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

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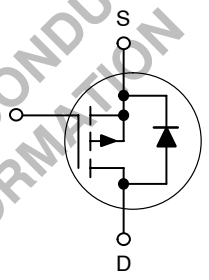
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
−20 V	16 mΩ @ −4.5 V	−9.0 A
	22 mΩ @ −2.5 V	

P−Channel MOSFET



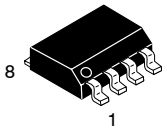
MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	−20	V
Gate−to−Source Voltage		V_{GS}	±8.0	V
Continuous Drain Current	Steady State	I_D	−6.9	A
	t ≤ 10 s		−9.0	
Pulsed Drain Current	t = 10 μs	I_{DM}	−30	A
Power Dissipation	Steady State	P_D	1.38	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to 150	°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	°C

THERMAL RESISTANCE RATINGS

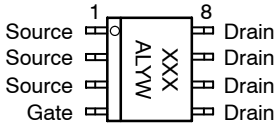
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	90	°C/W
Junction−to−Ambient − t ≤ 10 s (Note 1)	$R_{\theta JA}$	50	

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



SO−8
CASE 751
STYLE 12

MARKING DIAGRAM & PIN ASSIGNMENT



Top View

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

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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = −250 μA	$V_{(BR)DSS}$	−20			V
Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = −16 V	I_{DSS}			−10	μA
Gate−to−Source Leakage Current	V_{GS} = ±8.0 V, V_{DS} = 0 V	I_{GSS}			±100	nA
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = −250 μA	$V_{GS(th)}$	−0.45			V
Drain−to−Source On−Resistance	V_{GS} = −4.5 V, I_D = −6.9 A	$R_{DS(on)}$		16	19	mΩ
	V_{GS} = −2.5 V, I_D = −6.5 A			22	30	
Forward Transconductance	V_{DS} = −15 V, I_D = −6.9 A	g_{FS}		70		S
CHARGES AND CAPACITANCES						
Input Capacitance	V_{GS} = 0 V, f = 1 MHz, V_{DS} = −10 V	C_{iss}		3200		pF
Output Capacitance		C_{oss}		320		
Reverse Transfer Capacitance		C_{rss}		192		
Total Gate Charge	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −6.9 A	$Q_{G(TOT)}$		29.5	32	nC
Gate−to−Source Charge		Q_{GS}		6.0		
Gate−to−Drain Charge		Q_{GD}		7.5		
SWITCHING CHARACTERISTICS (Note 3)						
Turn−On Delay Time	V_{GS} = −4.5 V, V_{DD} = −10 V, I_D = −1.0 A, R_G = 6.0 Ω	$t_{d(on)}$		12.5		ns
Rise Time		t_r		9.0		
Turn−Off Delay Time		$t_{d(off)}$		144		
Fall Time		t_f		38.5		
DRAIN−SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{GS} = 0 V, I_S = −6.9 A	V_{SD}		0.72	0.95	V
Reverse Recovery Time	V_{GS} = 0 V, V_{DS} = −10 V, dI_S/dt = 100 A/μs, I_S = −6.9 A	t_{rr}		28	35	ns
Charge Time		t_a		12		
Discharge Time		t_b		15		
Reverse Recovery Charge		Q_{rr}		.017		nC

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

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

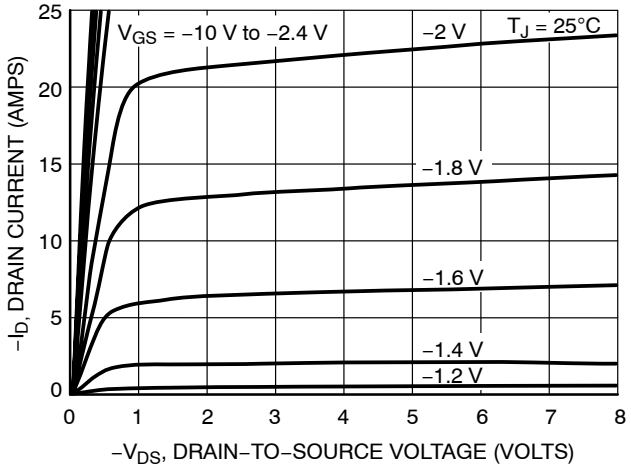


Figure 1. On−Region Characteristics

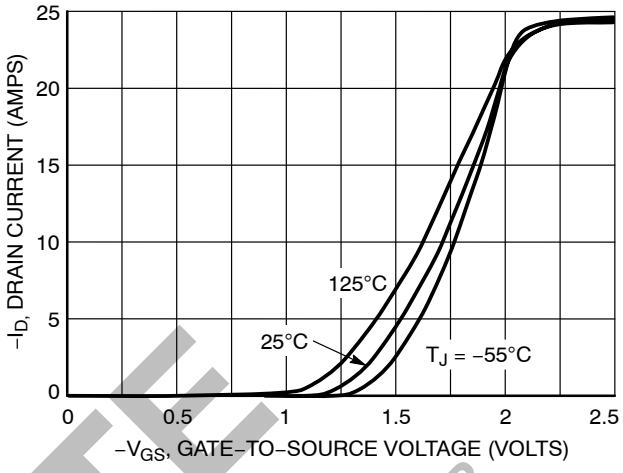


Figure 2. Transfer Characteristics

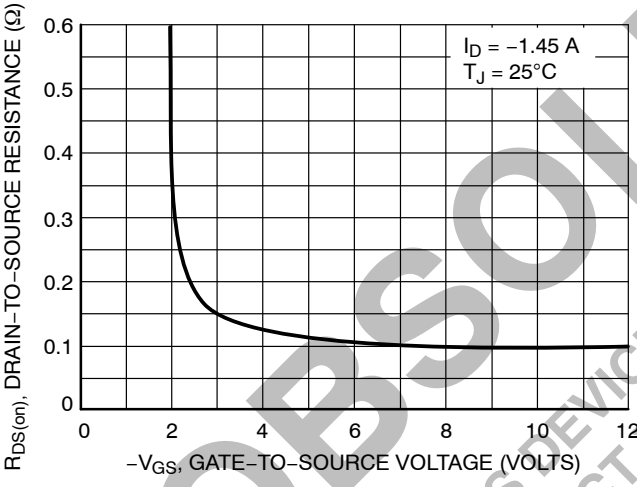


Figure 3. On−Resistance vs. Gate−to−Source Voltage

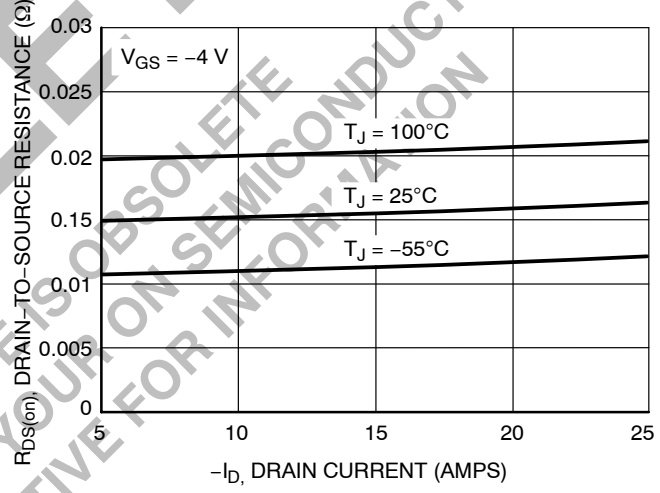


Figure 4. On−Resistance vs. Drain Current and Temperature

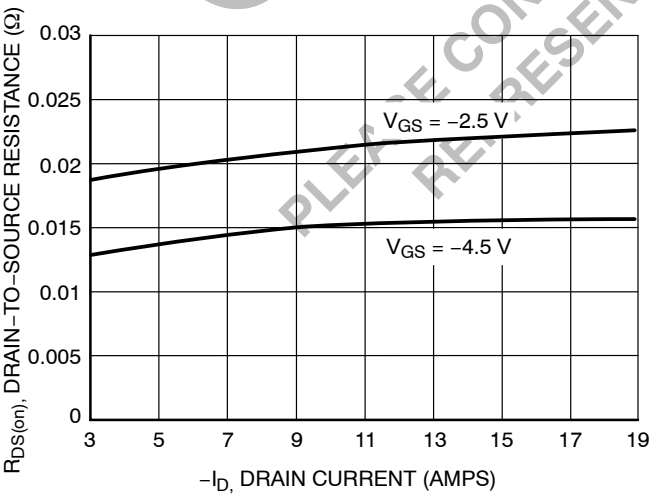


Figure 5. On−Resistance vs. Drain Current and Gate Voltage

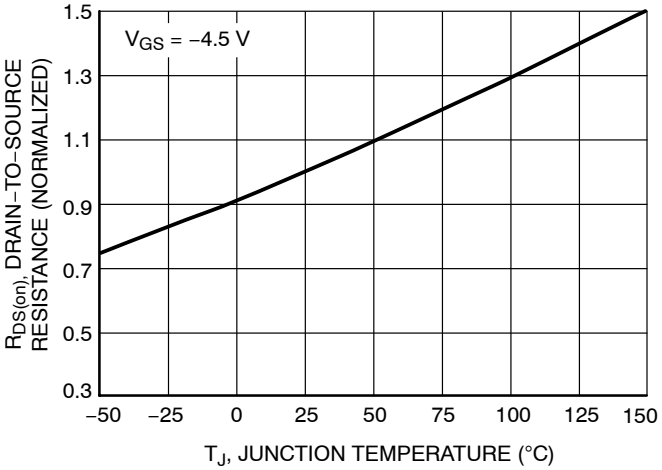


Figure 6. On−Resistance Variation with Temperature

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

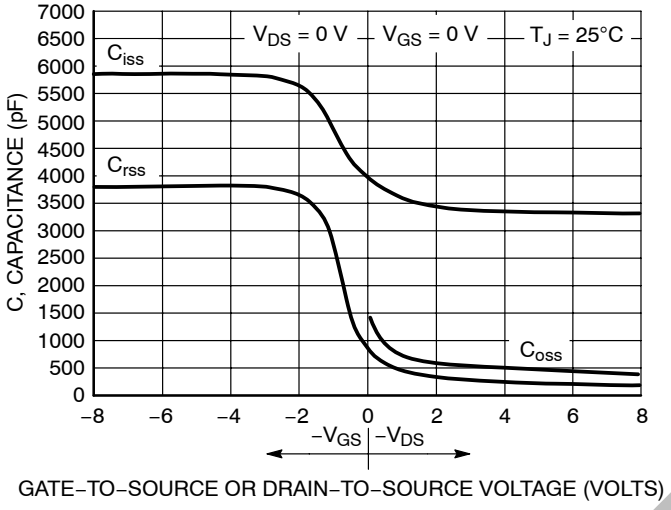


Figure 7. Capacitance Variation

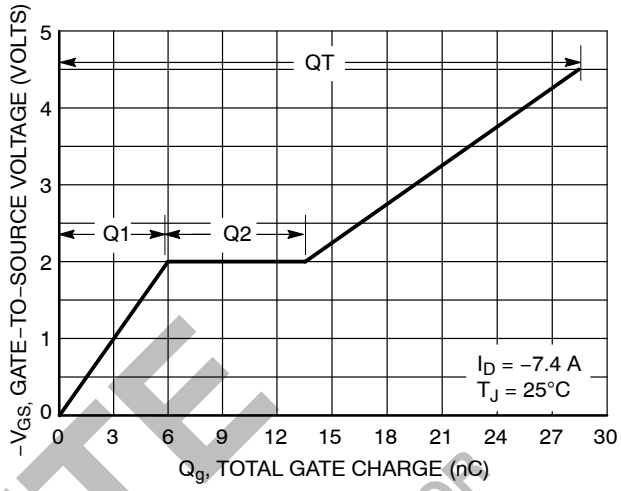


Figure 8. Gate−to−Source Voltage vs. Total Gate Charge

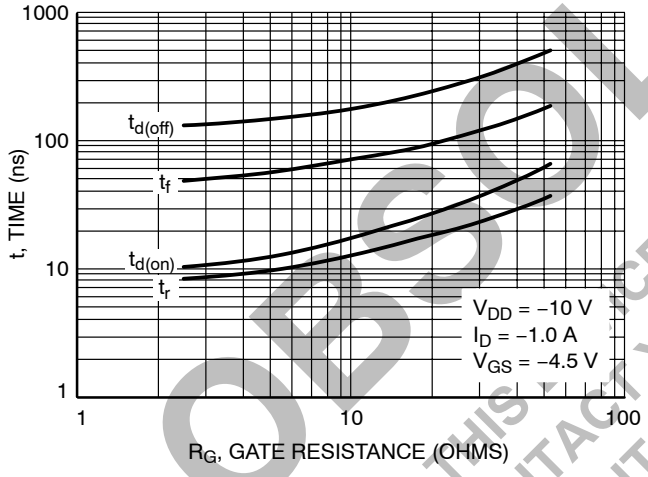


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

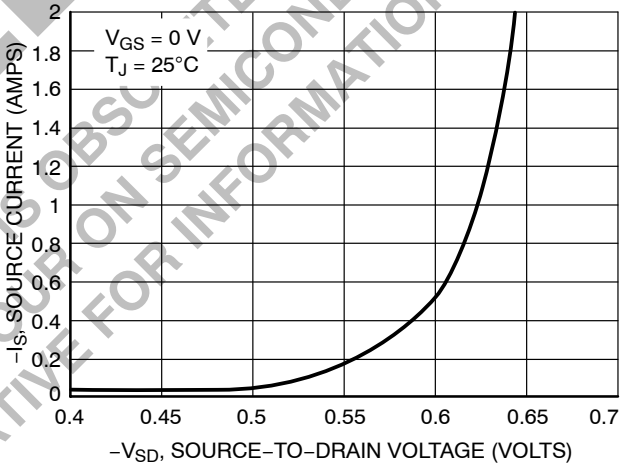


Figure 10. Diode Forward Voltage vs. Current

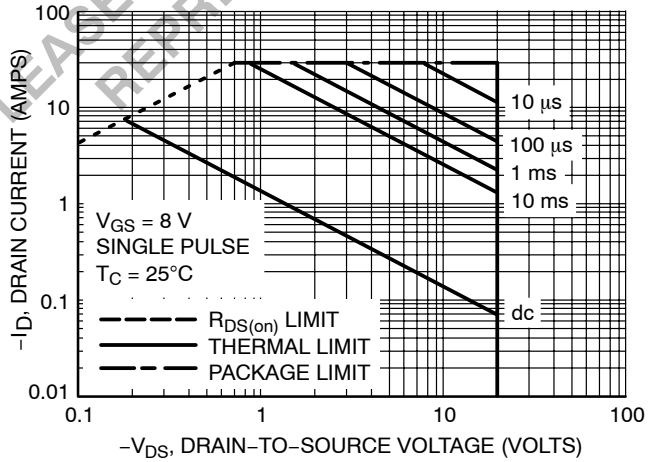
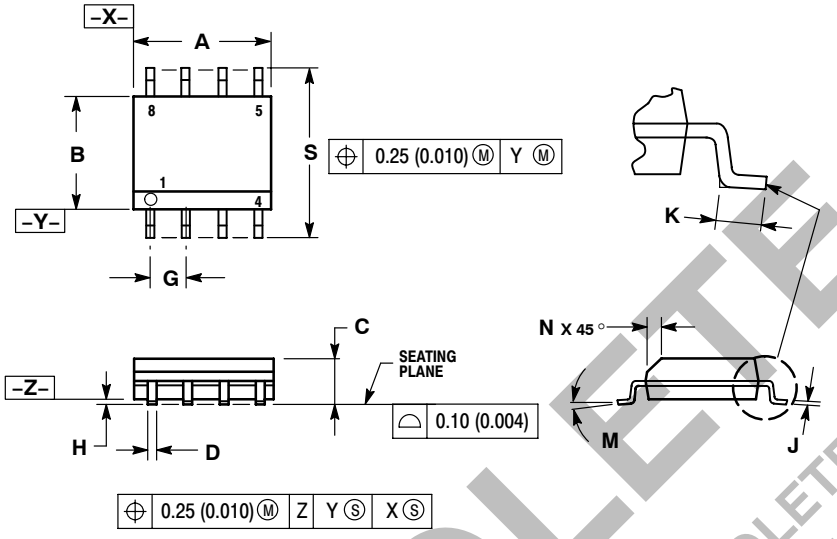


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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.

	MILLIMETERS		INCHES	
DIM	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

PUBLICATION ORDERING INFORMATION

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