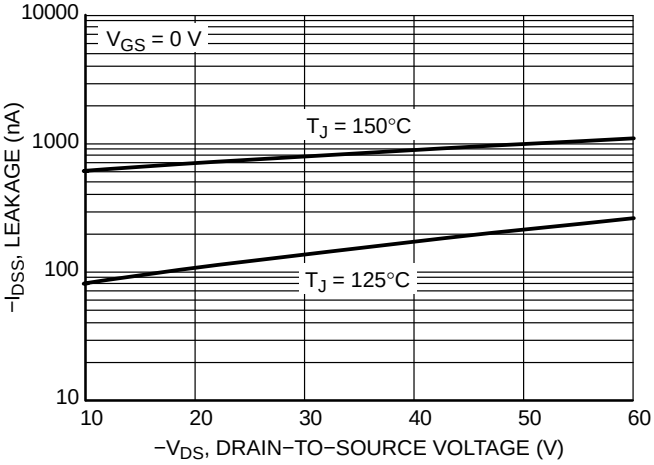


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

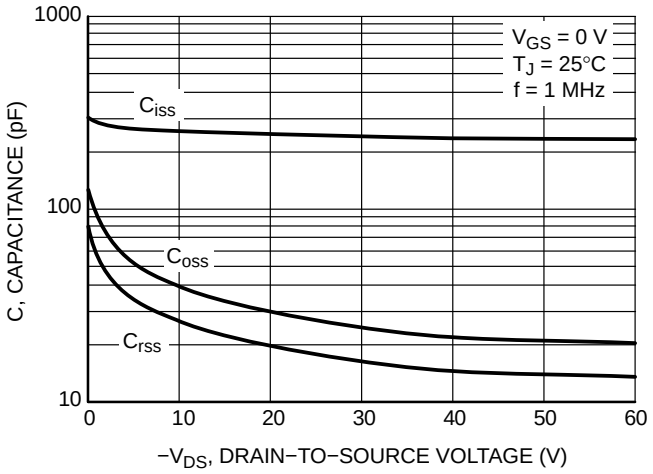


Figure 7. Capacitance Variation

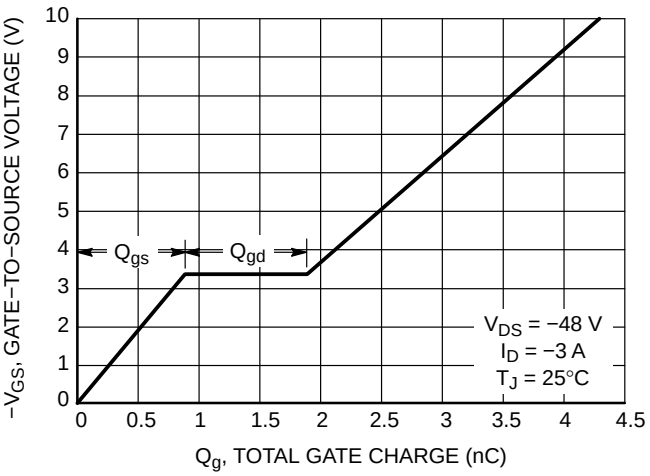


Figure 8. Gate−to−Source Voltage vs. Total Charge

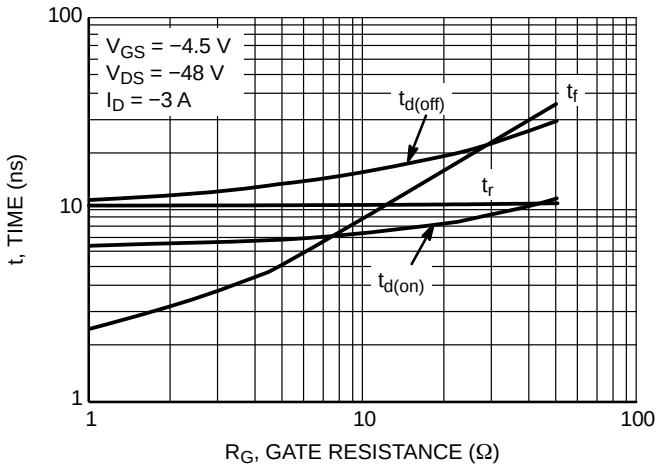


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

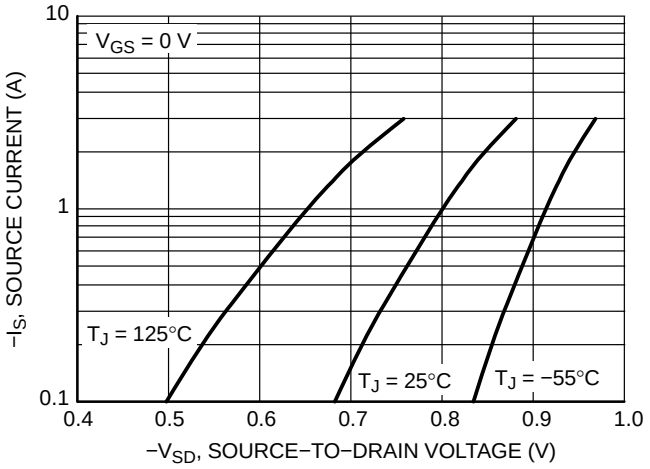


Figure 11. Diode Forward Voltage vs. Current

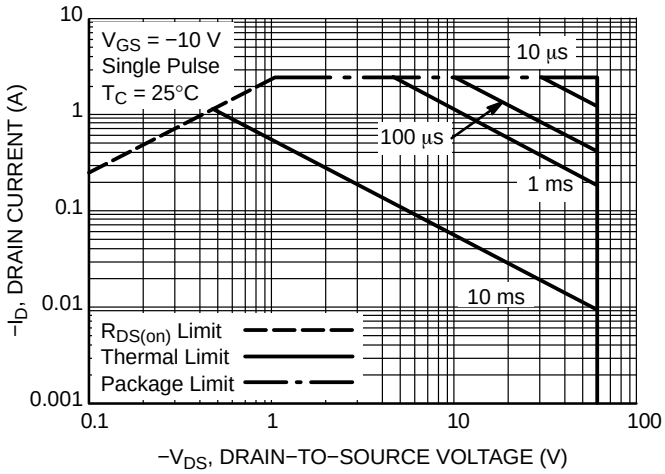


Figure 10. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

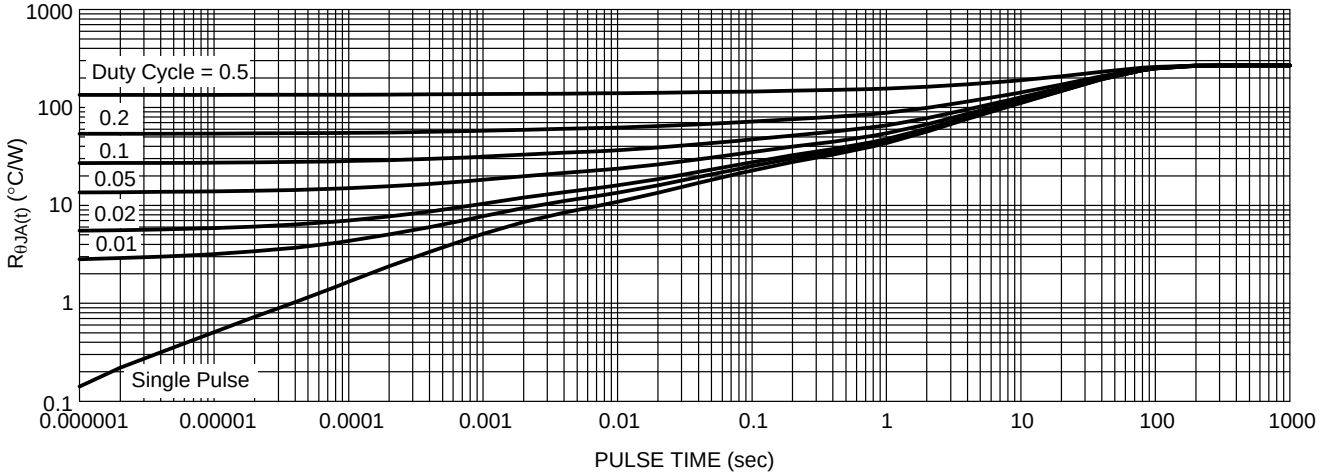
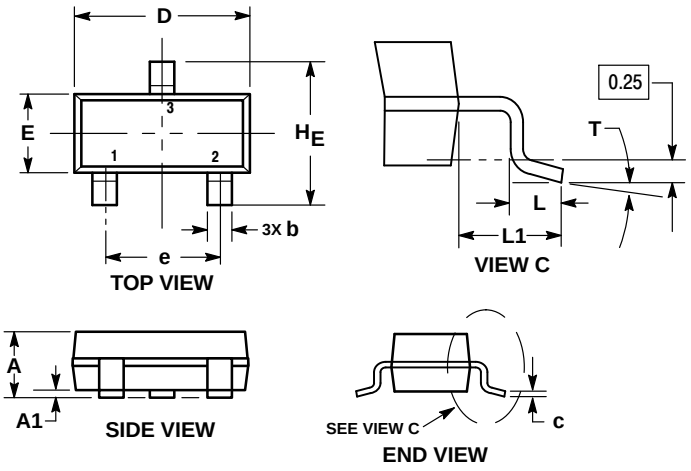


Figure 12. Thermal Response

NVR5124PL

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AR

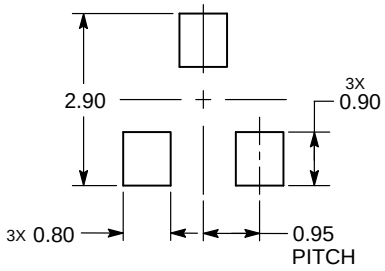


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
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	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	−−−	10°	0°	−−−	10°

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

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 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