

# MJ21195 - PNP MJ21196 - NPN

Preferred Devices

## Silicon Power Transistors

The MJ21195 and MJ21196 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 –  $h_{FE} = 25 \text{ Min @ } I_C = 8 \text{ Adc}$
- Excellent Gain Linearity
- High SOA: 3 A, 80 V, 1 Sec
- Pb-Free Packages are Available\*

### 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 – Peak (Note 1)	$I_C$	16 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	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Pulse Test: Pulse Width = 5  $\mu\text{s}$ , Duty Cycle  $\leq 10\%$ .

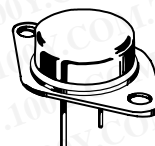
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## 16 AMPERES COMPLEMENTARY SILICON- POWER TRANSISTORS 250 VOLTS, 250 WATTS



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

### 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
MJ21195	TO-204	100 Units / Tray
MJ21195G	TO-204 (Pb-Free)	100 Units / Tray
MJ21196	TO-204	100 Units / Tray
MJ21196G	TO-204 (Pb-Free)	100 Units / Tray

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

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor 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
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Sustaining Voltage ( $I_C = 100\text{ mA}$ , $I_B = 0$ )	$V_{CE(sus)}$	250	–	–	Vdc
Collector Cutoff Current ( $V_{CE} = 200\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	–	100	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{CE} = 5\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	–	100	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = 250\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ )	$I_{CEX}$	–	–	100	$\mu\text{Adc}$

**SECOND BREAKDOWN**

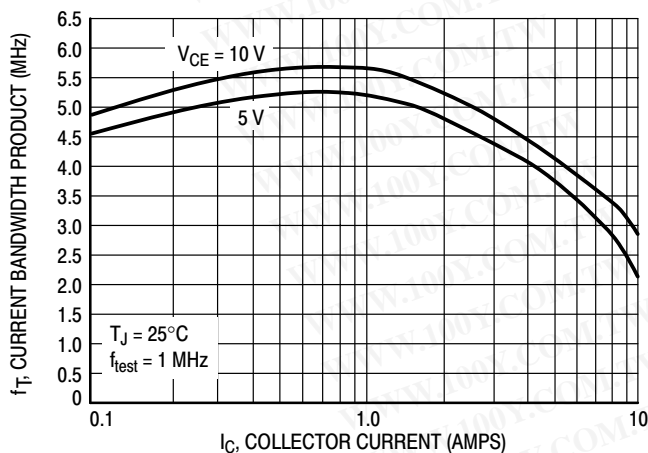
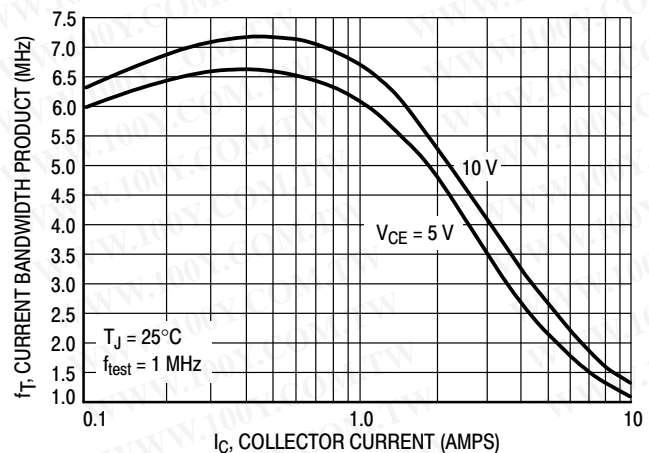
Second Breakdown Collector Current with Base Forward Biased ( $V_{CE} = 50\text{ Vdc}$ , $t = 1\text{ s}$ (non–repetitive)) ( $V_{CE} = 80\text{ Vdc}$ , $t = 1\text{ s}$ (non–repetitive))	$I_{S/b}$	5 2.5	– –	– –	Adc
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**ON CHARACTERISTICS**

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

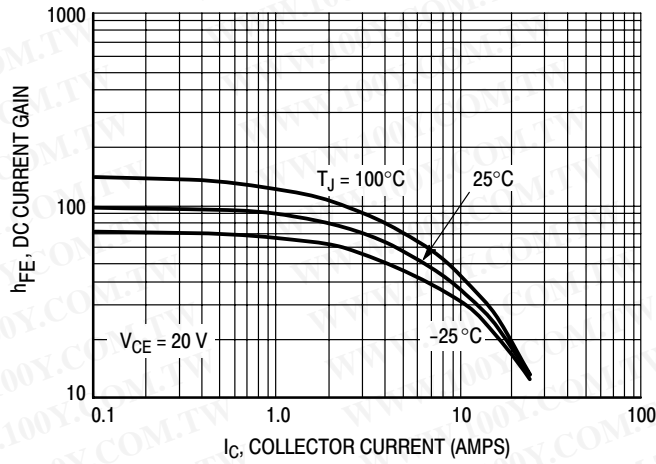
**DYNAMIC CHARACTERISTICS**

Total Harmonic Distortion at the Output $V_{RMS} = 28.3\text{ V}$ , $f = 1\text{ kHz}$ , $P_{LOAD} = 100\text{ W}_{RMS}$ (Matched pair $h_{FE} = 50$ @ $5\text{ A}/5\text{ V}$ )	$h_{FE}$ unmatched $h_{FE}$ matched	$T_{HD}$	– –	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

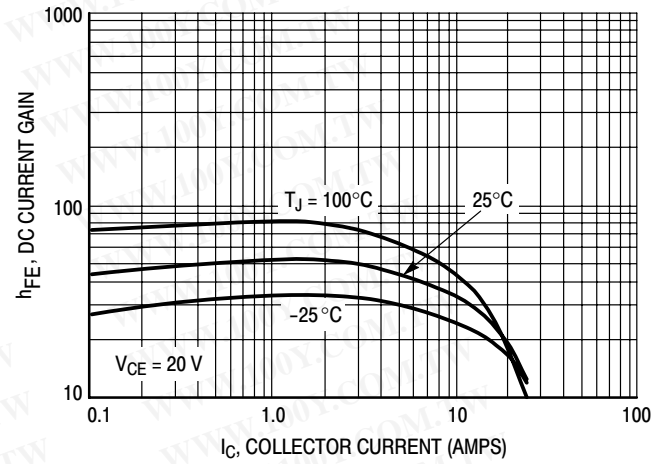
 2. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ 
**PNP MJ21195**

**Figure 1. Typical Current Gain Bandwidth Product**
**NPN MJ21196**

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

## TYPICAL CHARACTERISTICS

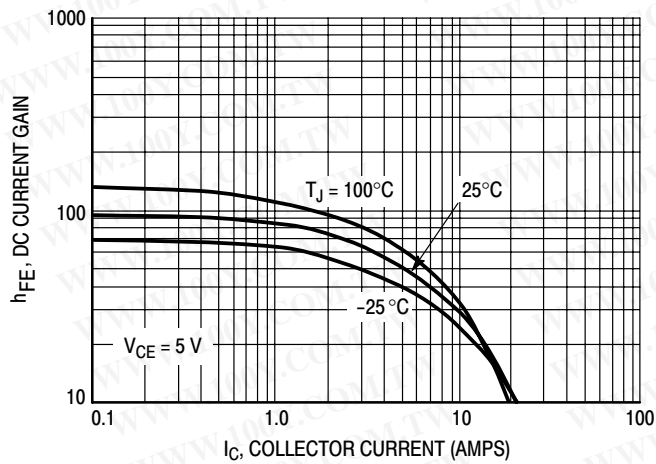
PNP MJ21195

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

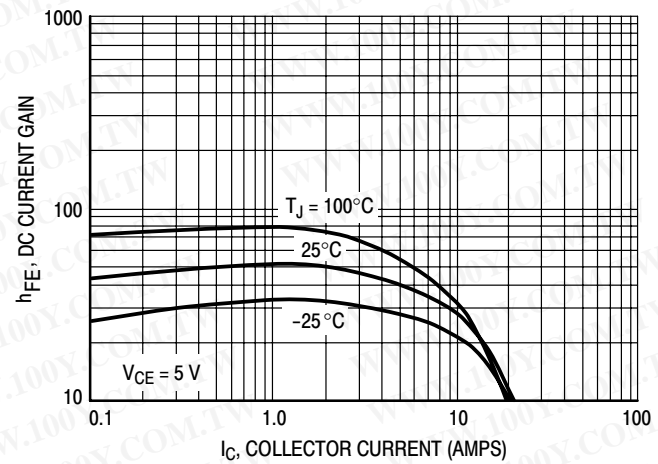
NPN MJ21196

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

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

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

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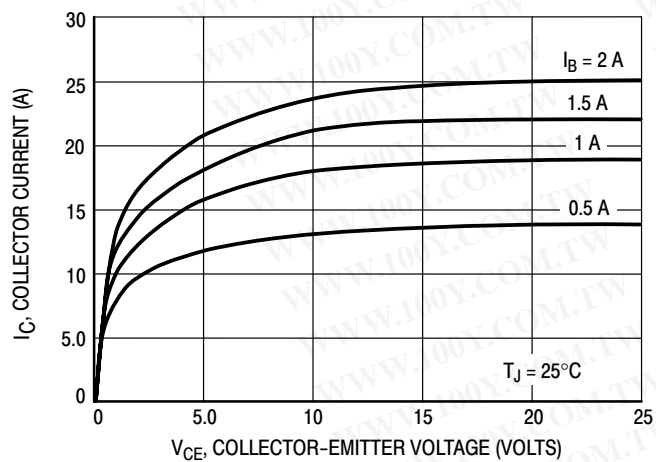


Figure 7. Typical Output Characteristics

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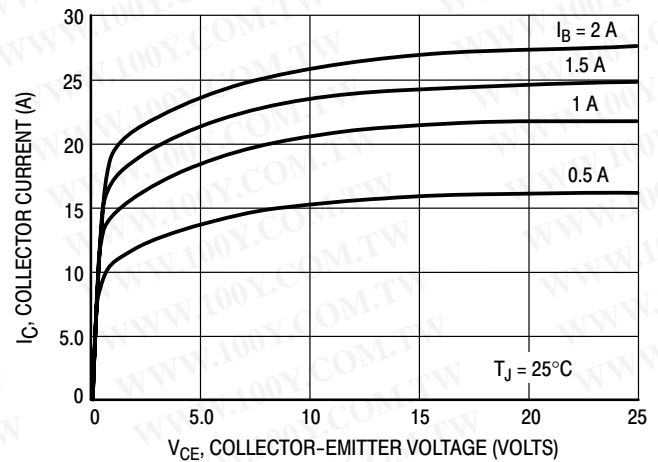


Figure 8. Typical Output Characteristics



## TYPICAL CHARACTERISTICS

PNP MJ21195

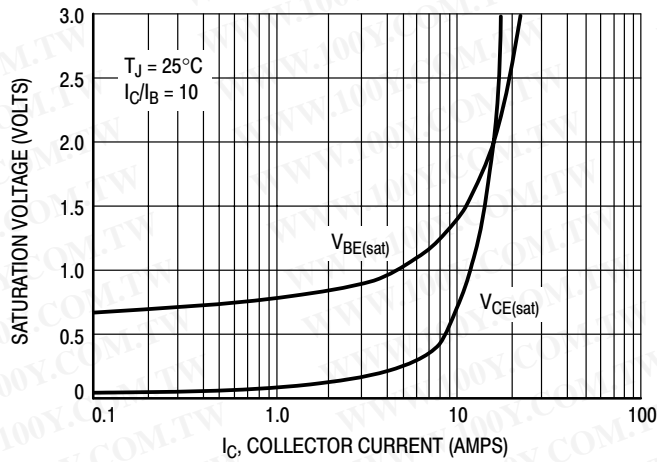


Figure 9. Typical Saturation Voltages

NPN MJ21196

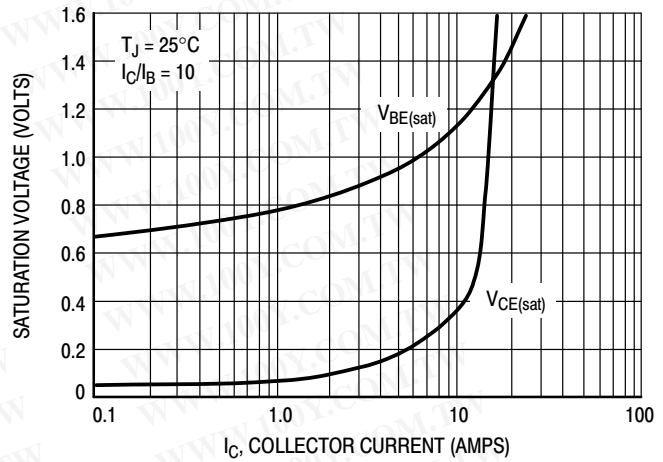


Figure 10. Typical Saturation Voltages

PNP MJ21195

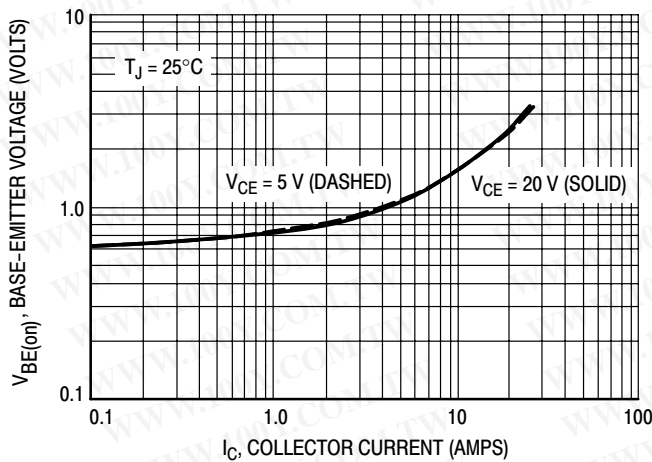


Figure 11. Typical Base-Emitter Voltage

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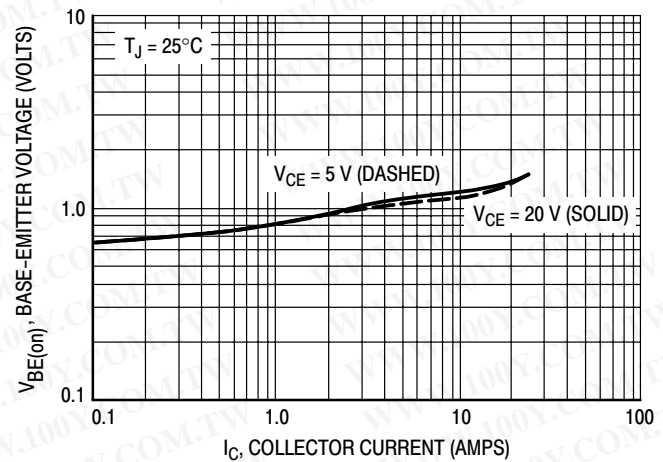


Figure 12. Typical Base-Emitter Voltage

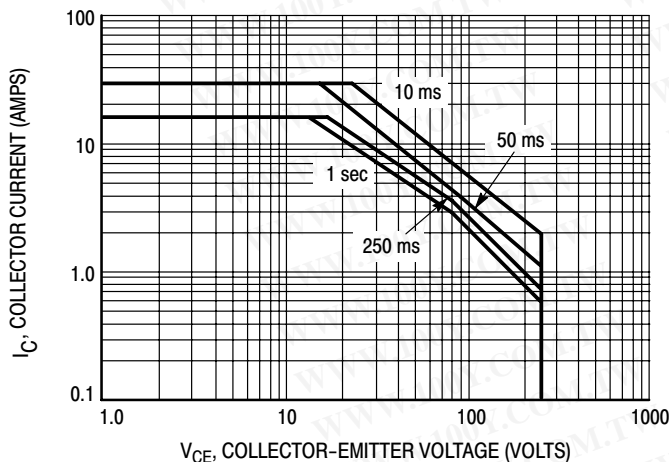


Figure 13. Active Region Safe Operating Area

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.

## MJ21195 – PNP

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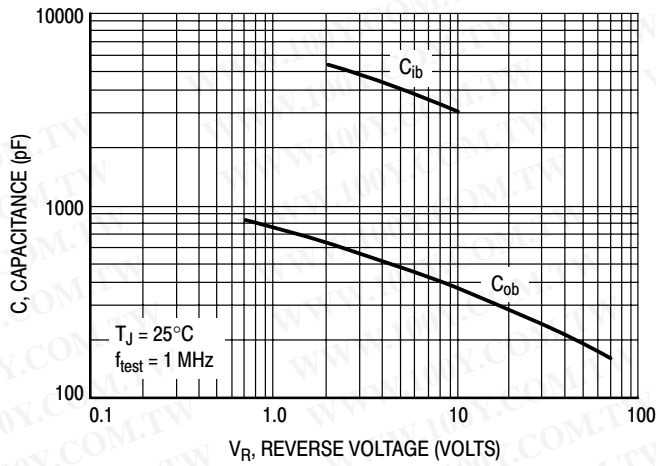


Figure 14. MJ21195 Typical Capacitance

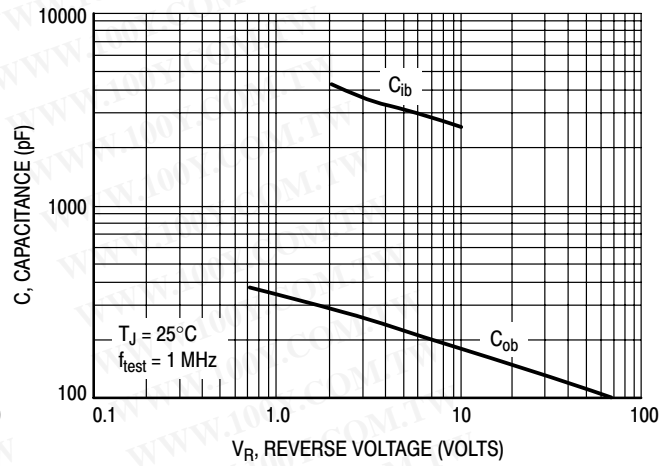


Figure 15. MJ21196 Typical Capacitance

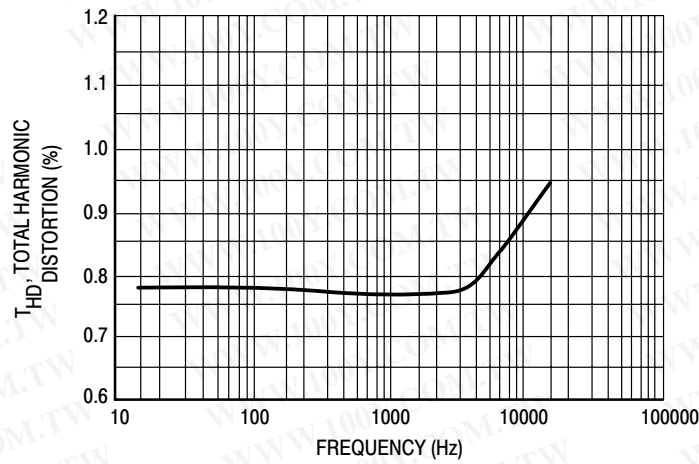


Figure 16. Typical Total Harmonic Distortion

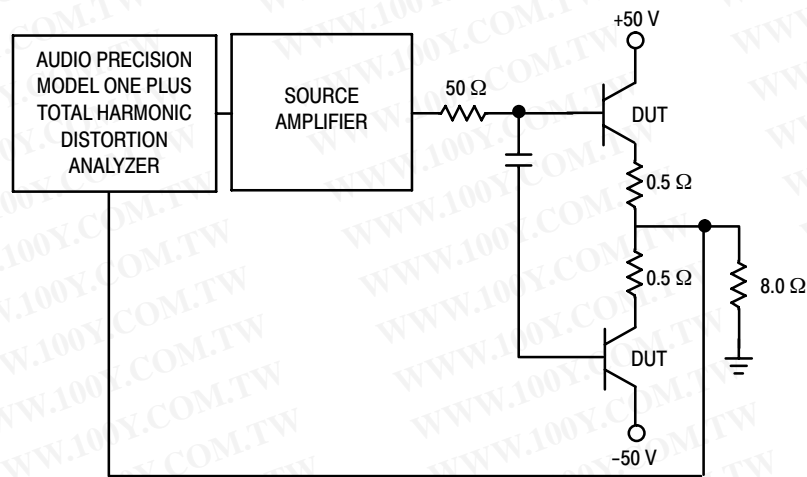


Figure 17. Total Harmonic Distortion Test Circuit

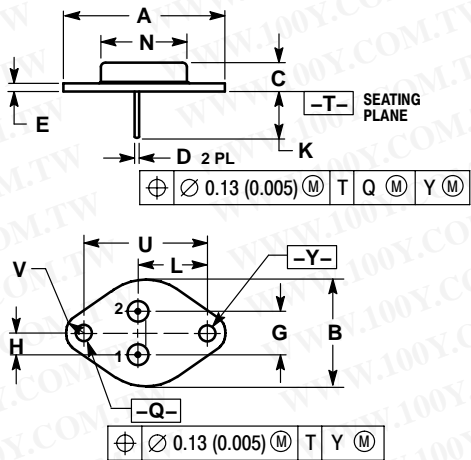
**MJ21196 – NPN**

## PACKAGE DIMENSIONS

**TO-204 (TO-3)**

CASE 1-07

ISSUE Z




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.

	INCHES		MILLIMETERS	
DIM	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

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