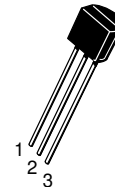
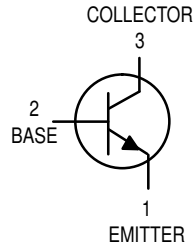


Amplifier Transistor

NPN Silicon

2N4410



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

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	80	Vdc
Collector–Base Voltage	V_{CBO}	120	Vdc
Emitter–Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	250	mA _{dc}
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°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 ⁽¹⁾ ($I_C = 1.0 \text{ mA}_{dc}$, $I_E = 0$)	$V_{(BR)CEO}$	80	—	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 500 \mu\text{A}_{dc}$, $V_{BE} = 5.0 \text{ Vdc}$, $R_{BE} = 8.2 \text{ k ohms}$)	$V_{(BR)CEX}$	120	—	Vdc
Collector–Base Breakdown Voltage ($I_C = 10 \mu\text{A}_{dc}$, $I_E = 0$)	$V_{(BR)CBO}$	120	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10 \mu\text{A}_{dc}$, $I_C = 0$)	$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current ($V_{CB} = 100 \text{ Vdc}$, $I_E = 0$) ($V_{CB} = 100 \text{ Vdc}$, $I_E = 0$, $T_A = 100^\circ\text{C}$)	I_{CBO}	— —	0.01 1.0	μA_{dc}
Emitter Cutoff Current ($V_{EB} = 4.0 \text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	0.1	μA_{dc}

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

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain (I _C = 1.0 mA, V _{CE} = 1.0 Vdc) (I _C = 10 mA, V _{CE} = 1.0 Vdc)	h _{FE}	60 60	— 400	—
Collector–Emitter Saturation Voltage (I _C = 1.0 mA, I _B = 0.1 mA)	V _{CE(sat)}	—	0.2	Vdc
Base–Emitter Saturation Voltage (I _C = 1.0 mA, I _B = 0.1 mA)	V _{BE(sat)}	—	0.8	Vdc
Base–Emitter On Voltage (I _C = 1.0 mA, V _{CE} = 5.0 Vdc)	V _{BE(on)}	—	0.8	Vdc
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain — Bandwidth Product ⁽²⁾ (I _C = 10 mA, V _{CE} = 10 Vdc, f = 20 MHz)	f _T	60	300	MHz
Collector–Base Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz, emitter guarded)	C _{cb}	—	12	pF
Emitter–Base Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz, collector guarded)	C _{eb}	—	50	pF

2. f_T = |h_{fe}| • f_{test}.

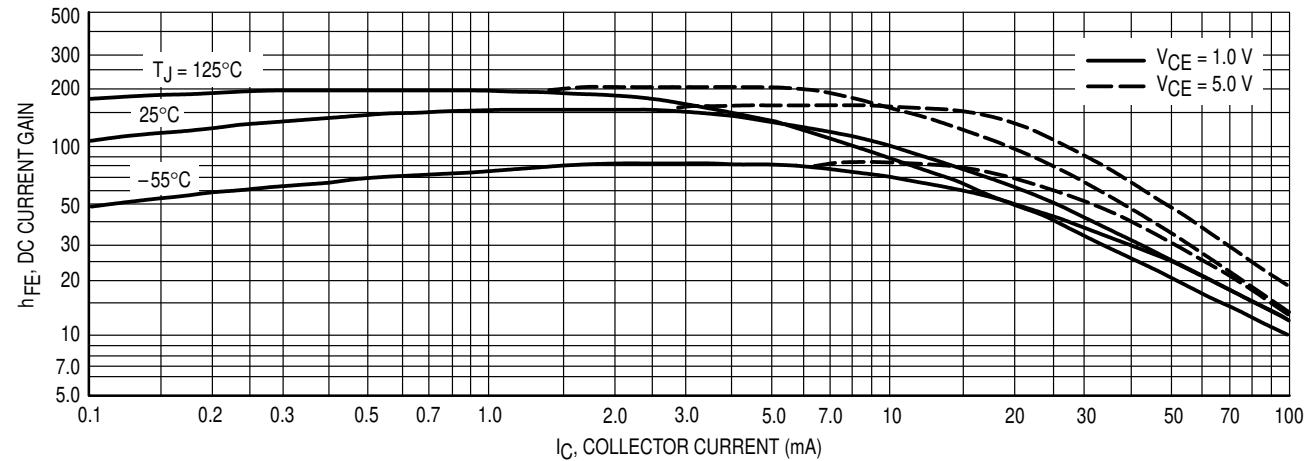


Figure 1. DC Current Gain

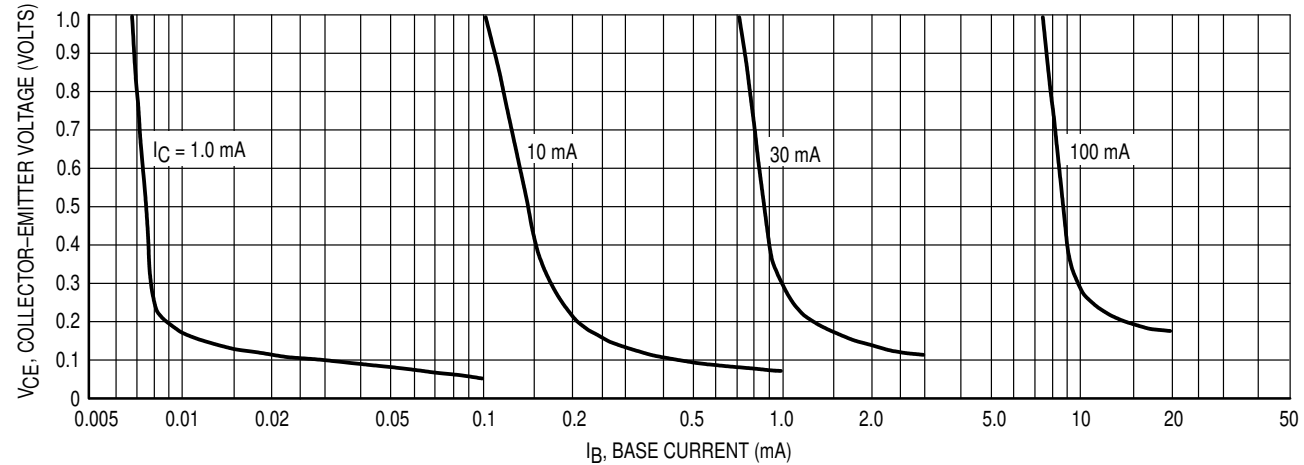


Figure 2. Collector Saturation Region

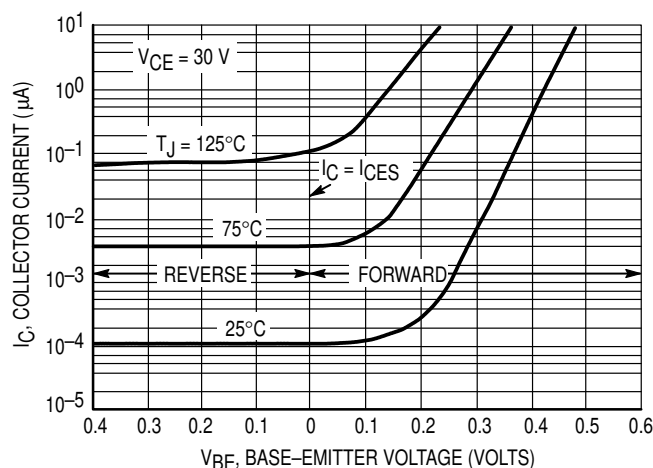


Figure 3. Collector Cut-Off Region

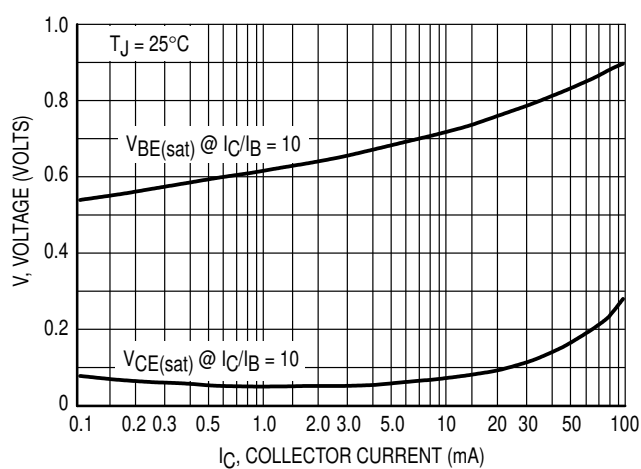


Figure 4. "On" Voltages

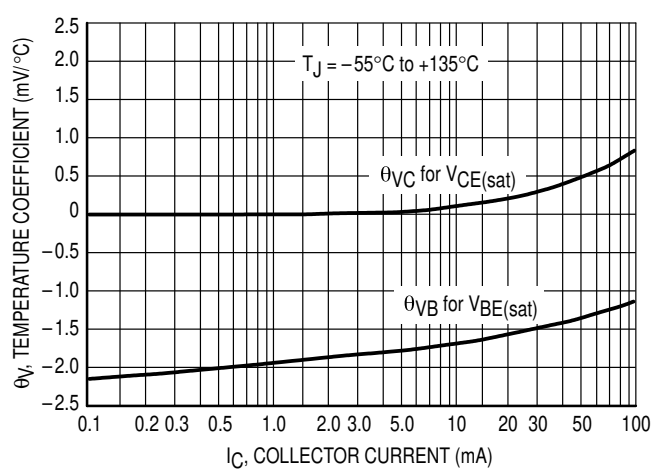
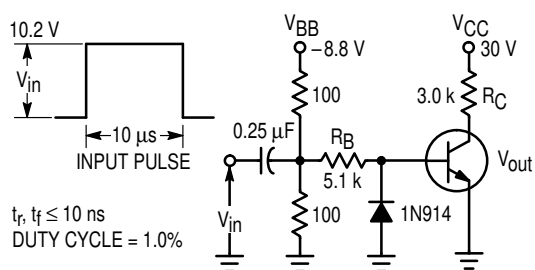


Figure 5. Temperature Coefficients



Values Shown are for I_C @ 10 mA

Figure 6. Switching Time Test Circuit

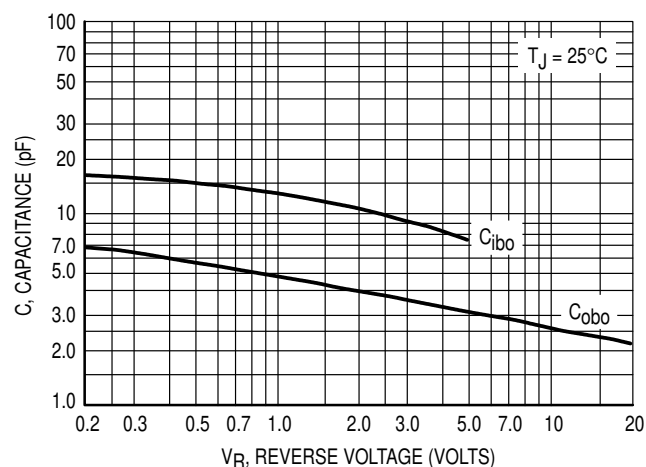


Figure 7. Capacitances

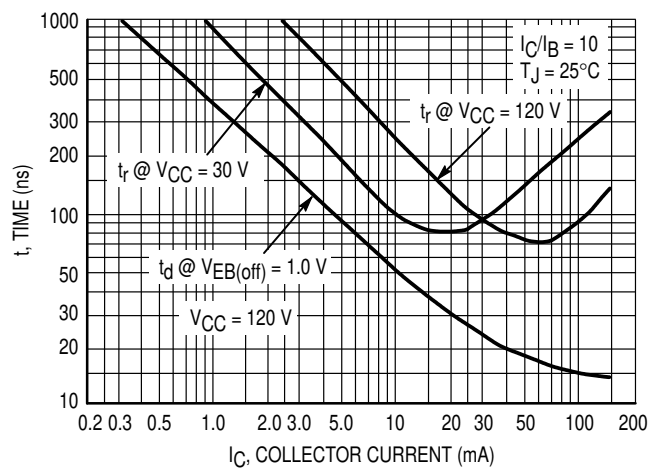


Figure 8. Turn-On Time

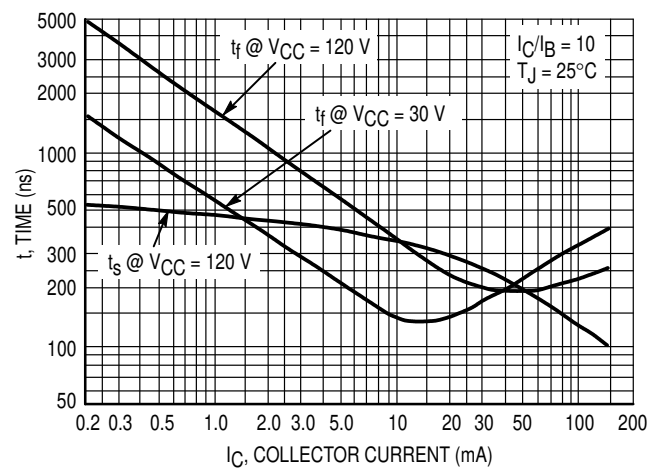
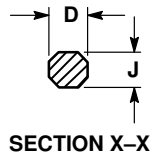
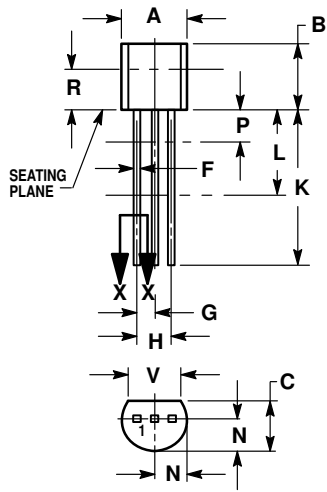


Figure 9. Turn-Off Time

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

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