## BC556B, BC557A, B, C, BC558B

## Amplifier Transistors <br> PNP Silicon

## Features

- $\mathrm{Pb}-$ Free Packages are Available*


## MAXIMUM RATINGS

| Rating |  | Symbol | Value | Unit |
| :--- | :--- | :---: | :---: | :---: |
| Collector - Emitter Voltage | BC556 | $\mathrm{V}_{\mathrm{CEO}}$ |  | Vdc |
|  | $\begin{array}{ll}\text { BC557 }\end{array}$ |  | -65 |  |
|  | BC558 |  |  |  |$)$

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
| :--- | :---: | :---: | :---: |
| Thermal Resistance, Junction-to-Ambient | $\mathrm{R}_{\text {өJA }}$ | 200 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| Thermal Resistance, Junction-to-Case | $\mathrm{R}_{\text {өJC }}$ | 83.3 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |

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.
 download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor ${ }^{\ominus}$
http://onsemi.com
(1) COLECTOR

MARKING DIAGRAM


| xx | $=6 \mathrm{~B}, 7 \mathrm{~A}, 7 \mathrm{~B}, 7 \mathrm{C}$, or 8 B |
| :--- | :--- |
| 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.

ELECTRICAL CHARACTERISTICS $\left(\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}\right.$ unless otherwise noted)

| Characteristic |  | Symbol | Min | Typ | Max | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| OFF CHARACTERISTICS |  |  |  |  |  |  |
| Collector-Emitter Breakdown Voltage $\left(I_{C}=-2.0 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=0\right)$ | $\begin{aligned} & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \end{aligned}$ | $\mathrm{V}_{\text {(BR) }}$ CEO | $\begin{aligned} & -65 \\ & -45 \\ & -30 \end{aligned}$ | - | - | V |
| $\begin{aligned} & \text { Collector-Base Breakdown Voltage } \\ & \quad\left(I_{C}=-100 \mu \mathrm{Adc}\right) \end{aligned}$ | $\begin{aligned} & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \end{aligned}$ | $\mathrm{V}_{\text {(BR) }}$ CBO | $\begin{aligned} & -80 \\ & -50 \\ & -30 \end{aligned}$ | - | - | V |
| Emitter-Base Breakdown Voltage $\left(I_{E}=-100 \mu A d c, I_{C}=0\right)$ | $\begin{aligned} & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \end{aligned}$ | $\mathrm{V}_{(\mathrm{BR}) \text { EBO }}$ | $\begin{aligned} & -5.0 \\ & -5.0 \\ & -5.0 \end{aligned}$ | - | - | V |
| $\begin{aligned} & \text { Collector-Emitter Leakage Current } \\ & \left(\mathrm{V}_{\text {CES }}=-40 \mathrm{~V}\right) \\ & \left(\mathrm{V}_{\mathrm{CES}}=-20 \mathrm{~V}\right) \\ & \left(\mathrm{V}_{\text {CES }}=-20 \mathrm{~V}, \mathrm{~T}_{\mathrm{A}}=125^{\circ} \mathrm{C}\right) \end{aligned}$ | $\begin{aligned} & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \\ & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \end{aligned}$ | $I_{\text {CES }}$ | - | $\begin{gathered} -2.0 \\ -2.0 \\ -2.0 \\ - \\ - \\ - \end{gathered}$ | $\begin{aligned} & -100 \\ & -100 \\ & -100 \\ & -4.0 \\ & -4.0 \\ & -4.0 \end{aligned}$ | nA <br> $\mu \mathrm{A}$ |

ON CHARACTERISTICS

| DC Current Gain <br> $\left(I_{C}=-10 \mu \mathrm{Adc}, \mathrm{V}_{\mathrm{CE}}=-5.0 \mathrm{~V}\right)$ <br> $\left(I_{C}=-2.0 \mathrm{mAdc}, \mathrm{V}_{\mathrm{CE}}=-5.0 \mathrm{~V}\right)$ <br> $\left(\mathrm{I}_{\mathrm{C}}=-100 \mathrm{mAdc}, \mathrm{V}_{\mathrm{CE}}=-5.0 \mathrm{~V}\right)$ | A Series Device B Series Devices C Series Devices BC557 <br> A Series Device B Series Devices C Series Devices <br> A Series Device B Series Devices C Series Devices | $\mathrm{h}_{\text {FE }}$ | $\begin{gathered} - \\ - \\ - \\ 120 \\ 120 \\ 180 \\ 420 \\ - \\ - \\ - \end{gathered}$ | $\begin{gathered} 90 \\ 150 \\ 270 \\ - \\ 170 \\ 290 \\ 500 \\ 120 \\ 180 \\ 300 \end{gathered}$ | $\begin{gathered} - \\ - \\ - \\ 800 \\ 220 \\ 460 \\ 800 \\ - \\ - \\ - \end{gathered}$ | - |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Collector-Emitter Saturation Voltage $\left(\mathrm{I}_{\mathrm{C}}=-10 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=-0.5 \mathrm{mAdc}\right)$ ( $\mathrm{I}_{\mathrm{C}}=-10 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=$ see Note 1) <br> ( $\mathrm{I}_{\mathrm{C}}=-100 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=-5.0 \mathrm{mAdc}$ ) |  | $\mathrm{V}_{\text {CE(sat) }}$ | $\begin{aligned} & - \\ & \text { - } \end{aligned}$ | $\begin{gathered} -0.075 \\ -0.3 \\ -0.25 \end{gathered}$ | $\begin{gathered} -0.3 \\ -0.6 \\ -0.65 \end{gathered}$ | V |
| Base-Emitter Saturation Voltage ( $\mathrm{I}_{\mathrm{C}}=-10 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=-0.5 \mathrm{mAdc}$ ) $\left(I_{C}=-100 \mathrm{mAdc}, \mathrm{I}_{\mathrm{B}}=-5.0 \mathrm{mAdc}\right)$ |  | $\mathrm{V}_{\mathrm{BE} \text { (sat) }}$ | - | $\begin{aligned} & -0.7 \\ & -1.0 \end{aligned}$ | - | V |
| $\begin{aligned} & \text { Base-Emitter On Voltage } \\ & \text { ( } \left.\mathrm{I}_{\mathrm{C}}=-2.0 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=-5.0 \mathrm{Vdc}\right) \\ & \left(\mathrm{I}_{\mathrm{C}}=-10 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=-5.0 \mathrm{Vdc}\right) \end{aligned}$ |  | $\mathrm{V}_{\mathrm{BE} \text { (on) }}$ | $-0.55$ | $\begin{gathered} -0.62 \\ -0.7 \end{gathered}$ | $\begin{gathered} -0.7 \\ -0.82 \end{gathered}$ | V |

SMALL-SIGNAL CHARACTERISTICS

| $\begin{aligned} & \text { Current-Gain - Bandwidth Product } \\ & \quad\left(\mathrm{IC}_{\mathrm{C}}=-10 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=-5.0 \mathrm{~V}, \mathrm{f}=100 \mathrm{MHz}\right) \end{aligned}$ | $\begin{aligned} & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \end{aligned}$ | $\mathrm{f}_{\mathrm{T}}$ | - | $\begin{aligned} & 280 \\ & 320 \\ & 360 \end{aligned}$ | - | MHz |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { Output Capacitance } \\ & \qquad\left(\mathrm{V}_{\mathrm{CB}}=-10 \mathrm{~V}, \mathrm{I}_{\mathrm{C}}=0, f=1.0 \mathrm{MHz}\right) \end{aligned}$ |  | $\mathrm{C}_{\text {ob }}$ | - | 3.0 | 6.0 | pF |
| $\begin{aligned} & \text { Noise Figure } \\ & \quad\left(\mathrm{I} \mathrm{C}=-0.2 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=-5.0 \mathrm{~V},\right. \\ & \left.\mathrm{RS}_{\mathrm{S}}=2.0 \mathrm{k} \Omega, \mathrm{f}=1.0 \mathrm{kHz}, \Delta \mathrm{f}=200 \mathrm{~Hz}\right) \end{aligned}$ | $\begin{aligned} & \text { BC556 } \\ & \text { BC557 } \\ & \text { BC558 } \end{aligned}$ | NF | - | $\begin{aligned} & 2.0 \\ & 2.0 \\ & 2.0 \end{aligned}$ | $\begin{aligned} & 10 \\ & 10 \\ & 10 \end{aligned}$ | dB |
| $\begin{aligned} & \text { Small-Signal Current Gain } \\ & \quad\left(\mathrm{I}_{\mathrm{C}}=-2.0 \mathrm{mAdc}, \mathrm{~V}_{\mathrm{CE}}=5.0 \mathrm{~V}, \mathrm{f}=1.0 \mathrm{kHz}\right) \end{aligned}$ | BC557 <br> A Series Device B Series Devices C Series Devices | $\mathrm{hfe}_{\text {fe }}$ | $\begin{aligned} & 125 \\ & 125 \\ & 240 \\ & 450 \\ & \hline \end{aligned}$ | - - - - | $\begin{aligned} & 900 \\ & 260 \\ & 500 \\ & 900 \\ & \hline \end{aligned}$ | - |

1. $\mathrm{I}_{\mathrm{C}}=-10 \mathrm{mAdc}$ on the constant base current characteristics, which yields the point $\mathrm{I}_{\mathrm{C}}=-11 \mathrm{mAdc}, \mathrm{V}_{\mathrm{CE}}=-1.0 \mathrm{~V}$.

BC556B, BC557A, B, C, BC558B

BC557/BC558


Figure 1. Normalized DC Current Gain


Figure 3. Collector Saturation Region


Figure 5. Capacitances


Figure 2. "Saturation" and "On" Voltages


Figure 4. Base-Emitter Temperature Coefficient


Figure 6. Current-Gain - Bandwidth Product

BC556B, BC557A, B, C, BC558B

BC556


Figure 7. DC Current Gain


Figure 9. Collector Saturation Region


Figure 11. Capacitance


Figure 8. "On" Voltage


Figure 10. Base-Emitter Temperature Coefficient


Figure 12. Current-Gain - Bandwidth Product


Figure 13. Thermal Response


Figure 14. Active Region - Safe Operating Area

The safe operating area curves indicate $I_{C}-V_{C E}$ 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 $T_{J(p k)}=150^{\circ} \mathrm{C} ; \mathrm{T}_{\mathrm{C}}$ or $\mathrm{T}_{\mathrm{A}}$ is variable depending upon conditions. Pulse curves are valid for duty cycles to $10 \%$ provided $\mathrm{T}_{\mathrm{J}(\mathrm{pk})} \leq 150^{\circ} \mathrm{C} . \mathrm{T}_{\mathrm{J}(\mathrm{pk})}$ 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 ${ }^{\dagger}$ |
| :---: | :---: | :---: |
| BC556BG | $\begin{gathered} \hline \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 5000 Units / Bulk |
| BC556BZL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Ammo Box |
| BC557AZL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Ammo Box |
| BC557BG | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 5000 Units / Bulk |
| BC557BRL1 | TO-92 | 2000 / Tape \& Reel |
| BC557BRL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Tape \& Reel |
| BC557BZL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Ammo Box |
| BC557CG | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 5000 Units / Bulk |
| BC557CZL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Ammo Box |
| BC558BRLG | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Tape \& Reel |
| BC558BRL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Tape \& Reel |
| BC558BZL1G | $\begin{gathered} \text { TO-92 } \\ \text { (Pb-Free) } \end{gathered}$ | 2000 / Ammo Box |

$\dagger$ 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.


STRAIGHT LEAD


BENT LEAD


STRAIGHT LEAD


BENT LEAD


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CONTOUR OF PACKAGE BEYOND DIMENSION RIS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN DIMENSIONS $P$ AND L. DIMENSIONS D AND J APPLY BETWEEN DIMENSIONS LAND K MINIMUM. THE LEAD DIMENSIONS ARE UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

|  | INCHES |  | MILLIMETERS |  |
| :---: | :---: | :---: | :---: | :---: |
| DIM | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.44 | 5.21 |
| B | 0.290 | 0.310 | 7.37 | 7.87 |
| C | 0.125 | 0.165 | 3.18 | 4.19 |
| D | 0.018 | 0.021 | 0.46 | 0.53 |
| 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 | 0.018 | 0.024 | 0.46 | 0.61 |
| 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 | 0.135 | --- | 3.43 | --- |
| V | 0.135 | --- | 3.43 | -- |

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. CONTOUR OF PACKAGE BEYOND DIMENSION RIS CONTOUR OF PACKA
4. DIMENSION F APPLIES BETWEEN DIMENSIONS P AND L. DIMENSIONS D AND J APPLY BETWEEN DIMENSIONS LAND K MINIMUM. THE LEAD DIMENSIONS ARE UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |  |  | MILLIMETERS |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | MIN | MAX | MIN | MAX |  |
|  | 0.175 | 0.025 | 4.44 | 5.21 |  |
|  | 0.290 | 0.310 | 7.37 | 7.87 |  |
| C | 0.125 | 0.165 | 3.18 | 4.19 |  |
| D | 0.018 | 0.021 | 0.46 | 0.53 |  |
| G | 0.094 | 0.102 | 2.40 | 2.80 |  |
| J | 0.018 | 0.024 | 0.46 | 0.61 |  |
| K | 0.500 | --- | 12.70 | --- |  |
| N | 0.080 | 0.105 | 2.04 | 2.66 |  |
| P | --- | 0.100 | -- | 2.54 |  |
| R | 0.135 | --- | 3.43 | --- |  |
| $\mathbf{V}$ | 0.135 | --- | 3.43 | --- |  |

## STYLES ON PAGE 2

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[^0]
## TO-92 (TO-226) 1 WATT

CASE 29-10
ISSUE A

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


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