

# MJ21195G - PNP

# MJ21196G - NPN

## Silicon Power Transistors

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 $25^\circ\text{C}$	$P_D$	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  $\mu\text{s}$ , Duty Cycle  $\leq 10\%$ .

### THERMAL CHARACTERISTICS

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

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

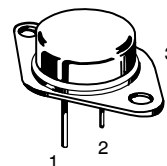
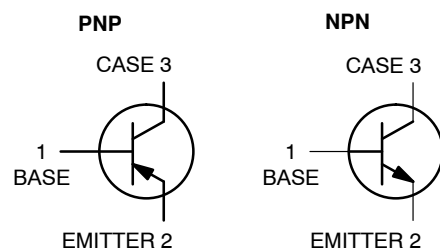


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## 16 AMPERES COMPLEMENTARY SILICON- POWER TRANSISTORS 250 VOLTS, 250 WATTS

### 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

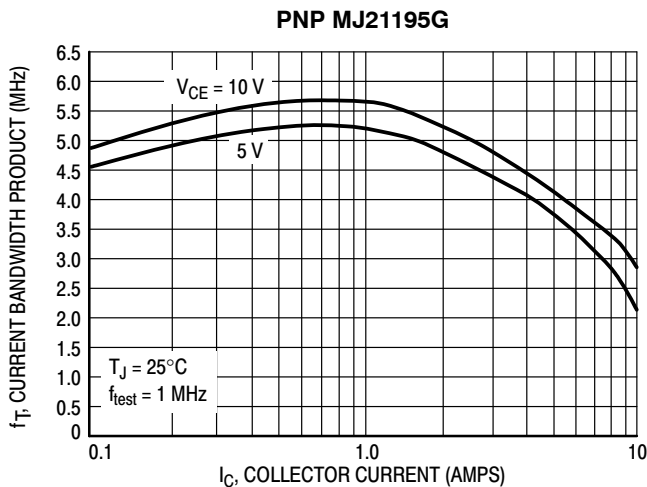
Device	Package	Shipping
MJ21195G	TO-204 (Pb-Free)	100 Units / Tray
MJ21196G	TO-204 (Pb-Free)	100 Units / Tray

# MJ21195G – PNP      MJ21196G – NPN

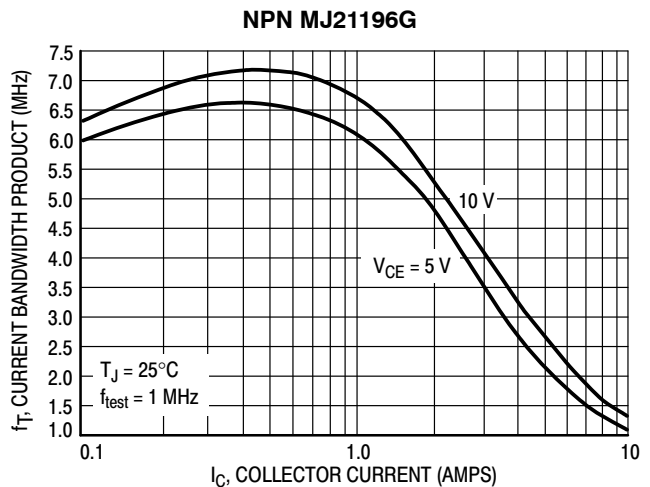
## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C} \pm 5^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typical	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Sustaining Voltage ( $I_C = 100 \text{ mAdc}$ , $I_B = 0$ )	$V_{CE(sus)}$	250	–	–	Vdc
Collector Cutoff Current ( $V_{CE} = 200 \text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	–	100	$\mu\text{A}$ dc
Emitter Cutoff Current ( $V_{CE} = 5 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	–	100	$\mu\text{A}$ dc
Collector Cutoff Current ( $V_{CE} = 250 \text{ Vdc}$ , $V_{BE(off)} = 1.5 \text{ Vdc}$ )	$I_{CEX}$	–	–	100	$\mu\text{A}$ dc
<b>SECOND BREAKDOWN</b>					
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	– –	– –	A
<b>ON CHARACTERISTICS</b>					
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
<b>DYNAMIC CHARACTERISTICS</b>					
Total Harmonic Distortion at the Output $V_{RMS} = 28.3 \text{ V}$ , $f = 1 \text{ kHz}$ , $P_{LOAD} = 100 \text{ W}_{RMS}$  (Matched pair $h_{FE} = 50 @ 5 \text{ A/5 V}$ )	$T_{HD}$	– –	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  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$



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



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

TYPICAL CHARACTERISTICS

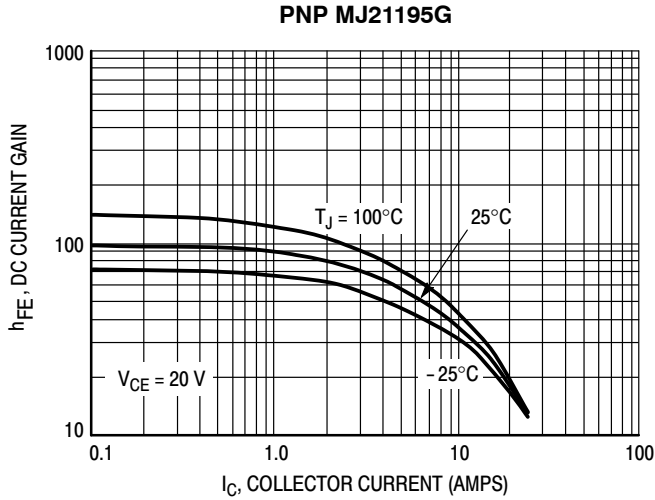


Figure 3. DC Current Gain,  $V_{CE} = 20\text{ V}$

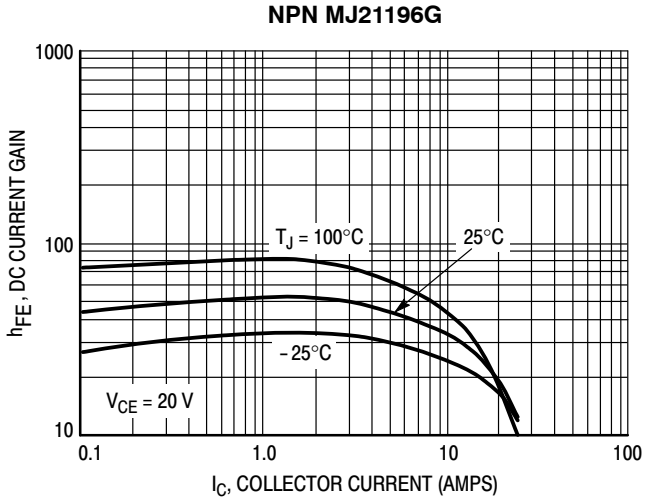


Figure 4. DC Current Gain,  $V_{CE} = 20\text{ V}$

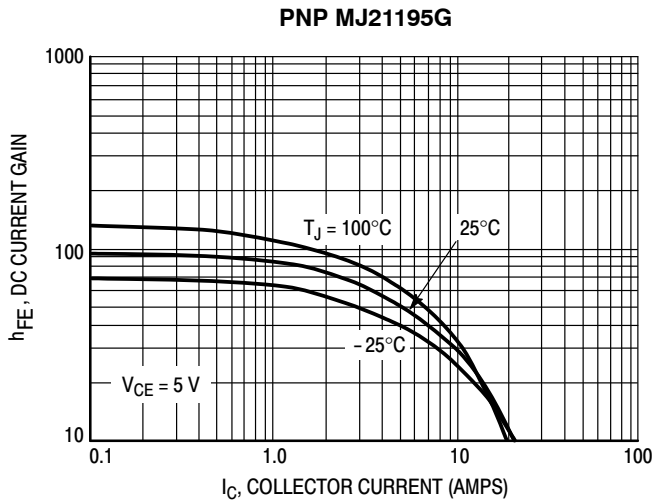


Figure 5. DC Current Gain,  $V_{CE} = 5\text{ V}$

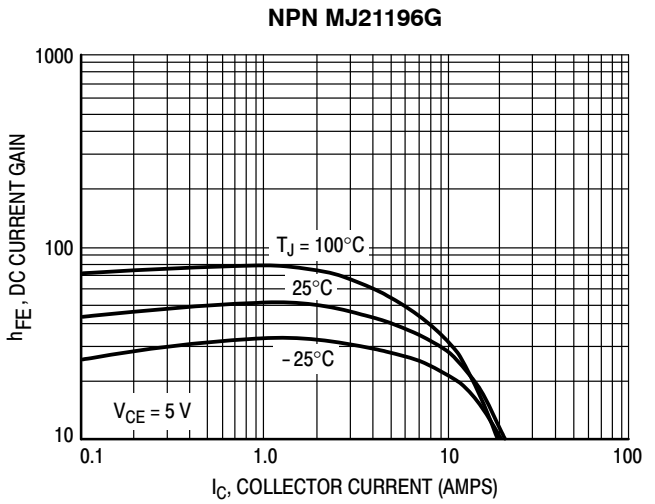


Figure 6. DC Current Gain,  $V_{CE} = 5\text{ V}$

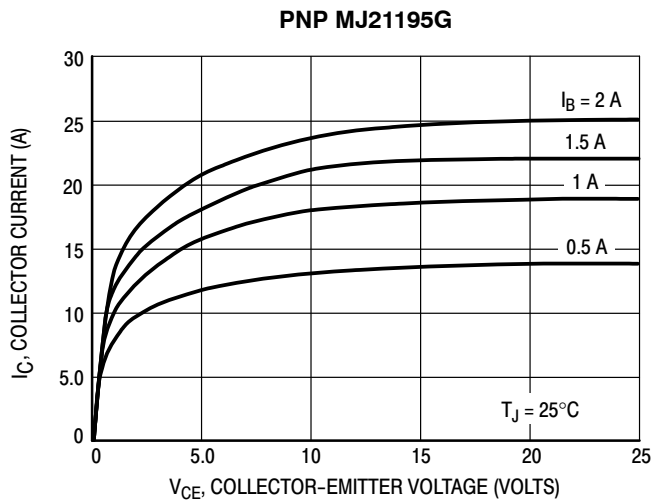


Figure 7. Typical Output Characteristics

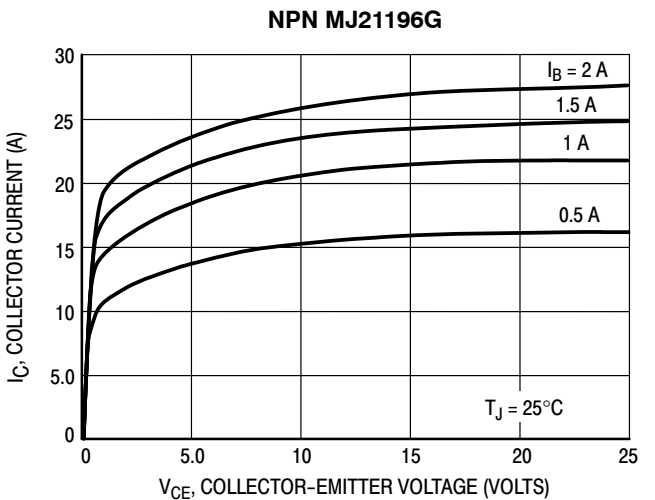


Figure 8. Typical Output Characteristics

TYPICAL CHARACTERISTICS

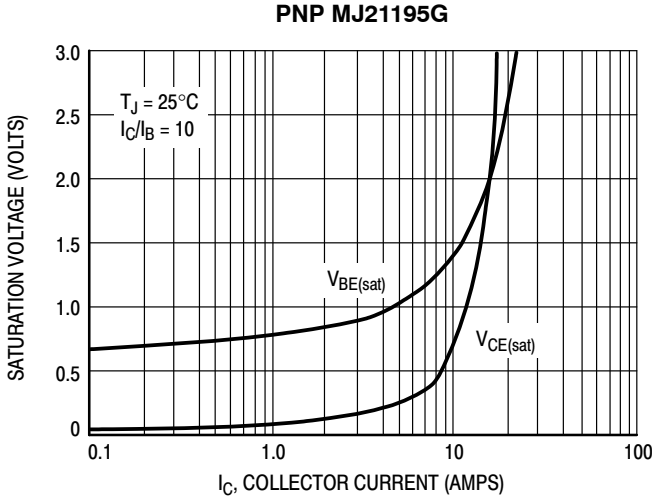


Figure 9. Typical Saturation Voltages

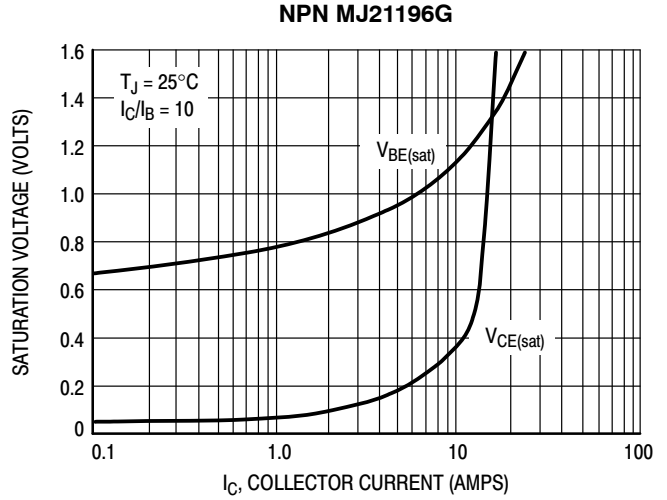


Figure 10. Typical Saturation Voltages

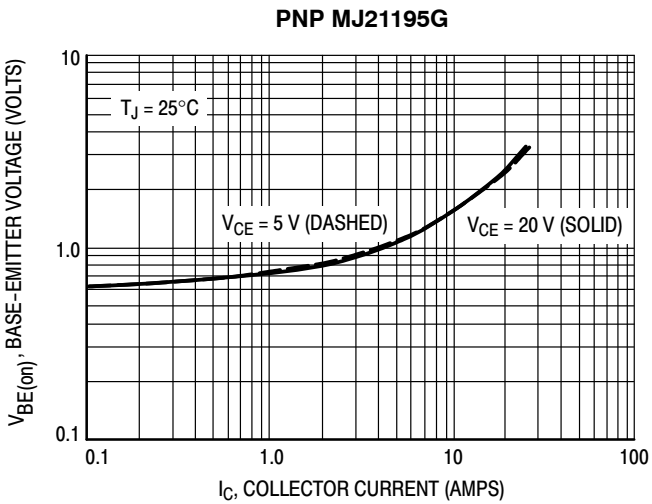


Figure 11. Typical Base-Emitter Voltage

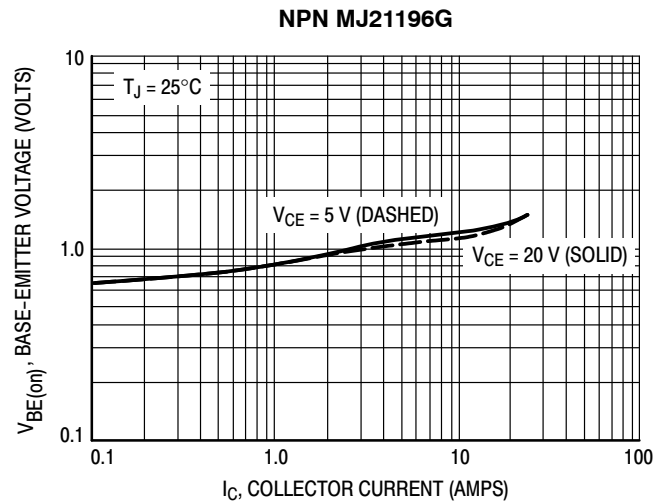


Figure 12. Typical Base-Emitter Voltage

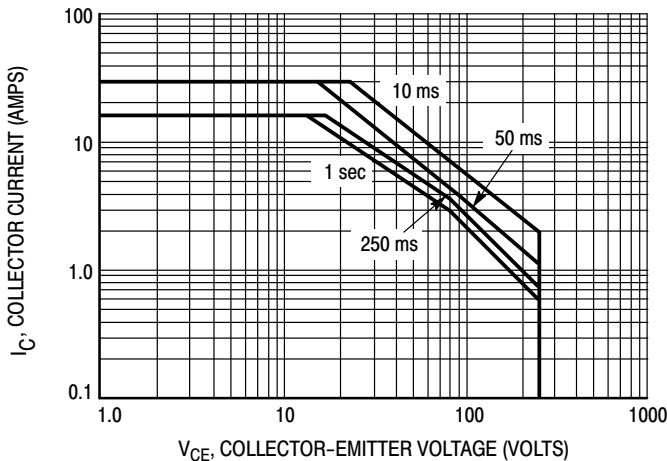


Figure 13. Active Region Safe Operating Area

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.

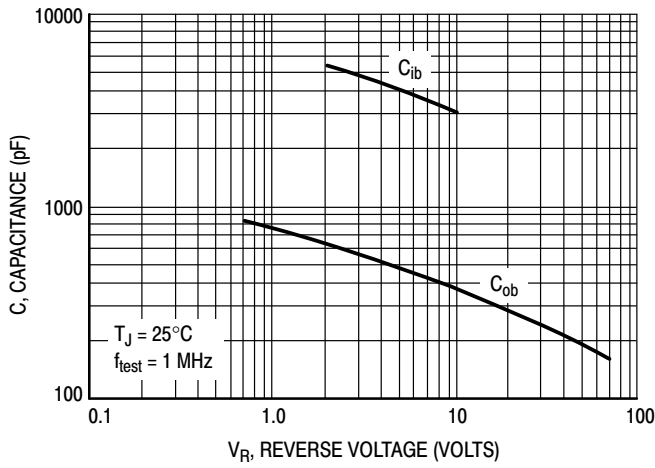


Figure 14. MJ21195 Typical Capacitance

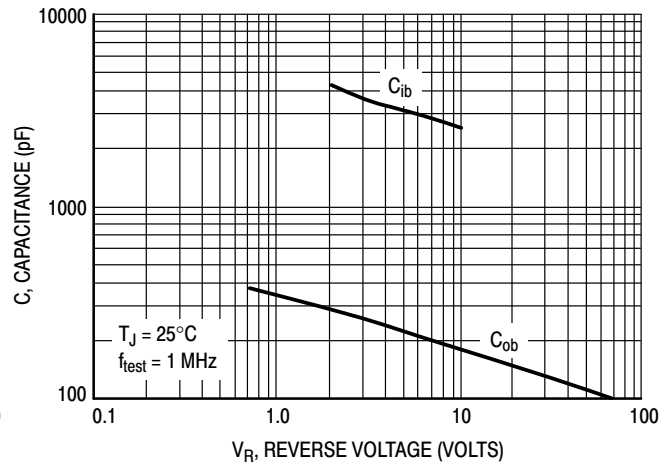


Figure 15. MJ21196 Typical Capacitance

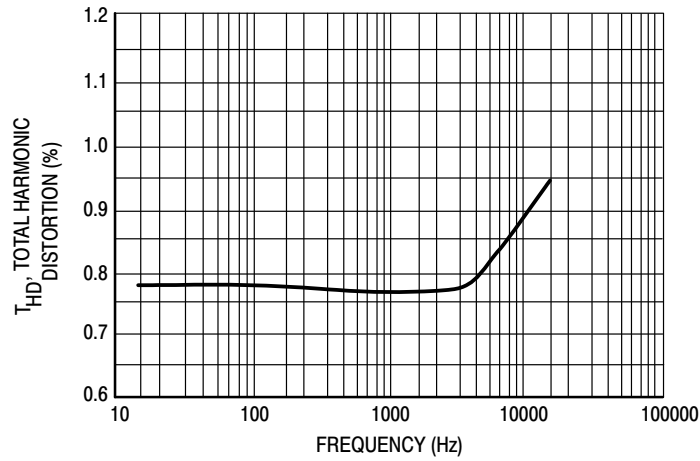


Figure 16. Typical Total Harmonic Distortion

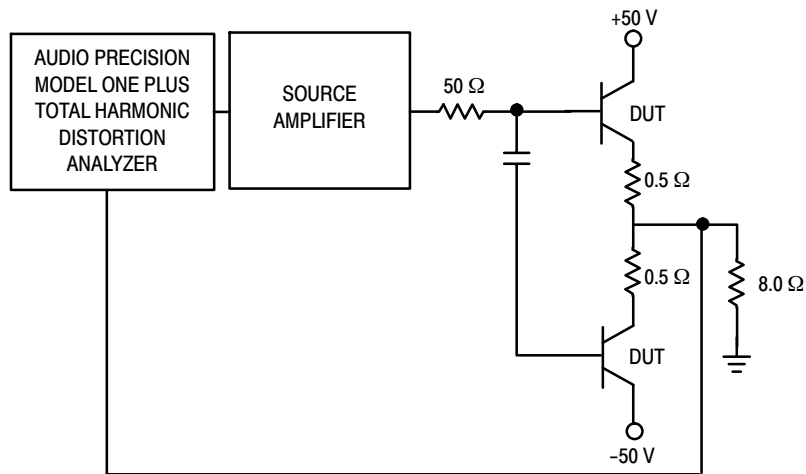


Figure 17. Total Harmonic Distortion Test Circuit

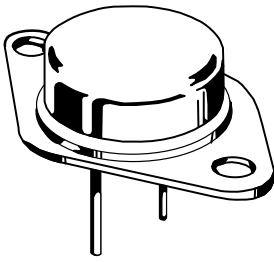
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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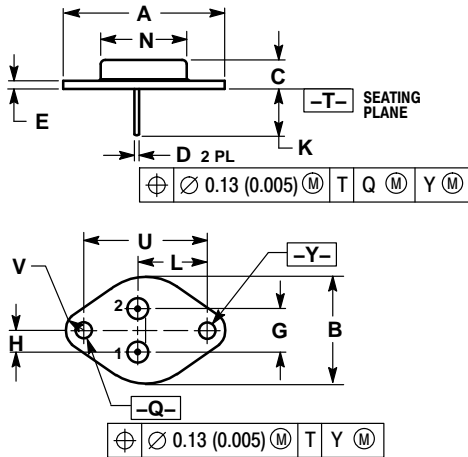


TO-204 (TO-3)  
CASE 1-07  
ISSUE Z

DATE 05/18/1988



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

- |  |  |   |   |   |
|--|--|---|---|---|
| <p>STYLE 1:<br/>PIN 1. BASE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 2:<br/>PIN 1. BASE<br/>2. COLLECTOR<br/>CASE: EMITTER</p> | <p>STYLE 3:<br/>PIN 1. GATE<br/>2. SOURCE<br/>CASE: DRAIN</p>           | <p>STYLE 4:<br/>PIN 1. GROUND<br/>2. INPUT<br/>CASE: OUTPUT</p>       | <p>STYLE 5:<br/>PIN 1. CATHODE<br/>2. EXTERNAL TRIP/DELAY<br/>CASE: ANODE</p> |
| <p>STYLE 6:<br/>PIN 1. GATE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 7:<br/>PIN 1. ANODE<br/>2. OPEN<br/>CASE: CATHODE</p>     | <p>STYLE 8:<br/>PIN 1. CATHODE #1<br/>2. CATHODE #2<br/>CASE: ANODE</p> | <p>STYLE 9:<br/>PIN 1. ANODE #1<br/>2. ANODE #2<br/>CASE: CATHODE</p> |   |

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