



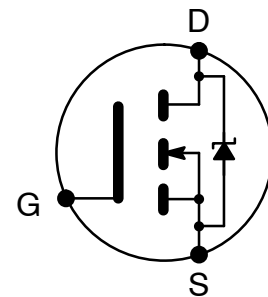
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**NTE2396A**  
**MOSFET**  
**N-Ch, Enhancement Mode**  
**High Speed Switch**  
**TO-220 Type Package**

**Features:**

- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- +175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated



**Absolute Maximum Ratings:**

Continuous Drain Current ( $V_{GS} = 10V$ ), $I_D$	
$T_C = +25^\circ C$ .....	33A
$T_C = +100^\circ C$ .....	23A
Pulsed Drain Current (Note 1), $I_{DM}$ .....	110A
Power Dissipation ( $T_C = +25^\circ C$ ), $P_D$ .....	130W
Derate Linearly Above 25°C .....	0.87W/°C
Gate-to-Source Voltage, $V_{GS}$ .....	$\pm 20V$
Single Pulse Avalanche Energy (Note 2), $E_{AS}$ .....	100mJ
Avalanche Current (Note 1), $I_{AR}$ .....	16A
Repetitive Avalanche Energy (Note 1), $E_{AR}$ .....	13mJ
Peak Diode Recovery dv/dt (Note 3), dv/dt .....	7V/ns
Operating Junction Temperature Range, $T_J$ .....	-55° to +175°C
Storage Temperature Range, $T_{stg}$ .....	-55° to +175°C
Lead Temperature (During Soldering, 1.6mm from case for 10sec), $T_L$ .....	+300°C
Mounting Torque (6-32 or M3 Screw) .....	10 lbf•in (1.1N•m)
Thermal Resistance, Junction-to-Case, $R_{thJC}$ .....	1.15°C/W
Thermal Resistance, Junction-to-Ambient, $R_{thJA}$ .....	62°C/W
Typical Thermal Resistance, Case-to-Sink (Flat, Greased Surface), $R_{thCS}$ .....	0.5°C/W

Note 1. Repetitive rating; pulse width limited by maximum junction temperature.

Note 2. Starting  $T_J = +25^\circ C$ ,  $L = 1.5mH$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 16A$

Note 3.  $I_{SD} \leq 16A$ ,  $di/dt \leq 340A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq +175^\circ C$

**Electrical Characteristics:** ( $T_J = +25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	100	-	-	V
Breakdown Voltage Temp. Coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T}$	Reference to $+25^\circ\text{C}$ , $I_D = 1\text{mA}$	-	0.12	-	V/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 16A$ , Note 4	-	-	0.044	$\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	-	4.0	V
Forward Transconductance	$g_{fs}$	$V_{DS} = 50V, I_D = 16A$ , Note 4	5.8	-	-	mhos
Drain-to-Source Leakage Current	$I_{DSS}$	$V_{DS} = 100V, V_{GS} = 0V$	-	-	25	$\mu A$
		$V_{DS} = 80V, V_{GS} = 0V, T_J = +150^\circ\text{C}$	-	-	250	$\mu A$
Gate-to-Source Forward Leakage	$I_{GSS}$	$V_{GS} = 20V$	-	-	100	nA
Gate-to-Source Reverse Leakage	$I_{GSS}$	$V_{GS} = -20V$	-	-	-100	nA
Total Gate Charge	$Q_g$	$I_D = 16A, V_{DS} = 80V, V_{GS} = 10V$	-	-	71	nC
Gate-to-Source Charge	$Q_{gs}$		-	-	14	nC
Gate-to-Drain ("Miller") Charge	$Q_{gd}$		-	-	21	nC
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50V, I_D = 16A, R_G = 5.1\Omega, V_{GS} = 10V$	-	11	-	ns
Rise Time	$t_r$		-	35	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	39	-	ns
Fall Time	$t_f$		-	35	-	ns
Internal Drain Inductance	$L_D$	Between lead, .250in. (6.0) mm from package and center of die contact	-	4.5	-	nH
Internal Source Inductance	$L_S$		-	7.5	-	nH
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{MHz}$	-	1960	-	pF
Output Capacitance	$C_{oss}$		-	250	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	40	-	pF
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	$I_{AS} = 16A, L = 1.5\text{mH}$	-	700 (Note 5)	185 (Note 6)	mJ

Note 2. Starting  $T_J = +25^\circ\text{C}$ ,  $L = 1.5\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 16A$

Note 4. Pulse width  $\leq 400 \mu\text{s}$ ; duty cycle  $\leq 2\%$ .

Note 5. This is a typical value at device destruction and represents operation outside rated limits.

Note 6. This is a calculated value limited to  $T_J = +175^\circ\text{C}$ .

**Source-Drain Ratings and Characteristics:**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Continuous Source Current (Body Diode)	$I_S$		-	-	33	A
Pulsed Source Current (Body Diode)	$I_{SM}$	Note 1	-	-	110	A
Diode Forward Voltage	$V_{SD}$	$T_J = +25^\circ\text{C}, I_S = 16A, V_{GS} = 0V$ , Note 4	-	-	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = +25^\circ\text{C}, I_F = 16A$ , $di/dt = 100A/\mu\text{s}$ , Note 4	-	115	170	ns
Reverse Recovery Charge	$Q_{rr}$		-	505	760	nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ )				

Note 1. Repetitive rating; pulse width limited by maximum junction temperature.

Note 4. Pulse width  $\leq 400 \mu\text{s}$ ; duty cycle  $\leq 2\%$ .

