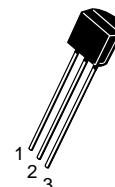


# Amplifier Transistors

## NPN Silicon

**BC237,A,B,C**  
**BC238B,C**  
**BC239,C**



CASE 29-04, STYLE 17  
TO-92 (TO-226AA)

### MAXIMUM RATINGS

Rating	Symbol	BC 237	BC 238	BC 239	Unit
Collector–Emitter Voltage	$V_{CEO}$	45	25	25	Vdc
Collector–Emitter Voltage	$V_{CES}$	50	30	30	Vdc
Emitter–Base Voltage	$V_{EBO}$	6.0	5.0	5.0	Vdc
Collector Current — Continuous	$I_C$	100			mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	350			mW
		2.8			mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0			Watts
		8.0			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 Ambient	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	125	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ( $I_C = 2.0\text{ mA}, I_B = 0$ )	BC237 BC238 BC239	$V_{(BR)CEO}$	45 25 25	— — —	— — —	V
Emitter–Base Breakdown Voltage ( $I_E = 100\ \mu\text{A}, I_C = 0$ )	BC237 BC238 BC239	$V_{(BR)EBO}$	6.0 5.0 5.0	— — —	— — —	V
Collector Cutoff Current ( $V_{CE} = 30\text{ V}, V_{BE} = 0$ )	BC238 BC239	$I_{CES}$	— —	0.2 0.2	15 15	nA
( $V_{CE} = 50\text{ V}, V_{BE} = 0$ )	BC237		—	0.2	15	
( $V_{CE} = 30\text{ V}, V_{BE} = 0$ ) $T_A = 125^\circ\text{C}$	BC238 BC239		— —	0.2 0.2	4.0 4.0	$\mu\text{A}$
( $V_{CE} = 50\text{ V}, V_{BE} = 0$ ) $T_A = 125^\circ\text{C}$	BC237		—	0.2	4.0	

**BC237,A,B,C BC238B,C BC239,C**
**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 10\ \mu\text{A}$ , $V_{CE} = 5.0\ \text{V}$ )	BC237A BC237B/238B BC237C/238C/239C	$h_{FE}$	— — —	90 150 270	— — —
( $I_C = 2.0\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ )	BC237 BC239 BC237A BC237B/238B BC237C/238C/239C		120 120 120 200 380	— — 170 290 500	800 800 220 460 800
( $I_C = 100\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ )	BC237A BC237B/238B BC237C/238C/239C		— — —	120 180 300	— — —
Collector–Emitter On Voltage ( $I_C = 10\ \text{mA}$ , $I_B = 0.5\ \text{mA}$ ) ( $I_C = 100\ \text{mA}$ , $I_B = 5.0\ \text{mA}$ )	BC237/BC238/BC239 BC237/BC239 BC238	$V_{CE(sat)}$	— —	0.07 0.2	0.2 0.6 0.8
Base–Emitter Saturation Voltage ( $I_C = 10\ \text{mA}$ , $I_B = 0.5\ \text{mA}$ ) ( $I_C = 100\ \text{mA}$ , $I_B = 5.0\ \text{mA}$ )		$V_{BE(sat)}$	— —	0.6 —	0.83 1.05
Base–Emitter On Voltage ( $I_C = 100\ \mu\text{A}$ , $V_{CE} = 5.0\ \text{V}$ ) ( $I_C = 2.0\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ ) ( $I_C = 100\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ )		$V_{BE(on)}$	— 0.55 —	0.5 0.62 0.83	— 0.7 —
<b>DYNAMIC CHARACTERISTICS</b>					
Current–Gain — Bandwidth Product ( $I_C = 0.5\ \text{mA}$ , $V_{CE} = 3.0\ \text{V}$ , $f = 100\ \text{MHz}$ )	BC237 BC238 BC239	$f_T$	— — —	100 120 140	— — —
( $I_C = 10\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ , $f = 100\ \text{MHz}$ )	BC237 BC238 BC239		150 150 150	200 240 280	— — —
Collector–Base Capacitance ( $V_{CB} = 10\ \text{V}$ , $I_C = 0$ , $f = 1.0\ \text{MHz}$ )		$C_{obo}$	—	—	4.5 pF
Emitter–Base Capacitance ( $V_{EB} = 0.5\ \text{V}$ , $I_C = 0$ , $f = 1.0\ \text{MHz}$ )		$C_{ibo}$	—	8.0	— pF
Noise Figure ( $I_C = 0.2\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ , $R_S = 2.0\ \text{k}\Omega$ , $f = 1.0\ \text{kHz}$ )	BC239	NF	—	2.0	4.0
( $I_C = 0.2\ \text{mA}$ , $V_{CE} = 5.0\ \text{V}$ , $R_S = 2.0\ \text{k}\Omega$ , $f = 1.0\ \text{kHz}$ , $\Delta f = 200\ \text{Hz}$ )	BC237 BC238 BC239		— — —	2.0 2.0 2.0	10 10 4.0

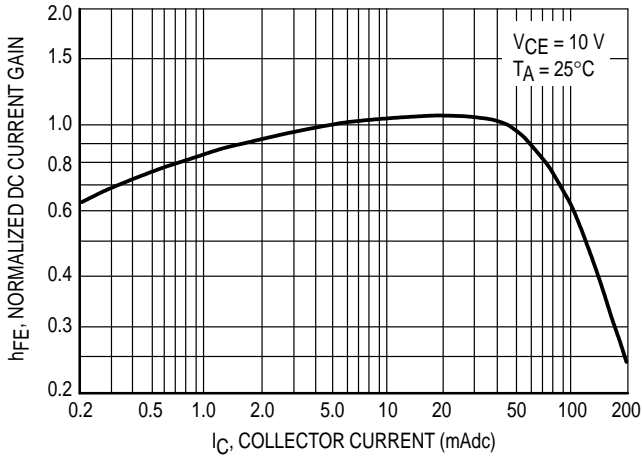


Figure 1. Normalized DC Current Gain

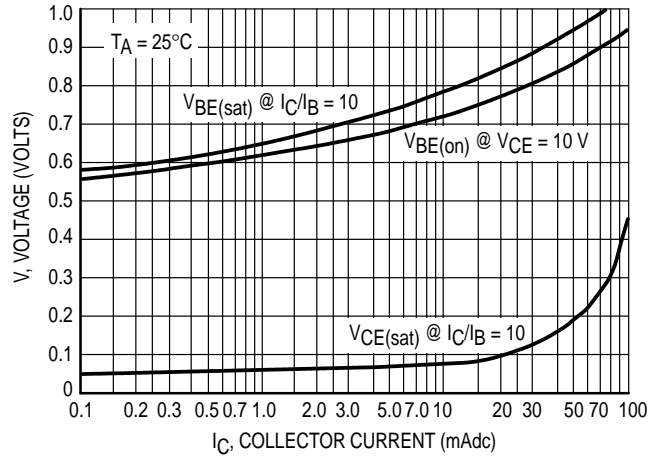


Figure 2. "Saturation" and "On" Voltages

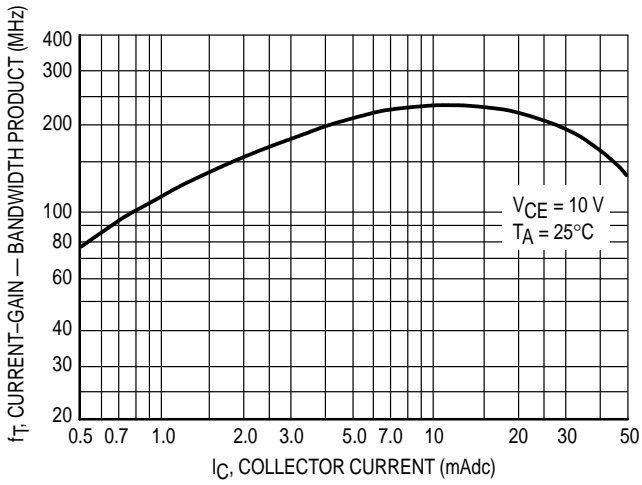


Figure 3. Current-Gain — Bandwidth Product

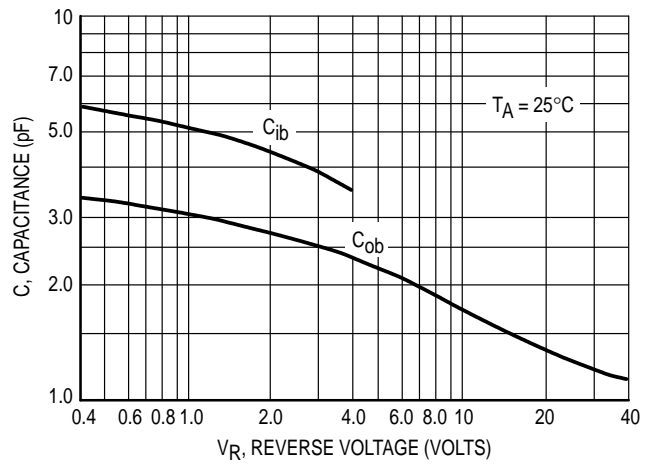


Figure 4. Capacitances

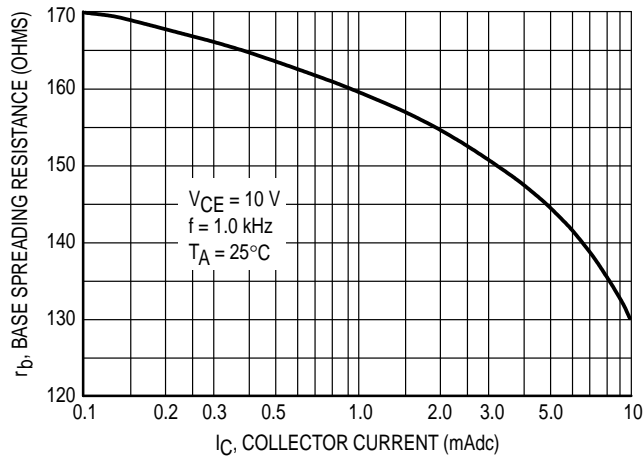


Figure 5. Base Spreading Resistance

PACKAGE DIMENSIONS



CASE 029-04  
(TO-226AA)  
ISSUE AD

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K. MINIMUM 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	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
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

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