

# NJW3281G (NPN) NJW1302G (PNP)

Preferred Devices

## Complementary NPN-PNP Silicon Power Bipolar Transistors

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 are Pb-Free Devices

### 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)

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

### THERMAL CHARACTERISTICS

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

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 ms, Duty Cycle < 10%.

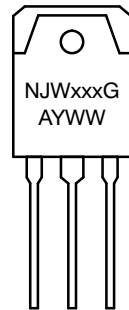
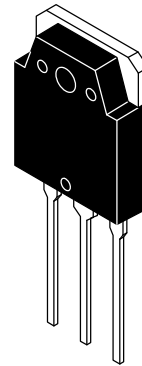


ON Semiconductor®

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**15 AMPERES  
COMPLEMENTARY  
SILICON POWER TRANSISTORS  
250 VOLTS 200 WATTS**

### MARKING DIAGRAM



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

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

Preferred devices are recommended choices for future use and best overall value.

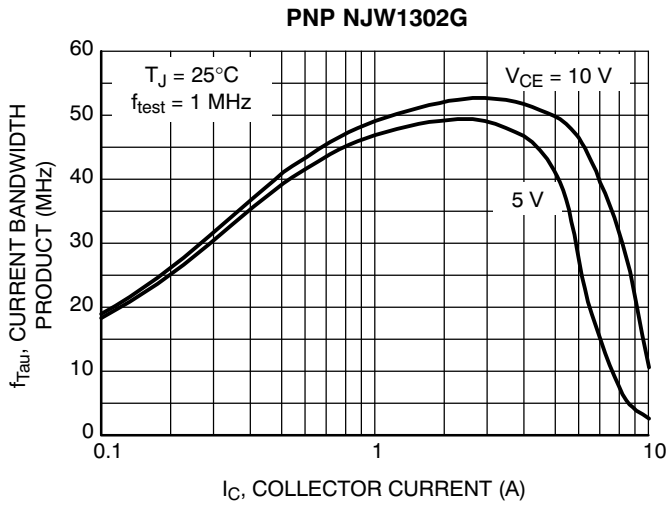
## NJW3281G (NPN) NJW1302G (PNP)

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

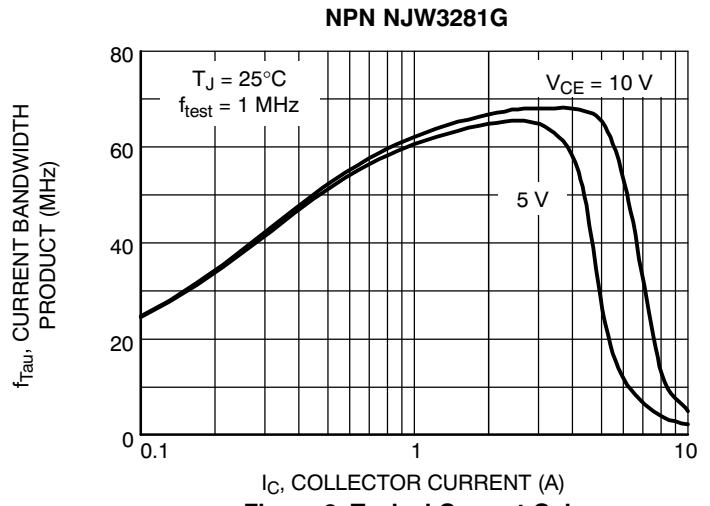
Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	250	-	-	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 250 V <sub>dc</sub> , I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	-	50	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>EB</sub> = 5 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	-	5	μA <sub>dc</sub>
<b>SECOND BREAKDOWN</b>					
Second Breakdown Collector with Base Forward Biased (V <sub>CE</sub> = 50 V <sub>dc</sub> , t = 1 s (non-repetitive))	I <sub>S/b</sub>	4	-	-	A <sub>dc</sub>
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 3 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 5 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 8 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> )	h <sub>FE</sub>	75 75 75 60 45	- - - - -	150 150 150 - -	-
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 8 A <sub>dc</sub> , I <sub>B</sub> = 0.8 A <sub>dc</sub> )	V <sub>CE(sat)</sub>	-	0.4	0.6	V <sub>dc</sub>
Base-Emitter On Voltage (I <sub>C</sub> = 8 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> )	V <sub>BE(on)</sub>	-	-	1.5	V <sub>dc</sub>
<b>DYNAMIC CHARACTERISTICS</b>					
Current-Gain - Bandwidth Product (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> , f <sub>test</sub> = 1 MHz)	f <sub>T</sub>	-	30	-	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)	C <sub>ob</sub>	-	-	600	pF

# NJW3281G (NPN) NJW1302G (PNP)

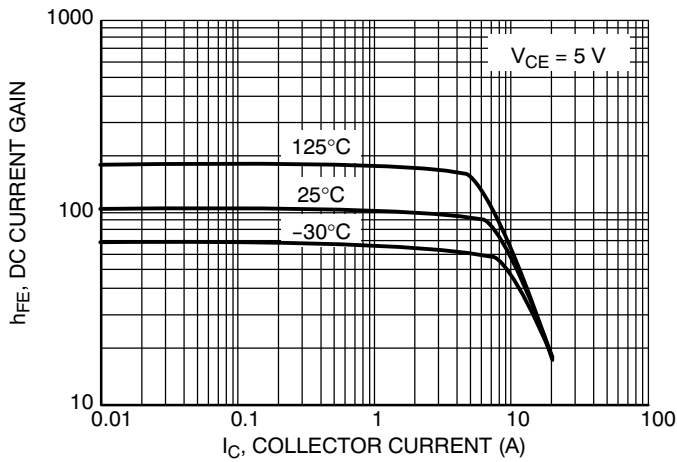
## TYPICAL CHARACTERISTICS



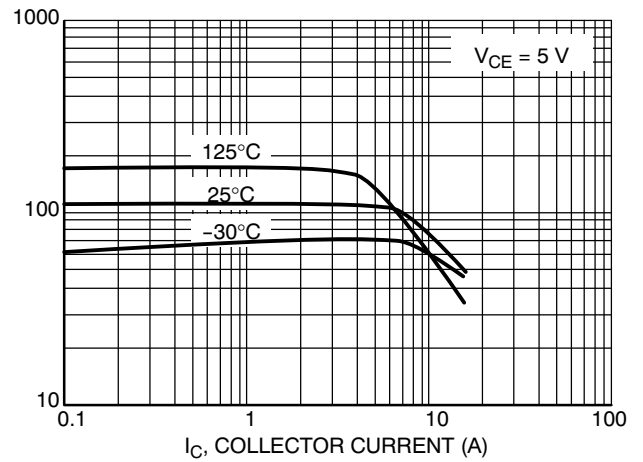
**Figure 1. Typical Current Gain Bandwidth Product**



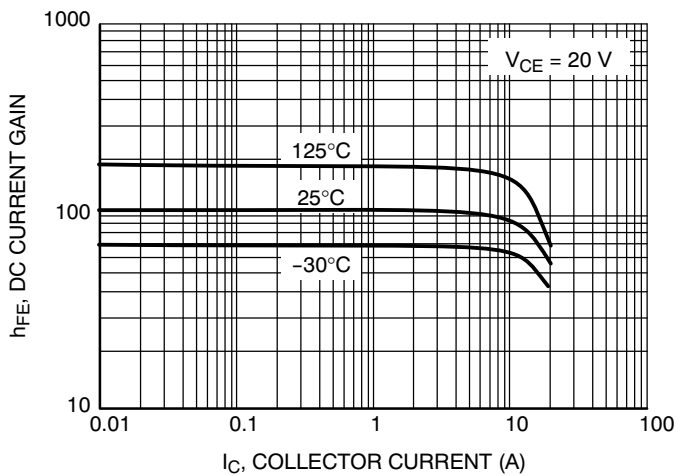
**Figure 2. Typical Current Gain Bandwidth Product**



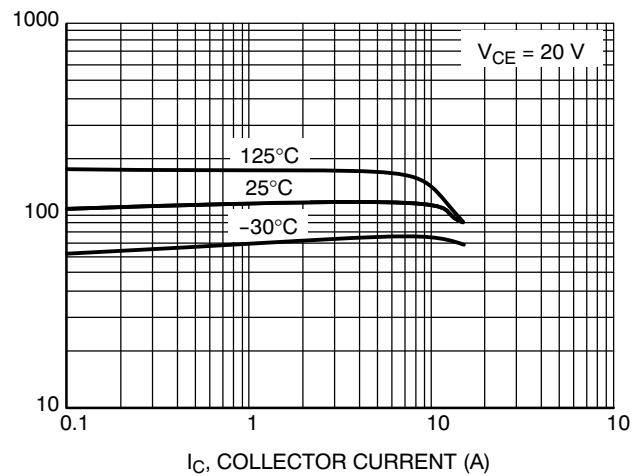
**Figure 3. DC Current Gain**



**Figure 4. DC Current Gain**



**Figure 5. DC Current Gain**



**Figure 6. DC Current Gain**

# NJW3281G (NPN) NJW1302G (PNP)

## TYPICAL CHARACTERISTICS

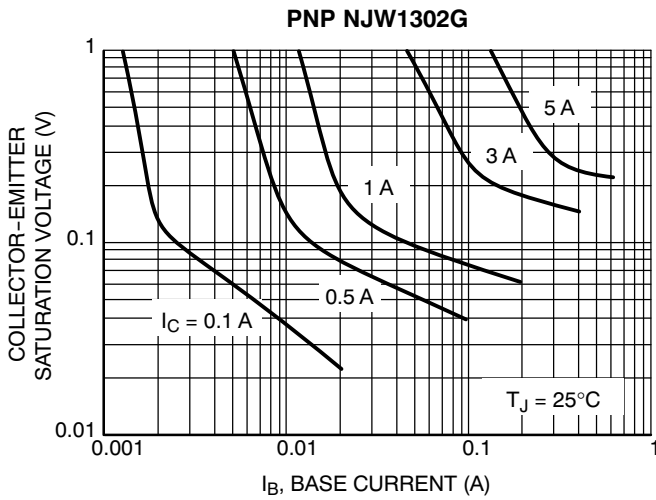


Figure 7. Saturation Region

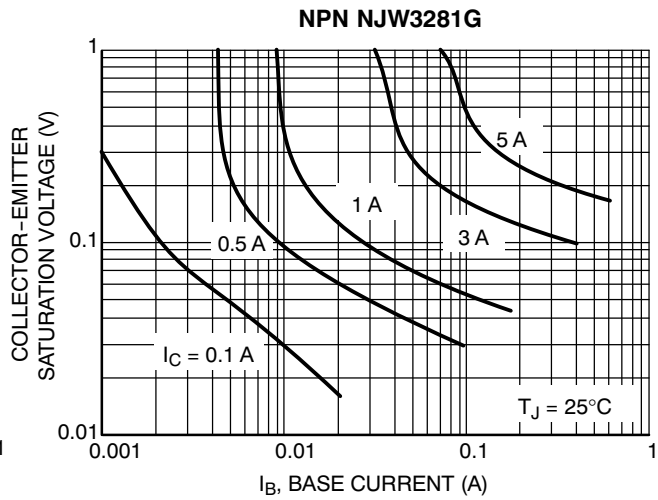


Figure 8. Saturation Region

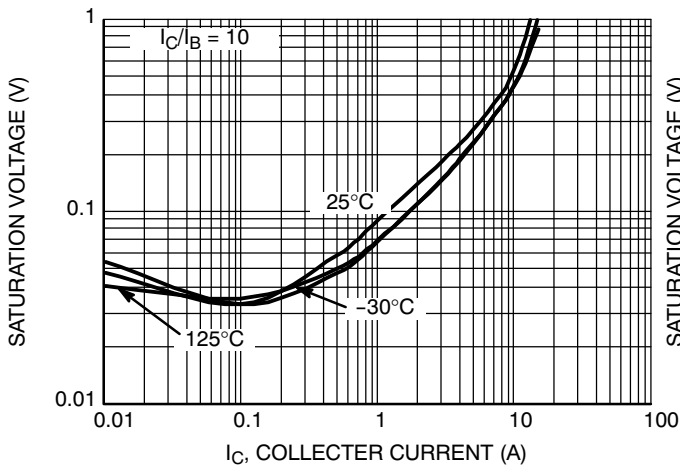


Figure 9.  $V_{CE(sat)}$ , Collector-Emitter Saturation Voltage

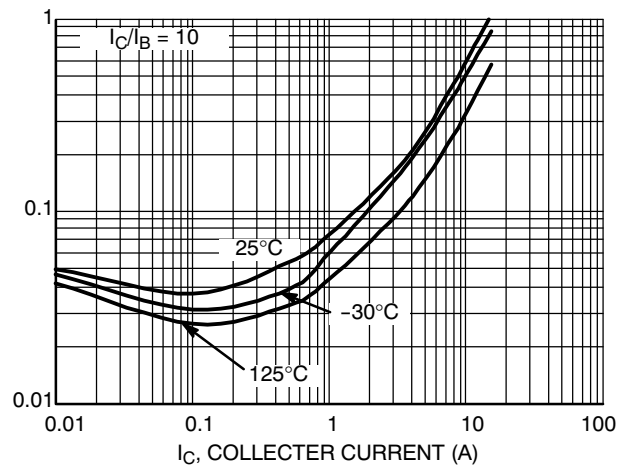


Figure 10.  $V_{CE(sat)}$ , Collector-Emitter Saturation Voltage

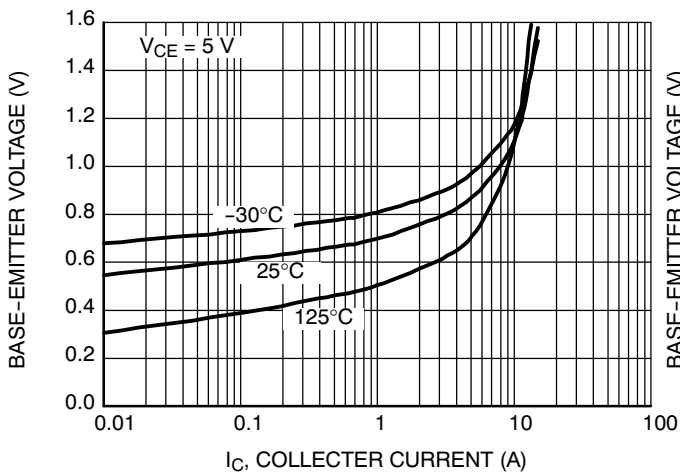


Figure 11.  $V_{BE(on)}$ , Base-Emitter Voltage

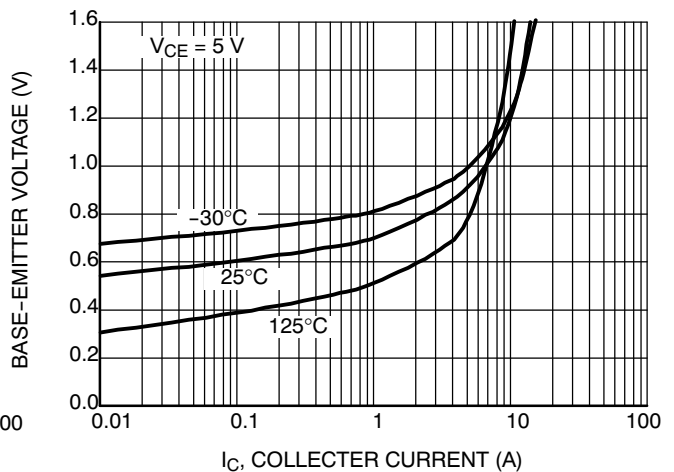
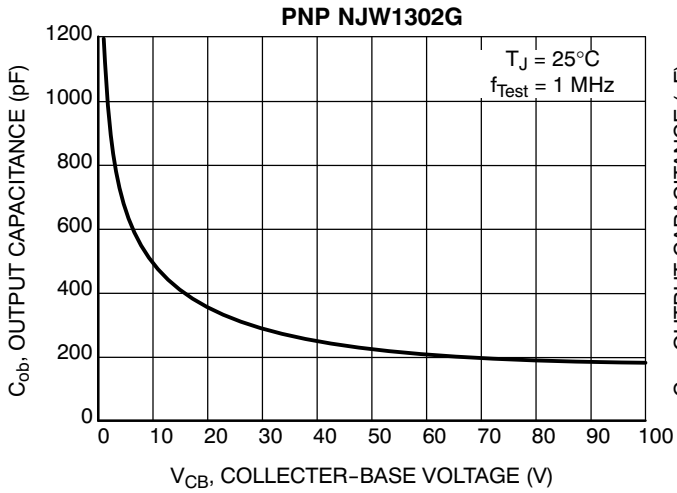


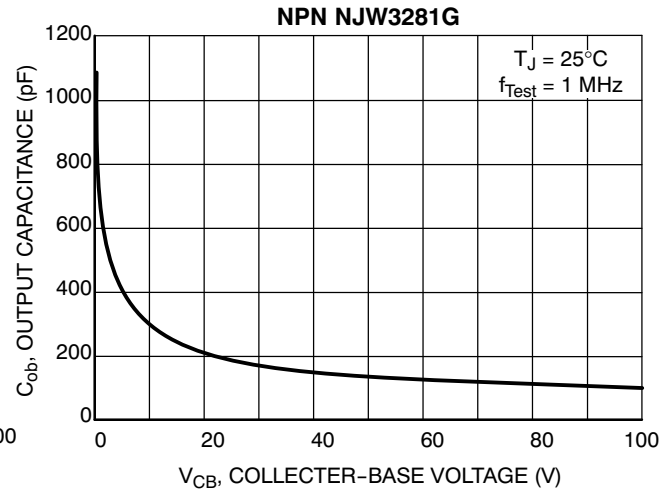
Figure 12.  $V_{BE(on)}$ , Base-Emitter Voltage

# NJW3281G (NPN) NJW1302G (PNP)

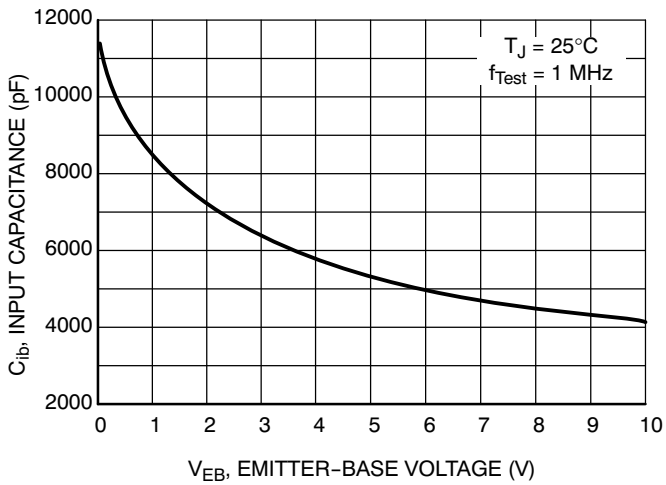
## TYPICAL CHARACTERISTICS



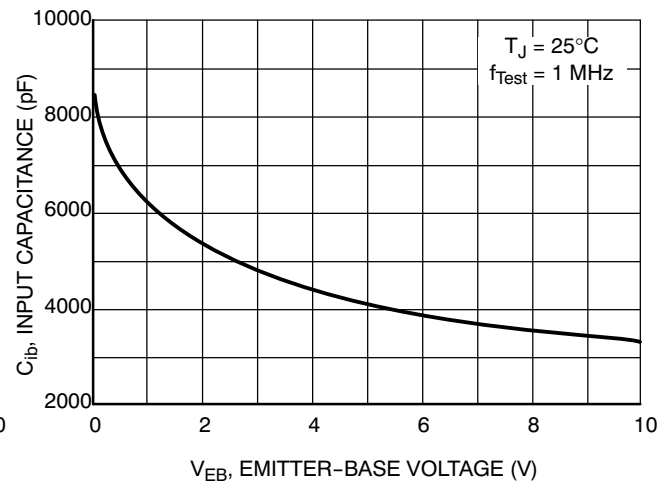
**Figure 13. Output Capacitance**



**Figure 14. Output Capacitance**

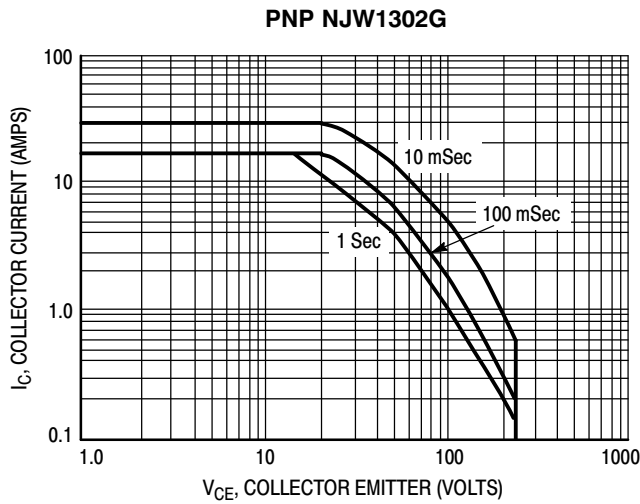


**Figure 15. Input Capacitance**



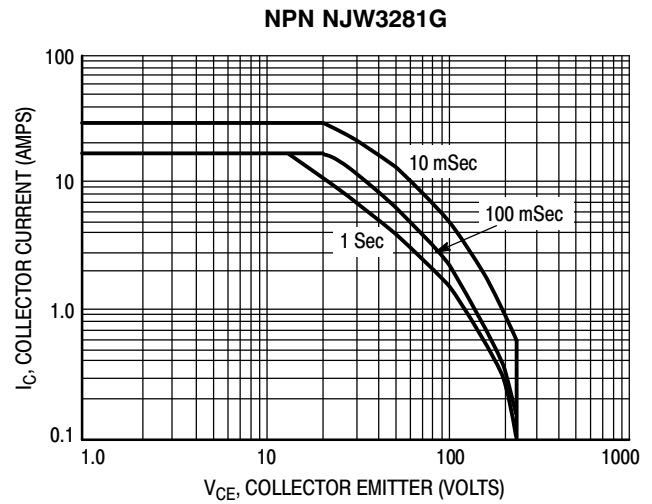
**Figure 16. Input Capacitance**

## 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.



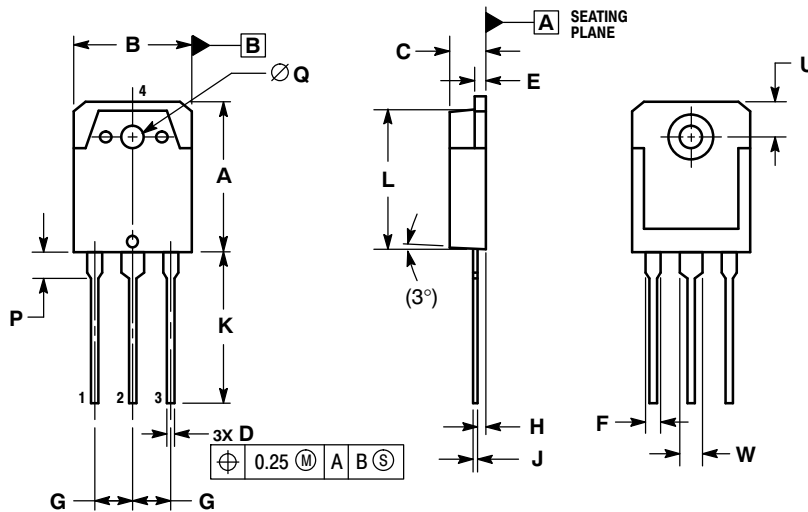
**Figure 18. Active Region Safe Operating Area**

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.

# NJW3281G (NPN) NJW1302G (PNP)

## PACKAGE DIMENSIONS

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



**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

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