

# NTMS4101P

## Trench Power MOSFET 20 V, 9.0 A, Single P-Channel, SO-8

### Features

- Leading -20 V Trench for Low  $R_{DS(on)}$
- Surface Mount SO-8 Package Saves Board Space
- Lead-Free Package for Green Manufacturing (G Suffix)

### Applications

- Power Management
- Load Switch
- Battery Protection

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	-20	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 8.0$	V
Continuous Drain Current	$I_D$	Steady State	-6.9
		$t \leq 10$ s	-9.0
Pulsed Drain Current	$I_{DM}$	-30	A
Power Dissipation	$P_D$	1.38	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Continuous Source Current (Body Diode)	$I_S$	-6.9	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds)	$T_L$	260	$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	90	$^\circ\text{C/W}$
Junction-to-Ambient - $t \leq 10$ s (Note 1)	$R_{\theta JA}$	50	

1. Surface-mounted on FR4 board using 1" sq. pad size (Cu. area = 1.127 in. sq. [1 oz.] including traces).

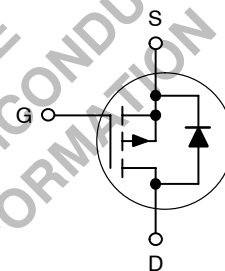


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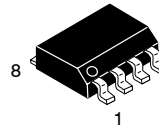
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
-20 V	16 m $\Omega$ @ -4.5 V	-9.0 A
	22 m $\Omega$ @ -2.5 V	

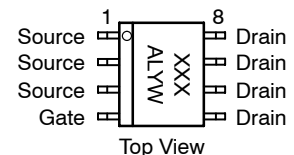
P-Channel MOSFET



### MARKING DIAGRAM & PIN ASSIGNMENT



SO-8  
CASE 751  
STYLE 12



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

### ORDERING INFORMATION

Device	Package	Shipping
NTMS4101PR2	SO-8	2500/Reel
NTMS4101PR2G	SO-8 (Pb-Free)	2500/Reel

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	V <sub>(BR)DSS</sub>	-20			V
Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -16 V	I <sub>DSS</sub>			-10	μA
Gate-to-Source Leakage Current	V <sub>GS</sub> = ±8.0 V, V <sub>DS</sub> = 0 V	I <sub>GSS</sub>			±100	nA

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA	V <sub>GS(th)</sub>	-0.45			V
Drain-to-Source On-Resistance	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -6.9 A	R <sub>DS(on)</sub>		16	19	mΩ
	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -6.5 A			22	30	
Forward Transconductance	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -6.9 A	g <sub>FS</sub>		70		S

### CHARGES AND CAPACITANCES

Input Capacitance	V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>DS</sub> = -10 V	C <sub>iss</sub>		3200		pF
Output Capacitance		C <sub>oss</sub>		320		
Reverse Transfer Capacitance		C <sub>rss</sub>		192		
Total Gate Charge	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V, I <sub>D</sub> = -6.9 A	Q <sub>G(TOT)</sub>		29.5	32	nC
Gate-to-Source Charge		Q <sub>GS</sub>		6.0		
Gate-to-Drain Charge		Q <sub>GD</sub>		7.5		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -10 V, I <sub>D</sub> = -1.0 A, R <sub>G</sub> = 6.0 Ω	t <sub>d(on)</sub>		12.5		ns
Rise Time		t <sub>r</sub>		9.0		
Turn-Off Delay Time		t <sub>d(off)</sub>		144		
Fall Time		t <sub>f</sub>		38.5		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -6.9 A	V <sub>SD</sub>		0.72	0.95	V
Reverse Recovery Time	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -10 V, di/dt = 100 A/μs, I <sub>S</sub> = -6.9 A	t <sub>rr</sub>		28	35	ns
Charge Time		t <sub>a</sub>		12		
Discharge Time		t <sub>b</sub>		15		
Reverse Recovery Charge		Q <sub>rr</sub>		.017		nC

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

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## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

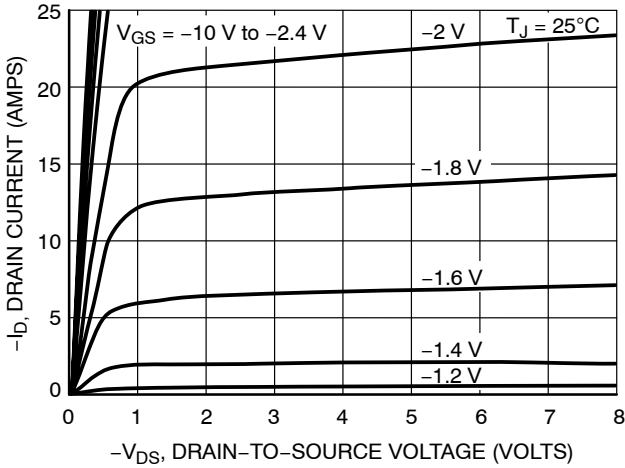


Figure 1. On-Region Characteristics

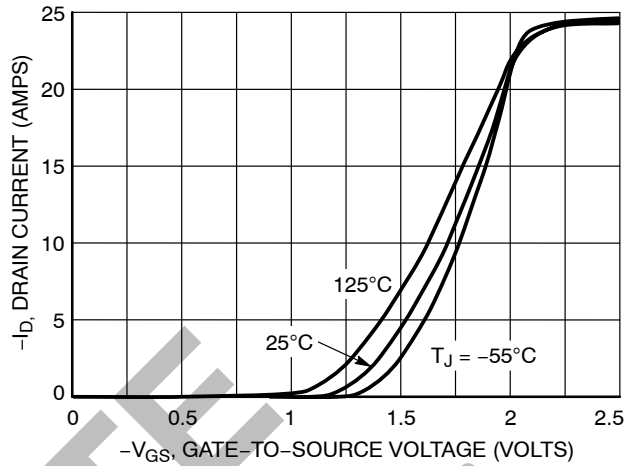


Figure 2. Transfer Characteristics

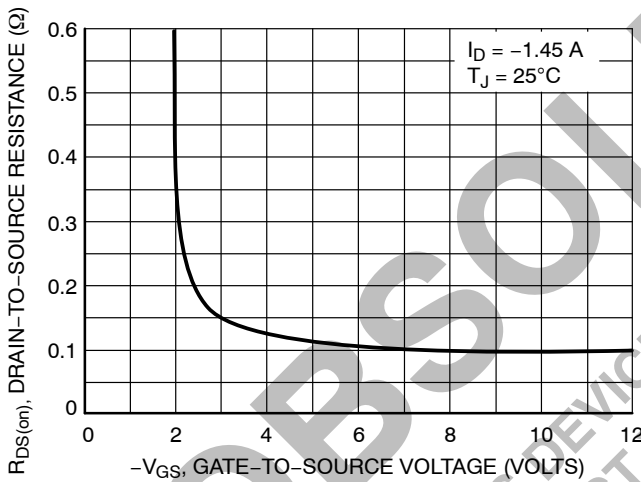


Figure 3. On-Resistance vs. Gate-to-Source Voltage

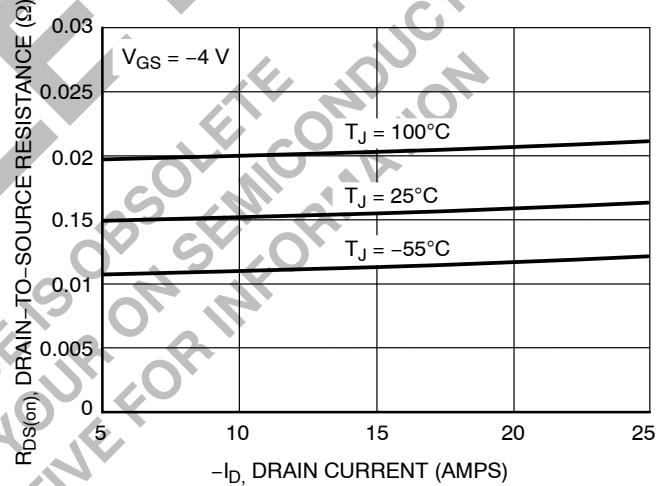


Figure 4. On-Resistance vs. Drain Current and Temperature

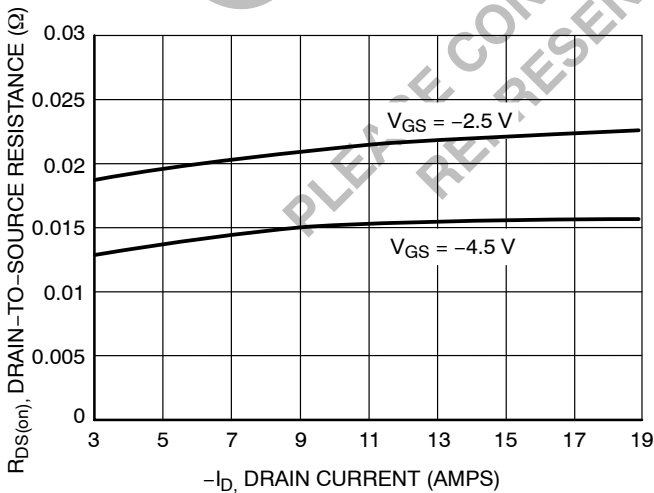


Figure 5. On-Resistance vs. Drain Current and Gate Voltage

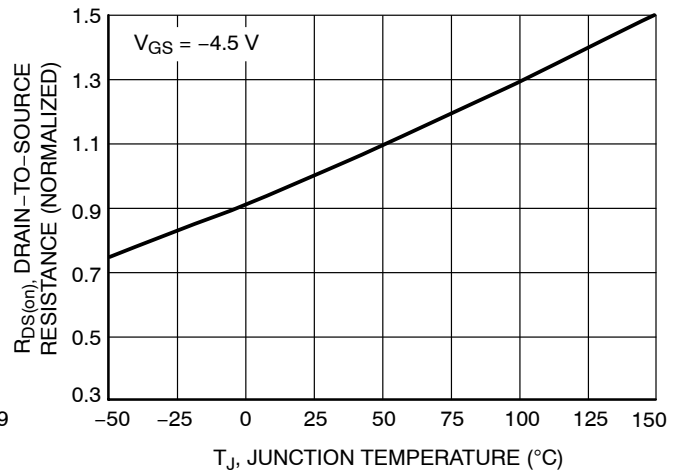


Figure 6. On-Resistance Variation with Temperature

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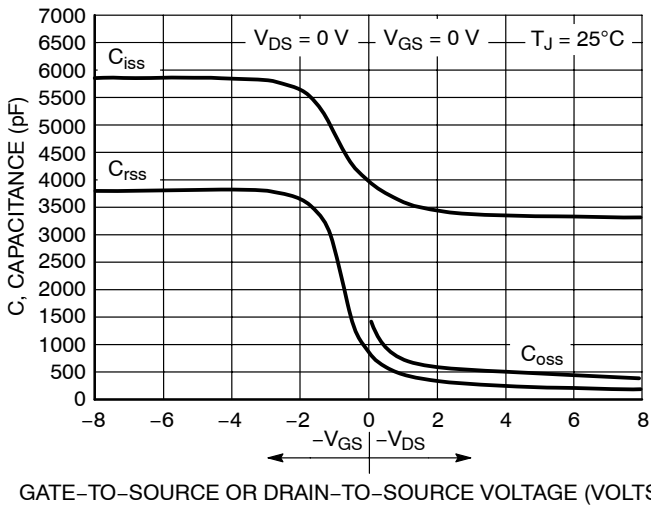


Figure 7. Capacitance Variation

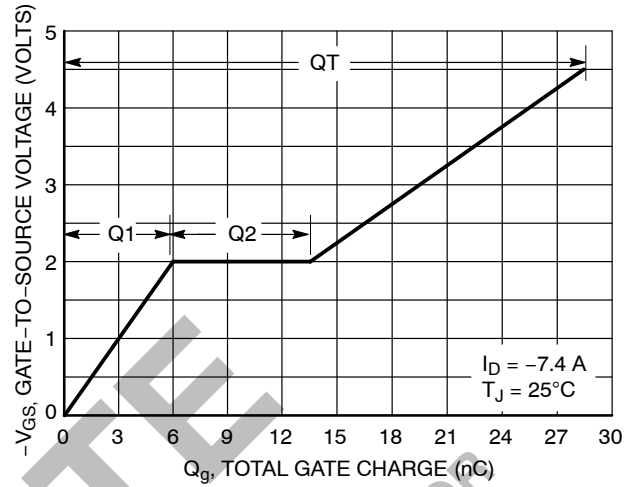


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

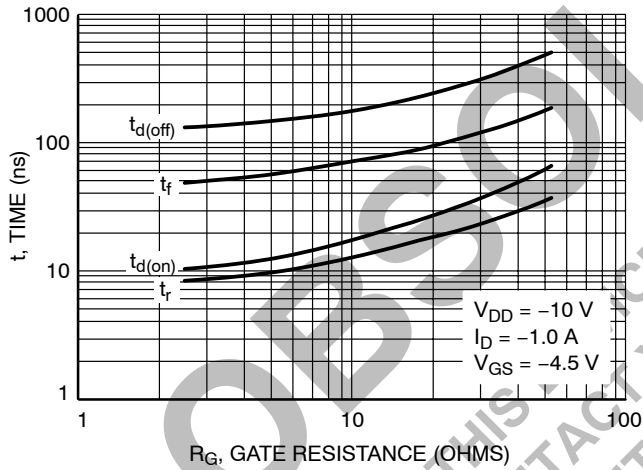


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

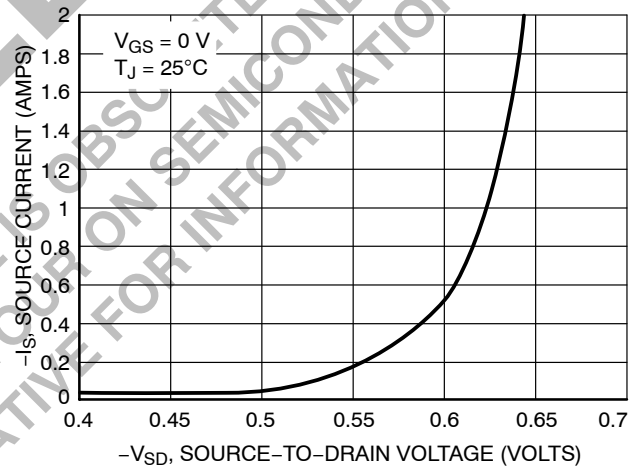


Figure 10. Diode Forward Voltage vs. Current

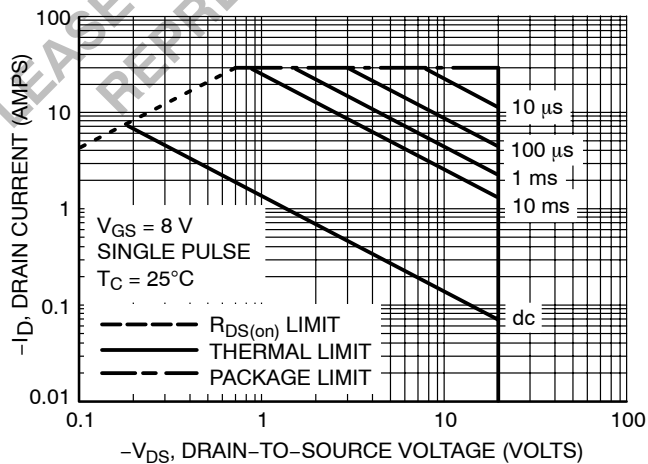
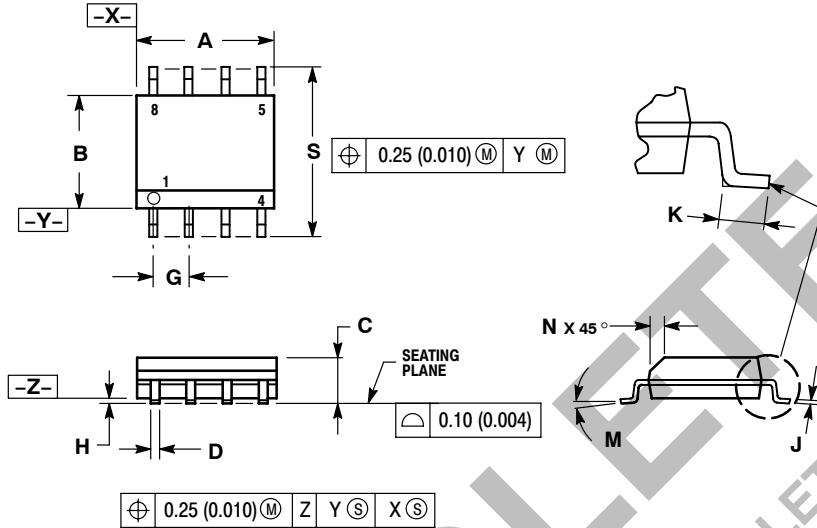


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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## PACKAGE DIMENSIONS

SOIC-8 NB  
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:

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

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