

**TO - 92 BIPOLAR TRANSISTORS
TRANSISTOR(NPN)**

FEATURES

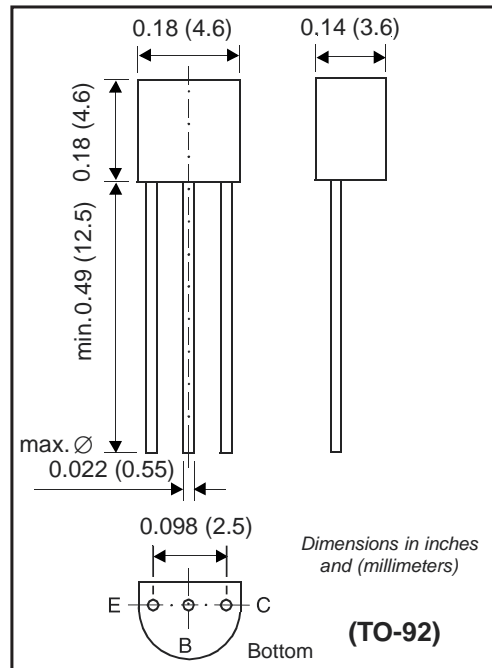
- * Power dissipation
P_{CM}: 625mW(T_{amb}=25°C)
- * Collector current
I_{CM}: 0.6 A
- * Collector-base voltage
V_{(BR)CBO}: 75 V
- * Operating and storage junction temperature range
T_J, T_{stg}: -55°C to +150°C

MECHANICAL DATA

- * Case: Molded plastic
- * Epoxy: UL 94V-O rate flame retardant
- * Lead: MIL-STD-202E method 208C guaranteed
- * Mounting position: Any
- * Weight: 0.008 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.



MAXIMUM RATINGS (@ T_A = 25°C unless otherwise noted)

| RATINGS | SYMBOL | VALUE | UNITS |
|--|------------------|-------------|-------|
| Max. Steady State Power Dissipation ⁽¹⁾ @T _A =25°C Derate above 25°C | P _D | 625 | mW |
| Max. Operating Temperature Range | T _J | 150 | °C |
| Storage Temperature Range | T _{STG} | -55 to +150 | °C |

ELECTRICAL CHARACTERISTICS (@ T_A = 25°C unless otherwise noted)

| CHARACTERISTICS | SYMBOL | MIN. | TYP. | MAX. | UNITS |
|--|------------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | R _{θJA} | - | - | 200 | °C/W |

Notes : 1. Alumina=0.4*0.3*0.024in.99.5% alumina
2. "Fully ROHS Compliant", "100% Sn plating (Pb-free)".

ELECTRICAL CHARACTERISTICS (@TA=25°C unless otherwise noted)

| Chatacteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|---|---------------|-----|------------|---------------|
| Collector-Emitter Breakdown Voltage ($I_C = 10\text{mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 40 | - | Vdc |
| Collector-Base Breakdown Voltage ($I_C = 10\text{uA}$, $I_E = 0$) | $V_{(BR)CBO}$ | 75 | - | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = 10\text{uA}$, $I_C = 0$) | $V_{(BR)EBO}$ | 6.0 | - | Vdc |
| Collector Cutoff Current ($V_{CE} = 60\text{Vdc}$, $V_{EB(off)} = 3.0\text{Vdc}$) | I_{CEX} | - | 0.01 | μA |
| Collector Cutoff Current ($V_{CB} = 60\text{Vdc}$, $I_E = 0$) ($V_{CB} = 60\text{Vdc}$, $I_E = 0$, $T_A = 150^\circ\text{C}$) | I_{CBO} | - | 0.01 10 | μA |
| Emitter Cutoff Current ($V_{EB} = 3.0\text{Vdc}$, $I_C = 0$) | I_{EBO} | - | 0.01 | μA |
| Base Cutoff Current ($V_{CE} = 60\text{Vdc}$, $V_{EB(off)} = 3.0\text{Vdc}$) | I_{BL} | - | 20 | nA |

ON CHARACTERISTICS

| | | | | |
|---|---------------|----------|------------|-----|
| DC Current Gain ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $T_A = -55^\circ\text{C}$) ($I_C = 500\text{mA}$, $V_{CE} = 10\text{Vdc}$) (1) | hFE | 35 40 | - - | - |
| Collector-Emitter Saturation Voltage (1) ($I_C = 150\text{mA}$, $I_B = 15\text{mA}$) ($I_C = 500\text{mA}$, $I_B = 50\text{mA}$) | $V_{CE(sat)}$ | - - | 0.3 1.0 | Vdc |
| Base-Emitter Saturation Voltage (1) ($I_C = 150\text{mA}$, $I_B = 15\text{mA}$) ($I_C = 500\text{mA}$, $I_B = 50\text{mA}$) | $V_{BE(sat)}$ | 0.6 - | 1.2 2.0 | Vdc |

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|---|---------------|-------------|-------------|------------------|
| Current-Gain-Bandwidth Product (2) ($I_C = 20\text{mA}$, $V_{CE} = 20\text{Vdc}$, $f = 100\text{MHz}$) | f_T | 300 | - | MHz |
| Input Capacitance ($V_{EB} = 0.5\text{Vdc}$, $I_C = 0$, $f = 1.0\text{MHz}$) | C_{ibo} | - | 25 | pF |
| Input Impedance ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) | h_{ie} | 2.0 0.25 | 8.0 1.25 | kohms |
| Voltage Feedback Ratio ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) | h_{re} | - - | 8.0 4.0 | $\times 10^{-4}$ |
| Small-Signal Current Gain ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) | h_{fe} | 50 75 | 300 375 | - |
| Output Admittance ($I_C = 1.0\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) ($I_C = 10\text{mA}$, $V_{CE} = 10\text{Vdc}$, $f = 1.0\text{kHz}$) | h_{oe} | 5.0 25 | 35 200 | μmhos |
| Collector Base Time Constant ($I_E = 20\text{mA}$, $V_{CB} = 20\text{Vdc}$, $f = 31.8\text{MHz}$) | $\tau_{b,Cc}$ | - | 150 | ps |
| Noise Figure ($I_C = 100\text{uA}$, $V_{CE} = 10\text{Vdc}$, $R_S = 1.0\text{kohms}$, $f = 1.0\text{kHz}$) | NF | - | 4.0 | dB |

SWITCHING CHARACTERISTICS

| | | | | | |
|---------------------------|--|----------------|--------|-----------|----|
| Delay Time Rise Time | ($V_{CC} = 30\text{Vdc}$, $V_{BE(off)} = -0.5\text{Vdc}$, $I_C = 150\text{mA}$, $I_{B1} = 15\text{mA}$) | t_d t_r | - - | 10 25 | ns |
| Storage Time Fall Time | ($V_{CC} = 30\text{Vdc}$, $I_C = 150\text{mA}$, $I_{B1} = I_{B2} = 15\text{mA}$) | t_s t_f | - - | 225 60 | ns |

NOTES : 1. Pulse Test: Pulse Width $\leq 300\text{ms}$, Duty Cycle $\leq 2.0\%$
2. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity

RATING AND CHARACTERISTICS CURVES (PN2222A)

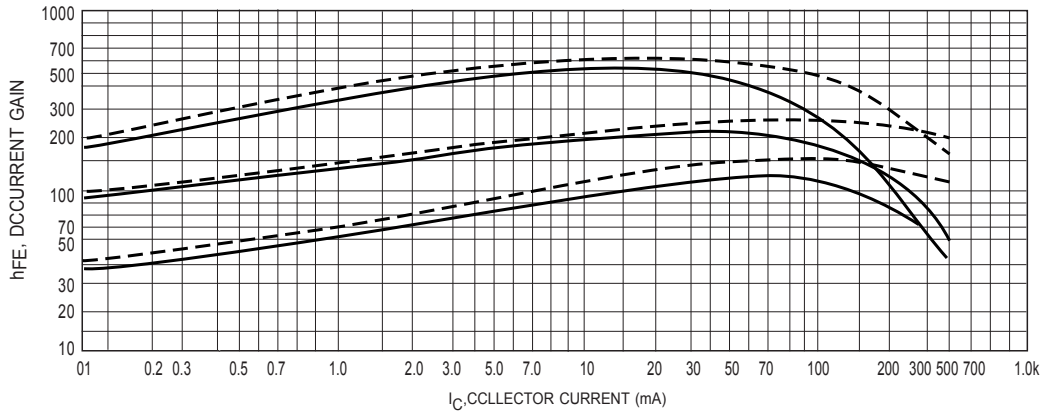


Figure 1. DC Current Gain

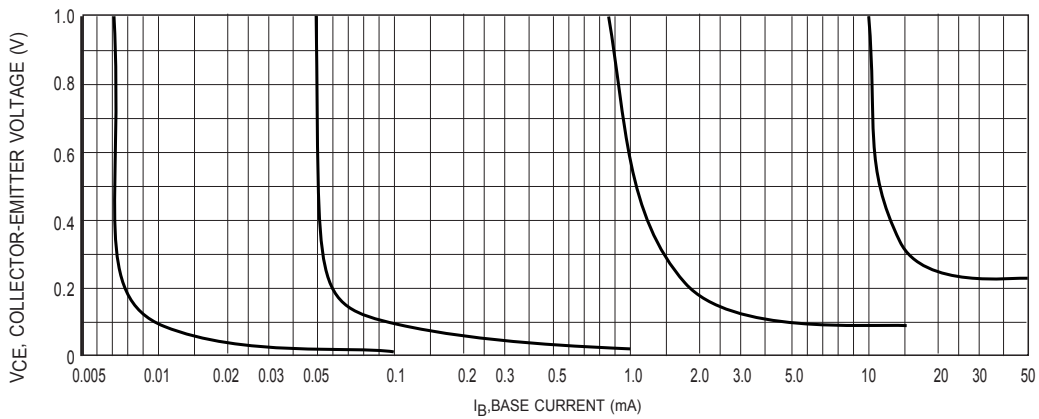


Figure 2. Collector Saturation Region

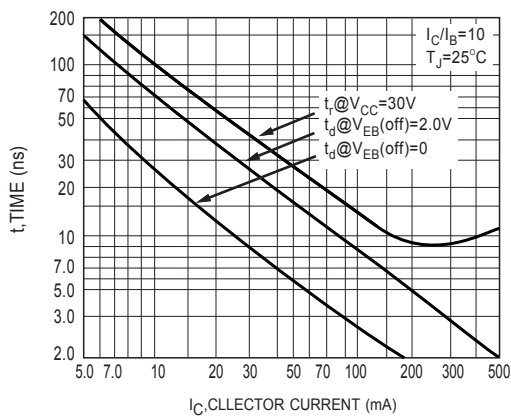


Figure 3. Turn-On Time

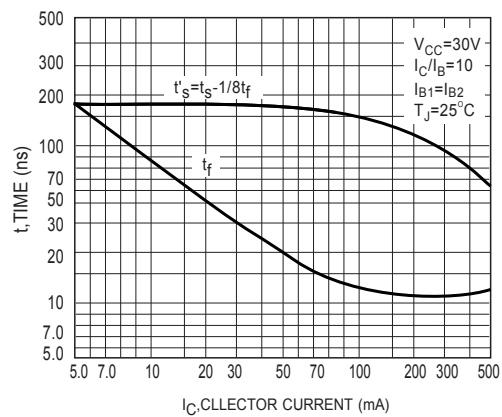


Figure 4. Turn-Off Time

RATING AND CHARACTERISTICS CURVES (PN2222A)

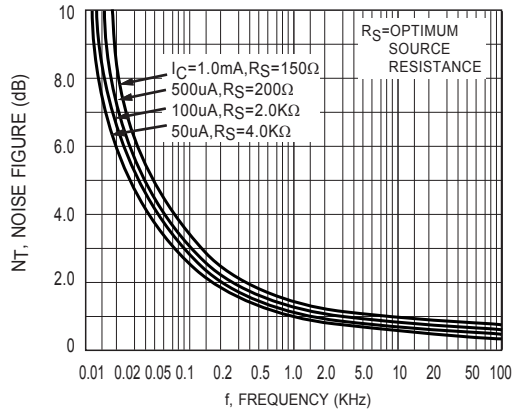


Figure 5. Frequency Effects

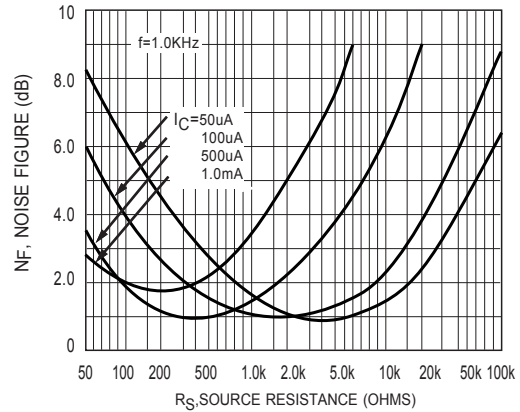


Figure 6. Source Resistance Effects

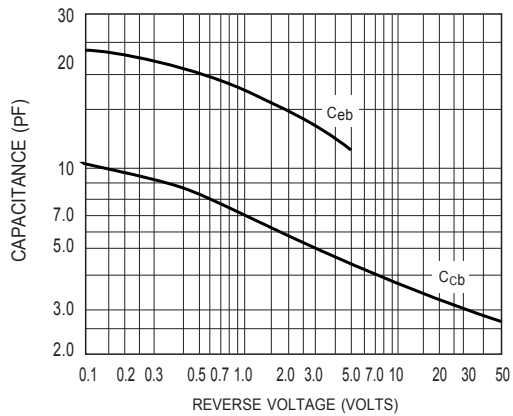


Figure 7. Capacitances

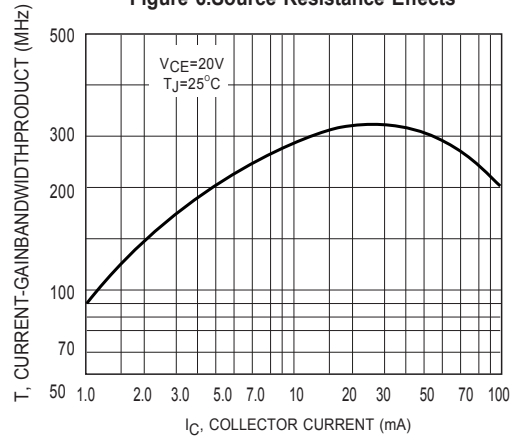


Figure 8. Current-Gain Bandwidth Product

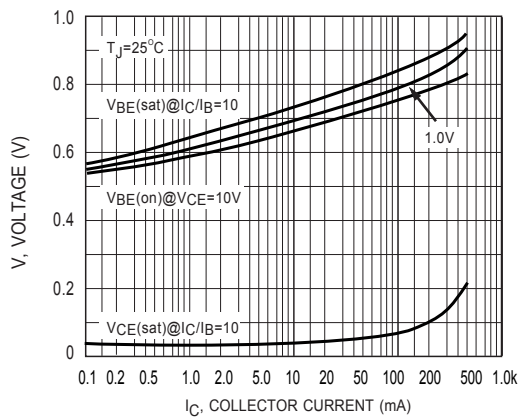


Figure 9. "On" Voltages

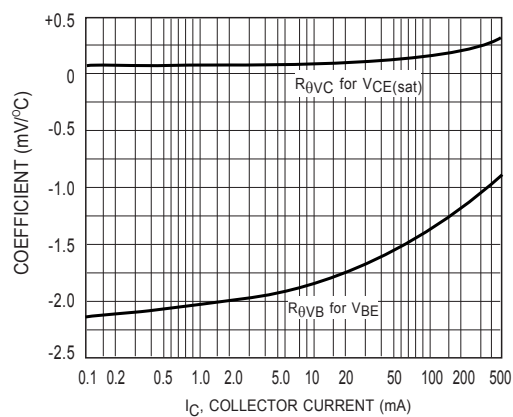


Figure 10. Temperature Coefficients