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NPN Silicon RF Broadband Transistor

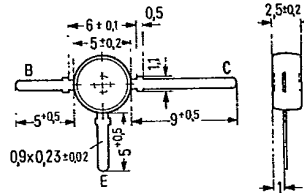
BFT 12

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BFT 12 is an epitaxial NPN silicon planar RF transistor in a plastic package similar to TO 119 (50 B 3 DIN 41 867), intended for universal application in amplifiers up to the GHz range, e. g. for broadband antenna amplifiers with a high output power and linearity and for oscillators.

Type	Ordering code
BFT 12	Q62702-F390



Approx. weight 0.3 g Dimensions in mm

Maximum ratings

Collector-base-voltage	V_{CBO}	25	V
Collector-emitter voltage	V_{CEO}	15	V
Emitter-base voltage	V_{EBO}	3.5	V
Collector current	I_C	150	mA
Collector peak current ($f > 1$ MHz)	I_{CM}	300	mA
Base current	I_B	50	mA
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-55 to +125	°C
Total power dissipation ($T_{amb} = 66$ °C)	P_{tot}	700	mW

Thermal resistance

Junction to ambient air ¹⁾	R_{thJA}	≤ 120	K/W
Junction to case	R_{thJC}	≤ 90	K/W

1) when mounted on glass fiber epoxy resin PCB 40 mm x 25 mm x 1 mm

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

Collector-base breakdown voltage ($I_{CBO} = 100 \mu\text{A}$)	$V_{(BR)CBO}$	> 25	V
DC current gain ($I_C = 50 \text{ mA}; V_{CE} = 5 \text{ V}$)	h_{FE}	≥ 25	-

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

Transition frequency ($I_C = 80 \text{ mA}; V_{CE} = 5 \text{ V}; f = 200 \text{ MHz}$)	f_T	1.9	GHz
Reverse transfer capacitance ($I_C = 5 \text{ mA}; V_{CE} = 10 \text{ V}; f = 1 \text{ MHz}$)	C_{12e}	2.4	pF
Collector-base capacitance ($V_{CBO} = 10 \text{ V}; f = 1 \text{ MHz}$)	C_{CBO}	3	pF
Power gain ($I_C = 40 \text{ mA}; V_{CE} = 7.5 \text{ V}; f = 800 \text{ MHz}; R_g = 60 \Omega$)	G_{pe}	7.5	dB
($I_C = 80 \text{ mA}; V_{CE} = 7.5 \text{ V}; f = 800 \text{ MHz}; R_g = 60 \Omega$)	G_{pe}	8	dB
Noise figure ($R_g = 60 \Omega; I_C = 40 \text{ mA}; V_{CE} = 7.5 \text{ V}; f = 800 \text{ MHz}$)	NF	6.5	dB
Output voltage ¹⁾ ($I_C = 80 \text{ mA}; V_{CE} = 7.5 \text{ V}; f = 800 \text{ MHz}; d_{IM} = 60 \text{ dB}, R_g = R_L = 75 \Omega$)	V_0	1000	mV

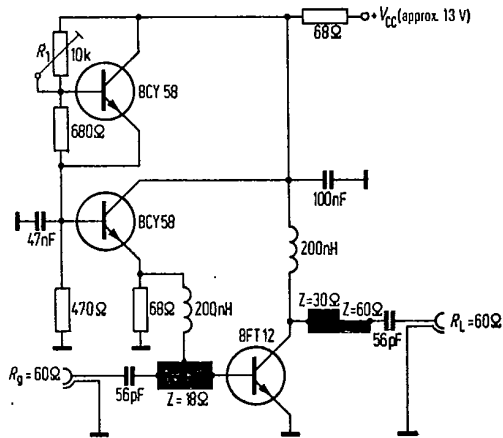
S parameter at $V_{CE} = 7.5 \text{ V}; I_C = 60 \text{ mA}; Z_o = 50 \Omega$

f (GHz)	S_{11e}	φ	S_{21e}	φ	S_{12e}	φ	S_{22e}	φ
0,1	0,691	-170	14,199	94	0,022	55	0,208	-115
0,2	0,701	-177	7,261	85	0,038	68	0,160	-135
0,3	0,717	177	4,860	78	0,053	70	0,151	-147
0,4	0,722	175	3,666	73	0,069	71	0,159	-148
0,5	0,715	173	2,909	67	0,083	72	0,168	-149
0,6	0,726	169	2,458	63	0,101	73	0,179	-148
0,7	0,738	167	2,102	59	0,115	72	0,192	-149
0,8	0,736	165	1,823	53	0,130	72	0,214	-149
0,9	0,740	163	1,619	49	0,146	71	0,240	-147
1	0,752	161	1,458	44	0,159	70	0,244	-148

1) three tone modulation f approx. 800 MHz

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Circuit example: Broadband RF amplifier



Operating point (set with R_1):
 $I_C = 80 \text{ mA}$; $V_{CE} = 7.5 \text{ V}$.

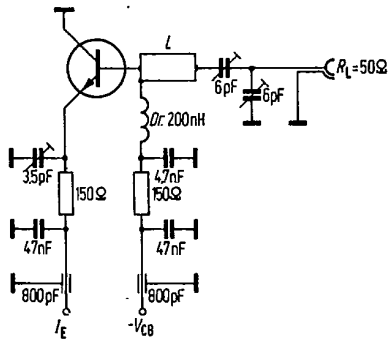
At $f = 800 \text{ MHz}$ and an intermodulation product distance of $d_{IM} = 60 \text{ dB}^1$, the following values are obtained:

Output voltage $V_O = 700 \text{ mV}$
 Power gain $G_P = 8 \text{ dB}$
 (refer to curve $G_P = f(f)$)

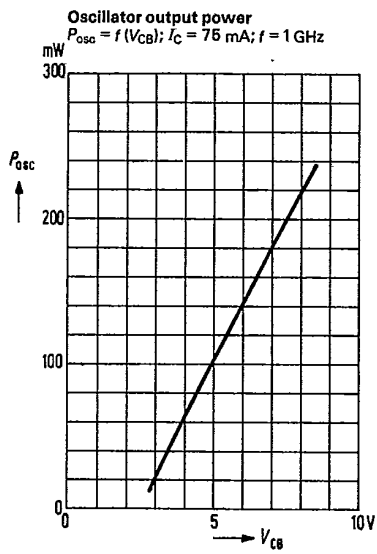
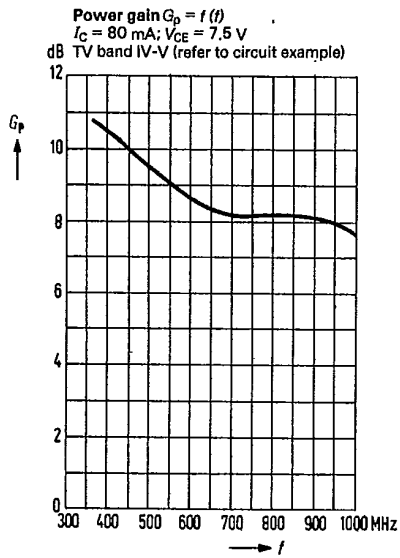
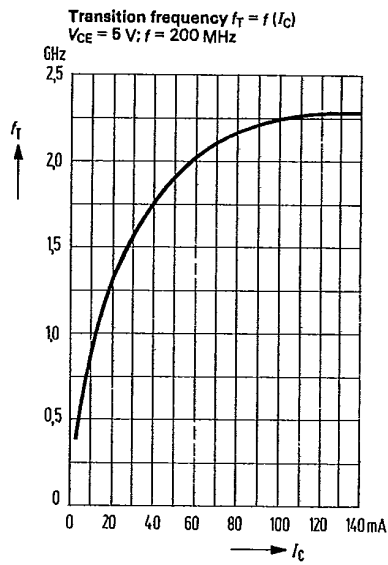
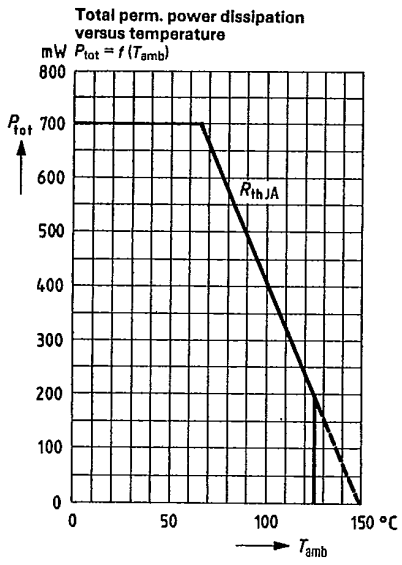
1) Two-tone modulation $f_1 = 800 \text{ MHz}$; $f_2 = 804 \text{ MHz}$.

Oscillator diagram

$f = 1 \text{ GHz}$; $L = 15 \text{ mm strip-line}$
 $Z_0 = 50 \Omega$



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