

Silicon Power Transistors

NJW21193G (PNP) NJW21194G (NPN)

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

Symbol	Rating	Value	Unit
V_{CEO}	Collector-Emitter Voltage	250	Vdc
V_{CBO}	Collector-Base Voltage	400	Vdc
V_{EBO}	Emitter-Base Voltage	5.0	Vdc
V_{CEX}	Collector-Emitter Voltage – 1.5 V	400	Vdc
I_C	Collector Current – Continuous	16	Adc
I_{CM}	Collector Current – Peak (Note 1)	30	Adc
I_B	Base Current – Continuous	5.0	Adc
P_D	Total Power Dissipation @ $T_C = 25\text{ }^\circ\text{C}$ Derate Above $25\text{ }^\circ\text{C}$	200 1.6	W W/ $^\circ\text{C}$
T_J, T_{stg}	Operating and Storage Junction Temperature Range	- 65 to +150	$^\circ\text{C}$

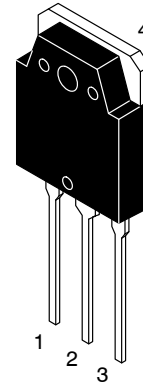
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

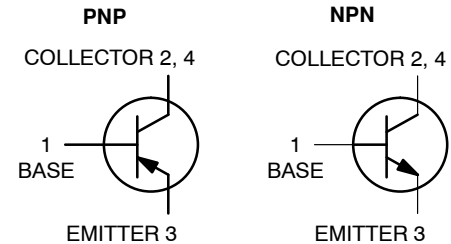
THERMAL CHARACTERISTICS

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

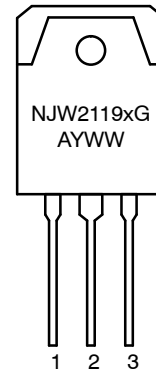
16 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 250 VOLTS, 200 WATTS



TO-3P
CASE 340AB
STYLES 1,2,3



MARKING DIAGRAM



NJW2119= Specific Device Code
x = 3 or 4
G = Pb-Free Package
A = Assembly Location
Y = Year
WW = Work Week

ORDERING INFORMATION

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

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ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Symbol	Characteristic	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

V _{CEO(sus)}	Collector-Emitter Sustaining Voltage (I _C = 100 mA _{dc} , I _B = 0)	250	–	–	V _{dc}
I _{CEO}	Collector Cutoff Current (V _{CE} = 200 V _{dc} , I _B = 0)	–	–	100	μA _{dc}
I _{EBO}	Emitter Cutoff Current (V _{CE} = 5 V _{dc} , I _C = 0)	–	–	100	μA _{dc}
I _{CEX}	Collector Cutoff Current (V _{CE} = 250 V _{dc} , V _{BE(off)} = 1.5 V _{dc})	–	–	100	μA _{dc}

SECOND BREAKDOWN

I _{S/b}	Second Breakdown Collector Current with Base Forward Biased (V _{CE} = 50 V _{dc} , t = 1 s (non-repetitive)) (V _{CE} = 80 V _{dc} , t = 1 s (non-repetitive))	4.0	–	–	A _{dc}
		2.25	–	–	

ON CHARACTERISTICS

h _{FE}	DC Current Gain (I _C = 8 A _{dc} , V _{CE} = 5 V _{dc}) (I _C = 16 A _{dc} , I _B = 5 A _{dc})	20	–	80	
		8	–	–	
V _{BE(on)}	Base-Emitter On Voltage (I _C = 8 A _{dc} , V _{CE} = 5 V _{dc})	–	–	2.2	V _{dc}
V _{CE(sat)}	Collector-Emitter Saturation Voltage (I _C = 8 A _{dc} , I _B = 0.8 A _{dc}) (I _C = 16 A _{dc} , I _B = 3.2 A _{dc})	–	–	1.4	V _{dc}
		–	–	4	

DYNAMIC CHARACTERISTICS

T _{HD}	Total Harmonic Distortion at the Output V _{RMS} = 28.3 V, f = 1 kHz, P _{LOAD} = 100 W _{RMS} (Matched pair h _{FE} = 50 @ 5 A/5 V)	h _{FE} unmatched h _{FE} matched	–	0.8	–	%
			–	0.08	–	
f _T	Current Gain Bandwidth Product (I _C = 1 A _{dc} , V _{CE} = 10 V _{dc} , f _{test} = 1 MHz)	4	–	–	MHz	
C _{ob}	Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f _{test} = 1 MHz)	–	–	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.

NJW21193G (PNP) NJW21194G (NPN)

TYPICAL CHARACTERISTICS

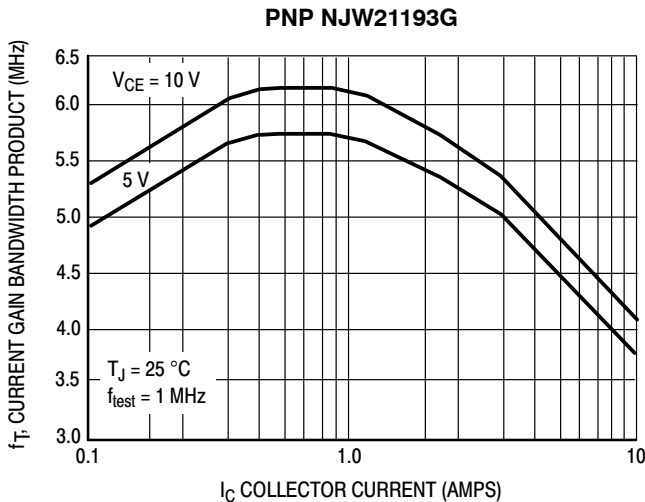


Figure 1. Typical Current Gain Bandwidth Product

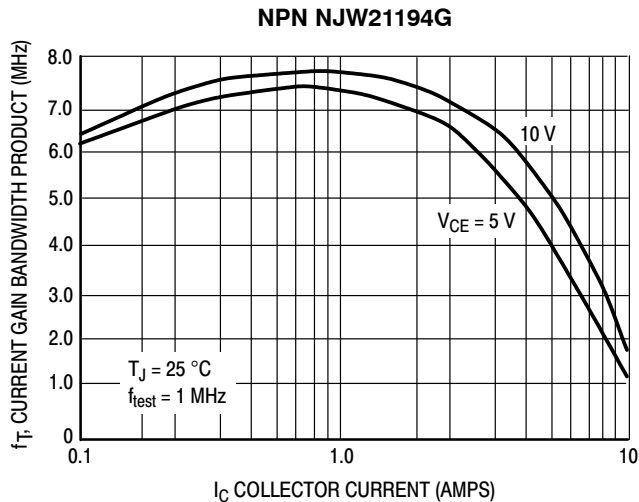


Figure 2. Typical Current Gain Bandwidth Product

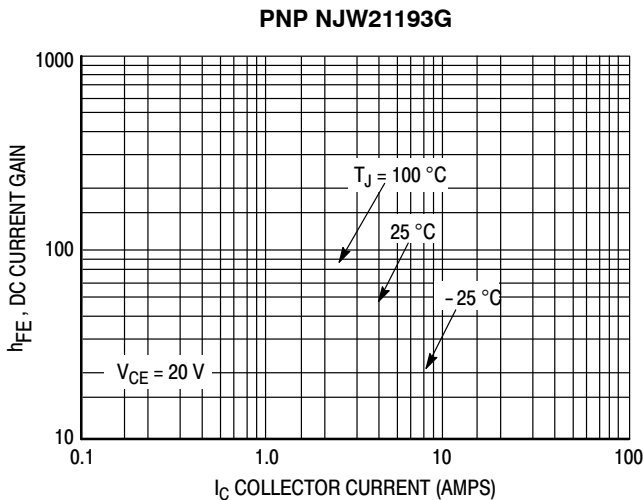


Figure 3. DC Current Gain, $V_{CE} = 20 V$

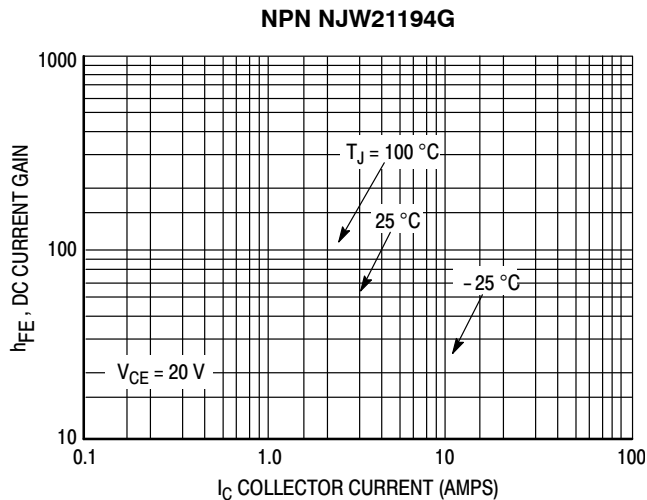


Figure 4. DC Current Gain, $V_{CE} = 20 V$

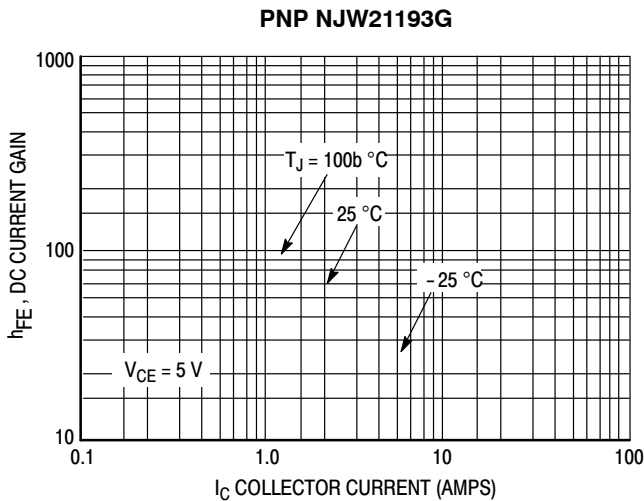


Figure 5. DC Current Gain, $V_{CE} = 5 V$

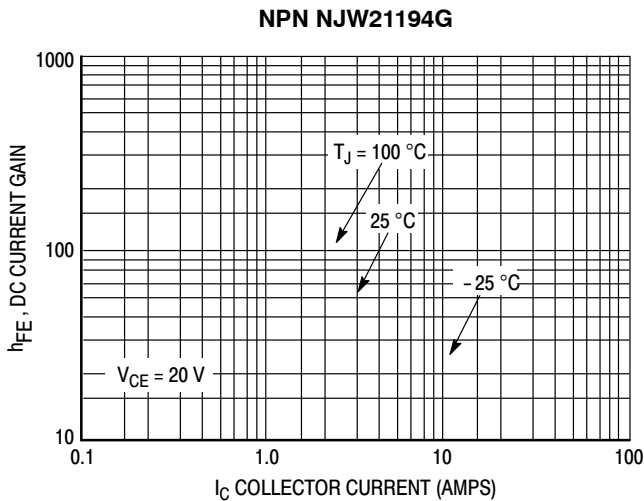


Figure 6. DC Current Gain, $V_{CE} = 5 V$

NJW21193G (PNP) NJW21194G (NPN)

TYPICAL CHARACTERISTICS

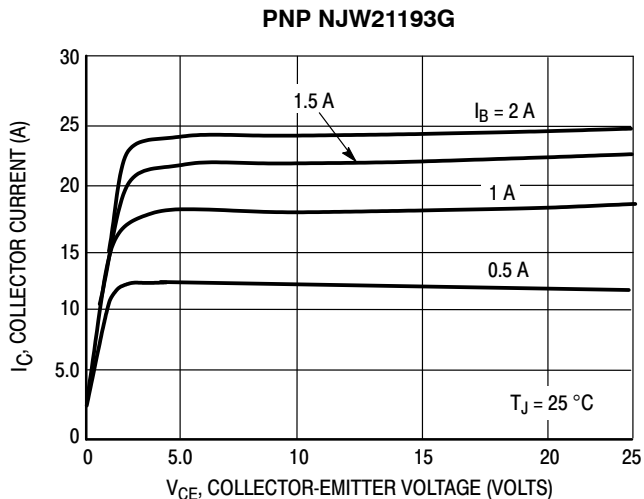


Figure 7. Typical Output Characteristics

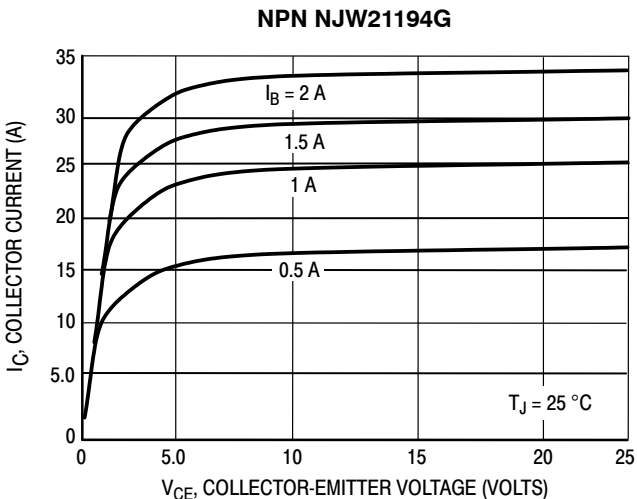


Figure 8. Typical Output Characteristics

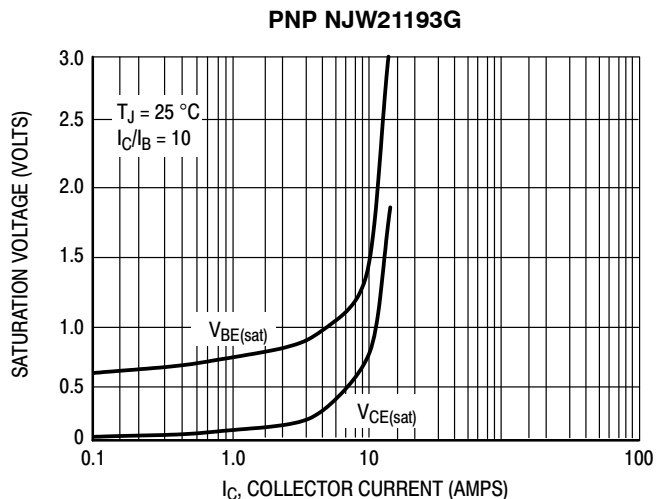


Figure 9. Typical Saturation Voltages

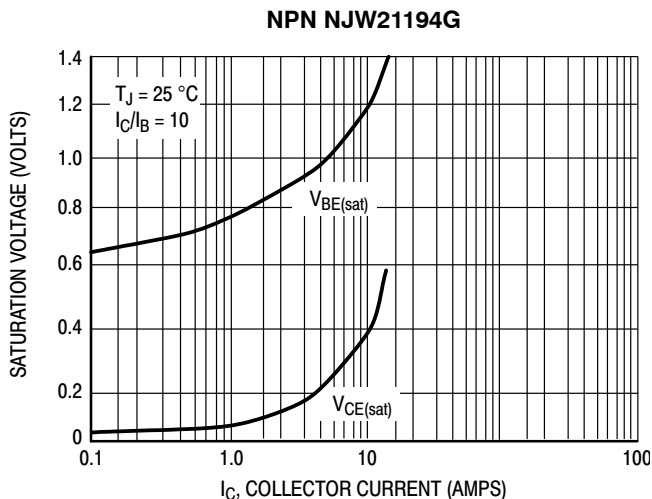


Figure 10. Typical Saturation Voltages

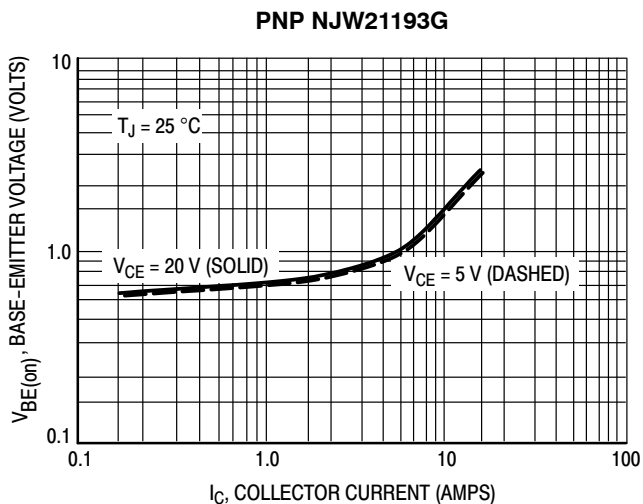


Figure 11. Typical Base-Emitter Voltage

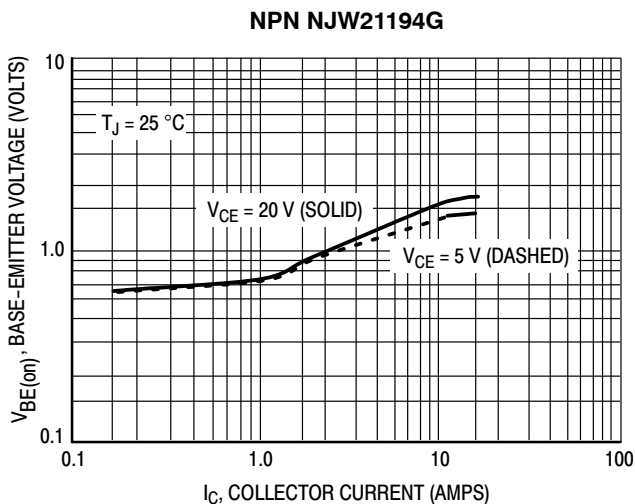


Figure 12. Typical Base-Emitter Voltage

NJW21193G (PNP) NJW21194G (NPN)

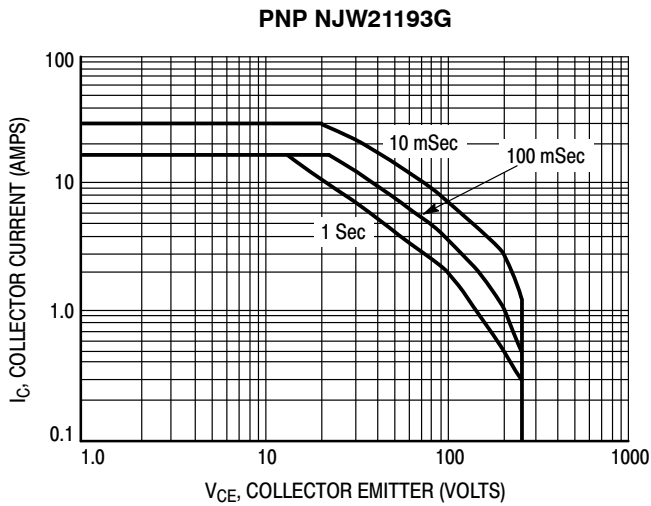


Figure 13. Active Region Safe Operating Area

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.

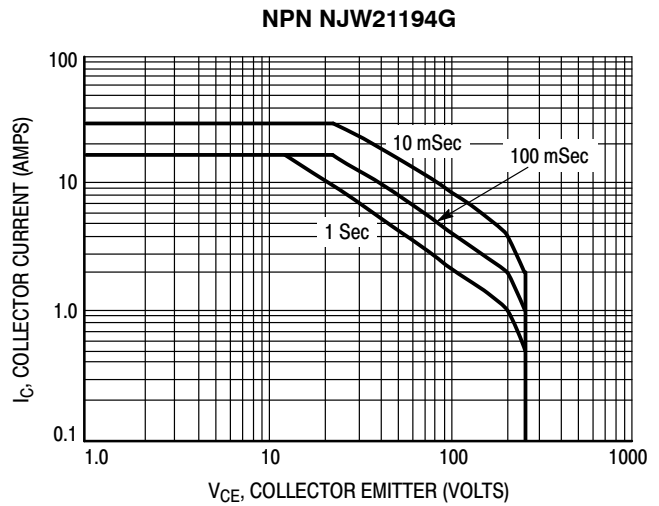


Figure 14. Active Region Safe Operating Area

The data of Figure 13 is based on $T_{J(pk)} = 150\text{ }^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

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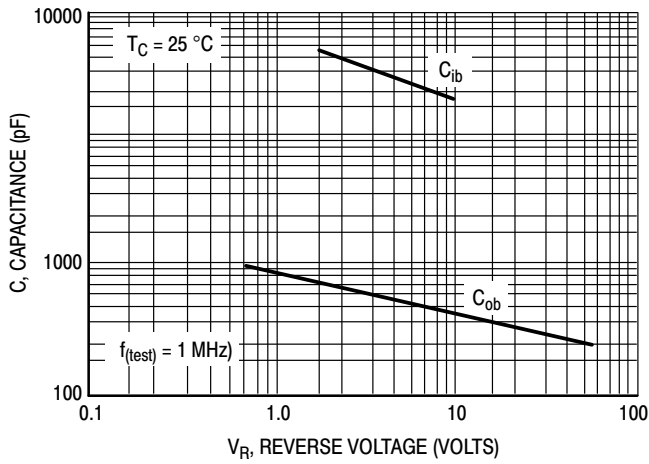


Figure 15. NJW21193G Typical Capacitance

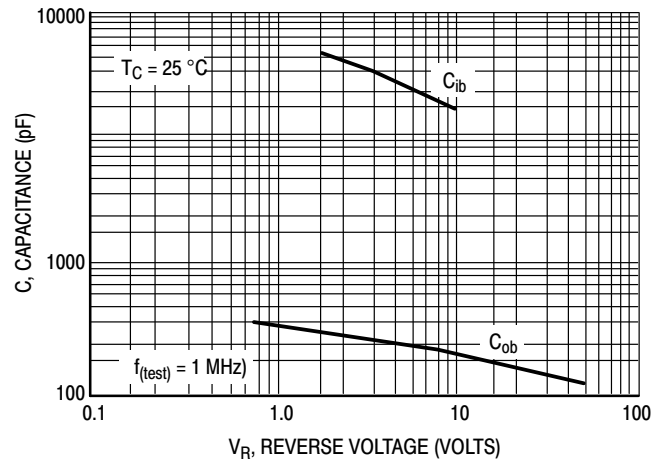


Figure 16. NJW21194G Typical Capacitance

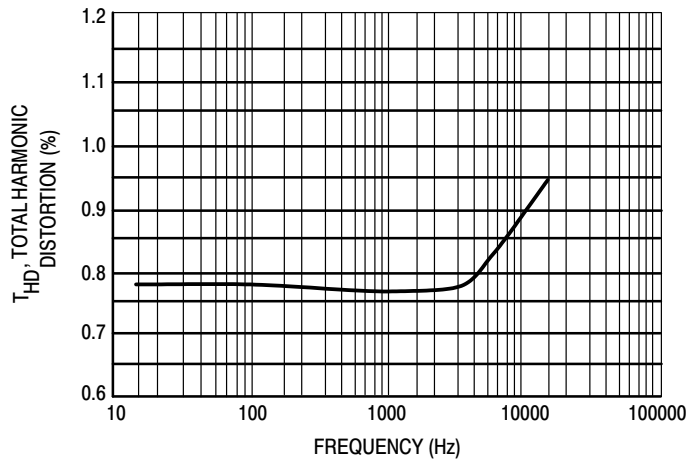


Figure 17. Typical Total Harmonic Distortion

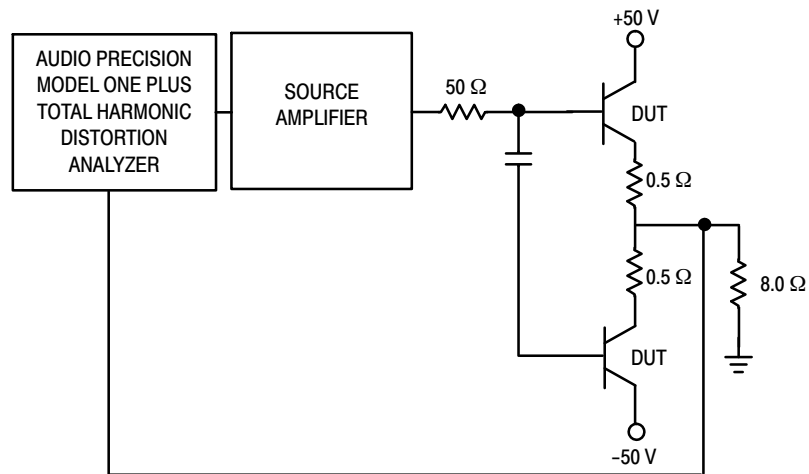
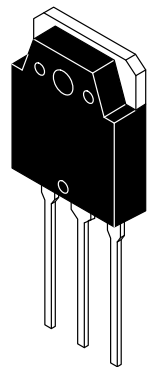


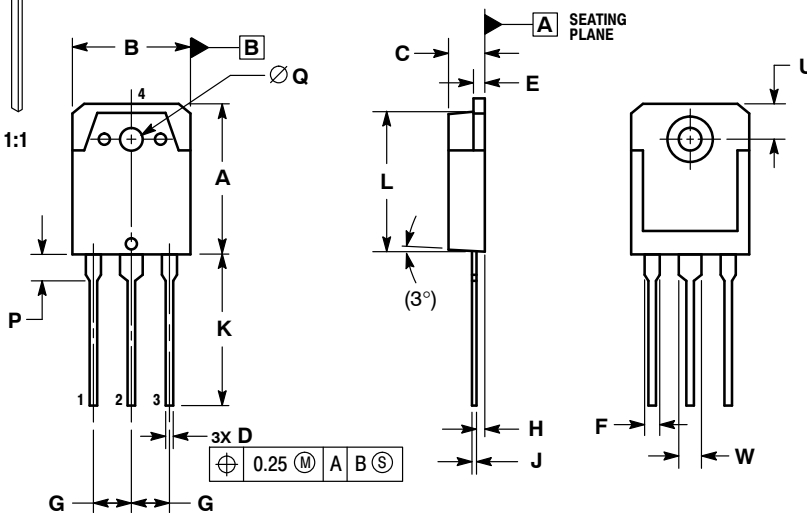
Figure 18. Total Harmonic Distortion Test Circuit

TO-3P-3LD
CASE 340AB
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

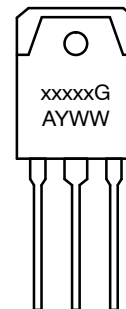
STYLE 2:

- 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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