MOTOROLA
**SEMICONDUCTOR**
TECHNICAL DATA

# BD505
# BD507
# BD509

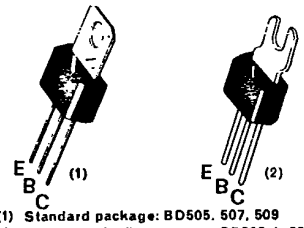
## NPN SILICON ANNULAR♦ TRANSISTORS

. . . designed for complementary symmetry audio circuits

- Excellent Current Gain Linearity — 1 0 mAdc to 1 0 Adc
- Low Collector-Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.7 Vdc (Max) @ $I_C$ = 1 0 Adc
- Complements to PNP BD506, BD508, BD510
- Uniwatt▲ Package for Excellent Thermal Properties —
  1 0 Watt @ $T_A$ = 25°C
  10 0 Watts @ $T_C$ = 25°C

## NPN SILICON AUDIO TRANSISTORS

20 - 30 - 40 VOLTS
10 WATTS



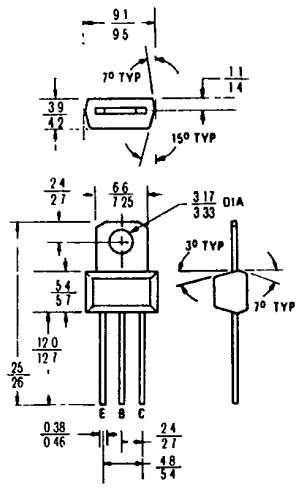

(1) **Standard package: BD505, 507, 509**
(2) Tab formed for flat mounting BD505-1, 507-1, 509 1
Also available with leads formed to TO-5 configuration BD505-5, 507-5, 509-5

MAXIMUM RATINGS

| Rating | Symbol | BD505 | BD507 | BD509 | Unit |
|---|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 20 | 30 | 40 | Vdc |
| Collector-Base Voltage | $V_{CB}$ | 30 | 40 | 50 | Vdc |
| Emitter-Base Voltage | $V_{EB}$ | —— 5 0 —— | | | Vdc |
| Collector Current Continuous | $I_C$ | —— 2 0 —— | | | Adc |
| Total Device Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 1 0<br>8 0 | | | Watt<br>mW/°C |
| Total Device Dissipation @ $T_C$ 25°C<br>Derate above 25°C | $P_D$ | 10<br>80 | | | Watts<br>mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$,$T_{stg}$ | -55 to +150 | | | °C |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $\theta_{JC}$ | 12 5 | °C/W |
| Thermal Resistance, Junction to Ambient | $\theta_{JA}$ | 125 | °C/W |




All dimensions in millimeters
Collector connected to tab

CASE 152

3

## BD505, BD507, BD509

T-33-07

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

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Emitter Breakdown Voltage ($I_C$ = 1.0 mAdc, $I_B$ = 0) | BD505 | $BV_{CEO}$ | 20 | — | — | Vdc |
| | BD507 | | 30 | — | — | |
| | BD509 | | 40 | — | — | |
| Emitter-Base Breakdown Voltage ($I_E$ = 100 μAdc, $I_C$ = 0) | | $BV_{EBO}$ | 5 | — | — | Vdc |
| Collector Cutoff Current (VCB = 20, 30, 40 Vdc, $I_E$ = 0) | BD505 | $I_{CBO}$ | — | — | 100 | nAdc |
| | BD507 | | — | — | 100 | |
| | BD509 | | — | — | 100 | |
| **ON CHARACTERISTICS** | | | | | | |
| DC Current Gain (1) ($I_C$ = 250 mAdc, $V_{CE}$ = 2 Vdc) | | $h_{FE}$ | 60 | 160 | — | — |
| ($I_C$ = 1 0 Adc, $V_{CE}$ = 2 Vdc) | | | 40 | 90 | — | |
| Collector-Emitter Saturation Voltage(1) ($I_C$ = 1.0 Adc, $I_B$ = 0 1 Adc) | | $V_{CE(sat)}$ | — | 0 30 | 0.7 | Vdc |
| Base-Emitter On Voltage (1) ($I_C$ = 1.0 Adc, $V_{CE}$ = 1.0 Vdc) | | $V_{BE(on)}$ | — | 0.91 | 1.2 | Vdc |
| **SMALL-SIGNAL CHARACTERISTICS** | | | | | | |
| Current-Gain--Bandwidth Product ($I_C$ = 50 mAdc, $V_{CE}$ = 5 0 Vdc, f = 100 MHz) | | $f_T$ | 50 | 250 | — | MHz |
| Output Capacitance ($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 100 kHz) | | $C_{ob}$ | — | — | 30 | pF |

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2 0%

FIGURE 1 — DC CURRENT GAIN

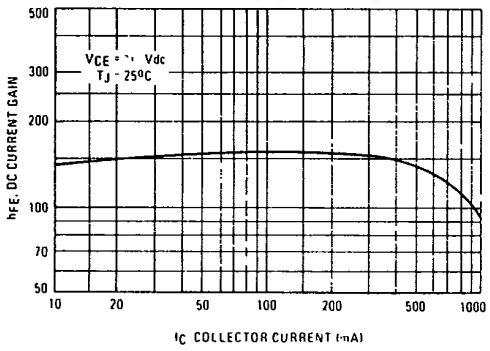



FIGURE 2 — "ON" VOLTAGES

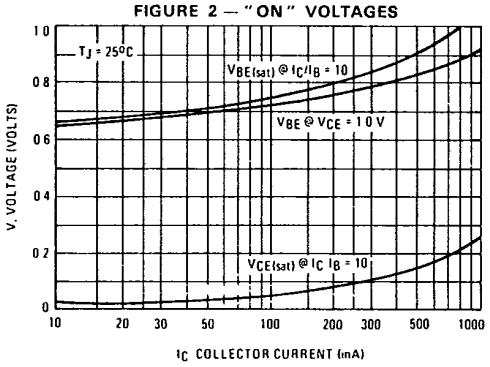
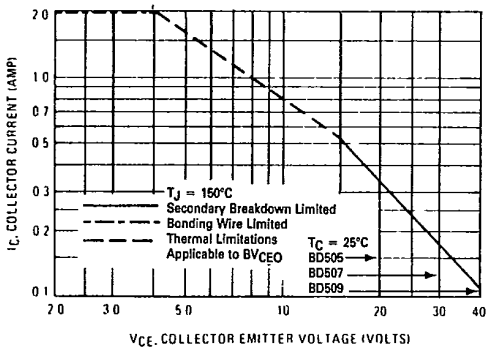



FIGURE 3 — DC SAFE OPERATING AREA




There are two limitations on the power handling ability of a transistor junction temperature and secondary breakdown Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation, i e , the transistor must not be subjected to greater dissipation than the curves indicate

The data of Figure 3 is based on $T_{J(pk)}$ = 150°C, $T_C$ is variable depending on conditions At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown