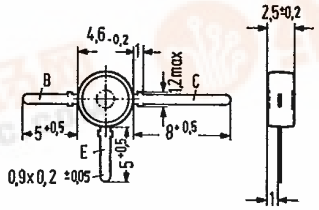
NPN Silicon Transistor for Low-Noise RF Broadband Amplifiers

BFR 34 A
2 N 6620

SIEMENS AKTIENGESELLSCHAF

BFR 34 A is an epitaxial NPN silicon planar RF transistor in a plastic package similar to TO 119 (50 B 3 DIN 41867) intended for use in RF amplifiers up to the GHz range, e. g. for low-noise input stages, broadband antenna amplifiers and oscillators. BFR 34 A is also available upon request as JEDEC type under the designation 2N6620.

Type	Ordering code
BFR 34 A	Q62702-F346-S1
2N 6620	Q68000-A4668



Approx. weight 0.25 g Dimensions in mm

Maximum ratings		BFR 34 A 2 N 6620	
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage ($R_{BE} \leq 50\ \Omega$)	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	30	mA
Base current	I_B	4	mA
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	–55 to +125	°C
Total power dissipation ($T_{amb} \leq 50$°C)	P_{tot}	200	mW
Thermal resistance			
Junction to ambient air (mounted on glass fiber epoxy resin PCB 40 mm x 25 mm x 1.5 mm)	R_{thJA}	≤500	K/W

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Static characteristics (T_{amb} = 25 °C)		**BFR 34 A 2 N 6620**	
Collector-emitter breakdown voltage (I_{CEO} = 500 µA)	$V_{(BR)CEO}$	>12	V
Collector-emitter breakdown voltage (I_{CER} = 10 mA; R_{BE} = 50 Ω)	$V_{(BR)CER}$	>20	V
Emitter-base breakdown voltage (I_{EBO} = 100 µA)	$V_{(BR)EBO}$	>2.5	V
Collector cutoff current (V_{CBO} = 10 V)	I_{CBO}	<50	nA
DC current gain (I_C = 5 to 25 mA; V_{CE} = 6 V)	h_{FE}	≥25	–
Dynamic characteristics (T_{amb} = 25 °C)			
Small signal current gain (I_C = 5 mA; V_{CE} = 6 V; f = 1 kHz)	h_{fe}	70	–
Transition frequency (I_C = 200 mA; V_{CE} = 10 V; f = 200 MHz)	f_T	5	GHz
Reverse transfer capacitance (I_C = 1 mA; V_{CE} = 6 V; f = 1 MHz)	C_{12e}	0.4	pF
Collector-base capacitance (V_{CBO} = 10 V, f = 1 MHz)	C_{CBO}	0.75	pF
Noise figure (I_C = 2 mA; V_{CE} = 6 V; f = 10 MHz; R_g = 75 Ω	NF	1.8	dB
(I_C = 2 mA; V_{CE} = 6 V; f = 200 MHz; R_g = 75 Ω)	NF	2	dB
(I_C = 2 mA; V_{CE} = 6 V; f = 800 MHz; R_g = 60 Ω)	NF	2	dB
(I_C = 3 mA; V_{CE} = 10 V; f = 2 GHz; $Z_g = Z_{g\,opt}$)	NF	4	dB
Power gain (I_C = 15 mA; V_{CE} = 6 V; f = 800 MHz; R_g = 60 Ω)	G_{pe}	14	dB
Output voltage (three tone modulation f approx. 800 MHz) (I_C = 15 mA, V_{CE} = 6 V; d_{IM} = 60 dB; $R_g = R_L$ = 75 Ω)	V_O	140	mV

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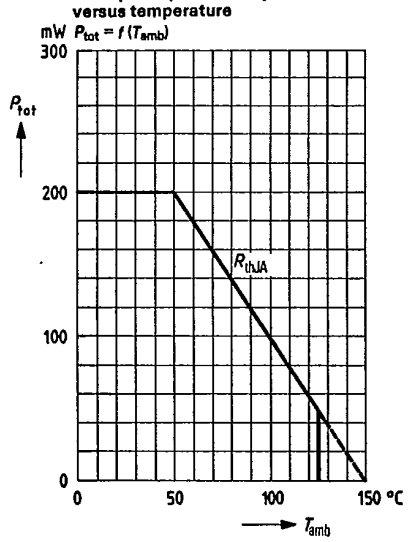
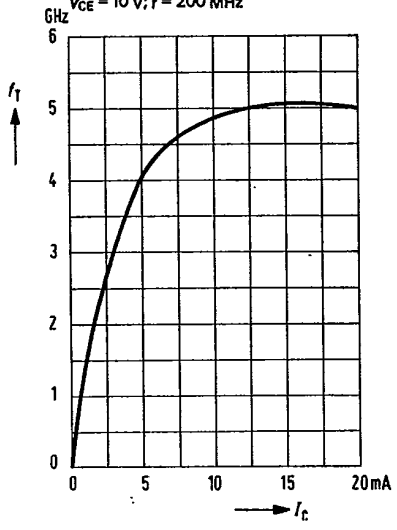
S parameter
Operating point: V_{CE} = 6 V, I_C = 5 mA, Z_o = 50 Ω

f (GHz)	S_{11}	φ	S_{21}	φ	S_{12}	φ	S_{22}	φ
0,1	0,794	– 27	13,08	153	0,021	75	0,930	–13
0,2	0,663	– 52	11,38	136	0,037	62	0,843	–20
0,3	0,535	– 71	9,11	121	0,047	58	0,697	–27
0,4	0,420	– 89	7,70	110	0,054	57	0,691	–27
0,5	0,385	–103	6,50	103	0,062	58	0,595	–26
0,6	0,306	–113	5,57	97	0,068	58	0,577	–30
0,7	0,287	–131	4,95	91	0,076	58	0,546	–31
0,8	0,272	–138	4,35	86	0,084	58	0,539	–33
0,9	0,254	–153	3,96	83	0,089	60	0,543	–34
1,0	0,264	–158	3,51	79	0,095	60	0,520	–33
1,1	0,256	–169	3,29	75	0,104	60	0,502	–37
1,2	0,268	–175	3,03	72	0,111	61	0,504	–38
1,3	0,271	177	2,82	69	0,120	61	0,488	–42
1,4	0,280	171	2,60	66	0,125	60	0,508	–42
1,5	0,236	158	2,30	62	0,121	53	0,439	–46
1,6	0,314	165	2,36	60	0,139	62	0,467	–46
1,7	0,328	161	2,21	59	0,148	64	0,469	–46
1,8	0,345	157	2,07	54	0,154	61	0,439	–50
1,9	0,354	156	1,99	52	0,162	62	0,452	–53
2,0	0,374	153	1,90	49	0,169	60	0,435	–55

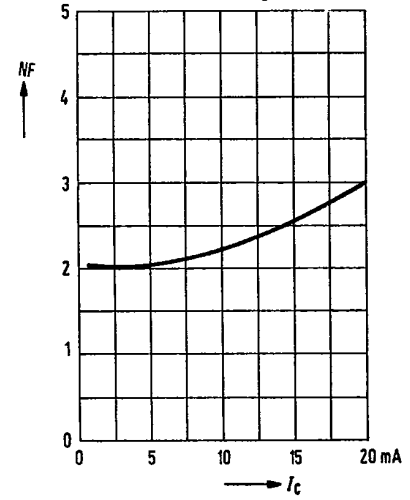
Total perm. power dissipation versus temperature



Transition frequency $f_T = f(I_C)$
$V_{CE} = 10$ V; $f = 200$ MHz



Noise figure $NF = f(I_C)$
dB $V_{CE} = 6$ V; $f = 800$ MHz; $R_g = 60\ \Omega$



Noise figure $NF = f(f)$