



## NTE2388 MOSFET N-Channel Enhancement Mode, High Speed Switch

### **Description:**

The NTE2388 is an N-Channel Enhancement Mode Power MOS Field Effect Transistor in a TO220 type package designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid, and relay drivers.

### **Features:**

- Silicon Gate for Fast Switching Speeds
- Low  $r_{DS(on)}$  to Minimize On-Losses. Specified at Elevated Temperatures.
- Rugged – SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads

### **Absolute Maximum Ratings:**

Drain-Source Voltage, $V_{DSS}$ .....	200V
Drain-Gate Voltage ( $R_{GS} = 20k\Omega$ ), $V_{DGR}$ .....	200V
Gate-Source Voltage, $V_{GS}$ .....	$\pm 20V$
Drain Current, $I_D$	
Continuous	
$T_C = +25^\circ C$ .....	18A
$T_C = +100^\circ C$ .....	11A
Peak	
$T_C = +25^\circ C$ .....	72A
Total Power Dissipation ( $T_C = +25^\circ C$ ), $P_D$ .....	125W
Derate Above $25^\circ C$ .....	1W/ $^\circ C$
Maximum Operating Junction Temperature Range, $T_J$ .....	$-55^\circ$ to $+150^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-55^\circ$ to $+150^\circ C$
Maximum Thermal Resistance, Junction-to-Case, $R_{thJC}$ .....	1 $^\circ C/W$
Maximum Thermal Resistance, Junction-to-Ambient, $R_{thJA}$ .....	62.5 $^\circ C/W$
Maximum Lead Temperature (During soldering, 1/8" from case for 5sec), $T_L$ .....	$+300^\circ C$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain–Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\mu\text{A}$ , $V_{GS} = 0$	200	–	–	V
Zero–Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ , $V_{DS} = \text{Max Rating}$	–	–	200	$\mu\text{A}$
		$V_{GS} = 0$ , $V_{DS} = 160\text{V}$ , $T_C = +125^\circ\text{C}$	–	–	1000	$\mu\text{A}$
Gate–Body Leakage Current, Forward	$I_{GSSF}$	$V_{DS} = 0$ , $V_{GSF} = 20\text{V}$	–	–	100	nA
Gate–Body Leakage Current, Reverse	$I_{GSSR}$	$V_{DS} = 0$ , $V_{GSR} = 20\text{V}$	–	–	100	nA
<b>ON Characteristics (Note 1)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	2	–	4	V
Static Drain–Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}$ , $I_D = 10\text{A}$	–	–	0.18	$\Omega$
On–State Drain Current	$I_{D(on)}$	$V_{GS} = 10\text{V}$ , $V_{DS} \geq 3.2\text{V}$	18	–	–	A
Forward Transconductance	$g_{fs}$	$V_{DS} \geq 3.2\text{V}$ , $I_D = 10\text{A}$	6	–	–	mhos
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0$ , $f = 1\text{MHz}$	–	–	1600	pf
Output Capacitance	$C_{oss}$		–	–	750	pf
Reverse Transfer Capacitance	$C_{rss}$		–	–	300	pf
<b>Switching Characteristics (Note 1)</b>						
Turn–On Time	$t_{d(on)}$	$V_{DD} \square 75\text{V}$ , $I_D = 10\text{A}_{PEAK}$ , $R_g = 4.7\Omega$	–	–	30	ns
Rise Time	$t_r$		–	–	60	ns
Turn–Off Delay Time	$t_{d(off)}$		–	–	80	ns
Fall Time	$t_f$		–	–	60	ns
Total Gate Charge	$Q_g$	$V_{DS} = 160\text{V}$ , $V_{GS} = 10\text{V}$ , $I_D = \text{Rated } I_D$	–	38	60	nC
Gate–Source Charge	$Q_{gs}$		–	16	–	nC
Gate–Drain Charge	$Q_{gd}$		–	22	–	nC
<b>Source Drain Diode Characteristics (Note 1)</b>						
Forward ON Voltage	$V_{SD}$	$I_S = \text{Rated } I_D$ , $V_{GS} = 0$	–	1.8	2.0	V
Forward Turn–On Time	$t_{on}$		Limited by stray inductance			
Reverse Recovery Time	$t_{rr}$		–	450	–	ns
<b>Internal Package Inductance</b>						
Internal Drain Inductance	$L_d$	Measured from the contact screw on tab to center of die	–	3.5	–	nH
		Measured from the drain lead 0.25" from package to center of die	–	4.5	–	nH
Internal Source Inductance	$L_s$	Measured from the source lead 0.25" from package to source bond pad	–	7.5	–	nH

Note 1. Pulse test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

