

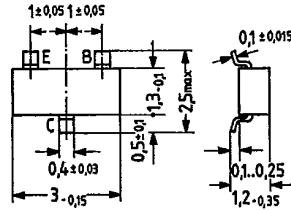
**NPN Silicon Transistor for Low-Noise RF Broadband Amplifiers and High-Speed Switching Applications**

**BFR 35 A  
BFR 35 AR  
2 N 6619**

SIEMENS AKTIENGESELLSCHAFT '4 0 7-31-15

BFR 35 A is an epitaxial NPN silicon planar RF transistor in TO 236 plastic package (23 A 3 DIN 41869), intended for use in film circuits up to the GHz range, e. g. for broadband amplifiers and ultrafast, unsaturated logic circuits. The transistor BFR 35 A is marked with the code letters "GB". The transistor is also available upon request with changed terminal sequence ("E" and "B" interchanged) under the designation BFR 35 AR (mark "GZ"). The BFR 35 A is also available upon request as JEDEC type, designated 2N6619,

Type	Mark	Ordering code
BFR 35 A	GB	Q62702-F347-S1
BFR 35 AR	GZ	Q62702-F500
2 N 6619	GB	Q68000-A4667



Approx. weight 0.02 g      Dimensions in mm

**Maximum ratings**

- Collector-emitter voltage
- Collector-emitter voltage ( $R_{BE} \leq 50 \Omega$ )
- Emitter-base voltage
- Collector current
- Base current
- Junction temperature
- Storage temperature range
- Total power dissipation ( $T_{amb} \leq 50^\circ\text{C}$ )

	BFR 35 A 2 N 6619	
$V_{CEO}$	12	V
$V_{CER}$	20	V
$V_{EBO}$	2.5	V
$I_C$	30	mA
$I_B$	4	mA
$T_j$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +125	$^\circ\text{C}$
$P_{tot}$	200	mW

**Thermal resistance**

- Junction to ambient air
- Junction to substrate back  
(ceramic substrate 0.7 mm; 2.5 cm<sup>2</sup> area)

$R_{thJA}$	<500	K/W
$R_{thJSB}$	<400	K/W

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Static characteristics ( $T_{amb} = 25^{\circ}\text{C}$ )

Collector-emitter breakdown voltage

 $(I_{CEO} = 500 \mu\text{A})$  $V_{(BR)CEO} > 12 \text{ V}$ 

Collector-emitter breakdown voltage

 $(I_{CER} = 10 \text{ mA}; R_{BE} = 50 \Omega)$  $V_{(BR)CER} > 20 \text{ V}$ 

Emitter-base breakdown voltage

 $(I_{EBO} = 100 \mu\text{A})$  $V_{(BR)EBO} > 2.5 \text{ V}$ 

Collector cutoff current

 $(V_{CBO} = 10 \text{ V})$  $I_{CBO} < 50 \text{ nA}$ 

DC current gain

 $(I_C = 5 \text{ to } 20 \text{ mA}; V_{CE} = 6 \text{ V})$  $h_{FE} > 25$ Dynamic characteristics ( $T_{amb} = 25^{\circ}\text{C}$ )

Small-signal current gain

 $(I_C = 5 \text{ mA}; V_{CE} = 6 \text{ V}; f = 1 \text{ kHz})$  $h_{fe} 70$ 

Transition frequency

 $(I_C = 20 \text{ mA}; V_{CE} = 10 \text{ V}; f = 200 \text{ MHz})$  $f_T 5 \text{ GHz}$ 

Reverse transfer capacitance

 $(I_C = 1 \text{ mA}; V_{CE} = 6 \text{ V}; f = 1 \text{ MHz})$  $C_{12e} 0.4 \text{ pF}$ 

Collector-base capacitance

 $(V_{CBO} = 10 \text{ V}; f = 1 \text{ MHz})$  $C_{CBO} 0.7 \text{ pF}$ 

Noise figure

 $(I_C = 2 \text{ mA}; V_{CE} = 6 \text{ V}; f = 200 \text{ MHz}; R_g = 75 \Omega)$  $NF 2 \text{ dB}$  $(I_C = 2 \text{ mA}; V_{CE} = 6 \text{ V}; f = 800 \text{ MHz}; R_g = 60 \Omega)$  $NF 2 \text{ dB}$  $(I_C = 3 \text{ mA}; V_{CE} = 10 \text{ V}; f = 2 \text{ GHz}; R_g = R_{g \text{ opt}})$  $NF 4 \text{ dB}$ 

Power gain

 $(I_C = 15 \text{ mA}; V_{CE} = 6 \text{ V}; f = 800 \text{ MHz};$  $R_g = 60 \Omega)$  $G_{pe} 14 \text{ dB}$ 

Output voltage:

(three tone modulation  $f$  approx. 800 MHz) $(I_C = 15 \text{ mA}; V_{CE} = 6 \text{ V};$  $d_{IM} = 60 \text{ dB}; R_g = R_L = 75 \Omega)$  $V_O 140 \text{ mV}$

25C D ■ 8235605 0004676 3 ■ SIEG

25C 04676 DT-31-15

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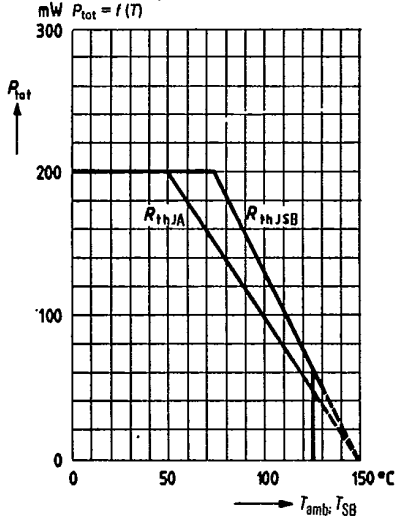
**S parameter**

Operating point:  $V_{CE} = 6 \text{ V}$ ,  $I_C = 5 \text{ mA}$ ,  $Z_o = 50 \Omega$

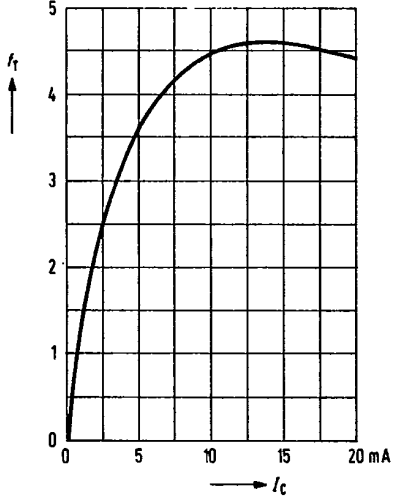
f (GHz)	S <sub>11</sub>	$\varphi$	S <sub>21</sub>	$\varphi$	S <sub>12</sub>	$\varphi$	S <sub>22</sub>	$\varphi$
0,1	0,771	- 29	12,75	150	0,025	73	0,971	-14
0,2	0,639	- 55	10,70	130	0,041	63	0,807	-21
0,3	0,486	- 72	8,34	115	0,052	57	0,697	-27
0,4	0,400	- 87	6,92	104	0,063	57	0,650	-26
0,5	0,326	- 97	5,78	97	0,071	57	0,582	-29
0,6	0,289	-105	4,88	91	0,079	57	0,591	-31
0,7	0,232	-112	4,30	85	0,089	56	0,585	-25
0,8	0,206	-123	3,79	80	0,098	56	0,501	-27
0,9	0,180	-129	3,47	76	0,109	57	0,527	-34
1,0	0,168	-142	3,12	73	0,116	57	0,560	-31
1,1	0,151	-146	2,88	68	0,125	56	0,505	-29
1,2	0,124	-163	2,65	64	0,136	55	0,512	-39
1,3	0,131	-174	2,50	60	0,147	54	0,541	-35
1,4	0,124	173	2,34	57	0,157	54	0,474	-36
1,5	0,128	164	2,20	53	0,167	53	0,521	-45
1,6	0,132	148	2,08	49	0,174	51	0,539	-38
1,7	0,160	142	1,98	47	0,188	51	0,425	-40
1,8	0,158	140	1,83	43	0,192	49	0,460	-60
1,9	0,160	131	1,81	40	0,207	47	0,586	-51
2,0	0,180	123	1,73	37	0,216	47	0,480	-43

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Total perm. power dissipation  
versus temperature



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



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

