HEWLETT PACKARD
COMPONENTS

LOW NOISE TRANSISTOR

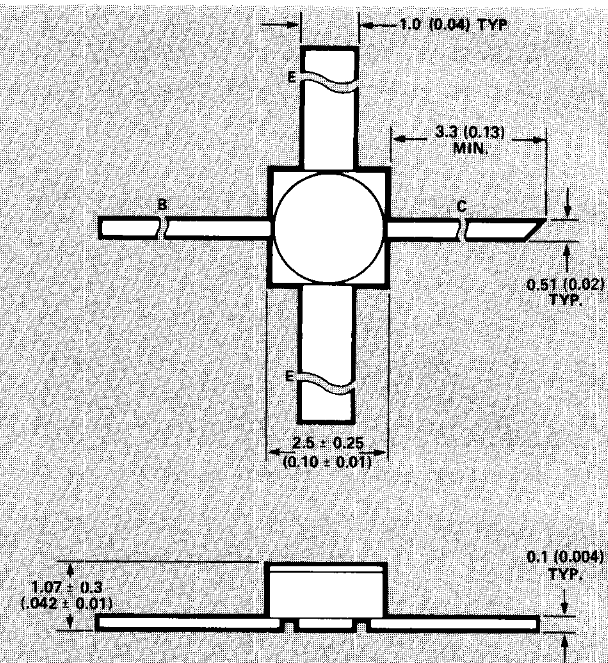
2N6618 NEW
(HXTR-6103)

Features

GUARANTEED LOW NOISE FIGURE
2.2 dB Max. at 2 GHz, 1.8 dB Typical

HIGH GAIN
12.0 dB Typical Gain at NF Bias Conditions

RUGGED HERMETIC PACKAGE
Co-fired Metal/Ceramic Construction



DIMENSIONS IN MILLIMETERS (INCHES).

HPAC-100 Package Outline

Description

The 2N6618 (HXTR-6103) is an NPN bipolar transistor designed for minimum noise figure at 2 GHz. The device utilizes ion implantation techniques and Ti/Pt/Au metallization in its manufacture. The chip is provided with scratch protection over its active area.

These devices are supplied in the HPAC-100, a rugged metal/ceramic hermetic package, and are capable of meeting the environmental requirements of MIL-S-19500 and the test requirements of MIL-STD-750/883.

Electrical Specifications at $T_{CASE} = 25°C$

Symbol	Parameters And Test Conditions	Test MIL-STD-750	Units	Min.	Typ.	Max.
BV_{CES}	Collector Emitter Breakdown Voltage at $I_C = 100\mu A$	3011.1*	V	30		
I_{CEO}	Collector Emitter Leakage Current at $V_{CE} = 10V$	3041.1	nA			500
I_{CBO}	Collector Cut Off Current at $V_{CB} = 10V$	3036.1	nA			100
h_{FE}	Forward Current Transfer Ratio at $V_{CE}=10V, I_C=3mA$	3076.1*	–	50	150	250
F_{MIN}	Minimum Noise Figure at 2 GHz	3246.1	dB		1.8	2.2
G_a	Associated Gain at 2 GHz Bias for above: $V_{CE} = 10V$, $I_C = 3$ mA		dB	11.0	12.0	
M_{MIN}**	Minimum Noise Measure $V_{CE} = 10V$, $I_C = 3$ mA, f= 2 GHz				1.90	2.35

*300 μs wide pulse measurement at ≤ 2% duty cycle.

** $M_{MIN} = 10 \text{ Log} \left(1 + \frac{F_{MIN} - 1}{1 - 1/G_a}\right)$ Noise measure (M_{MIN}) is the system noise figure of an infinite cascaded chain of identical amplifier stages. F_{MIN} and G_a specified as power ratios.

Recommended Maximum Continuous Operating Conditions[1]

Symbol	Parameter	Value
V_{CBO}	Collector to Base Voltage[2]	25V
V_{CEO}	Collector to Emitter Voltage[2]	16V
V_{EBO}	Emitter to Base Voltage[2]	1.0V
I_C	DC Collector Current[2]	10 mA
P_T	Total Device Dissipation[3]	150 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). Corresponds to maximum rating for 2N6618.
2. T_{CASE} = 25° C.
3. Derate at 3.3 mW/° C, $T_C \geq$ 155° C.

Absolute Maximum Ratings*

Symbol	Parameter	Limit
V_{CBO}	Collector to Base Voltage	35V
V_{CEO}	Collector to Emitter Voltage	20V
V_{EBO}	Emitter to Base Voltage	1.5V
I_C	DC Collector Current	20 mA
P_T	Total Device Dissipation	300 mW
T_J	Junction Temperature	300° C
$T_{STG(MAX)}$	Maximum Storage Temperature	250° C
—	Lead Temperature (Soldering 10 seconds each lead)	+250° C

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

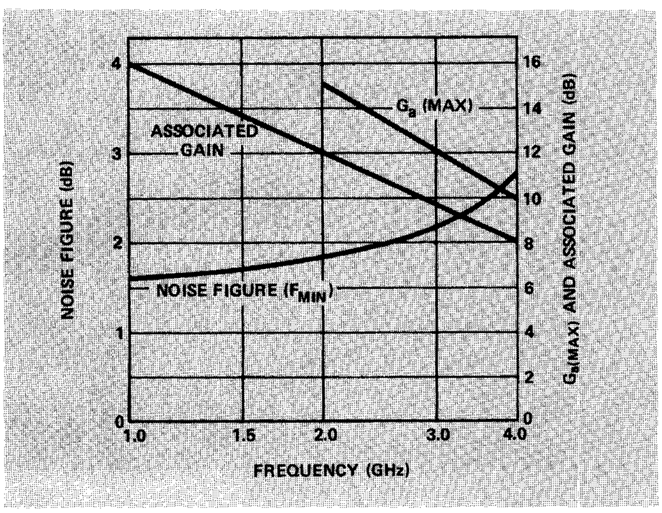


Figure 1. Typical $G_{a(max)}$, F_{MIN} and Associated Gain vs. Frequency at V_{CE} = 10V, I_C = 3 mA.

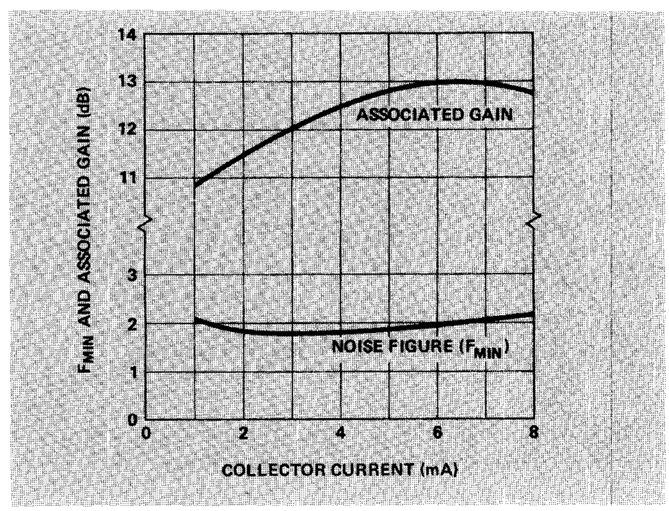


Figure 2. Typical F_{MIN} and Associated Gain vs. Collector Current at 2 GHz for V_{CE} = 10V (Tuned for F_{MIN}).

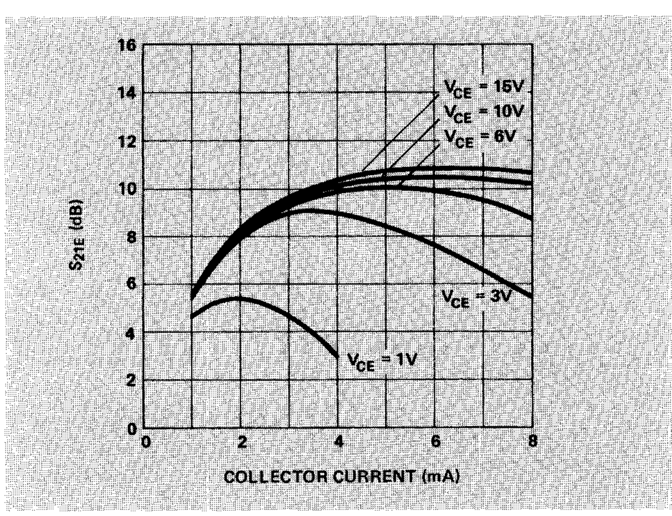


Figure 3. Typical S_{21E} vs. Bias at 2 GHz.

Typical Noise Parameters

Freq. (MHz)	Γ_o (Mag./Ang.)	R_N (Ohms)	F_{MIN} (dB)
1000	.465/36°	25.09	1.55
1500	.369/67°	22.47	1.65
2000	.323/94°	23.31	1.80

Figure 4. Typical Noise Parameters at V_{CE} = 10V, I_C = 3 mA.

Typical S-Parameters V_{CE} = 10V, I_C = 3 mA

Freq. (MHz)	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag.	Ang.	(dB)	Mag.	Ang.	(dB)	Mag.	Ang.	Mag.	Ang.
100	0.93	-11.5	16.2	6.46	168.0	-42.0	0.01	77.0	0.99	-4.0
200	0.89	-23.0	17.1	7.13	158.0	-37.0	0.01	77.0	0.97	-8.0
300	0.86	-34.0	16.4	6.58	149.0	-34.0	0.02	66.0	0.94	-12.0
400	0.83	-44.0	15.9	6.26	142.0	-32.0	0.03	60.0	0.92	-16.0
500	0.79	-54.0	15.6	6.02	135.0	-30.0	0.03	55.0	0.89	-19.0
600	0.75	-65.0	15.4	5.91	128.0	-29.0	0.04	51.0	0.87	-21.0
700	0.71	-73.0	15.0	5.62	121.0	-29.0	0.04	48.0	0.85	-24.0
800	0.68	-81.0	14.4	5.25	116.0	-28.0	0.04	45.0	0.84	-25.0
900	0.65	-91.0	14.0	4.99	111.0	-28.0	0.04	43.0	0.83	-27.0
1000	0.62	-97.0	13.5	4.72	106.0	-27.0	0.04	41.0	0.81	-28.0
1500	0.52	-129.0	11.4	3.71	84.0	-27.0	0.05	32.0	0.74	-35.0
2000	0.50	-151.0	9.3	2.93	69.0	-26.0	0.05	31.0	0.72	-43.0
2500	0.50	-169.0	7.8	2.45	55.0	-26.0	0.05	31.0	0.69	-51.0
3000	0.49	175.0	6.5	2.12	42.0	-26.0	0.06	33.0	0.68	-57.0
3500	0.54	165.0	5.4	1.87	29.0	-25.0	0.06	35.0	0.65	-68.0
4000	0.52	156.0	4.5	1.67	19.0	-24.0	0.06	37.0	0.68	-76.0
5000	0.53	140.0	2.6	1.35	-3.0	-23.0	0.08	35.0	0.71	-96.0
6000	0.48	120.0	0.9	1.11	-22.0	-21.0	0.09	34.0	0.73	-112.0