



**ELECTRONICS, INC.**  
44 FARRAND STREET  
BLOOMFIELD, NJ 07003  
(973) 748-5089

## NTE123AP Silicon NPN Transistor Audio Amplifier, Switch (Compl to NTE159)

**Absolute Maximum Ratings:**

|  |                                     |
|--|-------------------------------------|
| Collector–Emitter Voltage, $V_{CEO}$ .....                         | 40V                                 |
| Collector–Base Voltage, $V_{CB}$ .....                             | 60V                                 |
| Emitter–Base Voltage, $V_{EB}$ .....                               | 6V                                  |
| Continuous Collector Current, $I_C$ .....                          | 600mA                               |
| Total Device Dissipation ( $T_A = 25^\circ\text{C}$ ), $P_D$ ..... | 350mW                               |
| Derate Above $25^\circ\text{C}$ .....                              | 2.8mW/ $^\circ\text{C}$             |
| Total Device Dissipation ( $T_C = 25^\circ\text{C}$ ), $P_D$ ..... | 1.0W                                |
| Derate Above $25^\circ\text{C}$ .....                              | 8.0mW/ $^\circ\text{C}$             |
| Operating Junction Temperature Range, $T_J$ .....                  | $-55^\circ$ to $+150^\circ\text{C}$ |
| Storage Temperature Range, $T_{stg}$ .....                         | $-55^\circ$ to $+150^\circ\text{C}$ |
| Thermal Resistance, Junction to Case, $R_{\theta JC}$ .....        | 125 $^\circ\text{C}/\text{W}$       |
| Thermal Resistance, Junction to Ambient, $R_{\theta JA}$ .....     | 357 $^\circ\text{C}/\text{W}$       |

**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 | $V_{(BR)CEO}$ | $I_C = 1\text{mA}, I_B = 0$ , Note 1             | 40  | –   | –   | V             |
| Collector–Base Breakdown Voltage    | $V_{(BR)CBO}$ | $I_C = 0.1\text{mA}, I_E = 0$                    | 60  | –   | –   | V             |
| Emitter–Base Breakdown Voltage      | $V_{(BR)EBO}$ | $I_E = 0.1\text{mA}, I_C = 0$                    | 6   | –   | –   | V             |
| Collector Cutoff Current            | $I_{CEV}$     | $V_{CE} = 35\text{V}, V_{EB(off)} = 0.4\text{V}$ | –   | –   | 0.1 | $\mu\text{A}$ |
| Base Cutoff Current                 | $I_{BEV}$     | $V_{CE} = 35\text{V}, V_{EB(off)} = 0.4\text{V}$ | –   | –   | 0.1 | $\mu\text{A}$ |
| <b>ON Characteristics (Note 1)</b>  |               |  |     |     |     |               |
| DC Current Gain                     | $h_{FE}$      | $V_{CE} = 1\text{V}, I_C = 0.1\text{mA}$         | 20  | –   | –   |               |
|                                     |               | $V_{CE} = 1\text{V}, I_C = 1\text{mA}$           | 40  | –   | –   |               |
|                                     |               | $V_{CE} = 1\text{V}, I_C = 10\text{mA}$          | 80  | –   | –   |               |
|                                     |               | $V_{CE} = 1\text{V}, I_C = 150\text{mA}$         | 100 | –   | 300 |               |
|                                     |               | $V_{CE} = 1\text{V}, I_C = 500\text{mA}$         | 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             |
|---|---------------|--|------|-----|------|------------------|
| <b>ON Characteristics (Note 1) (Cont'd)</b> |               |  |      |     |      |                  |
| Collector–Emitter Saturation Voltage        | $V_{CE(sat)}$ | $I_C = 150\text{mA}, I_B = 15\text{mA}$  | –    | –   | 0.4  | V                |
|   |               | $I_C = 500\text{mA}, I_B = 50\text{mA}$  | –    | –   | 0.75 | V                |
| Base–Emitter Saturation Voltage             | $V_{BE(sat)}$ | $I_C = 150\text{mA}, I_B = 15\text{mA}$  | 0.75 | –   | 0.95 | V                |
|   |               | $I_C = 500\text{mA}, I_B = 50\text{mA}$  | –    | –   | 1.2  | V                |
| <b>Small–Signal Characteristics</b>         |               |  |      |     |      |                  |
| Current Gain–Bandwidth Product              | $f_T$         | $I_C = 20\text{mA}, V_{CE} = 10\text{V}, f = 100\text{MHz}$                              | 250  | –   | –    | MHz              |
| Collector–Base Capacitance                  | $C_{cb}$      | $V_{CB} = 5\text{V}, I_E = 0, f = 100\text{kHz}$   | –    | –   | 6.5  | pF               |
| Emitter–Base Capacitance                    | $C_{eb}$      | $V_{CB} = 0.5\text{V}, I_C = 0, f = 100\text{kHz}$                                       | –    | –   | 30   | pF               |
| Input Impedance                             | $h_{ie}$      | $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{kHz}$                                 | 1.0  | –   | 15   | k $\Omega$       |
| Voltage Feedback Ratio                      | $h_{re}$      | $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{kHz}$                                 | 0.1  | –   | 8.0  | $\times 10^{-6}$ |
| Small–Signal Current Gain                   | $h_{fe}$      | $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{kHz}$                                 | 40   | –   | 500  |                  |
| Output Admittance                           | $h_{oe}$      | $I_C = 1\text{mA}, V_{CE} = 10\text{V}, f = 1\text{kHz}$                                 | 1.0  | –   | 30   | $\mu\text{mhos}$ |
| <b>Switching Characteristics</b>            |               |  |      |     |      |                  |
| Delay Time                                  | $t_d$         | $V_{CC} = 30\text{V}, V_{EB(off)} = 2\text{V}, I_C = 150\text{mA}, I_{B1} = 15\text{mA}$ | –    | –   | 15   | ns               |
| Rise Time                                   | $t_r$         |  | –    | –   | 20   | ns               |
| Storage Time                                | $t_s$         | $V_{CC} = 30\text{V}, I_C = 150\text{mA}, I_{B1} = I_{B2} = 15\text{mA}$                 | –    | –   | 225  | ns               |
| Fall Time                                   | $t_f$         |  | –    | –   | 30   | ns               |

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

