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# Low Noise Transistors

## NPN Silicon

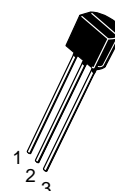
**BC549B,C**  
**BC550B,C**

### MAXIMUM RATINGS

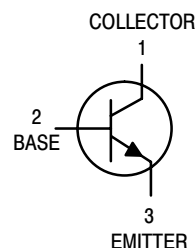
| Rating   | Symbol         | BC549       | BC550 | Unit                         |
|--|----------------|-------------|-------|------------------------------|
| Collector–Emitter Voltage  | $V_{CEO}$      | 30          | 45    | Vdc                          |
| Collector–Base Voltage   | $V_{CBO}$      | 30          | 50    | Vdc                          |
| Emitter–Base Voltage   | $V_{EBO}$      | 5.0         |       | Vdc                          |
| Collector Current — Continuous   | $I_C$          | 100         |       | mAdc                         |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625         | 5.0   | mW<br>mW/ $^\circ\text{C}$   |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.5         | 12    | Watt<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | –55 to +150 |       | $^\circ\text{C}$             |

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max  | Unit               |
|---|-----------------|------|--------------------|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case    | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |



**CASE 29–04, STYLE 17**  
**TO–92 (TO–226AA)**



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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |                      |               |          |        |           |                         |
|---|----------------------|---------------|----------|--------|-----------|-------------------------|
| Collector–Emitter Breakdown Voltage<br>( $I_C = 10 \text{ mAdc}$ , $I_B = 0$ )  | BC549B,C<br>BC550B,C | $V_{(BR)CEO}$ | 30<br>45 | —<br>— | —<br>—    | Vdc                     |
| Collector–Base Breakdown Voltage<br>( $I_C = 10 \text{ } \mu\text{Adc}$ , $I_E = 0$ )   | BC549B,C<br>BC550B,C | $V_{(BR)CBO}$ | 30<br>50 | —<br>— | —<br>—    | Vdc                     |
| Emitter–Base Breakdown Voltage<br>( $I_E = 10 \text{ } \mu\text{Adc}$ , $I_C = 0$ )   |                      | $V_{(BR)EBO}$ | 5.0      | —      | —         | Vdc                     |
| Collector Cutoff Current<br>( $V_{CB} = 30 \text{ V}$ , $I_E = 0$ )<br>( $V_{CB} = 30 \text{ V}$ , $I_E = 0$ , $T_A = +125^\circ\text{C}$ ) |                      | $I_{CBO}$     | —<br>—   | —<br>— | 15<br>5.0 | nAdc<br>$\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 4.0 \text{ Vdc}$ , $I_C = 0$ )  |                      | $I_{EBO}$     | —        | —      | 15        | nAdc                    |

# BC549B,C BC550B,C

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

| Characteristic   | Symbol        | Min                      | Typ                      | Max                  | Unit |
|--|---------------|--------------------------|--------------------------|----------------------|------|
| <b>ON CHARACTERISTICS</b>  |               |                          |                          |                      |      |
| DC Current Gain<br>( $I_C = 10\ \mu\text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )<br><br>( $I_C = 2.0\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )   | $h_{FE}$      | 100<br>100<br>200<br>420 | 150<br>270<br>290<br>500 | —<br>—<br>450<br>800 | —    |
| Collector–Emitter Saturation Voltage<br>( $I_C = 10\ \text{mAdc}$ , $I_B = 0.5\ \text{mAdc}$ )<br>( $I_C = 10\ \text{mAdc}$ , $I_B = \text{see note 1}$ )<br>( $I_C = 100\ \text{mAdc}$ , $I_B = 5.0\ \text{mAdc}$ , see note 2) | $V_{CE(sat)}$ | —<br>—<br>—              | 0.075<br>0.3<br>0.25     | 0.25<br>0.6<br>0.6   | Vdc  |
| Base–Emitter Saturation Voltage<br>( $I_C = 100\ \text{mAdc}$ , $I_B = 5.0\ \text{mAdc}$ )   | $V_{BE(sat)}$ | —                        | 1.1                      | —                    | Vdc  |
| Base–Emitter On Voltage<br>( $I_C = 10\ \mu\text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )<br>( $I_C = 100\ \mu\text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )<br>( $I_C = 2.0\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{Vdc}$ )                | $V_{BE(on)}$  | —<br>—<br>0.55           | 0.52<br>0.55<br>0.62     | —<br>—<br>0.7        | Vdc  |

## SMALL–SIGNAL CHARACTERISTICS

|  |                  |            |            |            |     |
|--|------------------|------------|------------|------------|-----|
| Current–Gain — Bandwidth Product<br>( $I_C = 10\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{Vdc}$ , $f = 100\ \text{MHz}$ )   | $f_T$            | —          | 250        | —          | MHz |
| Collector–Base Capacitance<br>( $V_{CB} = 10\ \text{Vdc}$ , $I_E = 0$ , $f = 1.0\ \text{MHz}$ )  | $C_{cbo}$        | —          | 2.5        | —          | pF  |
| Small–Signal Current Gain<br>( $I_C = 2.0\ \text{mAdc}$ , $V_{CE} = 5.0\ \text{V}$ , $f = 1.0\ \text{kHz}$ )   | $h_{fe}$         | 240<br>450 | 330<br>600 | 500<br>900 | —   |
| Noise Figure<br>( $I_C = 200\ \mu\text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ , $R_S = 2.0\ \text{k}\Omega$ , $f = 1.0\ \text{kHz}$ )<br>( $I_C = 200\ \mu\text{Adc}$ , $V_{CE} = 5.0\ \text{Vdc}$ , $R_S = 100\ \text{k}\Omega$ , $f = 1.0\ \text{kHz}$ ) | $NF_1$<br>$NF_2$ | —<br>—     | 0.6<br>—   | 2.5<br>10  | dB  |

### NOTES:

- $I_B$  is value for which  $I_C = 11\ \text{mA}$  at  $V_{CE} = 1.0\ \text{V}$ .
- Pulse test =  $300\ \mu\text{s}$  – Duty cycle = 2%.

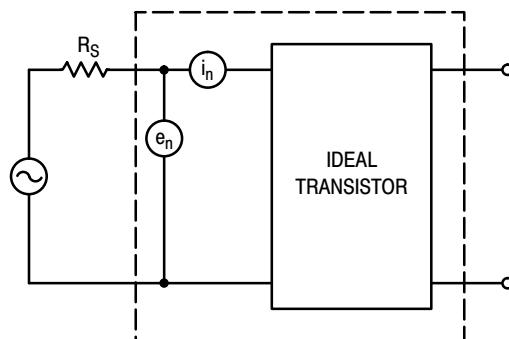


Figure 1. Transistor Noise Model

# BC549B,C BC550B,C

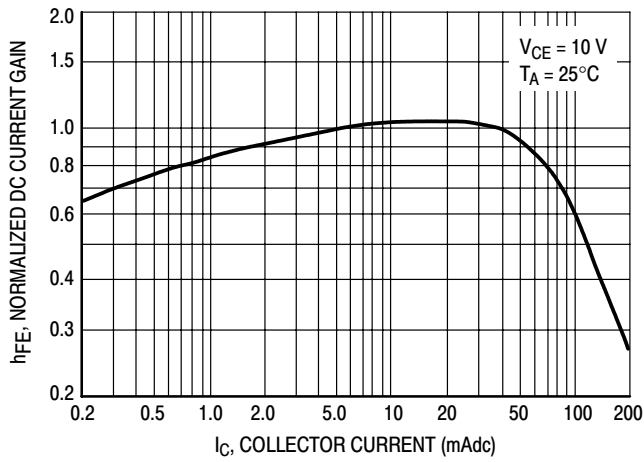


Figure 2. Normalized DC Current Gain

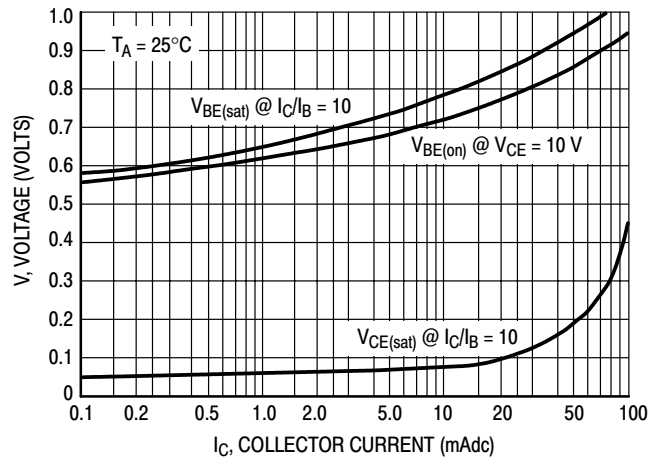


Figure 3. "Saturation" and "On" Voltages

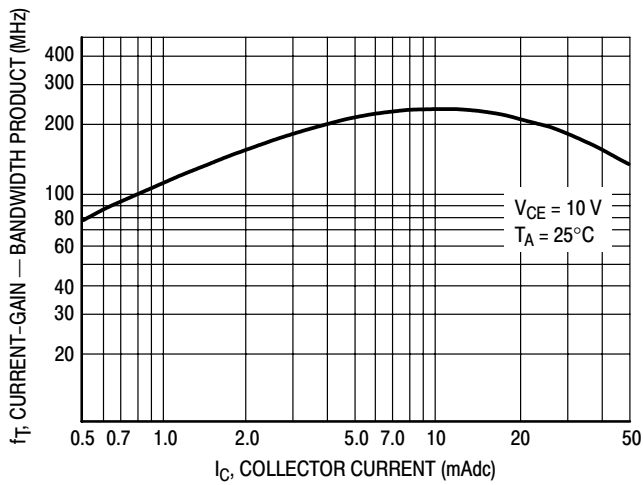


Figure 4. Current-Gain — Bandwidth Product

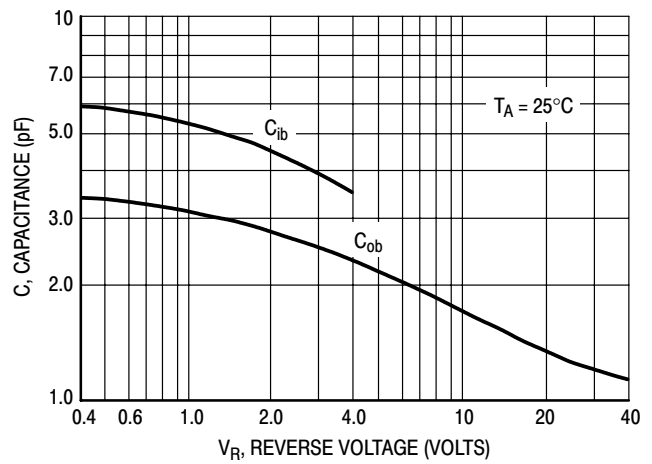


Figure 5. Capacitance

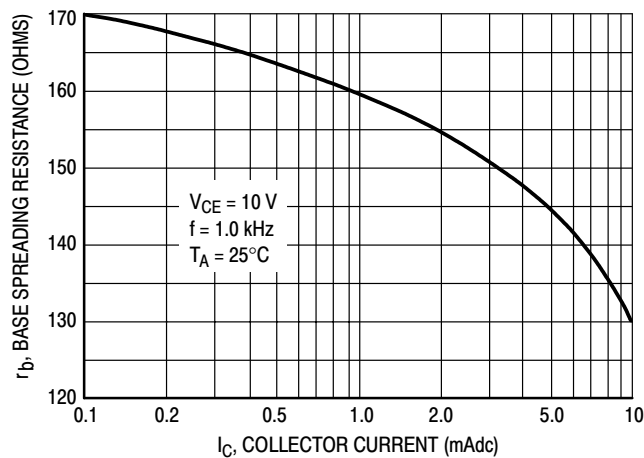
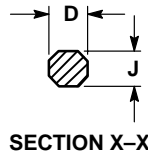
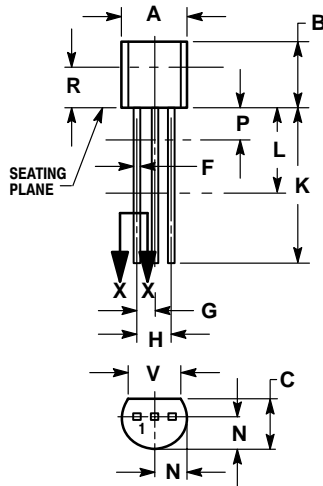


Figure 6. Base Spreading Resistance

# BC549B,C BC550B,C

## PACKAGE DIMENSIONS

CASE 029-04  
(TO-226AA)  
ISSUE AD




### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.175  | 0.205 | 4.45        | 5.20 |
| B   | 0.170  | 0.210 | 4.32        | 5.33 |
| C   | 0.125  | 0.165 | 3.18        | 4.19 |
| D   | 0.016  | 0.022 | 0.41        | 0.55 |
| F   | 0.016  | 0.019 | 0.41        | 0.48 |
| G   | 0.045  | 0.055 | 1.15        | 1.39 |
| H   | 0.095  | 0.105 | 2.42        | 2.66 |
| J   | 0.015  | 0.020 | 0.39        | 0.50 |
| K   | 0.500  | ---   | 12.70       | ---  |
| L   | 0.250  | ---   | 6.35        | ---  |
| N   | 0.080  | 0.105 | 2.04        | 2.66 |
| P   | ---    | 0.100 | ---         | 2.54 |
| R   | 0.115  | ---   | 2.93        | ---  |
| V   | 0.135  | ---   | 3.43        | ---  |

### STYLE 17:

1. COLLECTOR
2. BASE
3. EMITTER

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