

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}	± 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	$^\circ\text{C}$	

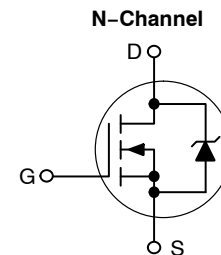
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



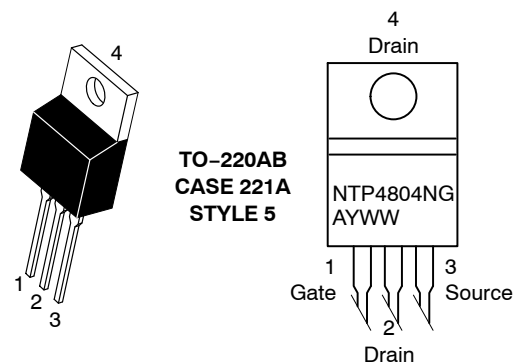
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	4.0 m Ω @ 10 V	133 A
	5.5 m Ω @ 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
OFF CHARACTERISTICS						
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	μA
			$T_J = 150^\circ\text{C}$		100	
	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 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	mΩ
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	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	
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.77	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

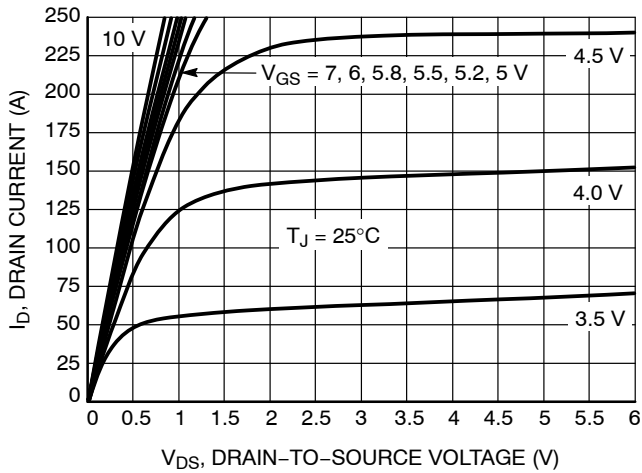


Figure 1. On-Region Characteristics

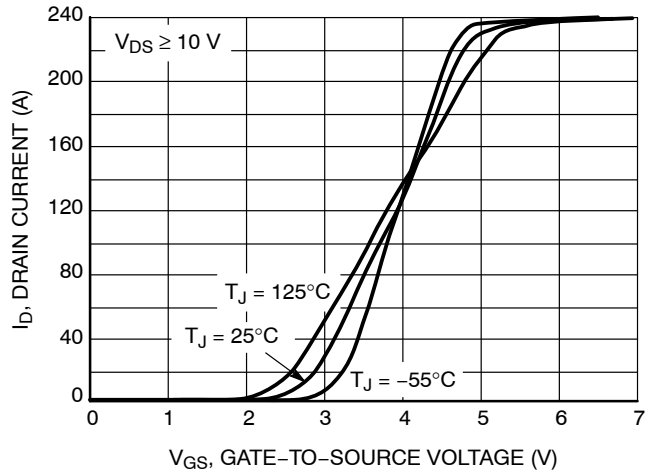


Figure 2. Transfer Characteristics

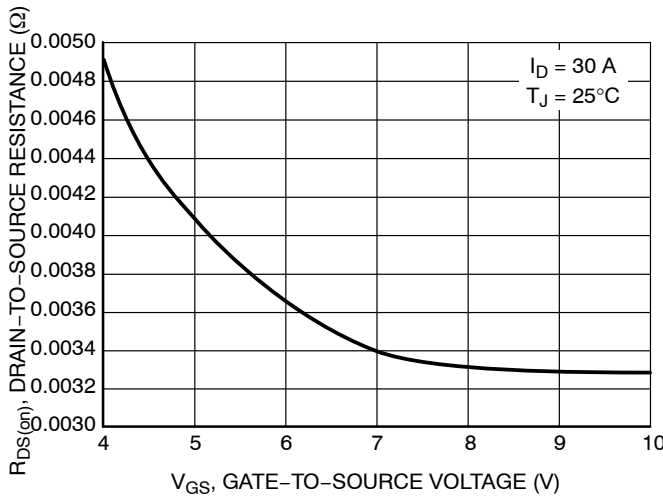


Figure 3. On-Resistance vs. Drain Current

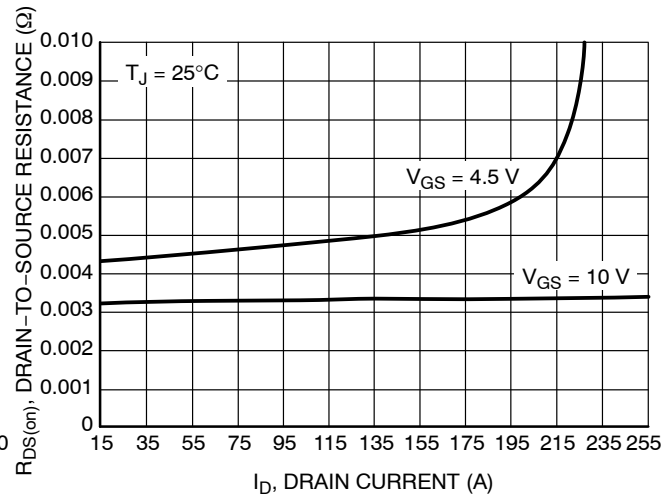


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

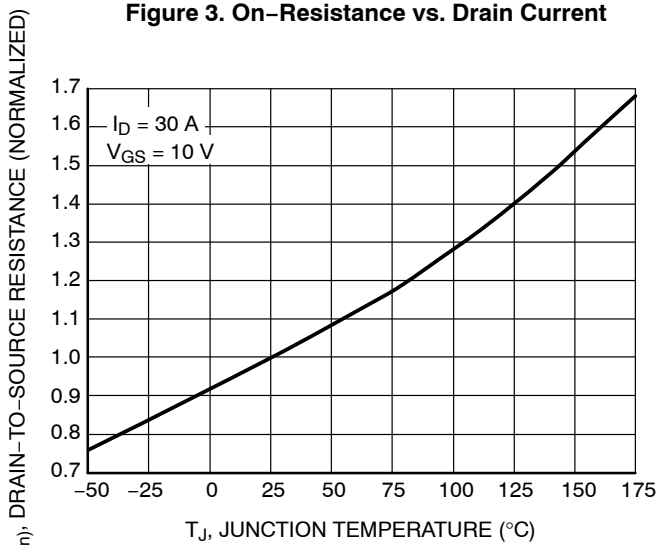


Figure 5. On-Resistance Variation with Temperature

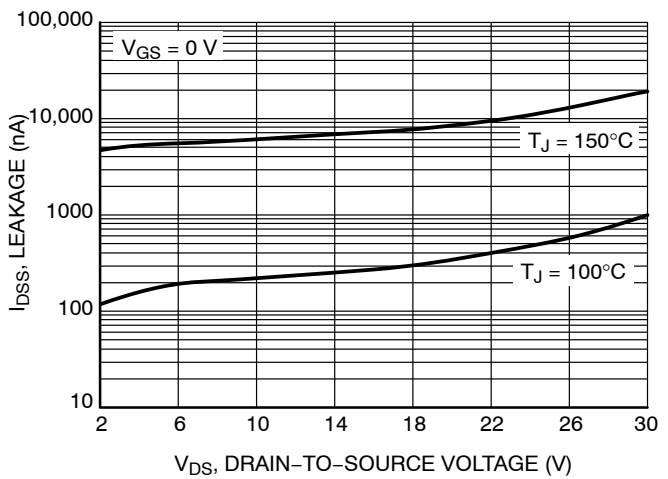


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

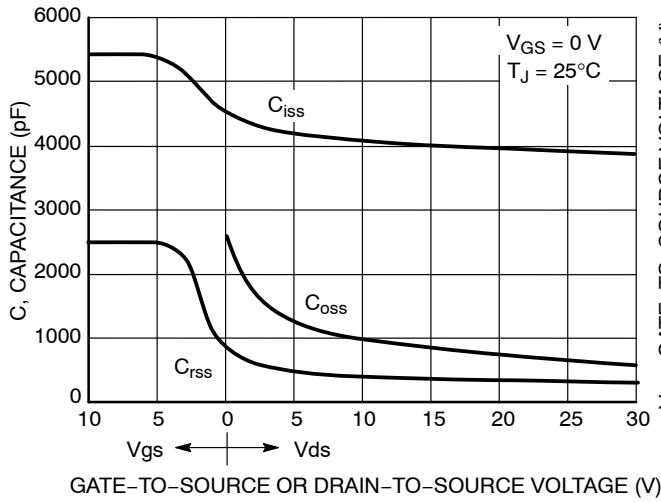


Figure 7. Capacitance Variation

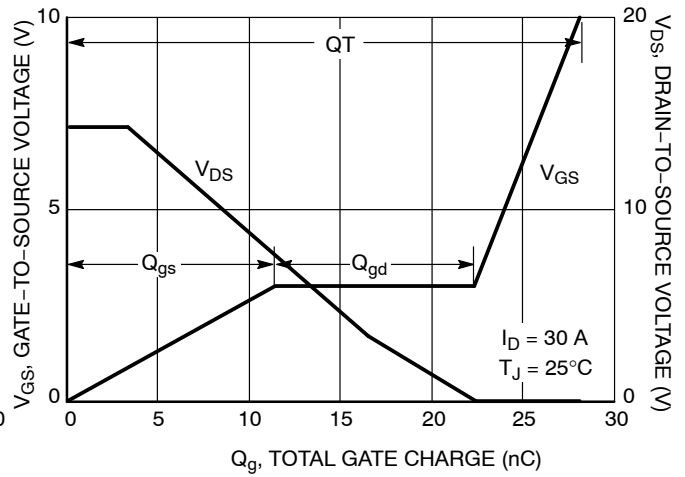


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

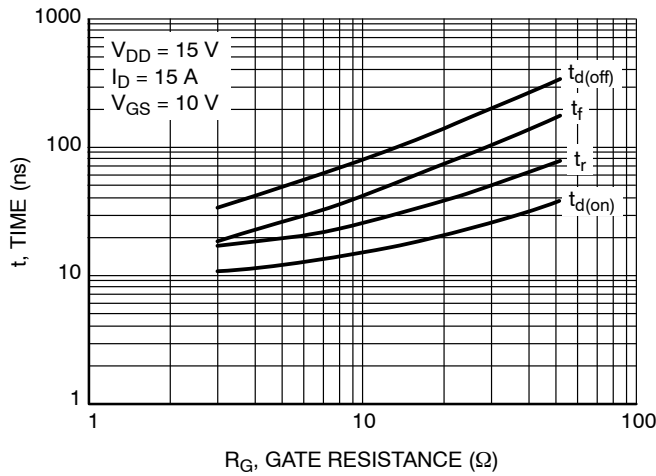


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

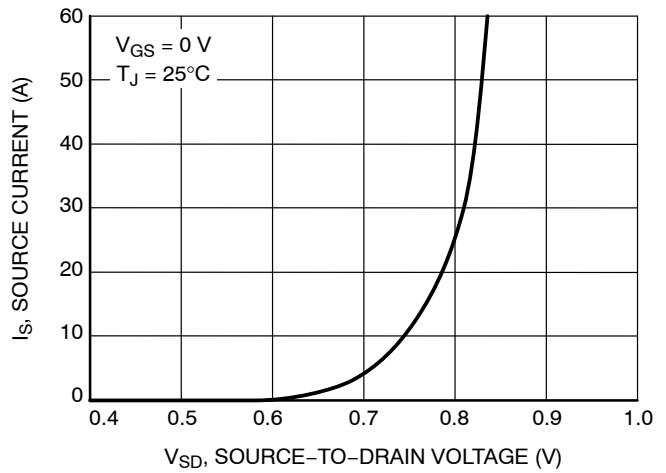
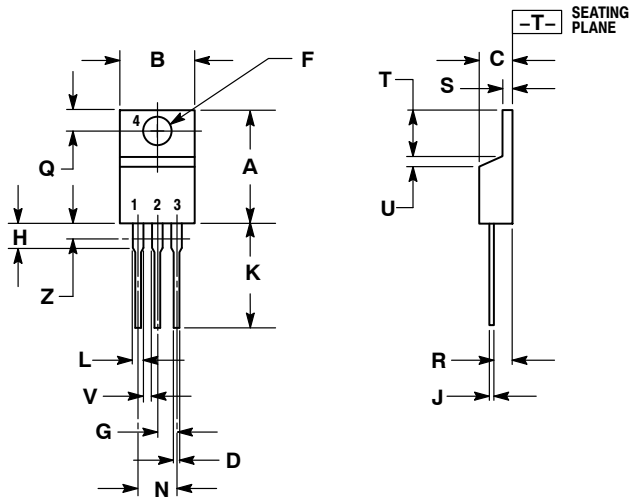


Figure 10. Diode Forward Voltage vs. Current

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

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