Silicon Power Transistors

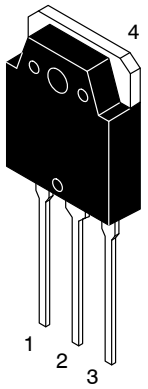
NJW21193G (PNP)
NJW21194G (NPN)

16 AMPERES
COMPLEMENTARY SILICON
POWER TRANSISTORS
250 VOLTS, 200 WATTS

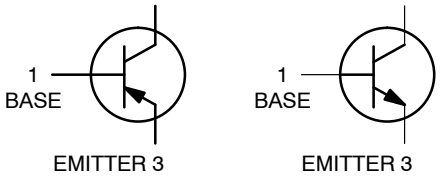
The NJW21193G and NJW21194G utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

Features

- Total Harmonic Distortion Characterized
- High DC Current Gain
- Excellent Gain Linearity
- High SOA
- These Devices are Pb-Free and are RoHS Compliant



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



MAXIMUM RATINGS

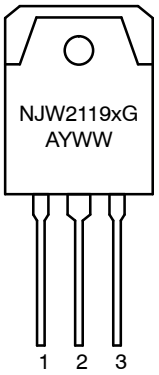
Symbol	Rating	Value	Unit
V_{CEO}	Collector-Emitter Voltage	250	Vdc
V_{CBO}	Collector-Base Voltage	400	Vdc
V_{EBO}	Emitter-Base Voltage	5.0	Vdc
V_{CEX}	Collector-Emitter Voltage – 1.5 V	400	Vdc
I_C	Collector Current – Continuous	16	Adc
I_{CM}	Collector Current – Peak (Note 1)	30	Adc
I_B	Base Current – Continuous	5.0	Adc
P_D	Total Power Dissipation @ T_C = 25 °C Derate Above 25 °C	200 1.6	W W/°C
T_J, T_{stg}	Operating and Storage Junction Temperature Range	– 65 to +150	°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 ≤ 10%.

THERMAL CHARACTERISTICS

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

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

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

Symbol	Characteristic	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	250	–	–	Vdc
I_{CEO}	Collector Cutoff Current (V_{CE} = 200 Vdc, I_B = 0)	–	–	100	μAdc
I_{EBO}	Emitter Cutoff Current (V_{CE} = 5 Vdc, I_C = 0)	–	–	100	μAdc
I_{CEX}	Collector Cutoff Current (V_{CE} = 250 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	–	–	100	μAdc
SECOND BREAKDOWN					
$I_{S/b}$	Second Breakdown Collector Current with Base Forward Biased				Adc
	(V_{CE} = 50 Vdc, t = 1 s (non-repetitive)	4.0	–	–	
	(V_{CE} = 80 Vdc, t = 1 s (non-repetitive)	2.25	–	–	
ON CHARACTERISTICS					
h_{FE}	DC Current Gain				
	(I_C = 8 Adc, V_{CE} = 5 Vdc)	20	–	80	
	(I_C = 16 Adc, I_B = 5 Adc)	8	–	–	
$V_{BE(on)}$	Base-Emitter On Voltage (I_C = 8 Adc, V_{CE} = 5 Vdc)	–	–	2.2	Vdc
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage				Vdc
	(I_C = 8 Adc, I_B = 0.8 Adc)	–	–	1.4	
	(I_C = 16 Adc, I_B = 3.2 Adc)	–	–	4	
DYNAMIC CHARACTERISTICS					
T_{HD}	Total Harmonic Distortion at the Output				%
	V_{RMS} = 28.3 V, f = 1 kHz, P_{LOAD} = 100 W_{RMS} h_{FE} unmatched	–	0.8	–	
	(Matched pair h_{FE} = 50 @ 5 A/5 V) h_{FE} matched	–	0.08	–	
f_T	Current Gain Bandwidth Product (I_C = 1 Adc, V_{CE} = 10 Vdc, f_{test} = 1 MHz)	4	–	–	MHz
C_{ob}	Output Capacitance (V_{CB} = 10 Vdc, 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.

TYPICAL CHARACTERISTICS

PNP NJW21193G

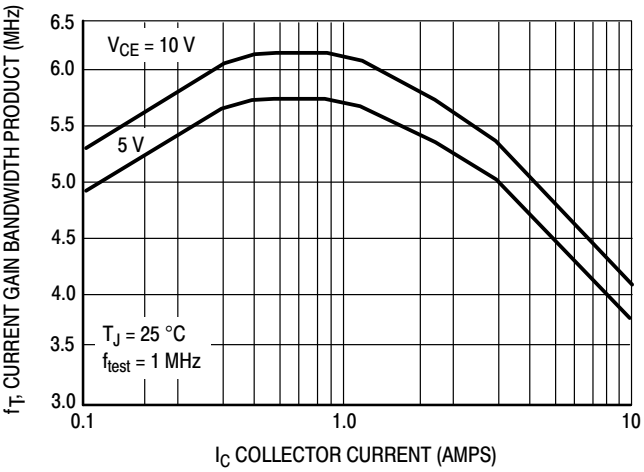


Figure 1. Typical Current Gain Bandwidth Product

NPN NJW21194G

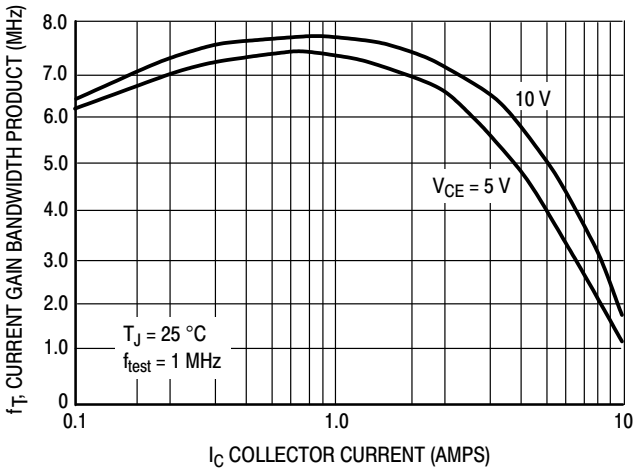


Figure 2. Typical Current Gain Bandwidth Product

PNP NJW21193G

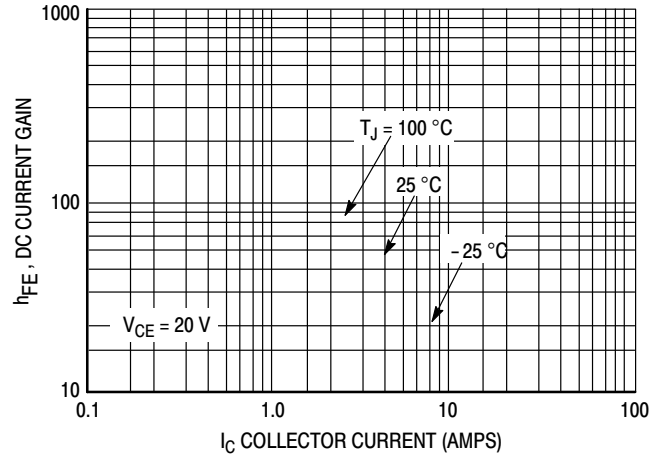


Figure 3. DC Current Gain, V_{CE} = 20 V

NPN NJW21194G

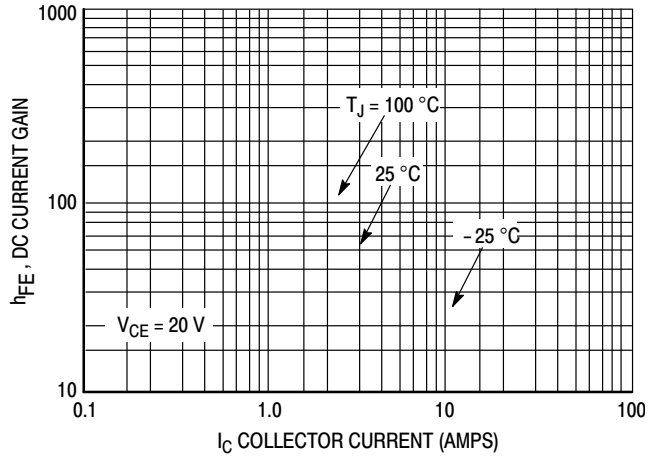


Figure 4. DC Current Gain, V_{CE} = 20 V

PNP NJW21193G

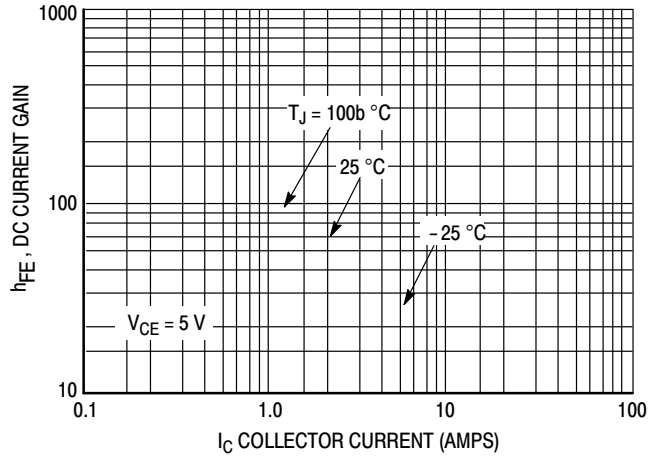


Figure 5. DC Current Gain, V_{CE} = 5 V

NPN NJW21194G

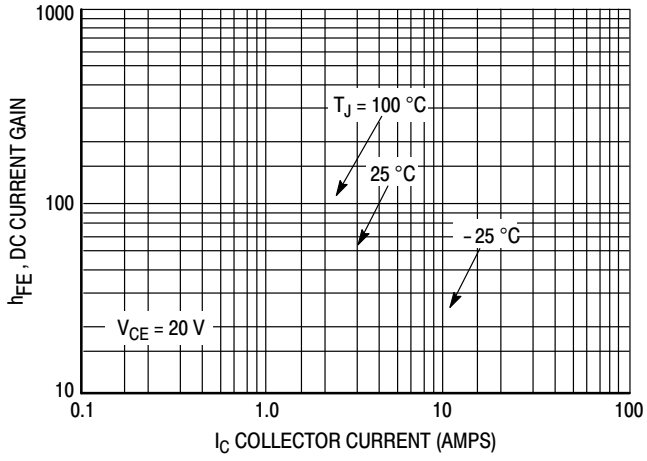


Figure 6. DC Current Gain, V_{CE} = 5 V

TYPICAL CHARACTERISTICS

PNP NJW21193G

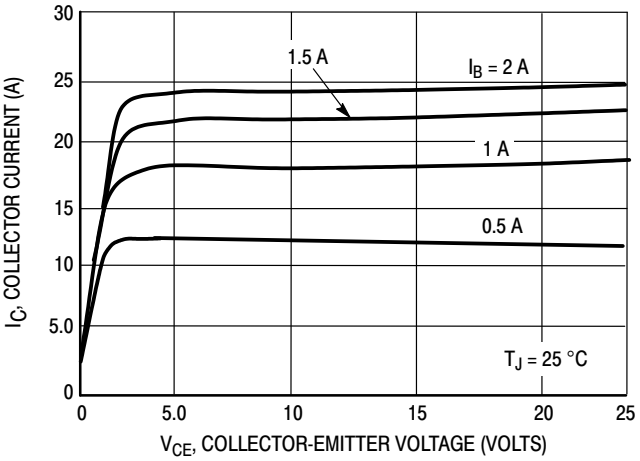


Figure 7. Typical Output Characteristics

NPN NJW21194G

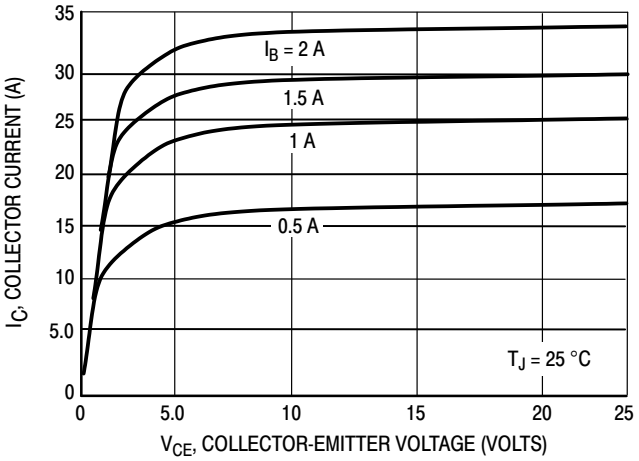


Figure 8. Typical Output Characteristics

PNP NJW21193G

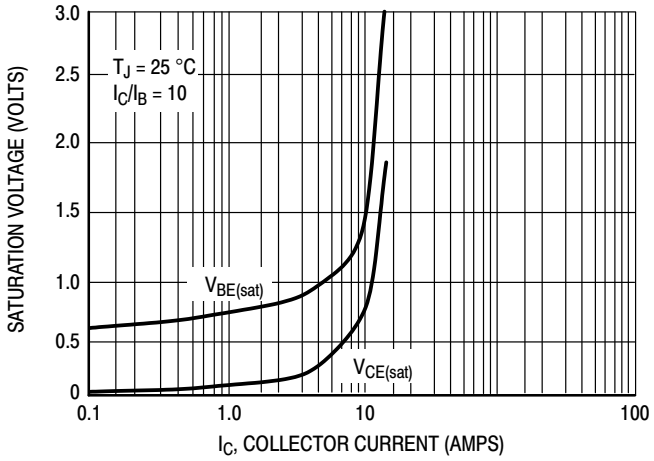


Figure 9. Typical Saturation Voltages

NPN NJW21194G

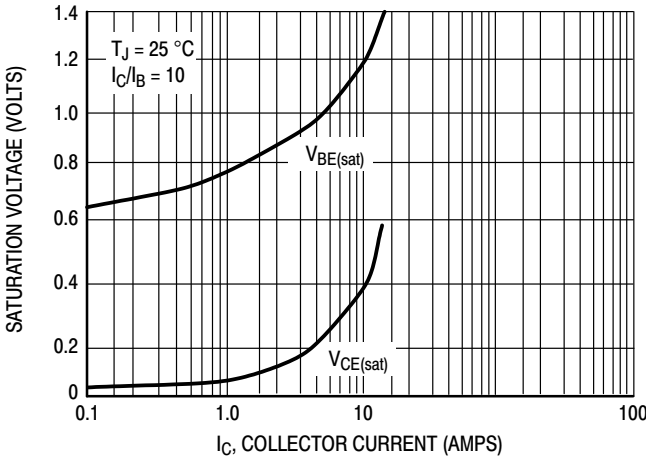


Figure 10. Typical Saturation Voltages

PNP NJW21193G

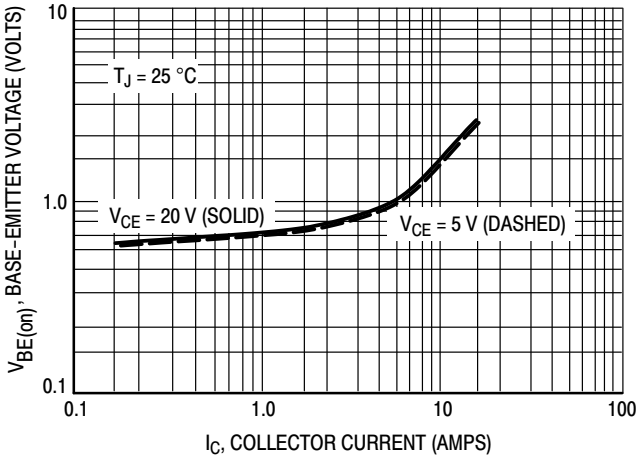


Figure 11. Typical Base-Emitter Voltage

NPN NJW21194G

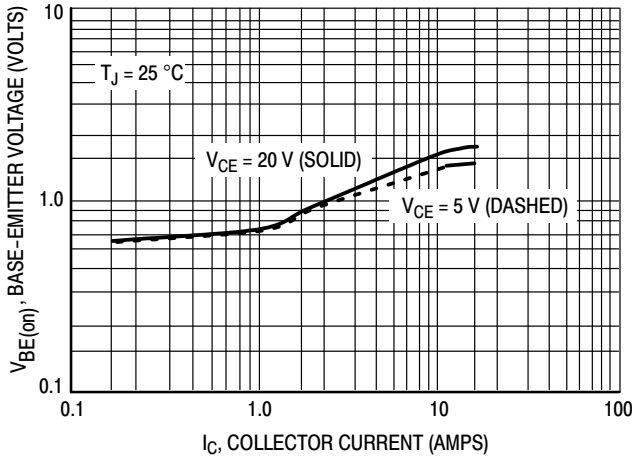


Figure 12. Typical Base-Emitter Voltage

PNP NJW21193G

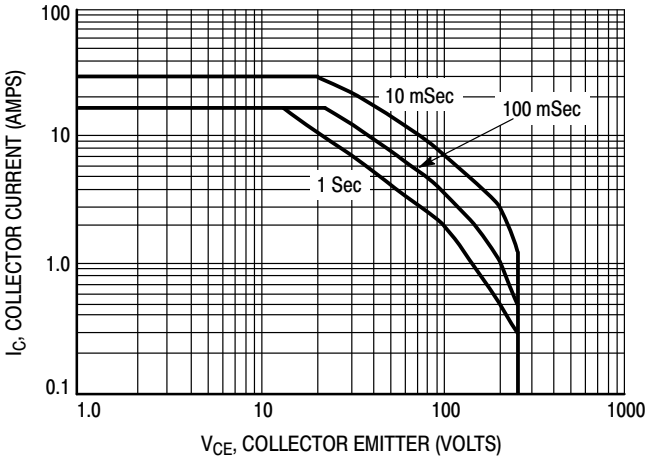


Figure 13. Active Region Safe Operating Area

NPN NJW21194G

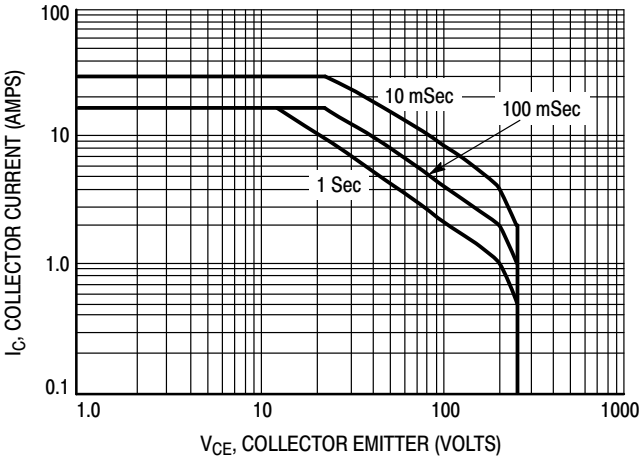


Figure 14. Active Region Safe Operating Area

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 °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.

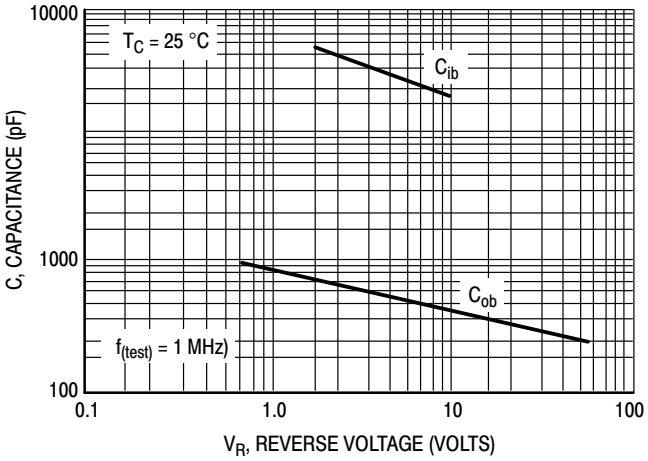


Figure 15. NJW21193G Typical Capacitance

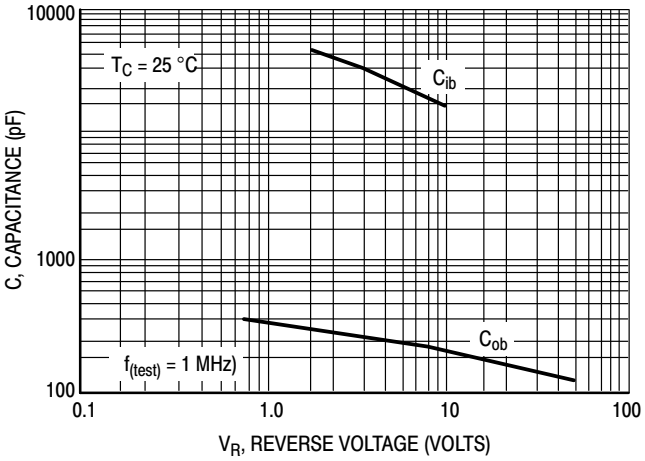


Figure 16. NJW21194G Typical Capacitance

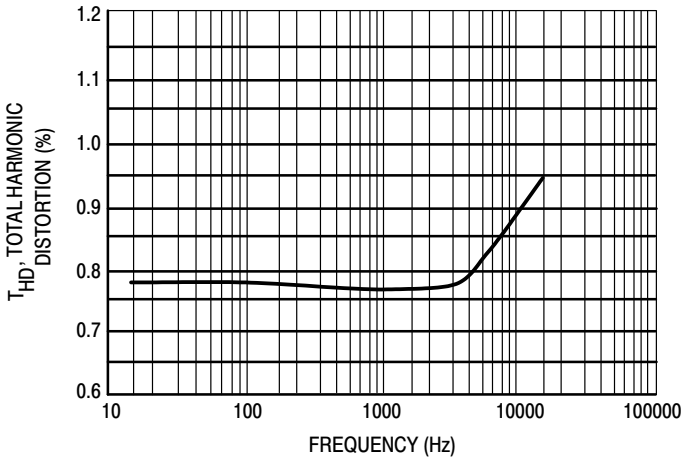


Figure 17. Typical Total Harmonic Distortion

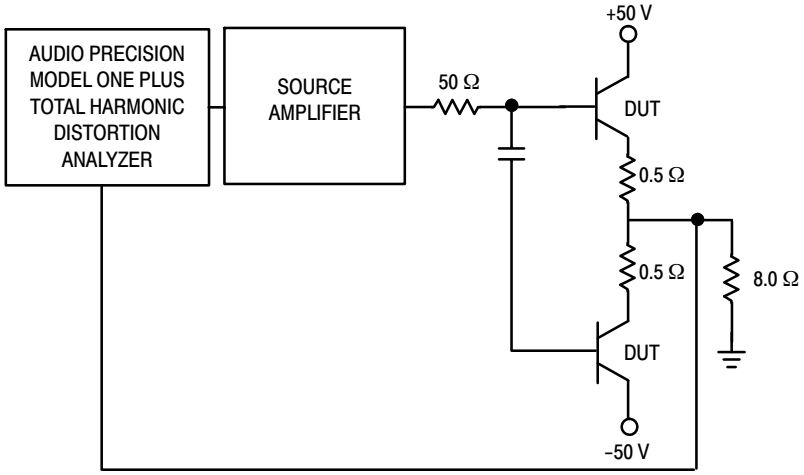
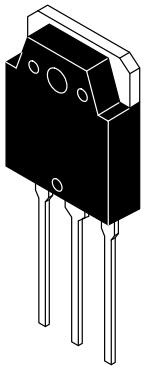


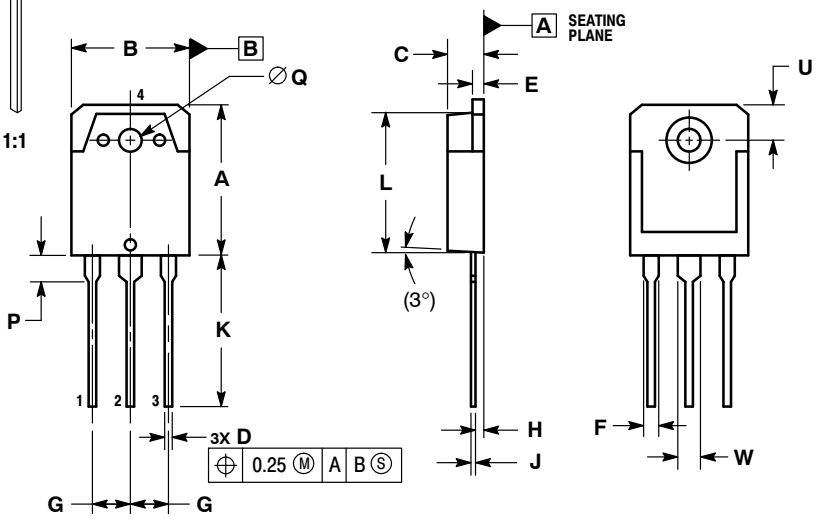
Figure 18. Total Harmonic Distortion Test Circuit

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.

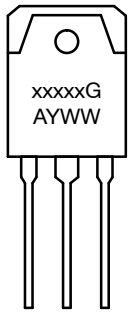
	MILLIMETERS		
DIM	MIN	NOM	MAX
A	19.70	19.90	20.10
B	15.40	15.60	15.80
C	4.60	4.80	5.00
D	0.80	1.00	1.20
E	1.45	1.50	1.65
F	1.80	2.00	2.20
G	5.45 BSC		
H	1.20	1.40	1.60
J	0.55	0.60	0.75
K	19.80	20.00	20.20
L	18.50	18.70	18.90
P	3.30	3.50	3.70
Q	3.10	3.20	3.50
U	5.00 REF		
W	2.80	3.00	3.20

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.

DOCUMENT NUMBER:	**98AON25095D**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**TO−3P−3LD**	**PAGE 1 OF 1**

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