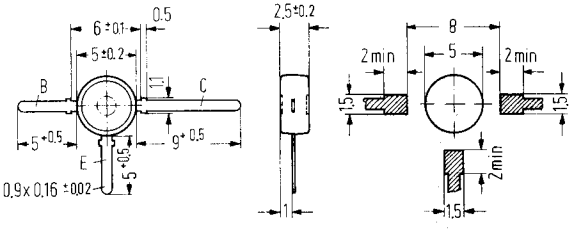
NPN Transistor for low-noise RF amplifier applications

Preliminary data

BFR 34 and BFR 34 A are epitaxial NPN silicon planar UHF transistors in a plastic case 50 B 3, DIN 41867 (sim. to TO-50) for use in RF amplifiers up into the GHz range, e.g. low-noise pre-stages, broadband antenna amplifiers and oscillators.

Type	Order number
BFR 34	Q62702-F346
BFR 34 A	Q62702-F346-S1



Weight approx. 0.25 g Dimensions in mm

Maximum ratings

		BFR 34 BFR 34 A	
Collector-emitter voltage	V_{CEO}	12	V
Collector-emitter voltage (R_{BE} = 50 Ω)	V_{CER}	20	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	30	mA
Base current	I_B	4	mA
Junction temperature	T_j	125	°C
Storage temperature	T_s	−55 to +125	°C
Total power dissipation[1]) (T_{amb} = 25 °C)	P_{tot}	200	mW
Thermal resistance			
Junction to air	R_{thJamb}	≦650	K/W
Junction to air[1])	R_{thJamb}	≦500	K/W

[1]) When mounted on epoxy glass 40 × 25 × 1.5 mm

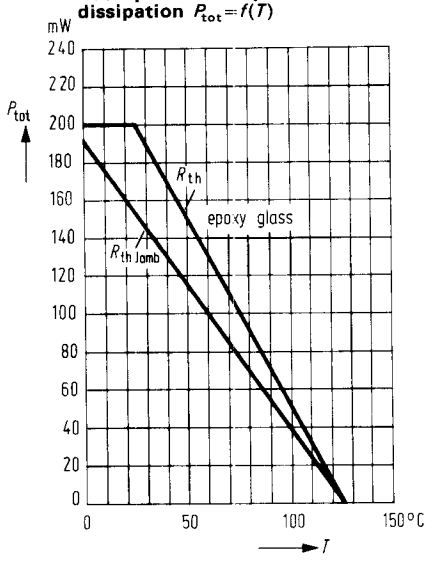
Static characteristics ($T_{amb}=25$ °C)		BFR 34 A	BFR 34	
Collector-emitter breakdown voltage ($I_{CEO}=500$ µA)	$V_{(BR)CEO}$	>12	>12	V
Collector-emitter breakdown voltage ($I_{CER}=10$ mA; $R_{BE}=50$ Ω)	$V_{(BR)CER}$	>20	>20	V
Emitter-base breakdown voltage ($I_{EBO}=100$ µA)	$V_{(BR)EBO}$	>3.5	>3.5	V
Collector-base cutoff current ($V_{CBO}=10$ V)	I_{CBO}	<50	<50	nA
DC forward current transfer ratio ($I_C=5$ to 25 mA; $V_{CE}=6$ V)	h_{FE}	≧25	≧25	–
Dynamic characteristics ($T_{amb}=25$ °C)				
Short-circuit forward current transfer ratio ($F_C=5$ mA; $V_{CE}=6$ V; $f=1$ kHz)	h_{21e}	70	70	–
Current-gain bandwidth product ($I_C=20$ mA; $V_{CE}=10$ V; $f=500$ MHz)	f_T	4.5	–	GHz
($I_C=10$ mA; $V_{CE}=6$ V; $f=500$ MHz)	f_T	–	3.3	GHz
($I_C=20$ mA; $V_{CE}=5$ V; $f=500$ MHz)	f_T	–	3.0	GHz
Short-circuit feedback capacitance ($I_C=1$ mA; $V_{CE}=6$ V; $f=1$ MHz)	$-C_{12e}$	0.38	0.38	pf
Collector-base capacitance ($V_{CBO}=10$ V; $f=1$ MHz)	C_{CBO}	0.75	0.75	pf
Noise figure				
($I_C=2$ mA; $V_{CE}=6$ V; $f=1$ MHz; $R_g=100$ Ω)	NF	–	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=200$ MHz; $R_g=100$ Ω)	NF	2	2	db
($I_C=2$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60$ Ω)	NF	2.5	3	db
($I_C=3$ mA; $V_{CE}=10$ V; $f=2$ GHz; $Z_g=Z_{gopt}$)	NF	4	5.5	db
Power gain				
($I_C=15$ mA; $V_{CE}=6$ V; $f=800$ MHz; $R_g=60$ Ω; $Z_L=Z_{Lopt}$)	G_{pe}	13	–	db

BFR 34 A:

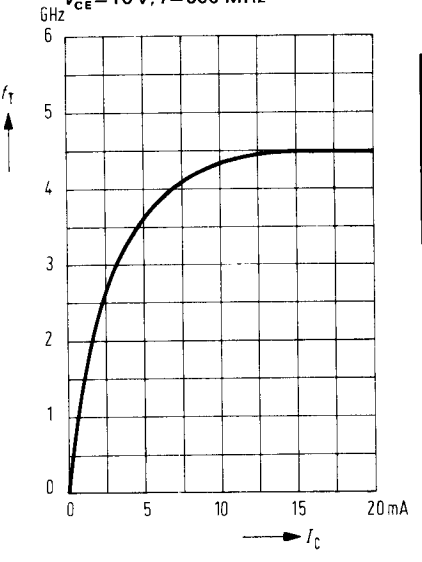
S-parameters at $V_{CE}=6$ V; $I_C=15$ mA; $Z_0=50$ Ω

$f=200$ MHz	$f=800$ MHz
$S_{11e}=0.33$; $\varphi_{11e}=-90°$	$S_{11e}=0.2$; $\varphi_{11e}=-175°$
$S_{22e}=0.68$; $\varphi_{22e}=-20°$	$S_{22e}=0.5$; $\varphi_{22e}=-20°$
$S_{12e}=0.028$; $\varphi_{12e}=+70°$	$S_{12e}=0.07$; $\varphi_{12e}=+75°$
$S_{21e}=15.5$; $\varphi_{21e}=+120°$	$S_{21e}=4.3$; $\varphi_{21e}=+80°$

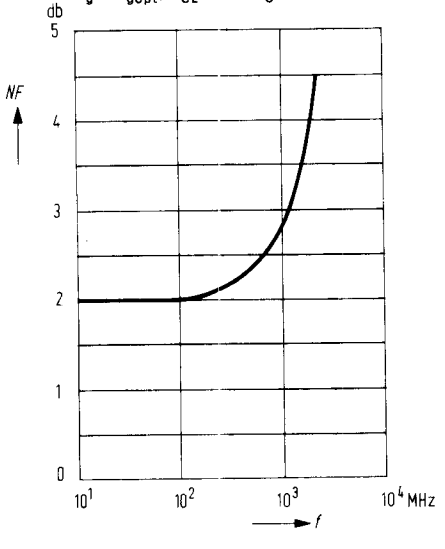
Total permissible power dissipation $P_{tot}=f(T)$



Current-gain bandwidth product $f_T=f(I_C)$
$V_{CE}=10$ V; $f=500$ MHz



Noise figure $NF=f(f)$
$R_g=R_{gopt}$; $V_{CE}=6$ V; $I_C=2$ mA



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