

MOSFET – Power, Single N-Channel, Small Signal, SOT-23 40 V, 6.6 A

NVRGS042N04CL

Features

- Low $R_{DS(on)}$
- Small Footprint Surface Mount Package
- Trench Technology
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		V_{DSS}	40	V	
Gate-to-Source Voltage		V_{GS}	± 20	V	
Continuous Drain Current $R_{\theta JL}$	Steady State	$T_L = 25^\circ\text{C}$	I_D	6.6	A
		$T_L = 100^\circ\text{C}$		4.6	
Power Dissipation $R_{\theta JL}$	Steady State	$T_L = 25^\circ\text{C}$	P_D	2.4	W
		$T_L = 100^\circ\text{C}$		1.2	
Continuous Drain Current $R_{\theta JA}$	Steady State	$T_A = 25^\circ\text{C}$	I_D	5.2	A
		$T_A = 100^\circ\text{C}$		3.6	
Power Dissipation $R_{\theta JA}$	Steady State	$T_A = 25^\circ\text{C}$	P_D	1.5	W
		$T_A = 100^\circ\text{C}$		0.7	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	151	A	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)		I_S	2.0	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^\circ\text{C}$	

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.

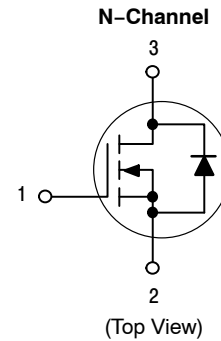
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	101	$^\circ\text{C}/\text{W}$
Junction-to-Lead – Steady State (Notes 1, 2)	$R_{\theta JL}$	62.3	

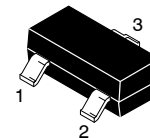
1. device mounted to 1 inch² 1s2p 2 oz copper
2. lead temp is referenced at the top of the drain pin

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
40 V	49 m Ω @ 4.5 V	6.6 A
	34 m Ω @ 10 V	

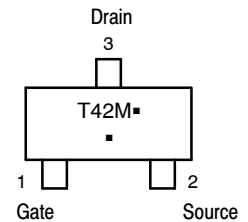
Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT



SOT-23
CASE 318
STYLE 21



T42 = Device Code
M = Date Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
NVRGS042N04CLT1G	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 Specifications Brochure, BRD8011/D.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$					$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}, T_J = 25^\circ\text{C}$			10	μA
		$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}, T_J = 125^\circ\text{C}$			250	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.2		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-5.4		$\text{mV}/^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		23.5	34	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		31.5	49	
Forward Transconductance	g_{FS}	$V_{DS} = 6\text{ V}, I_D = 5\text{ A}$		13.9		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		423		pF
Output Capacitance	C_{OSS}			189		
Reverse Transfer Capacitance	C_{RSS}			9.7		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}; I_D = 5\text{ A}$		8.8		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.8		
Gate-to-Source Charge	Q_{GS}			1.4		
Gate-to-Drain Charge	Q_{GD}			1.6		

SWITCHING CHARACTERISTICS, $V_{GS} = V$ (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 5\text{ A}, R_G = 1\ \Omega$		6.0		ns
Rise Time	t_r			6.3		
Turn-Off Delay Time	$t_{d(OFF)}$			16		
Fall Time	t_f			2.3		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 5\text{ A}, T_J = 25^\circ\text{C}$		0.86	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 5\text{ A}, T_J = 125^\circ\text{C}$		0.74		

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.

3. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$

4. Switching characteristics are independent of operating junction temperatures

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TYPICAL CHARACTERISTICS

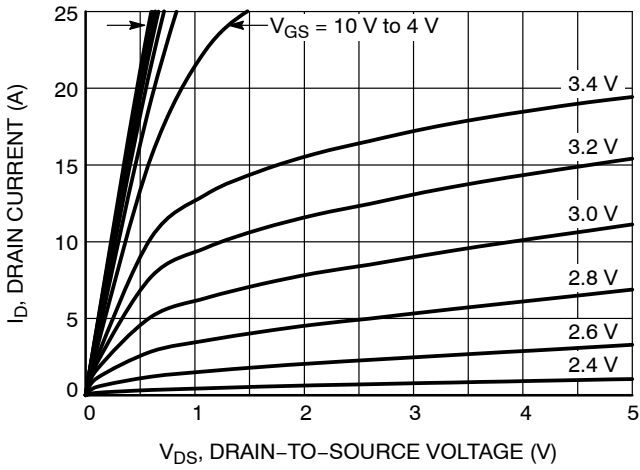


Figure 1. On-Region Characteristics

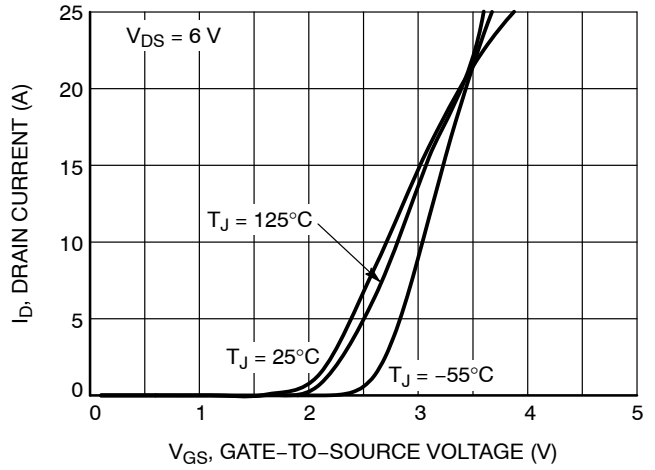


Figure 2. Transfer Characteristics

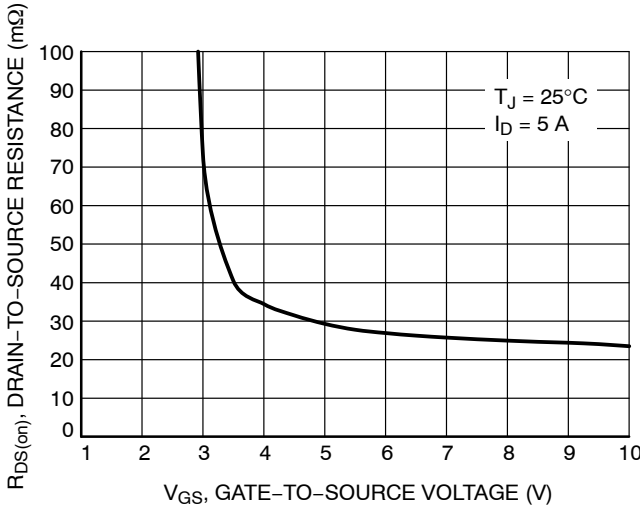


Figure 3. On-Resistance vs. Gate-to-Source Voltage

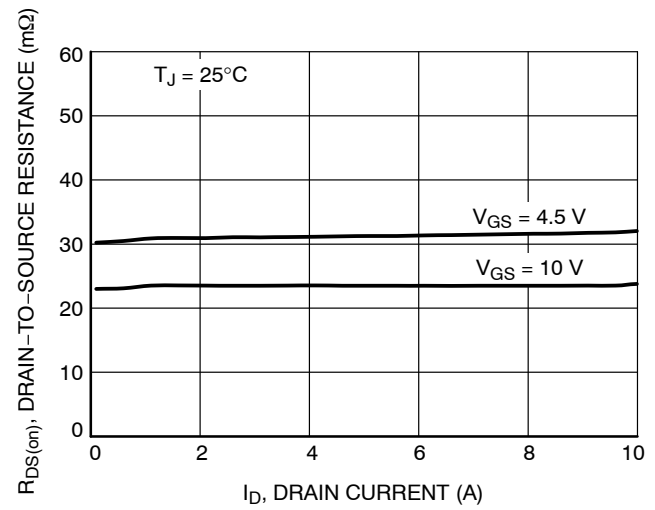


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

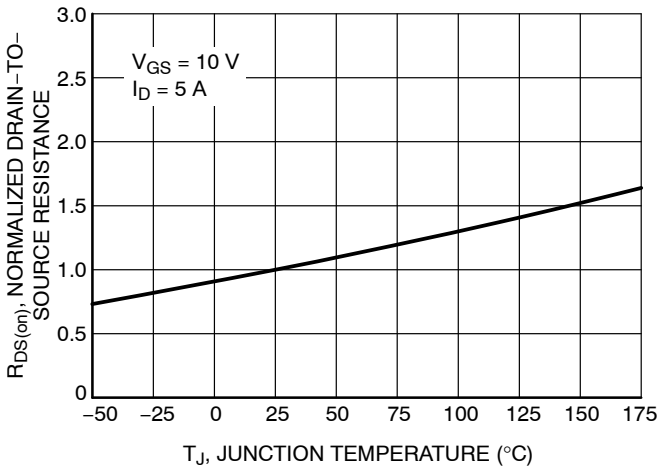


Figure 5. On-Resistance Variation with Temperature

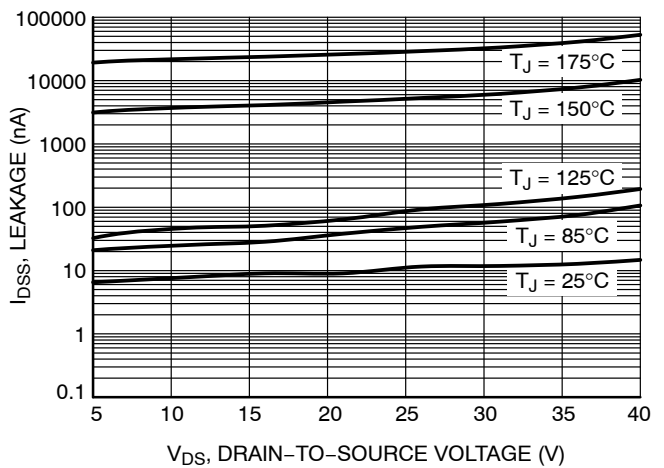


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

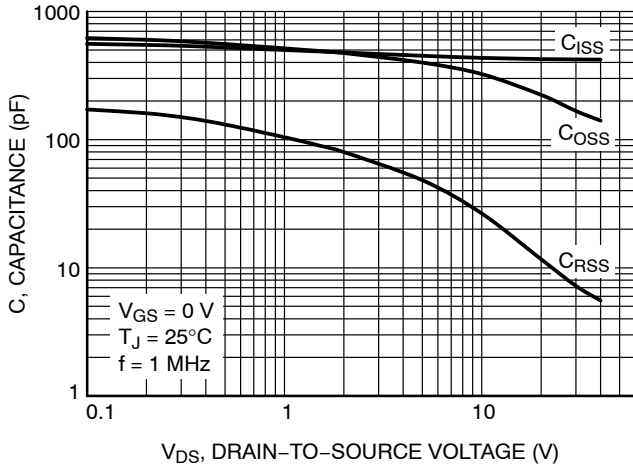


Figure 7. Capacitance Variation

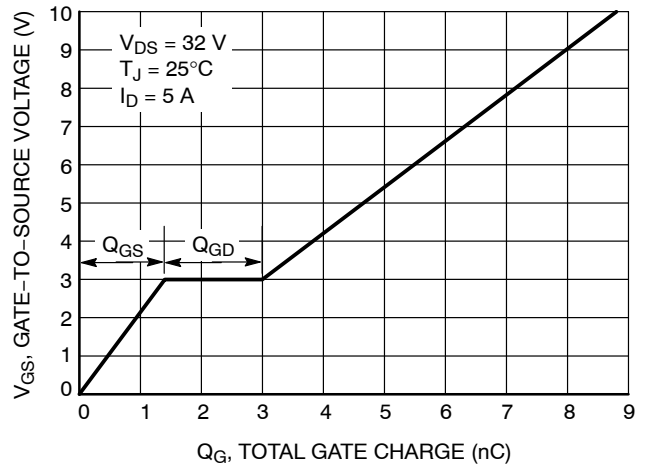


Figure 8. Gate-to-Source Voltage vs. Total Charge

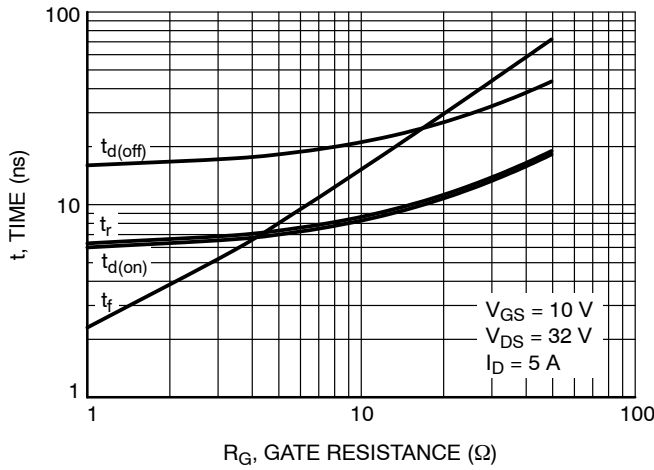


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

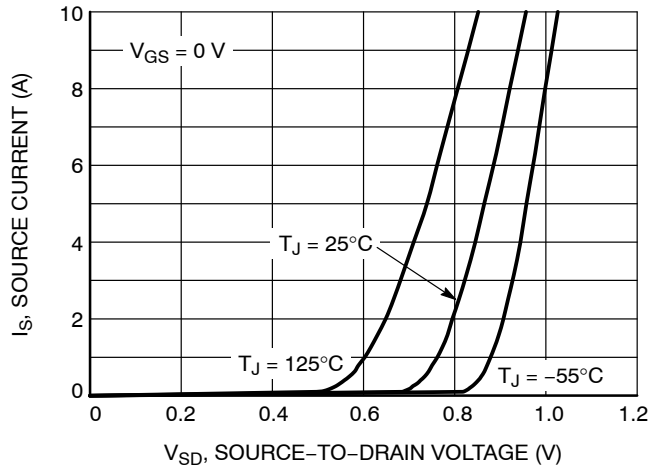


Figure 10. Diode Forward Voltage vs. Current

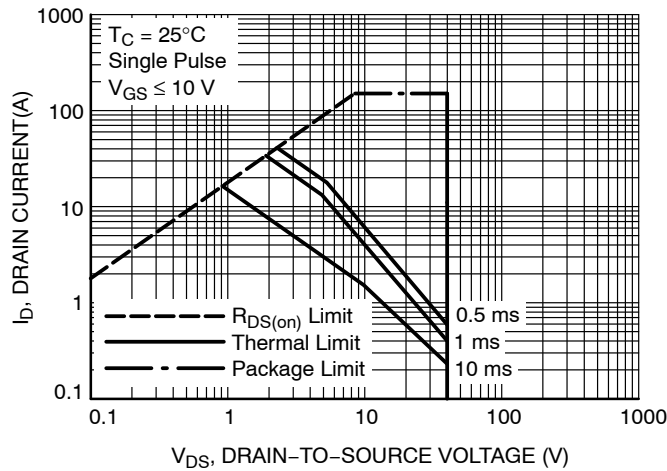


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS

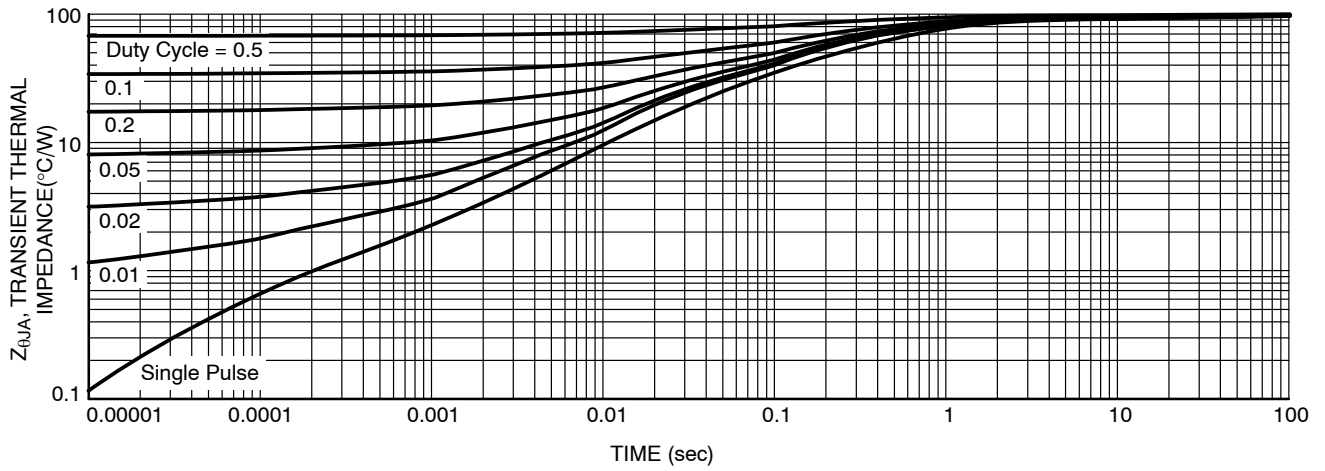
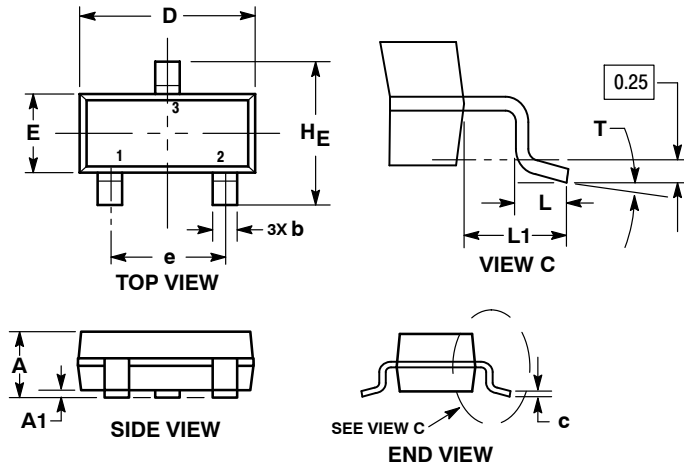


Figure 12. Thermal Response

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PACKAGE DIMENSIONS

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



NOTES:

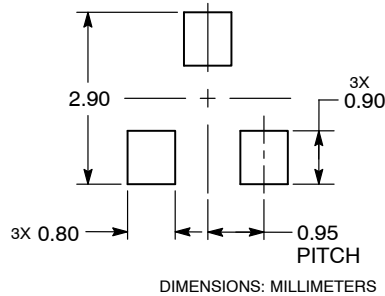
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	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
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

STYLE 21:

1. GATE
2. SOURCE
3. DRAIN

RECOMMENDED SOLDERING FOOTPRINT



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