NTR4503N

Power MOSFET

30 V, 2.5 A, Single N−Channel, SOT−23

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)
- Pb−Free Package for Green Manufacturing

Applications

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

MAXIMUM RATINGS (T_J = 25°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°C	I_D	2.0	A
		T_A = 85°C		1.5	
	t ≤ 10 s	T_A = 25°C		2.5	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	0.73	W
Continuous Drain Current (Note 2)	Steady State	T_A = 25°C	I_D	1.5	A
		T_A = 85°C		1.1	
Power Dissipation (Note 2)		T_A = 25°C	P_D	0.42	W
Pulsed Drain Current	tp = 10 μs		I_{DM}	6.0	A
ESD Capability (Note 3)	C = 100 pF, RS = 1500 Ω		ESD	125	V
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°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	°C

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.
3. ESD Rating Information: HBM Class 0.

ON Semiconductor®

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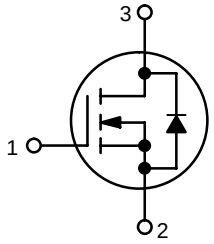
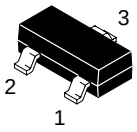
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
30 V	85 mΩ @ 10 V	2.5 A
	105 mΩ @ 4.5 V	

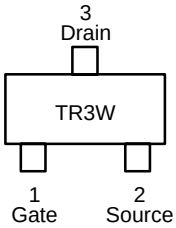
N−Channel



MARKING DIAGRAM/ PIN ASSIGNMENT



SOT−23
CASE 318
STYLE 21



TR3 = Specific Device Code
W = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NTR4503NT1	SOT−23	3000/Tape & Reel
NTR4503NT1G	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 Conditions	Min	Typ	Max	Units
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 4)						
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 5)						
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

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

TYPICAL PERFORMANCE CURVES

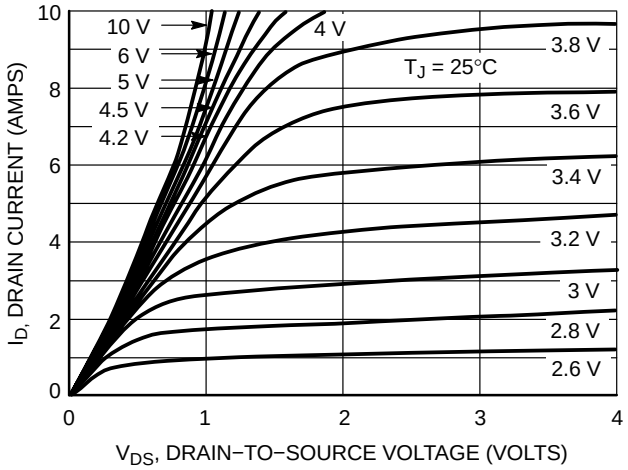


Figure 1. On−Region Characteristics

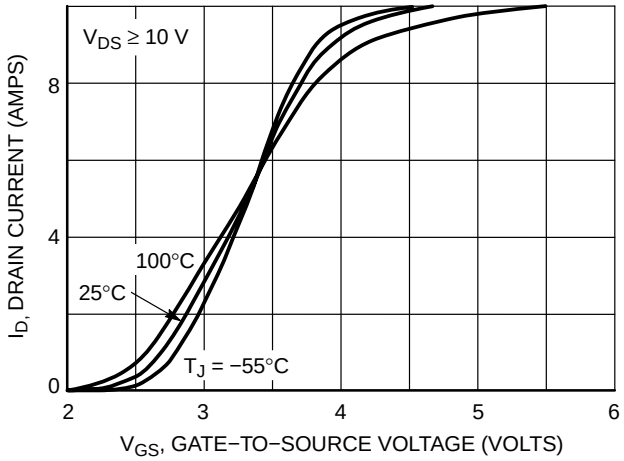


Figure 2. Transfer Characteristics

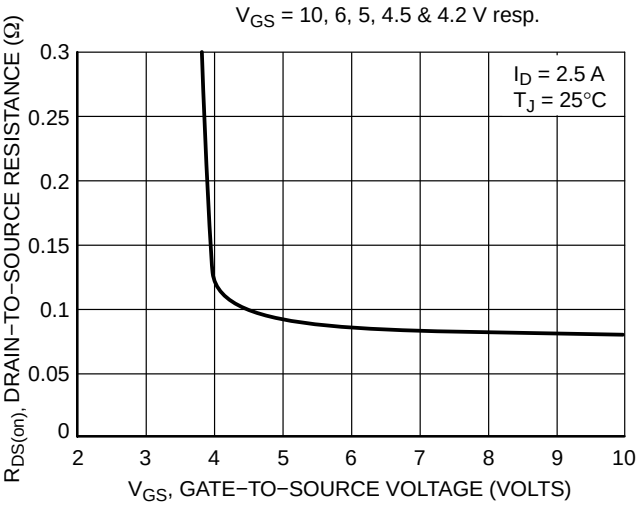


Figure 3. On−Resistance vs. Gate−to−Source Voltage

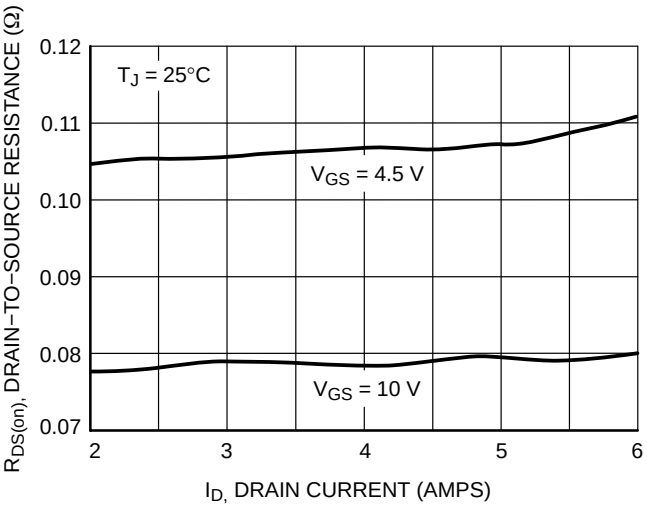


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

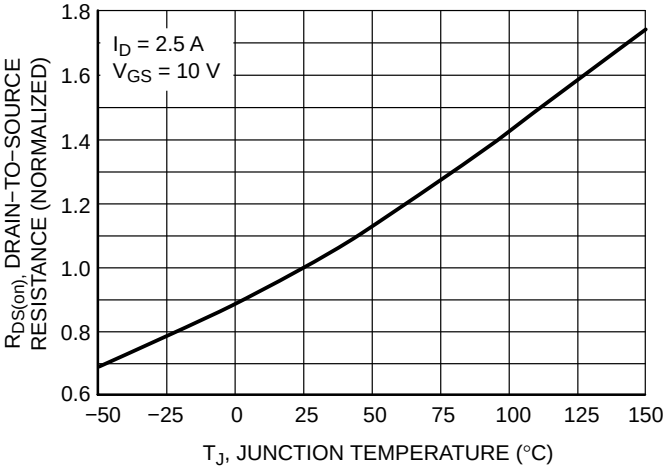


Figure 5. On−Resistance Variation with Temperature

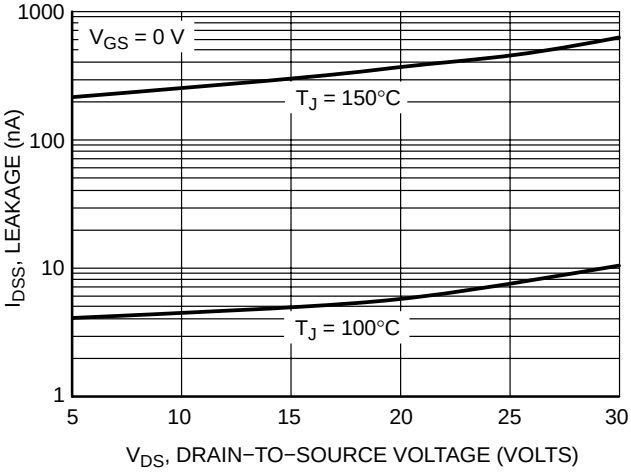


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

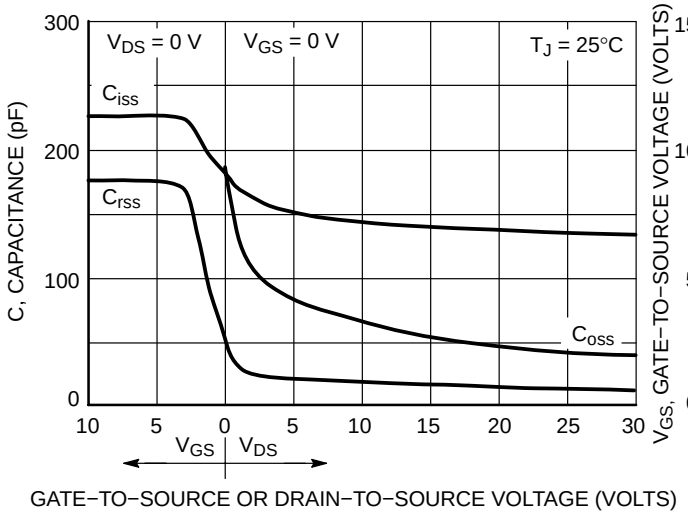


Figure 7. Capacitance Variation

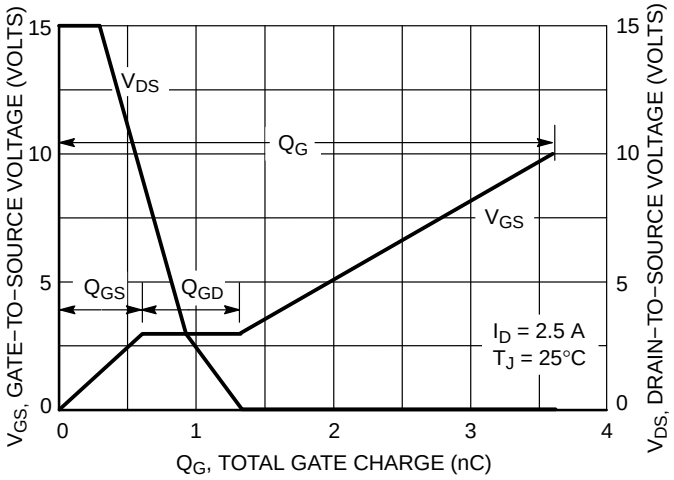


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

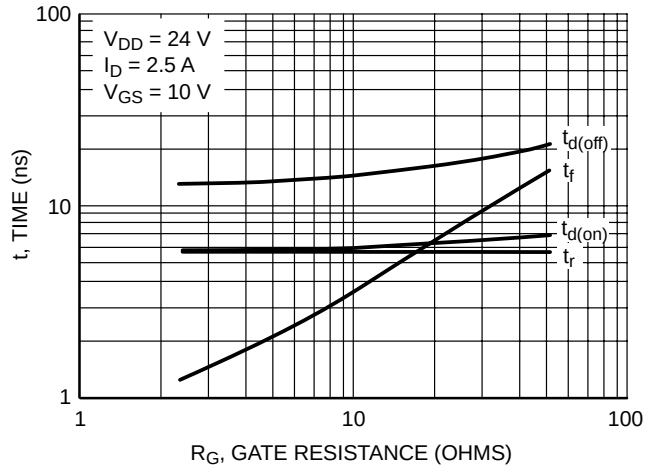


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

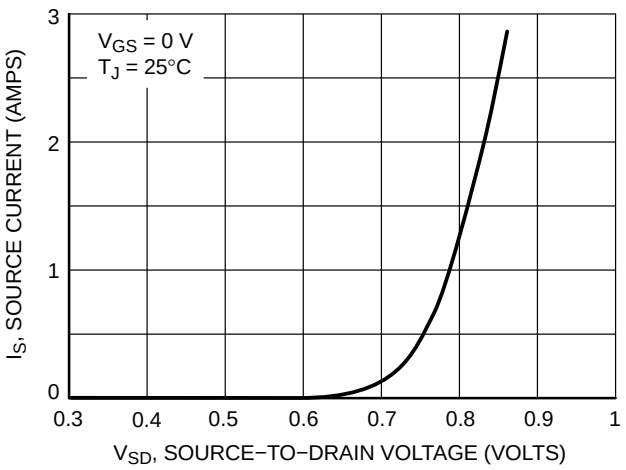
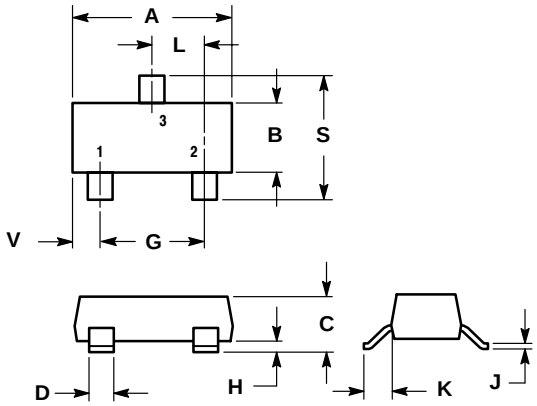


Figure 10. Diode Forward Voltage vs. Current

PACKAGE DIMENSIONS

SOT−23
CASE 318−09
ISSUE AH



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIUMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318−01, −02, AND −06 OBSOLETE, NEW STANDARD 318−09.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0385	0.0498	0.99	1.26
D	0.0140	0.0200	0.36	0.50
G	0.0670	0.0826	1.70	2.10
H	0.0040	0.0098	0.10	0.25
J	0.0034	0.0070	0.085	0.177
K	0.0180	0.0236	0.45	0.60
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.0984	2.10	2.50
V	0.0177	0.0236	0.45	0.60

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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