

# NTLMS4501N

## Power MOSFET

### 30 V, 14.7 A, N-Channel, SO-8 Leadless Package

#### Features and Benefits

- Fast Switching Performance
- Low  $t_{RR}$  and  $Q_{RR}$  Optimized for Synchronous Operation
- Low  $R_{DS(on)}$  to Minimize Conduction Loss
- Optimized FOM ( $Q_{GD} \times R_{DS(on)}$ )
- Low Gate Charge to Minimize Switching Losses

#### Applications

- Server and Notebook Power Supplies
- DC-DC Converters

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	30	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	10	A
		$T_A = 85^\circ\text{C}$		7.2	
	$t \leq 10$ s	$T_A = 25^\circ\text{C}$		14.7	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	2.3	W
		$t \leq 10$ s		5.0	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	7.0	A
		$T_A = 85^\circ\text{C}$		5.0	
Power Dissipation (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	1.13	W
Pulsed Drain Current (Note 1)	$t_p = 10$ $\mu\text{s}$		$I_{DM}$	30	A
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)		$I_S$	10	A	
Lead Temperature for Soldering Purposes (1/8 in from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	55	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t \leq 10$ s (Note 1)	$R_{\theta JA}$	25	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	110	$^\circ\text{C}/\text{W}$

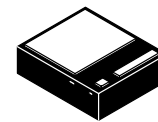
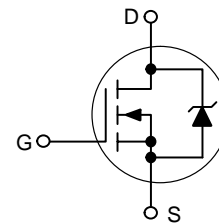
1. Surface-mounted on FR4 board using 1 sq. in. pad size (Cu. area = 1.127 sq. in. [1 oz] including traces).
2. Surface-mounted on FR4 board using minimum recommended pad size (Cu. area = 0.0821 sq. in.).



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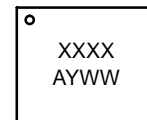
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
30 V	11.8 m $\Omega$ @ 10 V	14.7 A
	15 m $\Omega$ @ 4.5 V	



SO-8 Leadless  
CASE 751AD

#### MARKING DIAGRAM



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week

#### ORDERING INFORMATION

Device	Package	Shipping†
NTLMS4501NR2	SO-8 Leadless	2500/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.

# NTLMS4501N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	30	33		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			25		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 24 V	T <sub>A</sub> = 25°C		0.8	μA
			T <sub>A</sub> = 125°C		10	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

## ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.0	1.7	2.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			-4.0		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 14.7 A		11.8	13.5	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 13 A		15	16.5	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 14.7 A		20		S

## CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>DS</sub> = 20 V		1010	1100	pF
Output Capacitance	C <sub>OSS</sub>			325		
Reverse Transfer Capacitance	C <sub>RSS</sub>			94		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 14.7 A		9.25	9.7	nC
Gate-to-Source Gate Charge	Q <sub>GS</sub>			3.2		
Gate-to-Drain "Miller" Charge	Q <sub>GD</sub>			3.6		

## SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 15 V, I <sub>D</sub> = 14.7 A, R <sub>G</sub> = 2.5 Ω		8.5	9.5	ns
Rise Time	t <sub>r</sub>			37	39	
Turn-Off Delay Time	t <sub>d(OFF)</sub>			22	25	
Fall Time	t <sub>f</sub>			6.0	8.0	

## DRAIN-SOURCE DIODE CHARACTERISTICS (Note 3)

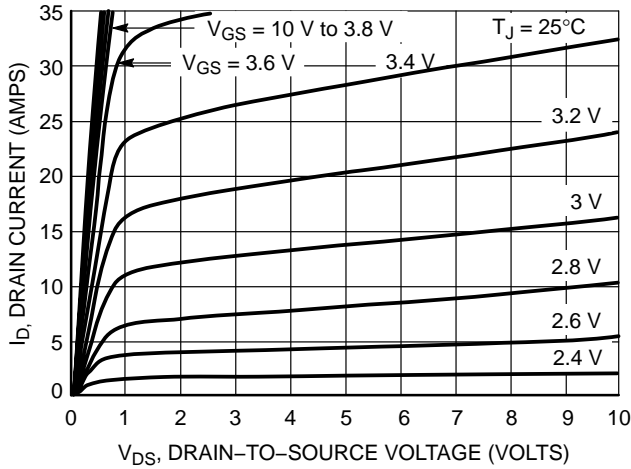
Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 10 A	T <sub>A</sub> = 25°C		1.0	1.2	V
			T <sub>A</sub> = 125°C		0.8		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, di <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 10 A		29	35	ns	
Charge Time	t <sub>a</sub>			15			
Discharge Time	t <sub>b</sub>			18			
Reverse Recovery Charge	Q <sub>RR</sub>			0.022			nC

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

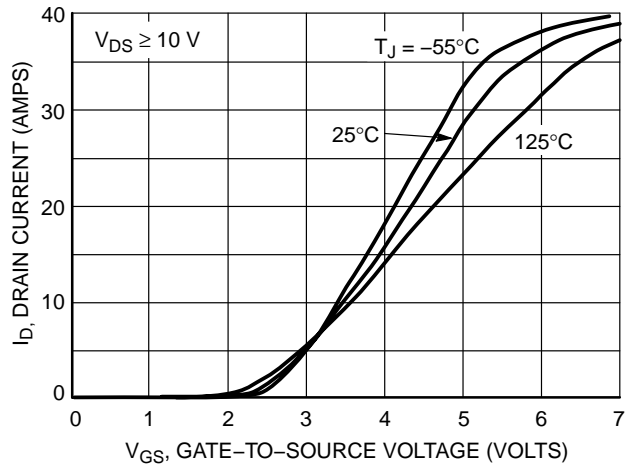
4. Switching characteristics are independent of operating junction temperatures.

# NTLMS4501N

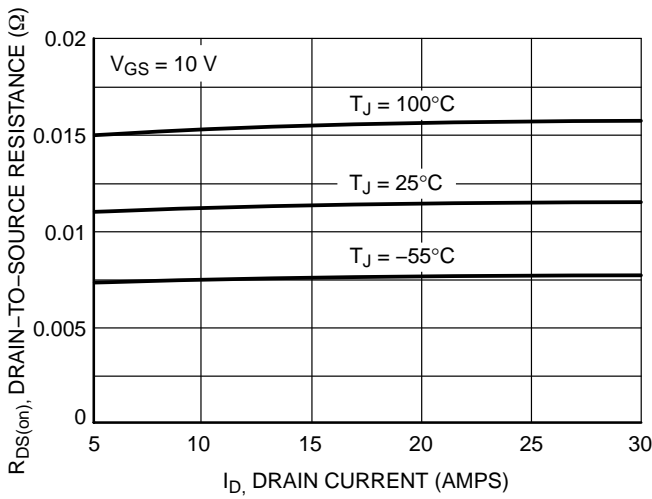
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



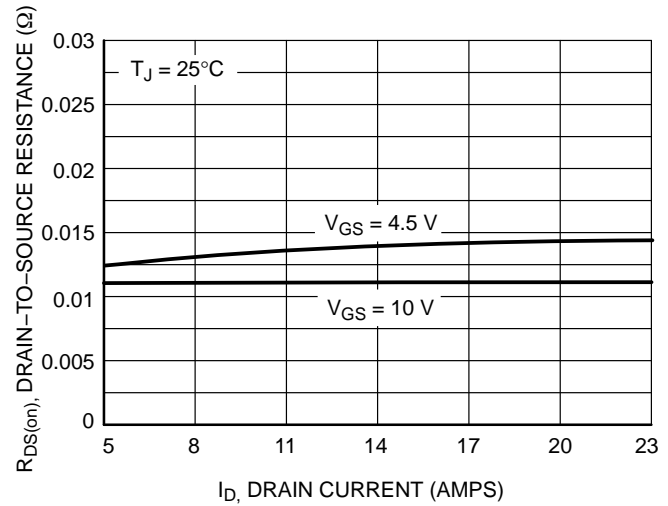
**Figure 1. On-Region Characteristics**



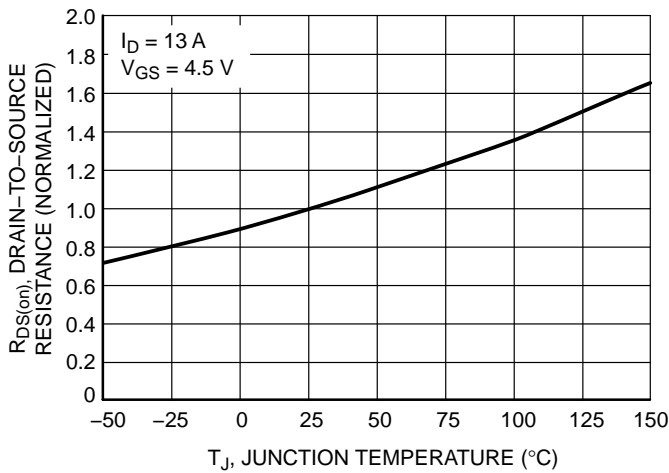
**Figure 2. Transfer Characteristics**



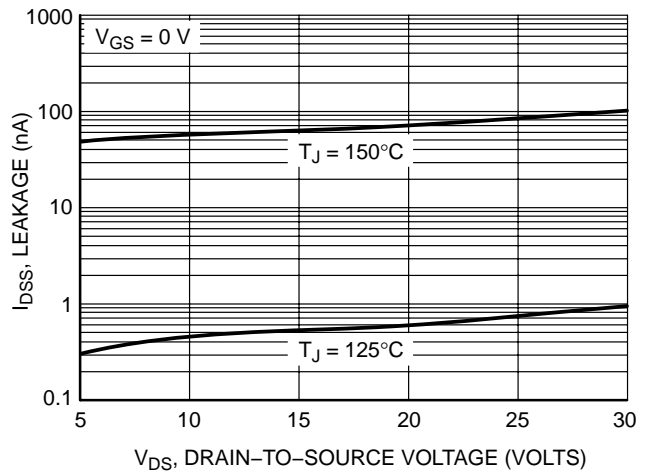
**Figure 3. On-Resistance vs. Drain Current and Temperature**



**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**

# NTLMS4501N

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

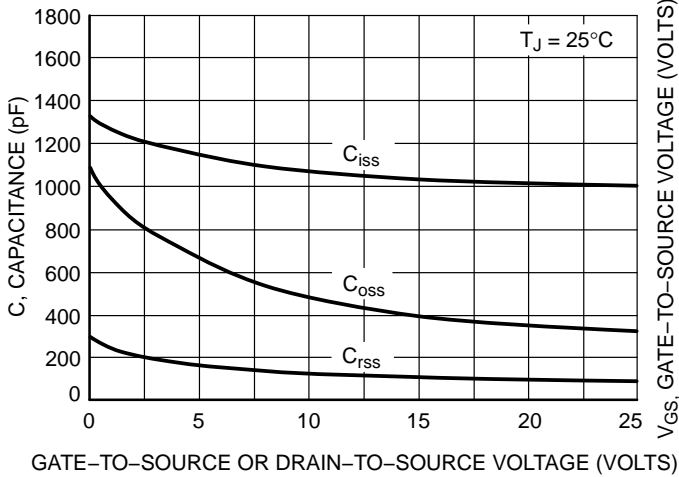


Figure 7. Capacitance Variation

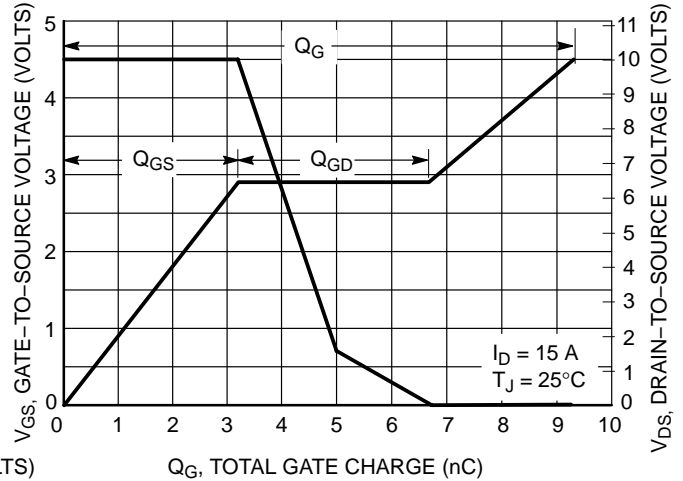


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

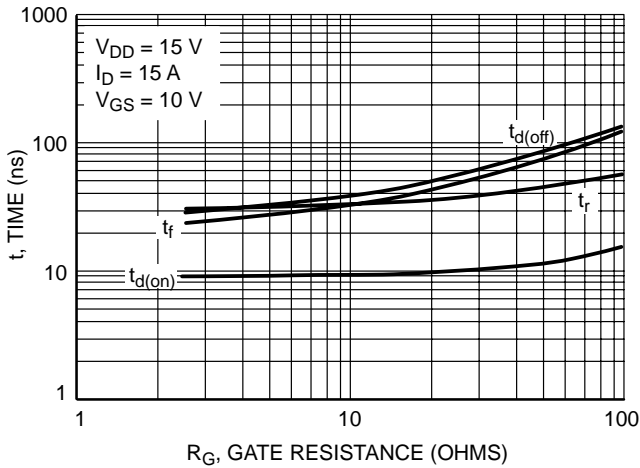


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

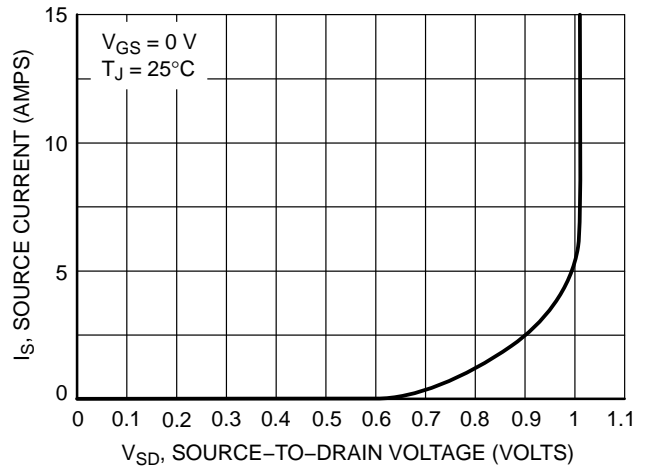


Figure 10. Diode Forward Voltage vs. Current

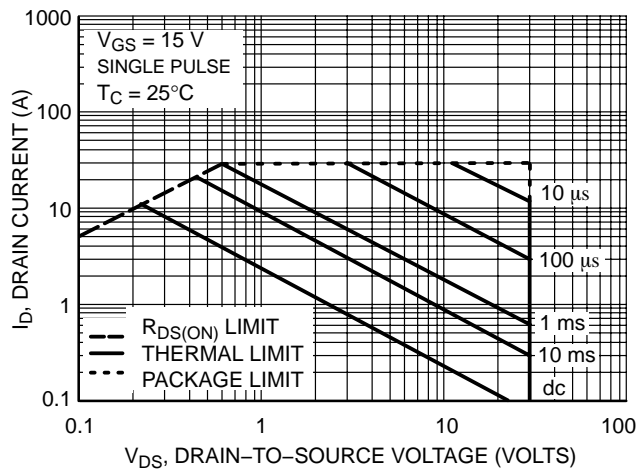
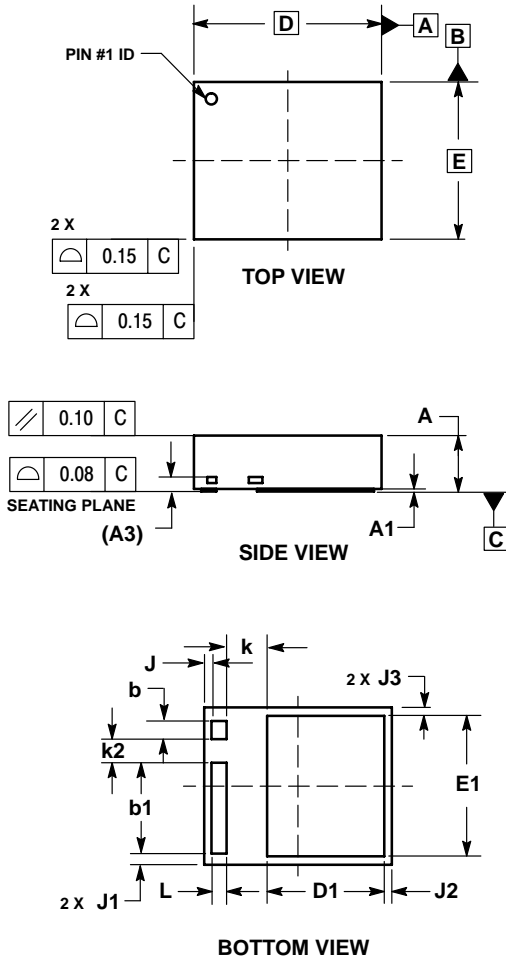


Figure 11. Maximum Rated Forward Biased Safe Operating Area

# NTLMS4501N

## PACKAGE DIMENSIONS

SO-8 Leadless  
CASE 751AD-01  
ISSUE O




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS	
	MIN	MAX
A	1.750	1.950
A1	0.000	0.050
A3	0.254 REF	
b	0.400	0.600
b1	2.930	3.030
D	6.200 BSC	
D1	3.777	3.977
E	5.200 BSC	
E1	4.544	4.744
J	0.027	0.227
J1	0.350	0.550
J2	0.154	0.354
J3	0.178	0.378
k	1.246	1.446
k2	0.680	0.880
L	0.500	0.700

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