HEWLETT hp PACKARD

COMPONENTS

GENERAL PURPOSE TRANSISTOR CHIP

HXTR-2001

Features

HIGH GAIN
17.5 dB Typical at 2 GHz

HIGH OUTPUT POWER
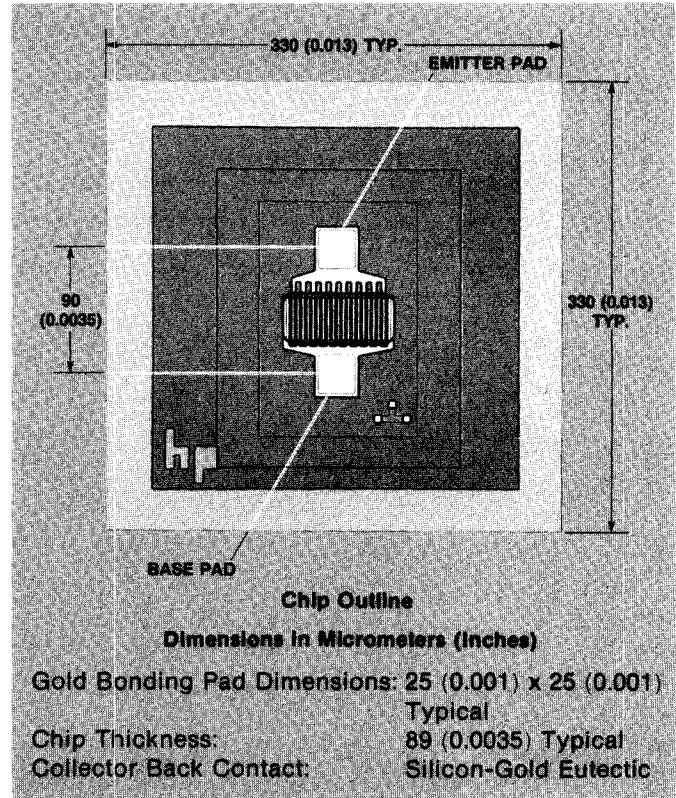20.0 dBm P_{1dB} Typical at 2 GHz

LOW NOISE FIGURE
3.8 dB Typical at 4 GHz

WIDE DYNAMIC RANGE

Description/Applications

The HXTR-2001 is an NPN bipolar transistor chip intended for use in hybrid applications requiring superior UHF and microwave performance. Use of ion implantation and self-alignment techniques in its manufacture produce uniform devices requiring little or no individual circuit adjustment. The HXTR-2001 features a Ti/Pt/Au metallization system and a dielectric scratch protection over its active area to insure reliable operation.

330 (0.013) TYP.

EMITTER PAD

90 (0.0035)

330 (0.013) TYP.

BASE PAD

Chip Outline

Dimensions in Micrometers (Inches)

Gold Bonding Pad Dimensions: 25 (0.001) x 25 (0.001) Typical

Chip Thickness: 89 (0.0035) Typical

Collector Back Contact: Silicon-Gold Eutectic

Electrical Specifications at $T_A = 25°C$

Symbol	Parameters and Test Conditions		MIL-STD-750 Test Method	Units	Min.	Typ.	Max.
BV$_{CES}$	Collector-Emitter Breakdown Voltage at I$_C$=100μA		3011.1*	V	30		
I$_{CEO}$	Collector-Emitter Leakage Current at V$_{CE}$=15V		3041.1**	nA			500
I$_{CBO}$	Collector Cutoff Current at V$_{CB}$=15V		3036.1**	nA			100
h$_{FE}$	Forward Current Transfer Ratio at V$_{CE}$=15V, I$_C$=15mA		3076.1*	—	50	120	220
G$_{a(max)}$	Maximum Available Gain	f=2GHz		dB		17.5	
		4GHz				11.5	
P$_{1dB}$	Power Output at 1dB Gain Compression	f=2GHz		dBm		20.0	
	Conditions for above: V$_{CE}$ = 15V, I$_C$ = 25 mA, θ$_{JA}$ = 210°C/W	4GHz				18.5	
F$_{MIN}$	Minimum Noise Figure	f=1.5GHz	3246.1	dB		2.2	
	Conditions for above: V$_{CE}$ = 15V, I$_C$ = 15 mA, θ$_{JA}$ = 210°C/W	4GHz				3.8	

*300μs wide pulse measurement <2% duty cycle.
**Measured under low ambient light conditions.

Recommended Maximum Continuous Operating Conditions [1]

Symbol	Parameter	Value
V_{CBO}	Collector to Base Voltage	25V
V_{CEO}	Collector to Emitter Voltage	16V
V_{EBO}	Emitter to Base Voltage	1.0V
I_C	DC Collector Current	35 mA
P_T	Total Device Dissipation [2]	450 mW
T_J	Junction Temperature	200° C
T_{STG}	Storage Temperature	-65° C to +200° C

Notes:
1. Operation of this device in excess of any one of these conditions is likely to result in a reduction in device mean time between failure (MTBF) to below the design goal of 1×10^7 hours at $T_J = 175°C$ (assumed Activation Energy = 1.5 eV).
2. Power dissipation derating should include a Θ_{JB} (Junction-to-Back contact thermal resistance) of 125°C/W.

   Total Θ_{JA} (Junction-to-Ambient) will be dependent upon the heat sinking provided in the individual application.

Absolute Maximum Ratings*

Symbol	Parameter	Limit
V_{CBO}	Collector to Base Voltage	30V
V_{CEO}	Collector to Emitter Voltage	20V
V_{EBO}	Emitter to Base Voltage	1.5V
I_C	DC Collector Current	70 mA
P_T	Total Device Dissipation	900 mW
T_J	Junction Temperature	300° C
$T_{STG(MAX)}$	Maximum Storage Temperature	300° C

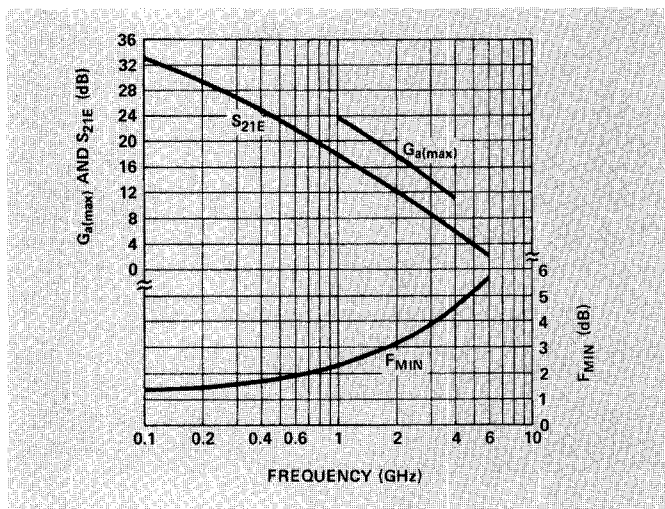*Operation in excess of any one of these conditions may result in permanent damage to this device.

Figure 1. Typical $G_{a(max)}$, S_{21E}, and Noise Figure (F_{MIN}) vs. Frequency at $V_{CE} = 15V$, $I_C = 25mA$.
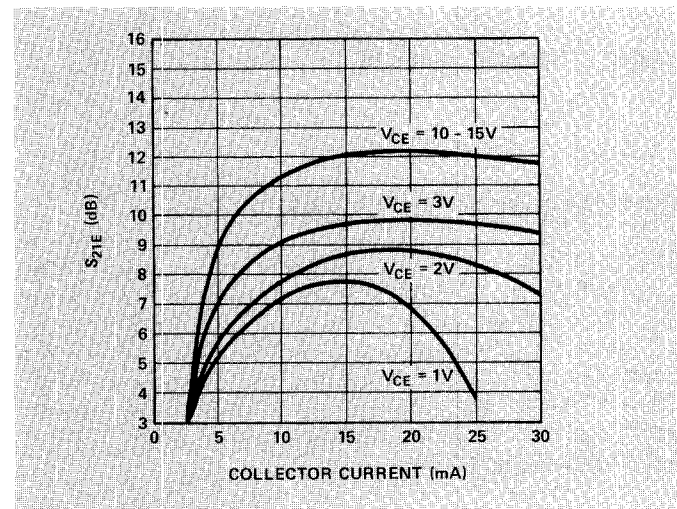

Figure 2. Typical S_{21E} vs. Current at 2GHz.

Typical S-Parameters* $V_{CE} = 15V$, $I_C = 25mA$

Freq. (MHz)	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag.	Ang.	(dB)	Mag.	Ang.	(dB)	Mag.	Ang.	Mag.	Ang.
100	0.57	-88	33.3	46.2	144	-42	0.008	58	0.85	-20
200	0.68	-124	30.2	32.5	123	-39	0.011	43	0.67	-26
300	0.72	-141	27.6	23.9	113	-38	0.013	37	0.56	-26
400	0.74	-150	25.4	18.7	106	-37	0.014	35	0.51	-24
500	0.75	-156	23.7	15.3	102	-37	0.014	35	0.48	-22
600	0.76	-160	22.2	12.9	99	-36	0.015	36	0.46	-21
700	0.76	-163	20.8	11.0	97	-36	0.015	37	0.45	-20
800	0.76	-165	19.9	9.8	95	-36	0.016	38	0.44	-19
900	0.76	-167	18.8	8.7	93	-36	0.016	40	0.44	-18
1000	0.76	-168	18.0	7.9	91	-35	0.017	42	0.44	-18
1500	0.77	-172	14.5	5.3	85	-34	0.021	49	0.43	-18
2000	0.77	-175	12.0	4.0	81	-32	0.025	54	0.43	-20
2500	0.77	-176	10.1	3.2	77	-31	0.029	58	0.43	-23
3000	0.77	-177	8.6	2.7	73	-29	0.034	60	0.43	-26
3500	0.77	-178	7.2	2.3	69	-28	0.038	61	0.44	-29
4000	0.76	-179	6.0	2.0	66	-27	0.043	62	0.44	-32
4500	0.76	-179	5.1	1.8	63	-26	0.048	62	0.45	-35
5000	0.76	-179	4.1	1.6	59	-26	0.052	62	0.45	-38
5500	0.76	-180	3.5	1.5	56	-25	0.057	62	0.46	-41
6000	0.76	-180	2.9	1.4	53	-24	0.062	61	0.47	-44

*Values do not include any parasitic bonding inductances and were generated by use of a computer model.