

Silicon NPN Planar RF Transistor

Electrostatic sensitive device.
Observe precautions for handling.

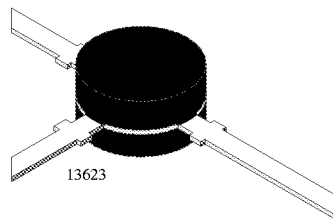
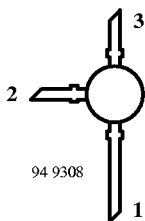


Applications

RF-amplifier up to GHz range specially for wide band antenna amplifier.

Features

- High power gain
- Low noise figures
- High transition frequency



Marking: BFQ 65
Plastic case (TO 50)
1 = Collector; 2 = Emitter; 3 = Base

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	10	V
Emitter-base voltage	V_{EBO}	2.5	V
Collector current	I_C	50	mA
Total power dissipation $T_{amb} \leq 60^\circ\text{C}$	P_{tot}	300	mW
Junction temperature	T_j	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-65 to +150	$^\circ\text{C}$

Maximum Thermal Resistance

Parameters	Symbol	Maximum	Unit
Junction ambient on glass fibre printed board (40 x 25 x 1.5) mm ³ plated with 35 μm Cu	R_{thJA}	300	K/W

Electrical DC Characteristics

$T_{amb} = 25^{\circ}\text{C}$

Parameters / Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector-emitter cut-off current $V_{CE} = 20\text{ V}, V_{BE} = C$	I_{CES}			100	μA
Collector-base cut-off current $V_{CB} = 15\text{ V}, I_E = 0$	I_{CBO}			100	nA
Emitter-base cut-off current $V_{EB} = 1\text{ V}, I_C = 0$	I_{EBO}			1	μA
Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	10			V
Collector-emitter saturation voltage $I_C = 50\text{ mA}, I_B = 5\text{ mA}$	V_{CEsat}		0.1	0.4	V
DC forward current transfer ratio $I_C = 15\text{ mA}, V_{CE} = 5\text{ V}$	h_{FE}	60	100	150	

Electrical AC Characteristics

$T_{amb} = 25^{\circ}\text{C}$

Parameters / Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Transition frequency $V_{CE} = 8\text{ V}, I_C = 15\text{ mA}, f = 500\text{ MHz}$	f_T		7.5		GHz
Collector-base capacitance $V_{CB} = 8\text{ V}, f = 1\text{ MHz}$	C_{cb}		0.4		pF
Collector-emitter capacitance $V_{CE} = 8\text{ V}, f = 1\text{ MHz}$	C_{ce}		0.3		pF
Emitter-base capacitance $V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}$	C_{eb}		1.0		pF
Noise figure $V_{CE} = 8\text{ V}, Z_S = 50\ \Omega, f = 800\text{ MHz}$ $I_C = 5\text{ mA}$ $I_C = 15\text{ mA}$	F F		1.3 1.7		dB dB
$V_{CE} = 8\text{ V}, Z_S = 50\ \Omega, f = 2\text{ GHz}$ $I_C = 5\text{ mA}$ $I_C = 15\text{ mA}$	F F		2.5 3.0		dB dB
Power gain $I_C = 15\text{ mA}, V_{CE} = 8\text{ V}, f = 2\text{ GHz}, Z_S = 50\ \Omega,$ $Z_L = Z_{Lopt}$	G_{pe}		8		dB
Linear output voltage – two tone intermodulation test $V_{CE} = 8\text{ V}, I_C = 15\text{ mA}, d_{IM} = 60\text{ dB},$ $f_1 = 806\text{ MHz}, f_2 = 810\text{ MHz}, Z_S = Z_L = 50\ \Omega$	$V_{01} = V_{02}$		160		mV
Third order intercept point $V_{CE} = 8\text{ V}, I_C = 15\text{ mA}, f = 800\text{ MHz}$	IP_3		26		dBm

Common Emitter S-Parameters

V _{CE} /V	I _C /mA	f/MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
			LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG	LIN MAG	ANG
				deg		deg		deg		deg
8	5	100	0.813	-27.4	13.71	157.3	0.020	76.8	0.943	-13.0
		300	0.600	-71.0	10.17	125.7	0.047	62.9	0.763	-28.5
		500	0.447	-100.9	7.39	106.9	0.063	59.4	0.652	-35.2
		800	0.336	-133.0	5.04	89.6	0.084	60.5	0.585	-41.8
		1000	0.289	-149.8	4.10	81.2	0.098	61.9	0.569	-46.1
		1200	0.264	-164.8	3.48	74.4	0.114	62.6	0.563	-50.7
		1500	0.236	-175.8	2.81	65.5	0.139	63.0	0.566	-57.7
		1800	0.217	-157.0	2.38	57.4	0.164	62.6	0.578	-65.0
		2000	0.205	-147.5	2.17	52.8	0.179	61.9	0.589	-69.8
	10	100	0.661	-38.2	21.80	148.0	0.018	74.0	0.879	-18.1
		300	0.398	-86.9	13.04	113.8	0.039	66.1	0.636	-31.3
		500	0.283	-114.8	8.62	98.3	0.056	67.4	0.548	-35.2
		800	0.220	-144.6	5.63	84.7	0.082	69.1	0.508	-41.1
		1000	0.194	-160.9	4.55	77.9	0.101	69.4	0.501	-45.7
		1200	0.182	-174.5	3.84	72.1	0.120	68.8	0.500	-50.5
		1500	0.170	-168.0	3.10	64.5	0.148	67.1	0.507	-58.2
		1800	0.157	-149.9	2.63	57.1	0.177	65.2	0.521	-65.8
		2000	0.151	-140.7	2.38	52.8	0.194	63.7	0.531	-70.8
	15	100	0.551	-45.6	26.77	142.0	0.016	72.9	0.828	-21.1
		300	0.304	-96.1	14.11	108.4	0.036	69.4	0.576	-31.3
		500	0.216	-122.9	9.04	94.9	0.054	71.5	0.505	-34.1
		800	0.177	-152.2	5.82	82.6	0.083	72.3	0.477	-40.3
		1000	0.160	-167.4	4.69	76.4	0.102	71.9	0.474	-45.2
		1200	0.153	-178.8	3.96	71.1	0.123	71.0	0.476	-50.3
		1500	0.144	-163.0	3.20	63.9	0.152	68.7	0.484	-58.3
		1800	0.136	-144.9	2.71	56.8	0.182	66.0	0.498	-66.2
		2000	0.133	-136.3	2.47	52.7	0.200	64.2	0.508	-71.2
	20	100	0.472	-51.3	29.92	137.7	0.015	72.8	0.788	-22.8
		300	0.250	-102.7	14.61	105.4	0.035	72.4	0.542	-30.9
		500	0.183	-129.7	9.22	92.9	0.054	73.9	0.484	-33.3
		800	0.157	-156.6	5.92	81.6	0.083	74.2	0.462	-39.5
		1000	0.145	-171.8	4.76	75.6	0.104	73.1	0.461	-44.7
		1200	0.141	-174.2	4.02	70.5	0.124	71.8	0.463	-50.1
		1500	0.133	-159.7	3.25	63.5	0.155	69.4	0.472	-58.2
		1800	0.134	-140.9	2.74	56.6	0.185	66.6	0.487	-66.2
		2000	0.128	-135.5	2.50	52.5	0.203	64.4	0.496	-71.3
	30	100	0.366	-60.5	33.31	132.4	0.014	74.0	0.736	-24.7
		300	0.197	-114.6	15.00	102.0	0.034	75.0	0.506	-29.8
		500	0.158	-141.2	9.32	90.8	0.053	76.3	0.461	-32.0
		800	0.147	-165.8	5.95	80.2	0.083	75.7	0.447	-38.9
		1000	0.142	-178.5	4.79	74.3	0.104	74.4	0.446	-44.3
		1200	0.139	-169.5	4.04	69.3	0.125	72.8	0.450	-49.8
		1500	0.136	-154.0	3.26	62.5	0.156	69.9	0.460	-58.2
		1800	0.136	-138.7	2.76	55.6	0.187	66.7	0.476	-66.4
		2000	0.132	-130.5	2.51	51.6	0.204	64.5	0.486	-71.7

Typical Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified)

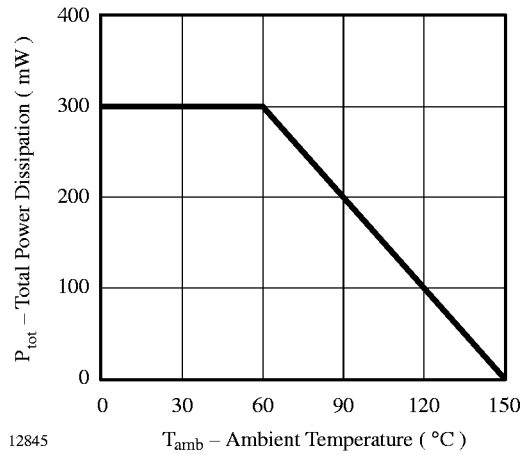


Figure 1. Total Power Dissipation vs. Ambient Temperature

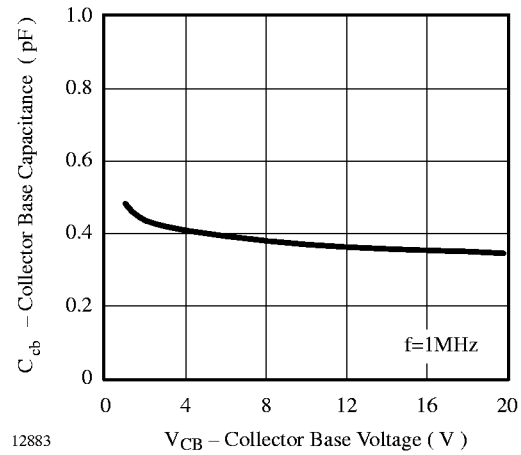


Figure 3. Collector Base Capacitance vs. Collector Base Voltage

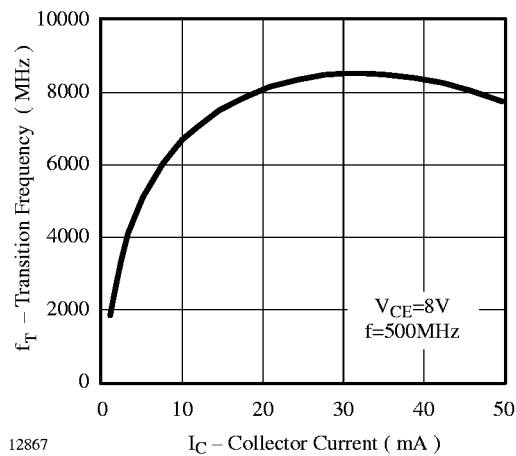


Figure 2. Transition Frequency vs. Collector Current

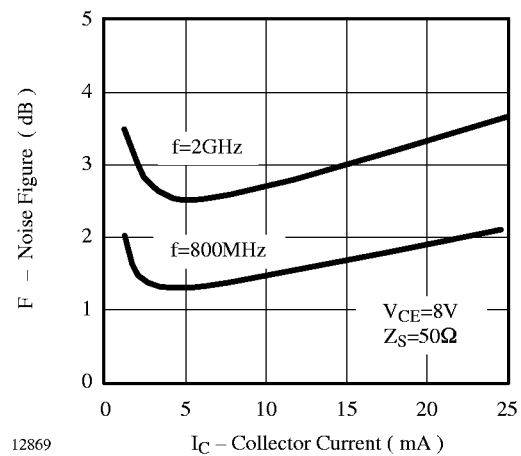


Figure 4. Noise Figure vs. Collector Current

$V_{CE} = 8 \text{ V}; I_C = 15 \text{ mA}; Z_0 = 50 \Omega$

S_{11}

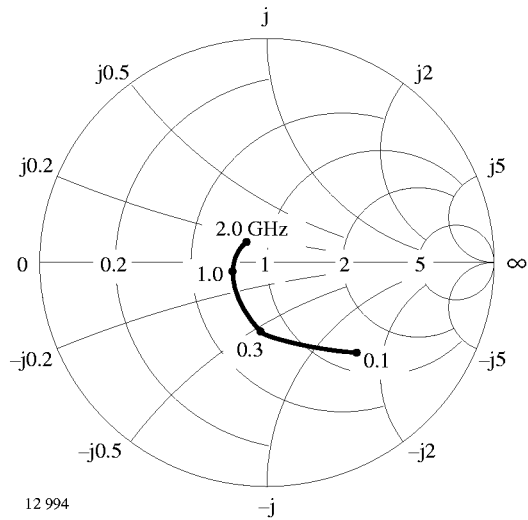


Figure 5. Input reflection coefficient

S_{12}

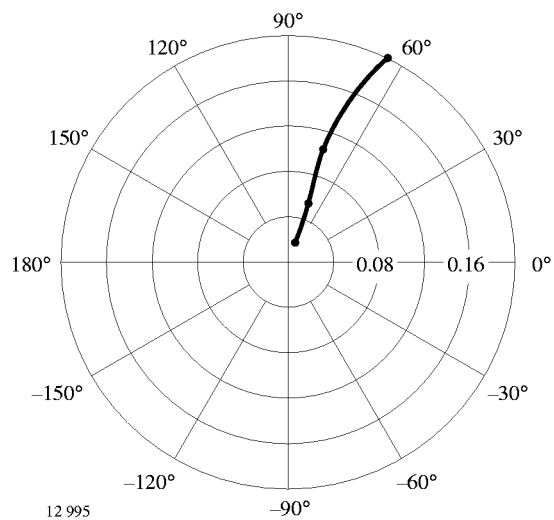


Figure 7. Reverse transmission coefficient

S_{21}

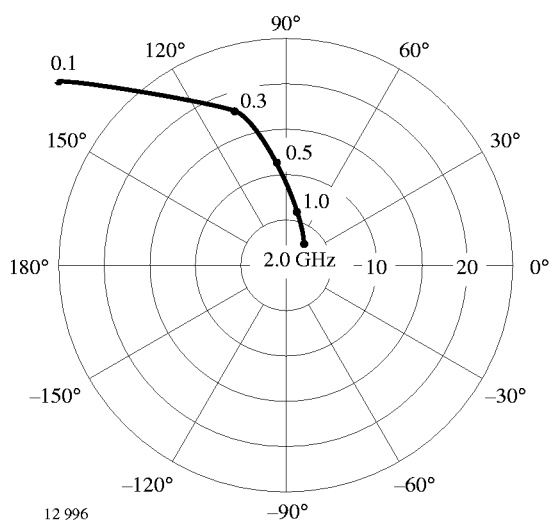


Figure 6. Forward transmission coefficient

S_{22}

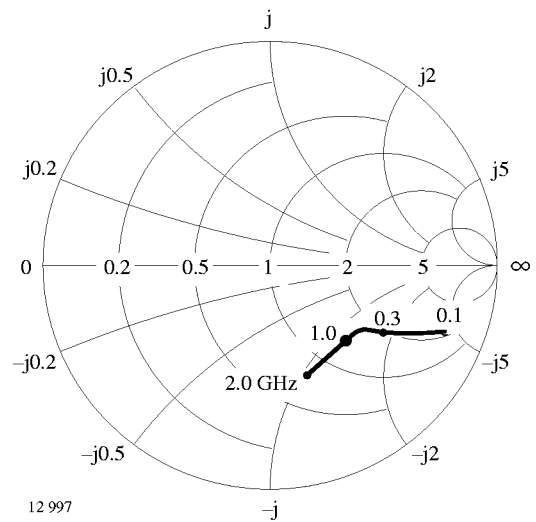


Figure 8. Output reflection coefficient

TELEFUNKEN Semiconductors
Rev. A2, 21-Mar-97