

NTMS4503N

Power MOSFET

28 V, 14 A, N-Channel, SO-8

Features

- Low $R_{DS(on)}$
- High Power and Current Handling Capability
- Low Gate Charge

Applications

- DC/DC Converters
- Motor Drives
- Synchronous Rectifier – POL
- Buck Low-Side

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	28	V
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	V
Drain Current	I_D	14	A
Continuous @ $T_A = 25^\circ\text{C}$ (Note 1)		12	
Continuous @ $T_A = 25^\circ\text{C}$ (Note 2)		9.0	
Continuous @ $T_A = 25^\circ\text{C}$ (Note 3)		40	
Single Pulse ($t_p = 10 \mu\text{s}$)	I_{DM}		
Total Power Dissipation	P_D	2.5	W
$T_A = 25^\circ\text{C}$ (Note 1)		1.66	
$T_A = 25^\circ\text{C}$ (Note 2)		0.93	
$T_A = 25^\circ\text{C}$ (Note 3)			
Operating and Storage Temperature	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 30 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_L = 12.2 \text{ A}$, $L = 1.0 \text{ mH}$, $R_G = 25 \Omega$)	E_{AS}	75	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Rating	Symbol	Value	Unit
Thermal Resistance	$R_{\theta JA}$	50	$^\circ\text{C/W}$
Junction-to-Ambient (Note 1)		75	
Junction-to-Ambient (Note 2)		135	
Junction-to-Ambient (Note 3)			

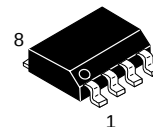
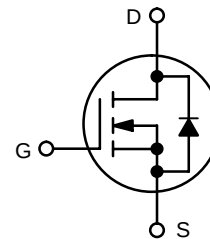
1. Surface-mounted on FR4 board using minimum recommended pad size (Cu area 0.412 in^2), $t < 10 \text{ s}$.
2. Surface-mounted on FR4 board using 1" pad size (Cu area 1.127 in^2) steady state.
3. Surface-mounted on FR4 board using minimum recommended pad size (Cu area 0.412 in^2), steady state.



ON Semiconductor®

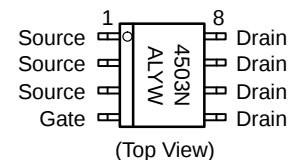
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX (Note 1)
28 V	7.0 m Ω @ 10 V	14 A
	8.8 m Ω @ 4.5 V	



SO-8
CASE 751
STYLE 12

MARKING DIAGRAM/ PIN ASSIGNMENT



4503N = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week

ORDERING INFORMATION

Device	Package	Shipping†
NTMS4503NR2	SO-8	2500/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.

NTMS4503N

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		28	31	–	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	–		–	22	–	mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$	–	–	1.0	μA
			$T_J = 100^\circ\text{C}$	–	–	25	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		–	–	± 100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.0	–	2.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	–	–	–5.0	–	mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 14\text{ A}$	–	7.0	8.0	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	–	8.8	9.8	
Forward Transconductance	g_{FS}	$V_{DS} = 10\text{ V}, I_D = 14\text{ A}$	–	30	–	S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 16\text{ V}$	–	2400	–	pF
Output Capacitance	C_{OSS}		–	1000	–	
Reverse Transfer Capacitance	C_{RSS}		–	375	–	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 16\text{ V}, I_D = 10\text{ A}$	–	23	–	nC
Threshold Gate Charge	$Q_{G(TH)}$		–	2.0	–	
Gate-to-Source Charge	Q_{GS}		–	5.0	–	
Gate-to-Drain Charge	Q_{GD}		–	12	–	

SWITCHING CHARACTERISTICS, $V_{GS} = V$ (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 16\text{ V}, I_D = 10\text{ A}, R_G = 2.0\text{ }\Omega$	–	18.5	–	ns
Rise Time	t_r		–	70	–	
Turn-Off Delay Time	$t_{d(OFF)}$		–	21	–	
Fall Time	t_f		–	23	–	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^{\circ}\text{C}$	–	0.82	1.2	V
			$T_J = 125^{\circ}\text{C}$	–	0.65	–	
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_{SD}/d_t = 100\text{ A}/\mu\text{s}, I_S = 14\text{ A}$		–	48	–	ns
Charge Time	T_a			–	23	–	
Discharge Time	T_b			–	25	–	
Reverse Recovery Charge	Q_{RR}			–	25	–	nC

4. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

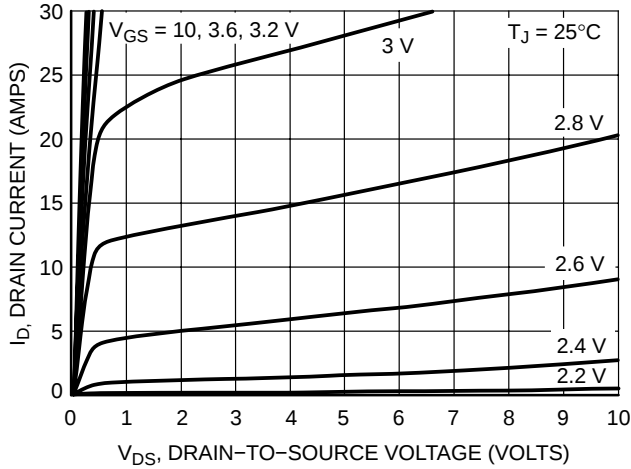


Figure 1. On-Region Characteristics

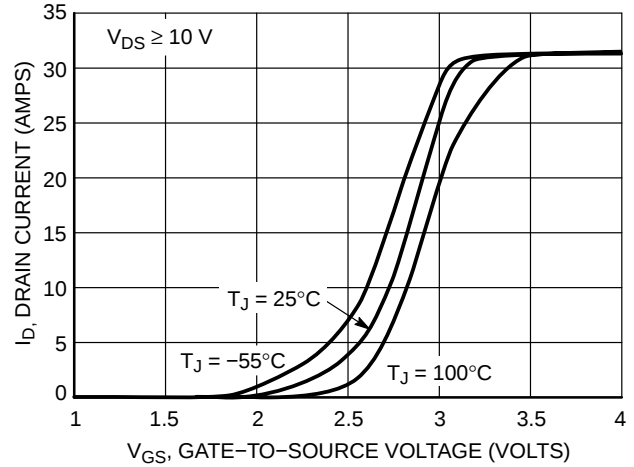


Figure 2. Transfer Characteristics

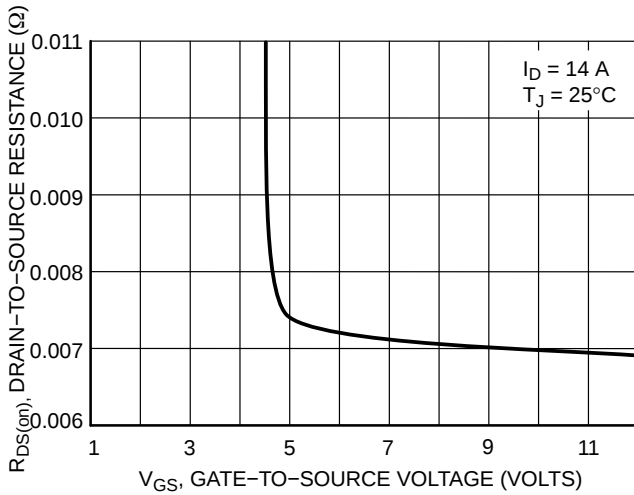


Figure 3. On-Resistance vs. Gate-to-Source Voltage

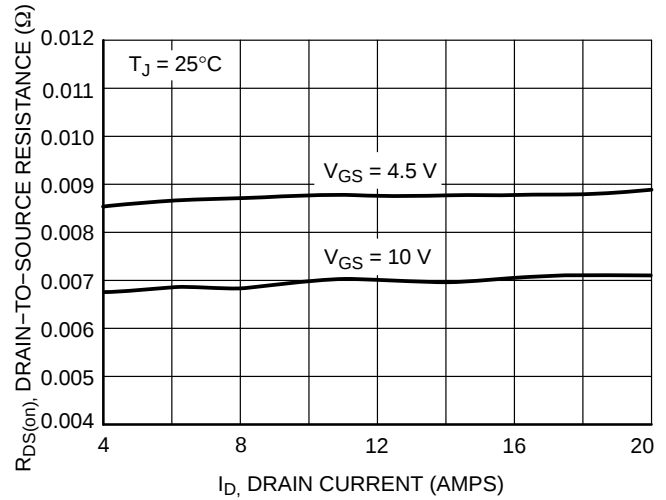


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

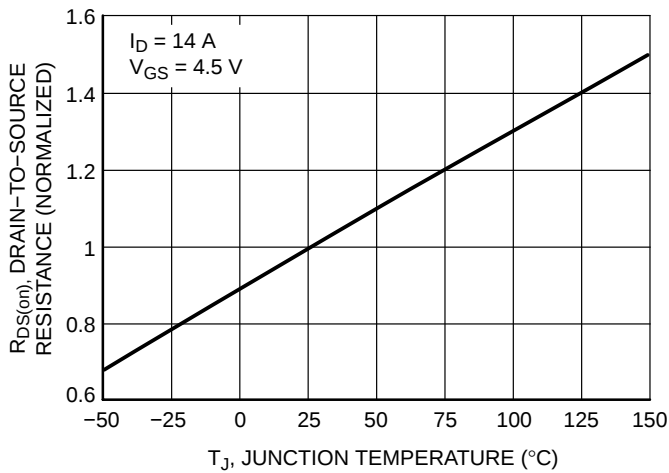


Figure 5. On-Resistance Variation with Temperature

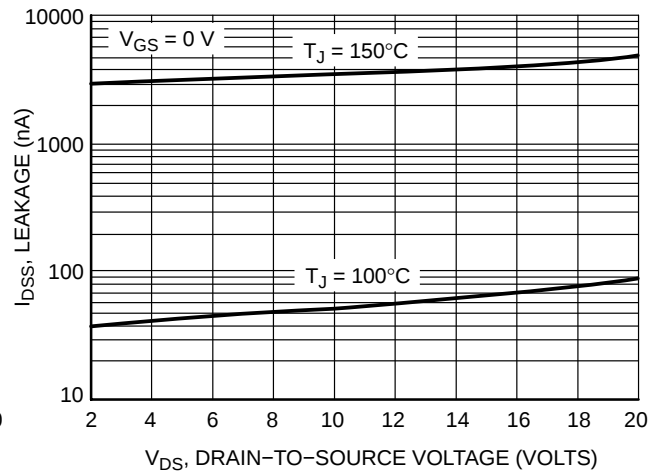


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

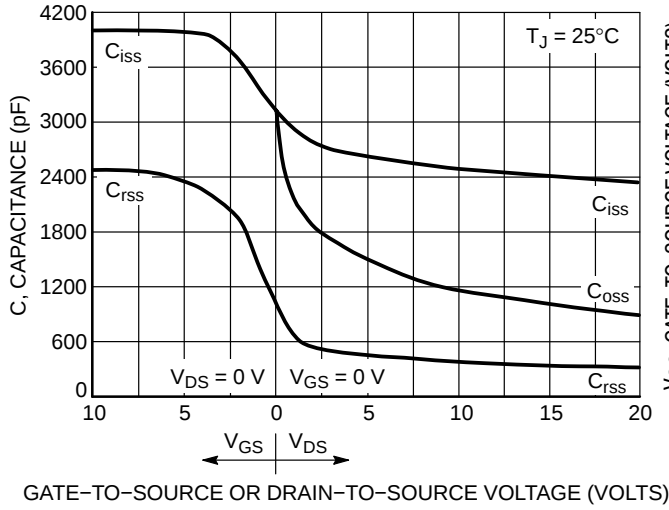


Figure 7. Capacitance Variation

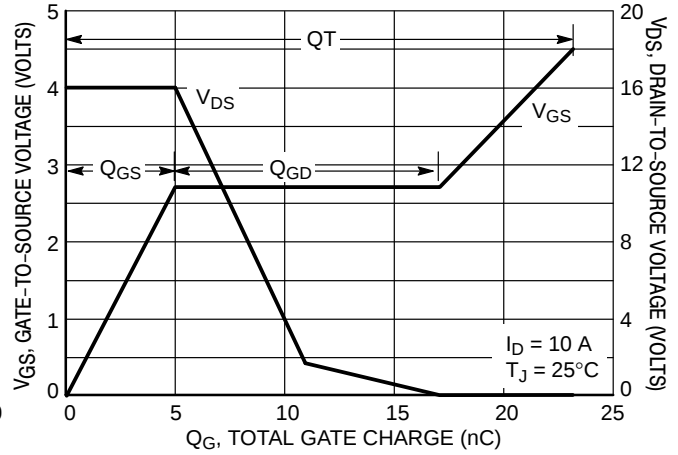


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

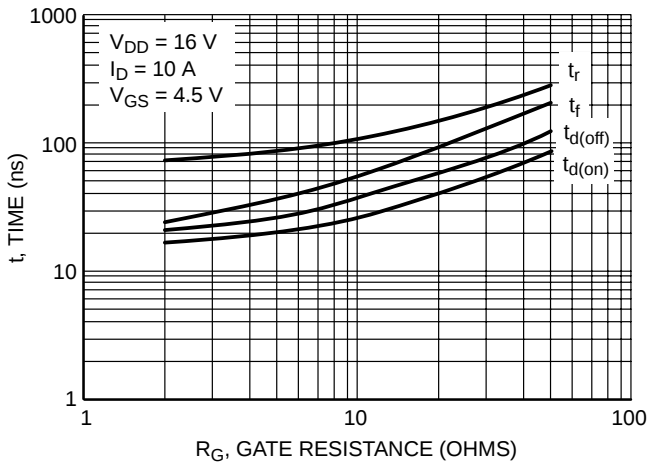


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

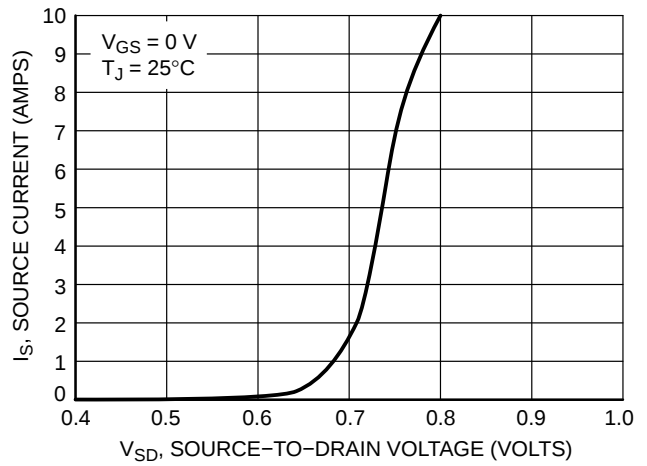
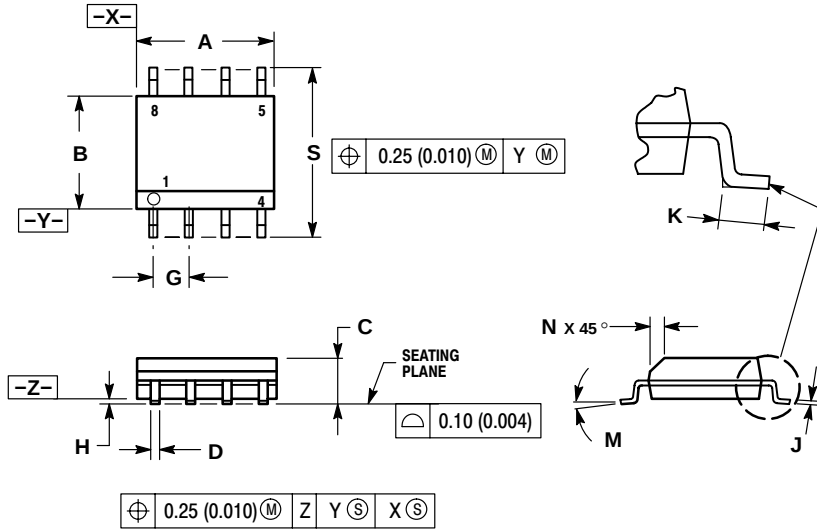


Figure 10. Diode Forward Voltage vs. Current

NTMS4503N

PACKAGE DIMENSIONS

SO-8
CASE 751-07
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

STYLE 12:

- PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

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