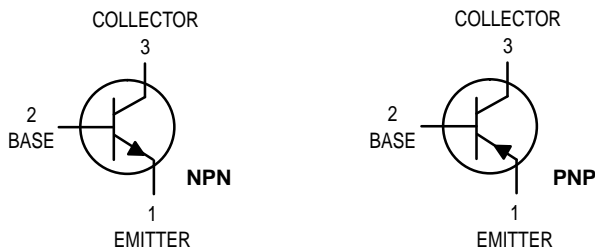


# Amplifier Transistors



**NPN**  
**MPSA05**  
**MPSA06\***  
**PNP**  
**MPSA55**  
**MPSA56\***

Voltage and current are negative  
for PNP transistors

\*Motorola Preferred Device

### MAXIMUM RATINGS

| Rating   | Symbol         | MPSA05<br>MPSA55 | MPSA06<br>MPSA56 | Unit           |
|--|----------------|------------------|------------------|----------------|
| Collector–Emitter Voltage  | $V_{CEO}$      | 60               | 80               | Vdc            |
| Collector–Base Voltage   | $V_{CBO}$      | 60               | 80               | Vdc            |
| Emitter–Base Voltage   | $V_{EBO}$      | 4.0              |                  | Vdc            |
| Collector Current – Continuous   | $I_C$          | 500              |                  | mAdc           |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625              | 5.0              | mW<br>mW/°C    |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.5              | 12               | Watts<br>mW/°C |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | –55 to +150      |                  | °C             |

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol                | Max  | Unit |
|---|-----------------------|------|------|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}^{(1)}$ | 200  | °C/W |
| Thermal Resistance, Junction to Case    | $R_{\theta JC}$       | 83.3 | °C/W |

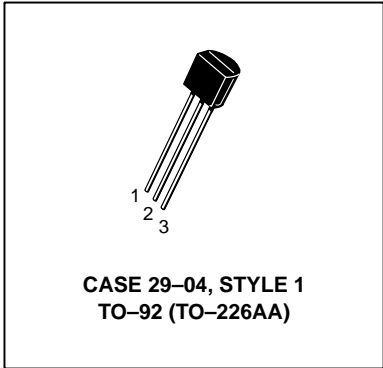
### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

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

### OFF CHARACTERISTICS

|  |                                  |               |          |            |           |
|--|----------------------------------|---------------|----------|------------|-----------|
| Collector–Emitter Breakdown Voltage <sup>(2)</sup><br>( $I_C = 1.0$ mAdc, $I_B = 0$ )            | MPSA05, MPSA55<br>MPSA06, MPSA56 | $V_{(BR)CEO}$ | 60<br>80 | —<br>—     | Vdc       |
| Emitter–Base Breakdown Voltage<br>( $I_E = 100$ $\mu$ Adc, $I_C = 0$ )                           |                                  | $V_{(BR)EBO}$ | 4.0      | —          | Vdc       |
| Collector Cutoff Current<br>( $V_{CE} = 60$ Vdc, $I_B = 0$ )                                     |                                  | $I_{CES}$     | —        | 0.1        | $\mu$ Adc |
| Collector Cutoff Current<br>( $V_{CB} = 60$ Vdc, $I_E = 0$ )<br>( $V_{CB} = 80$ Vdc, $I_E = 0$ ) | MPSA05, MPSA55<br>MPSA06, MPSA56 | $I_{CBO}$     | —<br>—   | 0.1<br>0.1 | $\mu$ Adc |

- $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board.
- Pulse Test: Pulse Width  $\leq 300$   $\mu$ s, Duty Cycle  $\leq 2.0\%$ .



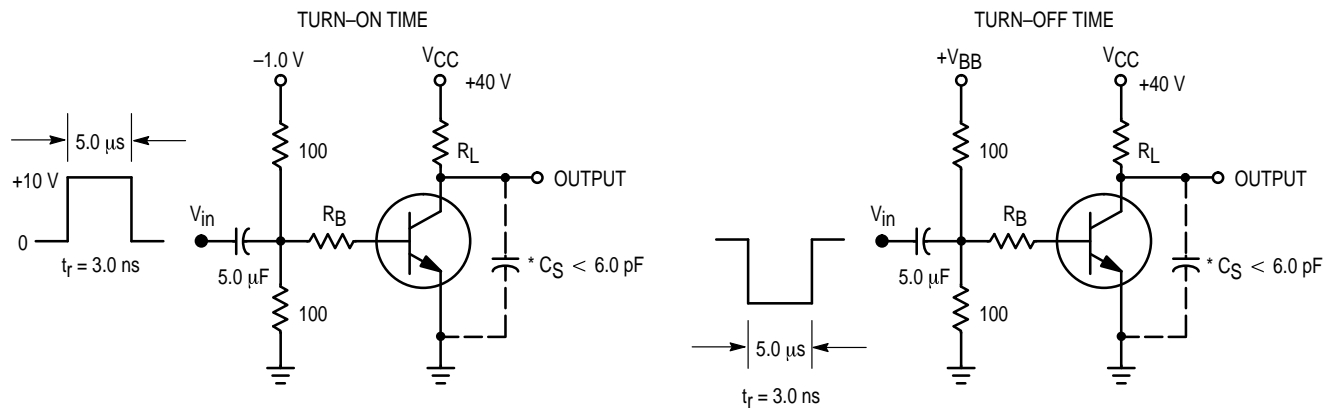
Preferred devices are Motorola recommended choices for future use and best overall value.

# NPN MPSA05 MPSA06 PNP MPSA55 MPSA56

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

| Characteristic   | Symbol        | Min              | Max    | Unit |
|--|---------------|------------------|--------|------|
| <b>ON CHARACTERISTICS</b>  |               |                  |        |      |
| DC Current Gain<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 100\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ )   | $h_{FE}$      | 100<br>100       | —<br>— | —    |
| Collector–Emitter Saturation Voltage<br>( $I_C = 100\text{ mA}$ , $I_B = 10\text{ mA}$ )   | $V_{CE(sat)}$ | —                | 0.25   | Vdc  |
| Base–Emitter On Voltage<br>( $I_C = 100\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ )   | $V_{BE(on)}$  | —                | 1.2    | Vdc  |
| <b>SMALL–SIGNAL CHARACTERISTICS</b>  |               |                  |        |      |
| Current–Gain — Bandwidth Product <sup>(3)</sup><br>( $I_C = 10\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ , $f = 100\text{ MHz}$ )<br><br>( $I_C = 100\text{ mA}$ , $V_{CE} = 1.0\text{ Vdc}$ , $f = 100\text{ MHz}$ ) | $f_T$         | 100<br>50        | —<br>— | MHz  |
|  |               | MPSA05<br>MPSA06 |        |      |
|  |               | MPSA55<br>MPSA56 |        |      |

3.  $f_T$  is defined as the frequency at which  $|h_{fe}|$  extrapolates to unity.



\* Total Shunt Capacitance of Test Jig and Connectors  
For PNP Test Circuits, Reverse All Voltage Polarities

**Figure 1. Switching Time Test Circuits**

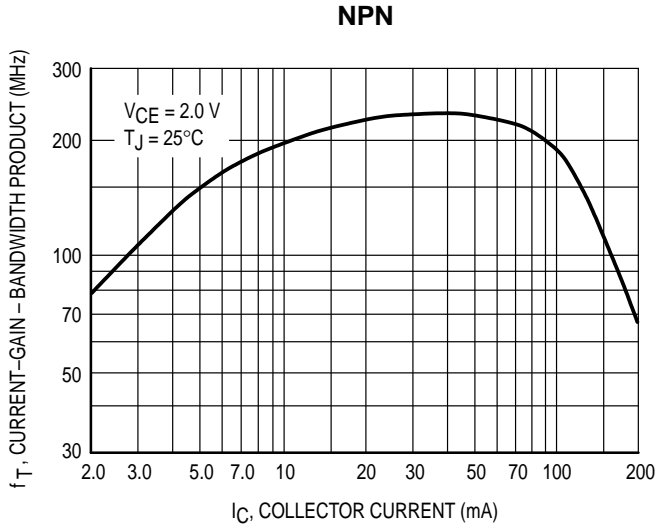


Figure 2. MPSA05/06 Current-Gain — Bandwidth Product

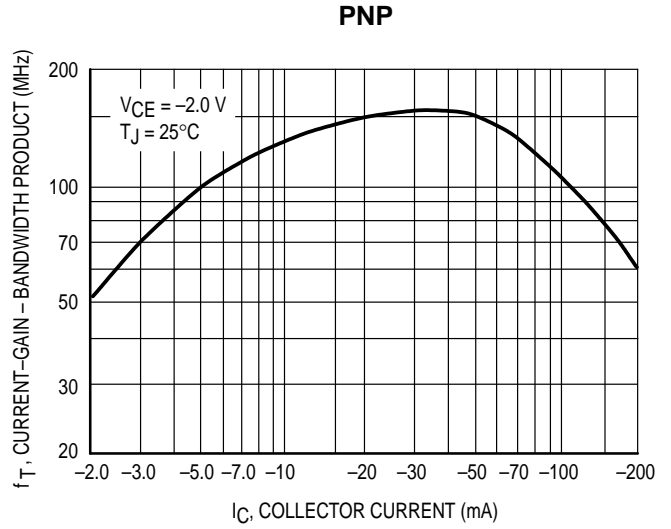


Figure 3. MPSA55/56 Current-Gain — Bandwidth Product

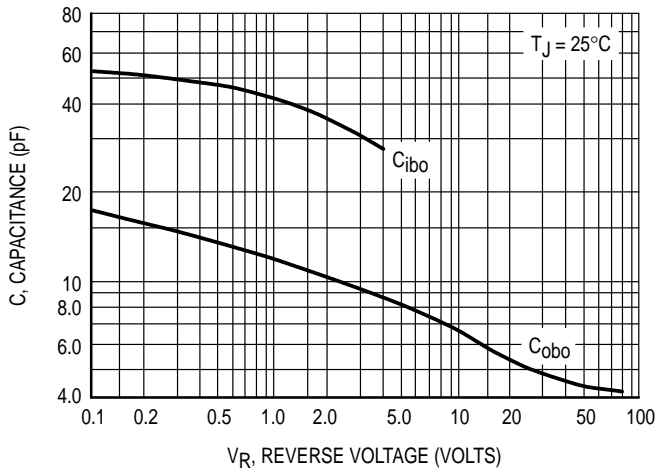


Figure 4. MPSA05/06 Capacitance

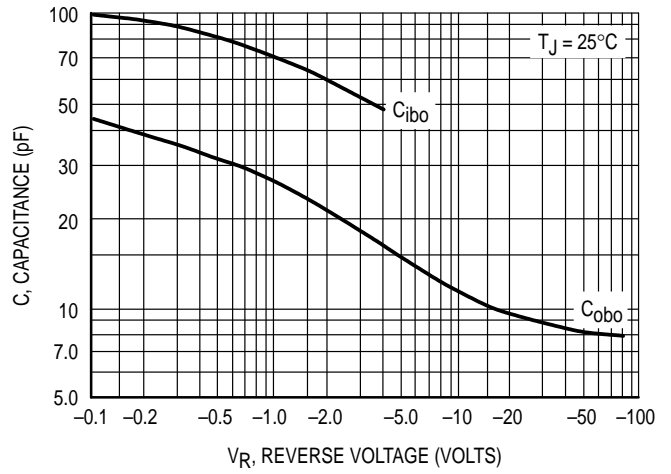


Figure 5. MPSA55/56 Capacitance

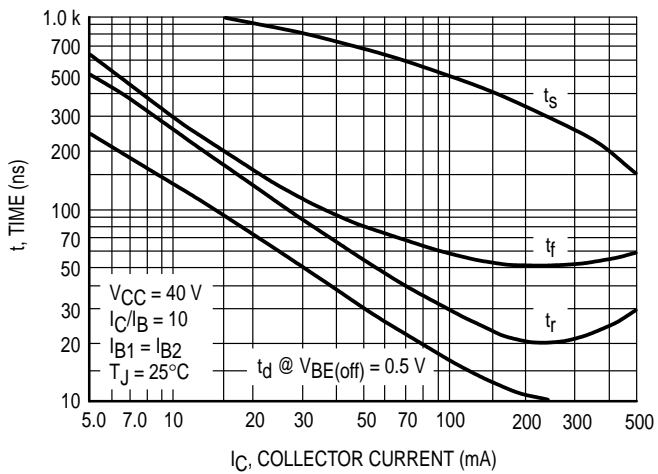


Figure 6. MPSA05/06 Switching Time

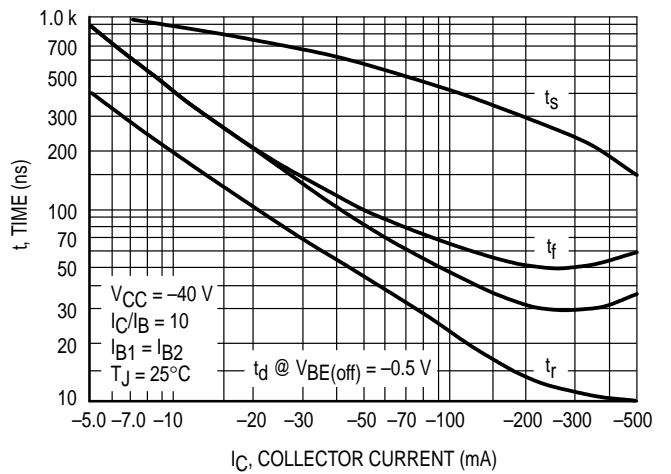


Figure 7. MPSA55/56 Switching Time

NPN

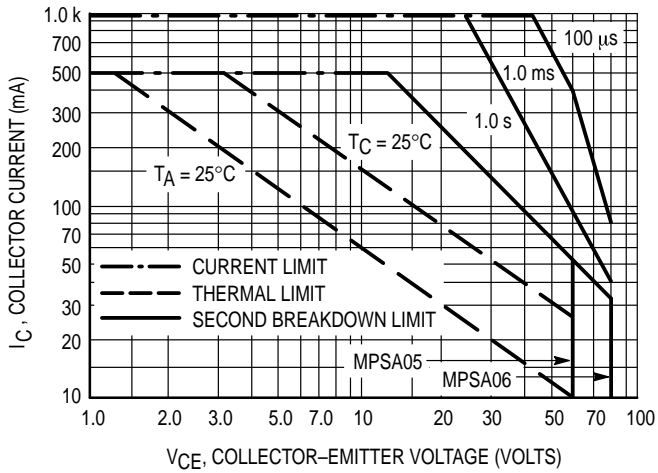


Figure 8. MPSA05/06 Active-Region Safe Operating Area

PNP

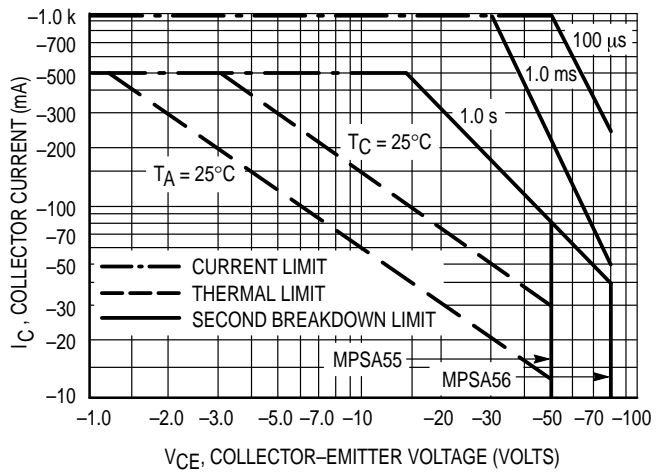


Figure 9. MPSA55/56 Active-Region Safe Operating Area

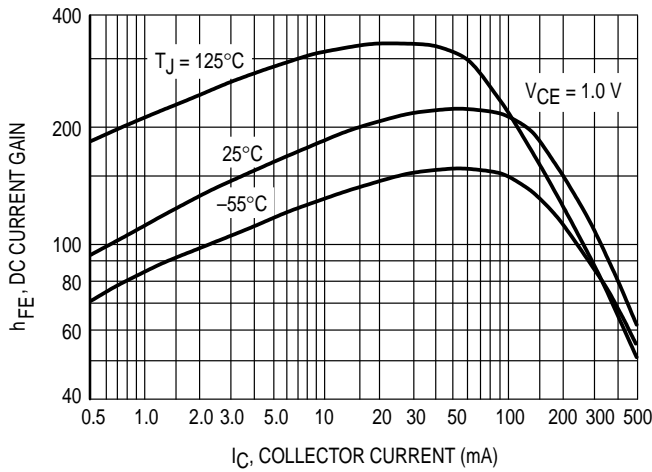


Figure 10. MPSA05/06 DC Current Gain

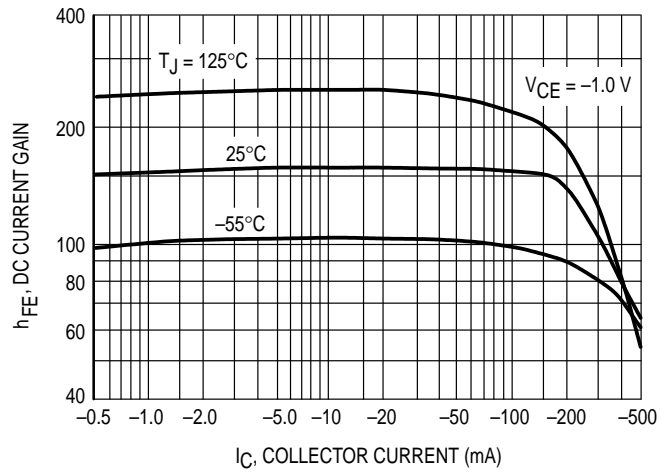


Figure 11. MPSA55/56 DC Current Gain

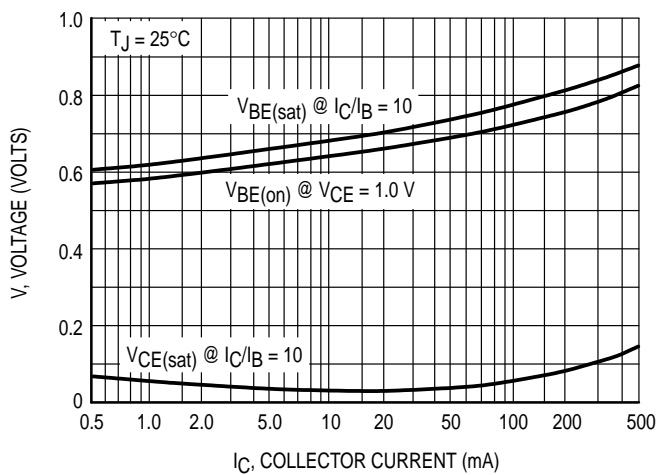


Figure 12. MPSA05/06 "ON" Voltages

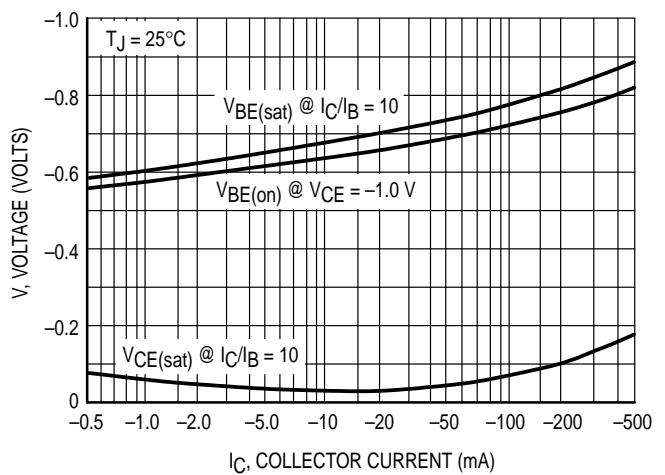


Figure 13. MPSA55/56 "ON" Voltages

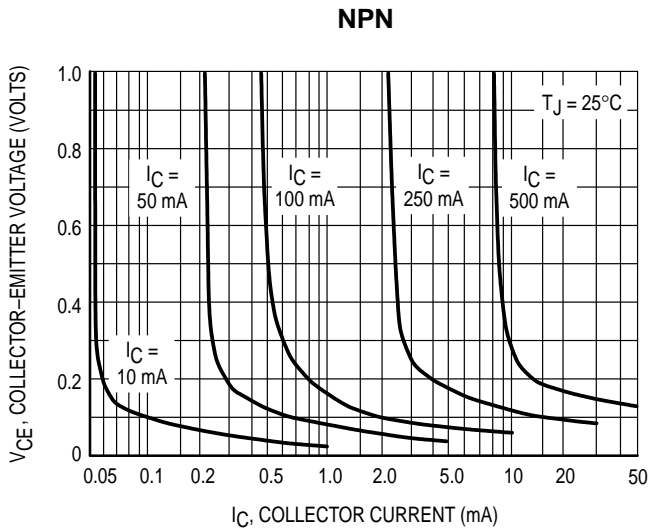


Figure 14. MPSA05/06 Collector Saturation Region

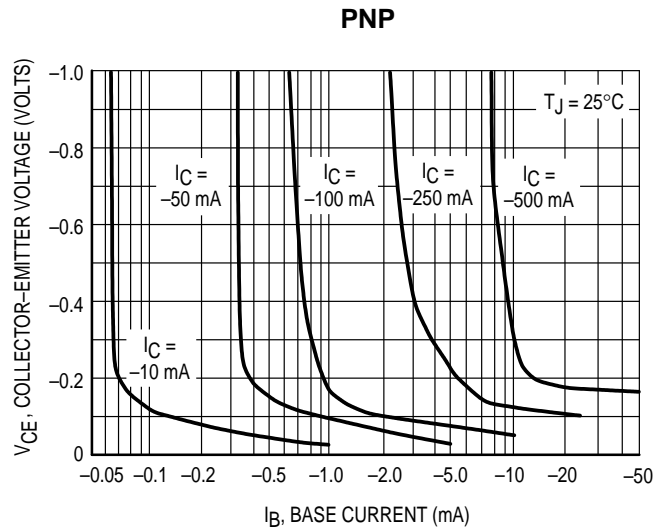


Figure 15. MPSA55/56 Collector Saturation Region

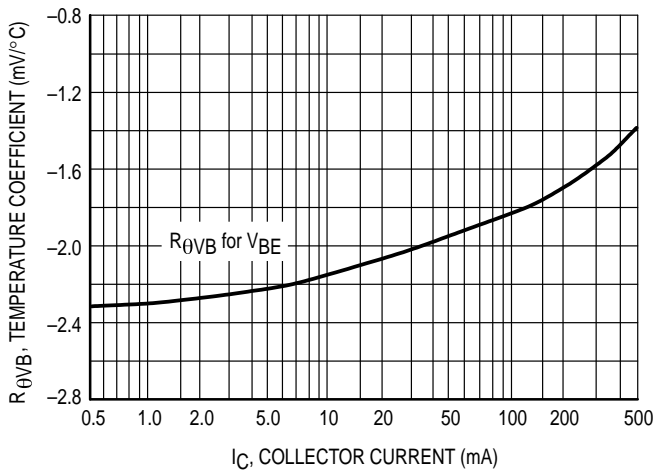


Figure 16. MPSA05/06 Base-Emitter Temperature Coefficient

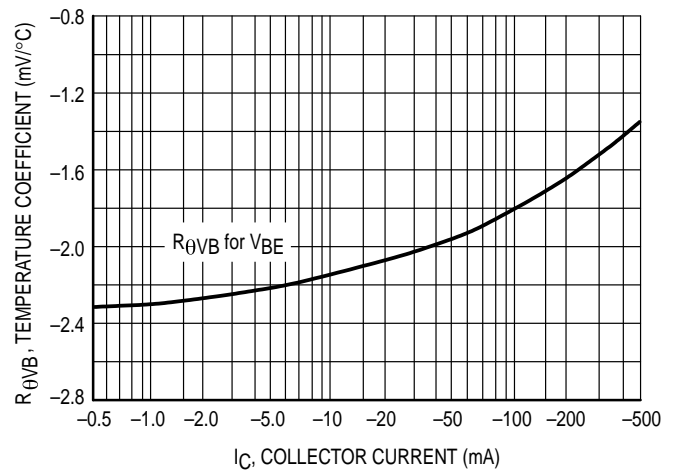


Figure 17. MPSA55/56 Base-Emitter Temperature Coefficient

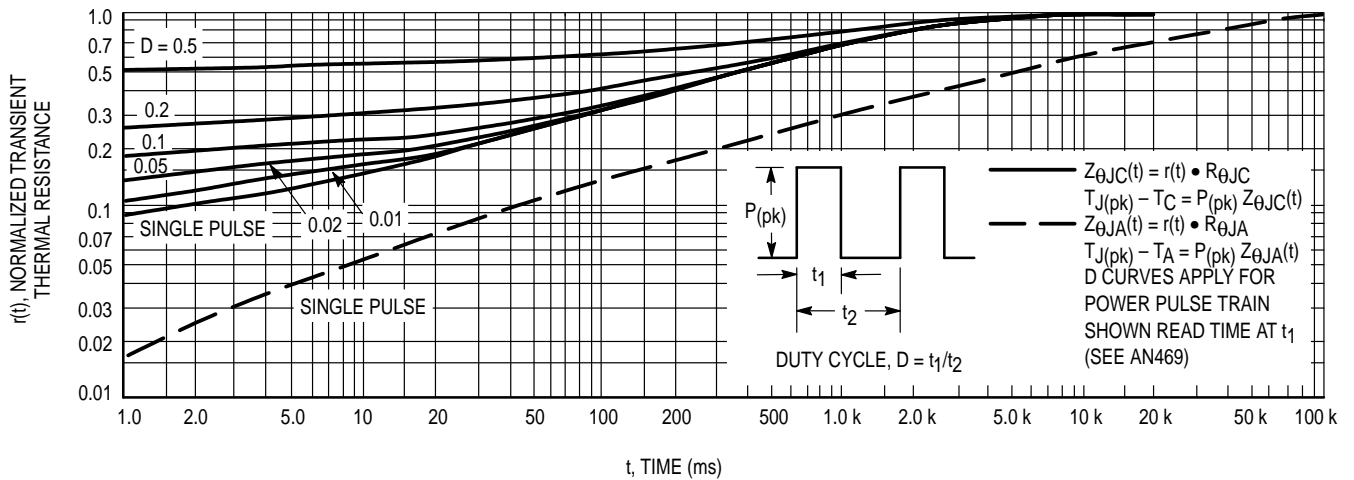


Figure 18. MPSA05, MPSA06, MPSA55 and MPSA56 Thermal Response

PACKAGE DIMENSIONS



CASE 029-04  
(TO-226AA)  
ISSUE AD

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K. MINIMUM LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.175  | 0.205 | 4.45        | 5.20 |
| B   | 0.170  | 0.210 | 4.32        | 5.33 |
| C   | 0.125  | 0.165 | 3.18        | 4.19 |
| D   | 0.016  | 0.022 | 0.41        | 0.55 |
| F   | 0.016  | 0.019 | 0.41        | 0.48 |
| G   | 0.045  | 0.055 | 1.15        | 1.39 |
| H   | 0.095  | 0.105 | 2.42        | 2.66 |
| J   | 0.015  | 0.020 | 0.39        | 0.50 |
| K   | 0.500  | —     | 12.70       | —    |
| L   | 0.250  | —     | 6.35        | —    |
| N   | 0.080  | 0.105 | 2.04        | 2.66 |
| P   | —      | 0.100 | —           | 2.54 |
| R   | 0.115  | —     | 2.93        | —    |
| V   | 0.135  | —     | 3.43        | —    |

STYLE 1:

1. EMITTER
2. BASE
3. COLLECTOR

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