# BC447, BC449, BC449A

# High Voltage Transistors

## NPN Silicon

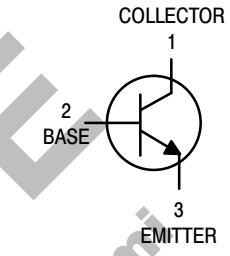
**ON Semiconductor®**

**http://onsemi.com**



### Features

- Pb−Free Packages are Available*





**TO−92**
**CASE 29**
**STYLE 17**

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector − Emitter Voltage<br>BC447<br>BC449, BC449A | $V_{CEO}$ | <br>80<br>100 | Vdc |
| Collector-Base Voltage<br>BC447<br>BC449, BC449A | $V_{CBO}$ | <br>80<br>100 | Vdc |
| Emitter-Base Voltage | $V_{EBO}$ | 5.0 | Vdc |
| Collector Current − Continuous | $I_C$ | 300 | mAdc |
| Total Device Dissipation<br>@ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | <br>625<br>5.0 | <br>mW<br>mW/°C |
| Total Device Dissipation<br>@ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | <br>1.5<br>12 | <br>W<br>mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −55 to +150 | °C |
| Moisture Sensitivity Level (MSL)<br>Electrostatic Discharge (ESD) | | MSL: 1<br>NA | |

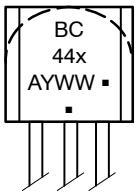
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance,<br>Junction−to−Ambient | $R_{\theta JA}$ | 200 | °C/W |
| Thermal Resistance,<br>Junction−to−Case | $R_{\theta JC}$ | 83.3 | °C/W |

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

### MARKING DIAGRAM




BC44x = Device Code
x = 7 or 9
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device | Package | Shipping |
|---|---|---|
| BC447 | TO−92 | 5000 Units / Box |
| BC447G | TO−92<br>(Pb−Free) | 5000 Units / Box |
| BC449 | TO−92 | 5000 Units / Box |
| BC449G | TO−92<br>(Pb−Free) | 5000 Units / Box |
| BC449A | TO−92 | 5000 Units / Box |
| BC449AG | TO−92<br>(Pb−Free) | 5000 Units / Box |

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector – Emitter Breakdown Voltage (Note 1) | | $V_{(BR)CEO}$ | | | | Vdc |
| ($I_C$ = 1.0 mAdc, $I_B$ = 0) | BC447 | | 80 | – | – | |
| | BC449, BC449A | | 100 | – | – | |
| Collector – Base Breakdown Voltage | | $V_{(BR)CBO}$ | | | | Vdc |
| ($I_C$ = 100 μAdc, $I_E$ = 0) | BC447 | | 80 | – | – | |
| | BC449, BC449A | | 100 | – | – | |
| Emitter – Base Breakdown Voltage | | $V_{(BR)EBO}$ | | | | Vdc |
| ($I_E$ = 10 μAdc, $I_C$ = 0) | | | 5.0 | – | – | |
| Collector Cutoff Current | | $I_{CBO}$ | | | | nAdc |
| ($V_{CB}$ = 60 Vdc, $I_E$ = 0) | BC447 | | – | – | 100 | |
| ($V_{CB}$ = 80 Vdc, $I_E$ = 0) | BC449, BC449A | | – | – | 100 | |
| **ON CHARACTERISTICS** (Note 1) | | | | | | |
| DC Current Gain | | $h_{FE}$ | | | | – |
| ($I_C$ = 2.0 mAdc, $V_{CE}$ = 5.0 Vdc) | BC447, BC449 | | 50 | – | 460 | |
| | BC449A | | 120 | – | 220 | |
| ($I_C$ = 10 mAdc, $V_{CE}$ = 5.0 Vdc) | BC447, BC449 | | 50 | – | – | |
| | BC449A | | 100 | – | – | |
| ($I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc) | BC447, BC449 | | 50 | – | – | |
| | BC449A | | 60 | – | – | |
| Collector – Emitter Saturation Voltage | | $V_{CE(sat)}$ | | | | Vdc |
| ($I_C$ = 100 mAdc, $I_B$ = 10 mAdc) | | | – | 0.125 | 0.25 | |
| Base – Emitter Saturation Voltage | | $V_{BE(sat)}$ | | | | Vdc |
| ($I_C$ = 100 mAdc, $I_B$ = 10 mAdc) | | | – | 0.85 | – | |
| Base – Emitter On Voltage | | $V_{BE(on)}$ | | | | Vdc |
| ($I_C$ = 2.0 mAdc, $V_{CE}$ = 5.0 Vdc) | | | 0.55 | – | 0.7 | |
| ($I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc) (Note 1) | | | – | 0.76 | 1.2 | |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Current – Gain – Bandwidth Product | | $f_T$ | | | | MHz |
| ($I_C$ = 50 mAdc, $V_{CE}$ = 5.0 Vdc, f = 100 MHz) | | | 100 | 200 | – | |

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle 2%

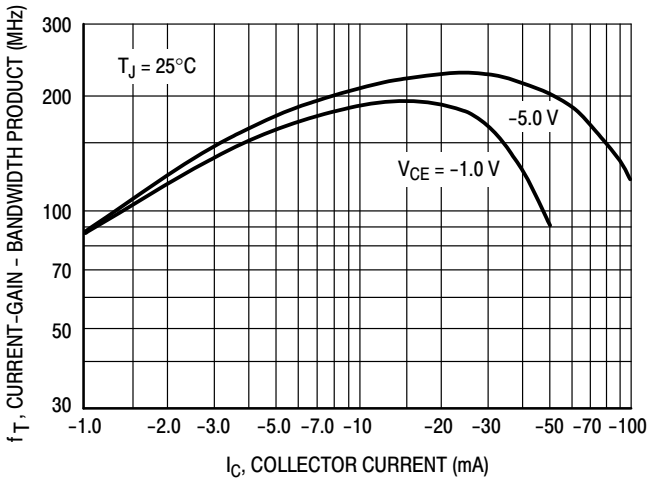



**Figure 1. Current−Gain — Bandwidth Product**

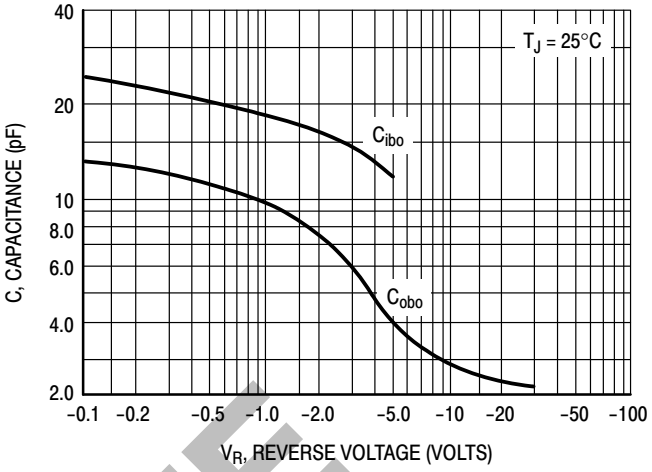



**Figure 2. Capacitance**

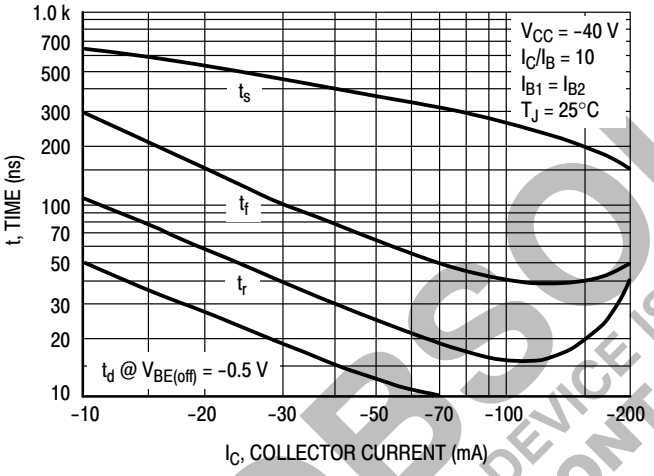



**Figure 3. Switching Times**

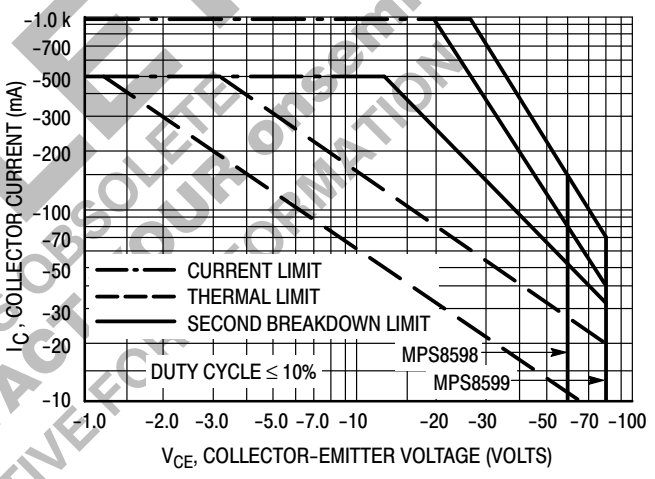



**Figure 4. Active−Region Safe Operating Area**

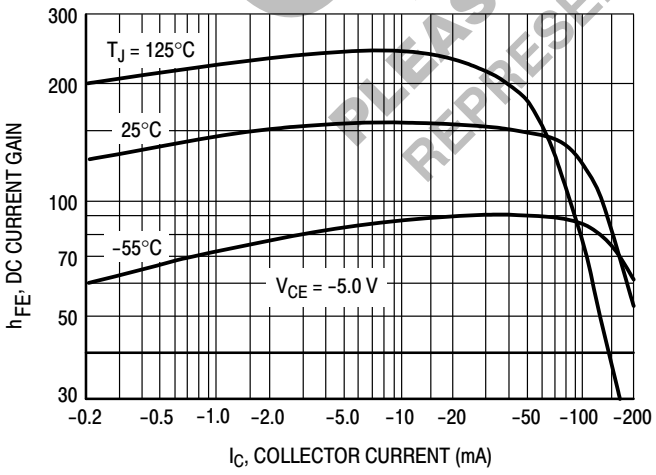



**Figure 5. DC Current Gain**

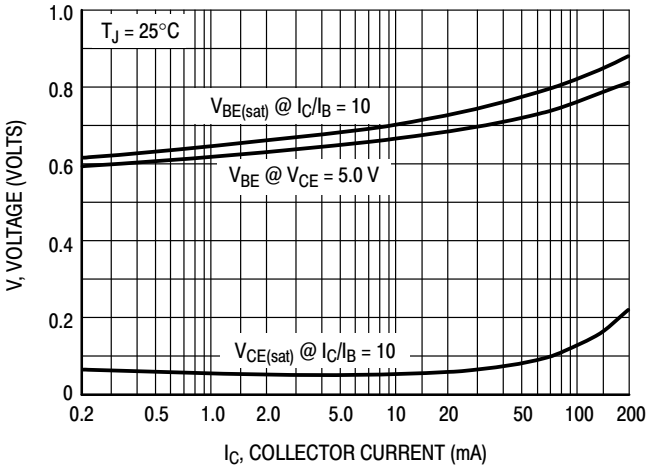



**Figure 6. “ON” Voltages**

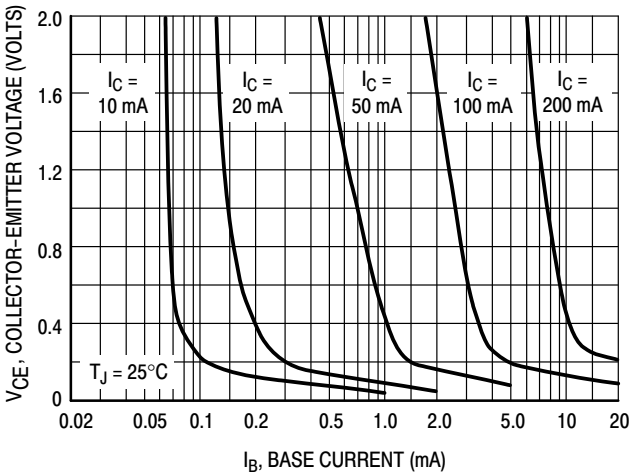



**Figure 7. Collector Saturation Region**

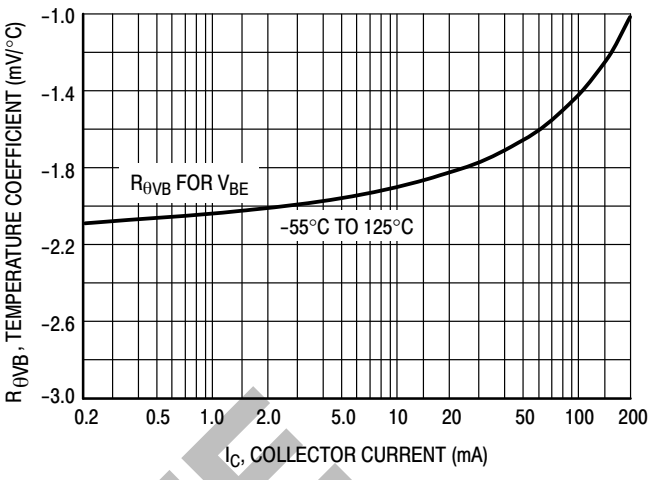



**Figure 8. Base−Emitter Temperature Coefficient**

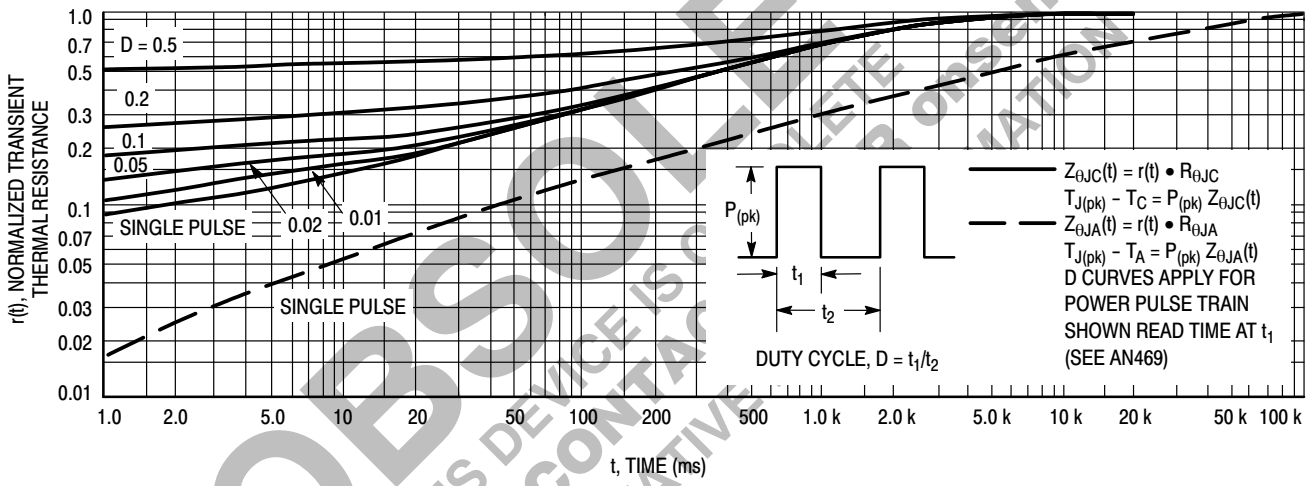
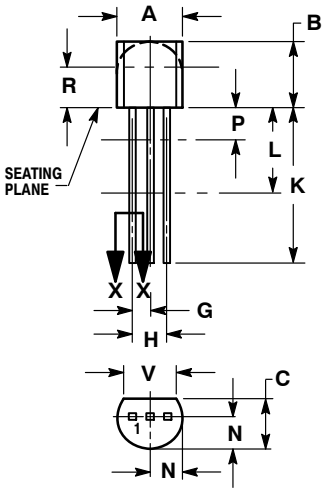
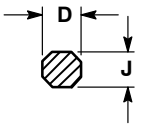



**Figure 9. Thermal Response**

## PACKAGE DIMENSIONS

**TO−92**
(TO−226)
CASE 29−11
ISSUE AL




SECTION X−X

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.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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





**PUBLICATION ORDERING INFORMATION**

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
**Phone**: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
**Fax**: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada

**Japan**: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
**Phone**: 81−3−5773−3850

**ON Semiconductor Website**: http://onsemi.com

**Order Literature**: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.