

Silicon Power Transistors

MJ21195G - PNP MJ21196G - NPN

The MJ21195G and MJ21196G utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

Features

- Total Harmonic Distortion Characterized
- High DC Current Gain
- Excellent Gain Linearity
- High SOA
- These Devices are Pb-Free and are RoHS Compliant*

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 – 1.5V | V_{CEX} | 400 | Vdc |
| Collector Current – Continuous | I_C | 16 | Adc |
| Collector Current – Peak (Note 1) | I_{CM} | 30 | Adc |
| Base Current – Continuous | I_B | 5 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 250 1.43 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -65 to +200 | $^\circ\text{C}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

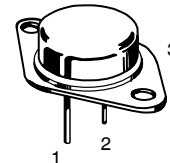
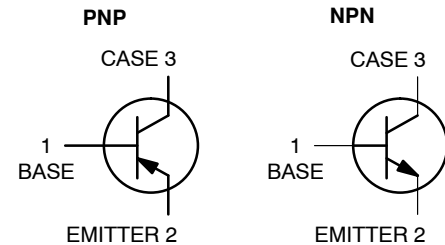
1. Pulse Test: Pulse Width = 5 μs , Duty Cycle $\leq 10\%$.

THERMAL CHARACTERISTICS

| Characteristics | Symbol | Max | Unit |
|--------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.7 | $^\circ\text{C/W}$ |

16 AMPERES COMPLEMENTARY SILICON- POWER TRANSISTORS 250 VOLTS, 250 WATTS

SCHEMATIC



TO-204AA (TO-3)
CASE 1-07
STYLE 1

MARKING DIAGRAM



MJ2119x = Device Code
x = 5 or 6
G = Pb-Free Package
A = Assembly Location
Y = Year
WW = Work Week
MEX = Country of Origin

ORDERING INFORMATION

| Device | Package | Shipping |
|----------|---------------------|------------------|
| MJ21195G | TO-204 (Pb-Free) | 100 Units / Tray |
| MJ21196G | TO-204 (Pb-Free) | 100 Units / Tray |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C} \pm 5^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typical | Max | Unit |
|---|----------------|----------|-------------|----------|-----------------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$, $I_B = 0$) | $V_{CEO(sus)}$ | 250 | – | – | Vdc |
| Collector Cutoff Current ($V_{CE} = 200\text{ Vdc}$, $I_B = 0$) | I_{CEO} | – | – | 100 | μAdc |
| Emitter Cutoff Current ($V_{CE} = 5\text{ Vdc}$, $I_C = 0$) | I_{EBO} | – | – | 100 | μAdc |
| Collector Cutoff Current ($V_{CE} = 250\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) | I_{CEX} | – | – | 100 | μAdc |
| SECOND BREAKDOWN | | | | | |
| Second Breakdown Collector Current with Base Forward Biased ($V_{CE} = 50\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive)) ($V_{CE} = 80\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive)) | $I_{S/b}$ | 5 2.5 | – – | – – | Adc |
| ON CHARACTERISTICS | | | | | |
| DC Current Gain ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 16\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) | h_{FE} | 25 8 | – – | 75 | – |
| Base–Emitter On Voltage ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) | $V_{BE(on)}$ | – | – | 2.2 | Vdc |
| Collector–Emitter Saturation Voltage ($I_C = 8\text{ Adc}$, $I_B = 0.8\text{ Adc}$) ($I_C = 16\text{ Adc}$, $I_B = 3.2\text{ Adc}$) | $V_{CE(sat)}$ | – – | – – | 1.4 4 | Vdc |
| DYNAMIC CHARACTERISTICS | | | | | |
| Total Harmonic Distortion at the Output $V_{RMS} = 28.3\text{ V}$, $f = 1\text{ kHz}$, $P_{LOAD} = 100\text{ W}_{RMS}$ (Matched pair $h_{FE} = 50 @ 5\text{ A}/5\text{ V}$) | T_{HD} | – – | 0.8 0.08 | – – | % |
| Current Gain Bandwidth Product ($I_C = 1\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1\text{ MHz}$) | f_T | 4 | – | – | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$) | C_{ob} | – | – | 500 | pF |

2. Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2\%$

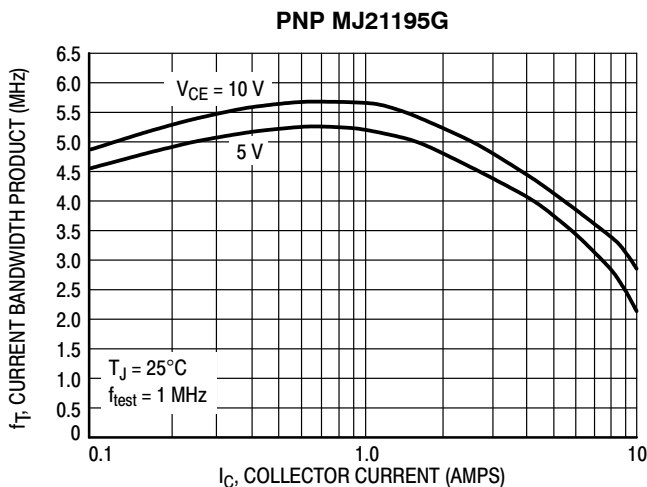


Figure 1. Typical Current Gain Bandwidth Product

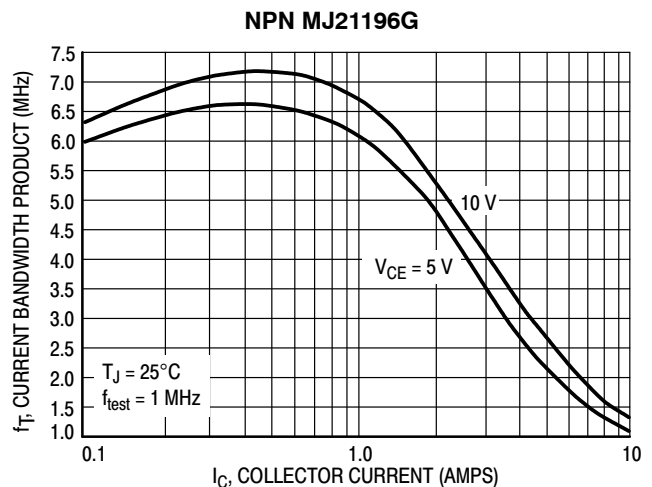


Figure 2. Typical Current Gain Bandwidth Product

TYPICAL CHARACTERISTICS

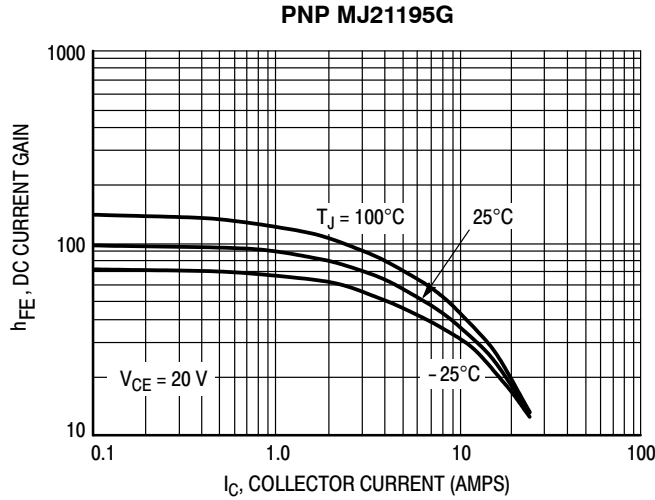


Figure 3. DC Current Gain, $V_{CE} = 20\text{ V}$

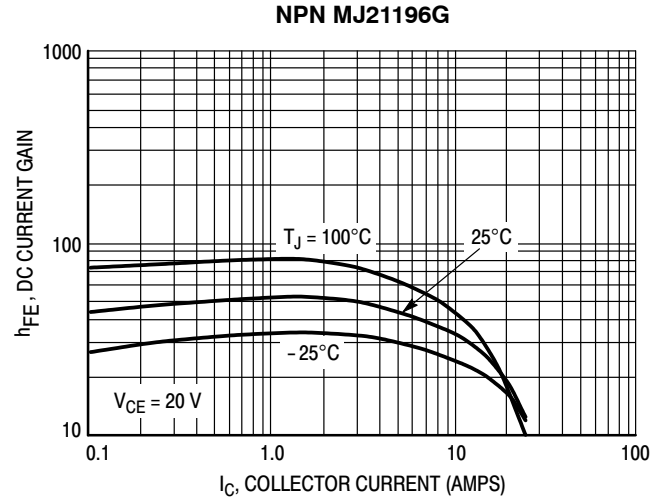


Figure 4. DC Current Gain, $V_{CE} = 20\text{ V}$

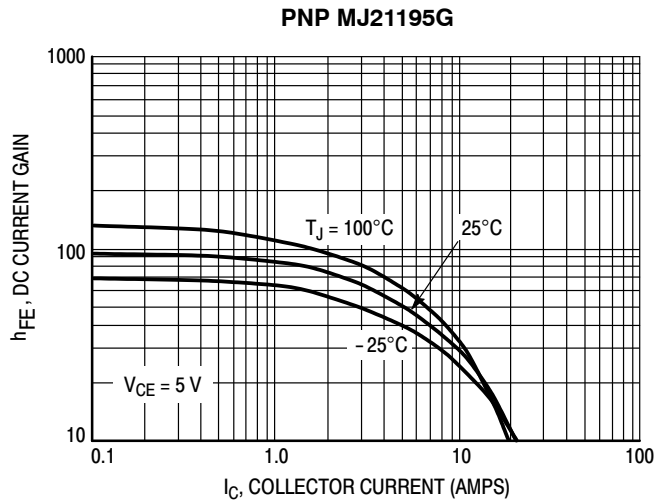


Figure 5. DC Current Gain, $V_{CE} = 5\text{ V}$

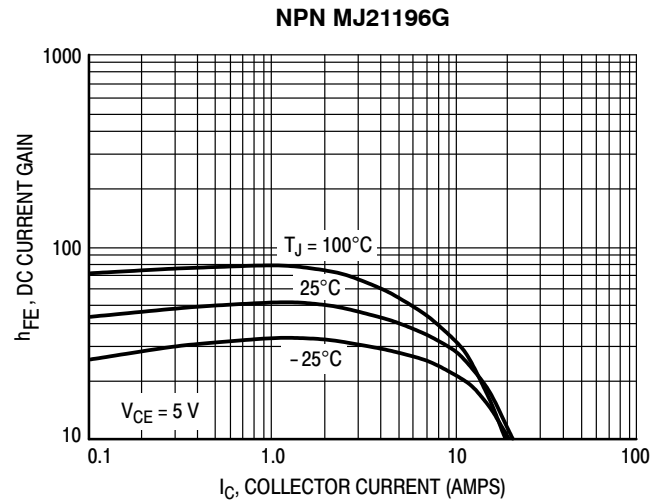


Figure 6. DC Current Gain, $V_{CE} = 5\text{ V}$

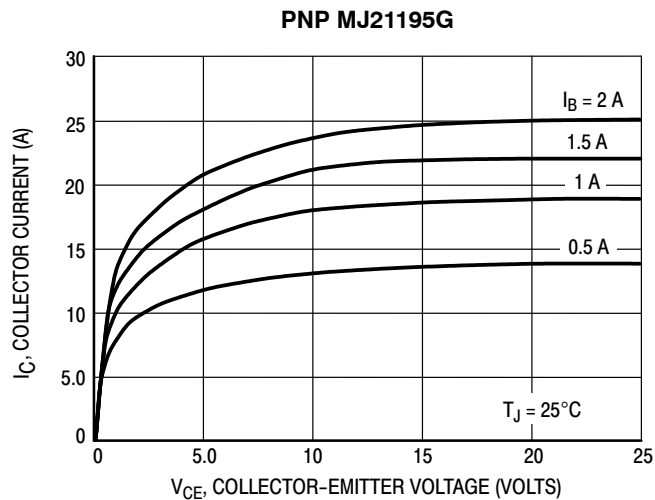


Figure 7. Typical Output Characteristics

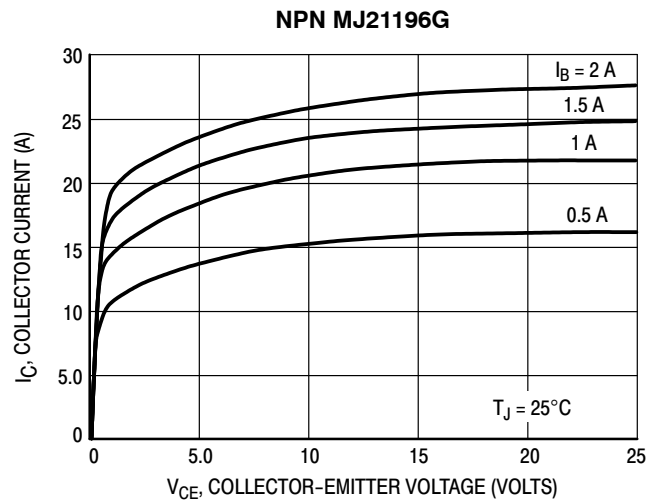


Figure 8. Typical Output Characteristics

TYPICAL CHARACTERISTICS

PNP MJ21195G

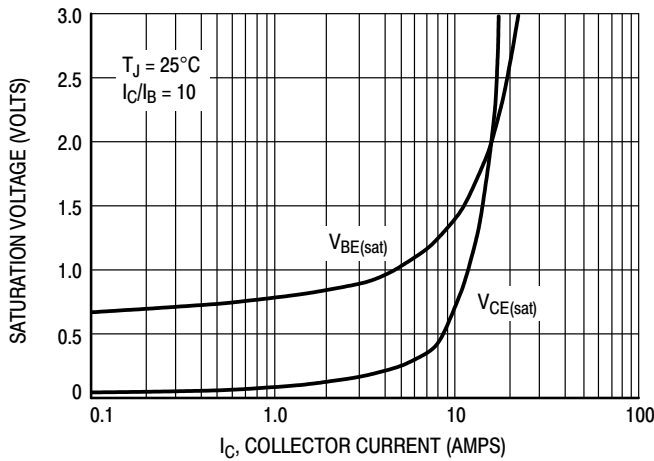


Figure 9. Typical Saturation Voltages

NPN MJ21196G

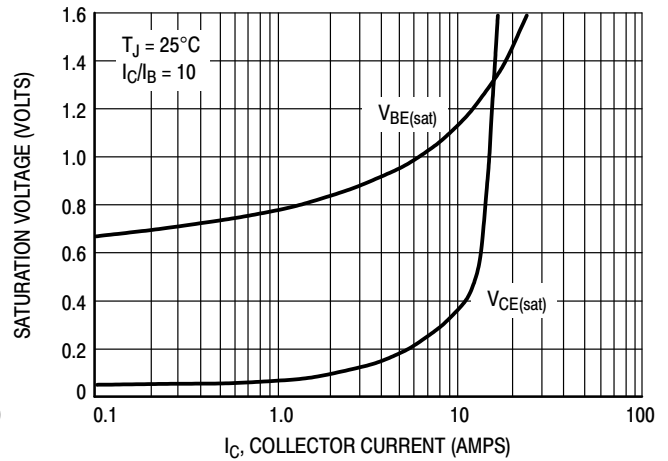


Figure 10. Typical Saturation Voltages

PNP MJ21195G

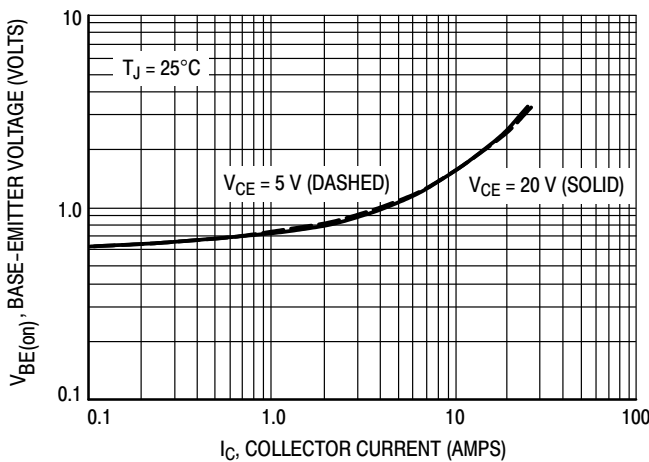


Figure 11. Typical Base-Emitter Voltage

NPN MJ21196G

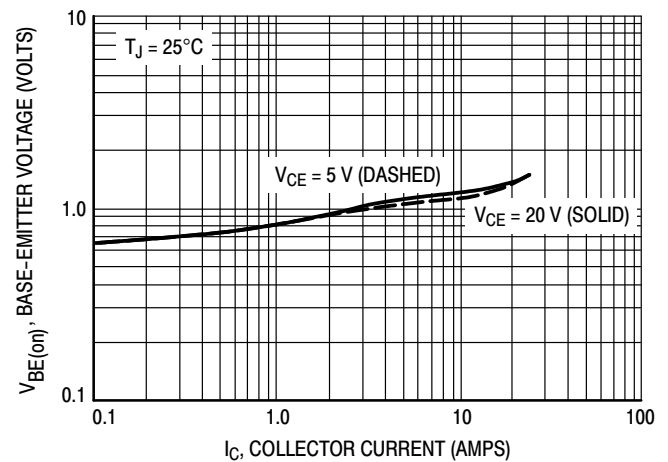


Figure 12. Typical Base-Emitter Voltage

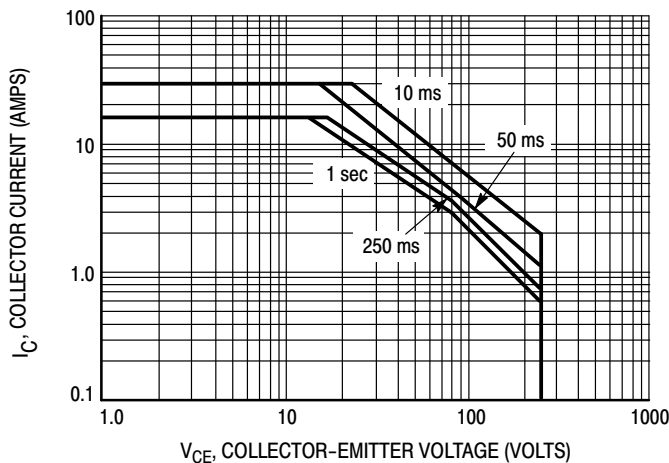


Figure 13. Active Region Safe Operating Area

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 $T_{J(pk)} = 200^\circ\text{C}$; 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.

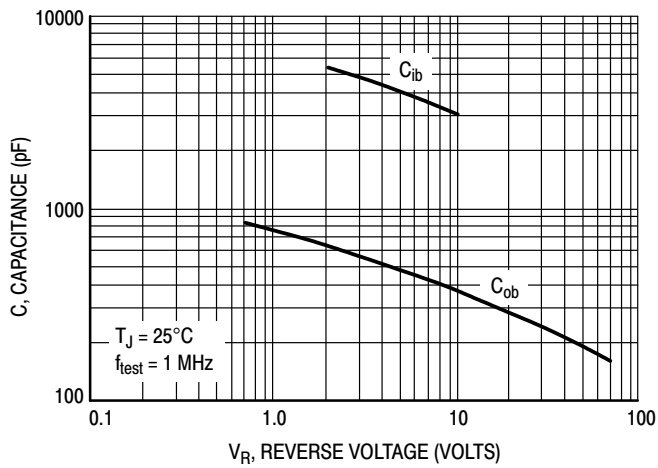


Figure 14. MJ21195 Typical Capacitance

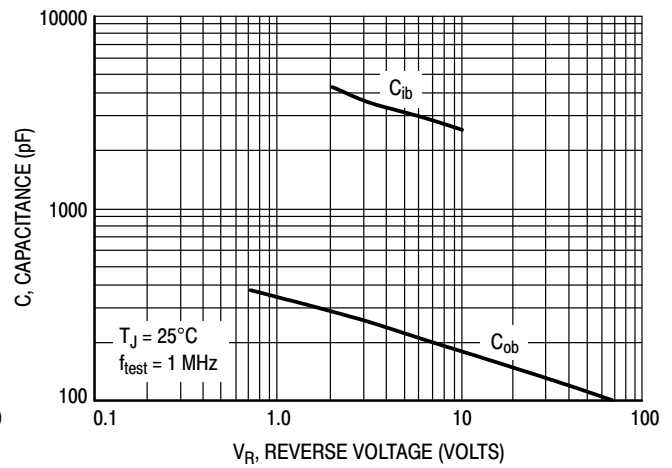


Figure 15. MJ21196 Typical Capacitance

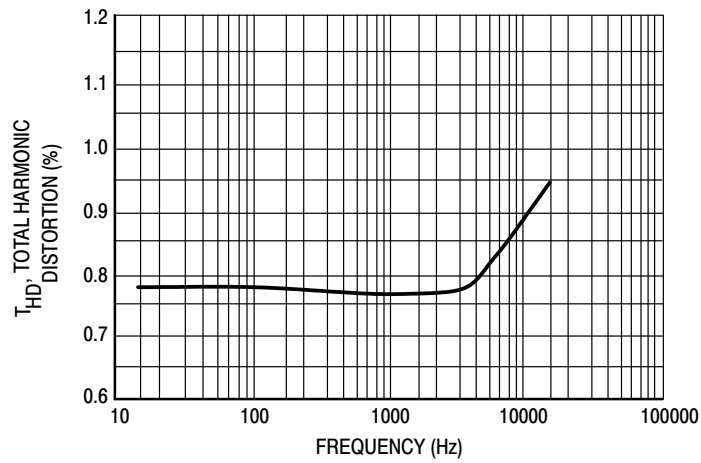


Figure 16. Typical Total Harmonic Distortion

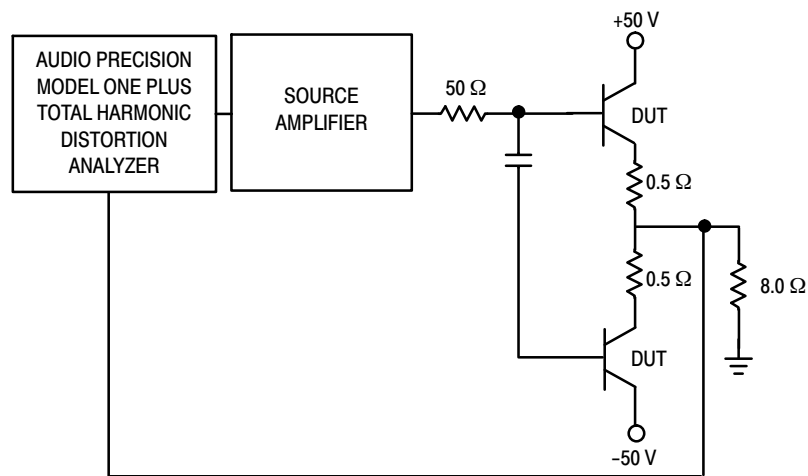
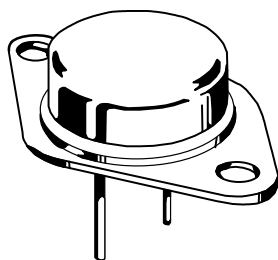


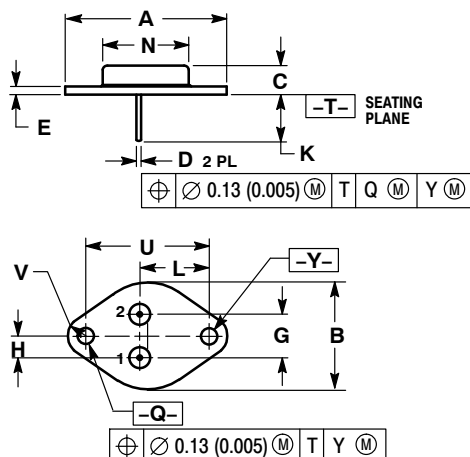
Figure 17. Total Harmonic Distortion Test Circuit



TO-204 (TO-3)
CASE 1-07
ISSUE Z

DATE 10 MAR 2000

SCALE 1:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.550 REF | | 39.37 REF | |
| B | --- | 1.050 | --- | 26.67 |
| C | 0.250 | 0.335 | 6.35 | 8.51 |
| D | 0.038 | 0.043 | 0.97 | 1.09 |
| E | 0.055 | 0.070 | 1.40 | 1.77 |
| G | 0.430 BSC | | 10.92 BSC | |
| H | 0.215 BSC | | 5.46 BSC | |
| K | 0.440 | 0.480 | 11.18 | 12.19 |
| L | 0.665 BSC | | 16.89 BSC | |
| N | --- | 0.830 | --- | 21.08 |
| Q | 0.151 | 0.165 | 3.84 | 4.19 |
| U | 1.187 BSC | | 30.15 BSC | |
| V | 0.131 | 0.188 | 3.33 | 4.77 |

STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

STYLE 2:
PIN 1. BASE
2. COLLECTOR
CASE: EMITTER

STYLE 3:
PIN 1. GATE
2. SOURCE
CASE: DRAIN

STYLE 4:
PIN 1. GROUND
2. INPUT
CASE: OUTPUT

STYLE 5:
PIN 1. CATHODE
2. EXTERNAL TRIP/DELAY
CASE: ANODE

STYLE 6:
PIN 1. GATE
2. EMITTER
CASE: COLLECTOR

STYLE 7:
PIN 1. ANODE
2. OPEN
CASE: CATHODE

STYLE 8:
PIN 1. CATHODE #1
2. CATHODE #2
CASE: ANODE

STYLE 9:
PIN 1. ANODE #1
2. ANODE #2
CASE: CATHODE

| | | |
|------------------|---------------|---|
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