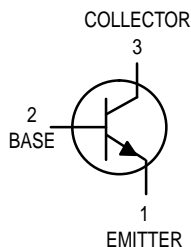


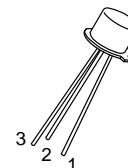
Switching Transistors

NPN Silicon



2N2369
2N2369A*

*Motorola Preferred Device



CASE 22-03, STYLE 1
TO-18 (TO-206AA)

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|--------------------|--------------|-------------------------------|
| Collector–Emitter Voltage | V_{CEO} | 15 | Vdc |
| Collector–Emitter Voltage | V_{CES} | 40 | Vdc |
| Collector–Base Voltage | V_{CBO} | 40 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 4.5 | Vdc |
| Collector Current (10 μ s pulse) | $I_C(\text{Peak})$ | 500 | mA |
| Collector Current — Continuous | I_C | 200 | mA |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 0.36 2.06 | Watt mW/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 100^\circ\text{C}$ Derate above 100°C | P_D | 0.68 6.85 | Watts mW/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -65 to +200 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-----|---------------------------|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 486 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 147 | $^\circ\text{C}/\text{W}$ |

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|---|----------------|-----|-----------|-----------------|
| Collector–Emitter Breakdown Voltage ($I_C = 10 \mu\text{A}, V_{BE} = 0$) | $V_{(BR)CES}$ | 40 | — | Vdc |
| Collector–Emitter Sustaining Voltage ⁽¹⁾ ($I_C = 10 \text{ mAdc}, I_B = 0$) | $V_{CEO(sus)}$ | 15 | — | Vdc |
| Collector–Base Breakdown Voltage ($I_C = 10 \mu\text{A}, I_B = 0$) | $V_{(BR)CBO}$ | 40 | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$) | $V_{(BR)EBO}$ | 4.5 | — | Vdc |
| Collector Cutoff Current ($V_{CB} = 20 \text{ Vdc}, I_E = 0$) ($V_{CB} = 20 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$) | I_{CBO} | — | 0.4 30 | μAdc |
| Collector Cutoff Current ($V_{CE} = 20 \text{ Vdc}, V_{BE} = 0$) | I_{CES} | — | 0.4 | μAdc |
| Base Current ($V_{CE} = 20 \text{ Vdc}, V_{BE} = 0$) | I_B | — | 0.4 | μAdc |

1. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

Preferred devices are Motorola recommended choices for future use and best overall value.

2N2369 2N2369A

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

| Characteristic | Symbol | Min | Max | Unit |
|---|---------------|------|------|------|
| ON CHARACTERISTICS | | | | |
| DC Current Gain ⁽¹⁾ ($I_C = 10\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) | h_{FE} | 40 | 120 | — |
| 2N2369 | | — | 120 | |
| 2N2369A | | — | 120 | |
| ($I_C = 10\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$, $T_A = -55^\circ\text{C}$) | 2N2369 | 20 | — | |
| ($I_C = 10\text{ mA}$, $V_{CE} = 0.35\text{ Vdc}$, $T_A = -55^\circ\text{C}$) | 2N2369A | 20 | — | |
| ($I_C = 30\text{ mA}$, $V_{CE} = 0.4\text{ Vdc}$) | 2N2369A | 30 | — | |
| ($I_C = 100\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) | 2N2369A | 20 | — | |
| ($I_C = 100\text{ mA}$, $V_{CE} = 2.0\text{ Vdc}$) | 2N2369 | 20 | — | |
| Collector–Emitter Saturation Voltage ⁽¹⁾ ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) | $V_{CE(sat)}$ | — | 0.25 | Vdc |
| 2N2369 | | — | 0.20 | |
| 2N2369A | | — | 0.20 | |
| ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$, $T_A = +125^\circ\text{C}$) | 2N2369A | — | 0.30 | |
| ($I_C = 30\text{ mA}$, $I_B = 3.0\text{ mA}$) | 2N2369A | — | 0.25 | |
| ($I_C = 100\text{ mA}$, $I_B = 10\text{ mA}$) | 2N2369A | — | 0.50 | |
| Base–Emitter Saturation Voltage ⁽¹⁾ ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) | $V_{BE(sat)}$ | 0.70 | 0.85 | Vdc |
| All Types | | 0.59 | — | |
| ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$, $T_A = +125^\circ\text{C}$) | 2N2369A | — | 1.02 | |
| ($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$, $T_A = -55^\circ\text{C}$) | 2N2369A | — | 1.15 | |
| ($I_C = 30\text{ mA}$, $I_B = 3.0\text{ mA}$) | 2N2369A | — | 1.15 | |
| ($I_C = 100\text{ mA}$, $I_B = 10\text{ mA}$) | 2N2369A | — | 1.60 | |

SMALL–SIGNAL CHARACTERISTICS

| | | | | |
|--|-----------|-----|-----|-----|
| Current–Gain — Bandwidth Product ($I_C = 10\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f = 100\text{ MHz}$) | f_T | 500 | — | MHz |
| Output Capacitance ($V_{CB} = 5.0\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{obo} | — | 4.0 | pF |
| Input Capacitance ($V_{EB} = 1.0\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$) | C_{ibo} | — | 4.0 | pF |

SWITCHING CHARACTERISTICS

| | | | | |
|--|-----------|---|----|----|
| Storage Time ($I_C = I_{B1} = 10\text{ mA}$, $I_{B2} = -10\text{ mA}$) | t_s | — | 13 | ns |
| Turn–On Time ($I_C = 10\text{ mA}$, $I_{B1} = 3.0\text{ mA}$, $I_{B2} = -1.5\text{ mA}$, $V_{CC} = 3.0\text{ Vdc}$) | t_{on} | — | 12 | ns |
| Turn–Off Time ($I_C = 10\text{ mA}$, $I_{B1} = 3.0\text{ mA}$, $I_{B2} = -1.5\text{ mA}$, $V_{CC} = 3.0\text{ Vdc}$) | t_{off} | — | 18 | ns |

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

SWITCHING TIME EQUIVALENT TEST CIRCUITS FOR 2N2369, 2N3227

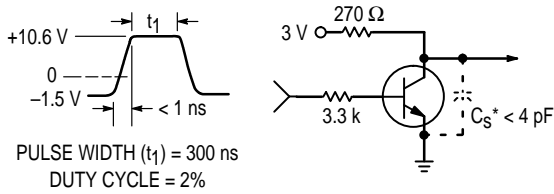


Figure 1. t_{on} Circuit — 10 mA

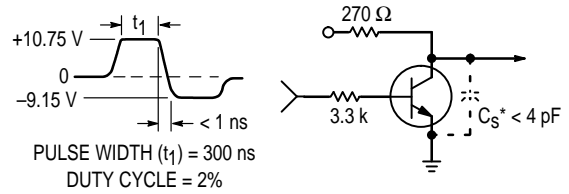


Figure 3. t_{off} Circuit — 10 mA

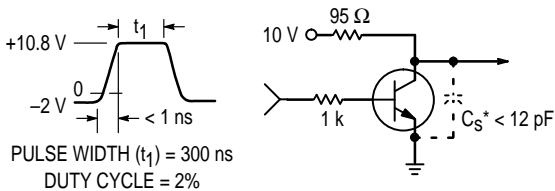


Figure 2. t_{on} Circuit — 100 mA

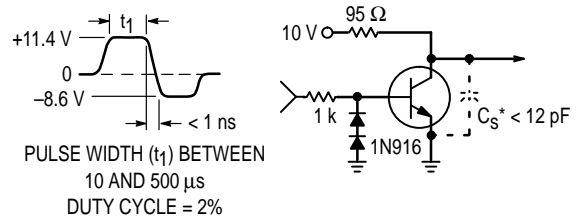


Figure 4. t_{off} Circuit — 100 mA

* Total shunt capacitance of test jig and connectors.

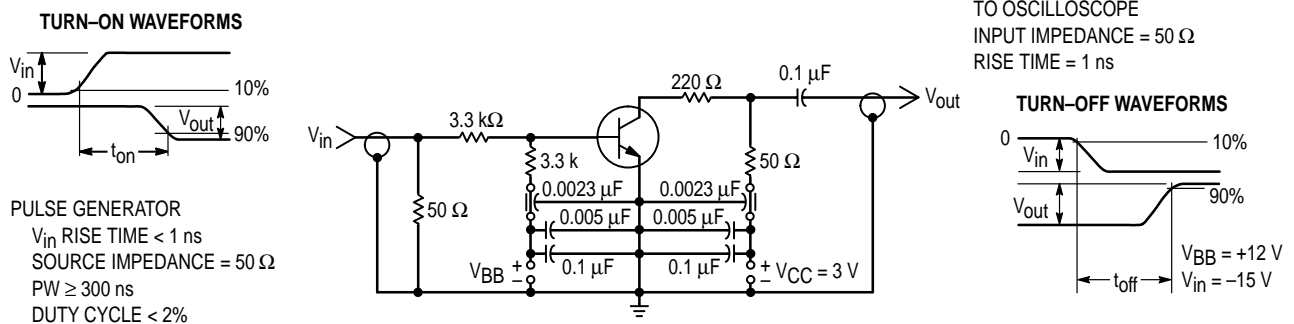


Figure 5. Turn-On and Turn-Off Time Test Circuit

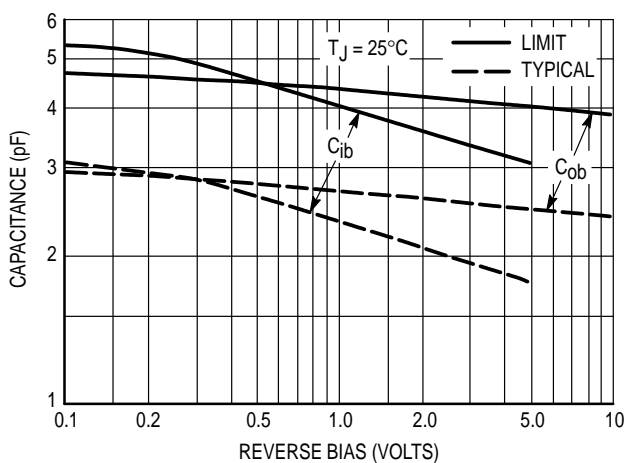


Figure 6. Junction Capacitance Variations

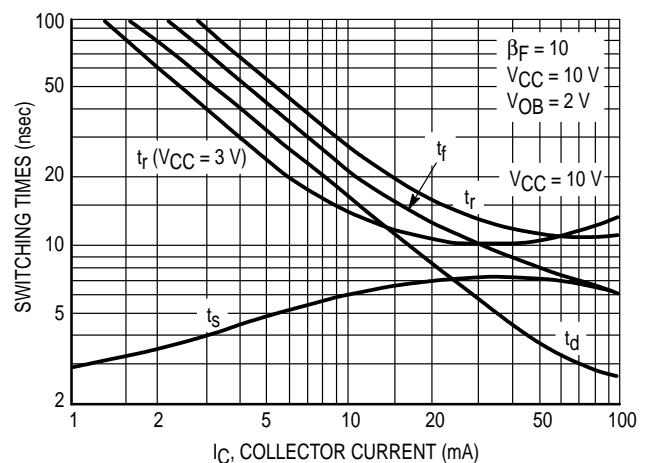


Figure 7. Typical Switching Times

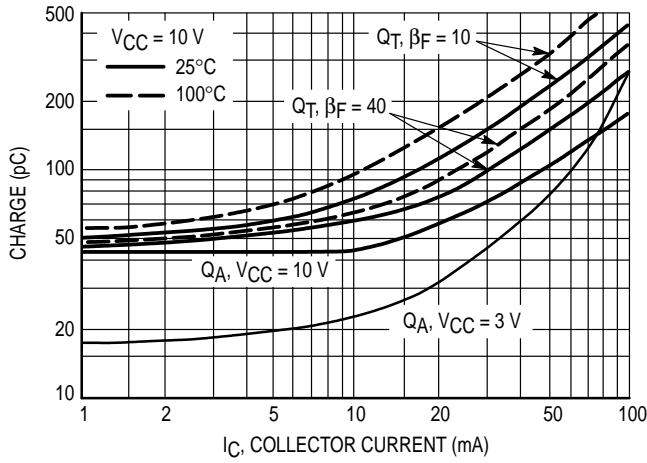


Figure 8. Maximum Charge Data

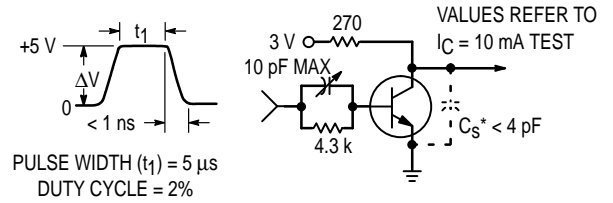


Figure 9. Q_T Test Circuit

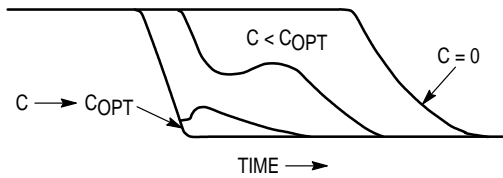


Figure 10. Turn-Off Waveform

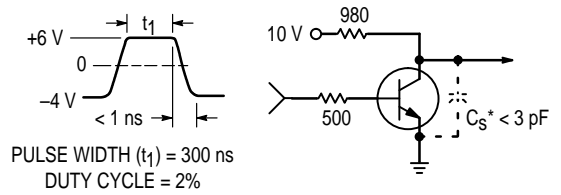


Figure 11. Storage Time Equivalent Test Circuit

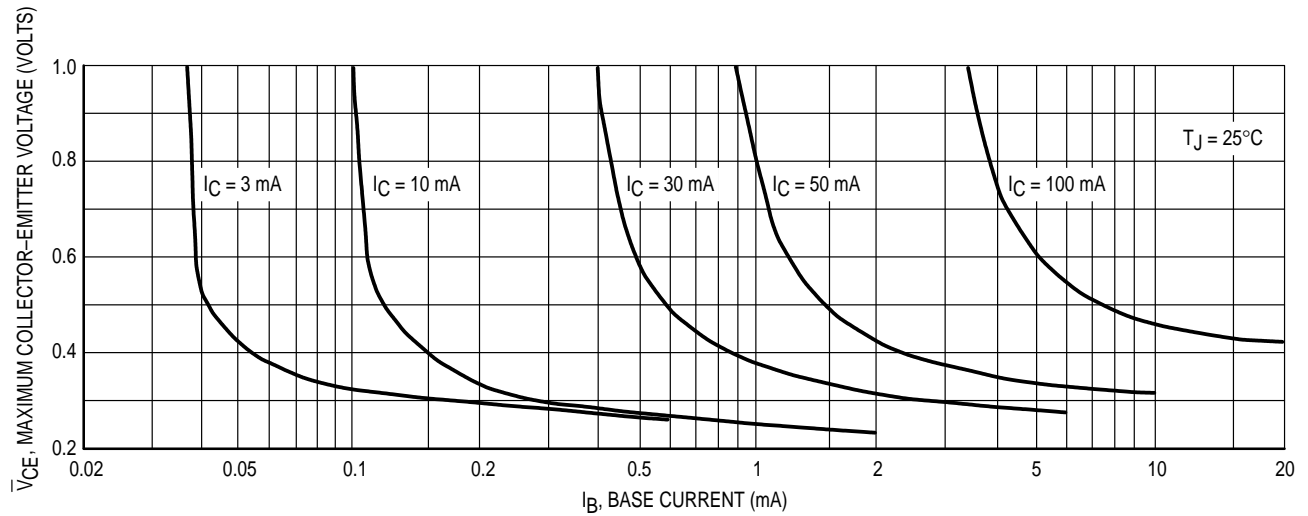


Figure 12. Maximum Collector Saturation Voltage Characteristics

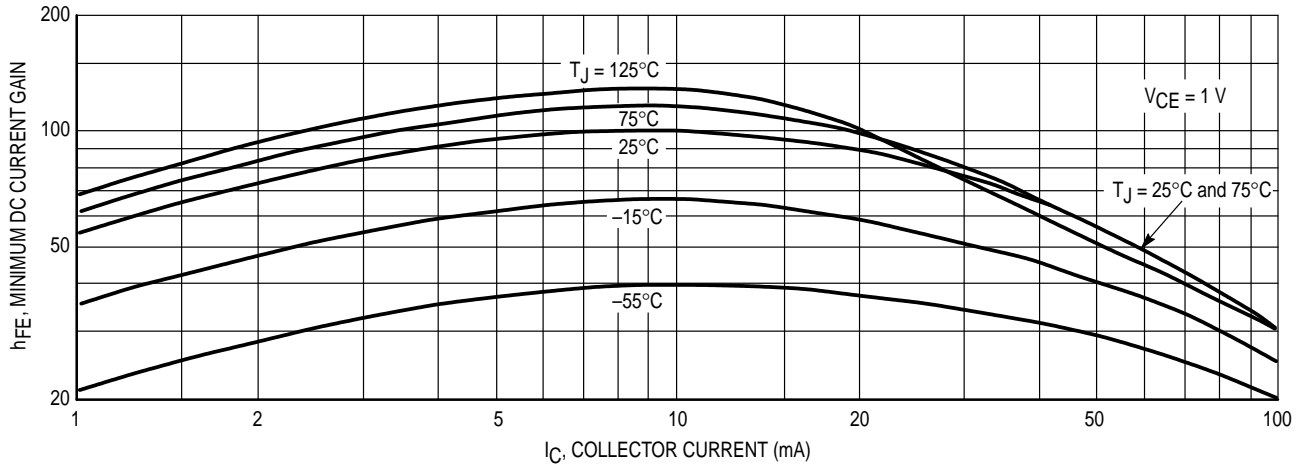


Figure 13. Minimum Current Gain Characteristics

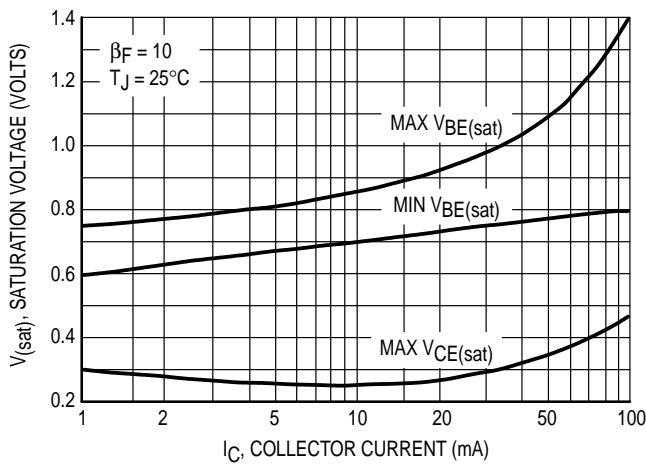


Figure 14. Saturation Voltage Limits

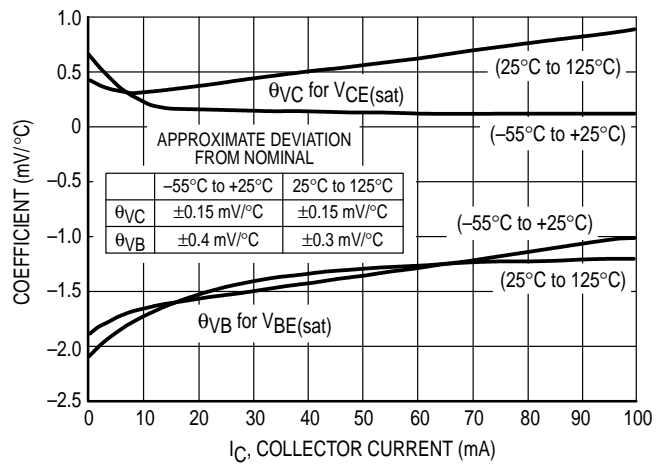
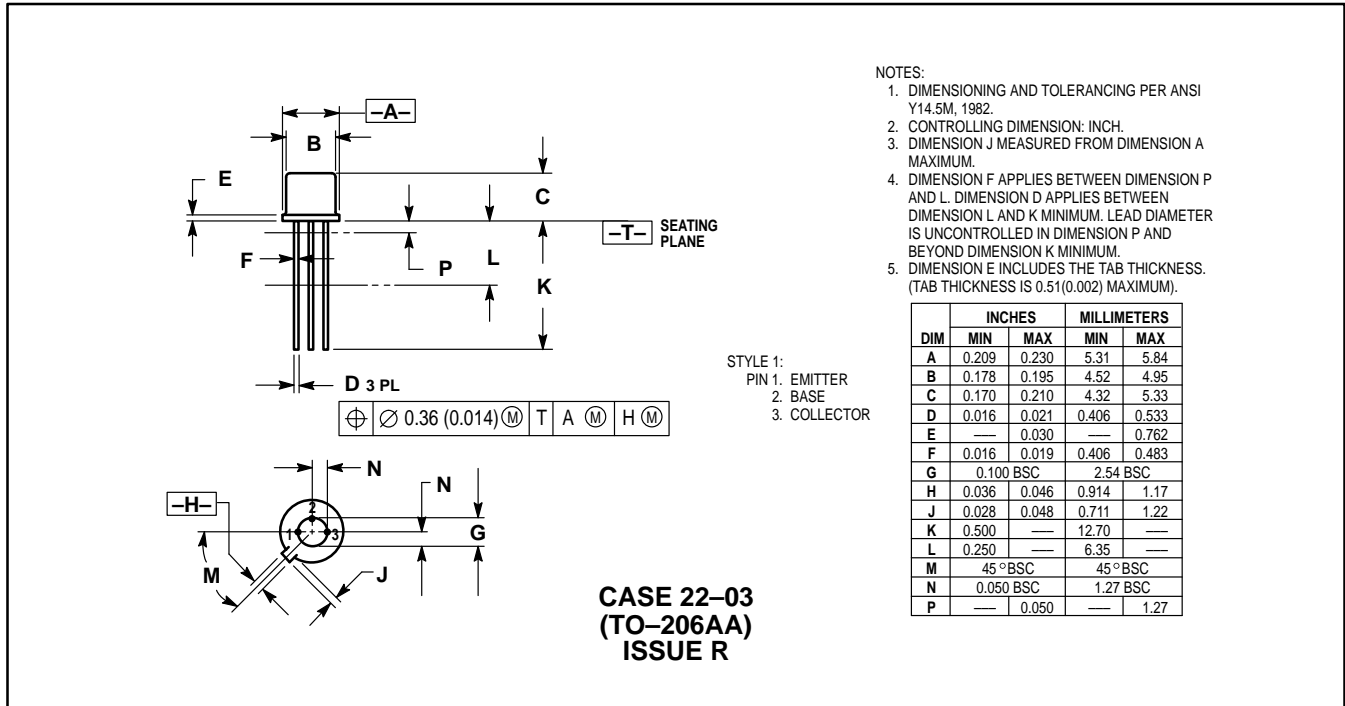


Figure 15. Typical Temperature Coefficients

PACKAGE DIMENSIONS



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