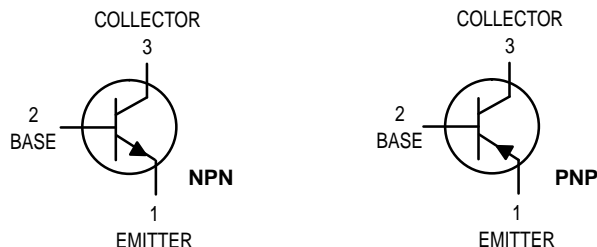


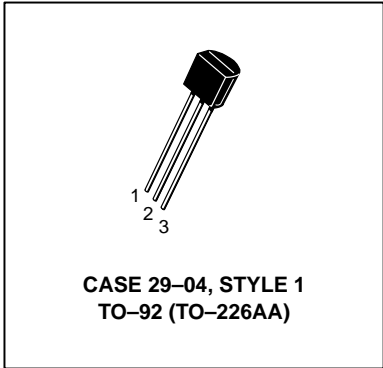
Amplifier Transistors



NPN
MPS6601
MPS6602*
PNP
MPS6651
MPS6652*

Voltage and current are negative
for PNP transistors

*Motorola Preferred Device



MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|----------------|----------------|----------------|
| Collector–Emitter Voltage MPS6601/6651 MPS6602/6652 | V_{CE0} | 25 40 | Vdc |
| Collector–Base Voltage MPS6601/6651 MPS6602/6652 | V_{CBO} | 25 30 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 4.0 | Vdc |
| Collector Current — Continuous | I_C | 1000 | mAdc |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 625 5.0 | mW mW/°C |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.5 12 | Watts mW/°C |
| Operating and Storage Junction 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 ($I_C = 1.0 \text{ mAdc}, I_B = 0$) | $V_{(BR)CEO}$ | 25 40 | — — | Vdc |
| Collector–Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}, I_E = 0$) | $V_{(BR)CBO}$ | 25 40 | — — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$) | $V_{(BR)EBO}$ | 4.0 | — | Vdc |
| Collector Cutoff Current ($V_{CE} = 25 \text{ Vdc}, I_B = 0$) ($V_{CE} = 30 \text{ Vdc}, I_B = 0$) | I_{CES} | — — | 0.1 0.1 | μAdc |
| Collector Cutoff Current ($V_{CB} = 25 \text{ Vdc}, I_E = 0$) ($V_{CB} = 30 \text{ Vdc}, I_E = 0$) | I_{CBO} | — — | 0.1 0.1 | μAdc |

1. $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.

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

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

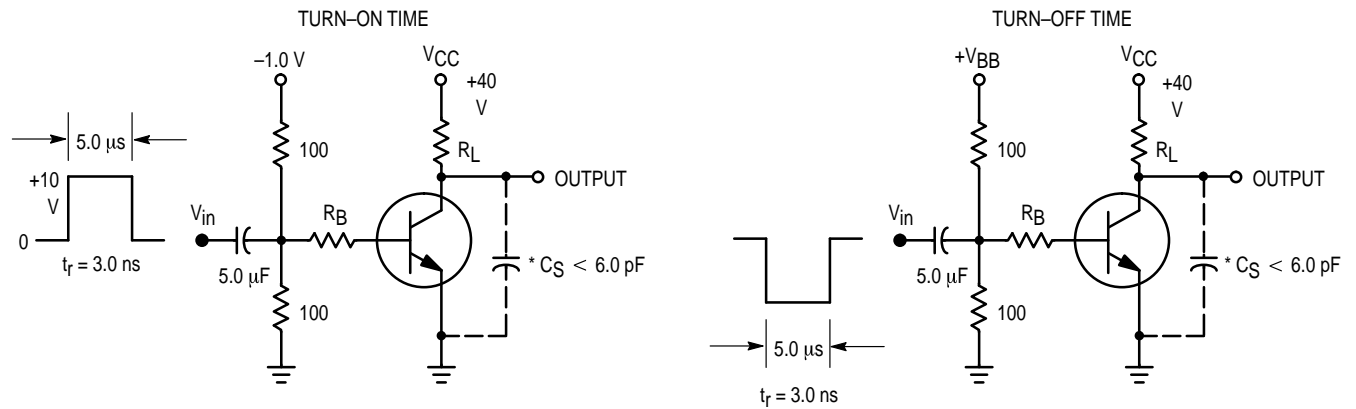
| Characteristic | Symbol | Min | Max | Unit |
|---|---------------|----------------|-------------|------|
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 100\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 500\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 1000\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) | h_{FE} | 50 50 30 | — — — | — |
| Collector–Emitter Saturation Voltage ($I_C = 1000\text{ mAdc}$, $I_B = 100\text{ mAdc}$) | $V_{CE(sat)}$ | — | 0.6 | Vdc |
| Base–Emitter On Voltage ($I_C = 500\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) | $V_{BE(on)}$ | — | 1.2 | Vdc |

SMALL–SIGNAL CHARACTERISTICS

| | | | | |
|--|-----------|-----|----|-----|
| Current–Gain — Bandwidth Product ($I_C = 50\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 100\text{ MHz}$) | f_T | 100 | — | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{obo} | — | 30 | pF |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|--|-------|---|-----|----|
| Delay Time | $(V_{CC} = 40\text{ Vdc}$, $I_C = 500\text{ mAdc}$, $I_{B1} = 50\text{ mAdc}$, $t_p \geq 300\text{ ns}$ Duty Cycle) | t_d | — | 25 | ns |
| Rise Time | | t_r | — | 30 | ns |
| Storage Time | | t_s | — | 250 | ns |
| Fall Time | | t_f | — | 50 | ns |



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

Figure 1. Switching Time Test Circuits

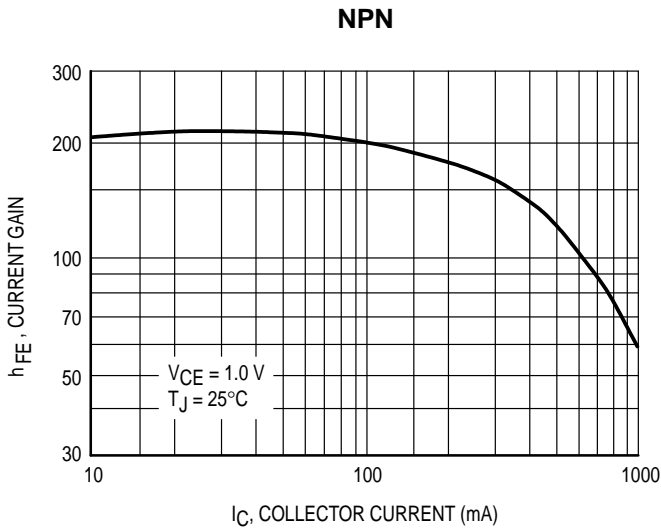


Figure 2. MPS6601/6602 DC Current Gain

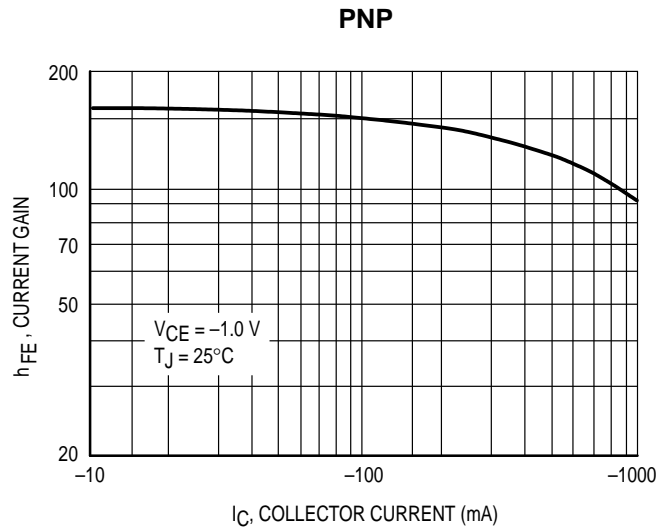


Figure 3. MPS6651/6652 DC Current Gain

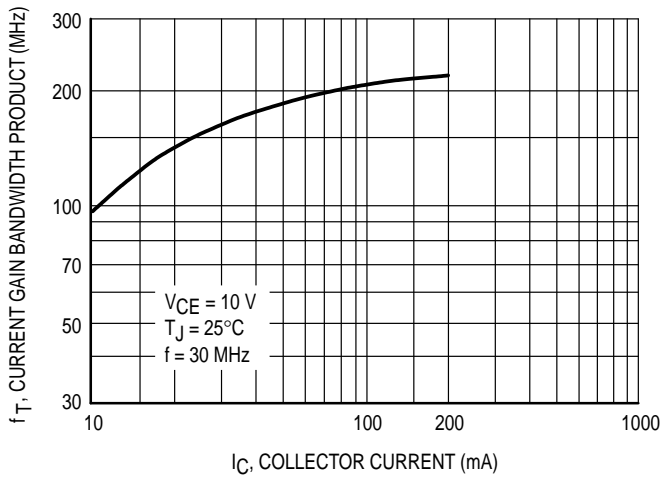


Figure 4. Current Gain Bandwidth Product

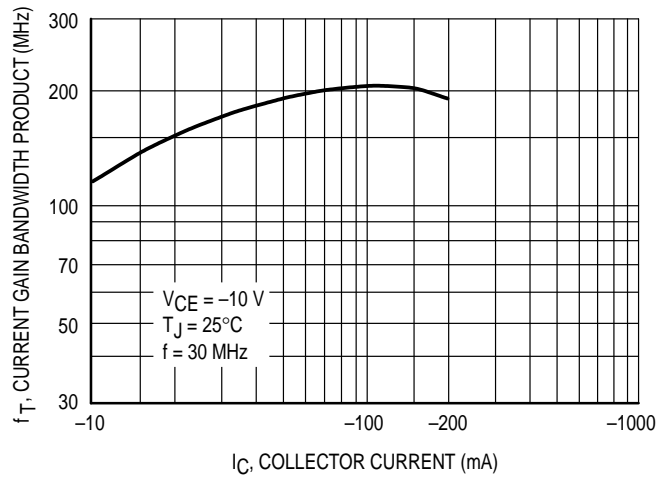


Figure 5. Current Gain Bandwidth Product

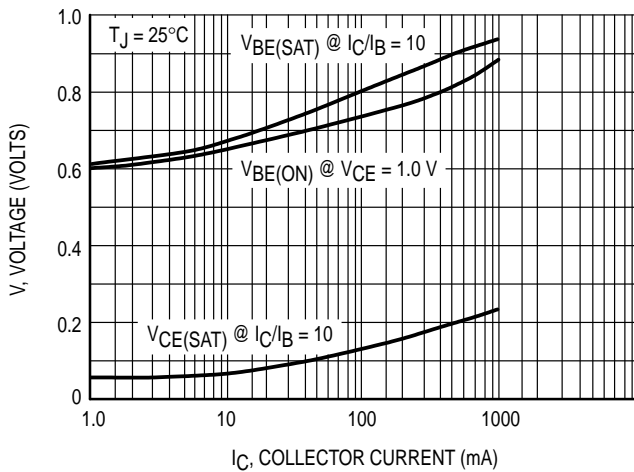


Figure 6. On Voltages

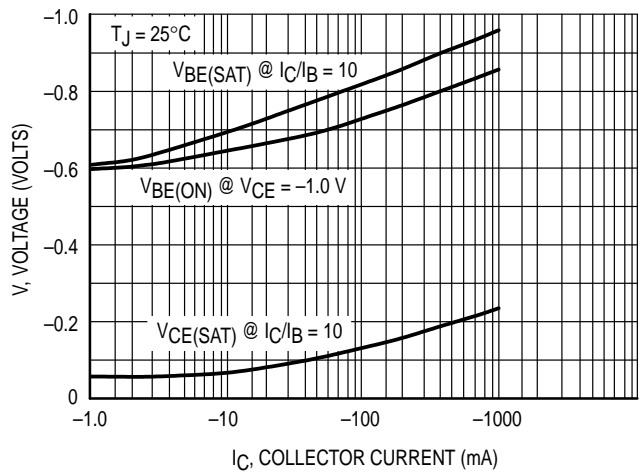
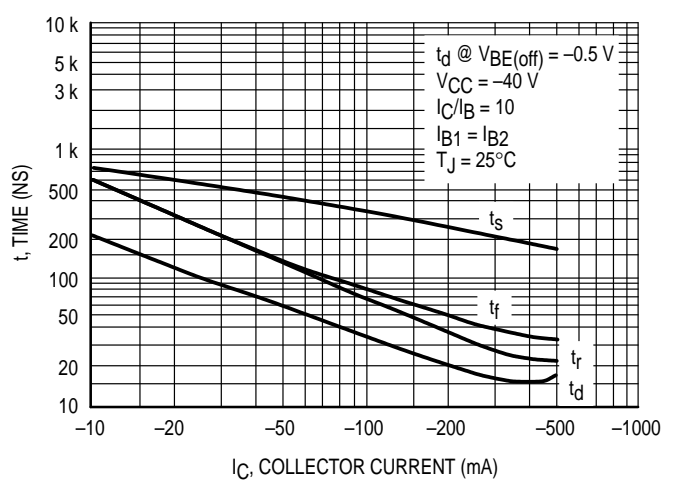
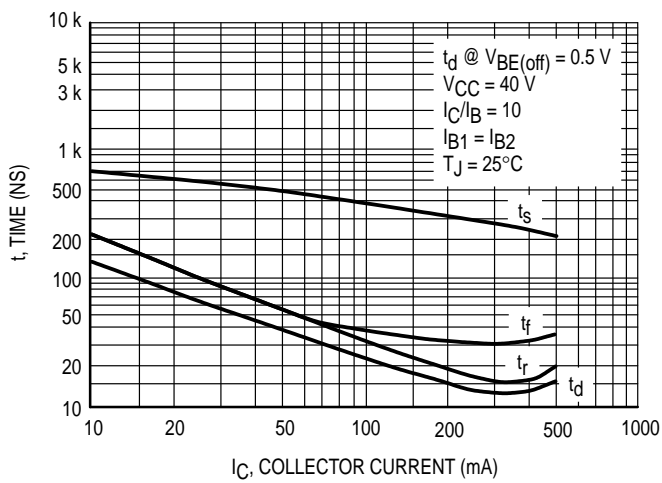
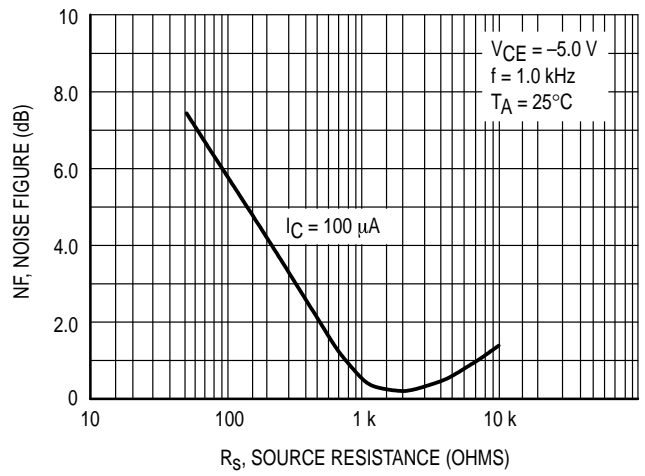
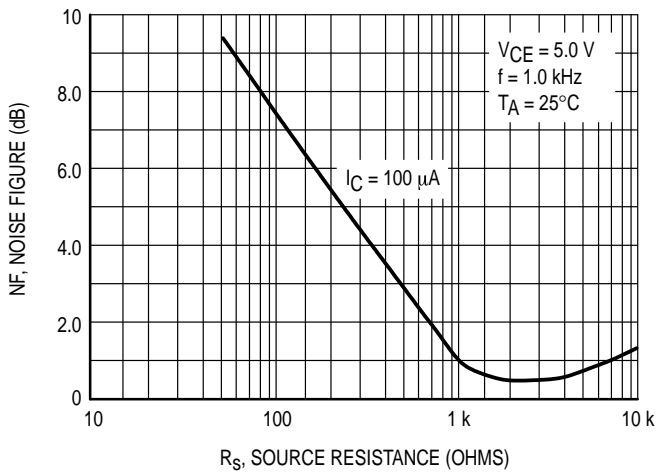
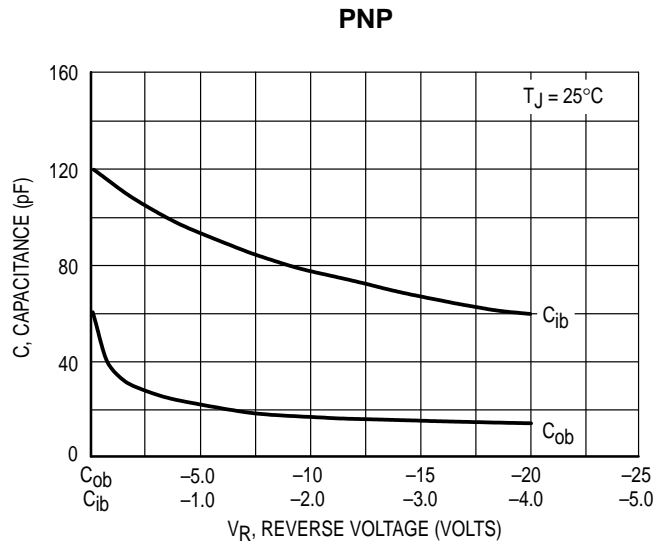
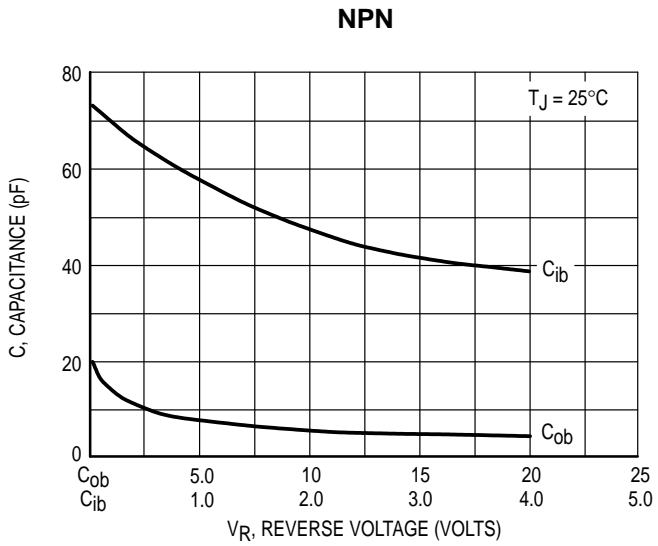


Figure 7. On Voltages



NPN

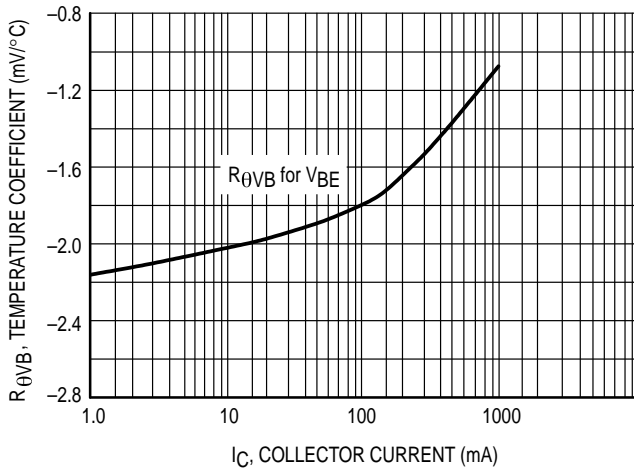


Figure 14. Base-Emitter Temperature Coefficient

PNP

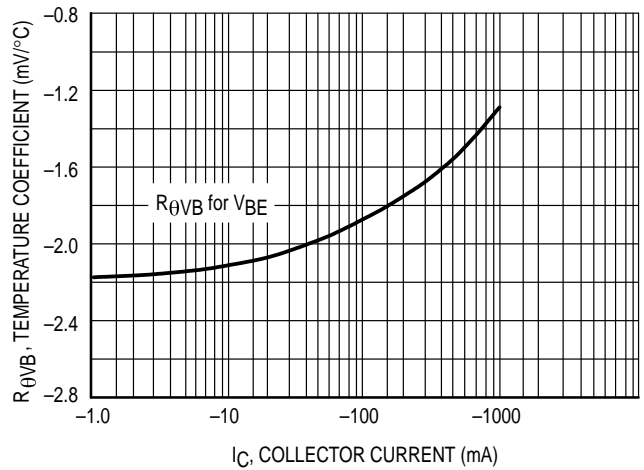


Figure 15. Base-Emitter Temperature Coefficient

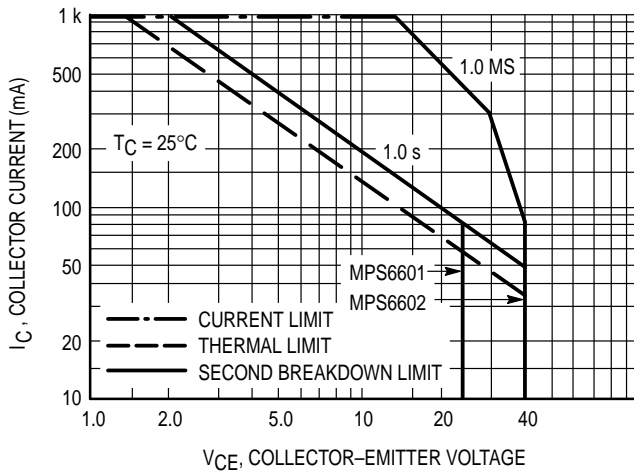


Figure 16. Safe Operating Area

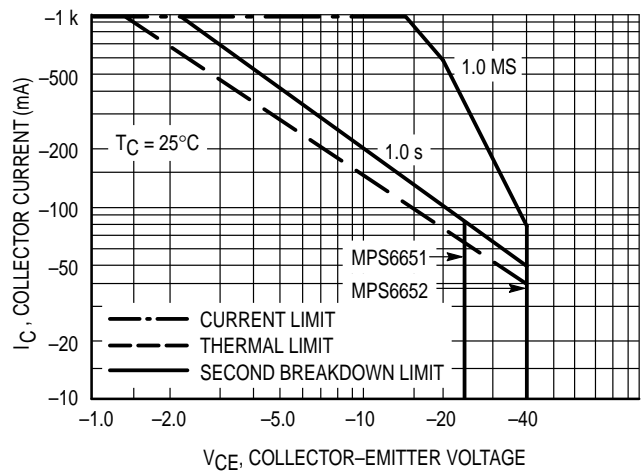


Figure 17. Safe Operating Area

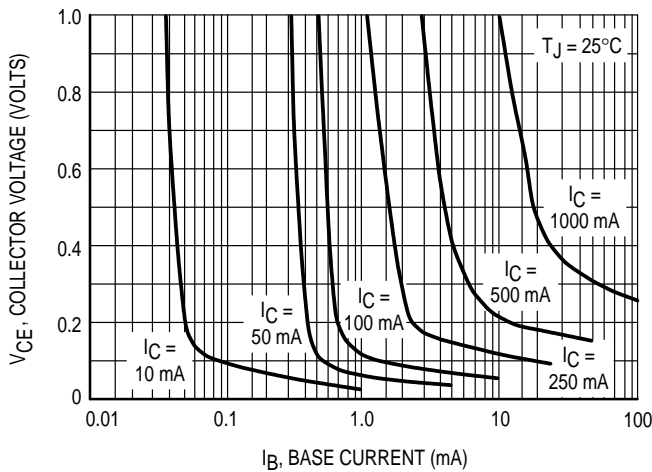


Figure 18. MPS6601/6602 Saturation Region

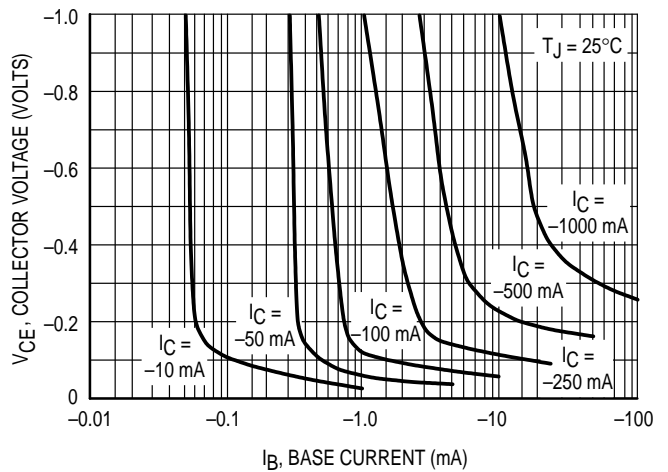


Figure 19. MPS6651/6652 Saturation Region

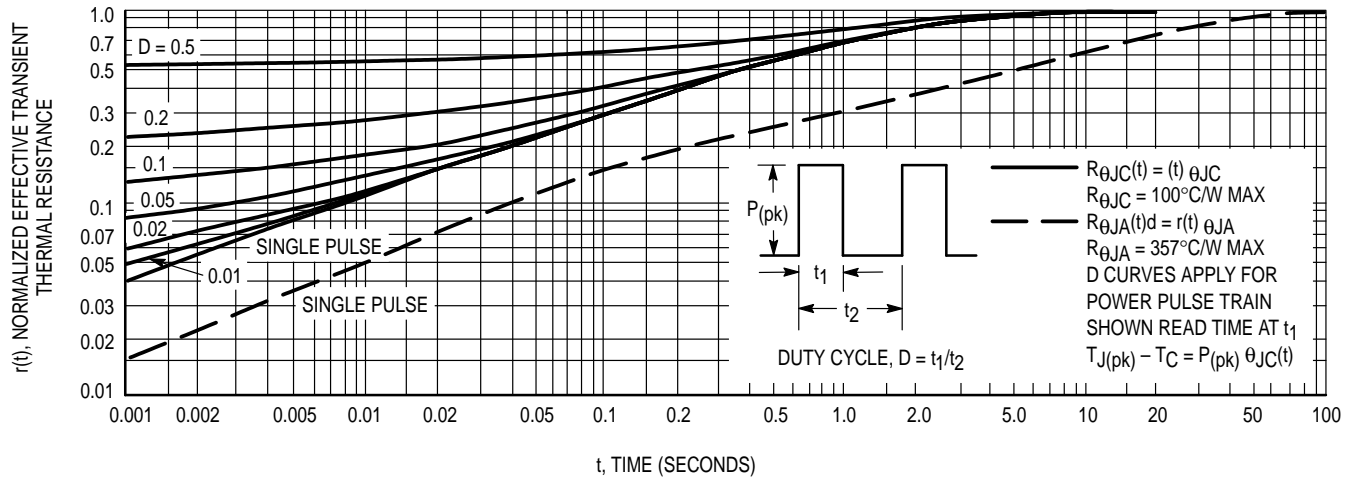
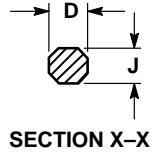
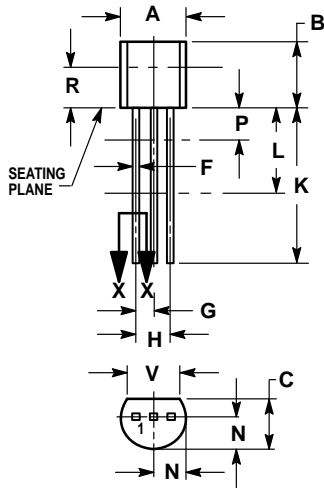


Figure 20. Thermal Response

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:

- PIN 1. EMITTER
2. BASE
3. COLLECTOR

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MPS6601/D

