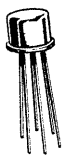
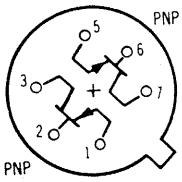
2N3804A, 2N3805A (SILICON)
2N3810A, 2N3811A
2N3816A, 2N3817A

Dual PNP silicon annular transistors specifically designed for differential amplifier applications.

2N3804A
2N3805A

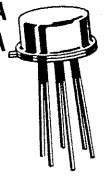


CASE 35
(TO-71)

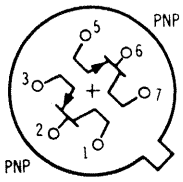


Pin Connections
Bottom View

2N3810A
2N3811A

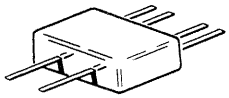


CASE 32C

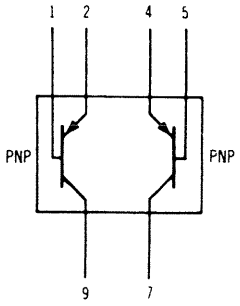


Pin Connections
Bottom View

2N3816A
and 2N3817A



CASE 33A
(TO-89)



Pin Connections
Bottom View

Lead 1 identified by square impression or dot on underside of case

All leads electrically isolated from case

MAXIMUM RATINGS (each side)

Rating	Symbol	Value		Unit
Collector-Emitter Voltage	V_{CEO}	60		Vdc
Collector-Base Voltage	V_{CB}	60		Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current	I_C	50		mAdc
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		°C
		One Side	Both Sides	
Total Device Dissipation @ T_A = 25°C	P_D			
Metal Can (2N3804A and 2N3805A)		250	360	mW
Derate above 25°C		1.5	2.06	mW/°C
Metal Can (2N3810A and 2N3811A)		500	600	mW
Derate above 25°C		2.9	3.4	mW/°C
Flat Package (2N3816A and 2N3817A)		250	350	mW
Derate above 25°C		1.5	2.0	mW/°C

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

Characteristics apply also to corresponding flat package type numbers

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage* (I_C = 10 mAdc, I_B = 0)	BV_{CEO}*	60		—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	BV_{CBO}	60	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	BV_{EBO}	5.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0)	I_{CBO}	—	—	0.01	μAdc
(V_{CB} = 50 Vdc, I_E = 0, T_A = 150°C)		—	—	10	
Emitter Cutoff Current ($V_{BE(off)}$ = 4.0 Vdc, I_C = 0)	I_{EBO}	—	—	20	nAdc

(continued)

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

Characteristics apply also to corresponding flat package type numbers

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS						
DC Current Gain *		h_{FE}*				—
(I_C = 1.0 μAdc, V_{CE} = 5.0 Vdc)	2N3805A, 11A, 17A		75	—	—	
(I_C = 10 μAdc, V_{CE} = 5.0 Vdc)	2N3804A, 10A, 16A		100	—	—	
	2N3805A, 11A, 17A		225	—	—	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)	2N3804A, 10A, 16A		150	—	450	
	2N3805A, 11A, 17A		300	—	900	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = -55°C)	2N3804A, 10A, 16A		75	—	—	
	2N3805A, 11A, 17A		150	—	—	
(I_C = 500 μAdc, V_{CE} = 5.0 Vdc)	2N3804A, 10A, 16A		150	—	450	
	2N3805A, 11A, 17A		300	—	900	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	2N3804A, 10A, 16A		150	—	450	
	2N3805A, 11A, 17A		300	—	900	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc)	2N3804A, 10A, 16A		125	—	—	
	2N3805A, 11A, 17A		250	—	—	
Collector-Emitter Saturation Voltage *		$V_{CE(sat)}$*				Vdc
(I_C = 100 μAdc, I_B = 10 μAdc)			—	—	0.2	
(I_C = 1.0 mAdc, I_B = 100 μAdc)			—	—	0.25	
Base-Emitter Saturation Voltage *		$V_{BE(sat)}$*				Vdc
(I_C = 100 μAdc, I_B = 10 μAdc)			—	—	0.7	
(I_C = 1.0 mAdc, I_B = 100 μAdc)			—	—	0.8	
Base-Emitter On Voltage		$V_{BE(on)}$				Vdc
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)			—	—	0.7	
SMALL-SIGNAL CHARACTERISTICS						
Current-Gain — Bandwidth Product		f_T				MHz
(I_C = 500 μAdc, V_{CE} = 5.0 Vdc, f = 30 MHz)			30	—	—	
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc, f = 100 MHz)			100	—	500	
Output Capacitance		C_{ob}				pF
(V_{CB} = 5.0 Vdc, I_E = 0, f = 100 kHz)			—	—	4.0	
Input Capacitance		C_{ib}				pF
($V_{BE(off)}$ = 0.5 Vdc, I_C = 0, f = 100 kHz)			—	—	8.0	
Input Impedance		h_{ie}				kΩ
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3804A, 10A, 16A		3.0	—	15	
	2N3805A, 11A, 17A		10	—	40	
Voltage Feedback Ratio		h_{re}				X 10^{-4}
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)			—	—	25	
Small-Signal Current Gain		h_{fe}				—
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3804A, 10A, 16A		150	—	600	
	2N3805A, 11A, 17A		300	—	900	
Output Admittance		h_{oe}				μmhos
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)			5.0	—	60	
Noise Figure		NF				dB
(I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 3.0 k ohms,						
f = 100 Hz)	2N2804A, 10A, 16A		—	4.0	7.0	
	2N3805A, 11A, 17A		—	2.5	4.0	
(I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 3.0 k ohms,						
f = 1.0 kHz)	2N3804A, 10A, 16A		—	1.5	3.0	
	2N3805A, 11A, 17A		—	0.8	1.5	
(I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 3.0 k ohms,						
f = 10 kHz)	2N3804A, 10A, 16A		—	1.0	2.5	
	2N3805A, 11A, 17A		—	0.8	1.5	
(I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 3.0 k ohms,						
Noise Bandwidth = 10 Hz to 15.7 kHz)	2N3804A, 10A, 16A		—	2.5	3.5	
	2N3805A, 11A, 17A		—	1.5	2.5	
MATCHING CHARACTERISTICS						
DC Current Gain Ratio**		h_{FE1}/h_{FE2}**				—
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)			0.95	—	1.0	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = -55°C to +125°C)			0.85	—	1.0	
Base Voltage Differential		$\lvert V_{BE1}-V_{BE2}\rvert$				mVdc
(I_C = 10 μAdc to 10 mAdc, V_{CE} = 5.0 Vdc)			—	—	5.0	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc)			—	—	1.5	
Base Voltage Differential Gradient		$\frac{\Delta(V_{BE1}-V_{BE2})}{\Delta T_A}$				μV/°C
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = -55°C to +25°C)			—	—	5.0	
(I_C = 100 μAdc, V_{CE} = 5.0 Vdc, T_A = +25°C to +125°C)			—	—	5.0	

*Pulse Test: Pulse width ≤300 μs, duty cycle ≤2% **The lowest h_{FE} reading is taken as h_{FE1} for this ratio.

SMALL-SIGNAL CHARACTERISTICS

NOISE FIGURE

FIGURE 1 — FREQUENCY EFFECTS

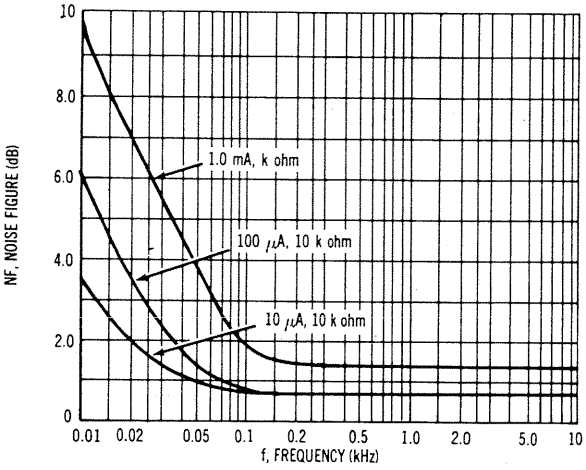
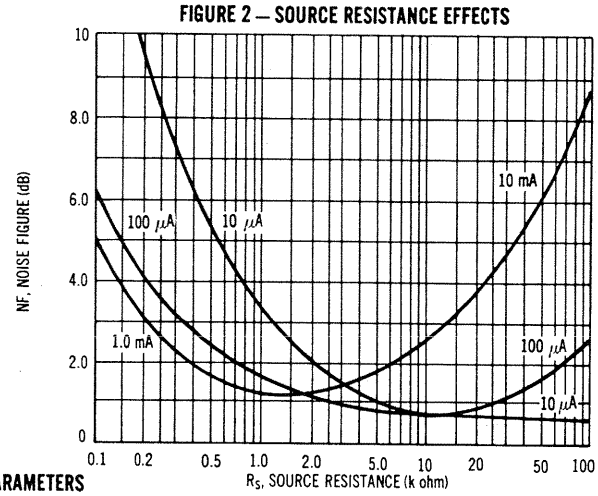


FIGURE 2 — SOURCE RESISTANCE EFFECTS



h PARAMETERS

V_{CE} = 10 Vdc, f = 1.0 kHz, T_A = 25°C

FIGURE 3 — INPUT IMPEDANCE

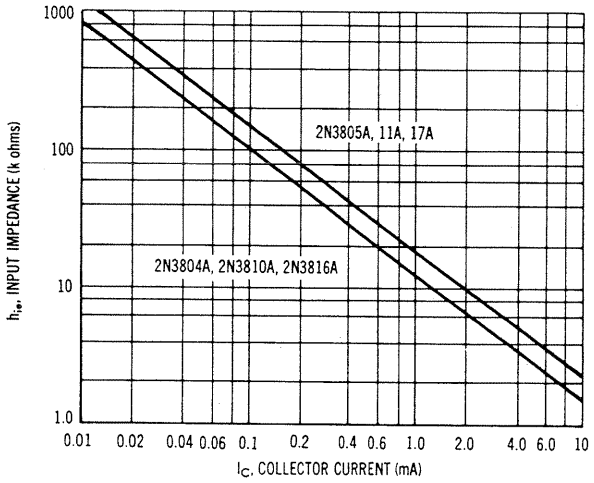


FIGURE 4 — VOLTAGE FEEDBACK RATIO

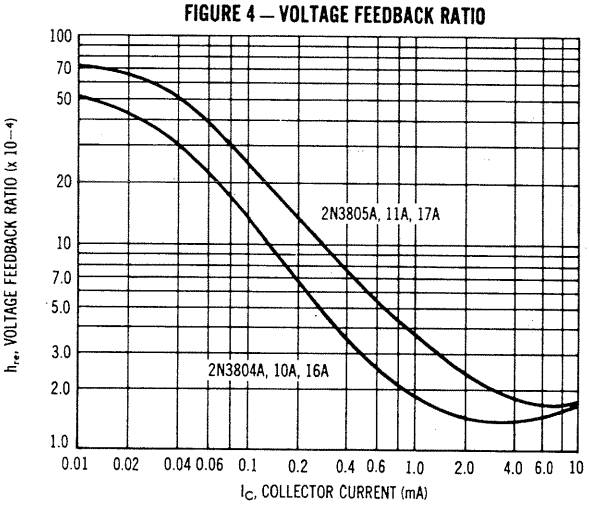


FIGURE 5 — CURRENT GAIN

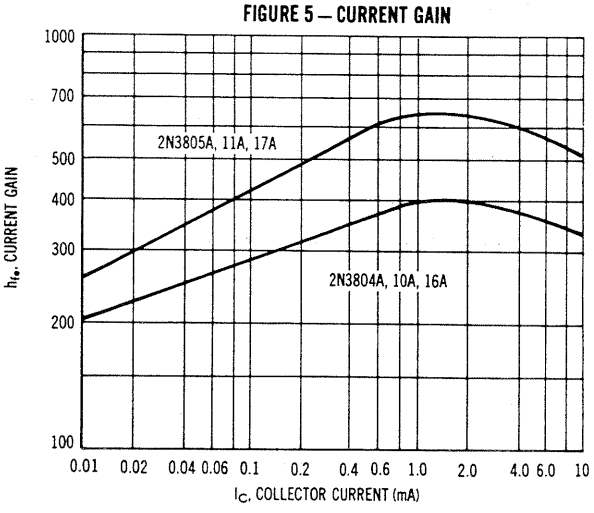


FIGURE 6 — OUTPUT ADMITTANCE

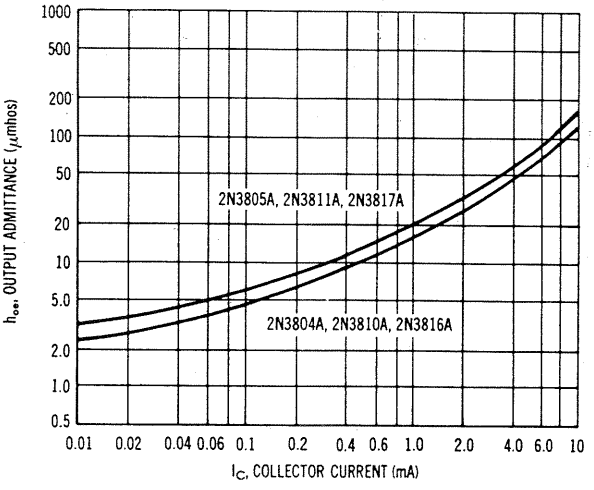
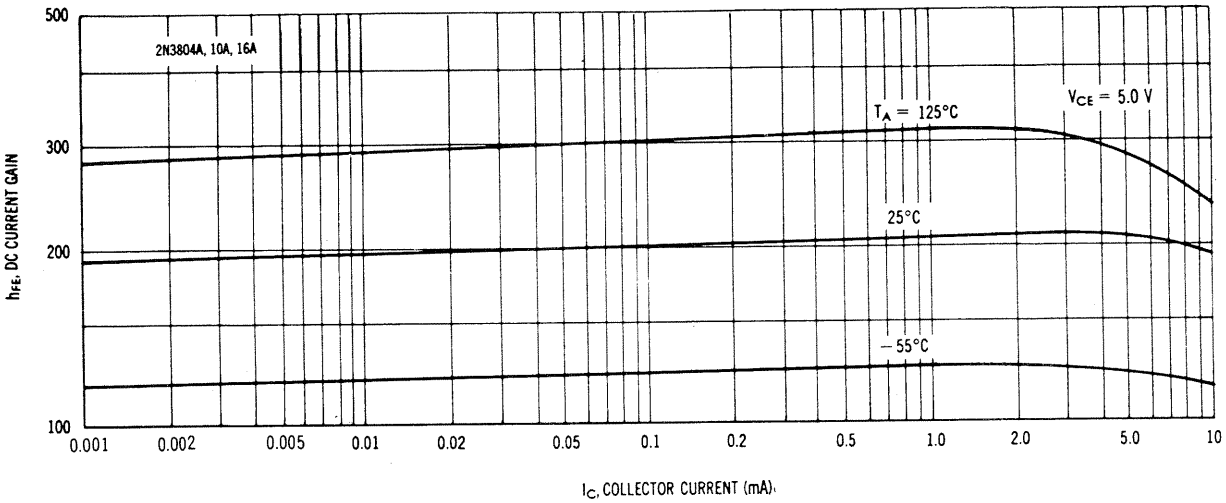


FIGURE 7 — TYPICAL CURRENT-GAIN CHARACTERISTICS



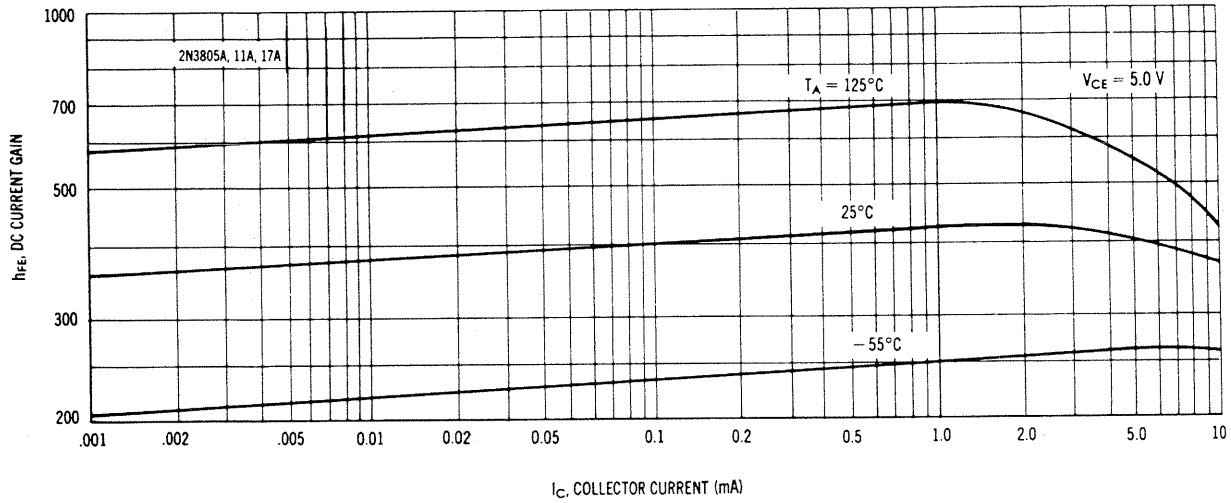


FIGURE 8 — BASE-EMITTER "ON" VOLTAGE versus TEMPERATURE