

# BC546B, BC547A, B, C, BC548B, C

## Amplifier Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value          | Unit                       |
|----------------------------------------------------------------------------------------|----------------|----------------|----------------------------|
| Collector - Emitter Voltage<br>BC546<br>BC547<br>BC548                                 | $V_{CEO}$      | 65<br>45<br>30 | Vdc                        |
| Collector - Base Voltage<br>BC546<br>BC547<br>BC548                                    | $V_{CBO}$      | 80<br>50<br>30 | Vdc                        |
| Emitter - Base Voltage                                                                 | $V_{EBO}$      | 6.0            | 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<br>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<br>12      | W<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,<br>Junction-to-Ambient | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance,<br>Junction-to-Case    | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |

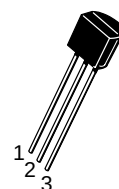
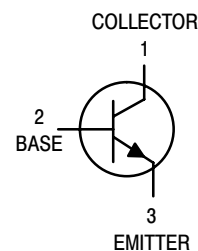
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



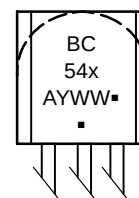
ON Semiconductor®

<http://onsemi.com>



TO-92  
CASE 29  
STYLE 17

#### MARKING DIAGRAM



BC54x = Device Code  
x = 6, 7, or 8  
A = Assembly Location  
Y = Year  
WW = Work Week  
■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

| Characteristic                                                                                                                                                                                                                  |                                          | Symbol               | Min               | Typ                    | Max                   | Unit             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------|-------------------|------------------------|-----------------------|------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                      |                                          |                      |                   |                        |                       |                  |
| Collector – Emitter Breakdown Voltage<br>(I <sub>C</sub> = 1.0 mA, I <sub>B</sub> = 0)                                                                                                                                          | BC546<br>BC547<br>BC548                  | V <sub>(BR)CEO</sub> | 65<br>45<br>30    | –<br>–<br>–            | –<br>–<br>–           | V                |
| Collector – Base Breakdown Voltage<br>(I <sub>C</sub> = 100 µA, I <sub>E</sub> = 0)                                                                                                                                             | BC546<br>BC547<br>BC548                  | V <sub>(BR)CBO</sub> | 80<br>50<br>30    | –<br>–<br>–            | –<br>–<br>–           | V                |
| Emitter – Base Breakdown Voltage<br>(I <sub>E</sub> = 10 µA, I <sub>C</sub> = 0)                                                                                                                                                | BC546<br>BC547<br>BC548                  | V <sub>(BR)EBO</sub> | 6.0<br>6.0<br>6.0 | –<br>–<br>–            | –<br>–<br>–           | V                |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 70 V, V <sub>BE</sub> = 0)<br>(V <sub>CE</sub> = 50 V, V <sub>BE</sub> = 0)<br>(V <sub>CE</sub> = 35 V, V <sub>BE</sub> = 0)<br>(V <sub>CE</sub> = 30 V, T <sub>A</sub> = 125°C) | BC546<br>BC547<br>BC548<br>BC546/547/548 | I <sub>CES</sub>     | –<br>–<br>–<br>–  | 0.2<br>0.2<br>0.2<br>– | 15<br>15<br>15<br>4.0 | nA<br><br><br>µA |

## ON CHARACTERISTICS

|                                                                                                                                                                                                            |                                                                        |                      |                                        |                                  |                                        |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------|----------------------------------------|----------------------------------|----------------------------------------|---|
| DC Current Gain<br>(I <sub>C</sub> = 10 µA, V <sub>CE</sub> = 5.0 V)                                                                                                                                       | BC547A<br>BC546B/547B/548B<br>BC548C                                   | h <sub>FE</sub>      | –<br>–<br>–                            | 90<br>150<br>270                 | –<br>–<br>–                            | – |
| (I <sub>C</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V)                                                                                                                                                         | BC546<br>BC547<br>BC548<br>BC547A<br>BC546B/547B/548B<br>BC547C/BC548C |                      | 110<br>110<br>110<br>110<br>200<br>420 | –<br>–<br>–<br>180<br>290<br>520 | 450<br>800<br>800<br>220<br>450<br>800 |   |
| (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 5.0 V)                                                                                                                                                         | BC547A/548A<br>BC546B/547B/548B<br>BC548C                              |                      | –<br>–<br>–                            | 120<br>180<br>300                | –<br>–<br>–                            |   |
| Collector – Emitter Saturation Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.5 mA)<br>(I <sub>C</sub> = 100 mA, I <sub>B</sub> = 5.0 mA)<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = See Note 1) |                                                                        | V <sub>CE(sat)</sub> | –<br>–<br>–                            | 0.09<br>0.2<br>0.3               | 0.25<br>0.6<br>0.6                     | V |
| Base – Emitter Saturation Voltage<br>(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.5 mA)                                                                                                                     |                                                                        | V <sub>BE(sat)</sub> | –                                      | 0.7                              | –                                      | V |
| Base – Emitter On Voltage<br>(I <sub>C</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V)<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 5.0 V)                                                                       |                                                                        | V <sub>BE(on)</sub>  | 0.55<br>–                              | –<br>–                           | 0.7<br>0.77                            | V |

## SMALL-SIGNAL CHARACTERISTICS

|                                                                                                                        |                                                                 |                  |                                 |                             |                                 |     |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------|---------------------------------|-----------------------------|---------------------------------|-----|
| Current – Gain – Bandwidth Product<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 5.0 V, f = 100 MHz)                   | BC546<br>BC547<br>BC548                                         | f <sub>T</sub>   | 150<br>150<br>150               | 300<br>300<br>300           | –<br>–<br>–                     | MHz |
| Output Capacitance<br>(V <sub>CB</sub> = 10 V, I <sub>C</sub> = 0, f = 1.0 MHz)                                        |                                                                 | C <sub>obo</sub> | –                               | 1.7                         | 4.5                             | pF  |
| Input Capacitance<br>(V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0, f = 1.0 MHz)                                        |                                                                 | C <sub>ibo</sub> | –                               | 10                          | –                               | pF  |
| Small – Signal Current Gain<br>(I <sub>C</sub> = 2.0 mA, V <sub>CE</sub> = 5.0 V, f = 1.0 kHz)                         | BC546<br>BC547/548<br>BC547A<br>BC546B/547B/548B<br>BC547C/548C | h <sub>fe</sub>  | 125<br>125<br>125<br>240<br>450 | –<br>–<br>220<br>330<br>600 | 500<br>900<br>260<br>500<br>900 | –   |
| Noise Figure<br>(I <sub>C</sub> = 0.2 mA, V <sub>CE</sub> = 5.0 V, R <sub>S</sub> = 2 kΩ,<br>f = 1.0 kHz, Δf = 200 Hz) | BC546<br>BC547<br>BC548                                         | NF               | –<br>–<br>–                     | 2.0<br>2.0<br>2.0           | 10<br>10<br>10                  | dB  |

1. I<sub>B</sub> is value for which I<sub>C</sub> = 11 mA at V<sub>CE</sub> = 1.0 V.

BC547/BC548

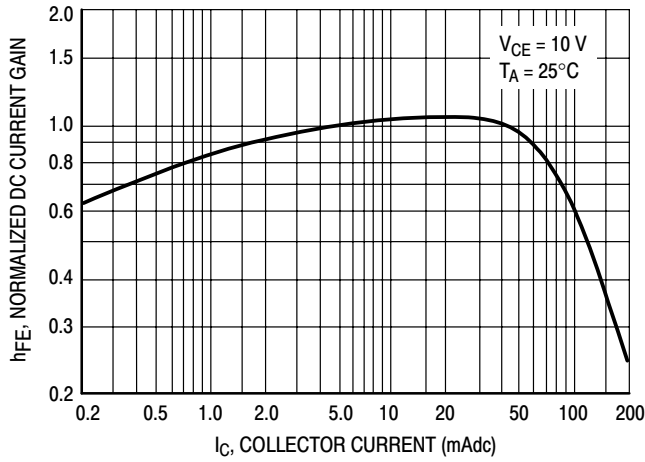


Figure 1. Normalized DC Current Gain

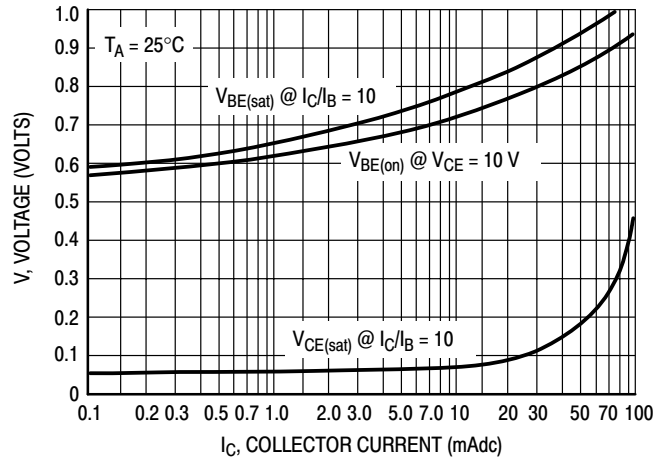


Figure 2. "Saturation" and "On" Voltages

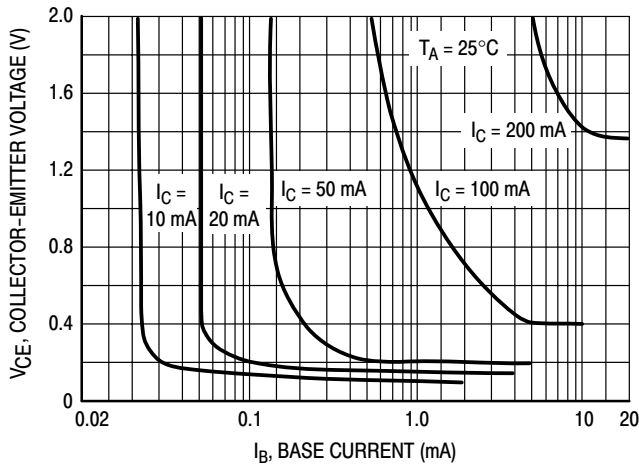


Figure 3. Collector Saturation Region

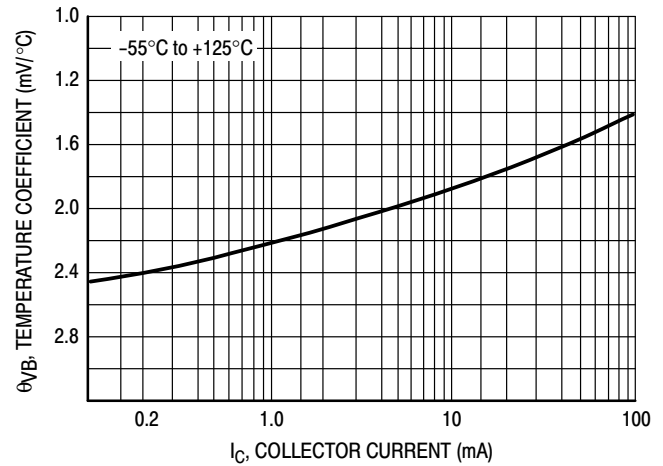


Figure 4. Base-Emitter Temperature Coefficient

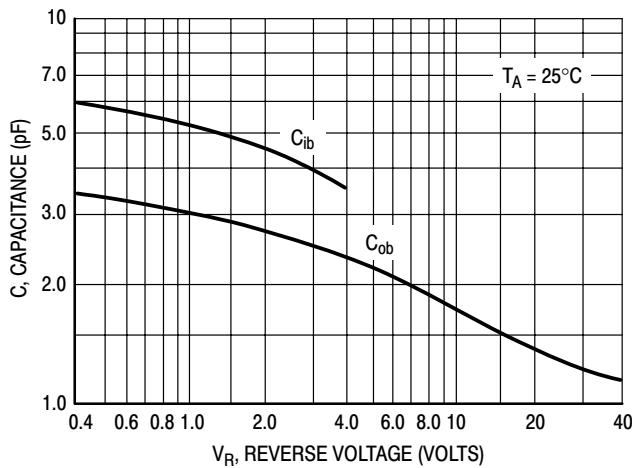


Figure 5. Capacitances

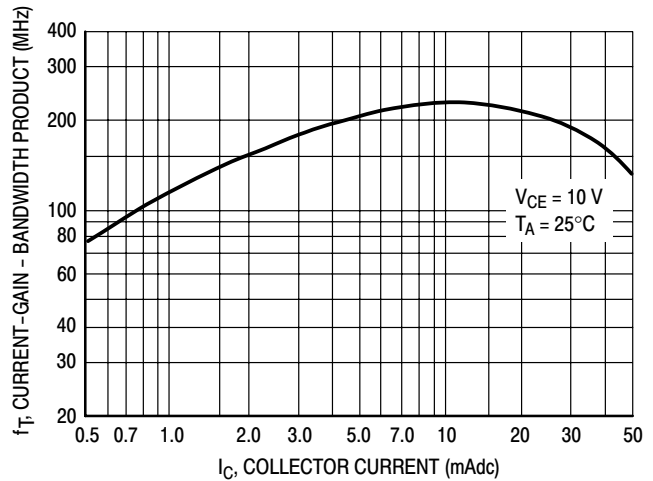


Figure 6. Current-Gain - Bandwidth Product

# BC546B, BC547A, B, C, BC548B, C

## BC546

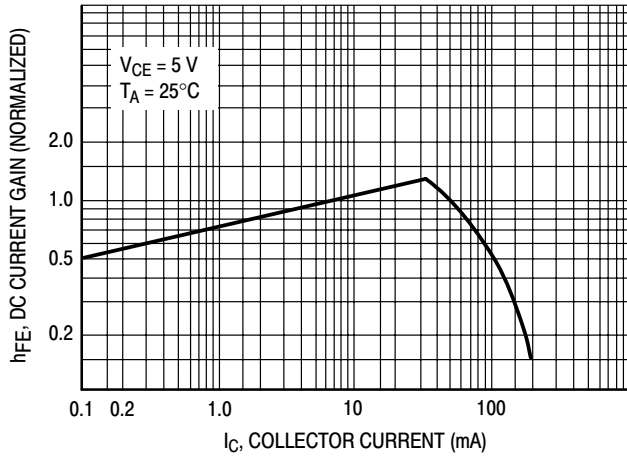


Figure 7. DC Current Gain

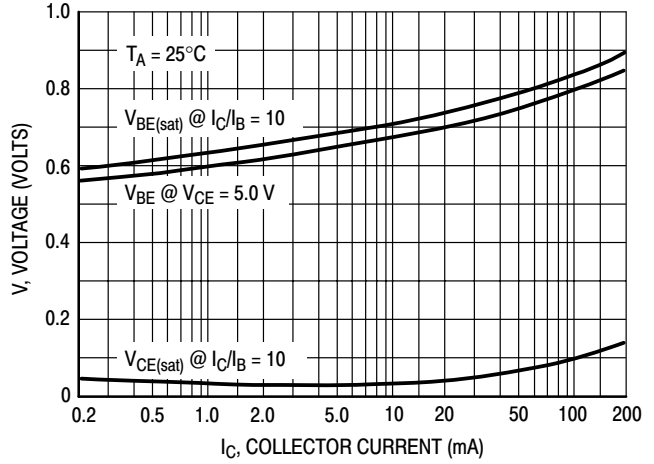


Figure 8. "On" Voltage

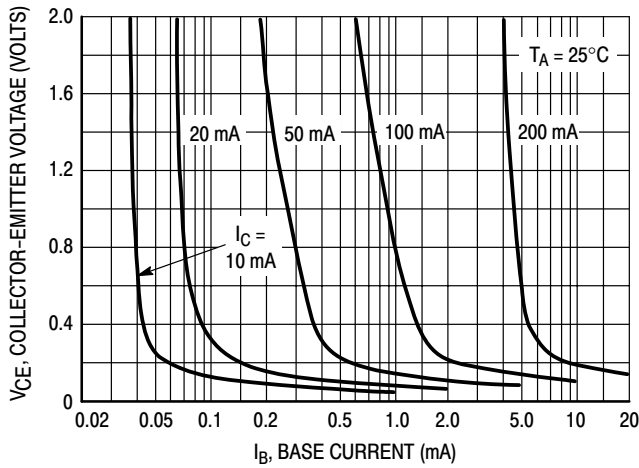


Figure 9. Collector Saturation Region

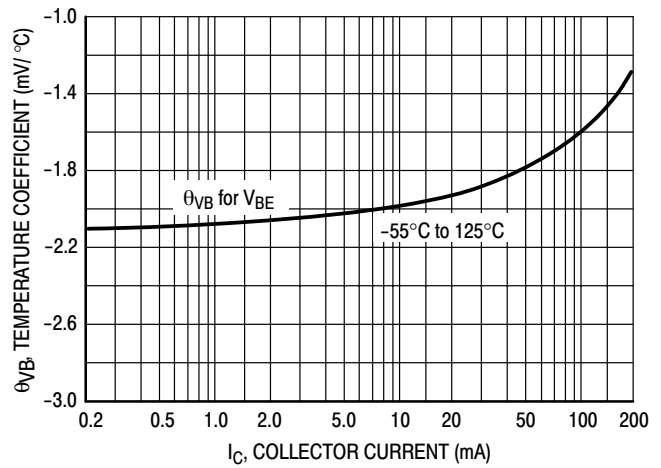


Figure 10. Base-Emitter Temperature Coefficient

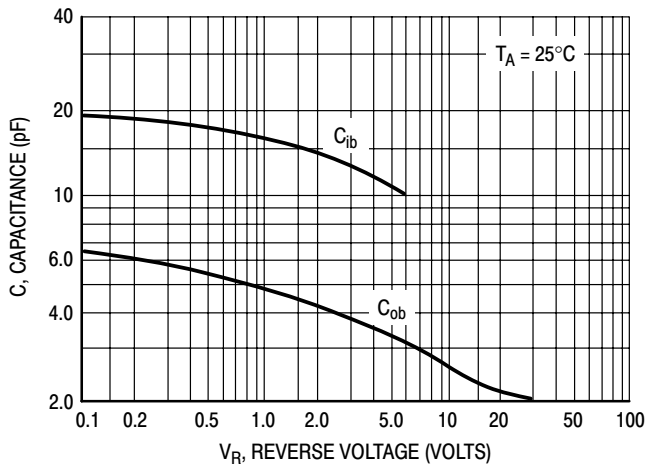


Figure 11. Capacitance

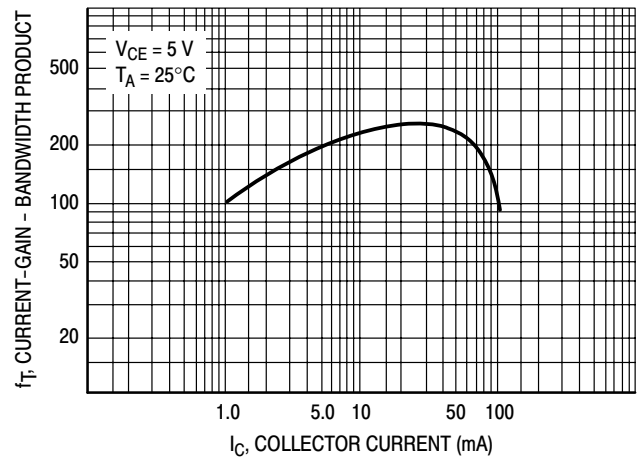


Figure 12. Current-Gain - Bandwidth Product

# BC546B, BC547A, B, C, BC548B, C

## DEVICE ORDERING INFORMATION

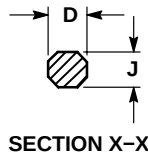
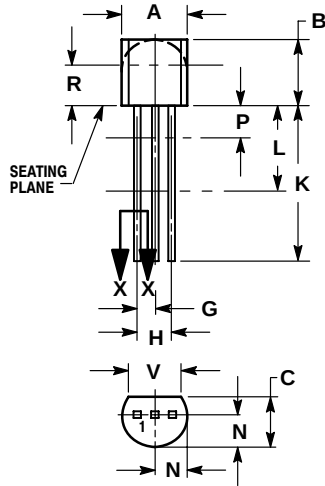
| Device     | Package            | Shipping <sup>†</sup> |
|------------|--------------------|-----------------------|
| BC546B     | TO-92              | 5000 Units / Bulk     |
| BC546BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC546BRL1  | TO-92              | 2000 / Tape & Reel    |
| BC546BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC546BZL1  | TO-92              | 2000 / Ammo Box       |
| BC546BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC547ARL   | TO-92              | 2000 / Tape & Reel    |
| BC547ARLG  | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC547ARL1  | TO-92              | 2000 / Tape & Reel    |
| BC547ARL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC547AZL1  | TO-92              | 2000 / Ammo Box       |
| BC547AZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC547B     | TO-92              | 5000 Units / Bulk     |
| BC547BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC547BRL1  | TO-92              | 2000 / Tape & Reel    |
| BC547BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC547BZL1  | TO-92              | 2000 / Ammo Box       |
| BC547BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC547C     | TO-92              | 5000 Units / Bulk     |
| BC547CG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC547CZL1  | TO-92              | 2000 / Ammo Box       |
| BC547CZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC548B     | TO-92              | 5000 Units / Bulk     |
| BC548BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC548BRL1  | TO-92              | 2000 / Tape & Reel    |
| BC548BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC548BZL1  | TO-92              | 2000 / Ammo Box       |
| BC548BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC548C     | TO-92              | 5000 Units / Bulk     |
| BC548CG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC548CZL1  | TO-92              | 2000 / Ammo Box       |
| BC548CZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# BC546B, BC547A, B, C, BC548B, C

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-11  
ISSUE AL



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. 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  | 0.021 | 0.407       | 0.533 |
| 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:

- PIN 1. COLLECTOR
2. BASE
3. EMITTER

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