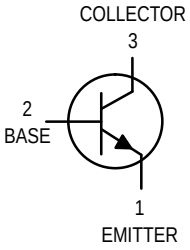
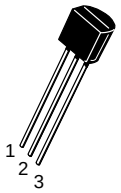
Amplifier Transistors

NPN Silicon

2N5209
2N5210





CASE 29–04, STYLE 1
TO–92 (TO–226AA)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	50	Vdc
Collector–Base Voltage	V_{CBO}	50	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	50	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.5 12	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	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	50	—	Vdc
Collector–Base Breakdown Voltage (I_C = 0.1 mAdc, I_E = 0)	$V_{(BR)CBO}$	50	—	Vdc
Collector Cutoff Current (V_{CB} = 35 Vdc, I_E = 0)	I_{CBO}	—	50	nAdc
Emitter Cutoff Current (V_{EB} = 3.0 Vdc, I_C = 0)	I_{EBO}	—	50	nAdc

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic		Symbol	Min	Max	Unit
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			—
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)	2N5209		100	300	
	2N5210		200	600	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	2N5209		150	—	
	2N5210		250	—	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc)(1)	2N5209		150	—	
	2N5210		250	—	
Collector–Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1.0 mAdc)		$V_{CE(sat)}$	—	0.7	Vdc
Base–Emitter On Voltage (I_C = 1.0 mAdc, V_{CE} = 5.0 mAdc)		$V_{BE(on)}$	—	0.85	Vdc
SMALL–SIGNAL CHARACTERISTICS					
Current–Gain — Bandwidth Product (I_C = 500 μAdc, V_{CE} = 5.0 Vdc, f = 20 MHz)		f_T	30	—	MHz
Collector–Base Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)		C_{cb}	—	4.0	pF
Small–Signal Current Gain		h_{fe}			—
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	2N5209		150	600	
	2N5210		250	900	
Noise Figure		NF			dB
(I_C = 20 μAdc, V_{CE} = 5.0 Vdc, R_S = 22 kΩ,	2N5209		—	3.0	
f = 1.0 kHz)	2N5210		—	2.0	
(I_C = 20 μAdc, V_{CE} = 5.0 Vdc, R_S = 10 kΩ,	2N5209		—	4.0	
f = 1.0 kHz)	2N5210		—	3.0	

1. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2.0%.

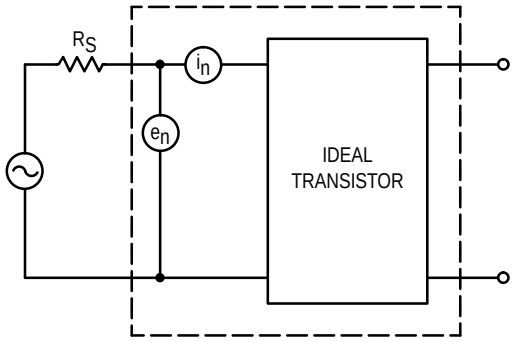


Figure 1. Transistor Noise Model

NOISE CHARACTERISTICS

(V_{CE} = 5.0 Vdc, T_A = 25°C)

NOISE VOLTAGE

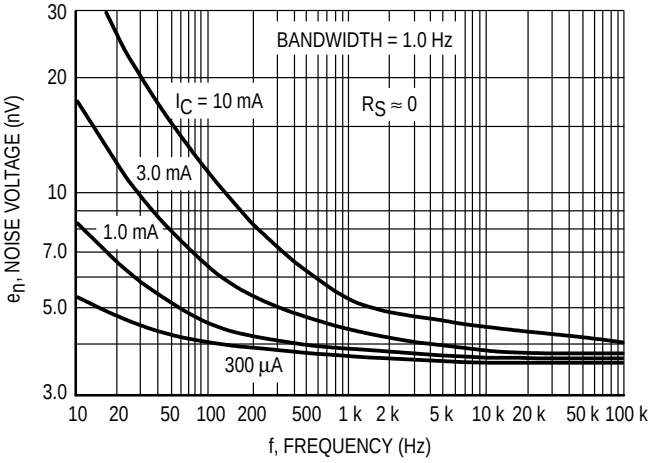


Figure 2. Effects of Frequency

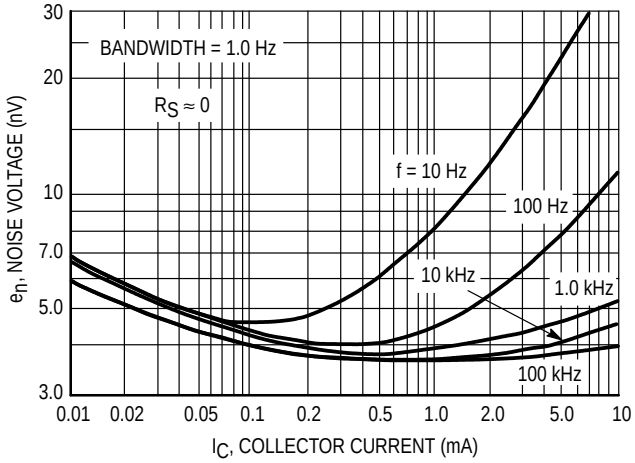


Figure 3. Effects of Collector Current

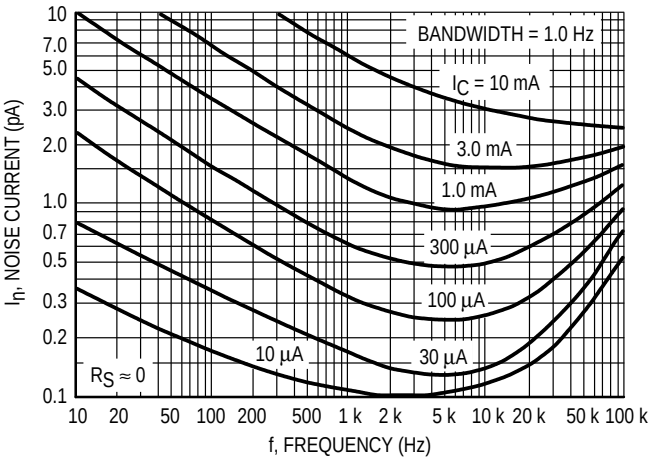


Figure 4. Noise Current

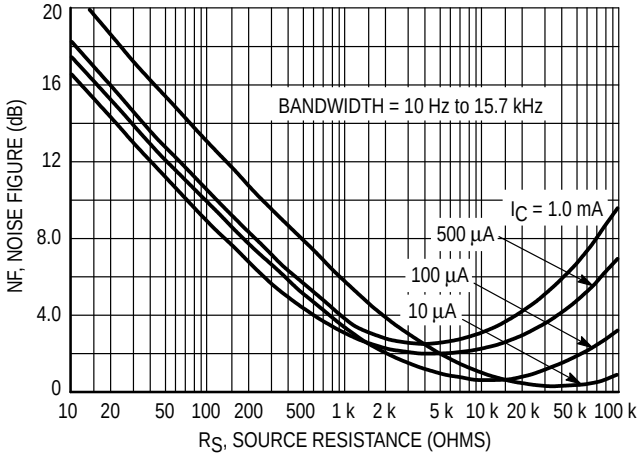


Figure 5. Wideband Noise Figure

100 Hz NOISE DATA

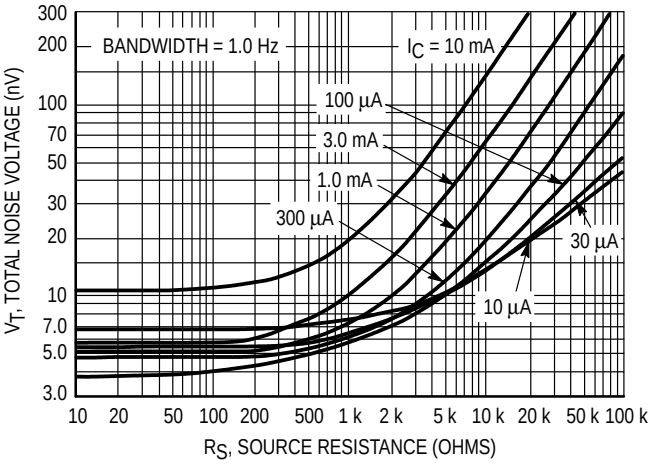


Figure 6. Total Noise Voltage

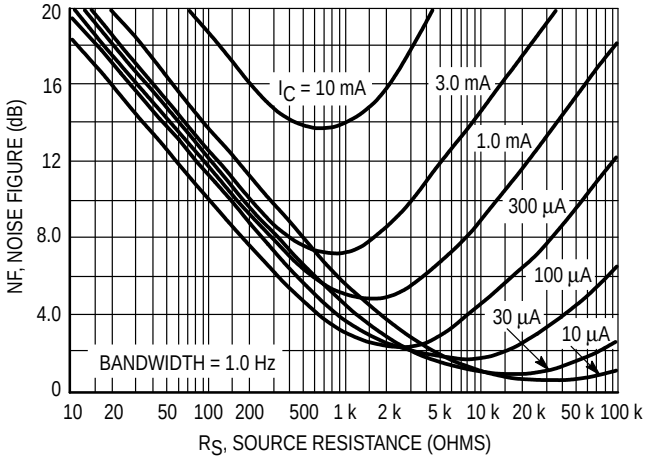


Figure 7. Noise Figure

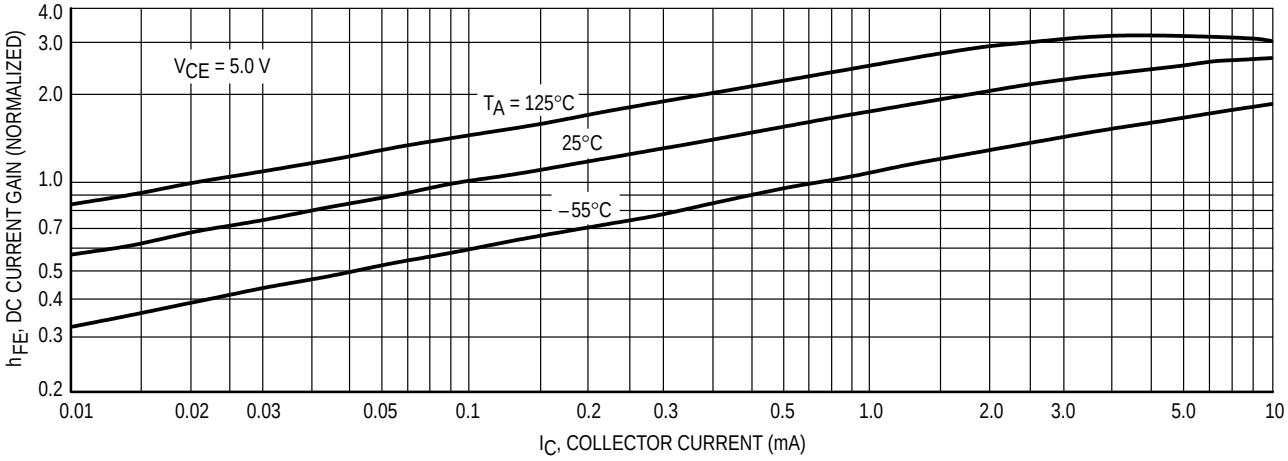


Figure 8. DC Current Gain

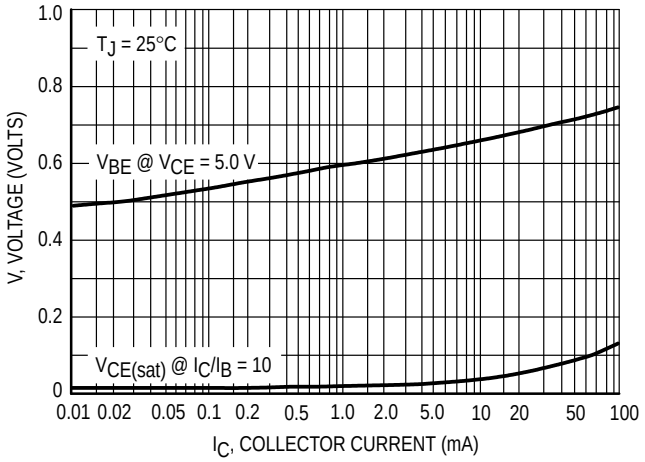


Figure 9. “On” Voltages

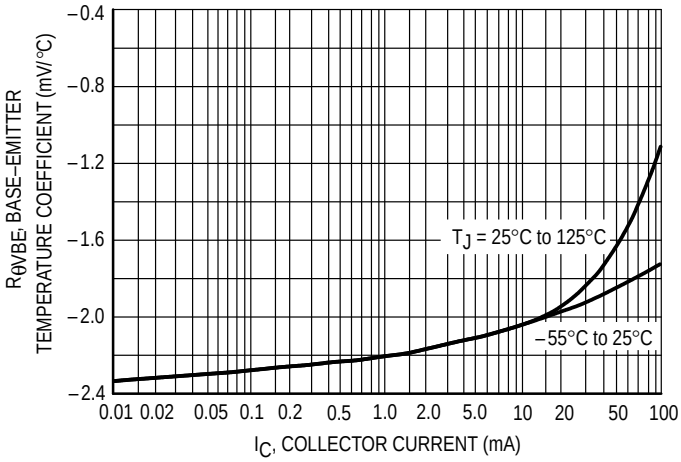


Figure 10. Temperature Coefficients

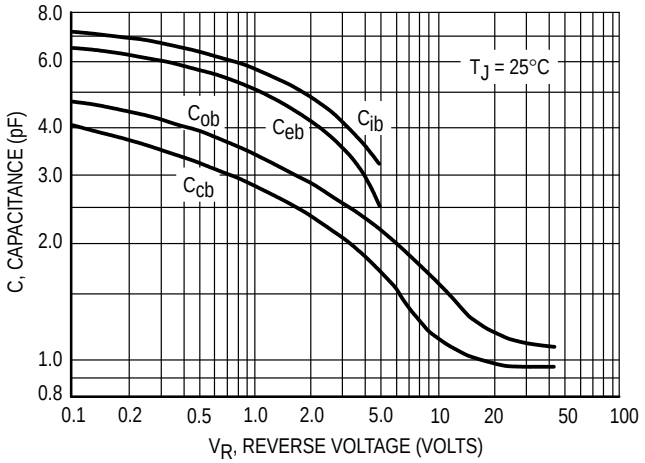


Figure 11. Capacitance

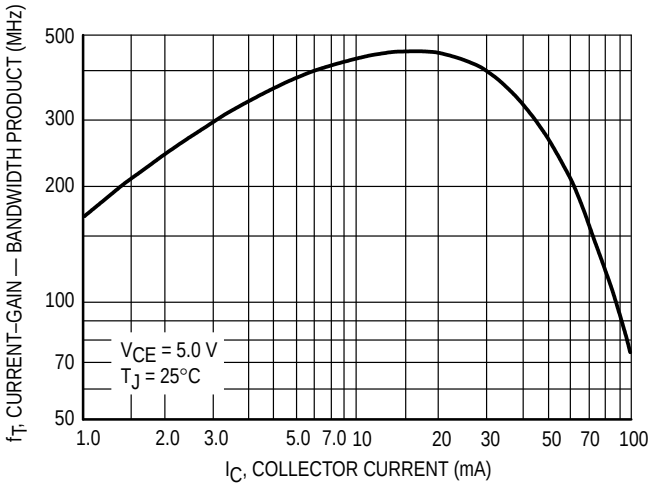
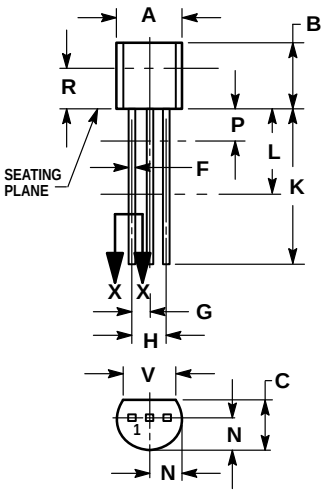
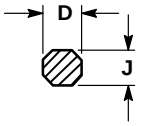


Figure 12. Current–Gain — Bandwidth Product

PACKAGE DIMENSIONS





SECTION X–X

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.

	INCHES		MILLIMETERS	
DIM	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 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

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