

# BC556B, BC557A, B, C, BC558B

## Amplifier Transistors

### PNP Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

| Rating                                                                                 | Symbol            | Value             | Unit                       |
|----------------------------------------------------------------------------------------|-------------------|-------------------|----------------------------|
| Collector - Emitter Voltage<br>BC556<br>BC557<br>BC558                                 | $V_{CEO}$         | -65<br>-45<br>-30 | Vdc                        |
| Collector - Base Voltage<br>BC556<br>BC557<br>BC558                                    | $V_{CBO}$         | -80<br>-50<br>-30 | Vdc                        |
| Emitter - Base Voltage                                                                 | $V_{EBO}$         | -5.0              | Vdc                        |
| Collector Current - Continuous<br>- Peak                                               | $I_C$<br>$I_{CM}$ | -100<br>-200      | mAdc                       |
| Base Current - Peak                                                                    | $I_{BM}$          | -200              | 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, Junction-to-Ambient | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |

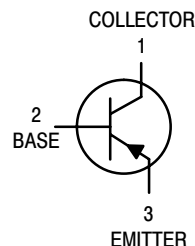
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

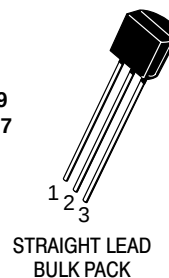


ON Semiconductor®

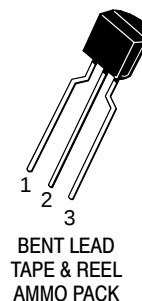
<http://onsemi.com>



TO-92  
CASE 29  
STYLE 17

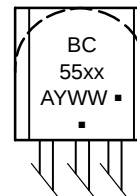


STRAIGHT LEAD  
BULK PACK



BENT LEAD  
TAPE & REEL  
AMMO PACK

#### MARKING DIAGRAM



xx = 6B, 7A, 7B, 7C, or 8B  
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 6 of this data sheet.

# BC556B, BC557A, B, C, BC558B

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

| Characteristic                                                                                                                                                    | Symbol        | Min                        | Typ                                 | Max                                          | Unit                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------|-------------------------------------|----------------------------------------------|-------------------------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                        |               |                            |                                     |                                              |                                     |
| Collector–Emitter Breakdown Voltage<br>( $I_C = -2.0\text{ mAdc}$ , $I_B = 0$ )                                                                                   | $V_{(BR)CEO}$ | -65<br>-45<br>-30          | -<br>-<br>-                         | -<br>-<br>-                                  | V                                   |
| Collector–Base Breakdown Voltage<br>( $I_C = -100\text{ }\mu\text{Adc}$ )                                                                                         | $V_{(BR)CBO}$ | -80<br>-50<br>-30          | -<br>-<br>-                         | -<br>-<br>-                                  | V                                   |
| Emitter–Base Breakdown Voltage<br>( $I_E = -100\text{ }\mu\text{Adc}$ , $I_C = 0$ )                                                                               | $V_{(BR)EBO}$ | -5.0<br>-5.0<br>-5.0       | -<br>-<br>-                         | -<br>-<br>-                                  | V                                   |
| Collector–Emitter Leakage Current<br>( $V_{CES} = -40\text{ V}$ )<br>( $V_{CES} = -20\text{ V}$ )<br><br>( $V_{CES} = -20\text{ V}$ , $T_A = 125^\circ\text{C}$ ) | $I_{CES}$     | -<br>-<br>-<br>-<br>-<br>- | -2.0<br>-2.0<br>-2.0<br>-<br>-<br>- | -100<br>-100<br>-100<br>-4.0<br>-4.0<br>-4.0 | nA<br><br><br><br><br>$\mu\text{A}$ |

## ON CHARACTERISTICS

|                                                                                                                                                                                                                      |                                                                                                                                                                                        |               |                                                        |                                                                 |                                                        |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------|---|
| DC Current Gain<br>( $I_C = -10\text{ }\mu\text{Adc}$ , $V_{CE} = -5.0\text{ V}$ )<br><br>( $I_C = -2.0\text{ mAdc}$ , $V_{CE} = -5.0\text{ V}$ )<br><br>( $I_C = -100\text{ mAdc}$ , $V_{CE} = -5.0\text{ V}$ )     | A Series Device<br>B Series Devices<br>C Series Devices<br>BC557<br>A Series Device<br>B Series Devices<br>C Series Devices<br>A Series Device<br>B Series Devices<br>C Series Devices | $h_{FE}$      | -<br>-<br>-<br>120<br>120<br>180<br>420<br>-<br>-<br>- | 90<br>150<br>270<br>-<br>170<br>290<br>500<br>120<br>180<br>300 | -<br>-<br>-<br>800<br>220<br>460<br>800<br>-<br>-<br>- | - |
| 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>( $I_C = -100\text{ mAdc}$ , $I_B = -5.0\text{ mAdc}$ ) |                                                                                                                                                                                        | $V_{CE(sat)}$ | -<br>-<br>-                                            | -0.075<br>-0.3<br>-0.25                                         | -0.3<br>-0.6<br>-0.65                                  | V |
| Base–Emitter Saturation Voltage<br>( $I_C = -10\text{ mAdc}$ , $I_B = -0.5\text{ mAdc}$ )<br>( $I_C = -100\text{ mAdc}$ , $I_B = -5.0\text{ mAdc}$ )                                                                 |                                                                                                                                                                                        | $V_{BE(sat)}$ | -<br>-                                                 | -0.7<br>-1.0                                                    | -<br>-                                                 | V |
| Base–Emitter On Voltage<br>( $I_C = -2.0\text{ mAdc}$ , $V_{CE} = -5.0\text{ Vdc}$ )<br>( $I_C = -10\text{ mAdc}$ , $V_{CE} = -5.0\text{ Vdc}$ )                                                                     |                                                                                                                                                                                        | $V_{BE(on)}$  | -0.55<br>-                                             | -0.62<br>-0.7                                                   | -0.7<br>-0.82                                          | V |

## SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                                                             |                                                                  |          |                          |                   |                          |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------|--------------------------|-------------------|--------------------------|-----|
| Current–Gain – Bandwidth Product<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ , $f = 100\text{ MHz}$ )                                             | BC556<br>BC557<br>BC558                                          | $f_T$    | -<br>-<br>-              | 280<br>320<br>360 | -<br>-<br>-              | MHz |
| Output Capacitance<br>( $V_{CB} = -10\text{ V}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )                                                                        |                                                                  | $C_{ob}$ | -                        | 3.0               | 6.0                      | pF  |
| Noise Figure<br>( $I_C = -0.2\text{ mAdc}$ , $V_{CE} = -5.0\text{ V}$ ,<br>$R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $\Delta f = 200\text{ Hz}$ ) | BC556<br>BC557<br>BC558                                          | NF       | -<br>-<br>-              | 2.0<br>2.0<br>2.0 | 10<br>10<br>10           | dB  |
| Small–Signal Current Gain<br>( $I_C = -2.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ V}$ , $f = 1.0\text{ kHz}$ )                                                  | BC557<br>A Series Device<br>B Series Devices<br>C Series Devices | $h_{fe}$ | 125<br>125<br>240<br>450 | -<br>-<br>-<br>-  | 900<br>260<br>500<br>900 | -   |

1.  $I_C = -10\text{ mAdc}$  on the constant base current characteristics, which yields the point  $I_C = -11\text{ mAdc}$ ,  $V_{CE} = -1.0\text{ V}$ .

# BC556B, BC557A, B, C, BC558B

## BC557/BC558

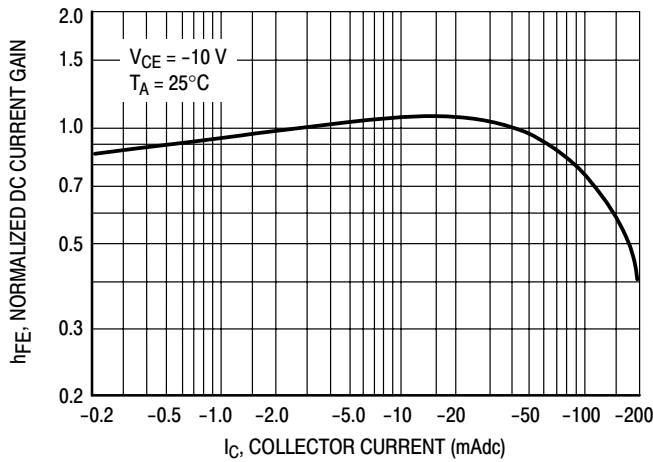


Figure 1. Normalized DC Current Gain

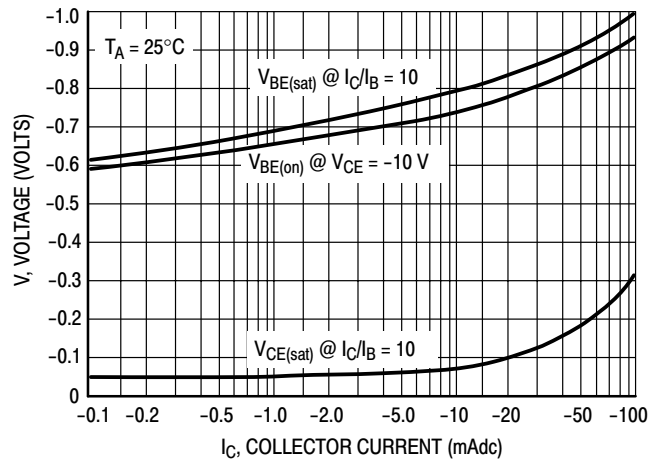


Figure 2. "Saturation" and "On" Voltages

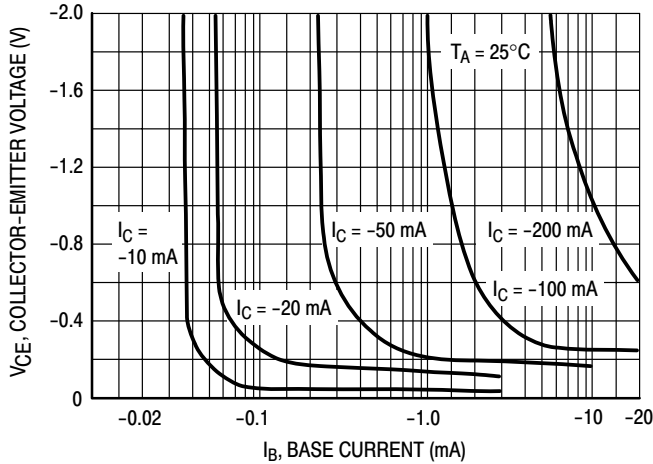


Figure 3. Collector Saturation Region

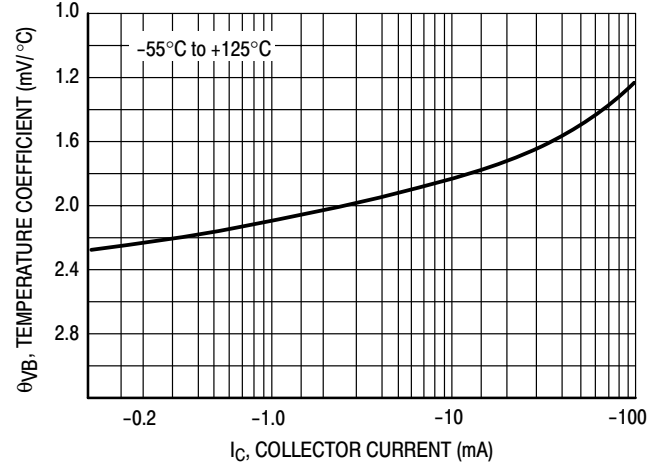


Figure 4. Base-Emitter Temperature Coefficient

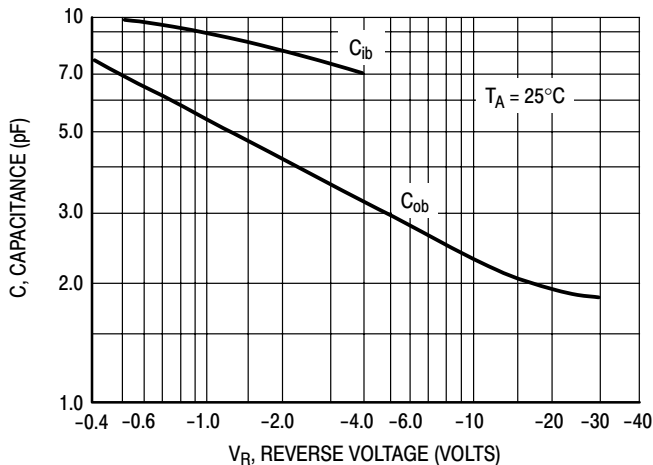


Figure 5. Capacitances

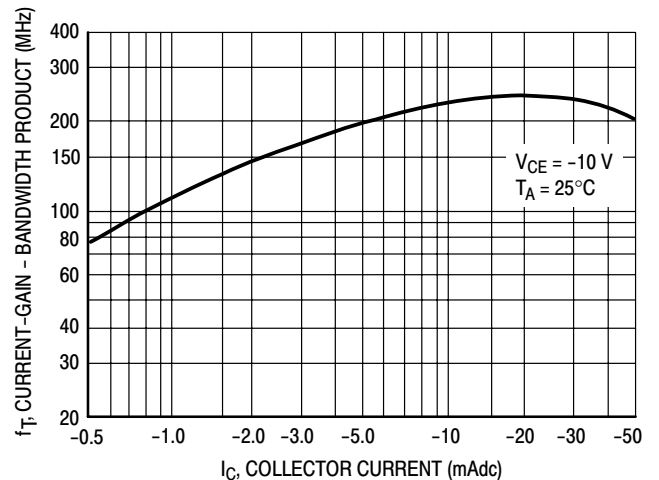


Figure 6. Current-Gain - Bandwidth Product

BC556

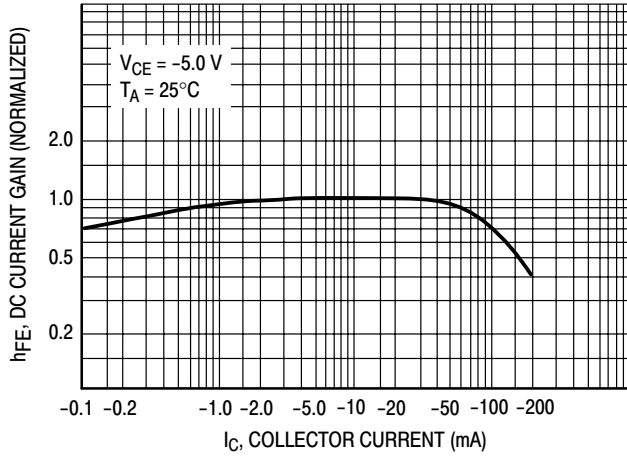


Figure 7. DC Current Gain

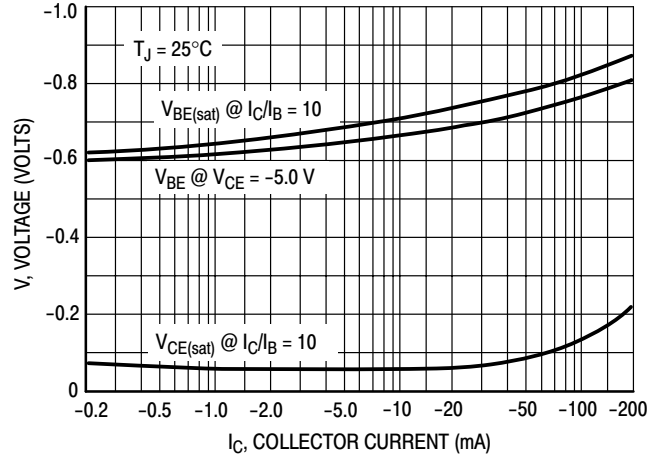


Figure 8. "On" Voltage

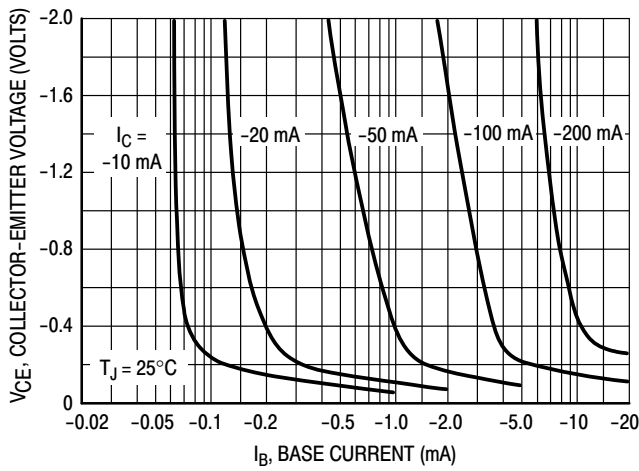


Figure 9. Collector Saturation Region

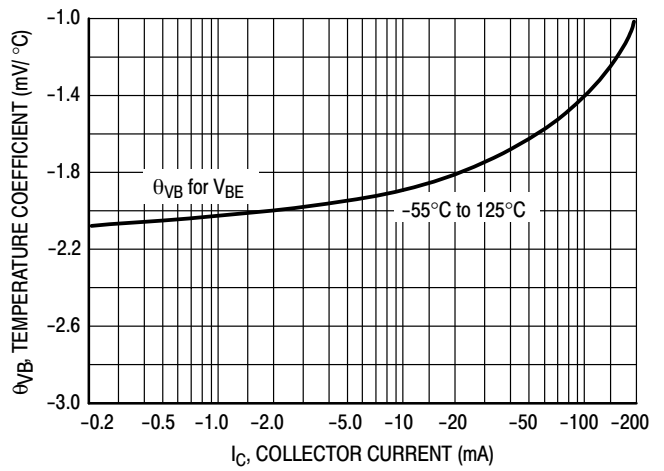


Figure 10. Base-Emitter Temperature Coefficient

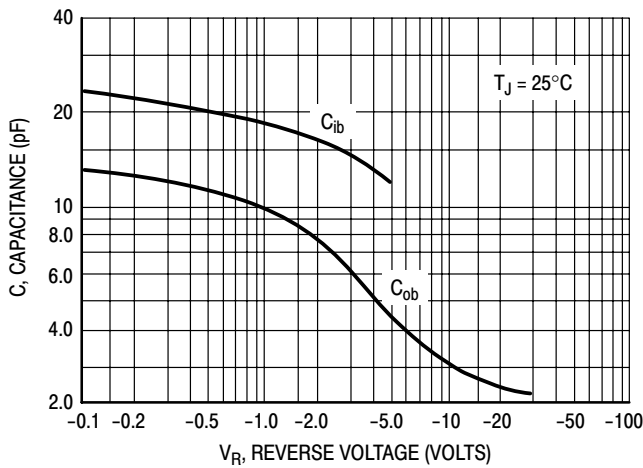


Figure 11. Capacitance

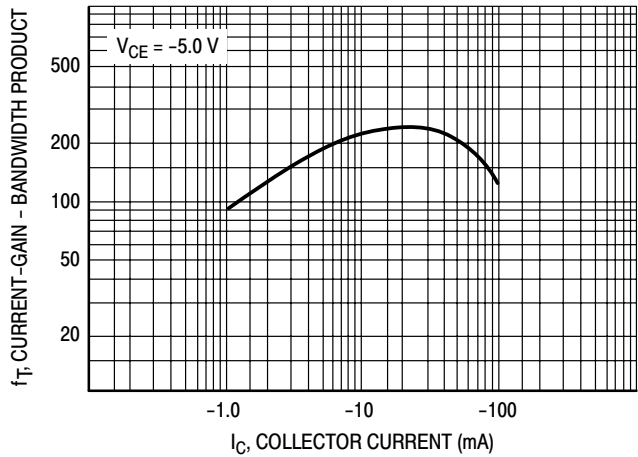


Figure 12. Current-Gain - Bandwidth Product

# BC556B, BC557A, B, C, BC558B

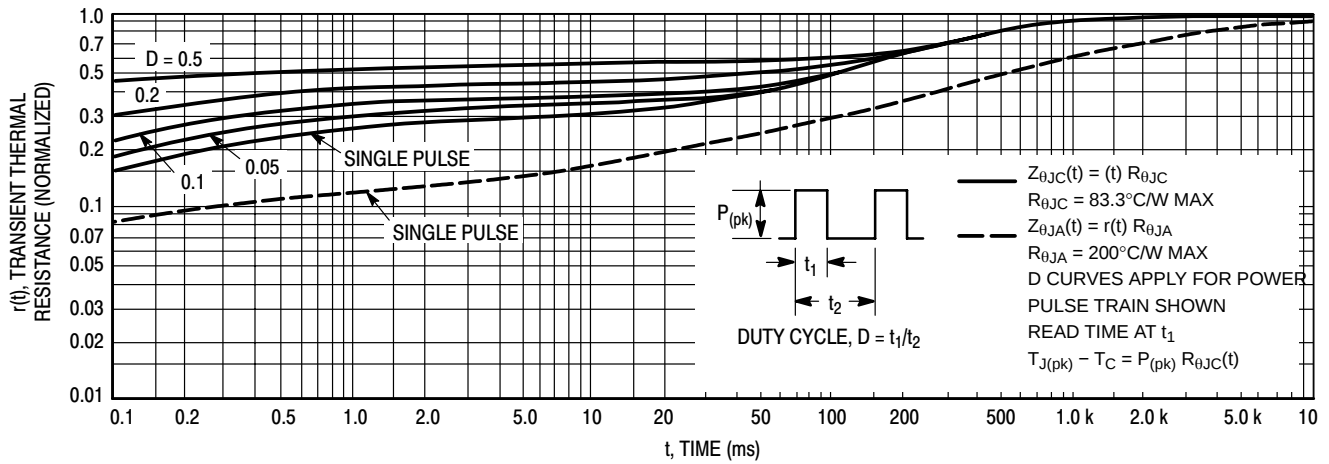


Figure 13. Thermal Response

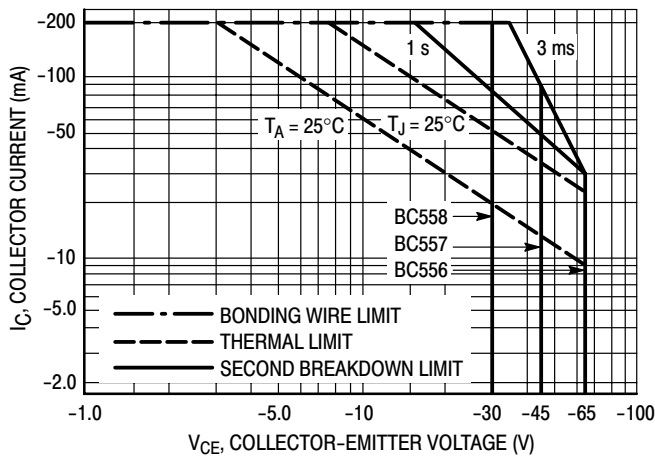


Figure 14. Active Region - Safe Operating Area

The safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 14 is based upon  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 13. At high case or ambient temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.

## BC556B, BC557A, B, C, BC558B

### ORDERING INFORMATION

| Device     | Package            | Shipping <sup>†</sup> |
|------------|--------------------|-----------------------|
| BC556BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC556BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC557AZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC557BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC557BRL1  | TO-92              | 2000 / Tape & Reel    |
| BC557BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC557BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC557CG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk     |
| BC557CZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |
| BC558BRLG  | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC558BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel    |
| BC558BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box       |

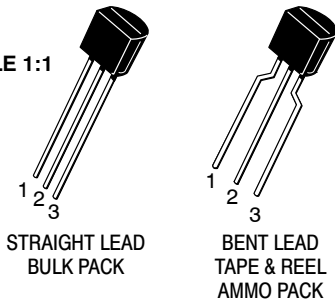
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®

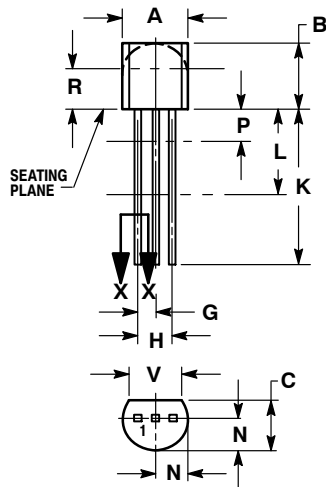
ON

SCALE 1:1

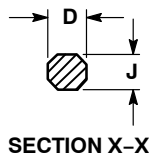


TO-92 (TO-226)  
CASE 29-11  
ISSUE AM

DATE 09 MAR 2007



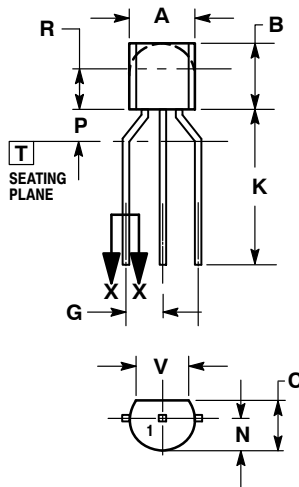
STRAIGHT LEAD  
BULK PACK



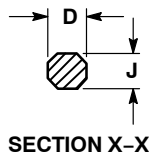
NOTES:

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        | ---   |



BENT LEAD  
TAPE & REEL  
AMMO PACK



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 4.45        | 5.20 |
| B   | 4.32        | 5.33 |
| C   | 3.18        | 4.19 |
| D   | 0.40        | 0.54 |
| G   | 2.40        | 2.80 |
| J   | 0.39        | 0.50 |
| K   | 12.70       | ---  |
| N   | 2.04        | 2.66 |
| P   | 1.50        | 4.00 |
| R   | 2.93        | ---  |
| V   | 3.43        | ---  |

STYLES ON PAGE 2

|                  |                           |                                                                                                                                                                                  |
|------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| STATUS:          | ON SEMICONDUCTOR STANDARD |                                                                                                                                                                                  |
| NEW STANDARD:    |                           |                                                                                                                                                                                  |
| DESCRIPTION:     | TO-92 (TO-226)            |                                                                                                                                                                                  |
|                  |                           | PAGE 1 OF 3                                                                                                                                                                      |

**TO-92 (TO-226)**  
**CASE 29-11**  
**ISSUE AM**

DATE 09 MAR 2007

|                                                               |                                                                      |                                                              |                                                                 |                                                             |
|---------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR         | STYLE 2:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR                | STYLE 3:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE           | STYLE 4:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE            | STYLE 5:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE            |
| STYLE 6:<br>PIN 1. GATE<br>2. SOURCE & SUBSTRATE<br>3. DRAIN  | STYLE 7:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE                     | STYLE 8:<br>PIN 1. DRAIN<br>2. GATE<br>3. SOURCE & SUBSTRATE | STYLE 9:<br>PIN 1. BASE 1<br>2. EMITTER<br>3. BASE 2            | STYLE 10:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE & ANODE<br>3. CATHODE | STYLE 12:<br>PIN 1. MAIN TERMINAL 1<br>2. GATE<br>3. MAIN TERMINAL 2 | STYLE 13:<br>PIN 1. ANODE 1<br>2. GATE<br>3. CATHODE 2       | STYLE 14:<br>PIN 1. EMITTER<br>2. COLLECTOR<br>3. BASE          | STYLE 15:<br>PIN 1. ANODE 1<br>2. CATHODE<br>3. ANODE 2     |
| STYLE 16:<br>PIN 1. ANODE<br>2. GATE<br>3. CATHODE            | STYLE 17:<br>PIN 1. COLLECTOR<br>2. BASE<br>3. EMITTER               | STYLE 18:<br>PIN 1. ANODE<br>2. CATHODE<br>3. NOT CONNECTED  | STYLE 19:<br>PIN 1. GATE<br>2. ANODE<br>3. CATHODE              | STYLE 20:<br>PIN 1. NOT CONNECTED<br>2. CATHODE<br>3. ANODE |
| STYLE 21:<br>PIN 1. COLLECTOR<br>2. EMITTER<br>3. BASE        | STYLE 22:<br>PIN 1. SOURCE<br>2. GATE<br>3. DRAIN                    | STYLE 23:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN            | STYLE 24:<br>PIN 1. EMITTER<br>2. COLLECTOR/ANODE<br>3. CATHODE | STYLE 25:<br>PIN 1. MT 1<br>2. GATE<br>3. MT 2              |
| STYLE 26:<br>PIN 1. $V_{CC}$<br>2. GROUND 2<br>3. OUTPUT      | STYLE 27:<br>PIN 1. MT<br>2. SUBSTRATE<br>3. MT                      | STYLE 28:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE           | STYLE 29:<br>PIN 1. NOT CONNECTED<br>2. ANODE<br>3. CATHODE     | STYLE 30:<br>PIN 1. DRAIN<br>2. GATE<br>3. SOURCE           |
| STYLE 31:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE             | STYLE 32:<br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER               | STYLE 33:<br>PIN 1. RETURN<br>2. INPUT<br>3. OUTPUT          | STYLE 34:<br>PIN 1. INPUT<br>2. GROUND<br>3. LOGIC              | STYLE 35:<br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER      |

|                         |                                  |                                                                                                                                                                                  |
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| <b>STATUS:</b>          | <b>ON SEMICONDUCTOR STANDARD</b> |                                                                                                                                                                                  |
| <b>NEW STANDARD:</b>    |                                  |                                                                                                                                                                                  |
| <b>DESCRIPTION:</b>     | <b>TO-92 (TO-226)</b>            | <b>PAGE 2 OF 3</b>                                                                                                                                                               |

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