358-848

2N3905
2N3906

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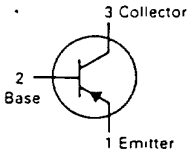
CASE 29-04, STYLE 1
TO-92 (TO-226AA)



GENERAL PURPOSE
TRANSISTOR

PNP SILICON

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	40	Vdc
Collector-Base Voltage	V_{CBO}	40	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	200	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Power Dissipation @ T_A = 60°C	P_D	250	mW
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 Case	$R_{\theta JC}$	83.3	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage(1) (I_C = 1.0 mAdc, I_B = 0)		$V_{(BR)CEO}$	40	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)		$V_{(BR)CBO}$	40	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)		$V_{(BR)EBO}$	5.0	—	Vdc
Base Cutoff Current (V_{CE} = 30 Vdc, V_{BE} = 3.0 Vdc)		I_{BL}	—	50	nAdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{BE} = 3.0 Vdc)		I_{CEX}	—	50	nAdc
ON CHARACTERISTICS(1)					
DC Current Gain		h_{FE}			—
(I_C = 0.1 mAdc, V_{CE} = 1.0 Vdc)	2N3905		30	—	
	2N3906		60	—	
(I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc)	2N3905		40	—	
	2N3906		80	—	
(I_C = 10 mAdc, V_{CE} = 1.0 Vdc)	2N3905		50	150	
	2N3906		100	300	
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)	2N3905		30	—	
	2N3906		60	—	
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc)	2N3905		15	—	
	2N3906		30	—	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			—	0.25	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			—	0.4	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)			0.65	0.85	
(I_C = 50 mAdc, I_B = 5.0 mAdc)			—	0.95	
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product		f_T			MHz
(I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	2N3905		200	—	
	2N3906		250	—	
Output Capacitance		C_{obo}	—	4.5	pF
(V_{CB} = 5.0 Vdc, I_E = 0, f = 100 kHz)					

2

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

Characteristic		Symbol	Min	Max	Unit
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 100 kHz)		C_{ibo}	—	10.0	pF
Input Impedance (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3905 2N3906	h_{ie}	0.5 2.0	8.0 12	k ohms
Voltage Feedback Ratio (I_C = 1.0 mAdc, V_{CB} = 10 Vdc, f = 1.0 kHz)	2N3905 2N3906	h_{re}	0.1 0.1	5.0 10	X 10^{-4}
Small-Signal Current Gain (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3905 2N3906	h_{fe}	50 100	200 400	—
Output Admittance (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N3905 2N3906	h_{oe}	1.0 3.0	40 60	μmhos
Noise Figure (I_C = 100 μAdc, V_{CE} = 5.0 Vdc, R_S = 1.0 k ohm, f = 10 Hz to 15.7 kHz)	2N3905 2N3906	NF	— —	5.0 4.0	dB

SWITCHING CHARACTERISTICS

Delay Time	(V_{CC} = 3.0 Vdc, V_{BE} = 0.5 Vdc I_C = 10 mAdc, I_{B1} = 1.0 mAdc)	t_d	—	35	ns
Rise Time		t_r	—	35	ns
Storage Time	(V_{CC} = 3.0 Vdc, I_C = 10 mAdc, I_{B1} = I_{B2} = 1.0 mAdc) 2N3905 2N3906	t_s	— —	200 225	ns
Fall Time	2N3905 2N3906	t_f	— —	60 75	ns

(1) Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

FIGURE 1 – DELAY AND RISE TIME EQUIVALENT TEST CIRCUIT

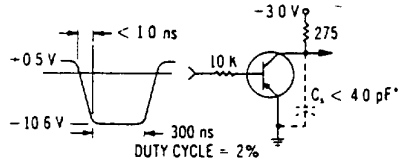
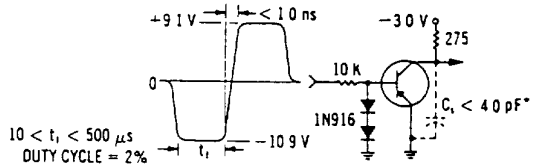


FIGURE 2 – STORAGE AND FALL TIME EQUIVALENT TEST CIRCUIT



*Total shunt capacitance of test jig and connectors

TRANSIENT CHARACTERISTICS
— T_J = 25°C --- T_J = 125°C

FIGURE 3 – CAPACITANCE

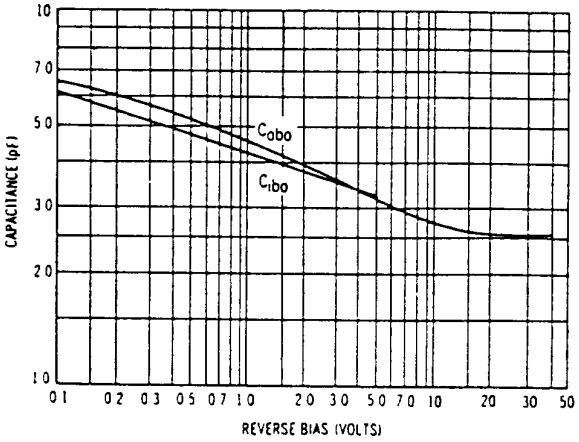


FIGURE 4 – CHARGE DATA

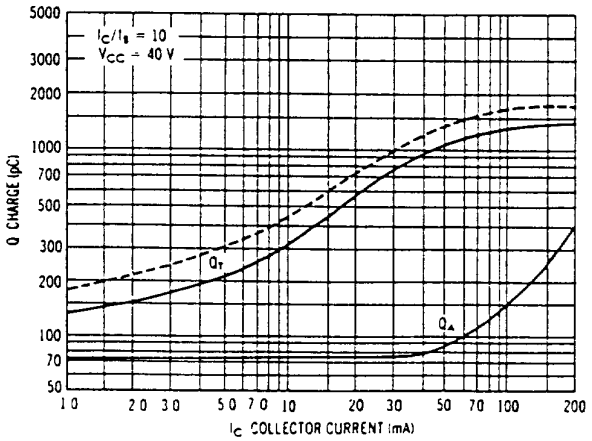


FIGURE 5 – TURN ON TIME

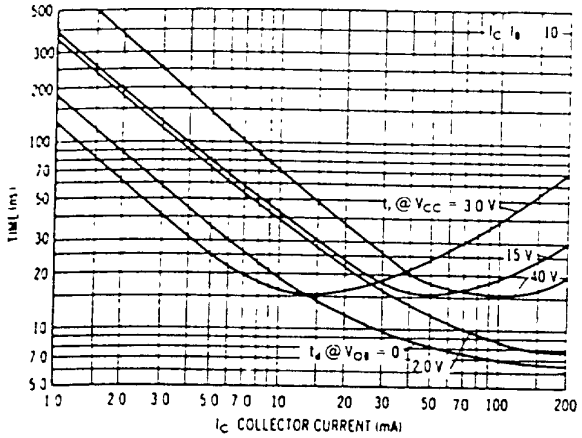
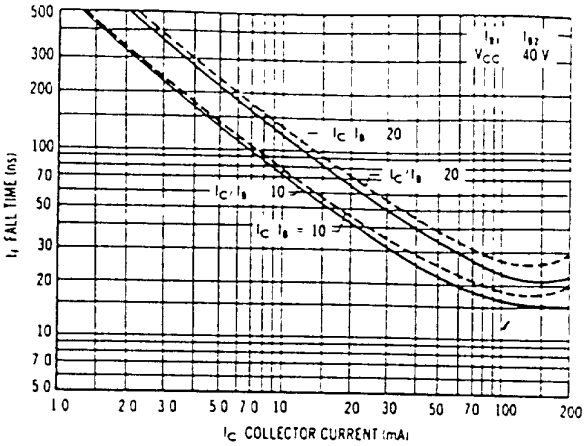


FIGURE 6 — FALL TIME



AUDIO SMALL SIGNAL CHARACTERISTICS

NOISE FIGURE VARIATIONS

V_{CE} = 5.0 Vdc, T_A = 25°C,
Bandwidth = 1.0 Hz

FIGURE 7 —

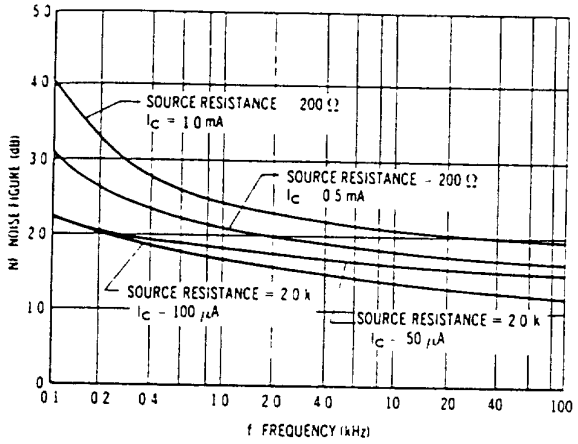
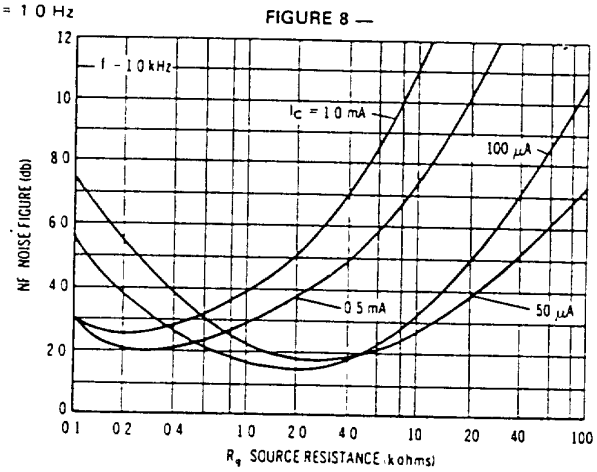


FIGURE 8 —



h PARAMETERS

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

FIGURE 9 — CURRENT GAIN

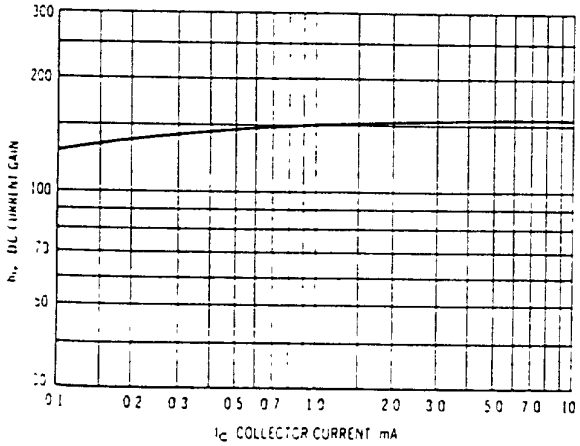


FIGURE 10 — OUTPUT ADMITTANCE

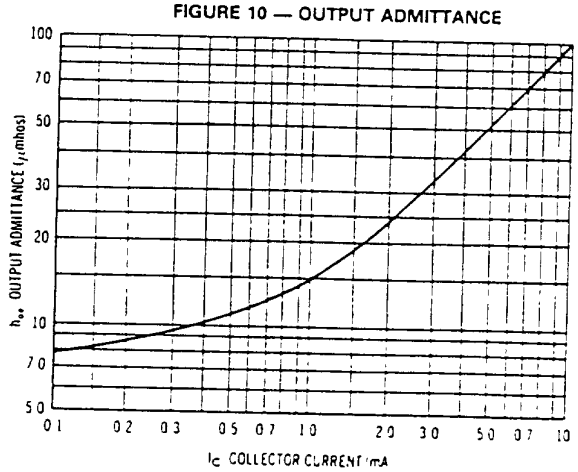


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FIGURE 11 — INPUT IMPEDANCE

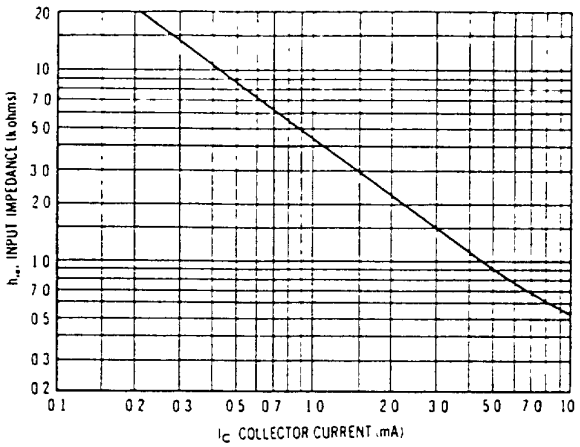
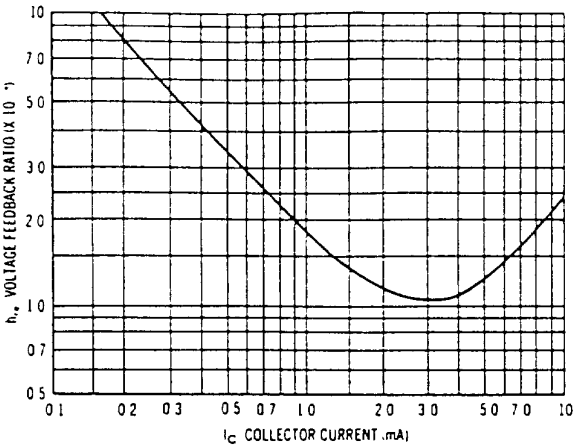


FIGURE 12 — VOLTAGE FEEDBACK RATIO



STATIC CHARACTERISTICS

FIGURE 13 — DC CURRENT GAIN

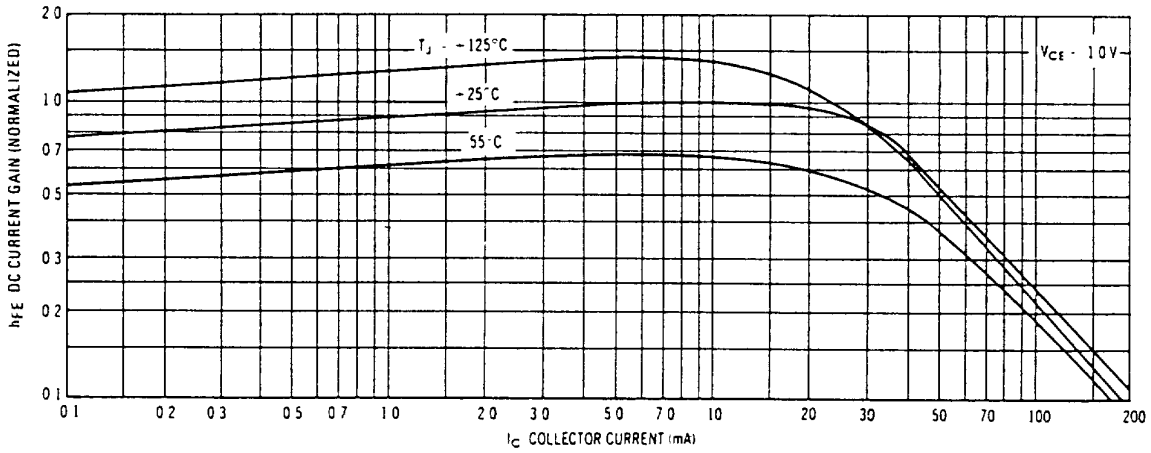


FIGURE 14 — COLLECTOR SATURATION REGION

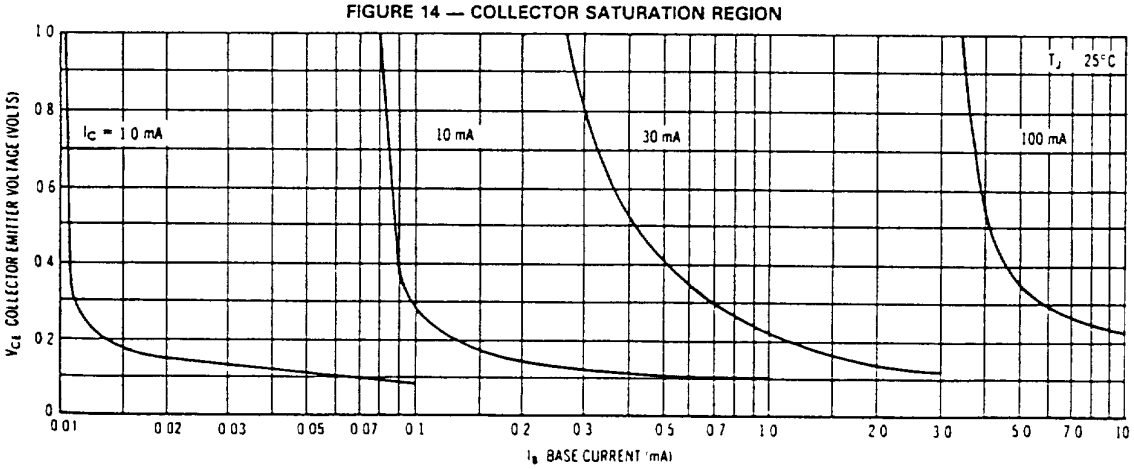


FIGURE 15 — "ON" VOLTAGES

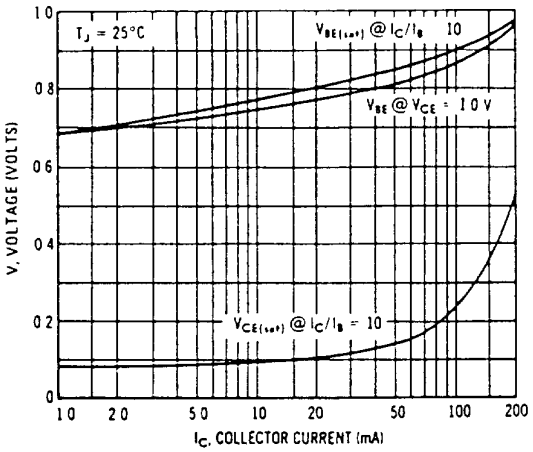
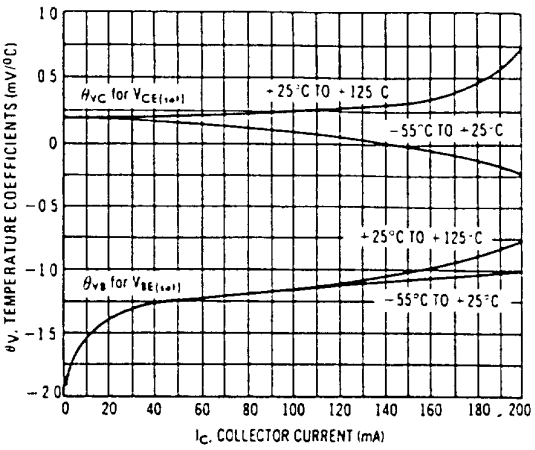


FIGURE 16 — TEMPERATURE COEFFICIENTS



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