ON Semiconductor

Is Now

To learn more about onsemi™, please visit our website at
www.onsemi.com

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°C Derate Above 25°C	P_D	200 1.6	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	− 65 to +150	°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 μs, Duty Cycle ≤ 10%.

THERMAL CHARACTERISTICS

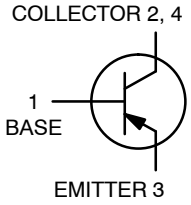
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	0.625	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	40	°C/W

ON Semiconductor®

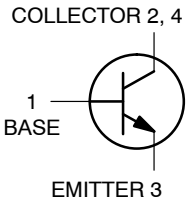
http://onsemi.com

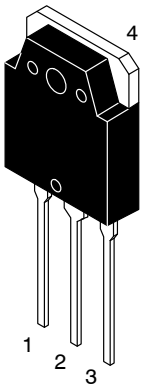
16 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 250 VOLTS, 200 WATTS

PNP



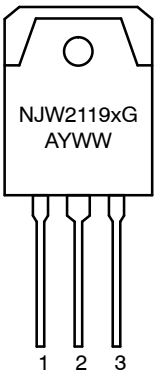
NPN





TO−3P
CASE 340AB
STYLES 1,2,3

MARKING DIAGRAM



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)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	$V_{CEO(sus)}$	250	–	–	Vdc
Collector Cutoff Current (V_{CE} = 200 Vdc, I_B = 0)	I_{CEO}	–	–	100	μAdc
Emitter Cutoff Current (V_{CE} = 5 Vdc, I_C = 0)	I_{EBO}	–	–	100	μAdc
Collector Cutoff Current (V_{CE} = 250 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	I_{CEX}	–	–	100	μAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with Base Forward Biased	$I_{S/b}$				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					
DC Current Gain	h_{FE}				
(I_C = 8 Adc, V_{CE} = 5 Vdc)		20	–	80	
(I_C = 16 Adc, I_B = 5 Adc)		8	–	–	
Base−Emitter On Voltage (I_C = 8 Adc, V_{CE} = 5 Vdc)	$V_{BE(on)}$	–	–	2.2	Vdc
Collector−Emitter Saturation Voltage	$V_{CE(sat)}$				Vdc
(I_C = 8 Adc, I_B = 0.8 Adc)		–	–	1.4	
(I_C = 16 Adc, I_B = 3.2 Adc)		–	–	4	
DYNAMIC CHARACTERISTICS					
Total Harmonic Distortion at the Output	T_{HD}				%
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	–	
Current Gain Bandwidth Product (I_C = 1 Adc, V_{CE} = 10 Vdc, f_{test} = 1 MHz)	f_T	4	–	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1 MHz)	C_{ob}	–	–	500	pF

PNP NJW21193G

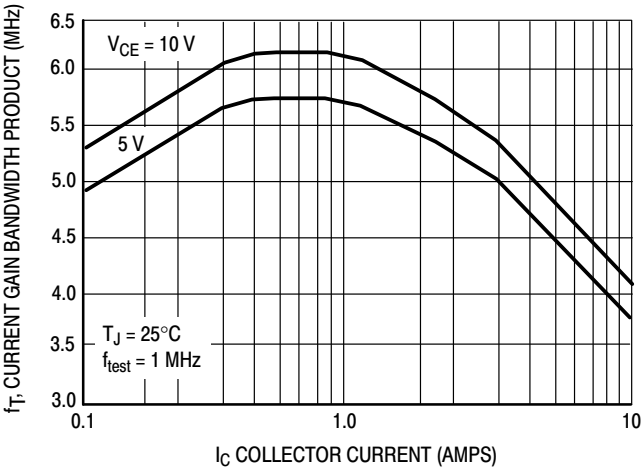


Figure 1. Typical Current Gain Bandwidth Product

NPN NJW21194G

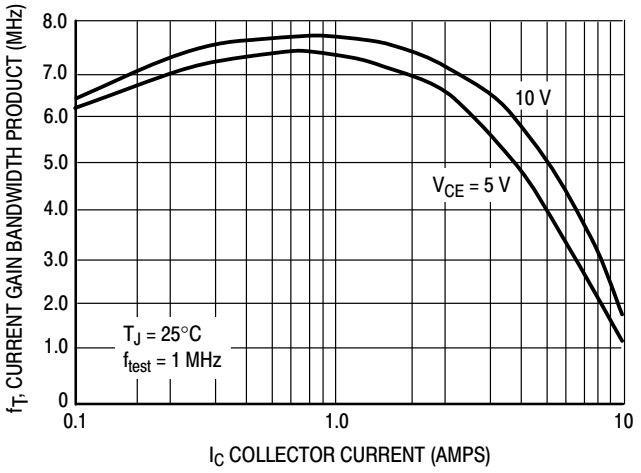


Figure 2. Typical Current Gain Bandwidth Product

TYPICAL CHARACTERISTICS

PNP NJW21193G

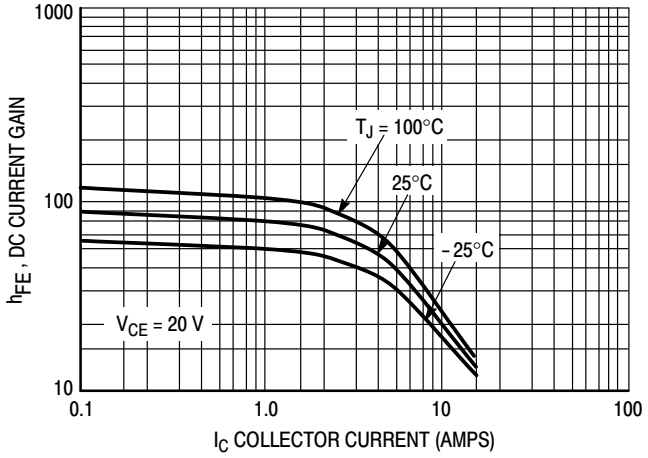


Figure 3. DC Current Gain, V_{CE} = 20 V

NPN NJW21194G

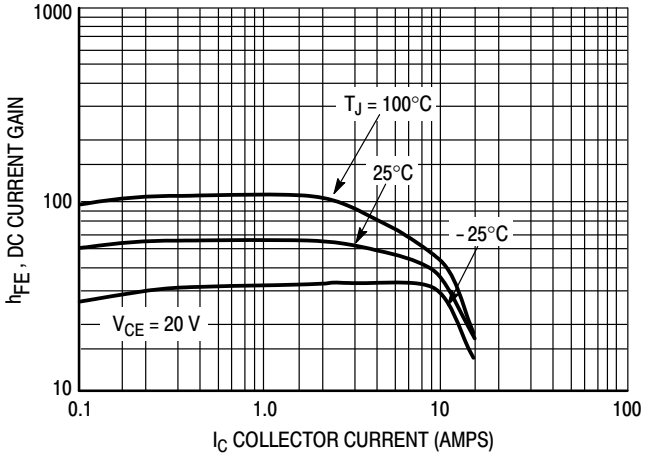


Figure 4. DC Current Gain, V_{CE} = 20 V

PNP NJW21193G

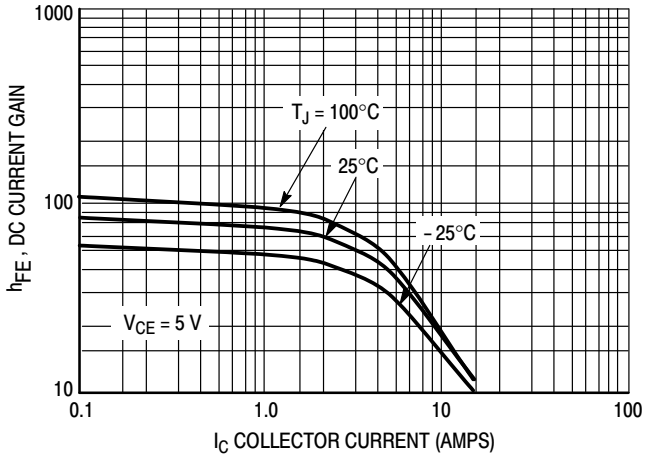


Figure 5. DC Current Gain, V_{CE} = 5 V

NPN NJW21194G

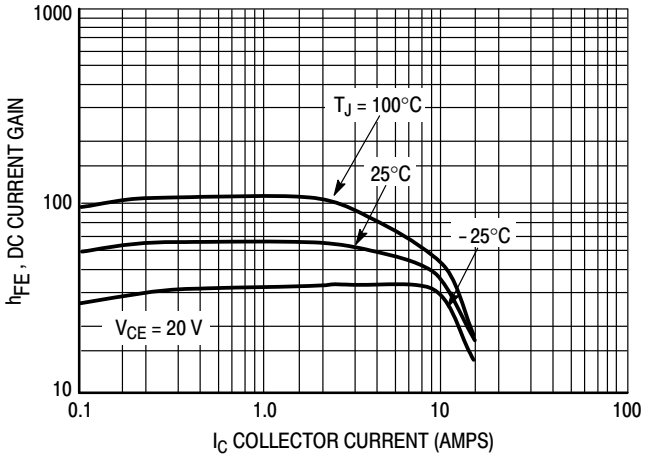


Figure 6. DC Current Gain, V_{CE} = 5 V

PNP NJW21193G

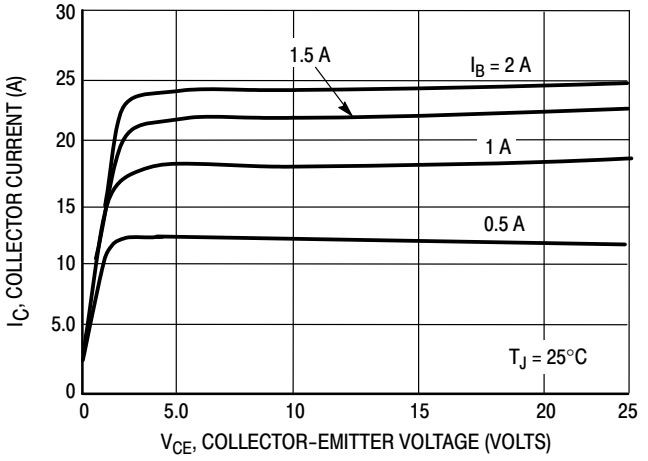


Figure 7. Typical Output Characteristics

NPN NJW21194G

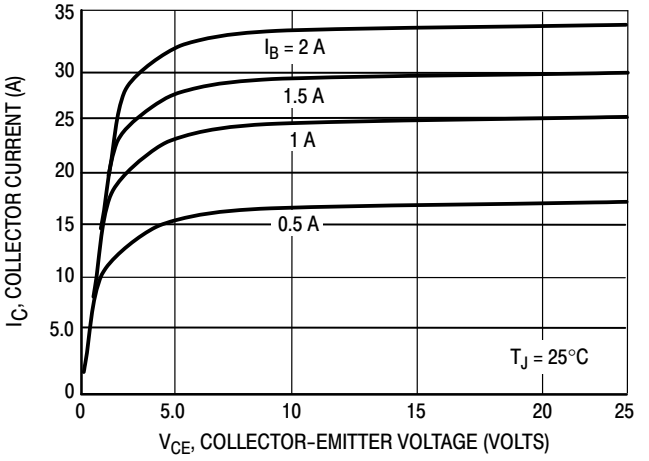


Figure 8. Typical Output Characteristics

TYPICAL CHARACTERISTICS

PNP NJW21193G

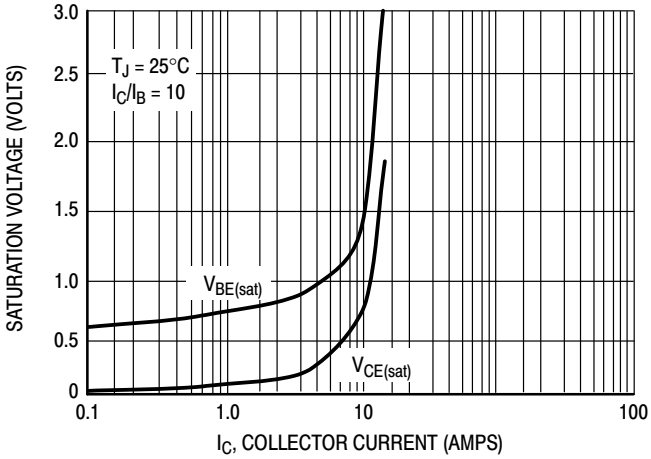


Figure 9. Typical Saturation Voltages

NPN NJW21194G

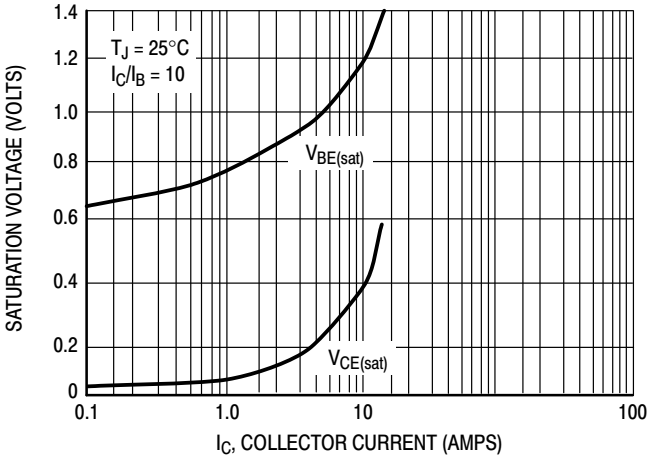


Figure 10. Typical Saturation Voltages

PNP NJW21193G

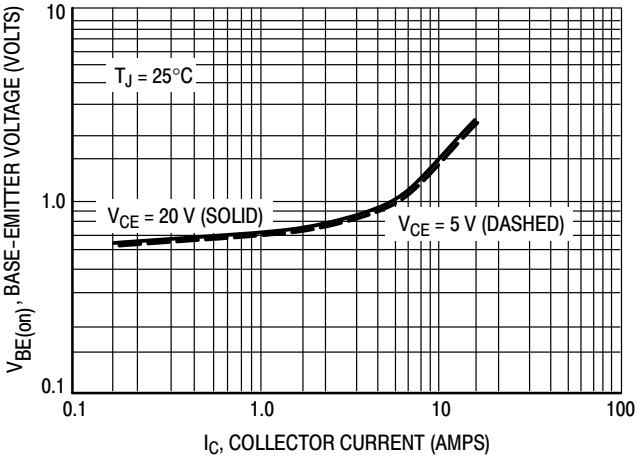


Figure 11. Typical Base−Emitter Voltage

NPN NJW21194G

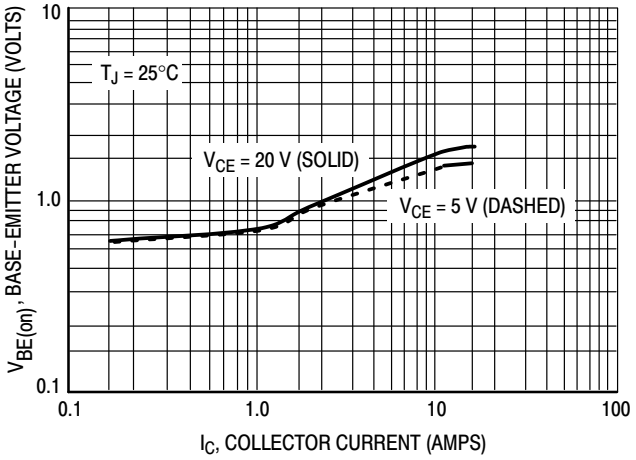


Figure 12. Typical Base−Emitter Voltage

PNP NJW21193G

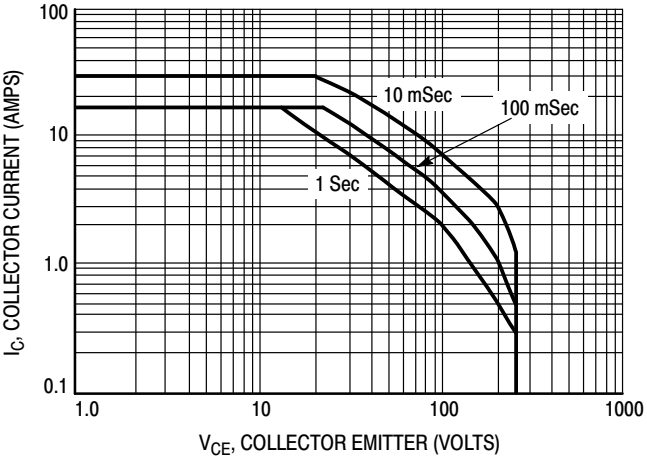


Figure 13. Active Region Safe Operating Area

NPN NJW21194G

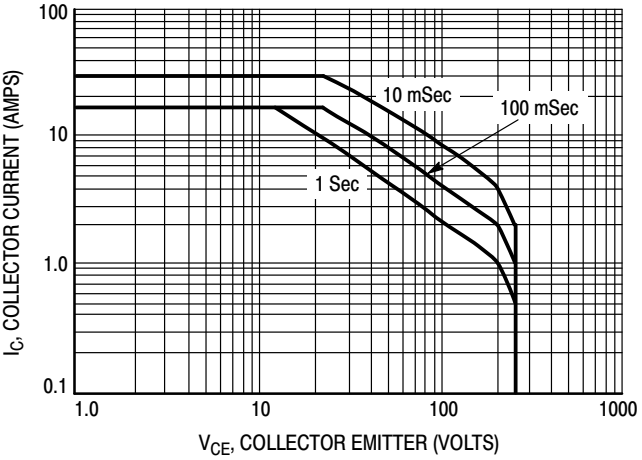


Figure 14. Active Region Safe Operating Area

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.

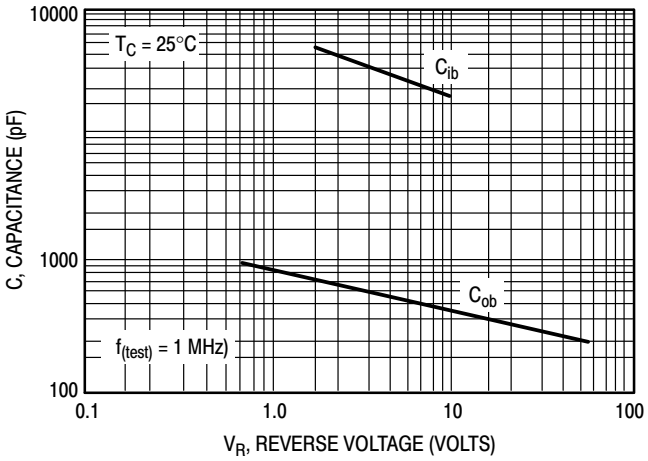


Figure 15. NJW21193G Typical Capacitance

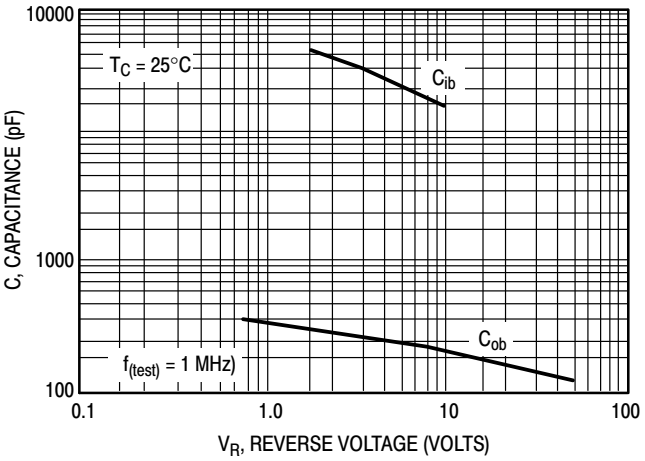


Figure 16. NJW21194G Typical Capacitance

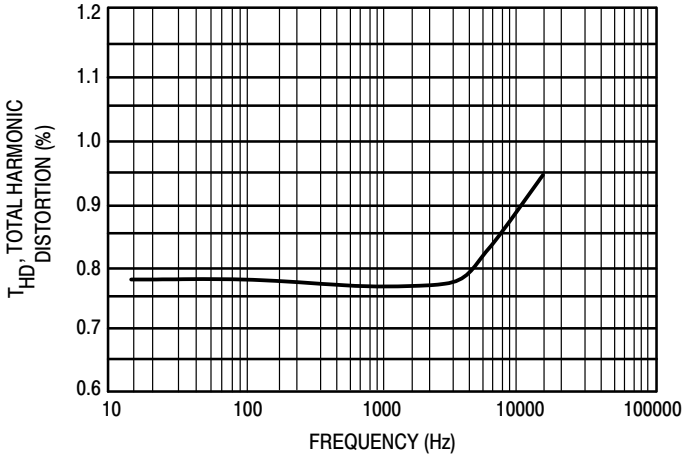


Figure 17. Typical Total Harmonic Distortion

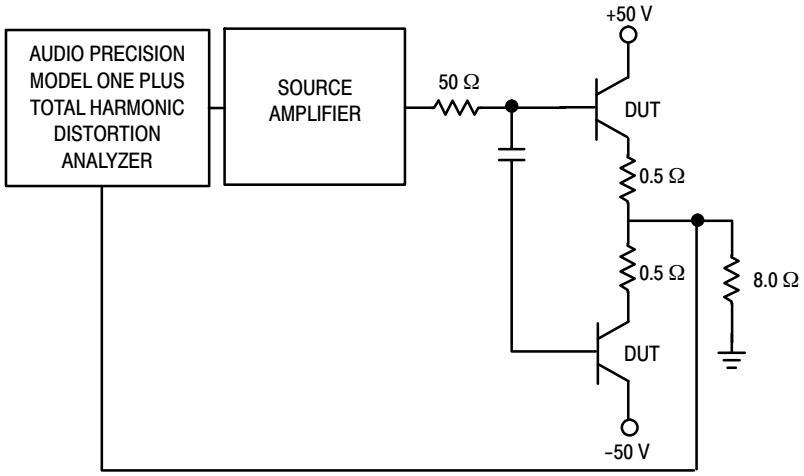


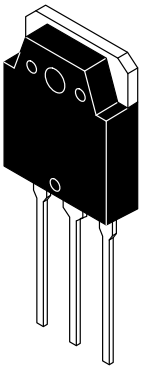
Figure 18. Total Harmonic Distortion Test Circuit

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

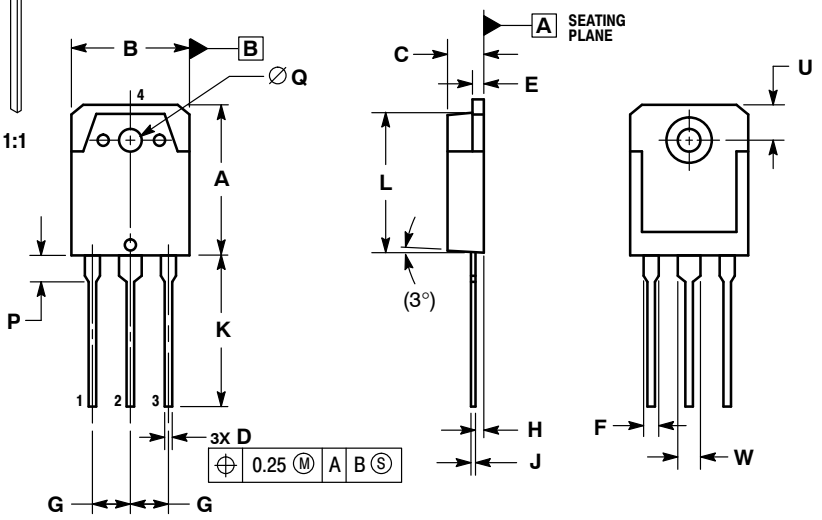
ON Semiconductor®

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.

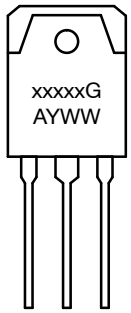
	MILLIMETERS		
DIM	MIN	NOM	MAX
A	19.70	19.90	20.10
B	15.40	15.60	15.80
C	4.60	4.80	5.00
D	0.80	1.00	1.20
E	1.45	1.50	1.65
F	1.80	2.00	2.20
G	5.45 BSC		
H	1.20	1.40	1.60
J	0.55	0.60	0.75
K	19.80	20.00	20.20
L	18.50	18.70	18.90
P	3.30	3.50	3.70
Q	3.10	3.20	3.50
U	5.00 REF		
W	2.80	3.00	3.20

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**

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

◊