THINKI SEMICONDUCTOR ®

Pb Free Plating Product

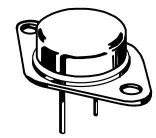
# MJ21195G/MJ21196G

RoHS Pb

## 250 Watt Silicon Type Metal Package Power Transistor

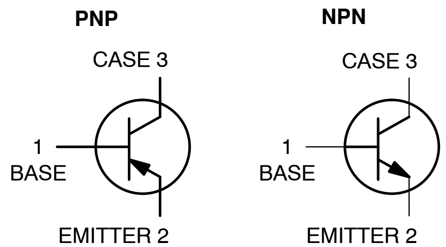
The MJ21195 and MJ21196 utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

- Total Harmonic Distortion Characterized
- High DC Current Gain – $h_{FE}$ = 25 Min @ $I_C$ = 8 Adc
- Excellent Gain Linearity
- High SOA: 3 A, 80 V, 1 Second



CASE 1–07
TO–204AA
(TO–3)

**SCHEMATIC**




**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 250 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 400 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 5 | Vdc |
| Collector–Emitter Voltage – 1.5 V | $V_{CEX}$ | 400 | Vdc |
| Collector Current — Continuous<br>Peak (1) | $I_C$ | 16<br>30 | Adc |
| Base Current — Continuous | $I_B$ | 5 | Adc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate Above 25°C | $P_D$ | 250<br>1.43 | Watts<br>W/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | – 65 to +200 | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 0.7 | °C/W |

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C ± 5°C unless otherwise noted)

| Characteristic | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Sustaining Voltage<br>($I_C$ = 100 mAdc, $I_B$ = 0) | $V_{CEO(sus)}$ | 250 | — | — | Vdc |
| Collector Cutoff Current<br>($V_{CE}$ = 200 Vdc, $I_B$ = 0) | $I_{CEO}$ | — | — | 100 | μAdc |

(1) Pulse Test: Pulse Width = 5 μs, Duty Cycle ≤10%.

(continued)

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Emitter Cutoff Current ($V_{CE}$ = 5 Vdc, $I_C$ = 0) | $I_{EBO}$ | — | — | 100 | μAdc |
| Collector Cutoff Current ($V_{CE}$ = 250 Vdc, $V_{BE(off)}$ = 1.5 Vdc) | $I_{CEX}$ | — | — | 100 | μAdc |
| **SECOND BREAKDOWN** | | | | | |
| Second Breakdown Collector Current with Base Forward Biased | $I_{S/b}$ | | | | Adc |
| ($V_{CE}$ = 50 Vdc, t = 1 s (non–repetitive) | | 5 | — | — | |
| ($V_{CE}$ = 80 Vdc, t = 1 s (non–repetitive) | | 2.5 | — | — | |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain | $h_{FE}$ | | | 75 | |
| ($I_C$ = 8 Adc, $V_{CE}$ = 5 Vdc) | | 25 | — | | |
| ($I_C$ = 16 Adc, $V_{CE}$ = 5 Vdc) | | 8 | — | | |
| Base–Emitter On Voltage ($I_C$ = 8 Adc, $V_{CE}$ = 5 Vdc) | $V_{BE(on)}$ | — | — | 2.2 | Vdc |
| Collector–Emitter Saturation Voltage | $V_{CE(sat)}$ | | | | Vdc |
| ($I_C$ = 8 Adc, $I_B$ = 0.8 Adc) | | — | — | 1.4 | |
| ($I_C$ = 16 Adc, $I_B$ = 3.2 Adc) | | — | — | 4 | |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Total Harmonic Distortion at the Output | $T_{HD}$ | | | | % |
| $V_{RMS}$ = 28.3 V, f = 1 kHz, $P_{LOAD}$ = 100 $W_{RMS}$ — $h_{FE}$ unmatched | | — | 0.8 | — | |
| (Matched pair $h_{FE}$ = 50 @ 5 A/5 V) — $h_{FE}$ matched | | — | 0.08 | — | |
| Current Gain Bandwidth Product ($I_C$ = 1 Adc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 1 MHz) | $f_T$ | 4 | — | — | MHz |
| Output Capacitance ($V_{CB}$ = 10 Vdc, $I_E$ = 0, $f_{test}$ = 1 MHz) | $C_{ob}$ | — | — | 500 | pF |

(1) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤2%

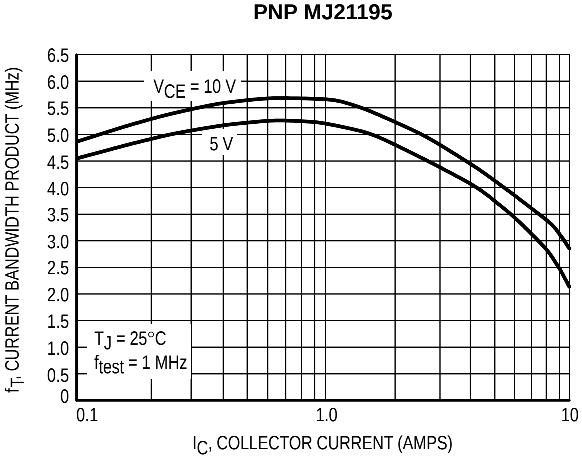



**Figure 1. Typical Current Gain Bandwidth Product**

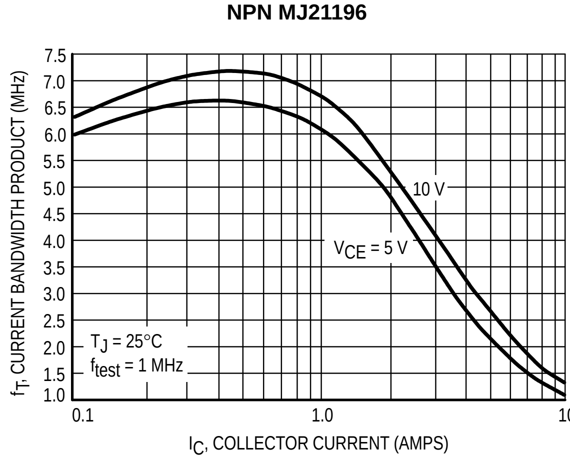



**Figure 2. Typical Current Gain Bandwidth Product**

**PNP MJ21195**

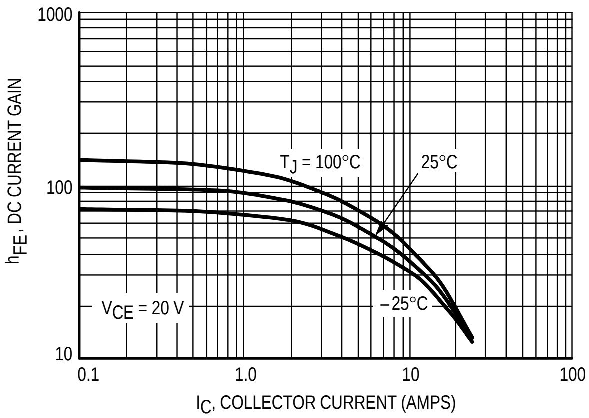



**Figure 3. DC Current Gain, $V_{CE}$ = 20 V**

**NPN MJ21196**

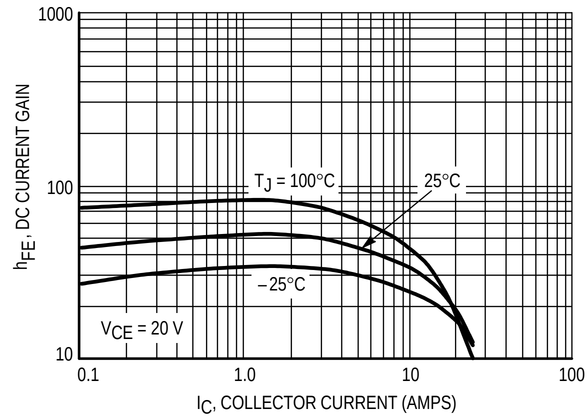



**Figure 4. DC Current Gain, $V_{CE}$ = 20 V**

**PNP MJ21195**

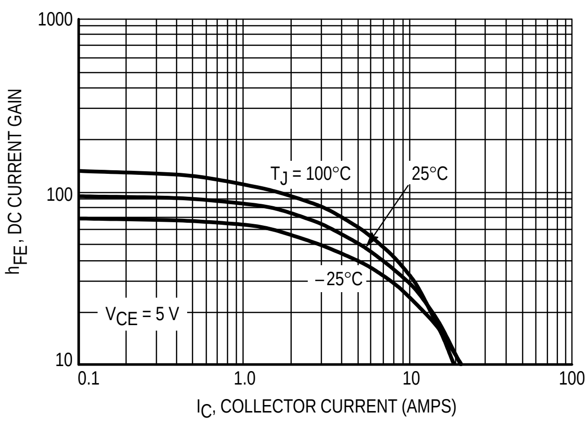



**Figure 5. DC Current Gain, $V_{CE}$ = 5 V**

**NPN MJ21196**

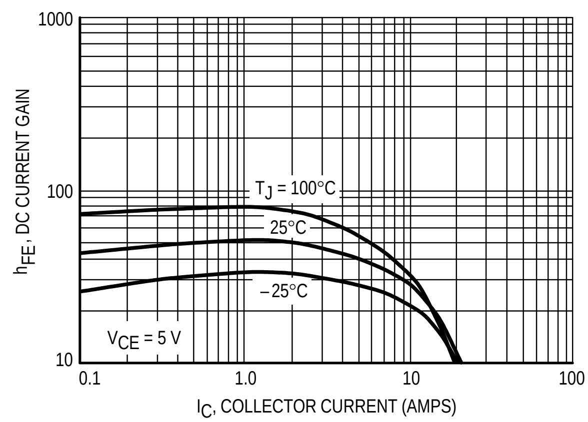



**Figure 6. DC Current Gain, $V_{CE}$ = 5 V**

**PNP MJ21195**

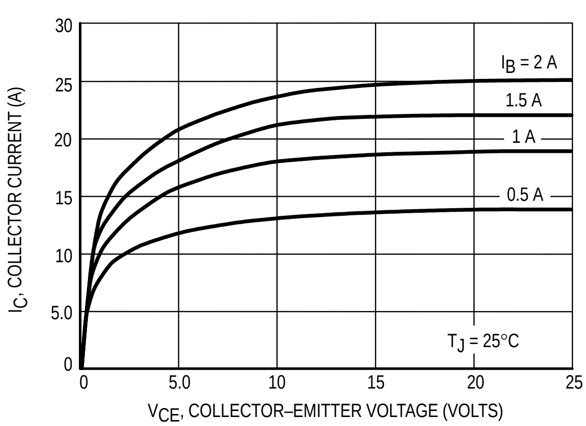



**Figure 7. Typical Output Characteristics**

**NPN MJ21196**

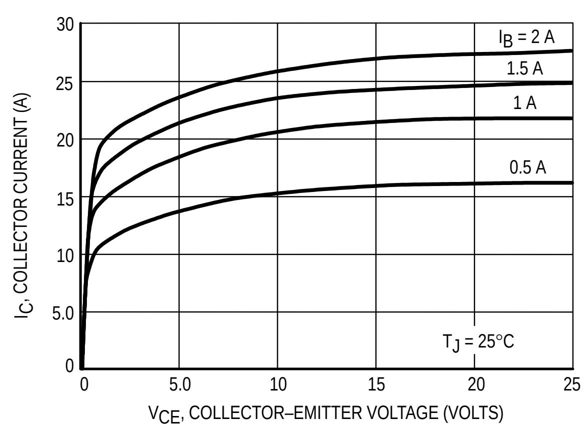



**Figure 8. Typical Output Characteristics**

## TYPICAL CHARACTERISTICS

**PNP MJ21195**

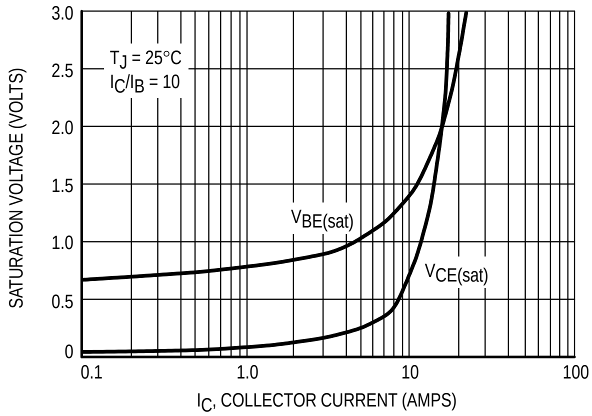



**Figure 9. Typical Saturation Voltages**

**NPN MJ21196**

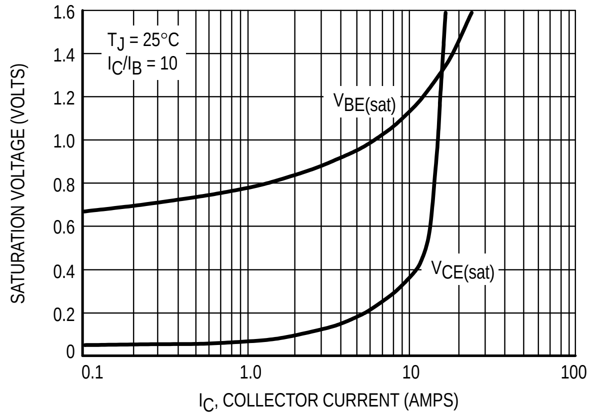



**Figure 10. Typical Saturation Voltages**

**PNP MJ21195**

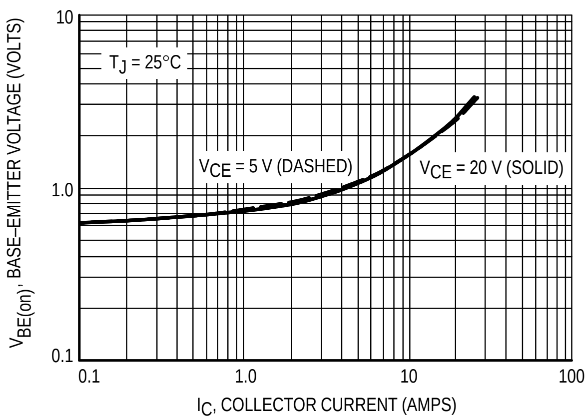



**Figure 11. Typical Base–Emitter Voltage**

**NPN MJ21196**

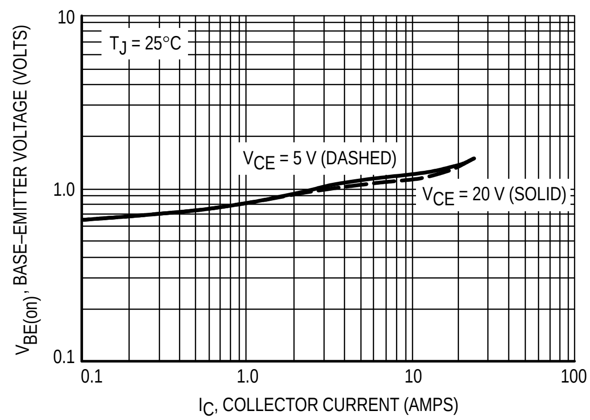



**Figure 12. Typical Base–Emitter Voltage**

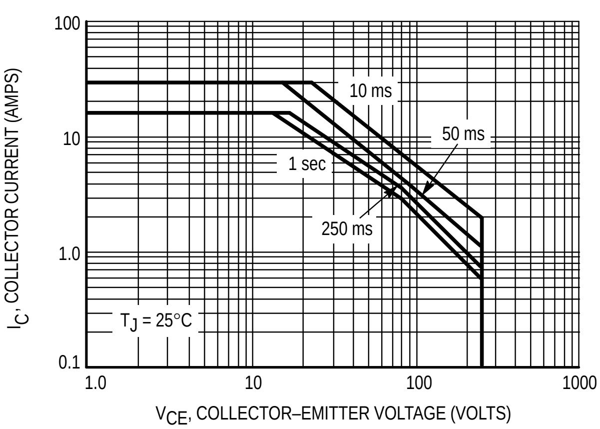



**Figure 13. Active Region Safe Operating Area**

There are two limitations on the power handling ability of a transistor; average junction temperature and secondary breakdown. Safe operating area curves indicate $I_C$ – $V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 13 is based on $T_{J(pk)}$ = 200°C; $T_C$ is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

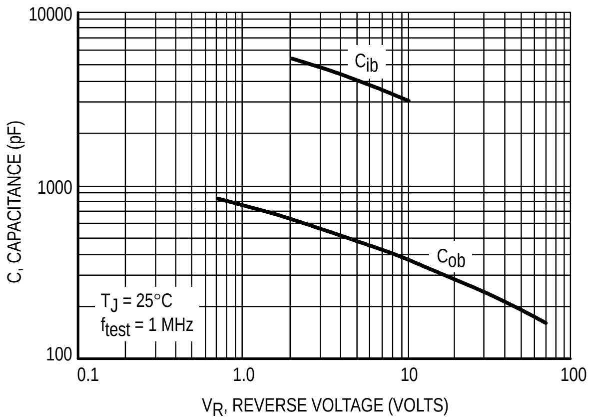



**Figure 14. MJ21195 Typical Capacitance**

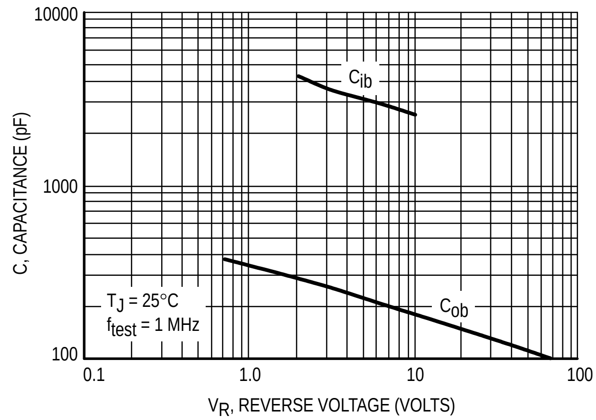



**Figure 15. MJ21196 Typical Capacitance**

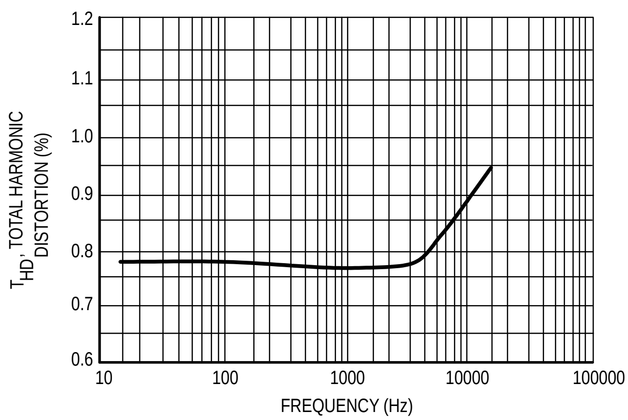



**Figure 16. Typical Total Harmonic Distortion**

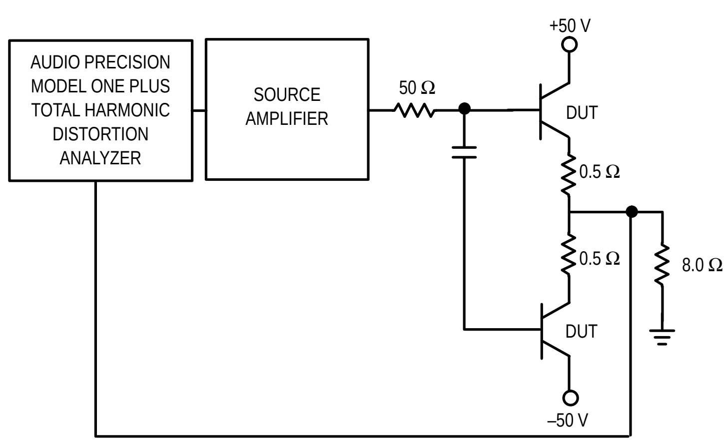



**Figure 17. Total Harmonic Distortion Test Circuit**