NTE ELECTRONICS, INC.

# NTE38 (PNP) & NTE175 (NPN)
# Silicon Complementary Transistors
# High Voltage, Medium Power Switch

**Description:**

The NTE38 (PNP) and NTE175 (NPN) complementary silicon transistors are designed for high–speed switching and linear amplifier applications for high–voltage operational amplifiers, switching regulators, converters, inverters, deflection stages, and high fidelity amplifiers.

**Features:**

- Collector–Emitter Sustaining Voltage:
  NTE38: $V_{CEO(sus)}$ = 350V @ $I_C$ = 200mA
  NTE175: $V_{CEO(sus)}$ = 300V @ $I_C$ = 200mA
- Second Breakdown Collector Current:
  NTE38 $I_{S/b}$ = 875mA @ $V_{CE}$ = 40V
  NTE175 $I_{S/b}$ = 350mA @ $V_{CE}$ = 100V
- Usable DC Current Gain to 2.0Adc

**Absolute Maximum Ratings:**

Collector–Emitter Voltage, $V_{CEO}$
- NTE38 . . . . . 350V
- NTE175 . . . . . 300V

Collector–Base Voltage, $V_{CB}$
- NTE38 . . . . . 400V
- NTE175 . . . . . 500V

Emitter–Base Voltage, $V_{EB}$ . . . . . 6Vdc

Collector Current, $I_C$
- Continuous . . . . . 2A
- Peak (Note 1) . . . . . 5A

Base Current, $I_B$ . . . . . 1A

Total Power Dissipation ($T_C$ = +25°C), $P_D$ . . . . . 35W
- Derate above 25°C . . . . . 0.2W/°C

Operating Junction Temperature Range, $T_J$ . . . . . –65° to +200°C

Storage Junction Temperature Range, $T_{stg}$ . . . . . –65° to +200°C

Thermal Resistance, Junction to Case, $R_{\Theta JC}$ . . . . . 5°C/W

Note 1. Pulse Test (NTE175 Only): Pulse Width = 5ms, Duty Cycle ≤ 10%.

**Electrical Characteristics:** ($T_C$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF Characteristics** (Note 2) | | | | | | |
| Collector–Emitter Sustaining Voltage<br>NTE38 | $V_{CEO(sus)}$ | $I_C$ = 200mA, $I_B$ = 0 | 350 | – | – | V |
| NTE175 | | | 300 | – | – | V |
| Collector–Emitter Sustaining Voltage<br>NTE38 Only | $V_{CEX(sus)}$ | $I_C$ = 200mA, $V_{BE}$ = –1.5V, L = 10mH | 400 | – | – | V |
| | $V_{CER(sus)}$ | $I_C$ = 200mA, $I_B$ = 0, $R_{BE}$ = 50Ω | 375 | – | – | V |
| Emitter–Base Breakdown Voltage<br>NTE38 Only | $V_{EBO}$ | $I_E$ = 0.5mA, $I_C$ = 0 | 6 | – | – | V |
| Collector Cutoff Current | $I_{CEO}$ | $V_{CE}$ = 150V, $I_B$ = 0 | – | – | 5 | mA |
| Collector Cutoff Current<br>NTE38 | $I_{CEV}$ | $V_{CE}$ = 250V, $V_{BE(off)}$ = 1.5V | – | – | 0.5 | mA |
| | | $V_{CE}$ = 250V, $V_{BE(off)}$ = 1.5V, $T_C$ = +100°C | – | – | 5.0 | mA |
| | | $V_{CE}$ = 315V, $V_{BE(off)}$ = 1.5V | – | – | 0.5 | mA |
| | | $V_{CE}$ = 315V, $V_{BE(off)}$ = 1.5V, $T_C$ = +100°C | – | – | 5.0 | mA |
| | | $V_{CE}$ = 360V, $V_{BE(off)}$ = 1.5V | – | – | 0.5 | mA |
| | | $V_{CE}$ = 360V, $V_{BE(off)}$ = 1.5V, $T_C$ = +100°C | – | – | 5.0 | mA |
| NTE175 | $I_{CEX}$ | $V_{CE}$ = 450V, $V_{BE(off)}$ = 1.5V | – | – | 1.0 | mA |
| | | $V_{CE}$ = 300V, $V_{BE(off)}$ = 1.5V, $T_C$ = +150°C | – | – | 3.0 | mA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$ = 6V, $I_C$ = 0 | – | – | 0.5 | mA |
| **ON Characteristics** (Note 2) | | | | | | |
| DC Current Gain<br>NTE38 | $h_{FE}$ | $I_C$ = 1A, $V_{CE}$ = 4V | 10 | – | 100 | |
| NTE175 | | $I_C$ = 0.1A, $V_{CE}$ = 10V | 40 | – | – | |
| | | $I_C$ = 1A, $V_{CE}$ = 2V | 8 | – | 80 | |
| | | $I_C$ = 1A, $V_{CE}$ = 10V | 25 | – | 100 | |
| Collector–Emitter Saturation Voltage<br>NTE38 | $V_{CE(sat)}$ | $I_C$ = 1A, $I_B$ = 125mA | – | – | 2.0 | V |
| NTE175 | | | – | – | 0.75 | V |
| Base–Emitter Saturation Voltage<br>NTE38 | $V_{BE(sat)}$ | $I_C$ = 1A, $I_B$ = 125mA | – | – | 1.4 | V |
| NTE175 | | $I_C$ = 1A, $I_B$ = 100mA | – | – | 1.4 | V |
| Base–Emitter ON Voltage<br>NTE175 Only | $V_{BE(on)}$ | $I_C$ = 1A, $V_{CE}$ = 10V | – | – | 1.4 | V |
| **Dynamic Characteristics** | | | | | | |
| Current Gain –Bandwidth Product<br>NTE38 | $f_T$ | $I_C$ = 200mA, $V_{CE}$ = 10V, $f_{test}$ = 5MHz, Note 3 | 20 | – | – | MHz |
| NTE175 | | | 15 | – | – | MHz |
| Output Capacitance (NTE175 Only) | $C_{ob}$ | $V_{CB}$ = 10V, $I_E$ = 0, f = 1MHz | – | – | 120 | pF |

Note 2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

Note 3. $f_T = |h_{fe}| \bullet f_{test}$

**Electrical Characteristics (Cont'd):** ($T_C$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Second Breakdown** | | | | | | |
| Second Breakdown Collector Current<br>NTE38 | $I_{S/b}$ | t = 1s (Non–Repetitive), $V_{CE}$ = 40V | 875 | – | – | mA |
| NTE175 | | $V_{CE}$ = 100V | 350 | – | – | mA |
| **Switching Characteristics** | | | | | | |
| NTE38<br>Rise Time | $t_r$ | $V_{CC}$ = 200V, $I_C$ = 1A<br>$I_{B1}$ = $I_{B2}$ = 125mA | – | – | 0.6 | µs |
| Storage Time | $t_s$ | | – | – | 2.5 | µs |
| Fall Time | $t_f$ | | – | – | 0.6 | µs |
| NTE175<br>Rise Time | $t_r$ | $V_{CC}$ = 200V, $I_C$ = 1A; $I_{B1}$ = 100mA, $R_L$ = 200Ω | – | – | 3.0 | µs |
| Storage Time | $t_s$ | $I_{B1}$ = $I_{B2}$ = 100mA | – | – | 4.0 | µs |
| Fall Time | $t_f$ | | – | – | 3.0 | µs |