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## NTE2970 MOSFET N-Channel, Enhancement Mode High Speed Switch TO3P Type Package

**Features:**

- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- Lower Leakage Current
- Lower  $R_{DS(ON)}$

**Applications:**

- SMPS
- DC-DC Converter
- Battery Charger
- Power Supply of Printer
- Copier
- HDD, FDD, TV, VCR
- Personal Computer

**Absolute Maximum Ratings:**

Drain-Source Voltage, $V_{DSS}$ .....	500V
Drain Current, Continuous, $I_D$	
$T_C = +25^\circ C$ .....	22A
$T_C = +100^\circ C$ .....	13.4A
Drain Current, Pulsed (Note 1), $I_{DM}$ .....	88A
Gate-Source Voltage, $V_{GS}$ .....	$\pm 30V$
Single Pulsed Avalanche Energy (Note 2), $E_{AS}$ .....	2151mJ
Avalanche Current (Note 1), $I_{AR}$ .....	22A
Repetitive Avalanche Energy (Note 1), $E_{AR}$ .....	27.8mJ
Peak Diode Recovery $dv/dt$ (Note 3), $dv/dt$ .....	3.5V/ns
Total Power Dissipation ( $T_C = +25^\circ C$ ), $P_D$ .....	278W
Linear Derating Factor .....	2.22W/ $^\circ C$
Operating Junction Temperature Range, $T_J$ .....	$-55^\circ$ to $+150^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-55^\circ$ to $+150^\circ C$
Lead Temperature (During Soldering, 1/8" from case, 5 sec.), $T_L$ .....	$+300^\circ C$
Maximum Thermal Resistance, Junction-to-Case, $R_{thJC}$ .....	0.45 $^\circ C/W$
Typical Thermal Resistance, Case-to-Sink, $R_{thCS}$ .....	0.24 $^\circ C/W$
Maximum Thermal Resistance, Junction-to-Ambient, $R_{thJA}$ .....	40 $^\circ C/W$

Note 1. Repetitive Rating: Pulse Width limited by Maximum Junction Temperature.

Note 2.  $L = 8mH$ ,  $I_{AS} = 22A$ ,  $V_{DD} = 50V$ ,  $R_G = 27\leq$ , Starting  $T_J = +25^\circ C$ .

Note 3.  $I_{SD} \leq 22A$ ,  $di/dt \leq 300A/^\circ s$ ,  $V_{DD} \leq V_{(BR)DSS}$ , 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	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250^\circ A$	500	–	–	V
Breakdown Voltage Temperature Coefficient	$\pm BV/\pm T_J$	$I_D = 250^\circ A$	–	0.69	–	V/ $^\circ\text{C}$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = 5V, I_D = 250^\circ A$	2.0	–	4.0	V
Gate–Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30V$	–	–	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500V$	–	–	10	$^\circ A$
		$V_{DS} = 400V, T_C = +125^\circ\text{C}$	–	–	100	$^\circ A$
Static Drain–Source ON Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 11A, \text{Note 4}$	–	–	0.25	$\leq$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50V, I_D = 11A, \text{Note 4}$	–	17.31	–	mhos
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{MHz}$	–	3940	5120	pF
Output Capacitance	$C_{oss}$		–	465	535	pF
Reverse Transfer Capacitance	$C_{rss}$		–	215	250	pF
Turn–On Delay Time	$t_{d(on)}$		$V_{DD} = 200V, I_D = 22A, V_{GS} = 10V, R_G = 5.3\leq, \text{Note 4, Note 5}$	–	27	65
Rise Time	$t_r$	–		30	70	ns
Turn–Off Delay Time	$t_{d(off)}$	–		150	310	ns
Fall Time	$t_f$	–		43	95	ns
Total Gate Charge	$Q_g$	$V_{DS} = 400V, V_{GS} = 10V, I_D = 22A, \text{Note 4, Note 5}$	–	182	236	nC
Gate–Source Charge	$Q_{gs}$		–	26	–	nC
Gate–Drain (Miller) Charge	$Q_{gd}$		–	79.6	–	nC
<b>Source–Drain Diode Ratings and Characteristics</b>						
Continuous Source Current	$I_S$	Integral Reverse PN–Diode in the MOSFET	–	–	22	A
Pulsed Source Current (Note 1)	$I_{SM}$		–	–	88	A
Diode Forward Voltage	$V_{SD}$	$T_J = +25^\circ\text{C}, I_S = 22A, V_{GS} = 0V$	–	–	1.4	V
Reverse Recovery Time	$t_{rr}$	$T_J = +25^\circ\text{C}, I_F = 22A, di_F/dt = 100A/^\circ\text{s}, \text{Note 4}$	–	528	–	ns
Reverse Recovery Charge	$Q_{rr}$		–	8.35	–	$^\circ\text{C}$

Note 1. Repetitive Rating: Pulse Width limited by Maximum Junction Temperature.

Note 4. Pulse Test: Pulse Width = 250 $^\circ$  s, Duty Cycle  $\leq$  2%.

Note 5. Essentially Independent of Operating Temperature.



