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# NJW21193G (PNP) NJW21194G (NPN)

## Silicon Power Transistors

The NJW21193G and NJW21194G 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	$V_{EBO}$	5.0	Vdc
Collector-Emitter Voltage – 1.5 V	$V_{CEX}$	400	Vdc
Collector Current – Continuous	$I_C$	16	Adc
Collector Current – Peak (Note 1)	$I_{CM}$	30	Adc
Base Current – Continuous	$I_B$	5.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	200 1.6	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	– 65 to +150	$^\circ\text{C}$

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

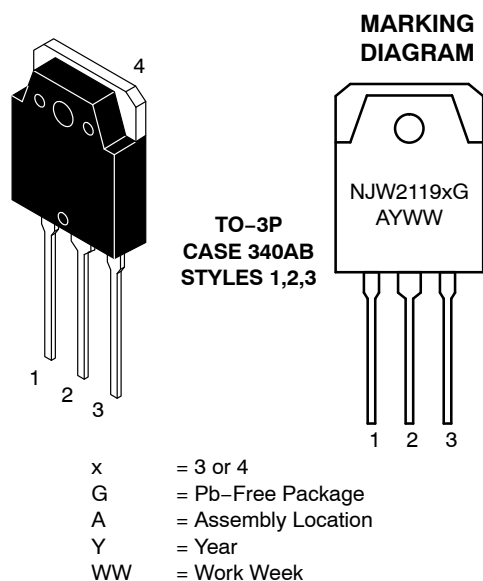
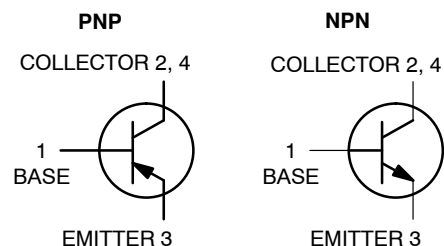
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.625	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	$^\circ\text{C/W}$



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<http://onsemi.com>

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



### ORDERING INFORMATION

Device	Package	Shipping
NJW21193G	TO-3P (Pb-Free)	30 Units/Rail
NJW21194G	TO-3P (Pb-Free)	30 Units/Rail

# NJW21193G (PNP) NJW21194G (NPN)

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	250	–	–	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 200 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	–	100	μAdc
Emitter Cutoff Current (V <sub>CE</sub> = 5 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	–	100	μAdc
Collector Cutoff Current (V <sub>CE</sub> = 250 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc)	I <sub>CEX</sub>	–	–	100	μAdc

### SECOND BREAKDOWN

Second Breakdown Collector Current with Base Forward Biased (V <sub>CE</sub> = 50 Vdc, t = 1 s (non-repetitive) (V <sub>CE</sub> = 80 Vdc, t = 1 s (non-repetitive)	I <sub>S/b</sub>	4.0 2.25	– –	– –	Adc
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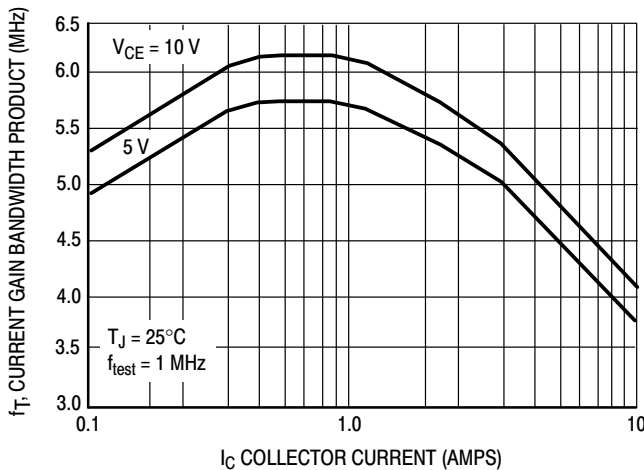
### ON CHARACTERISTICS

DC Current Gain (I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 5 Vdc) (I <sub>C</sub> = 16 Adc, I <sub>B</sub> = 5 Adc)	h <sub>FE</sub>	20 8	– –	80 –	
Base-Emitter On Voltage (I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 5 Vdc)	V <sub>BE(on)</sub>	–	–	2.2	Vdc
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 8 Adc, I <sub>B</sub> = 0.8 Adc) (I <sub>C</sub> = 16 Adc, I <sub>B</sub> = 3.2 Adc)	V <sub>CE(sat)</sub>	– –	– –	1.4 4	Vdc

### DYNAMIC CHARACTERISTICS

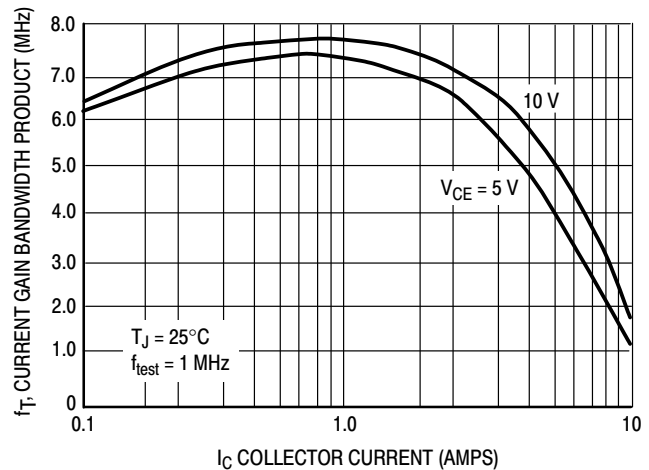
Total Harmonic Distortion at the Output V <sub>RMS</sub> = 28.3 V, f = 1 kHz, P <sub>LOAD</sub> = 100 W <sub>RMS</sub>  (Matched pair h <sub>FE</sub> = 50 @ 5 A/5 V)	h <sub>FE</sub> unmatched h <sub>FE</sub> matched	T <sub>HD</sub>	– –	0.8 0.08	– –	%
Current Gain Bandwidth Product (I <sub>C</sub> = 1 Adc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 1 MHz)	f <sub>T</sub>	4	–	–	–	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)	C <sub>ob</sub>	–	–	500	–	pF

**PNP NJW21193G**



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

**NPN NJW21194G**



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

# NJW21193G (PNP) NJW21194G (NPN)

## TYPICAL CHARACTERISTICS

PNP NJW21193G

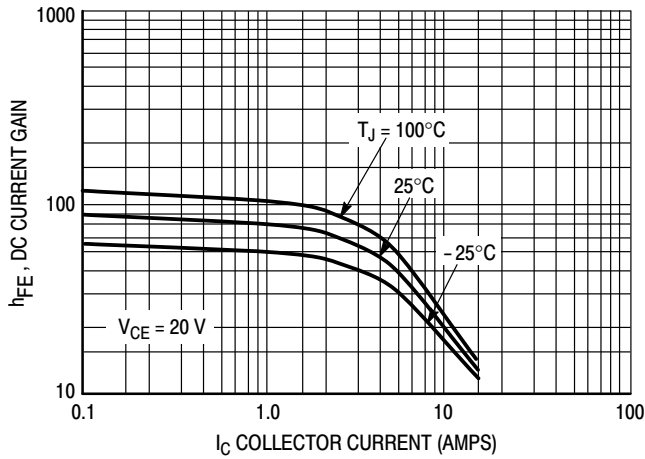


Figure 3. DC Current Gain,  $V_{CE} = 20\text{ V}$

NPN NJW21194G

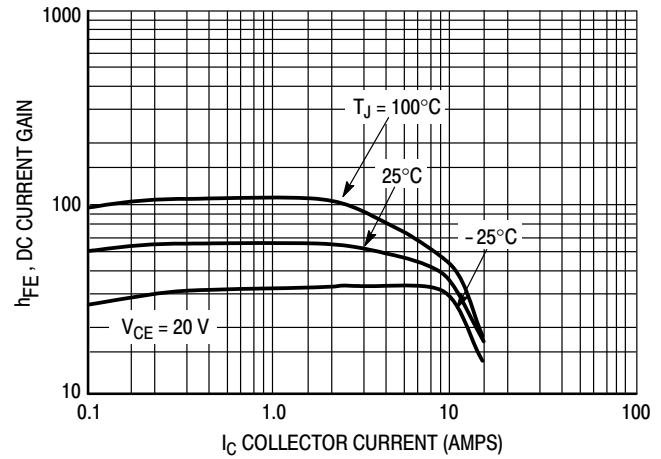


Figure 4. DC Current Gain,  $V_{CE} = 20\text{ V}$

PNP NJW21193G

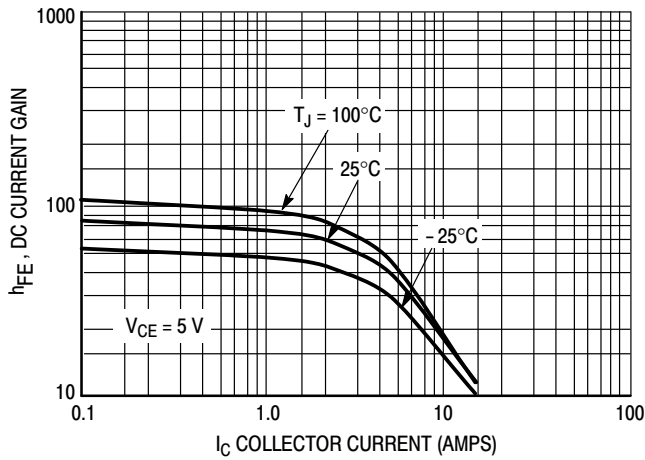


Figure 5. DC Current Gain,  $V_{CE} = 5\text{ V}$

NPN NJW21194G

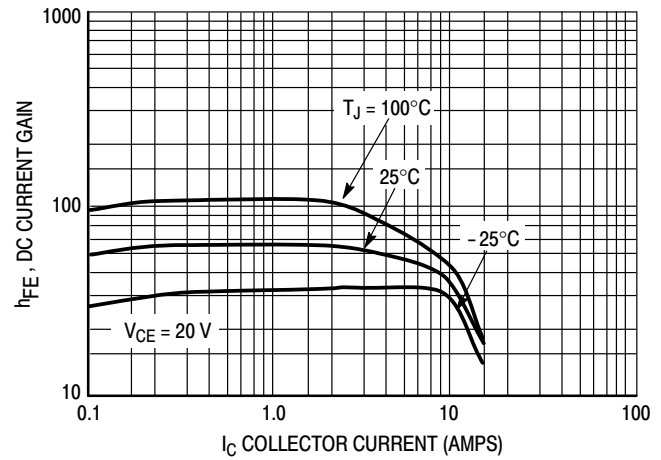


Figure 6. DC Current Gain,  $V_{CE} = 5\text{ V}$

PNP NJW21193G

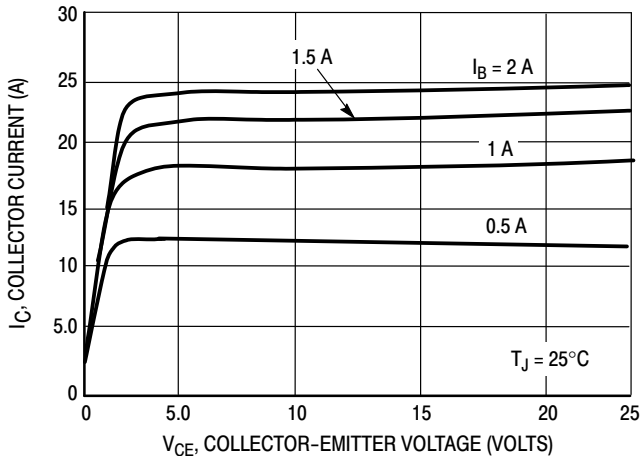


Figure 7. Typical Output Characteristics

NPN NJW21194G

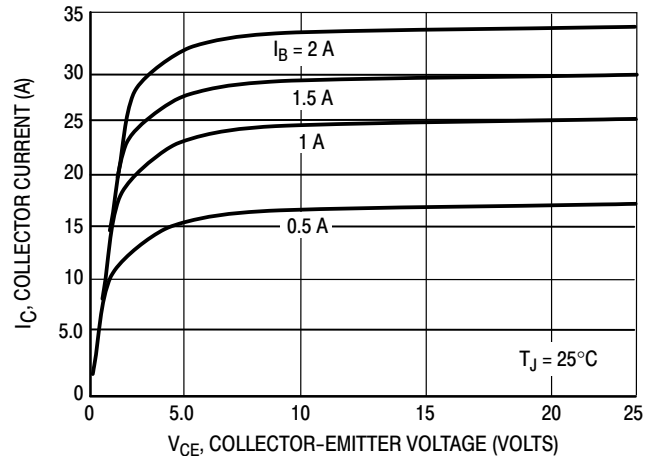


Figure 8. Typical Output Characteristics

# NJW21193G (PNP) NJW21194G (NPN)

## TYPICAL CHARACTERISTICS

PNP NJW21193G

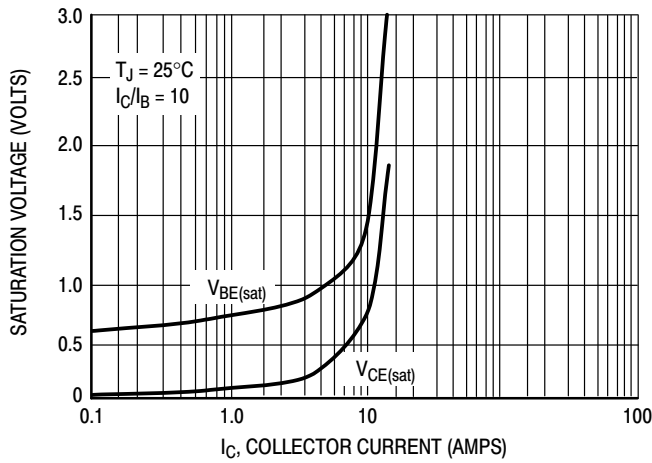


Figure 9. Typical Saturation Voltages

NPN NJW21194G

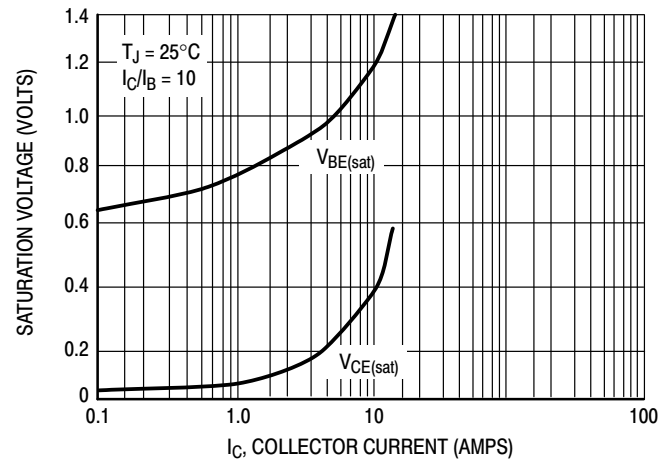


Figure 10. Typical Saturation Voltages

PNP NJW21193G

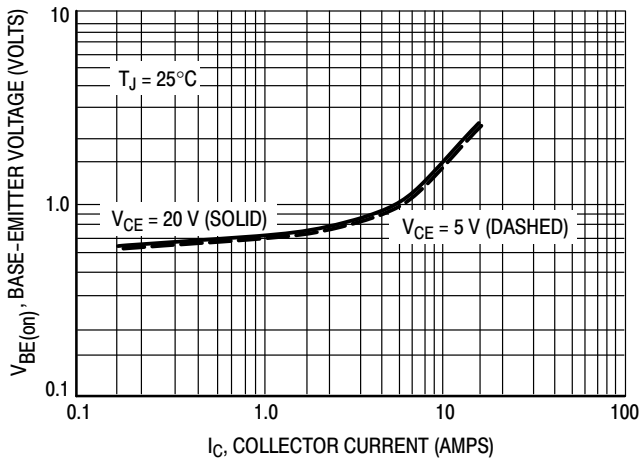


Figure 11. Typical Base-Emitter Voltage

NPN NJW21194G

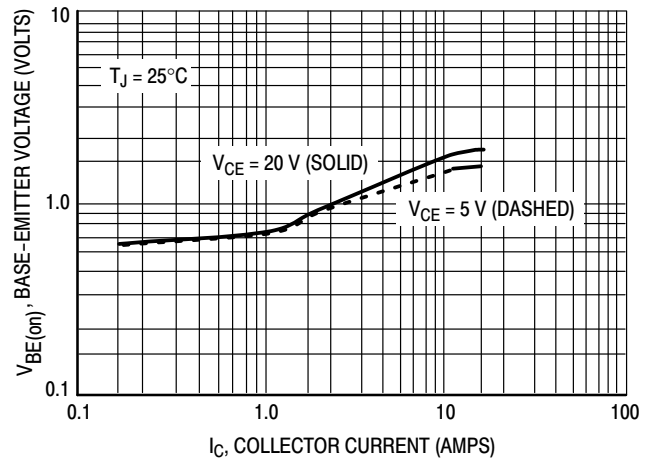


Figure 12. Typical Base-Emitter Voltage

PNP NJW21193G

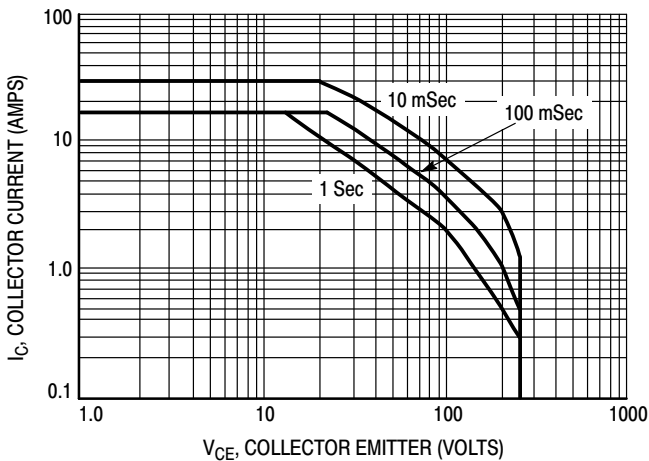


Figure 13. Active Region Safe Operating Area

NPN NJW21194G

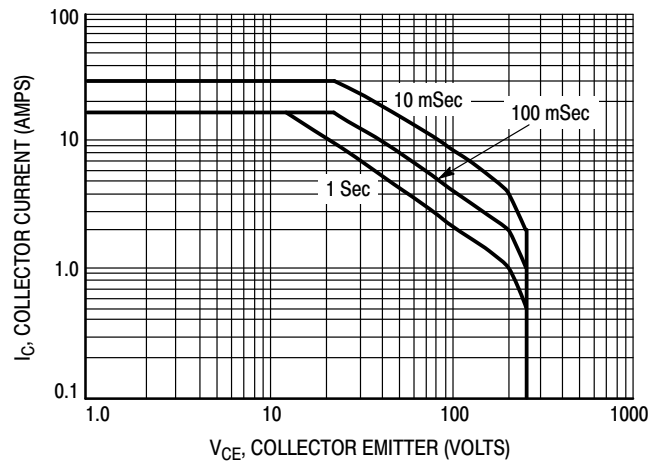


Figure 14. Active Region Safe Operating Area

## NJW21193G (PNP) NJW21194G (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.

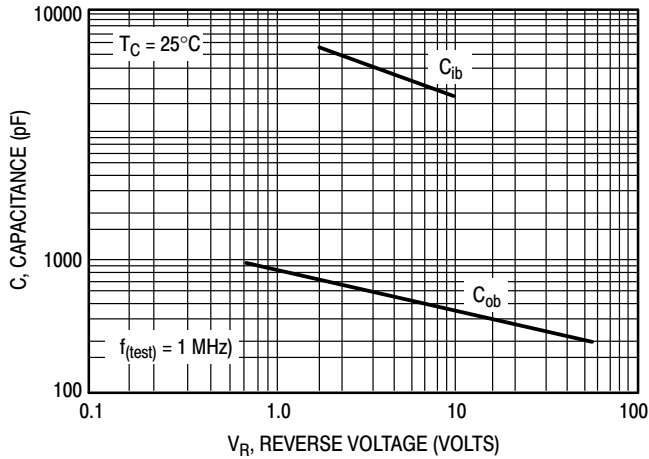


Figure 15. NJW21193G Typical Capacitance

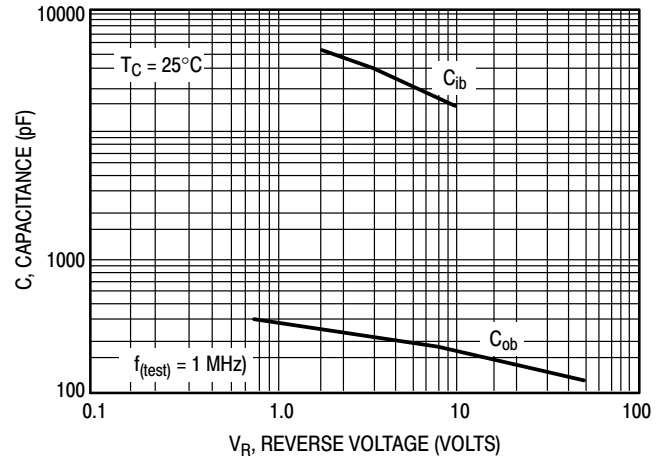


Figure 16. NJW21194G Typical Capacitance

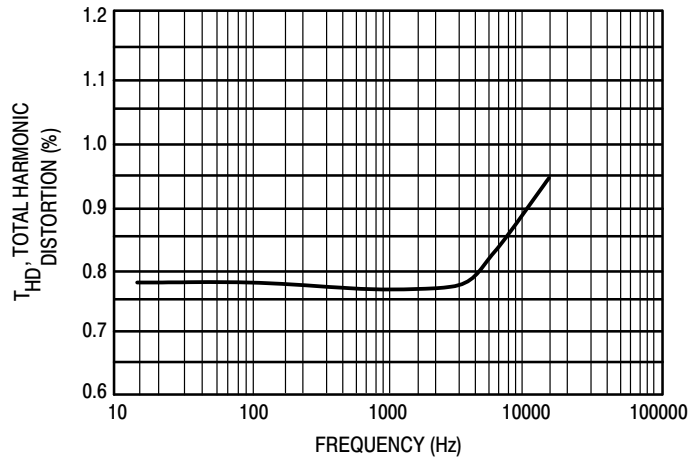


Figure 17. Typical Total Harmonic Distortion

## NJW21193G (PNP) NJW21194G (NPN)

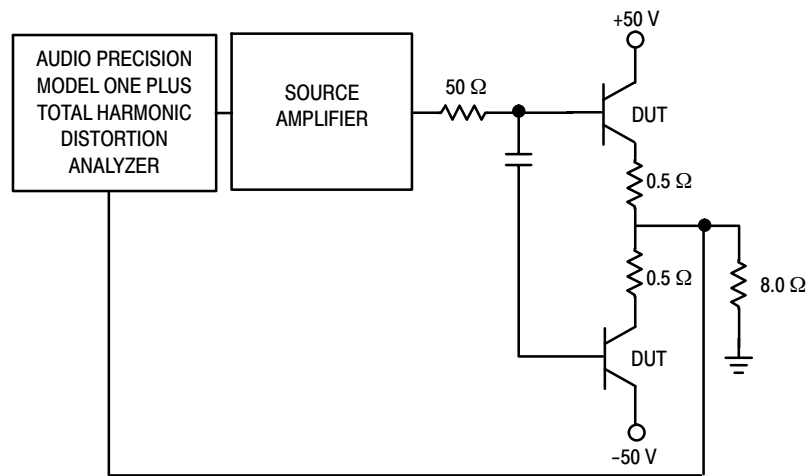


Figure 18. Total Harmonic Distortion Test Circuit

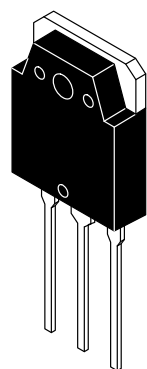
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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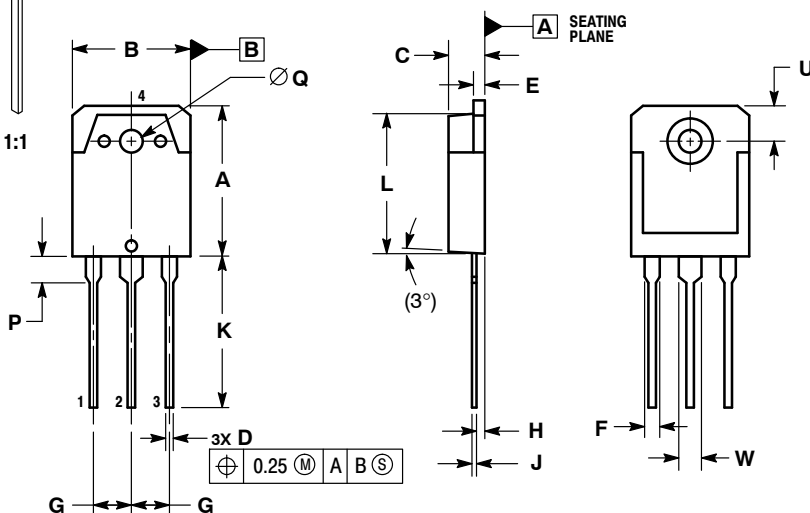


## TO-3P-3LD CASE 340AB-01 ISSUE A

DATE 30 OCT 2007



SCALE 1:1



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM THE TERMINAL TIP.
4. DIMENSION A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	19.70	19.90	20.10
B	15.40	15.60	15.80
C	4.60	4.80	5.00
D	0.80	1.00	1.20
E	1.45	1.50	1.65
F	1.80	2.00	2.20
G	5.45 BSC		
H	1.20	1.40	1.60
J	0.55	0.60	0.75
K	19.80	20.00	20.20
L	18.50	18.70	18.90
P	3.30	3.50	3.70
Q	3.10	3.20	3.50
U	5.00 REF		
W	2.80	3.00	3.20

### STYLE 1:

- PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

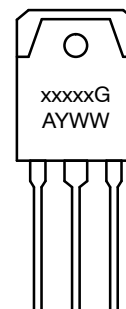
### STYLE 2:

- PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE

### STYLE 3:

- PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

## GENERIC MARKING DIAGRAM\*



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

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G", may or not be present.

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