

# Plastic Medium-Power Silicon NPN Transistors

## BD135G, BD137G, BD139G

This series of plastic, medium-power silicon NPN transistors are designed for use as audio amplifiers and drivers utilizing complementary or quasi complementary circuits.

### Features

- High DC Current Gain
- BD 135, 137, 139 are complementary with BD 136, 138, 140
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant\*

### MAXIMUM RATINGS

| Rating  | Symbol         | Value           | Unit                          |
|---|----------------|-----------------|-------------------------------|
| Collector–Emitter Voltage<br>BD135G<br>BD137G<br>BD139G                                   | $V_{CEO}$      | 45<br>60<br>80  | Vdc                           |
| Collector–Base Voltage<br>BD135G<br>BD137G<br>BD139G                                      | $V_{CBO}$      | 45<br>60<br>100 | Vdc                           |
| Emitter–Base Voltage  | $V_{EBO}$      | 5.0             | Vdc                           |
| Collector Current   | $I_C$          | 1.5             | Adc                           |
| Base Current  | $I_B$          | 0.5             | Adc                           |
| Total Device Dissipation<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.25<br>10      | Watts<br>mW/ $^\circ\text{C}$ |
| Total Device Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 12.5<br>100     | Watts<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range  | $T_J, T_{stg}$ | -55 to +150     | $^\circ\text{C}$              |

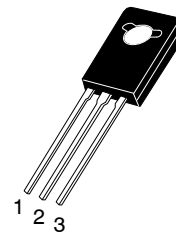
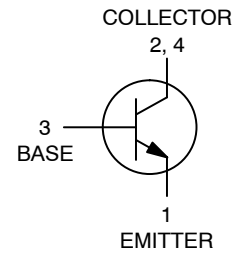
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max | Unit                      |
|---|-----------------|-----|---------------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 10  | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 100 | $^\circ\text{C}/\text{W}$ |

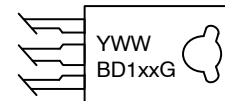
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## 1.5 A POWER TRANSISTORS NPN SILICON 45, 60, 80 V, 12.5 W



TO-225  
CASE 77-09  
STYLE 1

### MARKING DIAGRAM



- Y = Year  
 WW = Work Week  
 BD1xx = Device Code  
       xx = 35, 37, 39  
 G = Pb-Free Package

### ORDERING INFORMATION

| Device | Package             | Shipping        |
|--------|---------------------|-----------------|
| BD135G | TO-225<br>(Pb-Free) | 500 Units / Box |
| BD137G | TO-225<br>(Pb-Free) | 500 Units / Box |
| BD139G | TO-225<br>(Pb-Free) | 500 Units / Box |

### DISCONTINUED (Note 1)

| Device  | Package             | Shipping        |
|---------|---------------------|-----------------|
| BD135TG | TO-225<br>(Pb-Free) | 50 Units / Rail |

1. **DISCONTINUED:** These devices are not recommended for new design. Please contact your onsemi representative for information. The most current information on these devices may be available on [www.onsemi.com](http://www.onsemi.com).

# BD135G, BD137G, BD139G

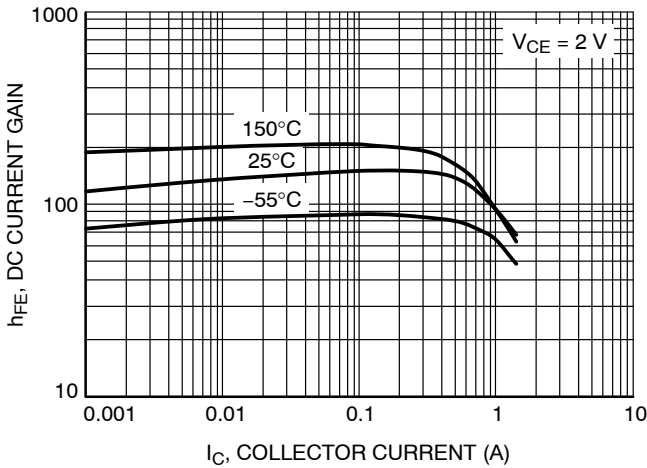
## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic   | Symbol          | Min            | Max           | Unit             |
|--|-----------------|----------------|---------------|------------------|
| Collector–Emitter Sustaining Voltage*<br>( $I_C = 0.03\text{ A}$ , $I_B = 0$ )<br>BD135G<br>BD137G<br>BD139G   | $V_{CE0}^*$     | 45<br>60<br>80 | –<br>–<br>–   | Vdc              |
| Collector Cutoff Current<br>( $V_{CB} = 30\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 30\text{ Vdc}$ , $I_E = 0$ , $T_C = 125^\circ\text{C}$ )                                   | $I_{CBO}$       | –<br>–         | 0.1<br>10     | $\mu\text{A}$ dc |
| Emitter Cutoff Current<br>( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )  | $I_{EBO}$       | –              | 10            | $\mu\text{A}$ dc |
| DC Current Gain<br>( $I_C = 0.005\text{ A}$ , $V_{CE} = 2\text{ V}$ )<br>( $I_C = 0.15\text{ A}$ , $V_{CE} = 2\text{ V}$ )<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 2\text{ V}$ ) | $h_{FE}^*$      | 25<br>40<br>25 | –<br>250<br>– | –                |
| Collector–Emitter Saturation Voltage*<br>( $I_C = 0.5\text{ A}$ , $I_B = 0.05\text{ A}$ )  | $V_{CE(sat)}^*$ | –              | 0.5           | Vdc              |
| Base–Emitter On Voltage*<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 2.0\text{ Vdc}$ )   | $V_{BE(on)}^*$  | –              | 1             | Vdc              |

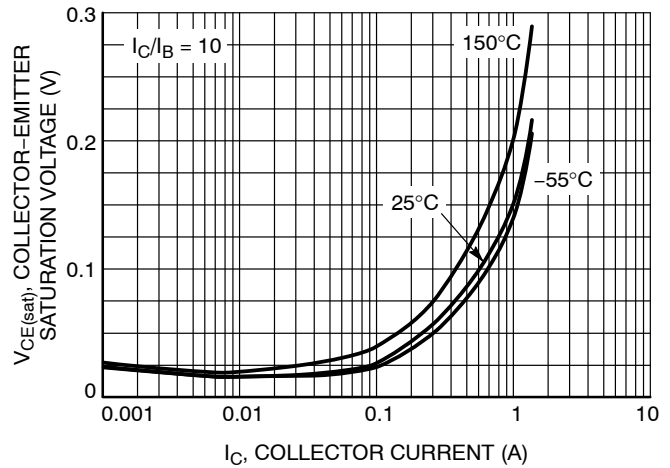
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## TYPICAL CHARACTERISTICS



**Figure 1. DC Current Gain**



**Figure 2. Collector–Emitter Saturation Voltage**

# BD135G, BD137G, BD139G

## TYPICAL CHARACTERISTICS

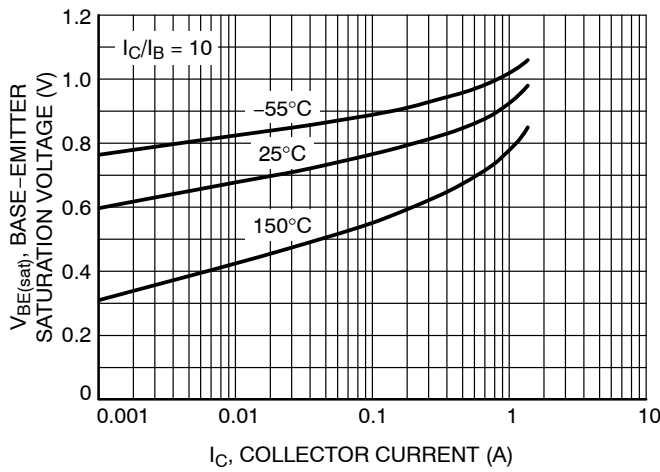


Figure 3. Base-Emitter Saturation Voltage

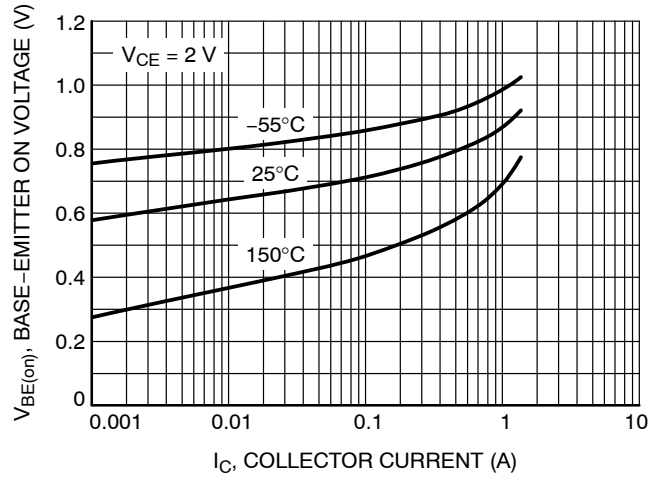


Figure 4. Base-Emitter On Voltage

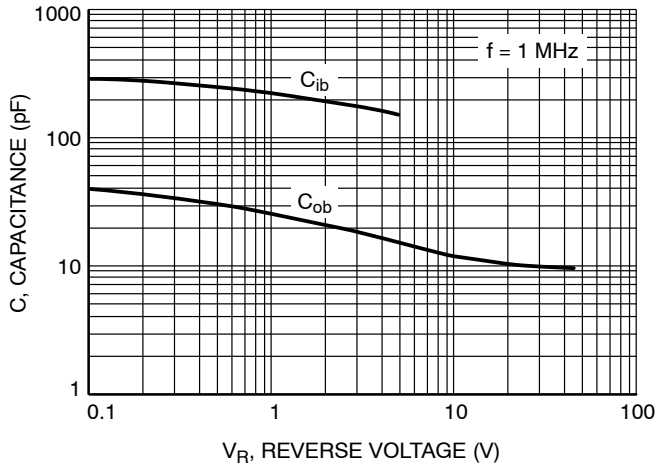


Figure 5. Capacitance

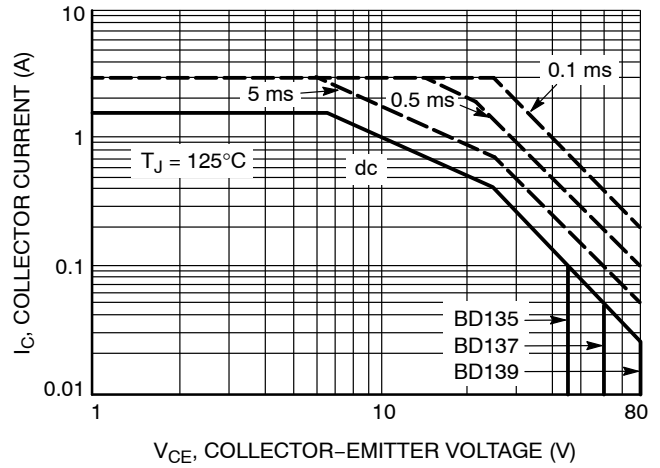


Figure 6. Active-Region Safe Operating Area

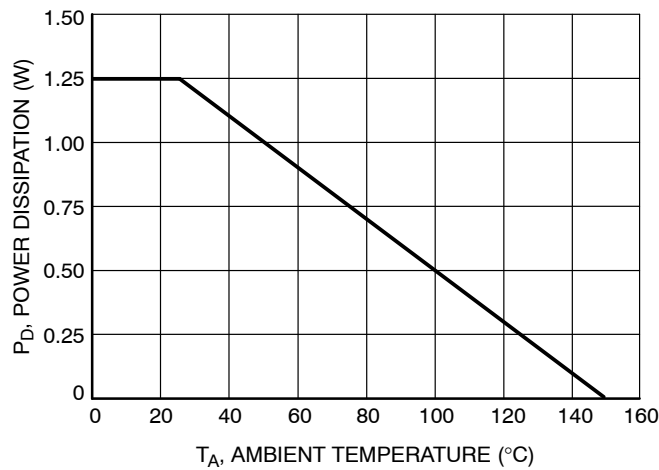
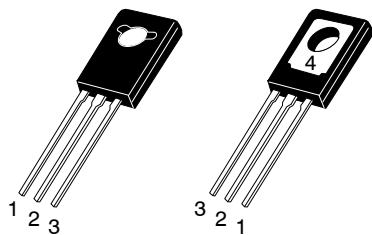
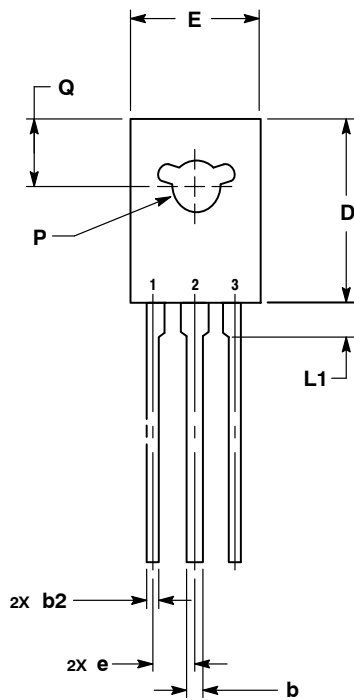


Figure 7. Power Derating

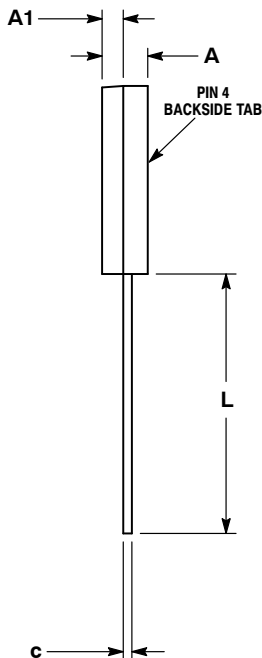


FRONT VIEW BACK VIEW

SCALE 1:1



FRONT VIEW



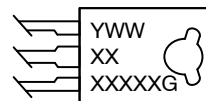
SIDE VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

| MILLIMETERS |       |       |
|-------------|-------|-------|
| DIM         | MIN   | MAX   |
| A           | 2.40  | 3.00  |
| A1          | 1.00  | 1.50  |
| b           | 0.60  | 0.90  |
| b2          | 0.51  | 0.88  |
| c           | 0.39  | 0.63  |
| D           | 10.60 | 11.10 |
| E           | 7.40  | 7.80  |
| e           | 2.04  | 2.54  |
| L           | 14.50 | 16.63 |
| L1          | 1.27  | 2.54  |
| P           | 2.90  | 3.30  |
| Q           | 3.80  | 4.20  |

GENERIC MARKING DIAGRAM\*



- Y = Year
- WW = Work Week
- XXXXX = Device Code
- G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "μ", may or may not be present. Some products may not follow the Generic Marking.

|   |   |   |   |   |
|---|---|---|---|---|
| STYLE 1:<br>PIN 1. EMITTER<br>2., 4. COLLECTOR<br>3. BASE | STYLE 2:<br>PIN 1. CATHODE<br>2., 4. ANODE<br>3. GATE | STYLE 3:<br>PIN 1. BASE<br>2., 4. COLLECTOR<br>3. EMITTER | STYLE 4:<br>PIN 1. ANODE 1<br>2., 4. ANODE 2<br>3. GATE | STYLE 5:<br>PIN 1. MT 1<br>2., 4. MT 2<br>3. GATE     |
| STYLE 6:<br>PIN 1. CATHODE<br>2., 4. GATE<br>3. ANODE     | STYLE 7:<br>PIN 1. MT 1<br>2., 4. GATE<br>3. MT 2     | STYLE 8:<br>PIN 1. SOURCE<br>2., 4. GATE<br>3. DRAIN      | STYLE 9:<br>PIN 1. GATE<br>2., 4. DRAIN<br>3. SOURCE    | STYLE 10:<br>PIN 1. SOURCE<br>2., 4. DRAIN<br>3. GATE |

|                  |             |   |
|------------------|-------------|---|
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| DESCRIPTION:     | TO-225      | PAGE 1 OF 1   |

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