

## NTE2386 MOSFET N-Channel Enhancement Mode, High Speed Switch

### **Description:**

The NTE2386 Power MOSFET features advantages such as voltage control, very fast switching, ease of paralleling and temperature stability, and is suited for applications such as switching power supplies, motor controls, inverters, choppers, audio amplifiers, and high energy pulse circuits.

### **Features:**

- Repetitive Avalanche Ratings
- Dynamic  $dv/dt$  Rating
- Simple Drive Requirements
- Ease of Paralleling

### **Absolute Maximum Ratings:**

Continuous Drain Current, $I_D$	
( $T_C = +25^\circ\text{C}$ )	6.2A
( $T_C = +100^\circ\text{C}$ )	2.8A
Pulsed Drain Current (Note 1), $I_{DM}$	25A
Maximum Power Dissipation ( $T_C = +25^\circ\text{C}$ ), $P_D$	125W
(Derate linearly above $+25^\circ\text{C}$ )	1.0W/ $^\circ\text{C}$
Gate-to-Source Voltage, $V_{GS}$	$\pm 20\text{V}$
Single Pulse Avalanche Energy (Note 2), $E_{AS}$	670mJ
Avalanche Current (Repetitive or Non-Repetitive, Note 1), $I_{AR}$	6.2A
Repetitive Avalanche Energy (Note 1), $E_{AR}$	13mJ
Peak Diode Recovery (Note 3), $dv/dt$	3.0V/mS
Operating Junction Temperature Range, $T_J$	$-55^\circ$ to $+150^\circ\text{C}$
Storage Temperature Range, $T_{stg}$	$-55^\circ$ to $+150^\circ\text{C}$
Lead Temperature (During Soldering, 0.063 in. (1.6mm) from case for 10s), $T_L$	$+300^\circ\text{C}$

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Breakdown Voltage Drain-to-Source	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	600	–	–	V
Static Drain-to-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 3.4A$ , Note 4	–	0.97	1.2	$\Omega$
On-State Drain Current	$I_{D(on)}$	$V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$ , Note 4	6.2	–	–	A
Gate Threshold Voltage	$V_{GS(HL)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	–	4.0	V
Forward Transconductance	$g_s$	$V_{DS} = 60V, I_{DC} = 3.4A$ , Note 4	4.7	70	–	mhos
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = \text{Max. Rating } V_{CS} = 0V$	–	–	250	$\mu A$
		$V_{DS} = 0.8 \times \text{Max Rating}, V_{SS} = 0V$ , $T_J = 125^{\circ}\text{C}$	–	–	1000	
Forward Leakage Current Gate-to-Source	$I_{GSS}$	$V_{GS} = 20V$	–	–	100	nA
Reverse Leakage Current Gate-to-Source	$I_{GSS}$	$V_{GS} = -20V$	–	–	-100	nA
Total Gate Charge	$Q_g$	$V_{GS} = 10V, I_D = 6.2A$ , $V_{DS} = 0.8 \times \text{Max Rating}$ (independent of operating temperature)	–	4.0	80	nC
Gate-to-Source Charge	$Q_{gs}$		–	6.5	8.2	nC
Gate-to-Drain (“Miller”) Charge	$Q_{gd}$		–	20	30	nC
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 300V, f_D = 6.2A$ , $R_G = 9.1\Omega, R_D = 47\Omega$ (independent at operating temperature)	–	1.3	20	ns
Rise Time	$t_r$		–	18	27	
Turn-Off Delay Time	$t_{d(off)}$		–	65	83	
Fall Time	$t_f$		–	20	20	
Internal Drain Inductance	$L_D$	Measured from the drain lead, 6mm (0.25 in) from packaged to center of die.	–	5.0	–	nH
Internal Source Inductance	$L_S$	Measured from the source lead, 6mm (0.25 in) from package to source bonding pad.	–	18	–	
Input Capacitance	$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1.0\text{MHz}$	–	1300	–	pF
Output Capacitance	$C_{oss}$		–	150	–	
Reverse Transfer Capacitance	$C_{rss}$		–	30	–	

**Source-Drain Diode Ratings and Characteristics:**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Continuous Source Current (Body Diode)	$I_S$		–	–	6.2	A
Pulsed Source Current (Body Diode)	$I_{SM}$	Note 1	–	–	26	A
Diode Forward Voltage	$V_{SO}$	$T_J = 25^{\circ}\text{C}, I_S = 6.2A, V_{GS} = 0V$ , Note 4	–	–	1.5	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25^{\circ}\text{C}, I_F = 6.2A$ $di/dt = 100A/\mu s$	1.8	3.6	7.9	$\mu C$
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible Turn on speed is substantially controlled by $L_S + L_D$				

### Thermal Resistance:

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Junction-to-Case	$R_{thJC}$		–	–	1.0	°C/W
Case-to-Sink	$R_{thCS}$	Mounting surface flat, smooth, and greased	–	0.12	–	°C/W
Junction-to-Ambient	$R_{thJA}$	Typical socket mount	–	–	30	°C/W

Note 1. Repetitive Rating: Pulse Width limited by maximum junction temperature.

Note 2.  $V_{DD} = 60V$ , Starting  $T_J = 25^{\circ}C$ ,  $L = 27mH$ ,  $R_G = 25\Omega$ , Peak  $I_C = 6.2A$

Note 3.  $I_{SD} \leq 6.2A$ ,  $di/dt = 80A/\mu s$   $V_{DD} \leq 3V_{DSS}$ ,  $T_J \leq 150^{\circ}C$ , Suggested  $R_G = 9.1\Omega$

Note 4. Pulse width  $\leq 300\mu s$ : Duty Cycle  $\leq 2\%$ .

