

NTR4503N, NVTR4503N

MOSFET – Power, Single, N-Channel, SOT-23 30 V, 2.5 A

Features

- Leading Planar Technology for Low Gate Charge / Fast Switching
- 4.5 V Rated for Low Voltage Gate Drive
- SOT-23 Surface Mount for Small Footprint (3 x 3 mm)
- NV 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

Applications

- DC-DC Conversion
- Load/Power Switch for Portables
- Load/Power Switch for Computing

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	30	V
Gate-to-Source Voltage			V_{GS}	± 20	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	2.0	A
		$T_A = 85^{\circ}\text{C}$		1.5	
	$t \leq 10\text{ s}$	$T_A = 25^{\circ}\text{C}$		2.5	
Power Dissipation (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	P_D	0.73	W
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	1.5	A
		$T_A = 85^{\circ}\text{C}$		1.1	
Power Dissipation (Note 2)		$T_A = 25^{\circ}\text{C}$	P_D	0.42	W
Pulsed Drain Current	$t_p = 10\text{ }\mu\text{s}$		I_{DM}	10	A
Operating Junction and Storage Temperature			T_J , T_{stg}	-55 to 150	$^{\circ}\text{C}$
Source Current (Body Diode)			I_S	2.0	A
Peak Source Current (Diode Forward)		$t_p = 10\text{ }\mu\text{s}$	I_{SM}	4.0	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.

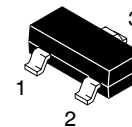
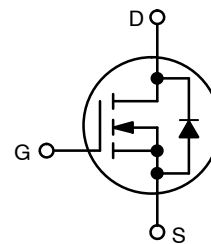


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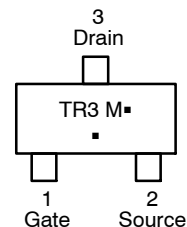
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
30 V	85 m Ω @ 10 V	2.5 A
	105 m Ω @ 4.5 V	

N-Channel



SOT-23
CASE 318
STYLE 21

MARKING DIAGRAM/ PIN ASSIGNMENT



TR3 = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTR4503NT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NVTR4503NT1G	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.

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THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	170	°C/W
Junction-to-Ambient – $t < 10$ s (Note 1)	$R_{\theta JA}$	100	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	300	

1. Surface-mounted on FR4 board using 1 in sq pad size.
2. Surface-mounted on FR4 board using the minimum recommended pad size.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	30	36		V
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 24 V			1.0	μA
		V _{GS} = 0 V, V _{DS} = 24 V, 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 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	1.0	1.75	3.0	V
Drain-to-Source On-Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 2.5 A		85	110	mΩ
		V _{GS} = 4.5 V, I _D = 2.0 A		105	140	
Forward Transconductance	g _{FS}	V _{DS} = 4.5 V, I _D = 2.5 A		5.3		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{iss}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 15 V		135		pF
Output Capacitance	C _{oss}			52		
Reverse Transfer Capacitance	C _{rss}			15		
Input Capacitance	C _{iss}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 24 V		130	250	pF
Output Capacitance	C _{oss}			42	75	
Reverse Transfer Capacitance	C _{rss}			13	25	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 15 V, I _D = 2.5 A		3.6	7.0	nC
Threshold Gate Charge	Q _{G(TH)}			0.3		
Gate-to-Source Charge	Q _{GS}			0.6		
Gate-to-Drain Charge	Q _{GD}			0.7		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 24 V, I _D = 2.5 A		1.9		nC
Threshold Gate Charge	Q _{G(TH)}			0.3		
Gate-to-Source Charge	Q _{GS}			0.6		
Gate-to-Drain Charge	Q _{GD}			0.9		

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t _{d(on)}	V _{GS} = 10 V, V _{DD} = 15 V, I _D = 1 A, R _G = 6 Ω		5.8	12	ns
Rise Time	t _r			5.8	10	
Turn-Off Delay Time	t _{d(off)}			14	25	
Fall Time	t _f			1.6	5.0	
Turn-On Delay Time	t _{d(on)}	V _{GS} = 10 V, V _{DD} = 24 V, I _D = 2.5 A, R _G = 2.5 Ω		4.8		ns
Rise Time	t _r			6.7		
Turn-Off Delay Time	t _{d(off)}			13.6		
Fall Time	t _f			1.8		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 2.0 A		0.85	1.2	V
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, I _S = 2.0 A, dI _S /dt = 100 A/μs		9.2		ns
Reverse Recovery Charge	Q _{RR}			4.0		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.

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

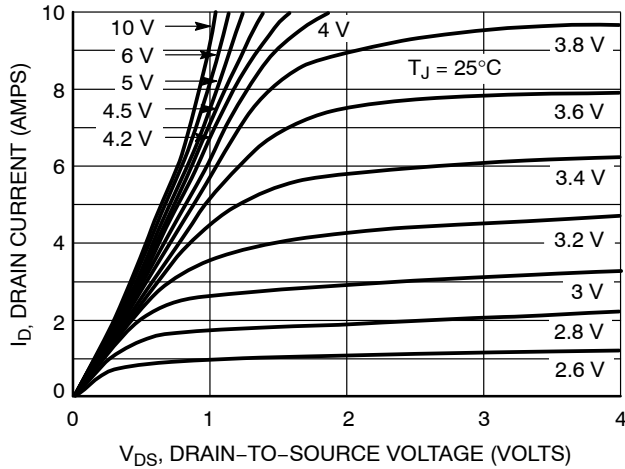


Figure 1. On-Region Characteristics

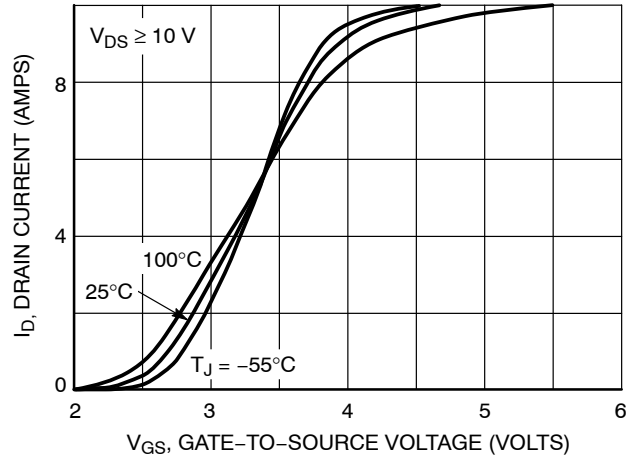


Figure 2. Transfer Characteristics

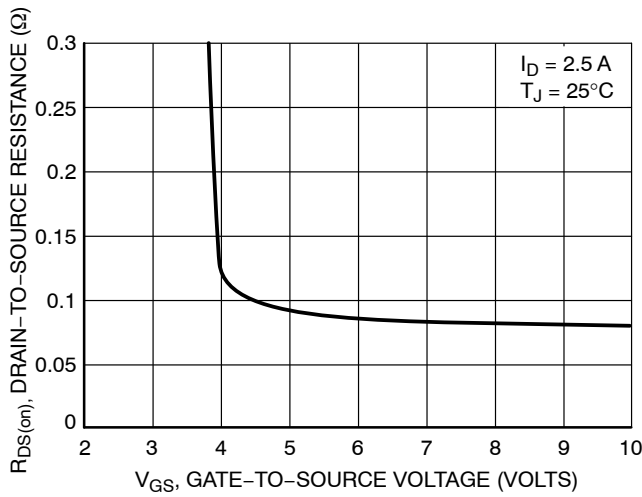


Figure 3. On-Resistance vs. Gate-to-Source Voltage

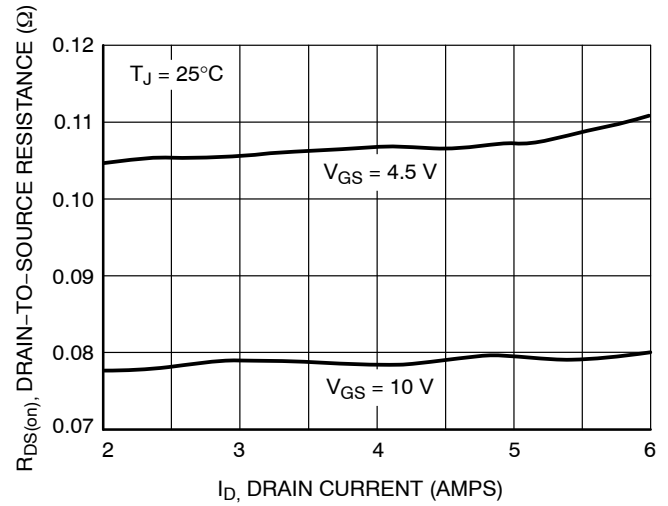


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

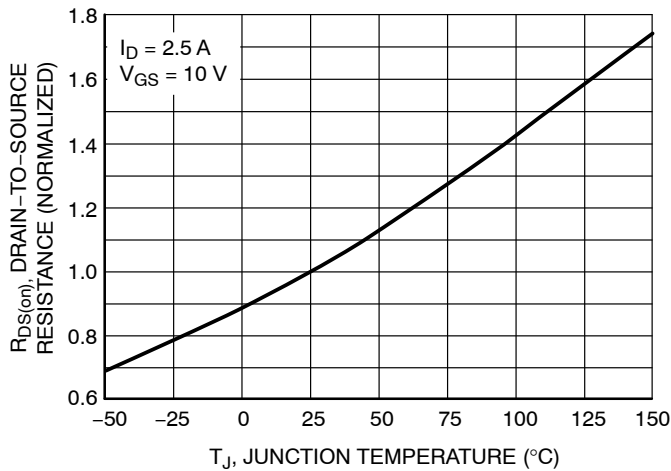


Figure 5. On-Resistance Variation with Temperature

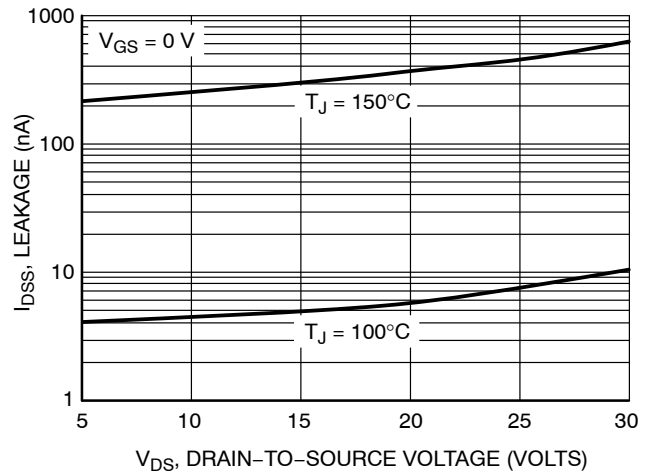


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

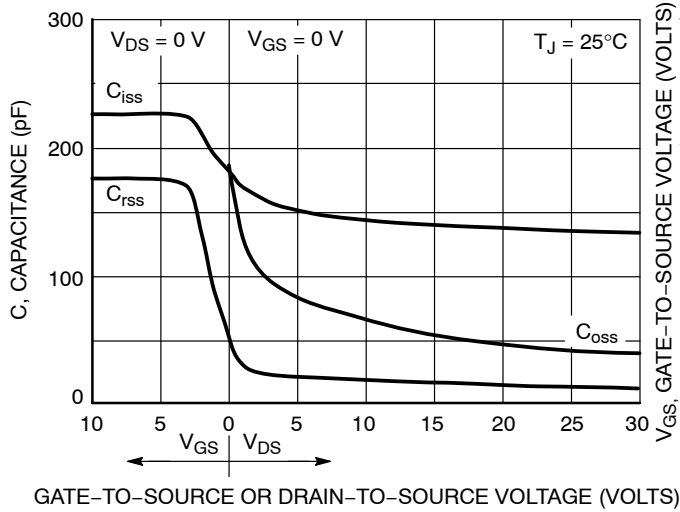


Figure 7. Capacitance Variation

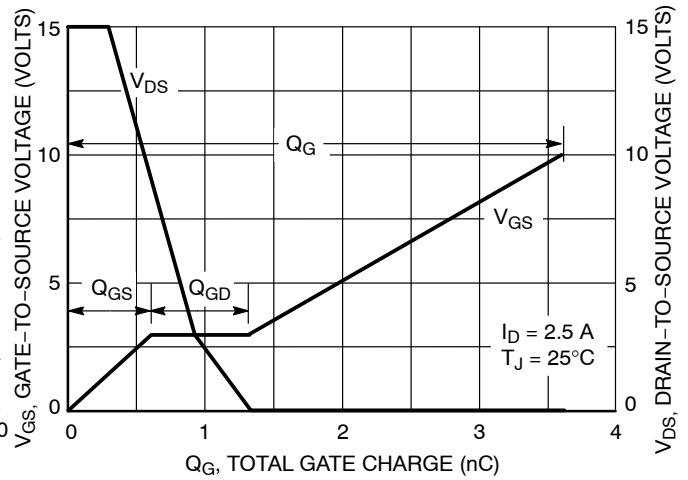


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

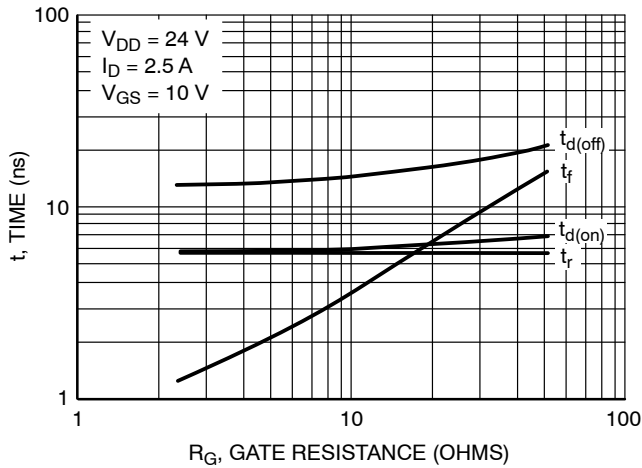


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

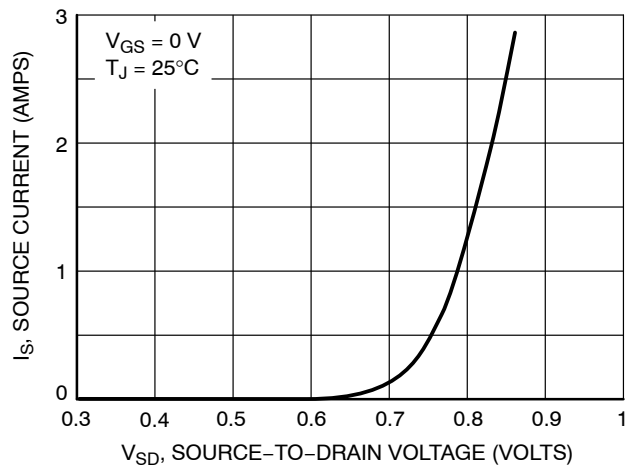


Figure 10. Diode Forward Voltage vs. Current

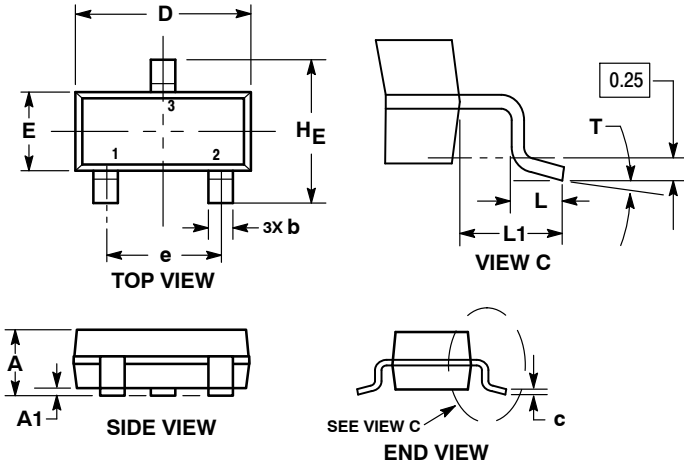
NTR4503N, NVTR4503N

PACKAGE DIMENSIONS

SOT-23 (TO-236)

CASE 318-08

ISSUE AR



NOTES:

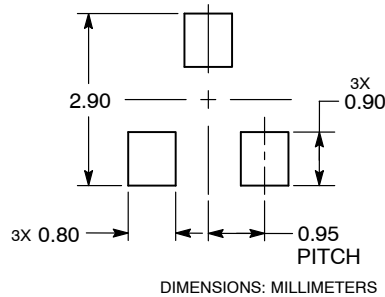
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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
H _E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°			0°		

STYLE 21:

1. GATE
2. SOURCE
3. DRAIN

RECOMMENDED 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.

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