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NTE2380 (N-Ch) & NTE2381 (P-Ch) Complementary Silicon Gate MOSFETs Enhancement Mode, High Speed Switch

Description:

The NTE2380 (N-Ch) and NTE2381 (P-Ch) are complementary TMOS power FETs in a TO220 type package designed for high voltage, high speed power switching applications such as switching regulators, converters, solenoid, and relay drivers.

Features:

- Silicon Gate for Fast Switching Speeds
- Rugged – SOA is Power Dissipation Limited
- Source-to-Drain Diode Characterized for Use With Inductive Loads

Absolute Maximim Ratings:

| | |
|--|-------------------------------|
| Drain-Source Voltage, V_{DSS} | 500V |
| Drain-Gate Voltage ($R_{GS} = 1M\Omega$), V_{DGR} | 500V |
| Gate-Source Voltage, V_{GS} | $\pm 20V$ |
| Drain Current, I_D | |
| Continuous | |
| NTE2380 | 2.5A |
| NTE2381 | 2.0A |
| Pulsed | |
| NTE2380 | 10A |
| NTE2381 | 8A |
| Total Power Dissipation ($T_C = +25^\circ C$), P_D | |
| NTE2380 | 40W |
| Derate Above $25^\circ C$ | 0.32W/ $^\circ C$ |
| NTE2381 | 75W |
| Derate Above $25^\circ C$ | 0.6W/ $^\circ C$ |
| Operating Temperature Range, T_{opr} | |
| NTE2380 | -55° to $+150^\circ C$ |
| NTE2381 | -65° to $+150^\circ C$ |
| Storage Temperature Range, T_{stg} | |
| NTE2380 | -55° to $+150^\circ C$ |
| NTE2381 | -65° to $+150^\circ C$ |
| Thermal Resistance, Junction-to-Ambient, R_{thJA} | 62.5 $^\circ C/W$ |
| Thermal Resistance, Junction-to-Case, R_{thJC} | |
| NTE2380 | 3.12 $^\circ C/W$ |
| NTE2381 | 1.67 $^\circ C/W$ |
| Maximum Lead Temperature (During Soldering, 1/8" from case, 5sec), T_L | |
| NTE2380 | +300 $^\circ C$ |
| NTE2381 | +275 $^\circ C$ |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---|---------------|--|------------------------------|-----|------|----------|------|
| OFF Characteristics | | | | | | | |
| Drain–Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0, I_D = 0.25\text{mA}$ | 500 | – | – | V | |
| Zero Gate Voltage Drain Current NTE2380 | I_{DSS} | $V_{DS} = 500\text{V}, V_{GS} = 0$ | – | – | 0.25 | mA | |
| NTE2381 | | | – | – | 0.2 | mA | |
| NTE2380 & NTE2381 | | $V_{DS} = 400\text{V}, V_{GS} = 0, T_J = +125^\circ\text{C}$ | – | – | 1.0 | mA | |
| Gate–Body Leakage Current, Forward NTE2380 | I_{GSSF} | $V_{GSF} = 20\text{V}, V_{DS} = 0$ | – | – | 500 | nA | |
| NTE2381 | | | – | – | 100 | nA | |
| Gate–Body Leakage Current, Reverse NTE2380 | I_{GSSR} | $V_{GSF} = 20\text{V}, V_{DS} = 0$ | – | – | 500 | nA | |
| NTE2381 | | | – | – | 100 | nA | |
| ON Characteristics (Note 1) | | | | | | | |
| Gate Threshold Voltage NTE2380 | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ | $I_D = 0.25\text{mA}$ | 2.0 | – | 4.0 | V |
| NTE2381 | | | $I_D = 1\text{mA}$ | 2.0 | – | 4.5 | V |
| Static Drain–Source On–Resistance NTE2380 | $r_{DS(on)}$ | $V_{GS} = 10\text{V}, I_D = 1\text{A}$ | – | – | 3 | Ω | |
| NTE2381 | | | – | – | 6 | Ω | |
| Forward Transconductance NTE2380 | g_{FS} | $I_D = 1\text{A}$ | $V_{DS} \geq 7.5\text{V}$ | 1 | – | – | mhos |
| NTE2381 | | | $V_{DS} = 15\text{V}$ | 0.5 | – | – | mhos |
| Dynamic Characteristics | | | | | | | |
| Input Capacitance NTE2380 | C_{iss} | $V_{DS} = 25\text{V}, V_{GS} = 0, f = 1\text{MHz}$ | – | – | 400 | pF | |
| NTE2381 | | | – | – | 100 | pF | |
| Output Capacitance NTE2380 | C_{oss} | | – | – | 150 | pF | |
| NTE2381 | | | – | – | 200 | pF | |
| Reverse Transfer Capacitance NTE2380 | C_{rss} | | – | – | 40 | pF | |
| NTE2381 | | | – | – | 80 | pF | |
| Switching Characteristics (Note 1) | | | | | | | |
| Turn–On Time NTE2380 | $t_{d(on)}$ | $I_D = 1\text{A}, R_{gen} = 50\Omega$ | $V_{DD} \square 200\text{V}$ | – | – | 60 | ns |
| NTE2381 | | | $V_{DS} = 125\text{V}$ | – | – | 50 | ns |
| Rise Time NTE2380 | t_r | | $V_{DD} \square 200\text{V}$ | – | – | 50 | ns |
| NTE2381 | | | $V_{DS} = 125\text{V}$ | – | – | 100 | ns |
| Turn–Off Time NTE2380 | $t_{d(off)}$ | | $V_{DD} \square 200\text{V}$ | – | – | 60 | ns |
| NTE2381 | | | $V_{DS} = 125\text{V}$ | – | – | 150 | ns |
| Fall Time NTE2380 | t_f | | $V_{DD} \square 200\text{V}$ | – | – | 30 | ns |
| NTE2381 | | | $V_{DS} = 125\text{V}$ | – | – | 50 | ns |

Note 1. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--|----------|---|-----------------------------|-----|-----|------|
| Switching Characteristics (Cont'd) (Note 1) | | | | | | |
| Total Gate Charge NTE2380 | Q_g | $V_{GS} = 10\text{V}, V_{DS} = 400\text{V},$ $I_D = \text{Rated } I_D$ | - | 12 | 15 | ns |
| NTE2381 | | | - | 20 | 25 | ns |
| Gate-Source Charge NTE2380 | Q_{gs} | | - | 6 | - | ns |
| NTE2381 | | | - | 10 | - | ns |
| Gate-Drain Charge NTE2380 | Q_{gd} | | - | 6 | - | ns |
| NTE2381 | | | - | 10 | - | ns |
| Source Drain Diode Characteristics (Note 1) | | | | | | |
| Forward On-Voltage NTE2380 | V_{SD} | $I_S = \text{Rated } I_D, V_{GS} = 0$ | - | - | 1.6 | V |
| NTE2381 | | | - | 1.8 | 2.5 | V |
| Forward Turn-On Time | t_{on} | | Limited by stray inductance | | | |
| Reverse Recovery Time NTE2380 | t_{rr} | | - | 500 | - | ns |
| NTE2381 | | | - | 120 | - | ns |
| Internal Package Inductance | | | | | | |
| Internal Drain Inductance | L_d | Measured from 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 center of pad | - | 7.5 | - | nH |

Note 1. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

