NPN 8 GHz wideband transistor BFQ66

DESCRIPTION

Small-signal planar epitaxial NPN transistor in hermetically-sealed sub-miniature SOT173 and SOT173X micro-stripline envelopes.

It is designed for wideband applications in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optic systems. The transistor features a very high transition frequency and a very low noise figure up to 2 GHz.

PINNING

PIN	DESCRIPTION
Code: Q6	
1	collector
2	emitter
3	base (indicated by a red dot on body)
4	emitter

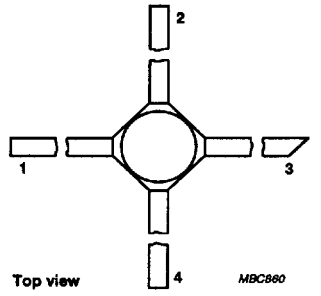

Fig.1 SOT173.

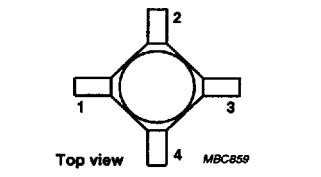

Fig.2 SOT173X.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CEO}	collector-emitter voltage	open base	–	–	10	V
I_C	DC collector current		–	–	50	mA
P_{tot}	total power dissipation	up to T_s = 145 °C (note 1)	–	–	350	mW
h_{FE}	DC current gain	I_C = 15 mA; V_{CE} = 5 V; T_j = 25 °C	60	100	–	
f_T	transition frequency	I_C = 15 mA; V_{CE} = 8 V; f = 500 MHz; T_j = 25 °C	–	8	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	–	11.5	–	dB

Note

1. T_s is the temperature at the soldering point of the collector lead.

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LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	10	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	DC collector current		–	50	mA
P_{tot}	total power dissipation	up to T_s = 145 °C (note 1)	–	350	mW
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	up to T_s = 145 °C (note 1)	80 K/W

Note

1. T_s is the temperature at the soldering point of the collector lead.

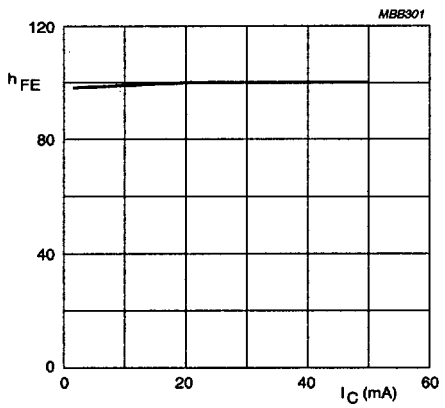
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 5 V	–	–	50	nA
h_{FE}	DC current gain	I_C = 15 mA; V_{CE} = 5 V	60	100	–	
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 8 V; f = 1 MHz	–	0.7	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	1.3	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 8 V; f = 1 MHz	–	0.4	–	pF
f_T	transition frequency	I_C = 15 mA; V_{CE} = 8 V; f = 500 MHz	–	8	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	–	11.5	–	dB
F	noise figure	I_C = 5 mA; V_{CE} = 8 V; Z_S = 50 Ω; f = 2 GHz; T_{amb} = 25 °C	–	2.1	–	dB
		I_C = 15 mA; V_{CE} = 8 V; Z_S = 50 Ω; f = 2 GHz; T_{amb} = 25 °C	–	2.7	4	dB

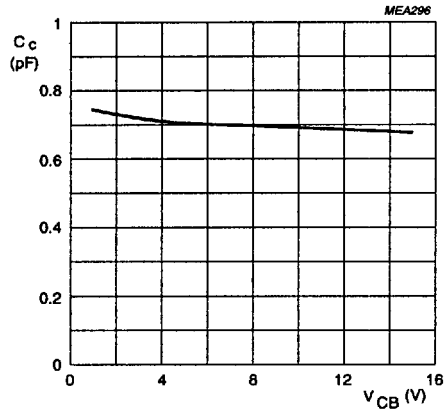
Note

1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$ dB.



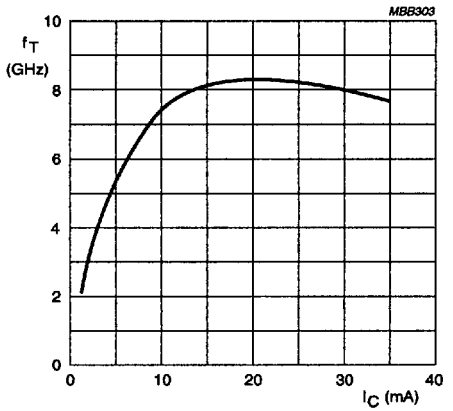
V_{CE} = 5 V; T_j = 25 °C.

Fig.3 DC current gain as a function of collector current.



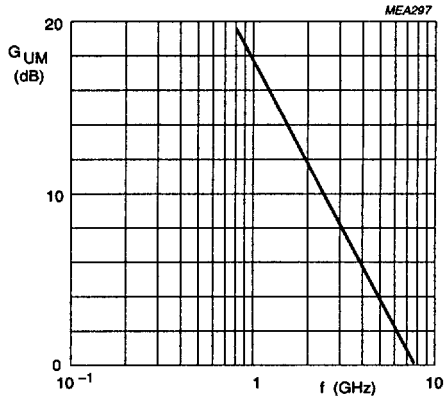
$I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C

Fig.4 Collector capacitance as a function of collector-base voltage.



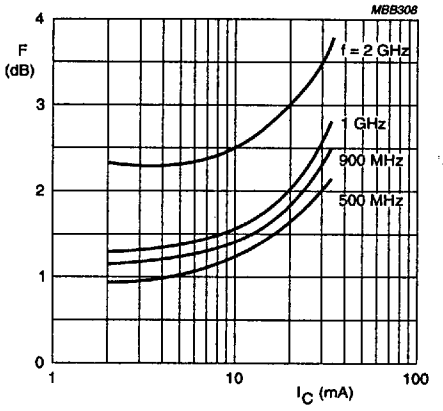
V_{CE} = 8 V; f = 500 MHz; T_j = 25 °C

Fig.5 Transition frequency as a function of collector current.



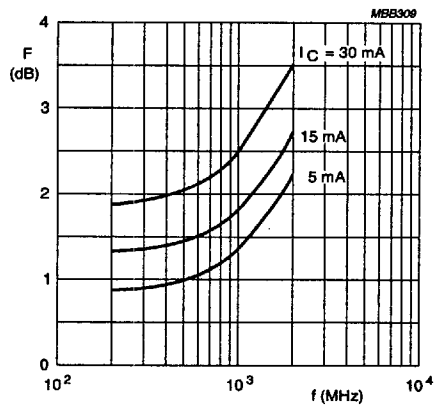
I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C

Fig.6 Maximum unilateral power gain as a function of frequency.



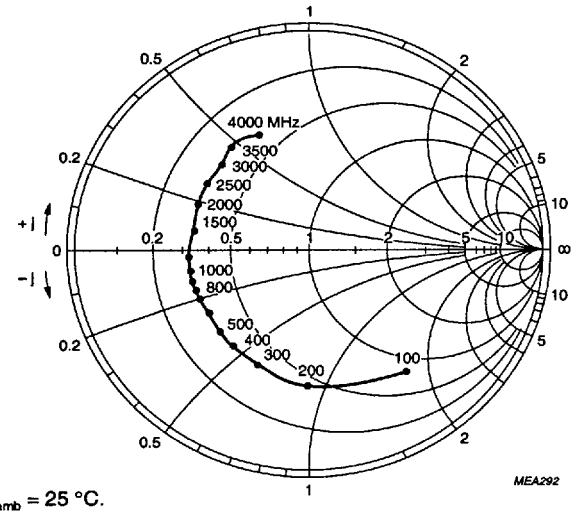
V_{CE} = 8 V; T_{amb} = 25 °C

Fig.7 Minimum noise figure as a function of collector current.



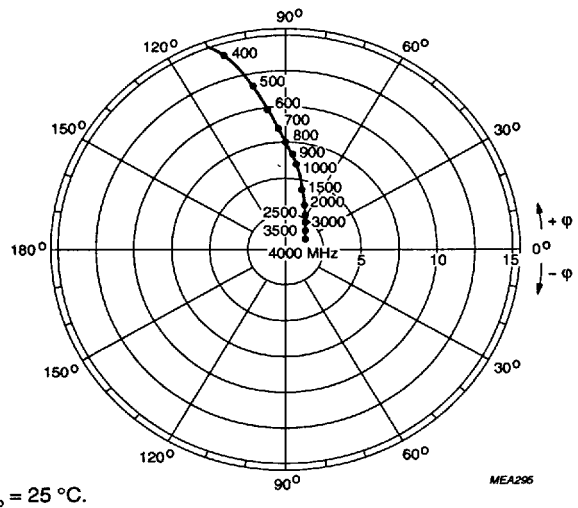
V_{CE} = 8 V; T_{amb} = 25 °C

Fig.8 Minimum noise figure as a function of frequency.



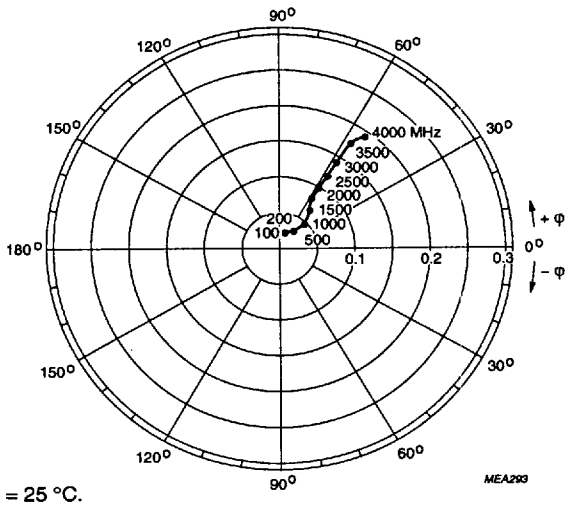
I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C.

Fig.9 Common emitter input reflection coefficient (S_{11}).



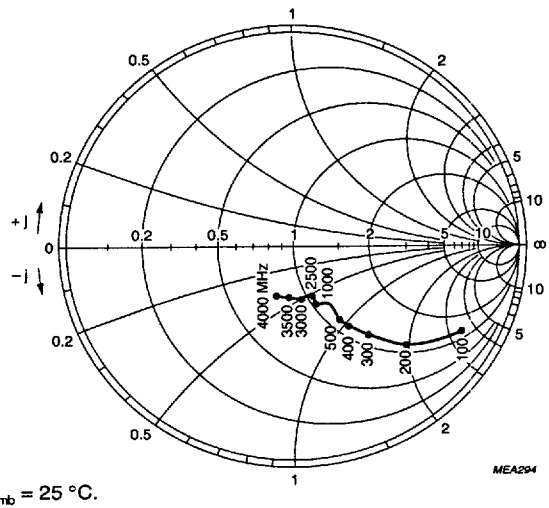
I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C.

Fig.10 Common emitter forward transmission coefficient (S_{21}).



I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C.

Fig.11 Common emitter reverse transmission coefficient (S_{12}).



I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C.

Fig.12 Common emitter output reflection coefficient (S_{22}).

Table 1 Common emitter scattering parameters, I_C = 10 mA; V_{CE} = 8 V

f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.796	−16.8	25.543	168.7	0.009	82.5	0.966	−8.5	44.3
100	0.757	−40.5	23.670	154.2	0.021	71.1	0.904	−20.0	38.6
200	0.679	−73.5	19.454	135.3	0.034	58.5	0.757	−34.2	32.2
300	0.621	−98.0	15.710	122.3	0.043	51.6	0.630	−42.6	28.2
400	0.591	−115.6	12.885	113.4	0.048	47.9	0.538	−47.7	25.6
500	0.575	−128.6	10.830	106.9	0.052	47.0	0.475	−50.8	23.5
600	0.565	−137.7	9.316	101.8	0.056	46.6	0.429	−52.8	21.9
700	0.552	−145.3	8.148	97.7	0.059	47.2	0.397	−54.0	20.5
800	0.543	−151.5	7.232	94.0	0.062	48.2	0.374	−54.9	19.4
900	0.533	−157.3	6.482	91.0	0.066	49.2	0.356	−55.8	18.3
1000	0.526	−162.7	5.860	88.2	0.069	50.4	0.342	−56.6	17.3
1200	0.524	−171.7	4.930	83.4	0.076	52.1	0.323	−58.5	15.7
1400	0.529	−178.4	4.267	78.6	0.082	53.6	0.312	−60.9	14.5
1600	0.531	176.2	3.762	74.4	0.090	56.0	0.309	−62.8	13.4
1800	0.523	171.1	3.379	70.8	0.098	56.4	0.306	−65.1	12.4
2000	0.522	165.5	3.058	67.5	0.106	57.6	0.300	−67.3	11.5
2200	0.529	160.5	2.805	64.3	0.113	58.4	0.293	−71.0	10.8
2400	0.541	156.9	2.564	60.5	0.119	59.8	0.291	−75.8	10.1
2600	0.541	154.6	2.383	57.7	0.129	60.1	0.300	−80.9	9.5
2800	0.530	151.2	2.257	53.9	0.137	59.7	0.312	−84.3	8.9
3000	0.518	146.9	2.115	51.0	0.144	61.2	0.320	−86.5	8.3

Table 2 Common emitter scattering parameters, I_C = 15 mA; V_{CE} = 8 V

f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.731	−21.3	33.483	166.2	0.008	81.4	0.951	−10.7	44.0
100	0.686	−50.6	29.946	149.2	0.019	67.6	0.860	−24.7	38.1
200	0.610	−87.7	22.993	129.0	0.030	55.6	0.676	−39.9	31.9
300	0.569	−112.4	17.764	116.6	0.037	51.5	0.541	−47.7	28.2
400	0.552	−128.8	14.214	108.5	0.041	49.6	0.453	−51.9	25.6
500	0.545	−140.3	11.771	102.6	0.045	49.8	0.397	−54.2	23.7
600	0.538	−148.1	10.029	98.1	0.049	50.9	0.358	−55.5	22.1
700	0.530	−154.6	8.726	94.4	0.053	52.2	0.331	−56.3	20.8
800	0.524	−160.0	7.711	91.2	0.056	53.6	0.312	−56.8	19.6
900	0.517	−165.0	6.895	88.5	0.060	54.8	0.298	−57.4	18.5
1000	0.513	−169.7	6.225	86.0	0.064	56.4	0.287	−58.0	17.6
1200	0.514	−177.7	5.224	81.7	0.072	58.0	0.272	−59.7	16.0
1400	0.522	176.6	4.505	77.3	0.080	59.3	0.265	−61.9	14.8
1600	0.522	171.8	3.970	73.3	0.089	61.0	0.264	−63.7	13.7
1800	0.515	167.2	3.560	70.0	0.099	61.4	0.262	−65.7	12.7
2000	0.516	161.9	3.221	66.8	0.107	62.0	0.258	−67.8	11.8
2200	0.524	157.4	2.950	63.9	0.115	62.3	0.252	−71.6	11.1
2400	0.536	154.1	2.696	60.3	0.121	63.4	0.251	−76.6	10.4
2600	0.536	152.0	2.505	57.5	0.133	63.3	0.260	−82.2	9.8
2800	0.525	149.3	2.366	53.9	0.141	62.4	0.274	−85.5	9.2
3000	0.512	144.7	2.217	51.1	0.148	63.7	0.280	−87.4	8.6

Table 3 Common emitter scattering parameters, I_C = 20 mA; V_{CE} = 8 V

f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	
40	0.684	−25.2	39.224	164.4	0.008	80.1	0.938	−12.4	43.8
100	0.637	−58.6	34.039	145.5	0.018	65.3	0.823	−27.9	37.8
200	0.572	−97.8	24.914	125.0	0.028	55.0	0.620	−43.2	31.8
300	0.543	−121.8	18.747	113.1	0.033	52.0	0.485	−50.2	28.1
400	0.534	−136.9	14.811	105.6	0.037	51.4	0.403	−53.7	25.6
500	0.531	−147.2	12.169	100.1	0.042	52.6	0.353	−55.4	23.7
600	0.528	−154.1	10.327	96.0	0.045	54.2	0.319	−56.3	22.2
700	0.522	−160.0	8.956	92.6	0.050	56.0	0.296	−56.8	20.8
800	0.517	−164.7	7.906	89.6	0.054	57.3	0.280	−57.1	19.7
900	0.512	−169.4	7.062	87.1	0.058	58.6	0.268	−57.5	18.6
1000	0.509	−173.8	6.370	84.8	0.062	59.7	0.259	−58.0	17.7
1200	0.512	178.9	5.338	80.7	0.071	61.4	0.247	−59.7	16.1
1400	0.520	173.7	4.599	76.5	0.079	62.2	0.242	−61.8	14.9
1600	0.521	169.4	4.047	72.7	0.089	63.6	0.242	−63.6	13.8
1800	0.514	165.0	3.627	69.4	0.099	63.6	0.242	−65.6	12.8
2000	0.515	159.8	3.281	66.3	0.107	64.3	0.238	−67.7	11.9
2200	0.524	155.7	3.004	63.5	0.115	64.3	0.232	−71.5	11.2
2400	0.538	152.6	2.745	60.0	0.122	65.2	0.233	−76.9	10.5
2600	0.536	150.8	2.546	57.3	0.134	64.8	0.242	−82.5	9.8
2800	0.522	147.9	2.404	53.6	0.142	63.9	0.256	−85.9	9.3
3000	0.513	143.6	2.255	51.0	0.150	65.0	0.263	−87.8	8.7