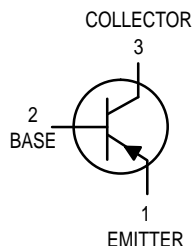
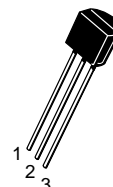


# Amplifier Transistors

## PNP Silicon



**BC212,B**  
**BC213**  
**BC214**



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

### MAXIMUM RATINGS

Rating	Symbol	BC 212	BC 213	BC 214	Unit
Collector–Emitter Voltage	$V_{CEO}$	–50	–30	–30	Vdc
Collector–Base Voltage	$V_{CBO}$	–60	–45	–45	Vdc
Emitter–Base Voltage	$V_{EBO}$	–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 2.8			mW mW/°C
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0 8.0			Watts 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 Ambient	$R_{\theta JA}$	357	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	125	°C/W

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

Characteristic		Symbol	Min	Typ	Max	Unit
Collector–Emitter Breakdown Voltage ( $I_C = -2.0 \text{ mAdc}$ , $I_B = 0$ )	BC212	$V_{(BR)CEO}$	–50	—	—	Vdc
	BC213		–30	—	—	
	BC214		–30	—	—	
Collector–Base Breakdown Voltage ( $I_C = -10 \mu\text{A}$ , $I_E = 0$ )	BC212	$V_{(BR)CBO}$	–60	—	—	Vdc
	BC213		–45	—	—	
	BC214		–45	—	—	
Emitter–Base Breakdown Voltage ( $I_E = -10 \mu\text{Adc}$ , $I_C = 0$ )	BC212	$V_{(BR)EBO}$	–5	—	—	Vdc
	BC213		–5	—	—	
	BC214		–5	—	—	
Collector–Emitter Leakage Current ( $V_{CB} = -30 \text{ V}$ )	BC212	$I_{CBO}$	—	—	–15	nAdc
	BC213		—	—	–15	
	BC214		—	—	–15	
Emitter–Base Leakage Current ( $V_{EB} = -4.0 \text{ V}$ , $I_C = 0$ )	BC212	$I_{EBO}$	—	—	–15	nAdc
	BC213		—	—	–15	
	BC214		—	—	–15	

**BC212,B BC213 BC214****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 ( $I_C = -10\ \mu\text{Adc}$ , $V_{CE} = -5.0\ \text{Vdc}$ )	$h_{FE}$	BC212 40	—	—	—
		BC213 40	—	—	
		BC214 100	—	—	
( $I_C = -2.0\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ )		BC212 60	—	—	600
		BC213 80	—	—	
		BC214 140	—	—	
( $I_C = -100\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ )(1)		BC212, BC214 —	120	—	—
		BC213 —	140	—	
Collector–Emitter Saturation Voltage ( $I_C = -10\ \text{mAdc}$ , $I_B = -0.5\ \text{mAdc}$ ) ( $I_C = -100\ \text{mAdc}$ , $I_B = -5.0\ \text{mAdc}$ )(1)	$V_{CE(sat)}$	— —	–0.10 –0.25	— –0.6	Vdc
Base–Emitter Saturation Voltage ( $I_C = -100\ \text{mAdc}$ , $I_B = -5.0\ \text{mAdc}$ )	$V_{BE(sat)}$	—	–1.0	–1.4	Vdc
Base–Emitter On Voltage ( $I_C = -2.0\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ )	$V_{BE(on)}$	–0.6	–0.62	–0.72	Vdc
<b>DYNAMIC CHARACTERISTICS</b>					
Current–Gain — Bandwidth Product ( $I_C = -10\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ , $f = 100\ \text{MHz}$ )	$f_T$	BC212 —	280	—	MHz
		BC214 —	320	—	
		BC213 —	360	—	
Common–Base Output Capacitance ( $V_{CB} = -10\ \text{Vdc}$ , $I_C = 0$ , $f = 1.0\ \text{MHz}$ )	$C_{ob}$	—	—	6.0	pF
Noise Figure ( $I_C = -0.2\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ , $R_S = 2.0\ \text{k}\Omega$ , $f = 1.0\ \text{kHz}$ )	NF	BC214 —	—	2	dB
( $I_C = -0.2\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ , $R_S = 2.0\ \text{k}\Omega$ , $f = 1.0\ \text{kHz}$ , $f = 200\ \text{Hz}$ )		BC212, BC213 —	—	10	
Small–Signal Current Gain ( $I_C = -2.0\ \text{mAdc}$ , $V_{CE} = -5.0\ \text{Vdc}$ , $f = 1.0\ \text{kHz}$ )	$h_{fe}$	BC212 60 BC213 80 BC214 140 BC212B 200	— — — — —	— — — — 400	—

1. Pulse Test:  $T_p$  300 s, Duty Cycle 2.0%.

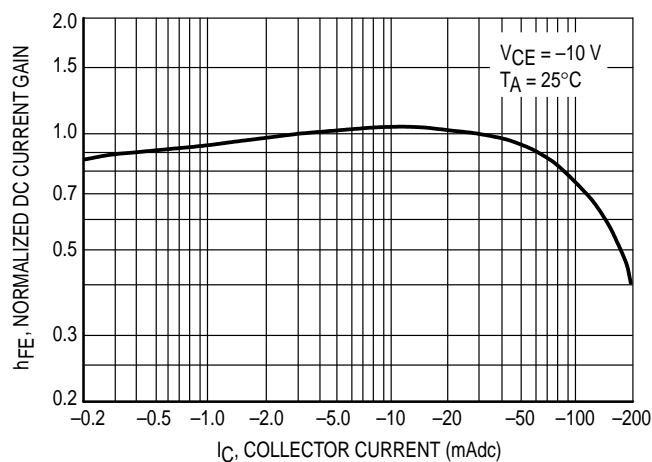


Figure 1. Normalized DC Current Gain

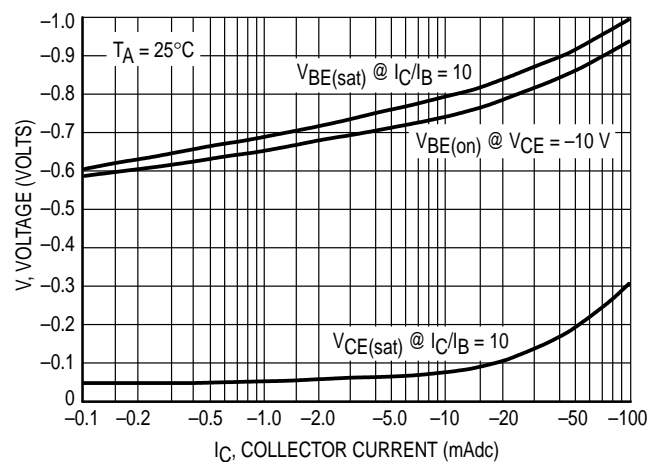


Figure 2. "Saturation" and "On" Voltages

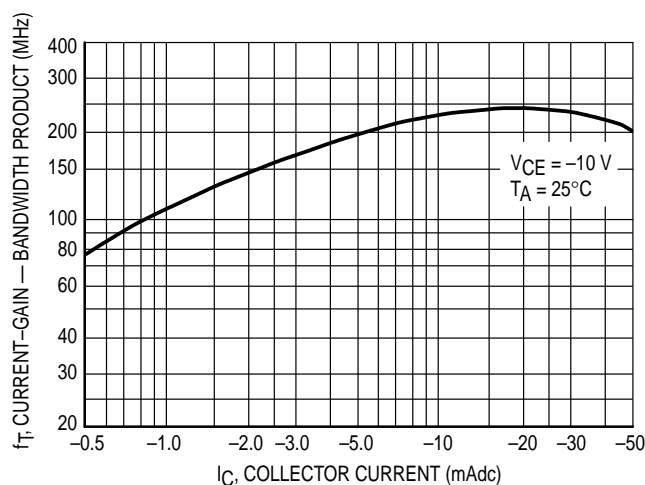


Figure 3. Current-Gain — Bandwidth Product

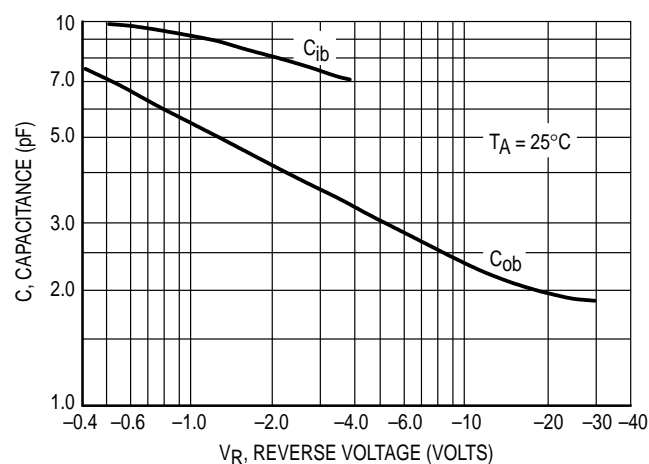


Figure 4. Capacitances

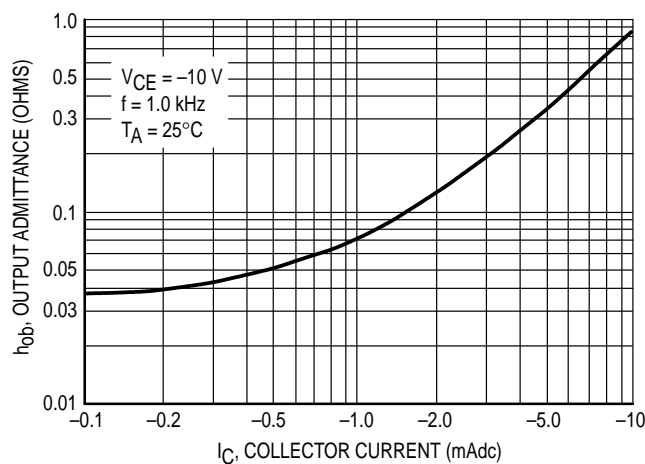


Figure 5. Output Admittance

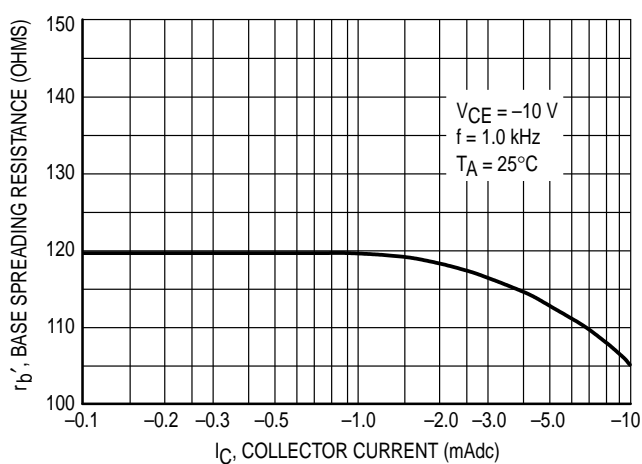
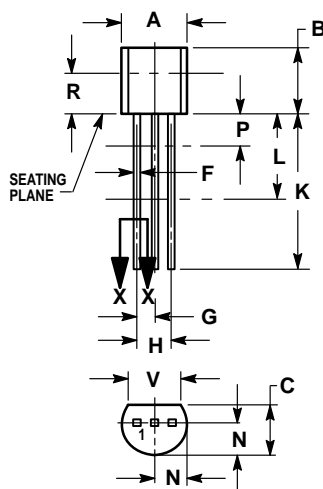


Figure 6. Base Spreading Resistance

## 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:

1. COLLECTOR
2. BASE
3. EMITTER

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

## How to reach us:

**USA/EUROPE:** Motorola Literature Distribution;  
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,  
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

**MFAX:** RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609  
**INTERNET:** http://Design-NET.com

**HONG KONG:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

