

CASE 317-01, STYLE 2
HIGH FREQUENCY TRANSISTOR
NPN SILICON



Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CBO}	20	Vdc
Emitter-Base Voltage	V_{EBO}	3.0	Vdc
Collector Current — Peak	I_C	40	mAdc
Total Device Dissipation @ $T_L = 50^\circ\text{C}$ Derate above 50°C	P_D	400 4.0	mW mW/ $^\circ\text{C}$
Storage Temperature	T_{std}	-65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	250	$^{\circ}\text{C/W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 1.0 \text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	12	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 0.1 \text{ mA}$, $I_E = 0$)	$V_{(BR)CBO}$	20	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 0.1 \text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	3.0	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 15 \text{ Vdc}$, $I_B = 0$)	I_{CBO}	—	—	50	nAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 30 \text{ mA}$, $V_{CE} = 10 \text{ V}$)	h_{FE}	30	—	200	—
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SMALL SIGNAL CHARACTERISTICS

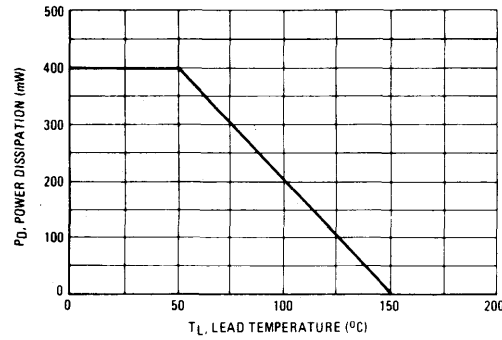
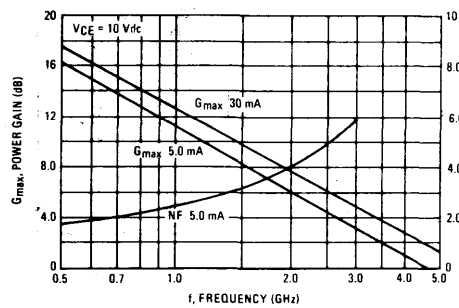
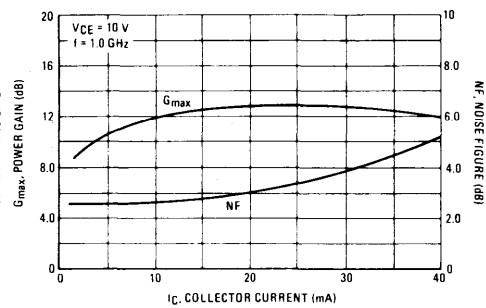
Current-Gain — Bandwidth Product ($I_C = 30 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f = 1.0 \text{ GHz}$)	f_T	—	5.0	—	GHz
Collector-Base Capacitance ($V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{cb}	—	0.6	1.0	pF

FUNCTIONAL TEST

Noise Figure $(I_C = 5.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ GHz})$ $(I_C = 5.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 2.0 \text{ GHz})$	NF	—	2.5	—	dB
Power Gain at Optimum Noise Figure $(I_C = 5.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ GHz})$ $(I_C = 5.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 2.0 \text{ GHz})$	G _{NF}	—	10	—	dB
Maximum Available Power Gain(1) $(I_C = 30 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ GHz})$ $(I_C = 30 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 2.0 \text{ GHz})$	G _{max}	—	12.5	—	dB
		—	7.5	—	

$$(1) G_{\max} = \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$$

FIGURE 1 – POWER DERATING

FIGURE 2 – POWER GAIN AND NOISE FIGURE
versus FREQUENCYFIGURE 3 – POWER GAIN AND NOISE FIGURE
versus COLLECTOR CURRENTFIGURE 4 – S_{11} PARAMETERS

Frequency (MHz)		500		1000		1500		2000	
VCE (Volts)	I _C (mA)	S ₁₁	$\angle \phi$	S ₁₁	$\angle \phi$	S ₁₁	$\angle \phi$	S ₁₁	$\angle \phi$
5.0	2.0	0.66	-125	0.64	-175	0.68	160	0.73	140
	5.0	0.57	-150	0.58	170	0.62	150	0.66	135
	10	0.54	-165	0.57	160	0.60	145	0.64	130
	20	0.54	-180	0.57	155	0.60	140	0.64	125
	30	0.54	175	0.57	155	0.61	140	0.65	125
10	2.0	0.66	-120	0.63	-170	0.67	160	0.71	140
	5.0	0.56	-145	0.56	175	0.60	150	0.64	135
	10	0.51	-160	0.53	165	0.57	145	0.61	130
	20	0.49	-175	0.52	160	0.57	145	0.60	130
	30	0.49	-175	0.53	160	0.57	145	0.61	130

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FIGURE 5 – S_{22} PARAMETERS

Frequency (MHz)		500		1000		1500		2000	
VCE (Volts)	IC (mA)	S22	$\angle \phi$	S22	$\angle \phi$	S22	$\angle \phi$	S22	$\angle \phi$
5.0	2.0	0.61	-45	0.50	-60	0.48	-80	0.50	-100
	5.0	0.40	-55	0.31	-65	0.30	-85	0.32	-100
	10	0.27	-60	0.20	-70	0.20	-90	0.23	-105
	20	0.19	-70	0.13	-75	0.14	-95	0.17	-110
	30	0.16	-70	0.11	-75	0.13	-95	0.16	-110
10	2.0	0.66	-35	0.55	-50	0.53	-70	0.54	-90
	5.0	0.47	-45	0.38	-50	0.37	-70	0.38	-75
	10	0.35	-45	0.28	-50	0.27	-65	0.29	-85
	20	0.26	-45	0.22	-50	0.22	-65	0.24	-80
	30	0.25	-40	0.21	-45	0.22	-60	0.24	-80

FIGURE 6 – S_{21} PARAMETERS

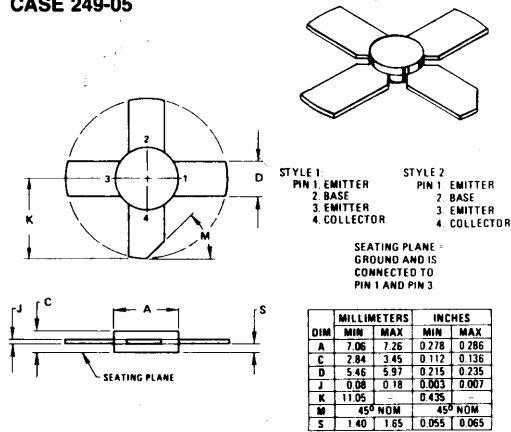
Frequency (MHz)		500		1000		1500		2000	
VCE (Volts)	IC (mA)	S21	$\angle \phi$	S21	$\angle \phi$	S21	$\angle \phi$	S21	$\angle \phi$
5.0	2.0	3.24	100	1.84	70	1.23	50	0.96	35
	5.0	4.85	90	2.60	70	1.76	50	1.38	40
	10	5.78	85	3.04	70	2.05	50	1.61	40
	20	6.40	85	3.30	65	2.23	50	1.24	40
	30	6.47	80	3.35	65	2.26	50	1.76	40
10	2.0	3.42	100	1.95	70	1.31	50	1.01	35
	5.0	5.20	95	2.80	70	1.89	50	1.45	40
	10	6.22	90	3.28	70	2.20	55	1.71	40
	20	6.82	85	3.55	65	2.37	55	1.84	40
	30	6.90	85	3.55	65	2.36	50	1.81	40

FIGURE 7 – S_{12} PARAMETERS

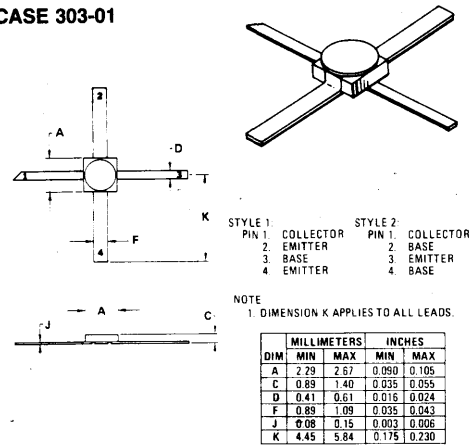
Frequency (MHz)		500		1000		1500		2000	
VCE (Volts)	IC (mA)	S12	$\angle \phi$	S12	$\angle \phi$	S12	$\angle \phi$	S12	$\angle \phi$
5.0	2.0	0.11	30	0.12	25	0.11	35	0.13	50
	5.0	0.08	40	0.10	45	0.13	55	0.17	55
	10	0.07	50	0.10	55	0.14	60	0.19	60
	20	0.06	60	0.11	65	0.15	65	0.20	60
	30	0.06	65	0.11	65	0.15	65	0.20	60
10	2.0	0.10	35	0.10	30	0.10	40	0.12	55
	5.0	0.07	40	0.09	45	0.12	55	0.15	60
	10	0.06	50	0.09	55	0.13	60	0.17	60
	20	0.06	60	0.10	65	0.13	65	0.18	60
	30	0.06	60	0.10	65	0.14	65	0.18	65

PACKAGE OUTLINE DIMENSIONS (continued)

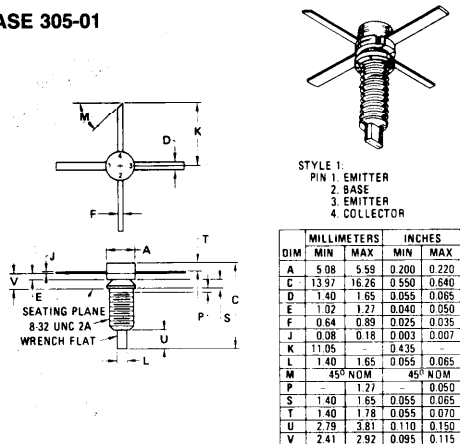
CASE 249-05



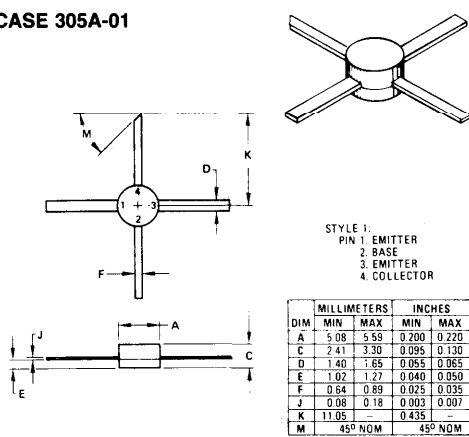
CASE 303-01



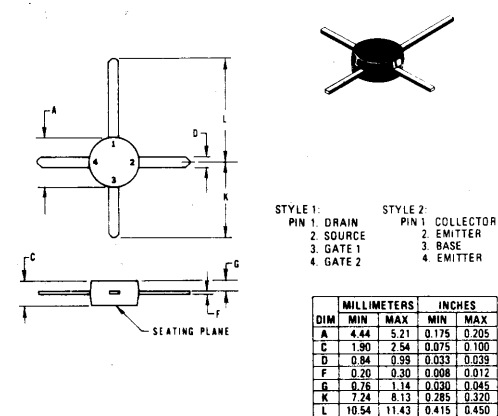
CASE 305-01



CASE 305A-01



CASE 317-01



CASE 317A-01

