HEWLETT hp PACKARD
COMPONENTS

LINEAR POWER TRANSISTOR CHIP

HXTR-5001

NEW

Features

HIGH P_{1dB} LINEAR POWER
23 dBm Typical at 2 GHz
22 dBm Typical at 4 GHz

HIGH P_{1dB} GAIN
13.5 dB Typical at 2 GHz
8.0 dB Typical at 4 GHz

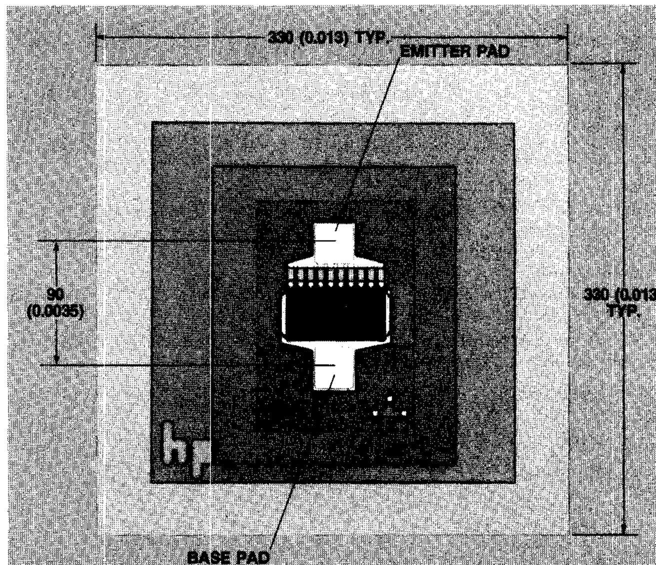
LOW DISTORTION

HIGH POWER-ADDED EFFICIENCY

Description/Applications

The HXTR-5001 is an NPN bipolar transistor chip designed for high output power and gain to 5 GHz. To achieve excellent uniformity and reliability, the manufacturing process utilizes ion implantation, self-alignment techniques and Ti/Pt/Au metallization. The chip has a dielectric scratch protection over its active area and Ta_2N ballast resistors for ruggedness.

The superior power, gain and distortion performance of the HXTR-5001 commend it for use in broad and narrow band commercial and military communications, radar, and ECM hybrid applications. Programs requiring hermetically packaged devices with similar performance should employ the HXTR-5101 and the HXTR-5103 which utilize this chip.



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		Test MIL-STD-750	Units	Min.	Typ.	Max.
BV_{CBO}	Collector-Base Breakdown Voltage at $I_C = 3$ mA		3001.1*	V	40		
BV_{CEO}	Collector-Emitter Breakdown Voltage at $I_C = 15$ mA		3011.1*	V	24		
BV_{EBO}	Emitter-Base Breakdown Voltage at $I_B = 30$ μA		3026.1*	V	3.3		
I_{EBO}	Emitter-Base Leakage Current at $V_{EB} = 2$ V		3061.1	μA			2
I_{CES}	Collector-Emitter Leakage Current at $V_{CE} = 32$ V		3041.1**	nA			200
I_{CBO}	Collector-Base Leakage Current at $V_{CB} = 20$ V		3036.1**	nA			100
h_{FE}	Forward Current Transfer Ratio at $V_{CE} = 18$ V, $I_C = 30$ mA		3076.1*		15	40	75
P_{1dB}	Power Output at 1 dB Gain Compression	f = 2 GHz 4 GHz		dBm		23 22	
G_{1dB}	Associated 1 dB Compressed Gain	f = 2 GHz 4 GHz		dB		13.5 8	
P_{SAT}	Saturated Power Output (8 dB Gain) (3 dB Gain)	f = 2 GHz 4 GHz		dBm		25.5 25	
η	Power-Added Efficiency at 1 dB Compression	f = 2 GHz 4 GHz		%		35 25	
IMD	Third Order Intermodulation Distortion (Reference to either tone), at P_O(PEP) = 22 dBm	f = 4 GHz		dB		-30	
	Tuned for Maximum Output Power at 1dB Compression $V_{CE} = 18$ V, $I_C = 30$ mA, $\theta_{JA} = 210°C/W$						

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

Recommended Maximum Continuous Operating Conditions[1]

Symbol	Parameter	Value
V_{CBO}	Collector to Base Voltage	40V
V_{CEO}	Collector to Emitter Voltage	22V
V_{EBO}	Emitter to Base Voltage	3.3V
I_C	DC Collector Current	50 mA
P_T	Total Device Dissipation[2]	700 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 x 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 150° 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	45V
V_{CEO}	Collector to Emitter Voltage	27V
V_{EBO}	Emitter to Base Voltage	4.0V
I_C	DC Collector Current	100 mA
P_T	Total Device Dissipation	1.4W
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.

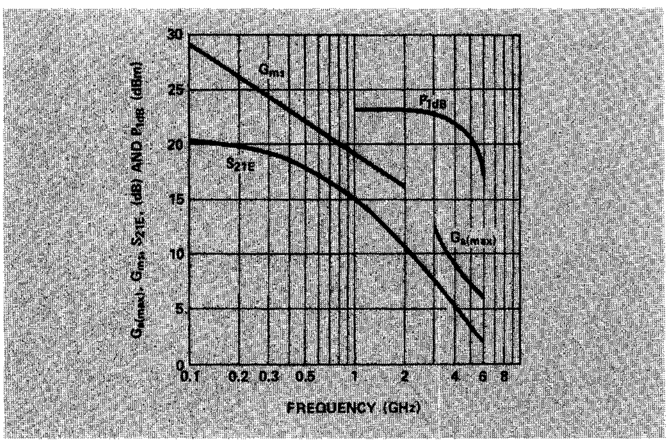


Figure 1. Typical G_a(max), Maximum Stable Gain (G_{ms}), S_{21E}, and P_{1dB} Linear Power vs. Frequency at V_{CE} = 18V, I_C = 30 mA.

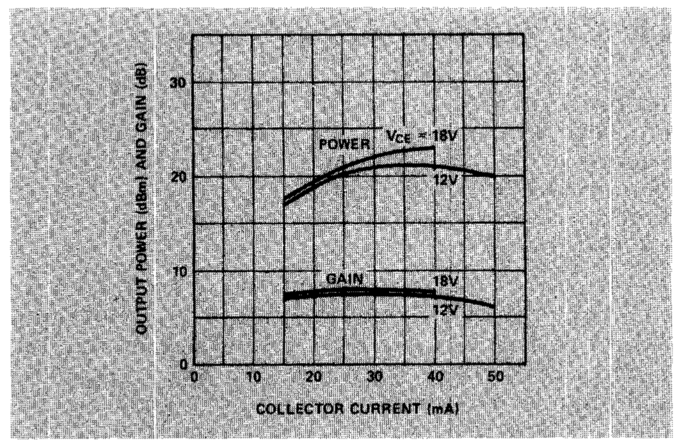


Figure 2. Typical P_{1dB} Linear Power and Associated 1 dB Compressed Gain vs. Current at V_{CE} = 12V and 18V at 4 GHz.

Typical S-Parameters* V_{CE} = 18V, I_C = 30 mA

	S_{11}		S_{21}			S_{12}			S_{22}	
Freq. (GHz)	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.
0.100	0.74	-15	20.2	10.2	171	-38	0.01	83	0.99	-5
0.200	0.73	-30	19.9	9.88	162	-33	0.02	75	0.97	-10
0.300	0.72	-44	19.5	9.42	154	-30	0.03	69	0.93	-15
0.400	0.71	-57	19.0	8.87	146	-28	0.04	63	0.89	-19
0.500	0.70	-68	18.4	8.28	140	-26	0.05	58	0.85	-22
0.600	0.69	-78	17.7	7.71	134	-25	0.06	54	0.80	-24
0.700	0.67	-87	17.1	7.16	129	-25	0.06	50	0.76	-26
0.800	0.67	-94	16.5	6.65	124	-24	0.06	47	0.73	-28
0.900	0.66	-101	15.8	6.19	120	-24	0.07	44	0.70	-29
1.000	0.65	-107	15.2	5.78	117	-23	0.07	42	0.67	-30
1.500	0.63	-128	12.6	4.25	103	-22	0.08	37	0.58	-32
2.000	0.62	-140	10.5	3.33	94	-22	0.08	35	0.53	-32
2.500	0.61	-148	8.7	2.73	87	-21	0.09	35	0.51	-33
3.000	0.61	-154	7.3	2.32	81	-21	0.09	35	0.50	-35
3.500	0.61	-158	6.1	2.02	76	-20	0.10	36	0.49	-36
4.000	0.60	-161	5.8	1.79	71	-20	0.10	37	0.49	-38
4.500	0.60	-164	4.1	1.61	66	-19	0.11	38	0.49	-40
5.000	0.60	-166	3.3	1.47	62	-19	0.11	39	0.49	-43
5.500	0.59	-168	2.6	1.35	58	-19	0.12	40	0.49	-45
6.000	0.59	-169	2.0	1.25	55	-18	0.12	40	0.49	-47

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