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## PN3645

### Silicon PNP Transistor Audio Amplifier, Switch TO-92 Type Package

**Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$ , Note 1 unless otherwise specified)

|  |                                     |
|--|-------------------------------------|
| Collector-Emitter Voltage, $V_{CEO}$ .....                         | 60V                                 |
| Collector-Base Voltage, $V_{CBO}$ .....                            | 60V                                 |
| Emitter-Base Voltage, $V_{EBO}$ .....                              | 5V                                  |
| Continuous Collector Current, $I_C$ .....                          | 800mA                               |
| Total Device Dissipation ( $T_A = 25^\circ\text{C}$ ), $P_D$ ..... | 625mW                               |
| Derate Above $25^\circ\text{C}$ .....                              | 5mW/ $^\circ\text{C}$               |
| 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, $R_{\theta JC}$ .....        | 83.3 $^\circ\text{C}/\text{W}$      |
| Thermal Resistance, Junction to Ambient, $R_{\theta JA}$ .....     | 200 $^\circ\text{C}/\text{W}$       |

Note 1. These ratings are limiting values above which the serviceability of any semiconductor device may be impaired and are based on a maximum junction temperature of  $+150^\circ\text{C}$ .

**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  | $V_{(BR)CEO}$ | $I_C = 10\text{mA}$ , $I_B = 0$ , Note 2                      | 60  | -   | -    | V             |
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = 100\mu\text{A}$ , $I_E = 0$                            | 60  | -   | -    | V             |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E = 10\mu\text{A}$ , $I_C = 0$                             | 5   | -   | -    | V             |
| Collector Cutoff Current             | $I_{CES}$     | $V_{CB} = 50\text{V}$ , $I_E = 0$                             | -   | -   | 35   | nA            |
|                                      |               | $V_{CB} = 50\text{V}$ , $I_E = 0$ , $T_A = +65^\circ\text{C}$ | -   | -   | 2    | $\mu\text{A}$ |
| Base Cutoff Current                  | $I_{BL}$      | $V_{CE} = 50\text{V}$ , $I_C = 0$                             | -   | -   | 35   | nA            |
| <b>ON Characteristics (Note 2)</b>   |               |   |     |     |      |               |
| DC Current Gain                      | $h_{FE}$      | $V_{CE} = 10\text{V}$ , $I_C = 0.1\text{mA}$                  | 40  | -   | -    |               |
|                                      |               | $V_{CE} = 10\text{V}$ , $I_C = 1\text{mA}$                    | 80  | -   | -    |               |
|                                      |               | $V_{CE} = 10\text{V}$ , $I_C = 10\text{mA}$                   | 100 | -   | -    |               |
|                                      |               | $V_{CE} = 10\text{V}$ , $I_C = 150\text{mA}$                  | 100 | -   | 300  |               |
|                                      |               | $V_{CE} = 2\text{V}$ , $I_C = 300\text{mA}$                   | 20  | -   | -    |               |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 50\text{mA}$                    | 80  | -   | 240  |               |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 50\text{mA}$ , $I_B = 2.5\text{mA}$                    | -   | -   | 0.25 | V             |
|                                      |               | $I_C = 150\text{mA}$ , $I_B = 15\text{mA}$                    | -   | -   | 0.4  | V             |

Note 2. 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 (Cont'd)</b> (Note 2) |               |  |     |     |     |      |
| Base-Emitter Saturation Voltage             | $V_{BE(sat)}$ | $I_C = 50\text{mA}, I_B = 2.5\text{mA}$                                  | -   | -   | 1.0 | V    |
|   |               | $I_C = 150\text{mA}, I_B = 15\text{mA}$                                  | -   | -   | 1.3 | V    |
| <b>Small Signal Characteristics</b>         |               |  |     |     |     |      |
| Output Capacitance                          | $C_{ob}$      | $V_{CB} = 10\text{V}, f = 140\text{kHz}$                                 | -   | -   | 8   | pF   |
| Input Capacitance                           | $C_{ib}$      | $V_{BE} = 0.5\text{V}, f = 140\text{kHz}$                                | -   | -   | 35  | pF   |
| Small-Signal Current Gain                   | $h_{fe}$      | $I_C = 20\text{mA}, V_{CE} = 20\text{V}, f = 100\text{MHz}$              | 2.0 | -   | -   |      |
| <b>Switching Characteristics</b>            |               |  |     |     |     |      |
| Turn-On Time                                | $t_{on}$      | $V_{CC} = 30\text{V}, I_C = 300\text{mA}, I_{B1} = 30\text{mA}$          | -   | -   | 40  | ns   |
| Delay Time                                  | $t_d$         |  | -   | -   | 25  | ns   |
| Rise Time                                   | $t_r$         |  | -   | -   | 35  | ns   |
| Turn-Off Time                               | $t_{off}$     | $V_{CC} = 30\text{V}, I_C = 300\text{mA}, I_{B1} = I_{B2} = 30\text{mA}$ | -   | -   | 100 | ns   |
| Storage Time                                | $t_s$         |  | -   | -   | 70  | ns   |
| Fall Time                                   | $t_f$         |  | -   | -   | 50  | ns   |

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

