

# Silicon Power Transistors

## MJW21195 (PNP) MJW21196 (NPN)

The MJW21195 and MJW21196 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 –  $h_{FE} = 20 \text{ Min @ } I_C = 8 \text{ A dc}$
- Excellent Gain Linearity
- High SOA: 2.25 A, 80 V, 1 Second
- 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                                                                  | $V_{EBO}$      | 5.0         | Vdc                      |
| Collector-Emitter Voltage – 1.5 V                                                     | $V_{CEX}$      | 400         | Vdc                      |
| Collector Current<br>– Continuous<br>– Peak (Note 1)                                  | $I_C$          | 16<br>30    | A dc                     |
| Base Current – Continuous                                                             | $I_B$          | 5.0         | A dc                     |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate Above $25^\circ\text{C}$ | $P_D$          | 200<br>1.43 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{stg}$ | –65 to +150 | $^\circ\text{C}$         |

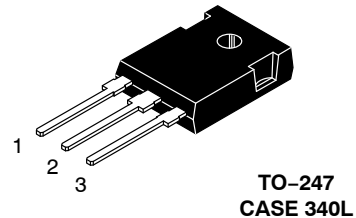
### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max | Unit               |
|-----------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 0.7 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 40  | $^\circ\text{C/W}$ |

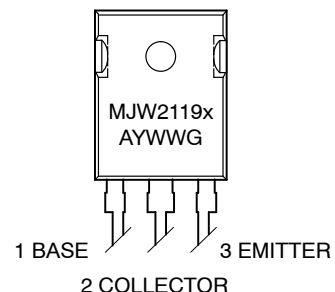
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

## 16 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 250 VOLTS, 200 WATTS



### MARKING DIAGRAM



x = 5 or 6  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

| Device    | Package             | Shipping      |
|-----------|---------------------|---------------|
| MJW21195  | TO-247              | 30 Units/Rail |
| MJW21195G | TO-247<br>(Pb-Free) | 30 Units/Rail |
| MJW21196  | TO-247              | 30 Units/Rail |
| MJW21196G | TO-247<br>(Pb-Free) | 30 Units/Rail |

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

# MJW21195 (PNP) MJW21196 (NPN)

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ 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 | $\mu\text{Adc}$ |
| Emitter Cutoff Current ( $V_{CE} = 5\text{ Vdc}$ , $I_C = 0$ )                          | $I_{EBO}$      | –   | – | 50  | $\mu\text{Adc}$ |
| Collector Cutoff Current ( $V_{CE} = 250\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) | $I_{CEX}$      | –   | – | 50  | $\mu\text{Adc}$ |

### SECOND BREAKDOWN

|                                                                                                                                                                                                   |           |             |        |        |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|--------|--------|-----|
| Second Breakdown Collector Current with Base Forward Biased<br>( $V_{CE} = 50\text{ Vdc}$ , $t = 1\text{ s}$ (non-repetitive))<br>( $V_{CE} = 80\text{ Vdc}$ , $t = 1\text{ s}$ (non-repetitive)) | $I_{S/b}$ | 4.0<br>2.25 | –<br>– | –<br>– | Adc |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|--------|--------|-----|

### ON CHARACTERISTICS

|                                                                                                                                                 |               |         |        |          |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|--------|----------|-----|
| DC Current Gain<br>( $I_C = 8\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ )<br>( $I_C = 16\text{ Adc}$ , $I_B = 5\text{ Adc}$ )                       | $h_{FE}$      | 20<br>8 | –<br>– | 80<br>–  |     |
| Base-Emitter On Voltage ( $I_C = 8\text{ Adc}$ , $V_{CE} = 5\text{ Vdc}$ )                                                                      | $V_{BE(on)}$  | –       | –      | 2.0      | Vdc |
| Collector-Emitter Saturation Voltage<br>( $I_C = 8\text{ Adc}$ , $I_B = 0.8\text{ Adc}$ )<br>( $I_C = 16\text{ Adc}$ , $I_B = 3.2\text{ Adc}$ ) | $V_{CE(sat)}$ | –<br>–  | –<br>– | 1.0<br>3 | Vdc |

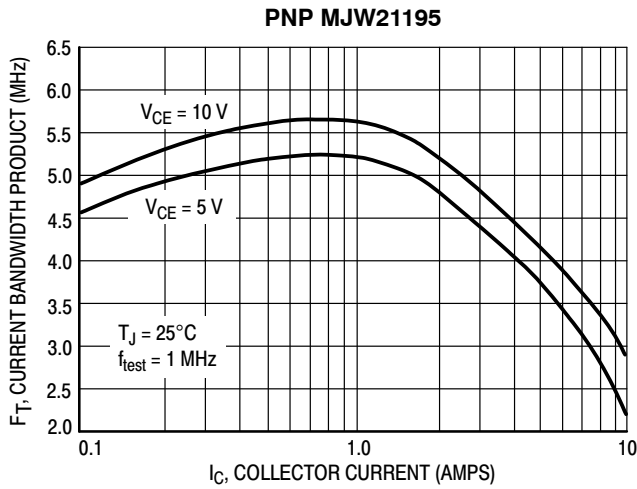
### DYNAMIC CHARACTERISTICS

|                                                                                                                                                                                      |          |        |             |        |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|-------------|--------|-----|
| Total Harmonic Distortion at the Output<br>$V_{RMS} = 28.3\text{ V}$ , $f = 1\text{ kHz}$ , $P_{LOAD} = 100\text{ W}_{RMS}$<br>(Matched pair $h_{FE} = 50 @ 5\text{ A}/5\text{ V}$ ) | $T_{HD}$ | –<br>– | 0.8<br>0.08 | –<br>– | %   |
| Current Gain Bandwidth Product<br>( $I_C = 1\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ )                                                                    | $f_T$    | 4      | –           | –      | MHz |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f_{test} = 1\text{ MHz}$ )                                                                                           | $C_{ob}$ | –      | –           | 500    | pF  |

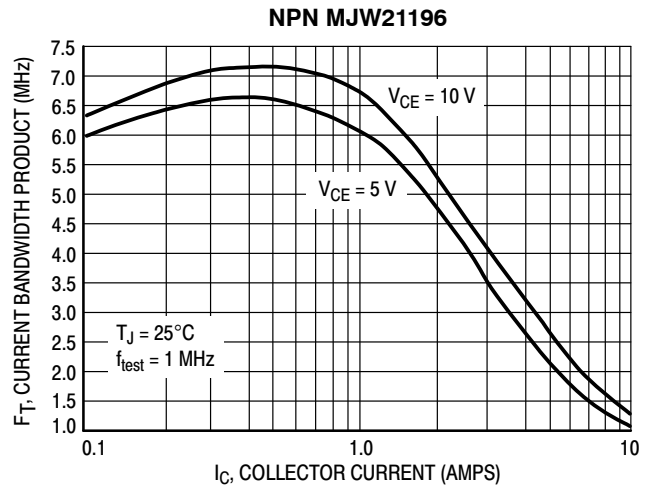
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# MJW21195 (PNP) MJW21196 (NPN)

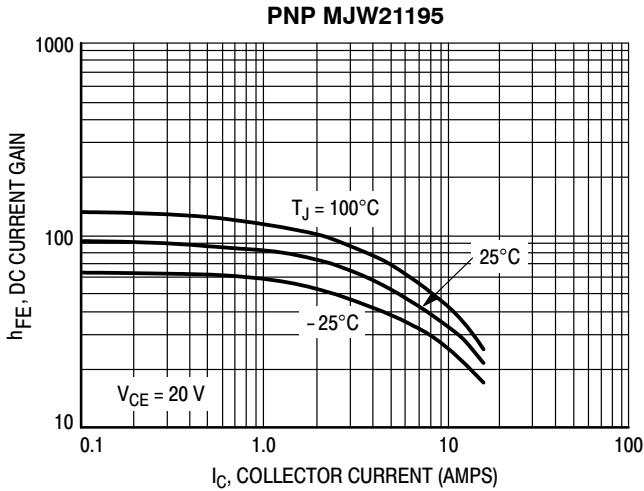
## TYPICAL CHARACTERISTICS



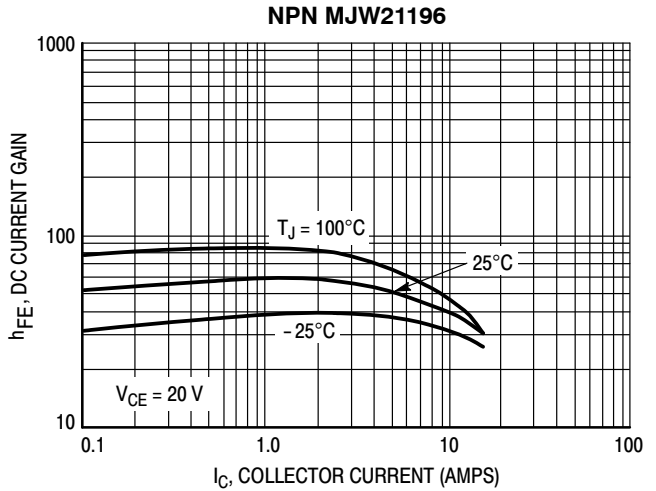
**Figure 1. Typical Current Gain Bandwidth Product**



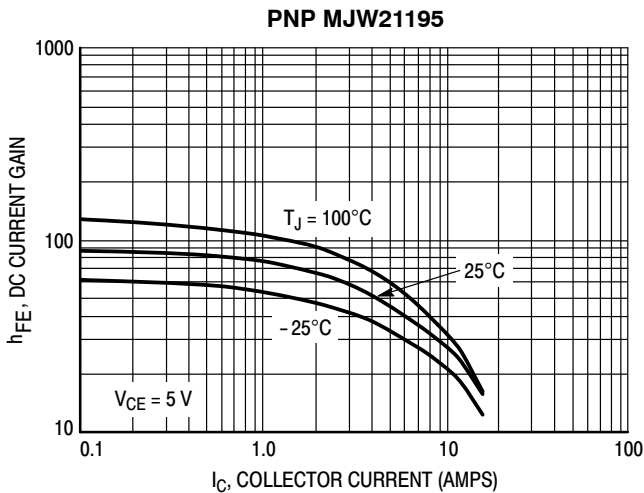
**Figure 2. Typical Current Gain Bandwidth Product**



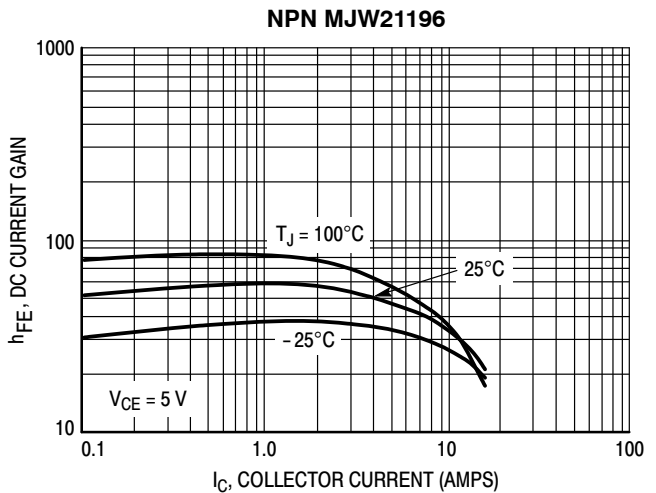
**Figure 3. DC Current Gain,  $V_{CE} = 20\text{ V}$**



**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,  $V_{CE} = 5\text{ V}$**

# MJW21195 (PNP) MJW21196 (NPN)

## TYPICAL CHARACTERISTICS

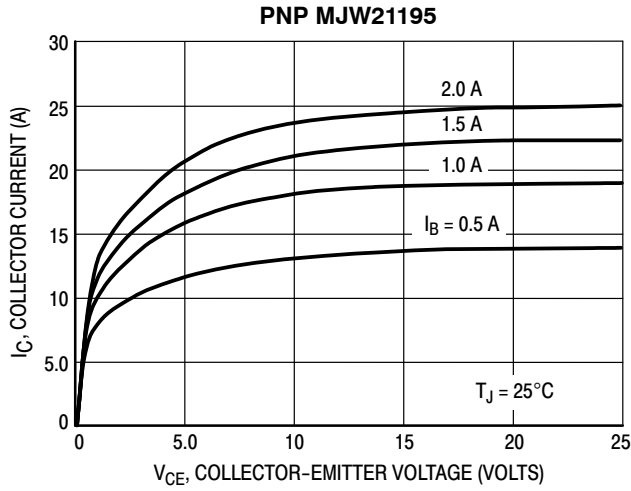


Figure 7. Typical Output Characteristics

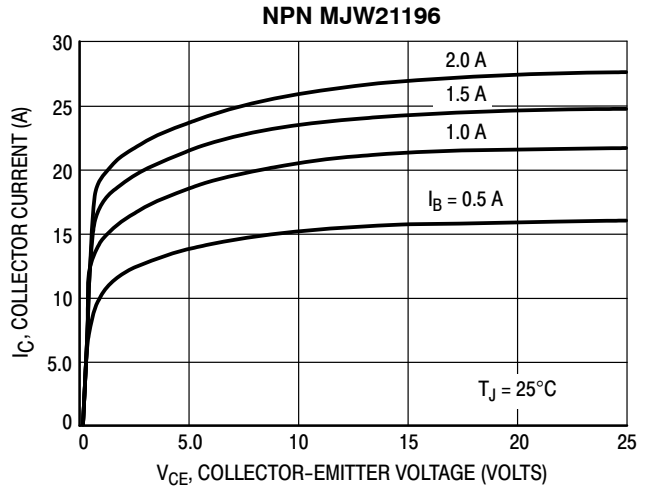


Figure 8. Typical Output Characteristics

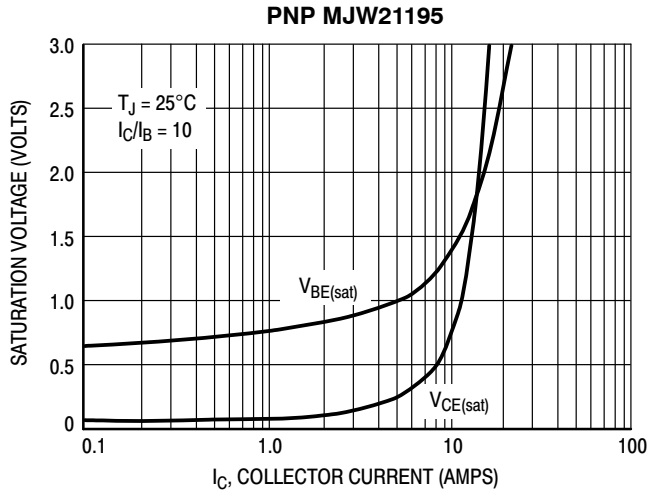


Figure 9. Typical Saturation Voltages

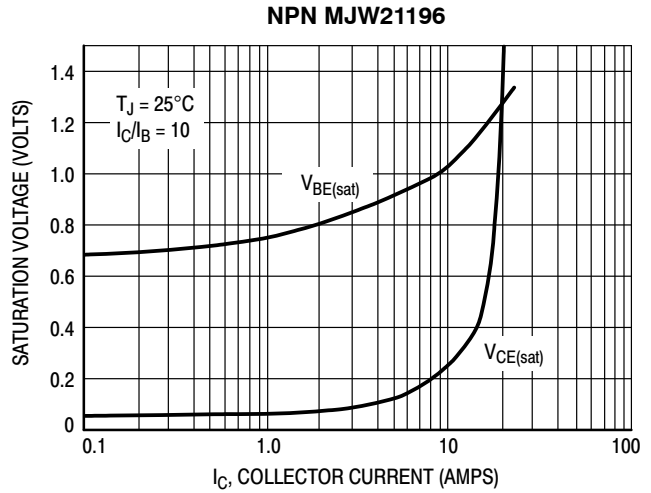


Figure 10. Typical Saturation Voltages

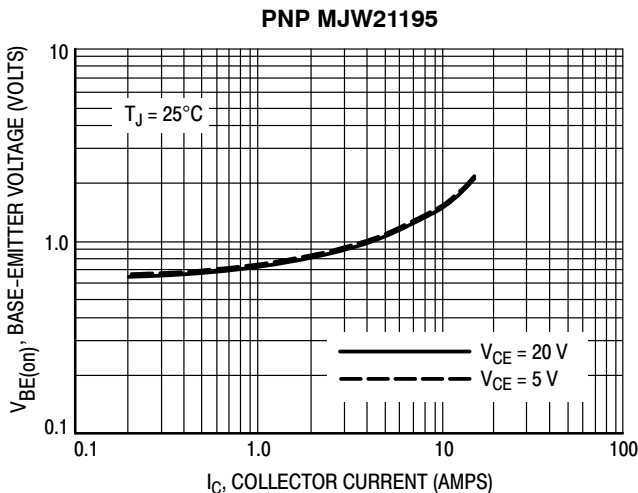


Figure 11. Typical Base-Emitter Voltage

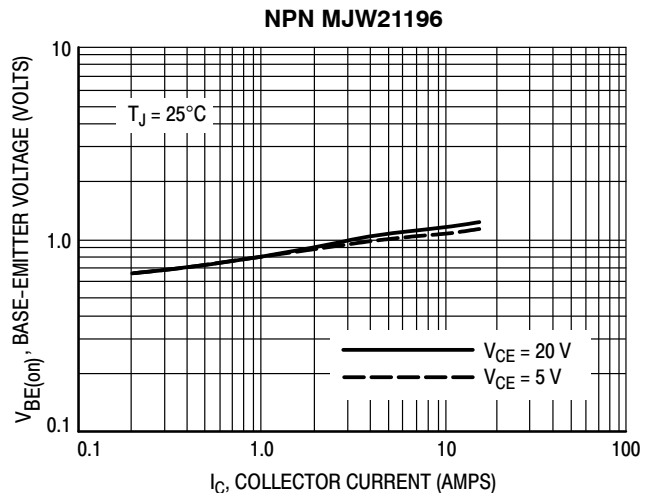


Figure 12. Typical Base-Emitter Voltage

## MJW21195 (PNP) MJW21196 (NPN)

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  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  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.

### TYPICAL CHARACTERISTICS

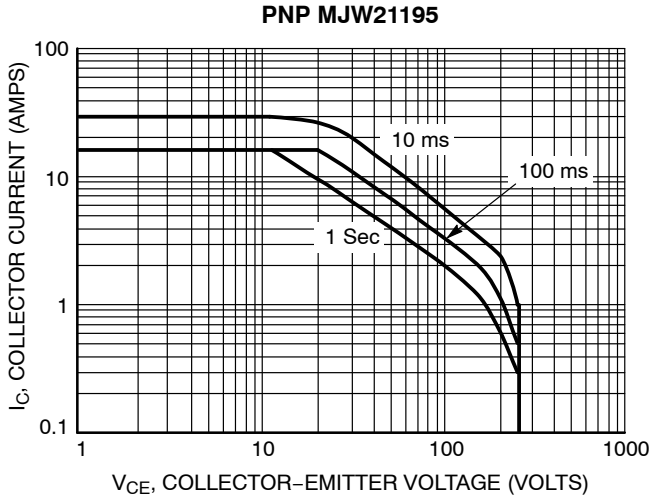


Figure 13. Active Region Safe Operating Area

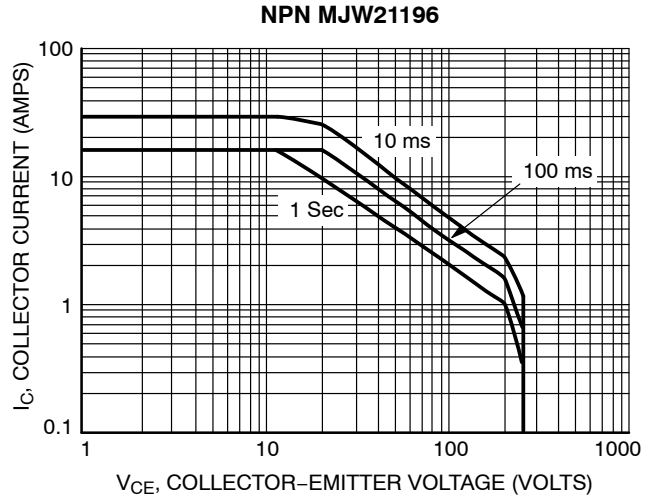


Figure 14. Active Region Safe Operating Area

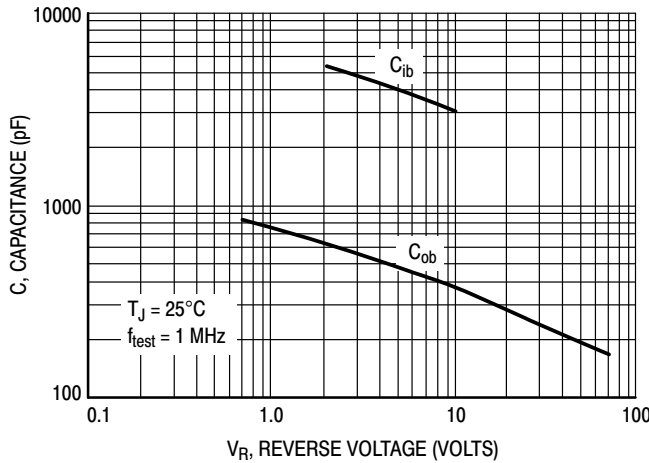


Figure 15. MJW21195 Typical Capacitance

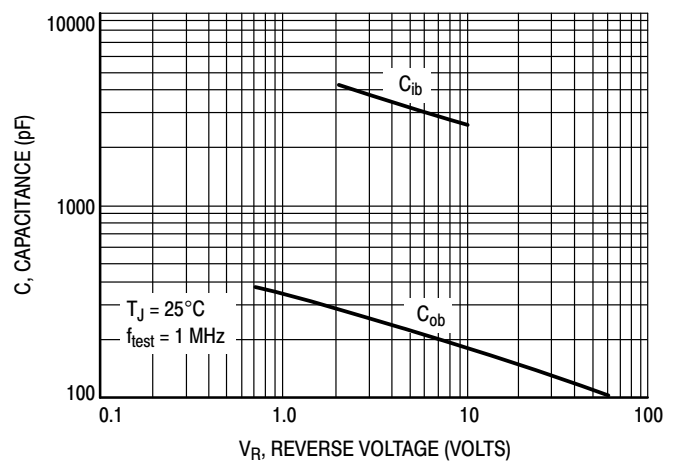


Figure 16. MJW21196 Typical Capacitance

MJW21195 (PNP) MJW21196 (NPN)

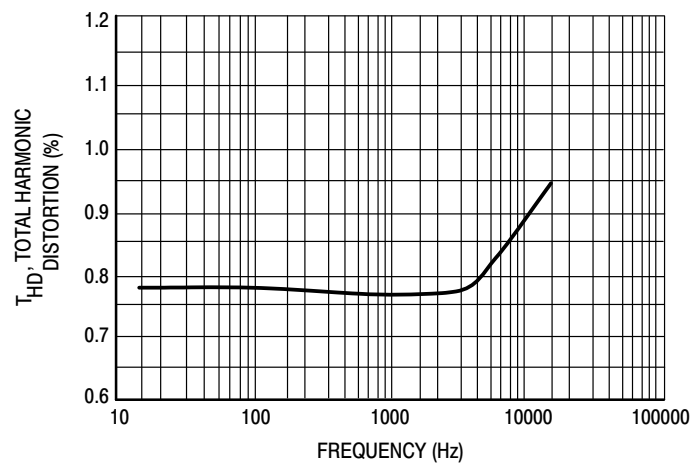


Figure 17. Typical Total Harmonic Distortion

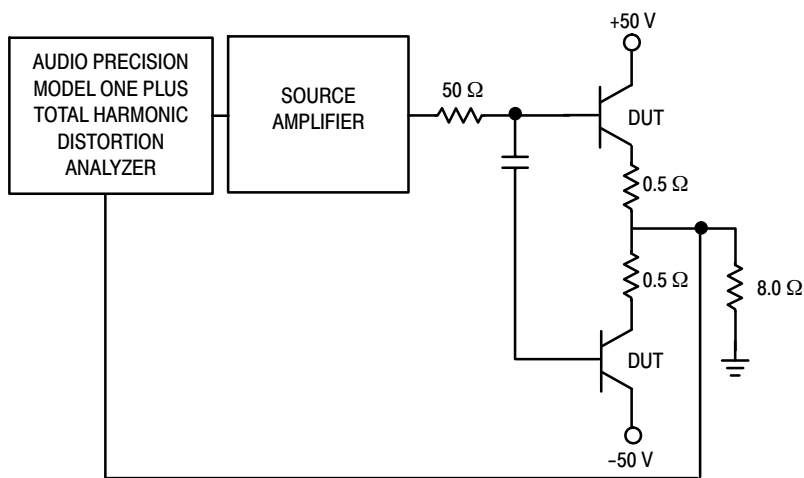
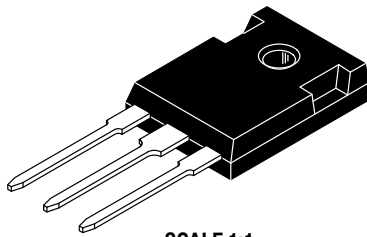


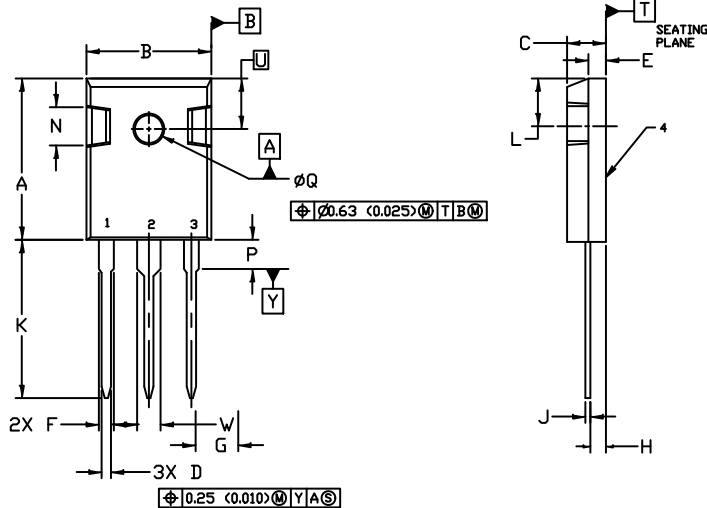
Figure 18. Total Harmonic Distortion Test Circuit



TO-247  
CASE 340L  
ISSUE G

DATE 06 OCT 2021

SCALE 1:1

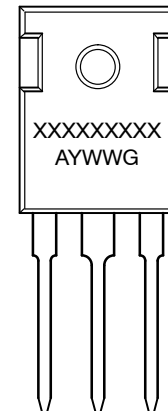


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN.        | MAX.  | MIN.      | MAX.  |
| A   | 20.32       | 21.08 | 0.800     | 0.830 |
| B   | 15.75       | 16.26 | 0.620     | 0.640 |
| C   | 4.70        | 5.30  | 0.185     | 0.209 |
| D   | 1.00        | 1.40  | 0.040     | 0.055 |
| E   | 1.90        | 2.60  | 0.075     | 0.102 |
| F   | 1.65        | 2.13  | 0.065     | 0.084 |
| G   | 5.45 BSC    |       | 0.215 BSC |       |
| H   | 1.50        | 2.49  | 0.059     | 0.098 |
| J   | 0.40        | 0.80  | 0.016     | 0.031 |
| K   | 19.81       | 20.83 | 0.780     | 0.820 |
| L   | 5.40        | 6.20  | 0.212     | 0.244 |
| N   | 4.32        | 5.49  | 0.170     | 0.216 |
| P   | ----        | 4.50  | ----      | 0.177 |
| Q   | 3.55        | 3.65  | 0.140     | 0.144 |
| U   | 6.15 BSC    |       | 0.242 BSC |       |
| W   | 2.87        | 3.12  | 0.113     | 0.123 |

GENERIC  
MARKING DIAGRAM\*



- STYLE 1:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN
- STYLE 2:  
PIN 1. ANODE  
2. CATHODE (S)  
3. ANODE 2  
4. CATHODE (S)
- STYLE 3:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 4:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 5:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE
- STYLE 6:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

XXXXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

|                  |             |                                                                                                                                                                                  |
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