

## NTE2406 Silicon NPN Transistor General Purpose Amp, Surface Mount (Compl to NTE2407)

**Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

|                                                                                 |                                     |
|---------------------------------------------------------------------------------|-------------------------------------|
| Collector–Base Voltage, $V_{CBO}$                                               | 75V                                 |
| Collector–Emitter Voltage, $V_{CEO}$                                            | 40V                                 |
| Emitter–Base Voltage, $V_{EBO}$                                                 | 6V                                  |
| Continuous Collector Current, $I_C$                                             | 600mA                               |
| Total Device Dissipation (FR–5 Board, Note 1), $P_D$                            | 225mW                               |
| Derate above $+25^\circ\text{C}$                                                | 1.8mW/ $^\circ\text{C}$             |
| Thermal Resistance, Junction–to–Ambient (FR–5 Board, Note 1), $R_{thJA}$        | 556 $^\circ\text{C}/\text{W}$       |
| Total Device Dissipation (Alumina Substrate, Note 2), $P_D$                     | 300mW                               |
| Derate above $+25^\circ\text{C}$                                                | 2.4mW/ $^\circ\text{C}$             |
| Thermal Resistance, Junction–to–Ambient (Alumina Substrate, Note 2), $R_{thJA}$ | 417 $^\circ\text{C}/\text{W}$       |
| Operating Junction Temperature Range, $T_J$                                     | $-55^\circ$ to $+150^\circ\text{C}$ |
| Storage Temperature Range, $T_{stg}$                                            | $-55^\circ$ to $+150^\circ\text{C}$ |

Note 1. FR–5 = 1.000 (25.4mm) x .750 (19.05mm) x .062 (1.57mm).

Note 2. Alumina = .400 (10.2mm) x .300 (7.62mm) x .024 (.609mm), 99.5% alumina.

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

| Parameter                           | Symbol        | Test Conditions                                                | Min | Typ | Max  | Unit          |
|-------------------------------------|---------------|----------------------------------------------------------------|-----|-----|------|---------------|
| <b>OFF Characteristics</b>          |               |                                                                |     |     |      |               |
| Collector–Base Breakdown Voltage    | $V_{(BR)CBO}$ | $I_C = 10\mu\text{A}$ , $I_E = 0$                              | 75  | –   | –    | V             |
| Collector–Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C = 10\text{mA}$ , $I_B = 0$                                | 40  | –   | –    | V             |
| Emitter–Base Breakdown Voltage      | $V_{(BR)EBO}$ | $I_E = 10\mu\text{A}$ , $I_C = 0$                              | 6   | –   | –    | V             |
| Collector Cutoff Current            | $I_{CBO}$     | $V_{CB} = 60\text{V}$ , $I_E = 0$                              | –   | –   | 0.01 | $\mu\text{A}$ |
|                                     |               | $V_{CB} = 60\text{V}$ , $I_E = 0$ , $T_A = +125^\circ\text{C}$ | –   | –   | 10   | $\mu\text{A}$ |
|                                     | $I_{CEX}$     | $V_{CE} = 60\text{V}$ , $V_{EB(off)} = 3\text{V}$              | –   | –   | 10   | nA            |
| Emitter Cutoff Current              | $I_{EBO}$     | $V_{EB} = 3\text{V}$ , $I_C = 0$                               | –   | –   | 10   | nA            |
| Base Cutoff Current                 | $I_{BL}$      | $V_{CE} = 60\text{V}$ , $V_{EB(off)} = 3\text{V}$              | –   | –   | 20   | nA            |

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

| Parameter                            | Symbol        | Test Conditions                                                | Min  | Typ | Max  | Unit          |
|--------------------------------------|---------------|----------------------------------------------------------------|------|-----|------|---------------|
| ON Characteristics (Note 3)          |               |                                                                |      |     |      |               |
| DC Current Gain                      | $h_{FE}$      | $V_{CE} = 10V, I_C = 0.1mA$                                    | 35   | —   | —    |               |
|                                      |               | $V_{CE} = 10V, I_C = 1mA$                                      | 50   | —   | —    |               |
|                                      |               | $V_{CE} = 10V, I_C = 10mA$                                     | 75   | —   | —    |               |
|                                      |               | $V_{CE} = 10V, I_C = 10mA, T_A = -55^{\circ}C$                 | 35   | —   | —    |               |
|                                      |               | $V_{CE} = 1V, I_C = 150mA$                                     | 50   | —   | —    |               |
|                                      |               | $V_{CE} = 10V, I_C = 150mA$                                    | 100  | —   | 300  |               |
|                                      |               | $V_{CE} = 10V, I_C = 500mA$                                    | 40   | —   | —    |               |
| Collector–Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 150mA, I_B = 15mA$                                      | —    | —   | 0.3  | V             |
|                                      |               | $I_C = 500mA, I_B = 50mA$                                      | —    | —   | 1.0  | V             |
| Base–Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C = 150mA, I_B = 15mA$                                      | 0.6  | —   | 1.2  | V             |
|                                      |               | $I_C = 500mA, I_B = 50mA$                                      | —    | —   | 2.0  | V             |
| Small–Signal Characteristics         |               |                                                                |      |     |      |               |
| Current Gain–Bandwidth Product       | $f_T$         | $I_C = 20mA, V_{CB} = 20V, f = 100MHz$                         | 300  | —   | —    | MHz           |
| Output Capacitance                   | $C_{obo}$     | $V_{CB} = 10V, I_E = 0, f = 1MHz$                              | —    | —   | 8    | pF            |
| Input Capacitance                    | $C_{ibo}$     | $V_{EB} = 0.5V, I_C = 0, f = 1MHz$                             | —    | —   | 25   | pF            |
| Input Impedance                      | $h_{ie}$      | $V_{CE} = 10V, I_C = 1mA, f = 1kHz$                            | 2    | —   | 8    | k $\Omega$    |
|                                      |               | $V_{CE} = 10V, I_C = 10mA, f = 1kHz$                           | 0.25 | —   | 1.25 | k $\Omega$    |
| Voltage Feedback Ratio               | $h_{re}$      | $V_{CE} = 10V, I_C = 1mA, f = 1kHz$                            | —    | —   | 8    | $\times 10^4$ |
|                                      |               | $V_{CE} = 10V, I_C = 10mA, f = 1kHz$                           | —    | —   | 4    | $\times 10^4$ |
| Small–Signal Current Gain            | $h_{fe}$      | $V_{CE} = 10V, I_C = 1mA, f = 1kHz$                            | 50   | —   | 300  |               |
|                                      |               | $V_{CE} = 10V, I_C = 10mA, f = 1kHz$                           | 75   | —   | 375  |               |
| Output Admittance                    | $h_{oe}$      | $V_{CE} = 10V, I_C = 1mA, f = 1kHz$                            | 5    | —   | 35   | $\mu mhos$    |
|                                      |               | $V_{CE} = 10V, I_C = 10mA, f = 1kHz$                           | 25   | —   | 200  | $\mu mhos$    |
| Collector–Base Time Constant         | $\tau_{bc}$   | $V_{CB} = 20V, I_E = 20mA, f = 31.8MHz$                        | —    | —   | 150  | ps            |
| Noise Figure                         | NF            | $I_C = 100\mu A, V_{CE} = 10V, R_S = 1k\Omega, f = 1kHz$       | —    | —   | 4    | dB            |
| Switching Characteristics            |               |                                                                |      |     |      |               |
| Delay Time                           | $t_d$         | $V_{CC} = 30V, I_C = 150mA, V_{BE(off)} = 0.5V, I_{B1} = 15mA$ | —    | —   | 10   | ns            |
| Rise Time                            | $t_r$         |                                                                | —    | —   | 25   | ns            |
| Storage Time                         | $t_s$         | $V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA$            | —    | —   | 225  | ns            |
| Fall Time                            | $t_f$         |                                                                | —    | —   | 60   | ns            |

Note 3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

