

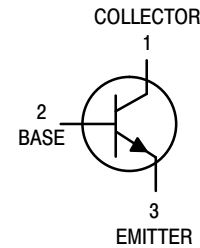
# Amplifier Transistors

## NPN Silicon

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

#### Features

- Pb-Free Packages are Available\*



#### MAXIMUM RATINGS

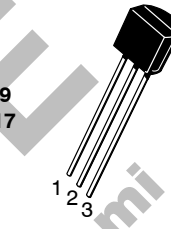
| Rating   | Symbol         | Value          | Unit                       |
|--|----------------|----------------|----------------------------|
| Collector - Emitter Voltage<br>BC546<br>BC547<br>BC548                                 | $V_{CEO}$      | 65<br>45<br>30 | Vdc                        |
| Collector - 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            | mA <sub>dc</sub>           |
| 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

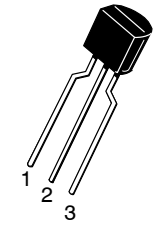
| Characteristic                          | Symbol          | Max  | Unit               |
|---|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 83.3 |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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

TO-92  
CASE 29  
STYLE 17

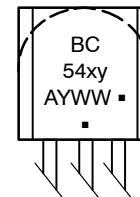


STRAIGHT LEAD



BENT LEAD  
TAPE & REEL

#### MARKING DIAGRAM



- x = 6, 7, or 8
- y = A, B or C
- 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.

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

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

## 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>( $I_C = 1.0\text{ mA}$ , $I_B = 0$ )  | $V_{(BR)CEO}$ | 65<br>45<br>30   | –<br>–<br>–   | –<br>–<br>–  | V                           |
| Collector – Base Breakdown Voltage<br>( $I_C = 100\text{ }\mu\text{A}$ )  | $V_{(BR)CBO}$ | 80<br>50<br>30   | –<br>–<br>–   | –<br>–<br>–  | V                           |
| Emitter – Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )   | $V_{(BR)EBO}$ | 6.0<br>6.0<br>6.0  | –<br>–<br>–   | –<br>–<br>–  | V                           |
| Collector Cutoff Current<br>( $V_{CE} = 70\text{ V}$ , $V_{BE} = 0$ )<br>( $V_{CE} = 50\text{ V}$ , $V_{BE} = 0$ )<br>( $V_{CE} = 35\text{ V}$ , $V_{BE} = 0$ )<br>( $V_{CE} = 30\text{ V}$ , $T_A = 125^\circ\text{C}$ ) | $I_{CES}$     | –<br>–<br>–<br>–   | 0.2<br>0.2<br>0.2<br>–  | 15<br>15<br>15<br>4.0  | nA<br><br><br>$\mu\text{A}$ |
| <b>ON CHARACTERISTICS</b>   |               |  |   |  |                             |
| DC Current Gain<br>( $I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )<br><br>( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )<br><br>( $I_C = 100\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )                      | $h_{FE}$      | –<br>–<br>–<br>110<br>110<br>110<br>110<br>200<br>420<br>–<br>–<br>– | 90<br>150<br>270<br>–<br>–<br>–<br>180<br>290<br>520<br>120<br>180<br>300 | –<br>–<br>–<br>450<br>800<br>800<br>220<br>450<br>800<br>–<br>–<br>– | –                           |
| Collector – Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ )<br>( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )<br>( $I_C = 10\text{ mA}$ , $I_B = \text{See Note 1}$ )                   | $V_{CE(sat)}$ | –<br>–<br>–  | 0.09<br>0.2<br>0.3  | 0.25<br>0.6<br>0.6   | V                           |
| Base – Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ )   | $V_{BE(sat)}$ | –  | 0.7   | –  | V                           |
| Base – Emitter On Voltage<br>( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )  | $V_{BE(on)}$  | 0.55<br>–  | –<br>–  | 0.7<br>0.77  | V                           |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>   |               |  |   |  |                             |
| Current – Gain – Bandwidth Product<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $f = 100\text{ MHz}$ )   | $f_T$         | 150<br>150<br>150  | 300<br>300<br>300   | –<br>–<br>–  | MHz                         |
| Output Capacitance<br>( $V_{CB} = 10\text{ V}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )   | $C_{obo}$     | –  | 1.7   | 4.5  | pF                          |
| Input Capacitance<br>( $V_{EB} = 0.5\text{ V}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )   | $C_{ibo}$     | –  | 10  | –  | pF                          |
| Small – Signal Current Gain<br>( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $f = 1.0\text{ kHz}$ )   | $h_{fe}$      | 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 ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $R_S = 2\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $\Delta f = 200\text{ Hz}$ )   | NF            | –<br>–<br>–  | 2.0<br>2.0<br>2.0   | 10<br>10<br>10   | dB                          |

1.  $I_B$  is value for which  $I_C = 11\text{ mA}$  at  $V_{CE} = 1.0\text{ V}$ .

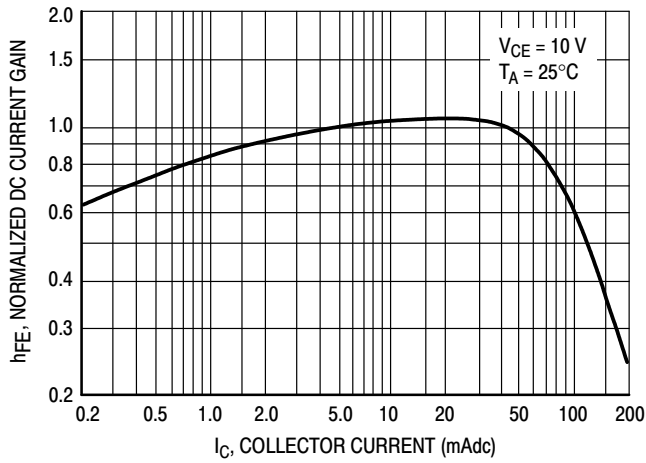


Figure 1. Normalized DC Current Gain

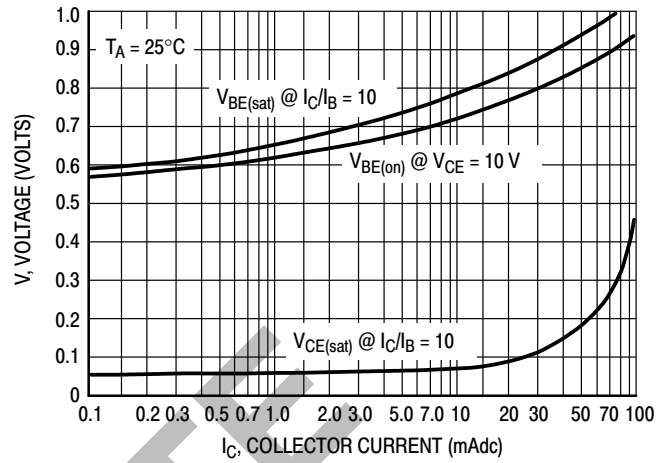


Figure 2. "Saturation" and "On" Voltages

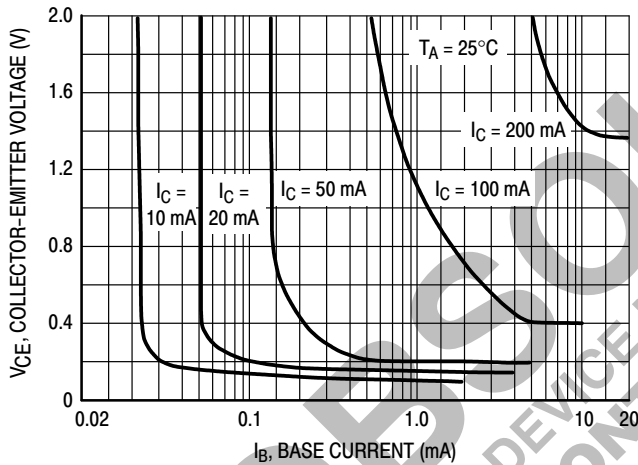


Figure 3. Collector Saturation Region

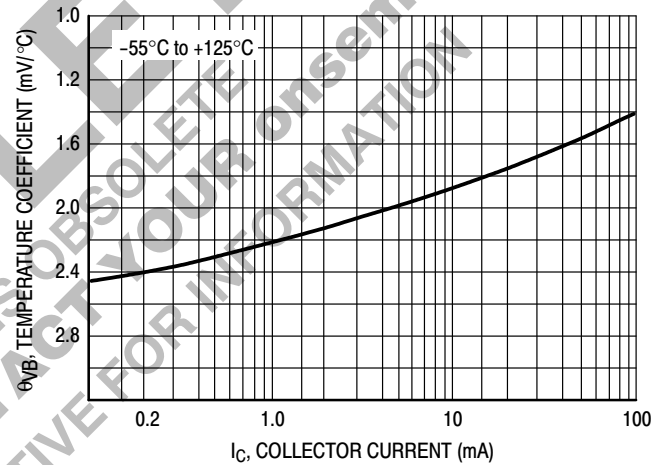


Figure 4. Base-Emitter Temperature Coefficient

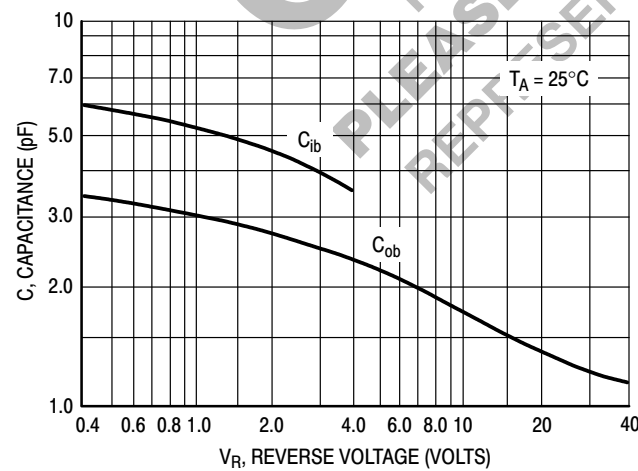


Figure 5. Capacitances

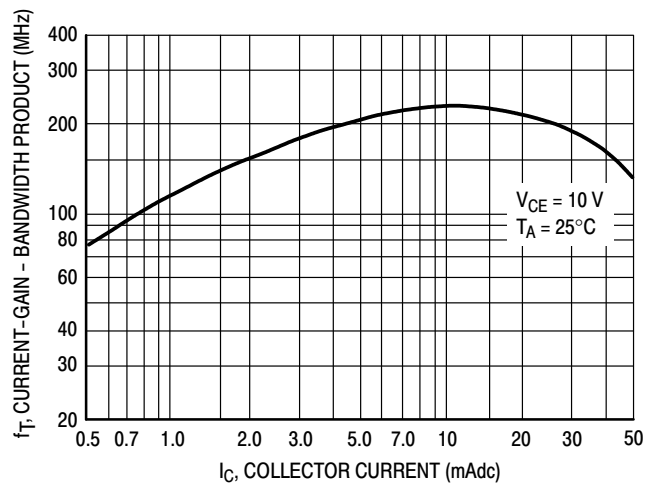


Figure 6. Current-Gain - Bandwidth Product

BC546

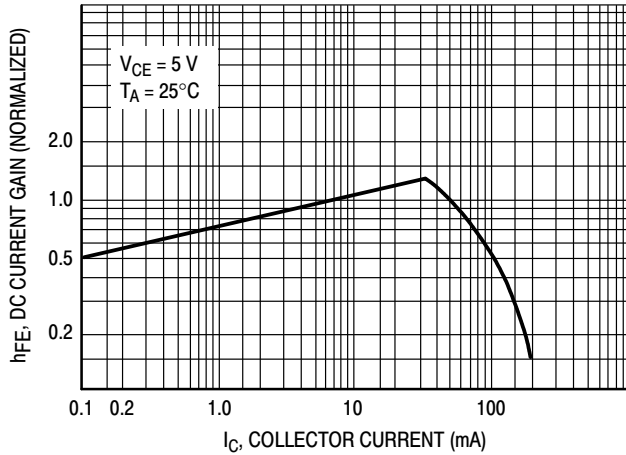


Figure 7. DC Current Gain

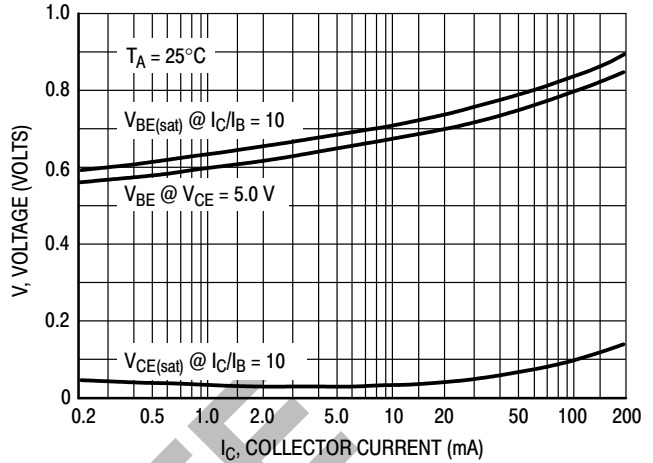


Figure 8. "On" Voltage

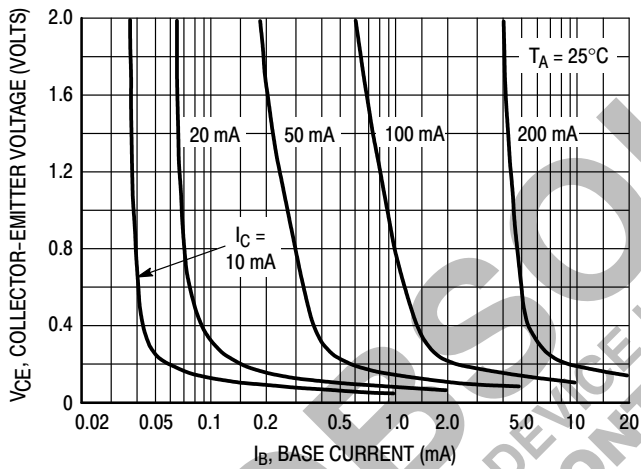


Figure 9. Collector Saturation Region

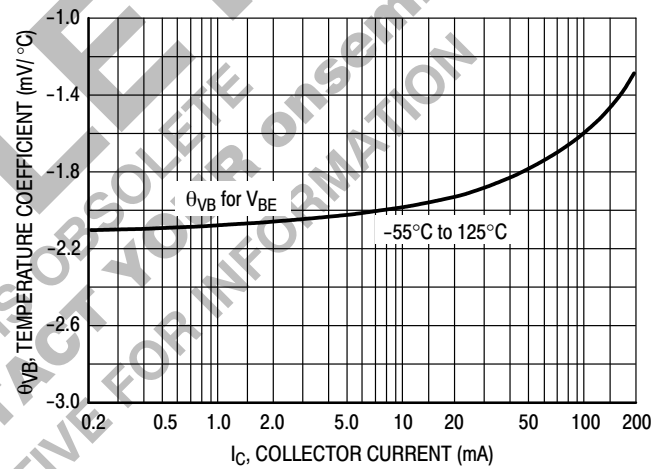


Figure 10. Base-Emitter Temperature Coefficient

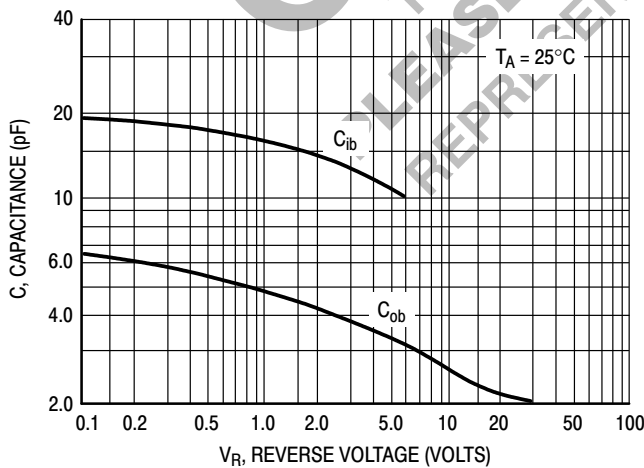


Figure 11. Capacitance

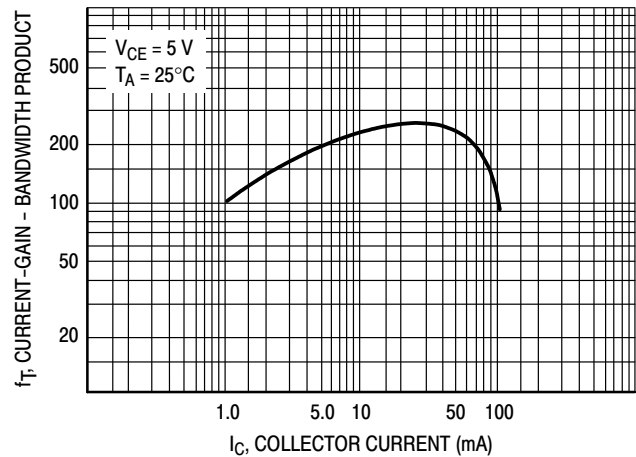


Figure 12. Current-Gain - Bandwidth Product

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

### ORDERING INFORMATION

| Device     | Package            | Shipping†          |
|------------|--------------------|--------------------|
| 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 |
| BC546BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box    |
| BC547ARL   | TO-92              | 2000 / Tape & Reel |
| BC547ARLG  | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| BC547AZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box    |
| BC547BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| BC547BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| BC547BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box    |
| BC547CG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| BC547CZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box    |
| BC548BG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| BC548BRL1G | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| BC548BZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box    |
| BC548CG    | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| BC548CZL1G | TO-92<br>(Pb-Free) | 2000 / Ammo Box    |

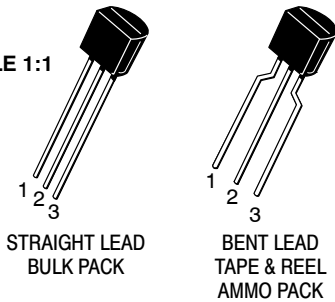
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®

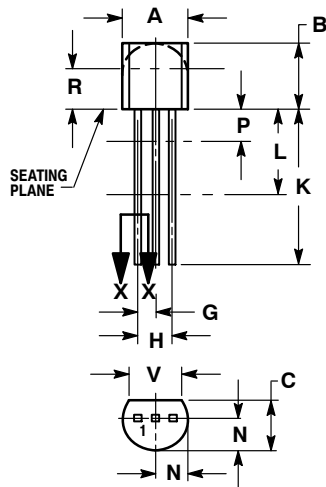
ON

SCALE 1:1

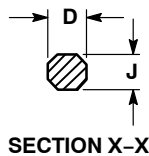


TO-92 (TO-226)  
CASE 29-11  
ISSUE AM

DATE 09 MAR 2007



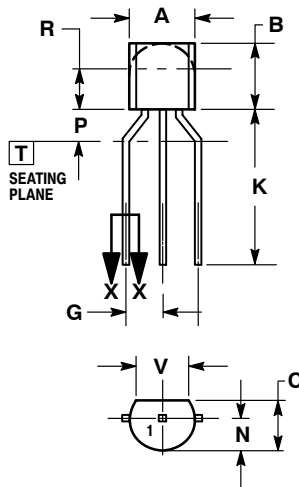
STRAIGHT LEAD  
BULK PACK



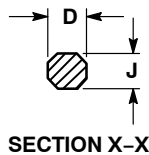
NOTES:

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

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