

## NTE106 Silicon PNP Transistor Switching Transistor

### **Absolute Maximum Ratings:**

|                                                               |                                     |
|---------------------------------------------------------------|-------------------------------------|
| Collector–Emitter Voltage, $V_{CEO}$                          | 15V                                 |
| Collector–Base Voltage, $V_{CBO}$                             | 15V                                 |
| Emitter–Base Voltage, $V_{EBO}$                               | 4.5V                                |
| Continuous Collector Current, $I_C$                           | 200mA                               |
| Total Device Dissipation ( $T_A = +25^\circ\text{C}$ ), $P_D$ | 0.36W                               |
| Derate Above $25^\circ\text{C}$                               | 2.06mW/ $^\circ\text{C}$            |
| Total Device Dissipation ( $T_C = +25^\circ\text{C}$ ), $P_D$ | 1.2W                                |
| Derate Above $25^\circ\text{C}$                               | 6.9mW/ $^\circ\text{C}$             |
| Operating Junction Temperature Range, $T_J$                   | $-65^\circ$ to $+200^\circ\text{C}$ |
| Storage Temperature Range, $T_{stg}$                          | $-65^\circ$ to $+200^\circ\text{C}$ |

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

| Parameter                           | Symbol        | Test Conditions                                                           | Min | Typ | Max | Unit          |
|-------------------------------------|---------------|---------------------------------------------------------------------------|-----|-----|-----|---------------|
| <b>OFF Characteristics</b>          |               |                                                                           |     |     |     |               |
| Collector–Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C = 3\text{mA}$ , $I_B = 0$ , Note 1                                   | 15  | –   | –   | V             |
|                                     | $V_{(BR)CES}$ | $I_C = 100\mu\text{A}$ , $V_{BE} = 0$                                     | 15  | –   | –   | V             |
| Collector–Base Breakdown Voltage    | $V_{(BR)CBO}$ | $I_C = 100\mu\text{A}$ , $I_E = 0$                                        | 15  | –   | –   | V             |
| Emitter–Base Breakdown Voltage      | $V_{(BR)EBO}$ | $I_E = 100\mu\text{A}$ , $I_C = 0$                                        | 4.5 | 5.9 | –   | V             |
| Collector Cutoff Current            | $I_{CES}$     | $V_{CE} = 8\text{V}$ , $V_{BE} = 0$                                       | –   | –   | 10  | nA            |
|                                     |               | $V_{CE} = 8\text{V}$ , $V_{BE} = 0$ , $T_A = +125^\circ\text{C}$          | –   | –   | 5   | $\mu\text{A}$ |
| Base Current                        | $I_B$         | $V_{CE} = 8\text{V}$ , $V_{BE} = 0$                                       | –   | –   | 1   | nA            |
| <b>ON Characteristics</b>           |               |                                                                           |     |     |     |               |
| DC Current Gain                     | $h_{FE}$      | $I_C = 1\text{mA}$ , $V_{CE} = 500\text{mV}$                              | 35  | –   | –   |               |
|                                     |               | $I_C = 10\text{mA}$ , $V_{CE} = 300\text{mV}$                             | 50  | –   | 120 |               |
|                                     |               | $I_C = 10\text{mA}$ , $V_{CE} = 300\text{mV}$ , $T_A = -55^\circ\text{C}$ | 20  | –   | –   |               |
|                                     |               | $I_C = 50\text{mA}$ , $V_{CE} = 1\text{V}$ , Note 1                       | 40  | –   | –   |               |

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

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

| Parameter                            | Symbol               | Test Conditions                                                                           | Min  | Typ  | Max  | Unit |
|--------------------------------------|----------------------|-------------------------------------------------------------------------------------------|------|------|------|------|
| ON Characteristics (Cont'd)          |                      |                                                                                           |      |      |      |      |
| Collector–Emitter Saturation Voltage | V <sub>CE(sat)</sub> | I <sub>C</sub> = 1mA, I <sub>B</sub> = 0.1mA                                              | –    | –    | 0.15 | V    |
|                                      |                      | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1mA                                               | –    | –    | 0.18 | V    |
|                                      |                      | I <sub>C</sub> = 50mA, I <sub>B</sub> = 5mA, Note 1                                       | –    | –    | 0.6  | V    |
| Base–Emitter Saturation Voltage      | V <sub>BE(sat)</sub> | I <sub>C</sub> = 1mA, I <sub>B</sub> = 0.1mA                                              | –    | 0.7  | 0.8  | V    |
|                                      |                      | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1mA                                               | 0.75 | 0.86 | 0.90 | V    |
|                                      |                      | I <sub>C</sub> = 50mA, I <sub>B</sub> = 5mA, Note 1                                       | –    | 1.1  | 1.5  | V    |
| Small–Signal Characteristics         |                      |                                                                                           |      |      |      |      |
| Current Gain–Bandwidth Product       | f <sub>T</sub>       | I <sub>C</sub> = 10mA, V <sub>CE</sub> = 10V, f = 100MHz                                  | 850  | 1100 | –    | MHz  |
| Output Capacitance                   | C <sub>obo</sub>     | V <sub>CB</sub> = 5V, I <sub>E</sub> = 0, f = 140kHz                                      | –    | 2.0  | 3.0  | pF   |
| Input Capacitance                    | C <sub>ibo</sub>     | V <sub>BE</sub> = 500mV, I <sub>C</sub> = 0, f = 140kHz                                   | –    | 2.0  | 3.5  | pF   |
| Switching Characteristics            |                      |                                                                                           |      |      |      |      |
| Turn–On Time                         | t <sub>on</sub>      | V <sub>CC</sub> = 1.5V, V <sub>BE</sub> = 0, I <sub>C</sub> = 10mA, I <sub>B1</sub> = 1mA | –    | 10   | 15   | ns   |
| Delay Time                           | t <sub>d</sub>       |                                                                                           | –    | 5    | 10   | ns   |
| Rise Time                            | t <sub>r</sub>       |                                                                                           | –    | 5    | 15   | ns   |
| Turn–Off Time                        | t <sub>off</sub>     | V <sub>CC</sub> = 1.5V, I <sub>C</sub> = 10mA, I <sub>B1</sub> = I <sub>B2</sub> = 1mA    | –    | 16   | 20   | ns   |
| Stoirage Time                        | t <sub>s</sub>       |                                                                                           | –    | 17   | 20   | ns   |
| Fall Time                            | t <sub>f</sub>       |                                                                                           | –    | 8    | 10   | ns   |
| Storage Time                         | t <sub>s</sub>       | I <sub>C</sub> = 10mA, I <sub>B1</sub> = 10mA, I <sub>B2</sub> = 10mA                     | –    | –    | 20   | ns   |

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

Note 2.  $f_T$  is defined as the frequency at which  $|h_{fe}|$  extrapolates to unity.

