

Complementary NPN-PNP Silicon Power Bipolar Transistors

NJW3281G (NPN), NJW1302G (PNP)

The NJW3281G and NJW1302G are power transistors for high power audio, disk head positioners and other linear applications.

Features

- Exceptional Safe Operating Area
- NPN/PNP Gain Matching within 10% from 50 mA to 5 A
- Excellent Gain Linearity
- High BVCEO
- High Frequency
- These Devices are Pb-Free and are RoHS Compliant

Benefits

- Reliable Performance at Higher Powers
- Symmetrical Characteristics in Complementary Configurations
- Accurate Reproduction of Input Signal
- Greater Dynamic Range
- High Amplifier Bandwidth

Applications

- High-End Consumer Audio Products
 - ◆ Home Amplifiers
 - ◆ Home Receivers
- Professional Audio Amplifiers
 - ◆ Theater and Stadium Sound Systems
 - ◆ Public Address Systems (PAs)

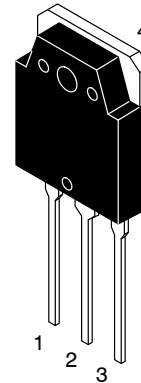
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Rating	Value	Unit
V_{CEO}	Collector-Emitter Voltage	250	Vdc
V_{CBO}	Collector-Base Voltage	250	Vdc
V_{EBO}	Emitter-Base Voltage	5.0	Vdc
V_{CEX}	Collector-Emitter Voltage – 1.5 V	250	Vdc
I_C	Collector Current – Continuous	15	Adc
I_{CM}	Collector Current – Peak (Note 1)	30	Adc
I_B	Base Current – Continuous	1.6	Adc
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above 25°C	200 1.43	W W/ $^\circ\text{C}$
T_J, T_{stg}	Operating and Storage Junction Temperature Range	– 65 to +150	$^\circ\text{C}$

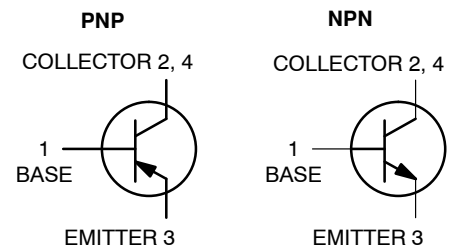
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

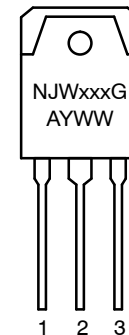
15 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 250 VOLTS 200 WATTS



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



MARKING DIAGRAM



xxxx = 0281 or 0302
 G = Pb-Free Package
 A = Assembly Location
 Y = Year
 WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NJW3281G	TO-3P (Pb-Free)	30 Units/Rail
NJW1302G	TO-3P (Pb-Free)	30 Units/Rail

NJW3281G (NPN), NJW1302G (PNP)

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	$^{\circ}\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Characteristic	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$, $I_B = 0$)	250	–	–	Vdc
I_{CBO}	Collector Cutoff Current ($V_{CB} = 250\text{ Vdc}$, $I_E = 0$)	–	–	50	μAdc
I_{EBO}	Emitter Cutoff Current ($V_{EB} = 5\text{ Vdc}$, $I_C = 0$)	–	–	5	μAdc

SECOND BREAKDOWN

$I_{S/b}$	Second Breakdown Collector with Base Forward Biased ($V_{CE} = 50\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive))	4	–	–	Adc
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ON CHARACTERISTICS

h_{FE}	DC Current Gain ($I_C = 100\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 1\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 3\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 5\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$)	75 75 75 60 45	– – – – –	150 150 150 – –	–
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ($I_C = 8\text{ Adc}$, $I_B = 0.8\text{ Adc}$)	–	0.4	0.6	Vdc
$V_{BE(on)}$	Base-Emitter On Voltage ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$)	–	–	1.5	Vdc

DYNAMIC CHARACTERISTICS

f_T	Current-Gain – Bandwidth Product ($I_C = 1\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$, $f_{test} = 1\text{ MHz}$)	–	30	–	MHz
C_{ob}	Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$)	–	–	600	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.

NJW3281G (NPN), NJW1302G (PNP)

TYPICAL CHARACTERISTICS

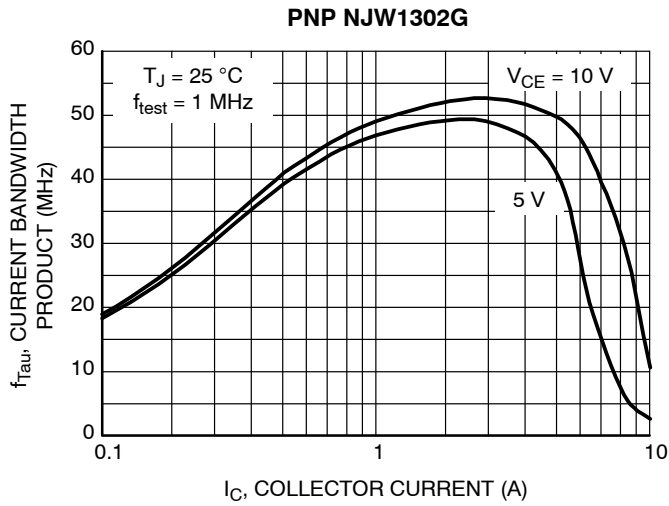


Figure 1. Typical Current Gain Bandwidth Product

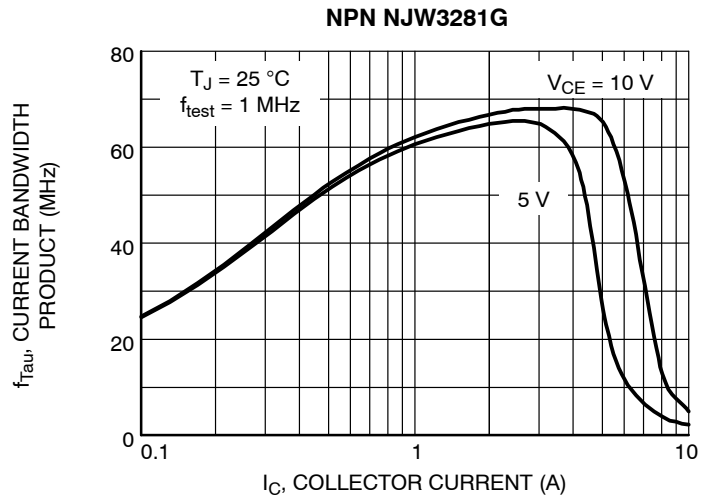


Figure 2. Typical Current Gain Bandwidth Product

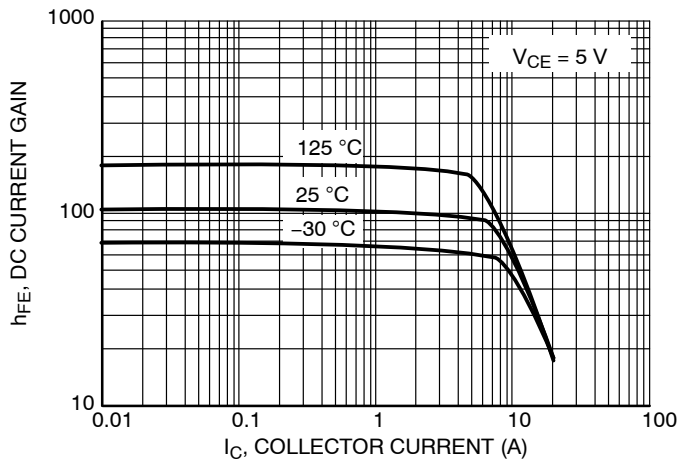


Figure 3. DC Current Gain

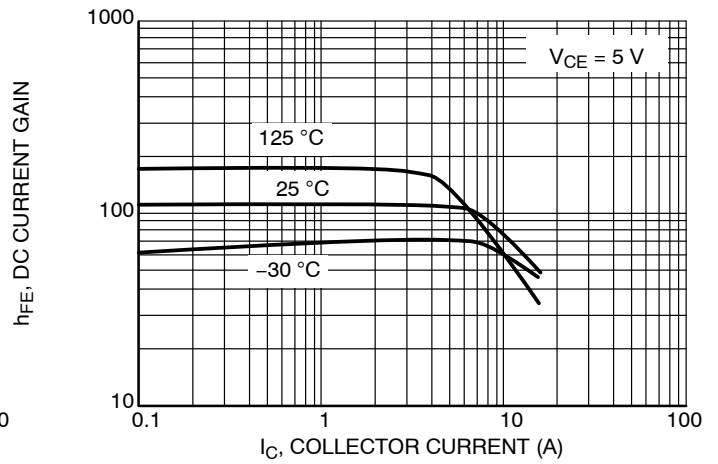


Figure 4. DC Current Gain

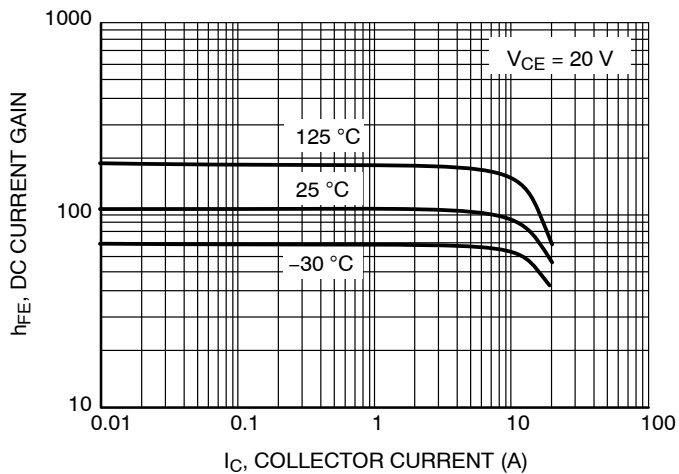


Figure 5. DC Current Gain

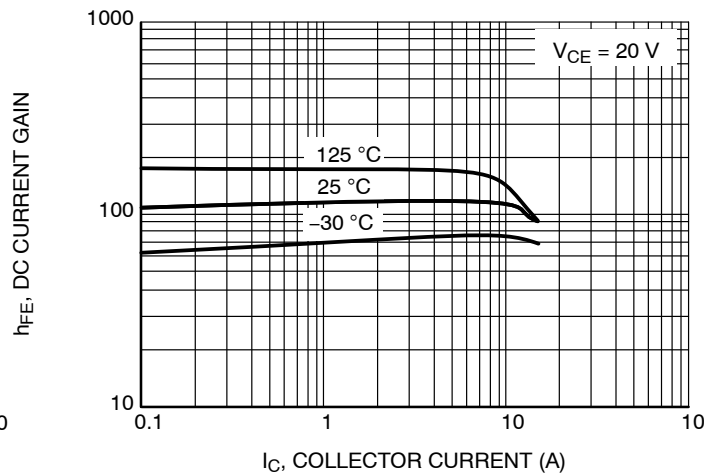


Figure 6. DC Current Gain

NJW3281G (NPN), NJW1302G (PNP)

TYPICAL CHARACTERISTICS (continued)

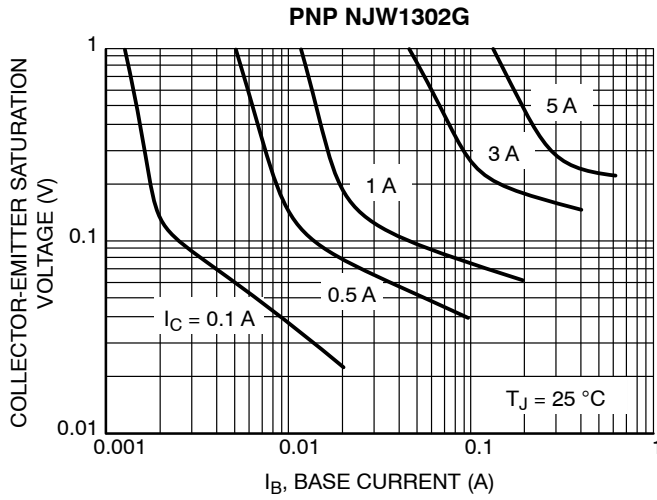


Figure 7. Saturation Region

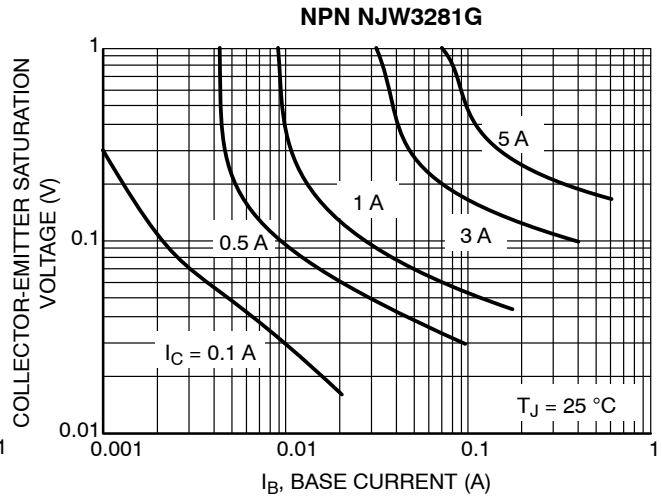


Figure 8. Saturation Region

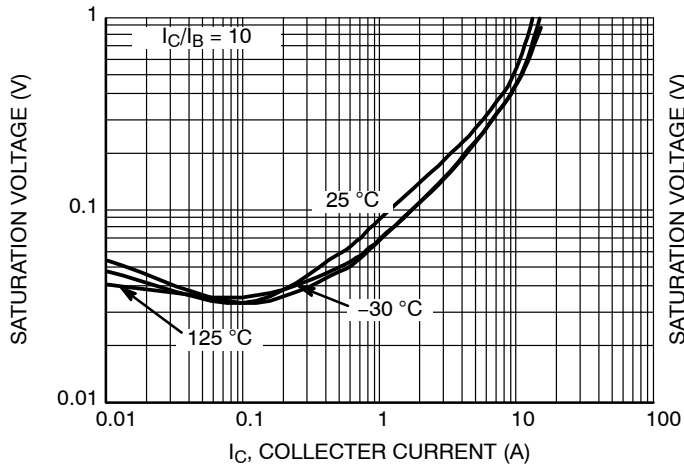


Figure 9. $V_{CE(sat)}$, Collector-Emitter Saturation Voltage

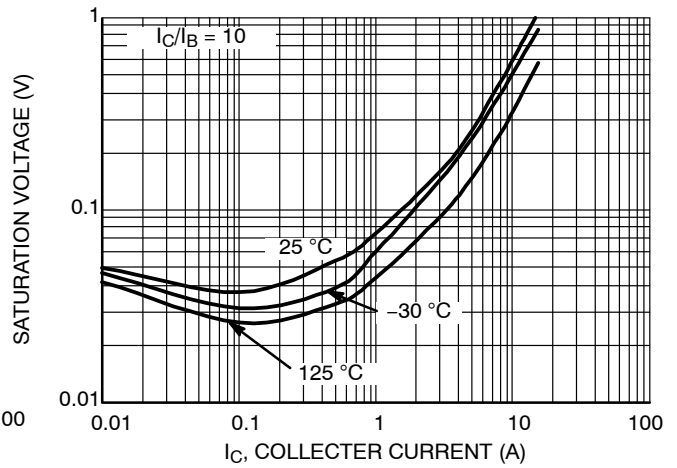


Figure 10. $V_{CE(sat)}$, Collector-Emitter Saturation Voltage

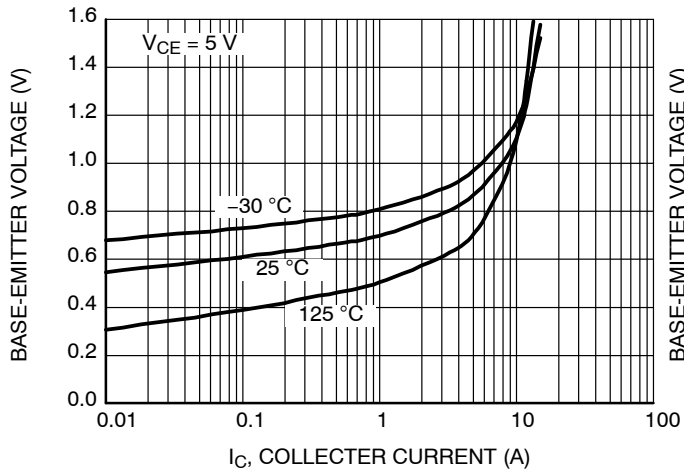


Figure 11. $V_{BE(on)}$, Base-Emitter Voltage

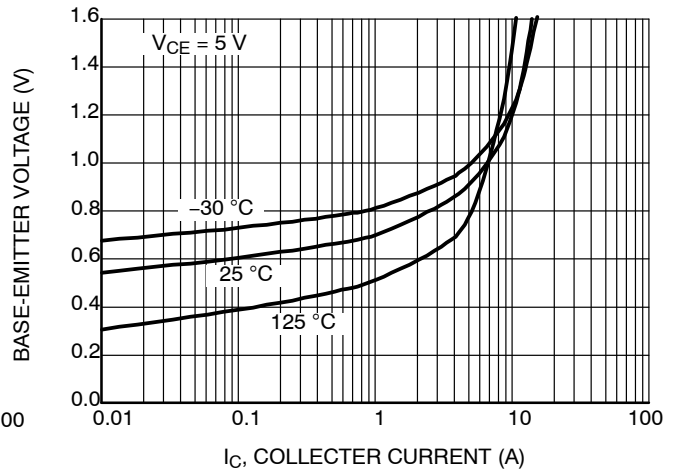


Figure 12. $V_{BE(on)}$, Base-Emitter Voltage

NJW3281G (NPN), NJW1302G (PNP)

TYPICAL CHARACTERISTICS (continued)

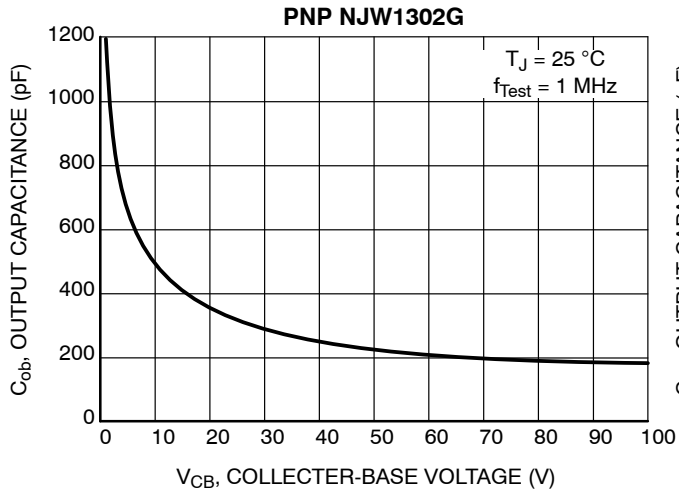


Figure 13. Output Capacitance

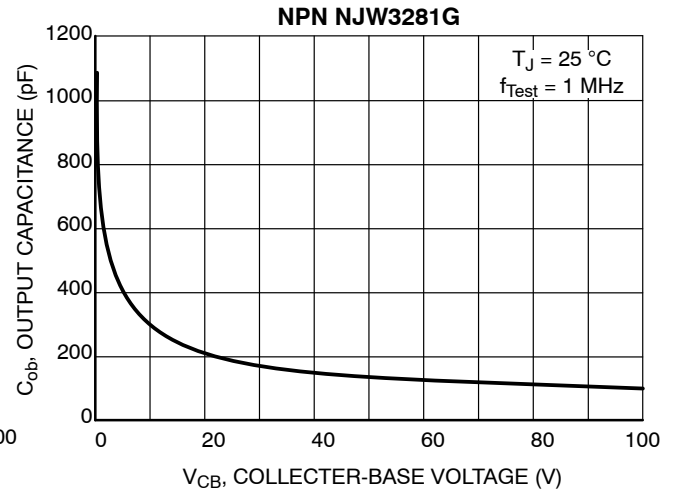


Figure 14. Output Capacitance

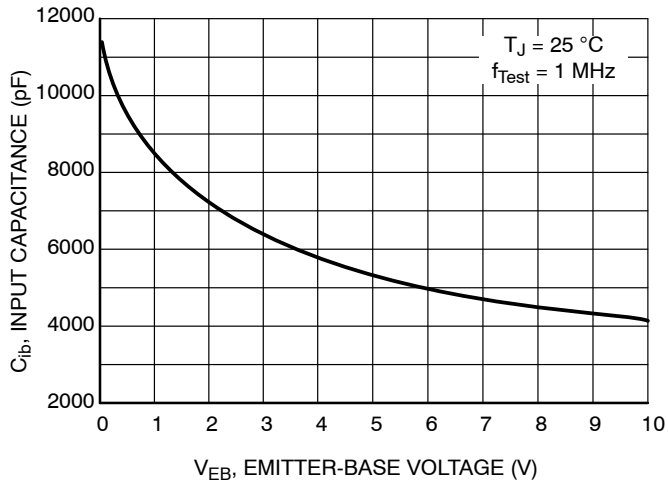


Figure 15. Input Capacitance

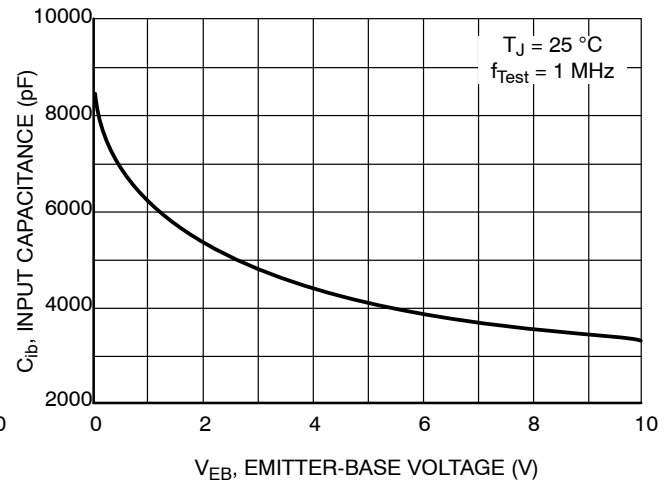


Figure 16. Input Capacitance

NJW3281G (NPN), NJW1302G (PNP)

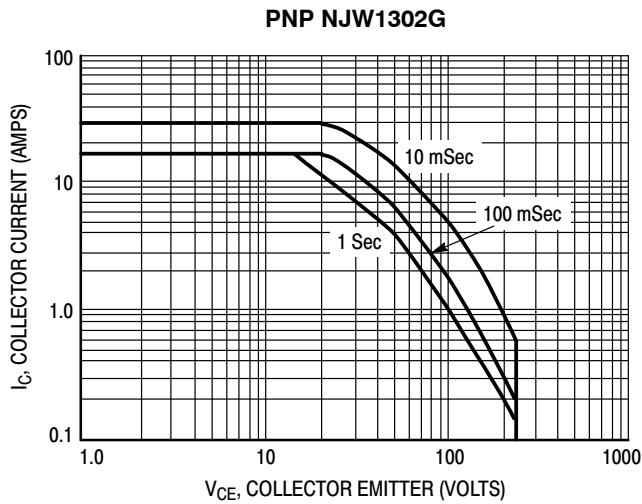


Figure 17. Active Region Safe Operating Area

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.

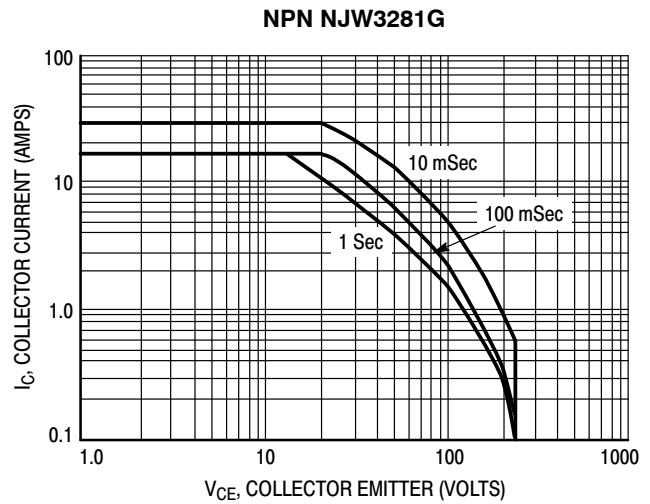
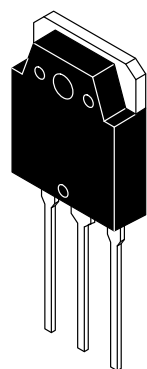


Figure 18. Active Region Safe Operating Area

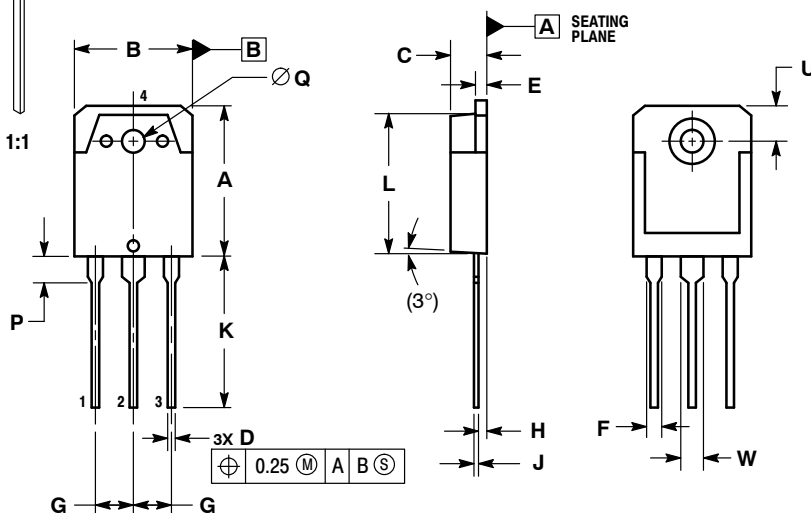
The data of Figures 17 and 18 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

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

DATE 30 OCT 2007



SCALE 1:1



STYLE 1:

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

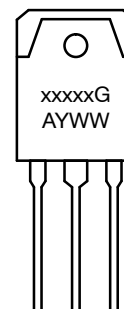
STYLE 2:

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.

	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

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