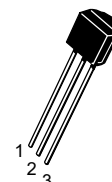
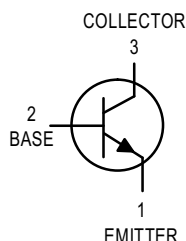


# General Purpose Transistors

## NPN Silicon

**2N4123**  
**2N4124**



CASE 29-04, STYLE 1  
TO-92 (TO-226AA)

### MAXIMUM RATINGS

Rating	Symbol	2N4123	2N4124	Unit
Collector–Emitter Voltage	$V_{CEO}$	30	25	Vdc
Collector–Base Voltage	$V_{CBO}$	40	30	Vdc
Emitter–Base Voltage	$V_{EBO}$	5.0		Vdc
Collector Current — Continuous	$I_C$	200		mA <sub>dc</sub>
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625	5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5	12	Watts 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	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage <sup>(1)</sup> ( $I_C = 1.0 \text{ mA}_{dc}, I_E = 0$ )	$V_{(BR)CEO}$	30 25	— —	Vdc
Collector–Base Breakdown Voltage ( $I_C = 10 \mu\text{A}_{dc}, I_E = 0$ )	$V_{(BR)CBO}$	40 30	— —	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10 \mu\text{A}_{dc}, I_C = 0$ )	$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current ( $V_{CB} = 20 \text{ Vdc}, I_E = 0$ )	$I_{CBO}$	—	50	nA <sub>dc</sub>
Emitter Cutoff Current ( $V_{EB} = 3.0 \text{ Vdc}, I_C = 0$ )	$I_{EBO}$	—	50	nA <sub>dc</sub>

1. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

## 2N4123 2N4124

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

Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS</b>				
DC Current Gain <sup>(1)</sup> ( $I_C = 2.0 \text{ mAdc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )	$h_{FE}$	50	150	—
2N4123		120	360	
2N4124				
( $I_C = 50 \text{ mAdc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )		25	—	
2N4123		60	—	
2N4124				
Collector–Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = 50 \text{ mAdc}$ , $I_B = 5.0 \text{ mAdc}$ )	$V_{CE(sat)}$	—	0.3	Vdc
Base–Emitter Saturation Voltage <sup>(1)</sup> ( $I_C = 50 \text{ mAdc}$ , $I_B = 5.0 \text{ mAdc}$ )	$V_{BE(sat)}$	—	0.95	Vdc

### SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ( $I_C = 10 \text{ mAdc}$ , $V_{CE} = 20 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	250	—	MHz
2N4123		300	—	
2N4124				
Input Capacitance ( $V_{EB} = 0.5 \text{ Vdc}$ , $I_C = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ibo}$	—	8.0	pF
Collector–Base Capacitance ( $I_E = 0$ , $V_{CB} = 5.0 \text{ V}$ , $f = 1.0 \text{ MHz}$ )	$C_{cb}$	—	4.0	pF
Small–Signal Current Gain ( $I_C = 2.0 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $R_S = 10 \text{ k ohm}$ , $f = 1.0 \text{ kHz}$ )	$h_{fe}$	50	200	—
2N4123		120	480	
2N4124				
Current Gain — High Frequency ( $I_C = 10 \text{ mAdc}$ , $V_{CE} = 20 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$ h_{fe} $	2.5	—	—
2N4123		3.0	—	
2N4124				
( $I_C = 2.0 \text{ mAdc}$ , $V_{CE} = 10 \text{ V}$ , $f = 1.0 \text{ kHz}$ )		50	200	
( $I_C = 2.0 \text{ mAdc}$ , $V_{CE} = 10 \text{ V}$ , $f = 1.0 \text{ kHz}$ )		120	480	
2N4123				
2N4124				
Noise Figure ( $I_C = 100 \mu\text{Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $R_S = 1.0 \text{ k ohm}$ , $f = 1.0 \text{ kHz}$ )	NF	—	6.0	dB
2N4123		—	5.0	
2N4124				

1. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

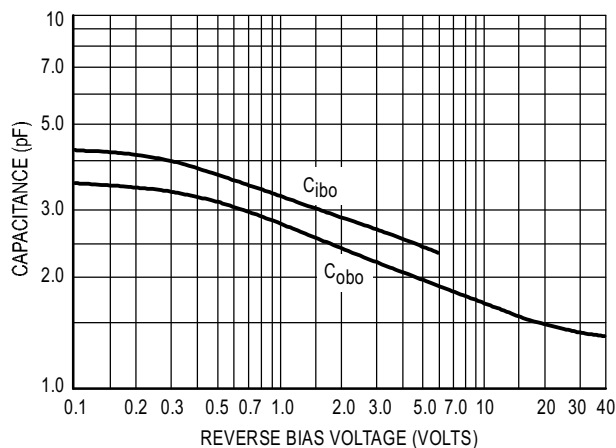


Figure 1. Capacitance

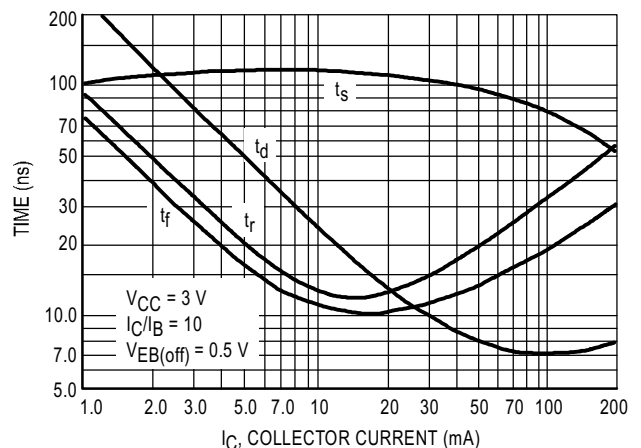


Figure 2. Switching Times

**AUDIO SMALL-SIGNAL CHARACTERISTICS**

**NOISE FIGURE**

( $V_{CE} = 5 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

Bandwidth = 1.0 Hz

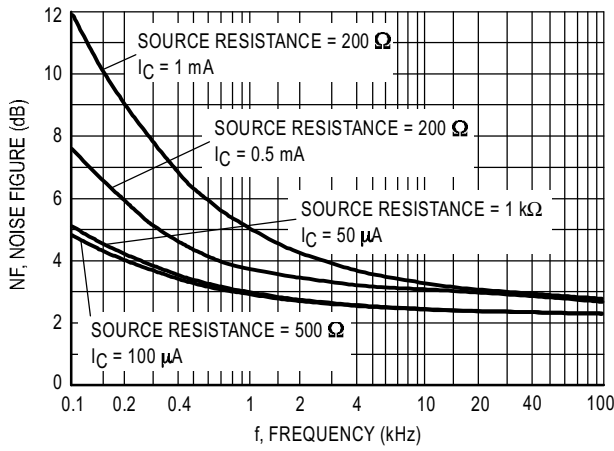


Figure 3. Frequency Variations

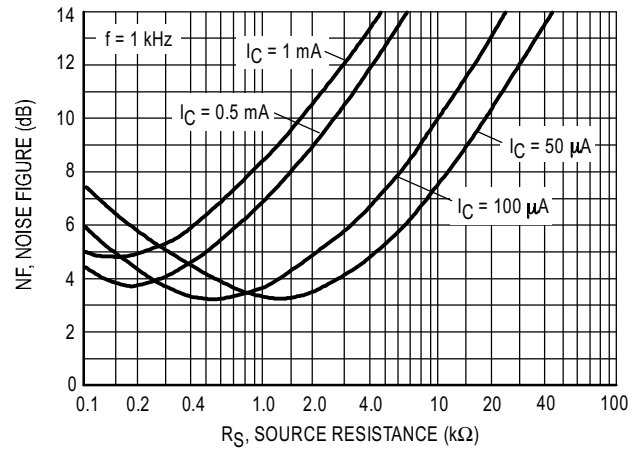


Figure 4. Source Resistance

**h PARAMETERS**

( $V_{CE} = 10 \text{ V}$ ,  $f = 1 \text{ kHz}$ ,  $T_A = 25^\circ\text{C}$ )

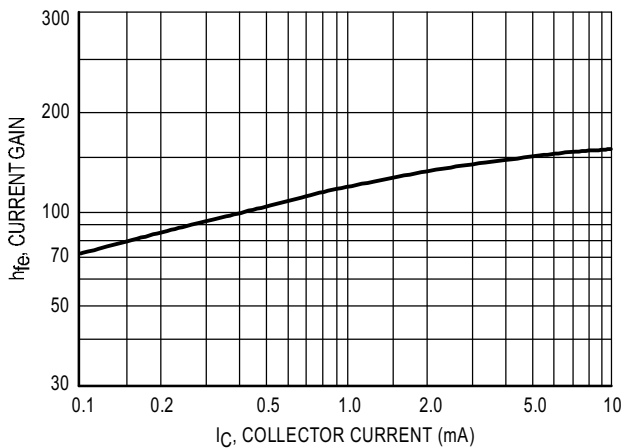


Figure 5. Current Gain

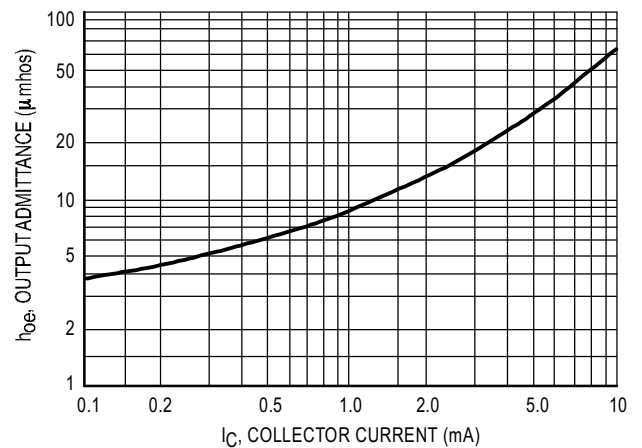


Figure 6. Output Admittance

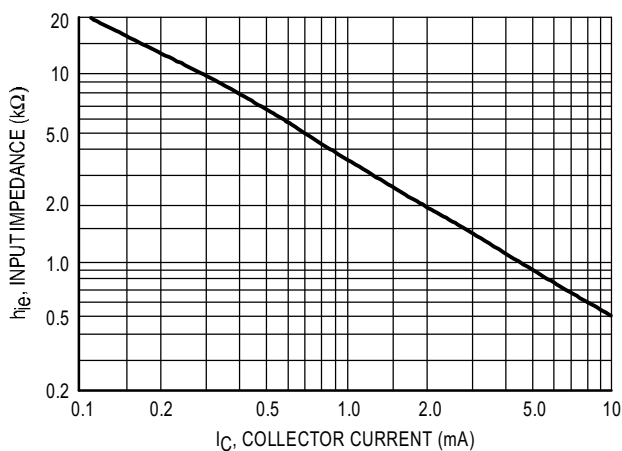


Figure 7. Input Impedance

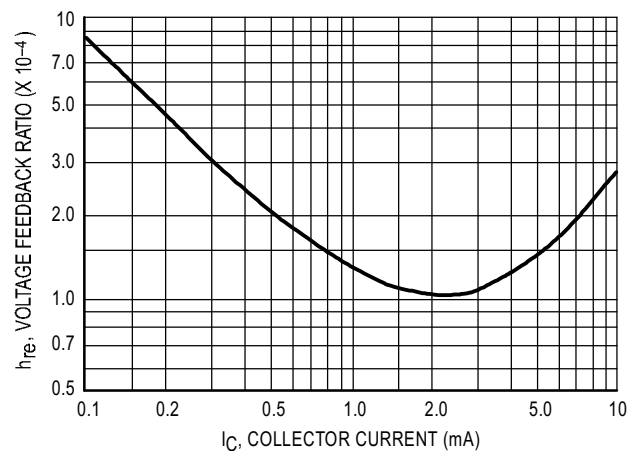


Figure 8. Voltage Feedback Ratio

STATIC CHARACTERISTICS

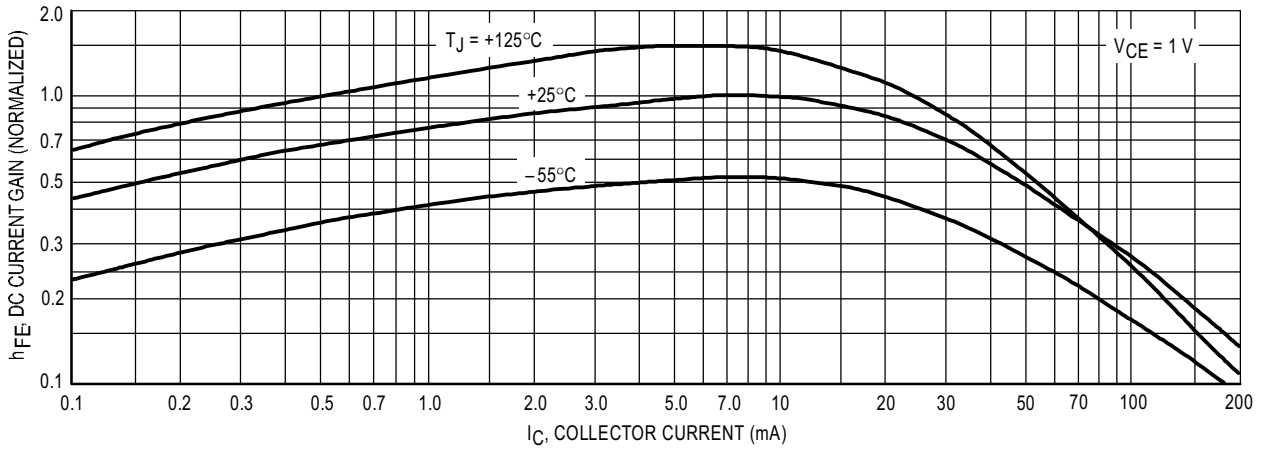


Figure 9. DC Current Gain

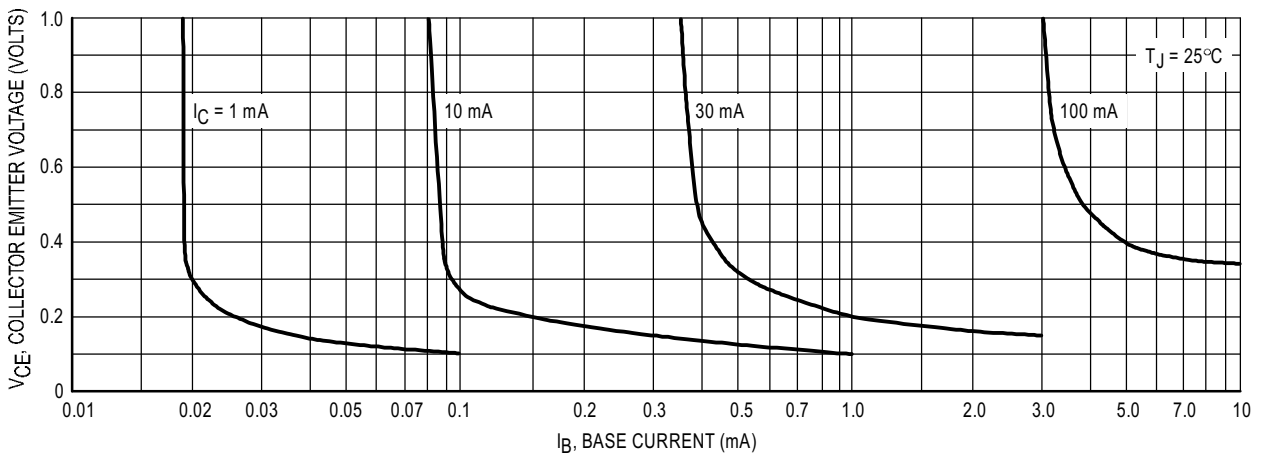


Figure 10. Collector Saturation Region

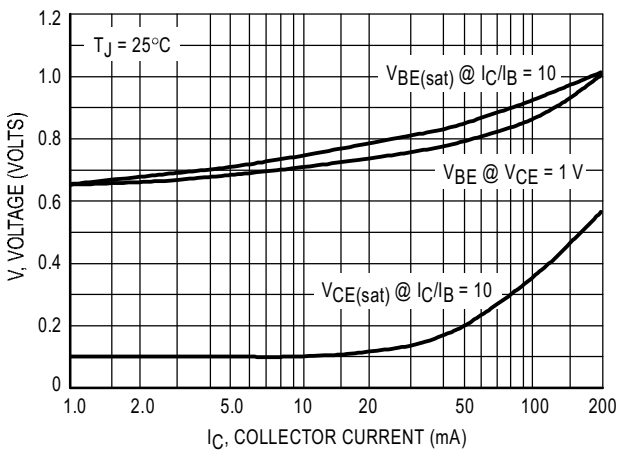


Figure 11. "On" Voltages

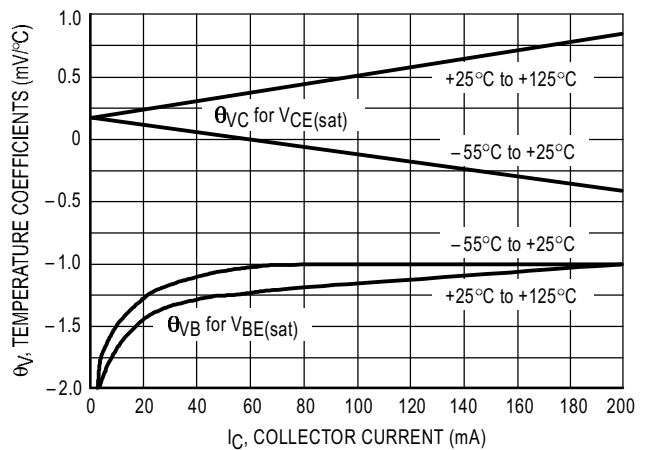
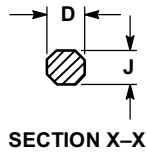
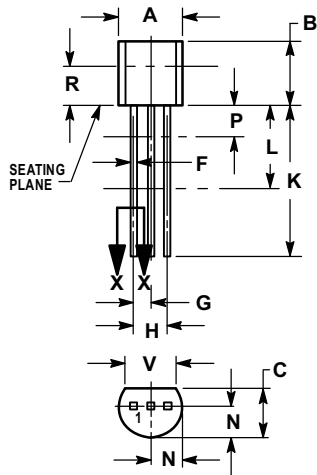


Figure 12. Temperature Coefficients

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 1:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

## 2N4123 2N4124

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