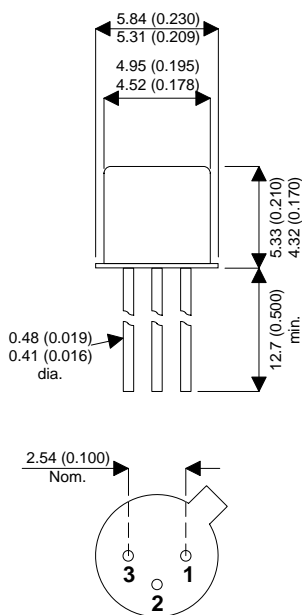


**MECHANICAL DATA**  
Dimensions in mm (inches)



**TO-18 METAL PACKAGE**

PIN 1 – Emitter    PIN 2 – Base    PIN 3 – Collector

**GENERAL PURPOSE  
NPN TRANSISTOR  
FOR HIGH RELIABILITY  
APPLICATIONS**

**FEATURES**

- SILICON PLANAR EPITAXIAL NPN TRANSISTOR
- CECC SCREENING OPTIONS
- HIGH SPEED SATURATED SWITCHING

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise stated)

|                 |   |                               |
|-----------------|---|-------------------------------|
| $V_{CBO}$       | Collector – Base Voltage                            | 60V                           |
| $V_{CEO}$       | Collector – Emitter Voltage                         | 40V                           |
| $V_{EBO}$       | Emitter – Base Voltage                              | 6V                            |
| $I_C$           | Collector Current                                   | 200mA                         |
| $P_D$           | Total Device Dissipation @ $T_A = 25^\circ\text{C}$ | 350mW                         |
|                 | Derate above $25^\circ\text{C}$                     | 3.33mW / $^\circ\text{C}$     |
| $R_{\theta JA}$ | Thermal Resistance Junction – Ambient               | 300 $^\circ\text{C}/\text{W}$ |
| $T_{STG}, T_J$  | Operating and Storage Temperature Range             | -55 to +175 $^\circ\text{C}$  |

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise stated)

| Parameter       | Test Conditions  | Min.                 | Typ. | Max. | Unit |
|-----------------|--|----------------------|------|------|------|
| $V_{(BR)CEO}^*$ | Collector – Emitter Breakdown Voltage<br>$I_C = 1\text{mA}$ $I_B = 0$            | 40                   |      |      | V    |
| $V_{(BR)CBO}$   | Collector – Base Breakdown Voltage<br>$I_C = 10\mu\text{A}$ $I_E = 0$            | 60                   |      |      |      |
| $V_{(BR)EBO}$   | Emitter – Base Breakdown Voltage<br>$I_E = 10\mu\text{A}$ $I_C = 0$              | 6                    |      |      |      |
| $I_{BL}$        | Base Cut-off Current<br>$V_{CE} = 30\text{V}$                                    |                      |      | 50   | nA   |
| $I_{CEX}$       | Collector – Emitter Cut-off Current<br>$V_{EB} = 3\text{V}$                      |                      |      | 50   |      |
| $V_{CE(sat)}$   | Collector – Emitter Saturation Voltage   |                      |      | 0.2  | V    |
|                 | $I_C = 10\text{mA}$ $I_B = 1\text{mA}$<br>$I_C = 50\text{mA}$ $I_B = 5\text{mA}$ |                      |      | 0.3  |      |
| $V_{BE(sat)}^*$ | Base – Emitter Saturation Voltage  | 0.65                 |      | 0.85 | V    |
|                 | $I_C = 10\text{mA}$ $I_B = 1\text{mA}$<br>$I_C = 50\text{mA}$ $I_B = 5\text{mA}$ |                      |      | 0.95 |      |
| $h_{FE}^*$      | DC Current Gain<br>$V_{CE} = 1\text{V}$  | $I_C = 0.1\text{mA}$ | 40   |      | —    |
|                 |  | $I_C = 1\text{mA}$   | 70   |      |      |
|                 |  | $I_C = 10\text{mA}$  | 100  | 300  |      |
|                 |  | $I_C = 50\text{mA}$  | 60   |      |      |
|                 |  | $I_C = 100\text{mA}$ | 30   |      |      |

\* Pulse Test:  $t_p \leq 300\mu\text{s}$ ,  $\delta \leq 2\%$ .

**SMALL SIGNAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise stated)

| Parameter | Test Conditions  | Min. | Typ. | Max. | Unit             |
|-----------|--|------|------|------|------------------|
| $f_t$     | Current Gain Bandwidth Product<br>$V_{CE} = 20\text{V}$ $I_C = 10\text{mA}$<br>$f = 100\text{MHz}$       | 300  |      |      | MHz              |
| $C_{ob}$  | Output Capacitance<br>$V_{CB} = 5\text{V}$ $I_E = 0$<br>$f = 1\text{MHz}$                                |      |      | 4    | pF               |
| $C_{ib}$  | Input Capacitance<br>$V_{BE} = 0.5\text{V}$ $I_C = 0$<br>$f = 1\text{MHz}$                               |      |      | 8    | pF               |
| $h_{ie}$  | Input Impedance<br>$V_{CE} = 10\text{V}$   | 1    |      | 10   | k $\Omega$       |
| $h_{oe}$  | Output Admittance<br>$I_C = 1\text{mA}$  | 1    |      | 40   | $\mu\text{hmos}$ |
| $h_{re}$  | Voltage Feedback Ratio<br>$f = 1\text{kHz}$  | 0.5  |      | 8    | $\times 10^{-4}$ |
| $h_{fe}$  | Small Signal Current Gain  | 100  |      | 400  | —                |
| $N_F$     | Noise Figure<br>$V_{CE} = 5\text{V}$ $I_C = 100\mu\text{A}$<br>$f = 1\text{kHz}$ $R_S = 1\text{k}\Omega$ |      |      | 5    | dB               |

**SWITCHING CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise stated)

| Parameter | Test Conditions   | Min. | Typ. | Max. | Unit |
|-----------|---|------|------|------|------|
| $t_d$     | Delay Time<br>$V_{CC} = 3\text{V}$ $V_{BE} = 0.5\text{V}$   |      |      | 35   | ns   |
| $t_r$     | Rise Time<br>$I_C = 10\text{mA}$ $I_{B1} = 1\text{mA}$      |      |      | 35   |      |
| $t_s$     | Storage Time<br>$V_{CC} = 3\text{V}$ $V_{BE} = 0.5\text{V}$ |      |      | 200  |      |
| $t_f$     | Fall Time<br>$I_{B1} = I_{B2} = 1\text{mA}$                 |      |      | 50   |      |