

6367254 MOTOROLA SC (XSTRS/R F)

96D 80599

D

T-33-07

**MOTOROLA SEMICONDUCTOR TECHNICAL DATA**

**BD505  
BD507  
BD509**

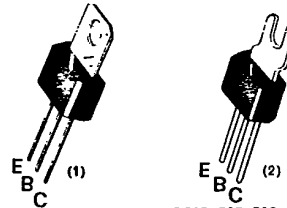
**NPN SILICON ANNULAR TRANSISTORS**

... designed for complementary symmetry audio circuits

- Excellent Current Gain Linearity — 1.0 mAdc to 1.0 Adc
- Low Collector-Emitter Saturation Voltage —  $V_{CE(sat)} = 0.7 \text{ Vdc (Max) @ } I_C = 1.0 \text{ Adc}$
- Complements to PNP BD506, BD508, BD510
- Uniwatt<sup>®</sup> Package for Excellent Thermal Properties —  
1.0 Watt @  $T_A = 25^\circ\text{C}$   
10.0 Watts @  $T_C = 25^\circ\text{C}$

**NPN SILICON AUDIO TRANSISTORS**

20 - 30 - 40 VOLTS  
10 WATTS



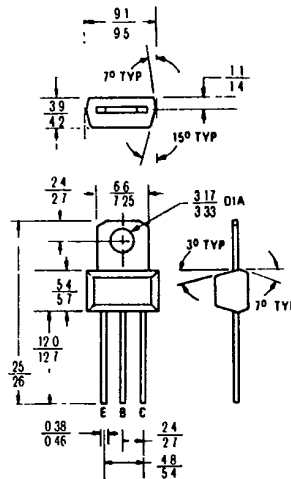
(1) Standard package: BD505, 507, 509  
(2) Tab formed for flat mounting: BD505-1, 507-1, 509-1  
Also available with leads formed to TO-5 configuration: BD505-5, 507-5, 509-5

**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 @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0			Watt
		8.0			mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	10			Watts
		80			mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150			$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$\theta_{JC}$	12.5	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$\theta_{JA}$	125	$^\circ\text{C/W}$



All dimensions in millimeters  
Collector connected to tab

CASE 152

6367254 MOTOROLA SC (XSTRS/R F)

96D 80600 D

BD505, BD507, BD509

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage ( $I_C = 1.0 \text{ mA}$ , $I_B = 0$ )	BD505 BD507 BD509	20 30 40	— — —	— — —	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 100 \mu\text{A}$ , $I_C = 0$ )		5	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 20, 30, 40 \text{ Vdc}$ , $I_E = 0$ )	BD505 BD507 BD509	— — —	— — —	100 100 100	nA

**ON CHARACTERISTICS**

DC Current Gain (1) ( $I_C = 250 \text{ mA}$ , $V_{CE} = 2 \text{ Vdc}$ ) ( $I_C = 1.0 \text{ A}$ , $V_{CE} = 2 \text{ Vdc}$ )	$h_{FE}$	60 40	160 90	— —	—
Collector-Emitter Saturation Voltage(1) ( $I_C = 1.0 \text{ A}$ , $I_B = 0.1 \text{ A}$ )	$V_{CE(sat)}$	—	0.30	0.7	Vdc
Base-Emitter On Voltage (1) ( $I_C = 1.0 \text{ A}$ , $V_{CE} = 1.0 \text{ Vdc}$ )	$V_{BE(on)}$	—	0.91	1.2	Vdc

**SMALL-SIGNAL CHARACTERISTICS**

Current-Gain-Bandwidth Product ( $I_C = 50 \text{ mA}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	50	250	—	MHz
Output Capacitance ( $V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ , $f = 100 \text{ kHz}$ )	$C_{ob}$	—	—	30	pF

(1) Pulse Test Pulse Width ~ 300  $\mu\text{s}$  Duty Cycle ~ 20%

FIGURE 1 — DC CURRENT GAIN

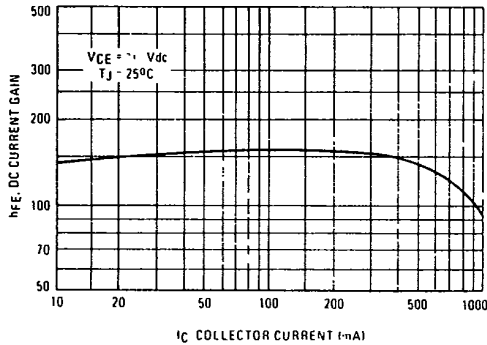


FIGURE 2 — "ON" VOLTAGES

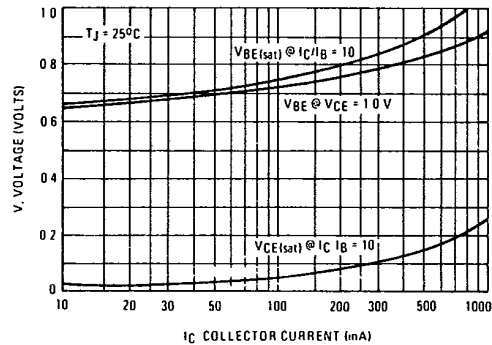
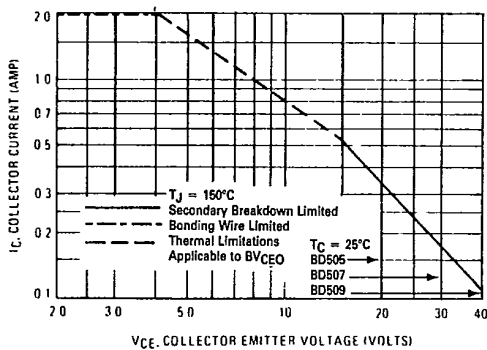


FIGURE 3 — DC SAFE OPERATING AREA



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  $T_{J(pk)} = 150^\circ\text{C}$ .  $T_C$  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.



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