



## NTE2396 MOSFET N–Ch, Enhancement Mode High Speed Switch

### **Features:**

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Current Sense
- +175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements

### **Absolute Maximum Ratings:**

Continuous Drain Current ( $V_{GS} = 10V$ ),  $I_D$

|                            |     |
|----------------------------|-----|
| $T_C = +25^\circ C$ .....  | 28A |
| $T_C = +100^\circ C$ ..... | 20A |

Pulsed Drain Current (Note 1),  $I_{DM}$  ..... 110A

Power Dissipation ( $T_C = +25^\circ C$ ),  $P_D$  ..... 150W  
Derate Linearly Above 25°C ..... 1.0W/°C

Gate-to-Source Voltage,  $V_{GS}$  .....  $\pm 20V$

Single Pulse Avalanche Energy (Note 2),  $E_{AS}$  ..... 100mJ

Avalanche Current (Note 1),  $I_{AR}$  ..... 28A

Repetitive Avalanche Energy (Note 1),  $E_{AR}$  ..... 15mJ

Peak Diode Recovery dv/dt (Note 3), dv/dt ..... 5.5V/ns

Operating Junction Temperature Range,  $T_J$  .....  $-55^\circ$  to  $+175^\circ C$

Storage Temperature Range,  $T_{stg}$  .....  $-55^\circ$  to  $+175^\circ C$

Lead Temperature (During Soldering, 1.6mm from case for 10sec),  $T_L$  .....  $+300^\circ C$

Mounting Torque (6–32 or M3 Screw) ..... 10 lbf•in (1.1N•m)

Thermal Resistance, Junction-to-Case,  $R_{thJC}$  .....  $1.0^\circ C/W$

Thermal Resistance, Junction-to-Ambient,  $R_{thJA}$  .....  $62^\circ C/W$

Typical Thermal Resistance, Case-to-Sink (Flat, Greased Surface),  $R_{thCS}$  .....  $0.5^\circ C/W$

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

Note 2.  $V_{DD} = 25V$ , starting  $T_J = +25^\circ C$ ,  $L = 191\mu H$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 28A$

Note 3.  $I_{SD} \leq 28A$ ,  $di/dt \leq 170A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq +175^\circ C$

**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  | $\frac{\Delta V_{(BR)DSS}}{\Delta T_J}$ | Reference to $+25^\circ\text{C}$ , $I_D = 1mA$                             | —   | 0.13 | —     | V/ $^\circ\text{C}$ |
| Static Drain-to-Source On-Resistance | $R_{DS(on)}$                            | $V_{GS} = 10V, I_D = 17A$ , Note 4                                         | —   | —    | 0.077 | $\Omega$            |
| Gate Threshold Voltage               | $V_{GS(th)}$                            | $V_{DS} = V_{GS}, I_D = 250\mu A$                                          | 2.0 | —    | 4.0   | V                   |
| Forward Transconductance             | $g_{fs}$                                | $V_{DS} = 50V, I_D = 17A$ , 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                    | $Q_g$                                   | $I_D = 29A, V_{DS} = 80V, V_{GS} = 10V$ ,<br>Note 4                        | —   | —    | 69    | nC                  |
| Gate-to-Source Charge                | $Q_{gs}$                                |                                                                            | —   | —    | 13    | nC                  |
| Gate-to-Drain ("Miller") Charge      | $Q_{gd}$                                |                                                                            | —   | —    | 37    | nC                  |
| Turn-On Delay Time                   | $t_{d(on)}$                             | $V_{DD} = 50V, I_D = 29A, R_G = 9.1\Omega$ ,<br>$R_D = 1.7\Omega$ , Note 4 | —   | 13   | —     | ns                  |
| Rise Time                            | $t_r$                                   |                                                                            | —   | 77   | —     | ns                  |
| Turn-Off Delay Time                  | $t_{d(off)}$                            |                                                                            | —   | 40   | —     | ns                  |
| Fall Time                            | $t_f$                                   |                                                                            | —   | 48   | —     | ns                  |
| Internal Drain Inductance            | $L_D$                                   | Between lead, .250in. (6.0) mm from<br>package and center of die contact   | —   | 4.5  | —     | nH                  |
| Internal Source Inductance           | $L_S$                                   |                                                                            | —   | 7.5  | —     | nH                  |
| Input Capacitance                    | $C_{iss}$                               | $V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$                                      | —   | 1300 | —     | pF                  |
| Output Capacitance                   | $C_{oss}$                               |                                                                            | —   | 630  | —     | pF                  |
| Reverse Transfer Capacitance         | $C_{rss}$                               |                                                                            | —   | 130  | —     | pF                  |

**Source-Drain Ratings and Characteristics:**

| Parameter                              | Symbol   | Test Conditions                                                             | Min | Typ  | Max | Unit    |
|----------------------------------------|----------|-----------------------------------------------------------------------------|-----|------|-----|---------|
| Continuous Source Current (Body Diode) | $I_S$    |                                                                             | —   | —    | 28  | A       |
| Pulsed Source Current (Body Diode)     | $I_{SM}$ | Note 1                                                                      | —   | —    | 110 | A       |
| Diode Forward Voltage                  | $V_{SD}$ | $T_J = +25^\circ\text{C}, I_S = 28A, V_{GS} = 0V$ ,<br>Note 4               | —   | —    | 2.5 | V       |
| Reverse Recovery Time                  | $t_{rr}$ | $T_J = +25^\circ\text{C}, I_F = 29A$ ,<br>$di/dt = 100A/\mu s$ , Note 4     | —   | 120  | 260 | ns      |
| Reverse Recovery Charge                | $Q_{rr}$ |                                                                             | —   | 0.52 | 1.2 | $\mu C$ |
| 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  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

