

**NTE2946**  
**MOSFET**  
**N-Channel, Enhancement Mode**  
**High Speed Switch**

**Features:**

- Low Static Drain-Source ON Resistance
- Improved Inductive Ruggedness
- Fast Switching Times
- Low Input Capacitance
- Extended Safe Operating Area
- Improved High Temperature Reliability
- TO220 Type Isolated Package

**Absolute Maximum Ratings:**

Drain-Source Voltage (Note 1), $V_{DSS}$ .....	500V
Drain-Gate Voltage ( $R_{GS} = 1M\Omega$ , Note 1), $V_{DGR}$ .....	500V
Gate-Source Voltage, $V_{GS}$ .....	$\pm 20V$
Drain Current, $I_D$	
Continuous	
$T_C = +25^\circ C$ .....	4.6A
$T_C = +100^\circ C$ .....	3.2A
Pulsed (Note 2) .....	32A
Gate Current (Pulsed), $I_{GM}$ .....	$\pm 1.5A$
Single Pulsed Avalanche Energy (Note 3), $E_{AS}$ .....	161mJ
Avalanche Current, $I_{AS}$ .....	4.6A
Total Power Dissipation ( $T_C = +25^\circ C$ ), $P_D$ .....	40W
Derate Above $25^\circ C$ .....	0.32W/ $^\circ C$
Operating Junction Temperature Range, $T_J$ .....	$-55^\circ$ to $+150^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-55^\circ$ to $+150^\circ C$
Maximum Lead Temperature (During Soldering, 1/8" from case, 5sec), $T_L$ .....	$+300^\circ C$
Thermal Resistance:	
Maximum Junction-to-Case, $R_{thJC}$ .....	3.12K/W
Typical Case-to-Sink (Mounting surface flat, smooth, and greased), $R_{thCS}$ .....	0.5K/W
Maximum Junction-to-Ambient (Free Air Operation), $R_{thJA}$ .....	62.5K/W

Note 1.  $T_J = +25^\circ$  to  $+150^\circ C$ .

Note 2. Repetitive Rating: Pulse width limited by maximum junction temperature.

Note 3.  $L = 14mH$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = +25^\circ C$ .

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain–Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500	–	–	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	–	4.0	V
Gate–Source Leakage Forward	$I_{GSS}$	$V_{GS} = 20V$	–	–	100	nA
Gate–Source Leakage Reverse	$I_{GSS}$	$V_{GS} = -20V$	–	–	-100	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = \text{Max. Rating}, V_{GS} = 0$	–	–	250	$\mu A$
		$V_{DS} = 0.8 \text{ Max. Rating}, T_C = +125^\circ\text{C}$	–	–	1000	$\mu A$
Static Drain–Source ON Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 4A, \text{Note 4}$	–	–	0.85	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} \geq 50V, I_D = 4A, \text{Note 4}$	4.0	6.5	–	mhos
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{MHz}$	–	1510	–	pF
Output Capacitance	$C_{oss}$		–	154	–	pF
Reverse Transfer Capacitance	$C_{rss}$		–	66	–	pF
Turn–On Delay Time	$t_{d(on)}$	$V_{DD} = 0.5 BV_{DSS}, I_D = 8A, Z_O = 9.1\Omega,$ (MOSFET switching times are essentially independent of operating temperature)	–	14	21	ns
Rise Time	$t_r$		–	23	35	ns
Turn–Off Delay Time	$t_{d(off)}$		–	49	74	ns
Fall Time	$t_f$		–	20	30	ns
Total Gate Charge (Gate–Source Plus Gate–Drain)	$Q_g$	$V_{GS} = 10V, I_D = 8A, V_{DS} = 0.8 \text{ Max. Rating},$ (Gate charge is essentially independent of operating temperature)	–	–	74	nC
Gate–Source Charge	$Q_{gs}$		–	9	–	nC
Gate–Drain (“Miller”) Charge	$Q_{gd}$		–	27	–	nC
<b>Source–Drain Diode Ratings and Characteristics</b>						
Continuous Source Current	$I_S$	(Body Diode)	–	–	8	A
Pulse Source Current	$I_{SM}$	(Body Diode) Note 2	–	–	32	A
Diode Forward Voltage	$V_{SD}$	$T_J = +25^\circ\text{C}, I_S = 8A, V_{GS} = 0V, \text{Note 4}$	–	–	2	V
Reverse Recovery Time	$t_{rr}$	$T_J = +25^\circ\text{C}, I_F = 8A, dI_F/dt = 100A/\mu s$	–	460	970	ns

Note 2. Repetitive Rating: Pulse width limited by maximum junction temperature.

Note 4. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

