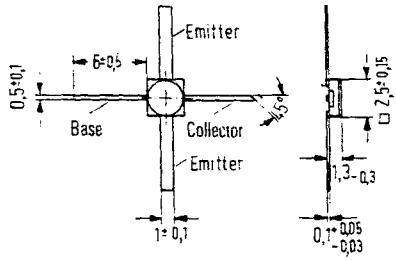
Low-Noise NPN Silicon Microwave Transistor up to 4 GHz BFQ 58

BFQ 58 is a bipolar silicon NPN microwave transistor in hermetically sealed metal ceramic 100 mil package similar to TO 120. State-of-the-art manufacturing processes such as ion implantation technique, titanium-platinum-gold metallization as well as a glass passivated chip surface ensure very high reliability. The transistor is particularly intended for use in low-noise amplifiers and oscillators up to 4 GHz. It is marked on its package with the short designation "58".

Type	Mark	Ordering code
BFQ 58	58	Q62702-F653



Approx. weight 0.05 g

Dimensions in mm

Maximum ratings

Collector-emitter voltage	V_{CEO}	16	V
Collector-emitter voltage (R_{BE} = 0)	V_{CES}	30	V
Collector-base voltage	V_{CBO}	25	V
Emitter base voltage	V_{EBO}	1	V
Collector current	I_C	30	mA
Storage temperature range	T_{stg}	−65 to +175	°C
Junction temperature	T_j	200	°C
Total power dissipation ($T_{amb} \leqq 87$ °C)	P_{tot}	450	mW

Thermal resistance

Junction to ambient air (when mounted on AL_2O_3 ceramics or glass-fiber reinforced Teflon 40x25x1.5 mm.)	R_{thJA}	≦250	K/W

Static characteristics (T_{amb} = 25 °C)

Collector-emitter breakdown voltage (I_C = 100 μA)	$V_{(BR)CES}$	30	V
Collector cutoff current (V_{CBO} = 15 V)	I_{CBO}	100	nA
Collector cutoff current (V_{CEO} = 15 V)	I_{CEO}	500	nA
DC current gain (V_{CE} = 15 V; I_C = 15 mA)	h_{FE}	120	–

Dynamic characteristics (T_{amb} = 25 °C)

Transition frequency (V_{CE} = 15 V; I_C = 25 mA)	f_T	6.5	GHz
Noise figure			
(V_{CE} = 15 V; I_C = 15 mA; f = 4 GHz)	NF_{min}	3.8	dB
(V_{CE} = 15 V; I_C = 15 mA; f = 1.5 GHz)	NF_{min}	2.2	dB
Power gain at noise matching			
(V_{CE} = 15 V; I_C = 15 mA; f = 4 GHz)	G_{GP}	9	dB
(V_{CE} = 15 V; I_C = 15 mA; f = 1.5 GHz)	G_{GP}	15	dB
Output power (G_{popt} –1 dB)			
(V_{CE} = 15 V; I_C = 15 mA; f = 4 GHz)	$P_{1\ dB}$	14	dBm
Noise figure (measured)[1]			
(V_{CE} = 15 V; I_C = 15 mA; f = 4 GHz)	NF_{min}	4.2	dB
Reverse transfer capacitance			
(V_{CE} = 10 V; I_C = 1 mA; f = 1 MHz)	C_{12e}	0.33	pF

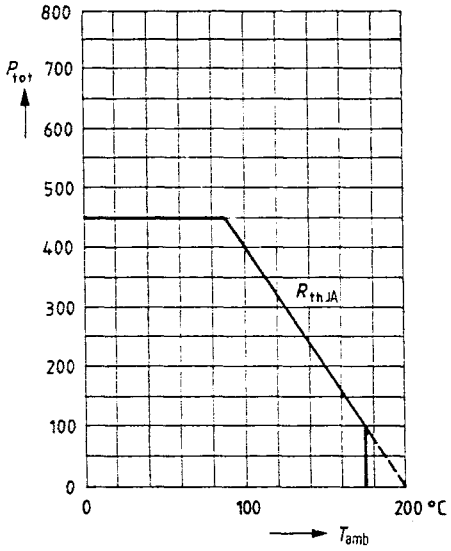
1) $NF_{min} = 10 \log \left(1 + \frac{NF_{min} - 1}{1 - \frac{1}{G_{GP}}} \right)$

S parameter:
Operating point: V_{CE} = 15 V, I_C = 15 mA, Z_o = 50 Ω

f (GHz)	S_{11}	φ	S_{21}	φ	S_{12}	φ	S_{22}	φ	G_{max} (dB)
0,1	0,615	– 42	25,67	153	0,013	67	0,913	– 17	38,0
0,2	0,591	– 81	21,93	134	0,022	52	0,743	– 29	32,2
0,3	0,568	–106	18,07	121	0,028	48	0,673	– 36	29,5
0,4	0,583	–123	14,90	113	0,030	45	0,588	– 37	27,1
0,5	0,582	–133	12,51	104	0,033	42	0,538	– 40	25,2
0,6	0,558	–142	10,81	98	0,036	40	0,496	– 39	23,5
0,7	0,538	–152	9,41	92	0,037	41	0,464	– 40	22,0
0,8	0,550	–160	8,36	88	0,039	42	0,424	– 40	20,9
0,9	0,546	–166	7,47	84	0,041	43	0,403	– 44	19,8
1	0,550	–170	6,75	81	0,044	43	0,407	– 44	19,0
1,1	0,552	–175	6,10	78	0,046	43	0,379	– 46	18,0
1,2	0,563	–177	5,60	74	0,048	43	0,390	– 48	17,4
1,3	0,545	178	5,18	71	0,050	44	0,367	– 48	16,4
1,4	0,562	174	4,87	68	0,054	42	0,389	– 53	16,1
1,5	0,562	172	4,55	66	0,055	45	0,370	– 47	15,4
1,6	0,548	168	4,28	64	0,058	46	0,377	– 56	14,9
1,7	0,557	164	3,97	61	0,059	46	0,387	– 50	14,3
1,8	0,564	165	3,73	58	0,062	46	0,359	– 57	13,7
1,9	0,532	160	3,56	57	0,065	47	0,403	– 55	13,2
2	0,534	158	3,40	56	0,069	45	0,366	– 58	12,7
2,5	0,558	151	2,79	42	0,083	43	0,371	– 72	11,2
3	0,532	140	2,33	31	0,097	41	0,388	– 79	9,5
3,5	0,556	132	2,02	22	0,111	39	0,380	– 92	8,4
4	0,521	121	1,78	9	0,128	33	0,423	–100	7,3
4,5	0,546	110	1,63	0	0,146	28	0,418	–109	6,6
5	0,538	97	1,51	–11	0,164	24	0,451	–119	6,1
5,5	0,568	86	1,37	–21	0,181	21	0,442	–129	5,4
6	0,590	76	1,23	–33	0,194	10	0,442	–144	4,6

Total perm. power dissipation versus temperature

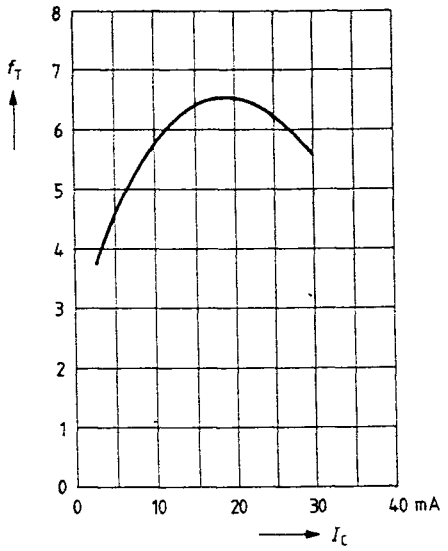
mW $P_{tot} = f(T_{amb})$



Transition frequency $f_T = f(I_C)$

V_{CE} = 10 V

GHz



Noise figure $NF = f(I_C)$

dB $Z_g = Z_{g\,opt}$; V_{CE} = 10 V; f = 2 GHz