

# NTP4804N

## Power MOSFET

30 V, 133 A, Single N-Channel, TO-220

### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These are Pb-Free Devices\*

### Applications

- AC-DC Converters
- DC-DC Converters
- Low Side Switching

### 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 $R_{\theta JA}$ (Note 1)	$I_D$	$T_A = 25^\circ\text{C}$	21	A
		$T_A = 85^\circ\text{C}$	13	
Power Dissipation $R_{\theta JA}$ (Note 1)	$P_D$	$T_A = 25^\circ\text{C}$	3.0	W
		$T_C = 25^\circ\text{C}$		
Continuous Drain Current $R_{\theta JC}$	$I_D$	$T_C = 25^\circ\text{C}$	133	A
		$T_C = 85^\circ\text{C}$	85	
Power Dissipation $R_{\theta JC}$	$P_D$	120	W	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$	350	A
Current Limited by Package	$T_A = 25^\circ\text{C}$	$I_{DmaxPkg}$	45	A
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)	$I_S$	78	A	
Drain to Source DV/DT	dV/dt	6	V/ns	
Single Pulse Drain-to-Source Avalanche Energy $T_J = 25^\circ\text{C}, V_{DD} = 24 \text{ V}, V_{GS} = 10 \text{ V}, I_{L(pk)} = 56 \text{ A}, L = 0.3 \text{ mH}, R_G = 25 \Omega$	EAS	474	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$	

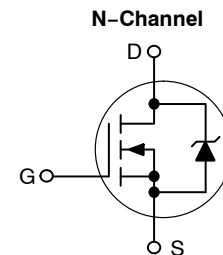
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



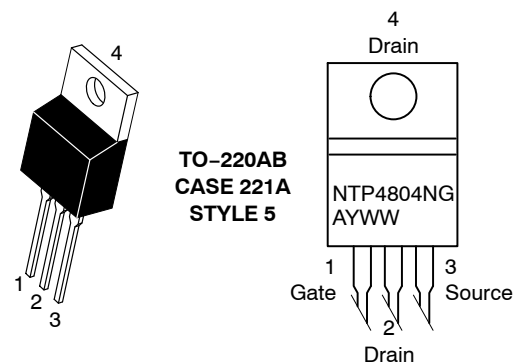
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
30 V	4.0 m $\Omega$ @ 10 V	133 A
	5.5 m $\Omega$ @ 4.5 V	



### MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location  
 Y = Year  
 WW = Work Week  
 G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

# NTP4804N

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	1.25	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	50	

1. Surface mounted on FR4 board using 1 in sq pad size, 1 oz Cu.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			21		mV/°C
Zero Gate Voltage Drain Current Gate-to-Source Leakage Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 150^\circ\text{C}$		100	
	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

## ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			6.9		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$	3.3	4.0	m $\Omega$
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	4.4	5.5	
			$I_D = 15\text{ A}$	4.4	5.5	
Forward Transconductance	$g_{FS}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		22		TBD

## CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 12\text{ V}$		4160		pF
Output Capacitance	$C_{OSS}$			938		
Reverse Transfer Capacitance	$C_{RSS}$			455		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		28	40	nC
Threshold Gate Charge	$Q_{G(TH)}$			3.4		
Gate-to-Source Charge	$Q_{GS}$			11.3		
Gate-to-Drain Charge	$Q_{GD}$			11.1		
Gate Resistance	$R_G$			0.49		

## SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		18		ns
Rise Time	$t_r$			20		
Turn-Off Delay Time	$t_{d(OFF)}$			24		
Fall Time	$t_f$			8.0		
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		13		ns
Rise Time	$t_r$			19.6		
Turn-Off Delay Time	$t_{d(OFF)}$			35.7		
Fall Time	$t_f$			7.7		

2. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

3. Switching characteristics are independent of operating junction temperatures.

# NTP4804N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit	
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>							
Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.77	1.2	V
			$T_J = 150^\circ\text{C}$		0.57		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 30\text{ A}$		34.4		ns	
Charge Time	$T_a$			18.9			
Discharge Time	$T_b$			15.5			
Reverse Recovery Charge	$Q_{RR}$			29.5		nC	

- Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

## ORDERING INFORMATION

Order Number	Package	Shipping
NTP4804NG	TO-220 (Pb-Free)	50 Units / Rail

TYPICAL CHARACTERISTICS

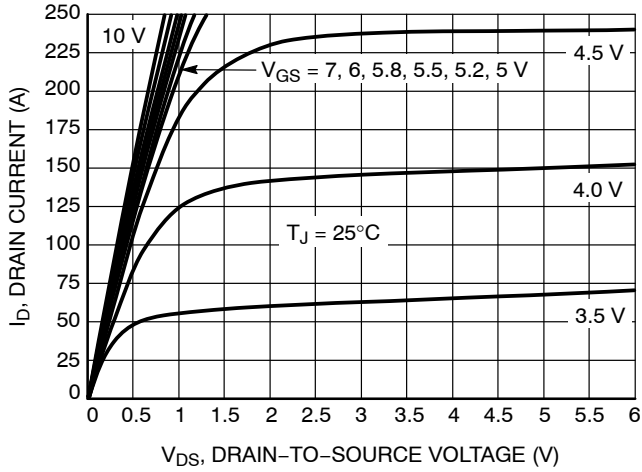


Figure 1. On-Region Characteristics

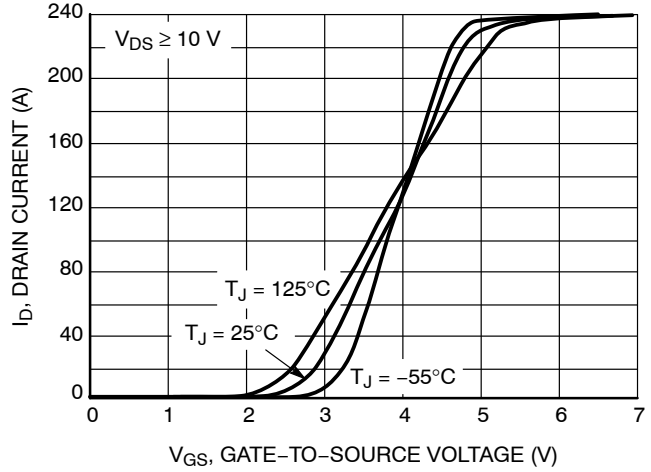


Figure 2. Transfer Characteristics

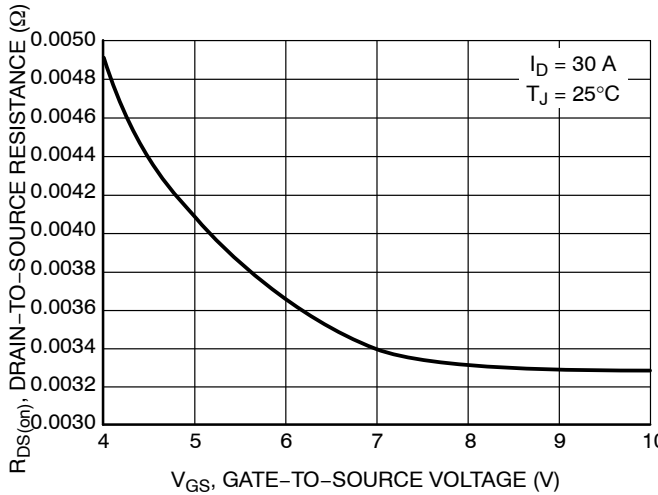


Figure 3. On-Resistance vs. Drain Current

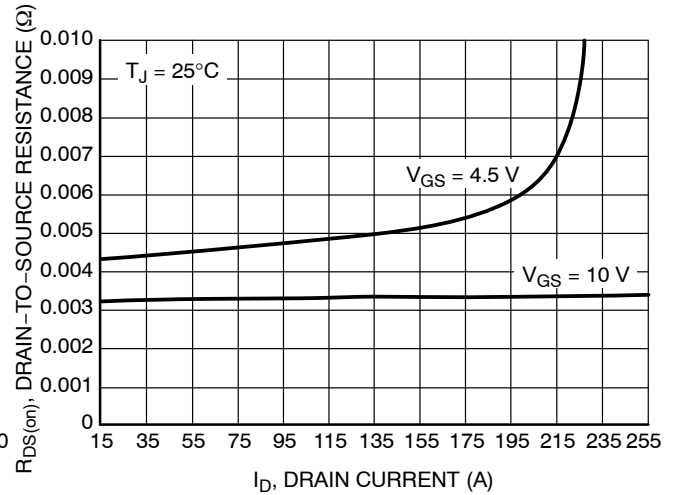


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

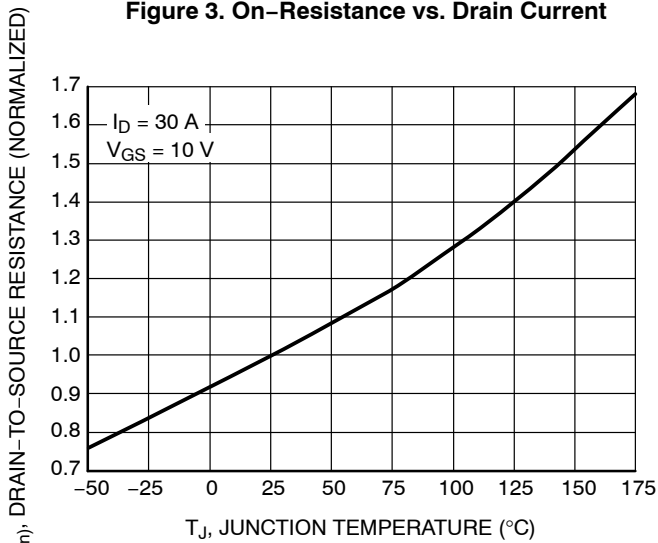


Figure 5. On-Resistance Variation with Temperature

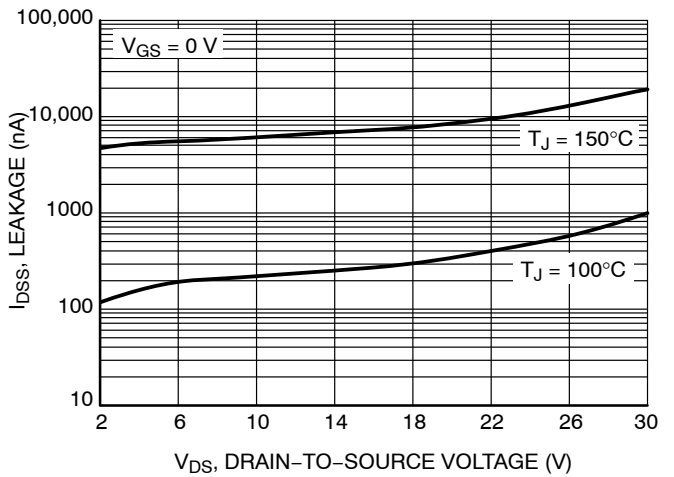


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

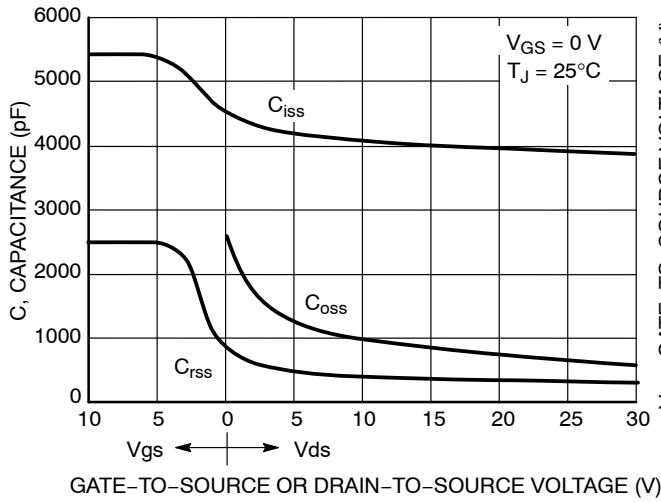


Figure 7. Capacitance Variation

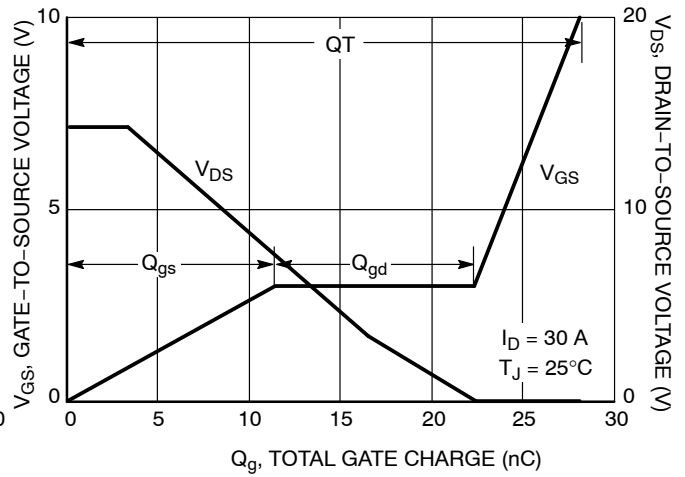


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

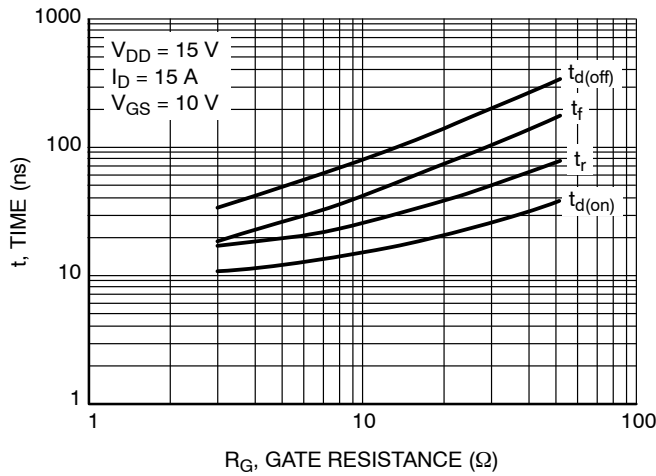


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

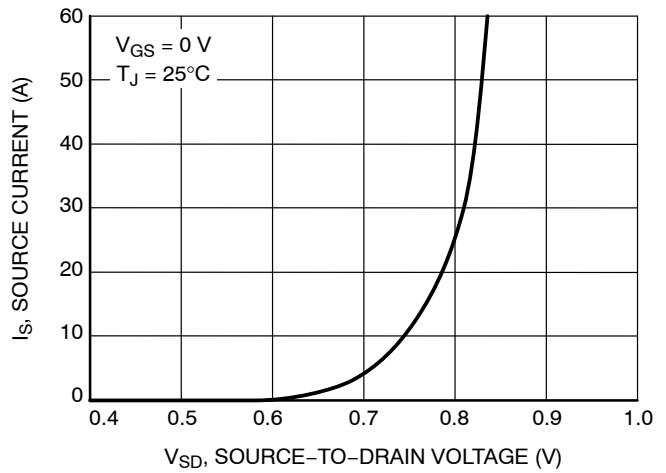
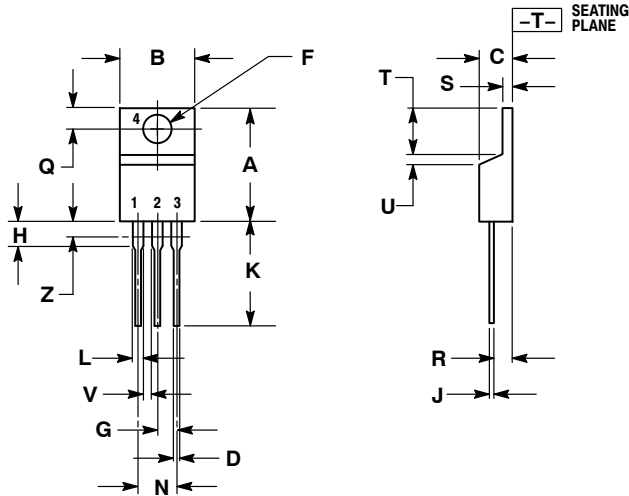


Figure 10. Diode Forward Voltage vs. Current

# NTP4804N

## PACKAGE DIMENSIONS

### TO-220, SINGLE GAUGE CASE 221AB-01 ISSUE O



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.020	0.055	0.508	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

**STYLE 5:**

- PIN 1. GATE
- DRAIN
- SOURCE
- DRAIN

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT:**

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: orderlit@onsemi.com

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5773-3850

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative