NPN 5 GHz wideband transistor

T-33-05

BFP96

DESCRIPTION

NPN transistor in hermetically sealed sub-miniature SOT173 and SOT173X micro-stripline envelopes. It features low noise, high gain and low distortion figures and is primarily intended for RF wideband amplifiers and applications up to 1 GHz.

PNP complement is BFQ32C.

PINNING

PIN	DESCRIPTION
Code: P6	
1	collector
2	emitter
3	base (indicated by a red dot on body)
4	emitter

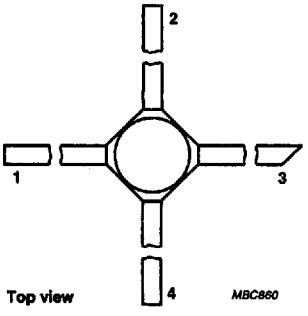

Fig.1 SOT173.

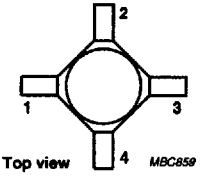

Fig.2 SOT173X.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	–	15	V
I_C	DC collector current		–	–	100	mA
P_{tot}	total power dissipation	up to T_s = 90 °C (note 1)	–	–	1	W
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V; T_j = 25 °C	25	80	–	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C	–	5	–	GHz
G_{UM}	maximum unilateral power gain	I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	–	19	–	dB
		I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	–	15	–	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	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	DC collector current		–	100	mA
P_{tot}	total power dissipation	up to T_s = 90 °C (note 1)	–	1	W
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 = 90 °C (note 1)	85 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} = 10 V	–	–	100	nA
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 10 V	25	80	–	
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 10 V; f = 1 MHz	–	1.3	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	5.5	–	pF
C_{re}	feedback capacitance	I_C = 0; V_{CE} = 10 V; f = 1 MHz	–	1	–	pF
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz	–	5	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	–	19	–	dB
		I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	–	15	–	dB
F	noise figure	I_C = 50 mA; V_{CE} = 10 V; Z_S = opt.; f = 800 MHz; T_{amb} = 25 °C	–	3.7	–	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.

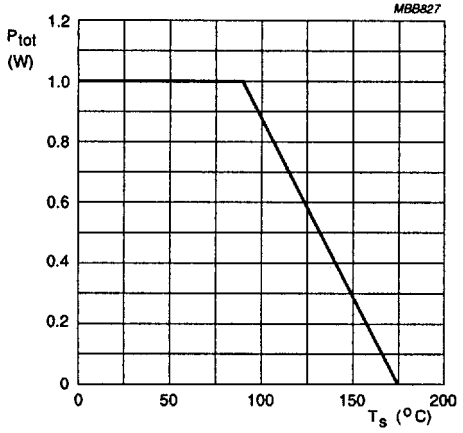
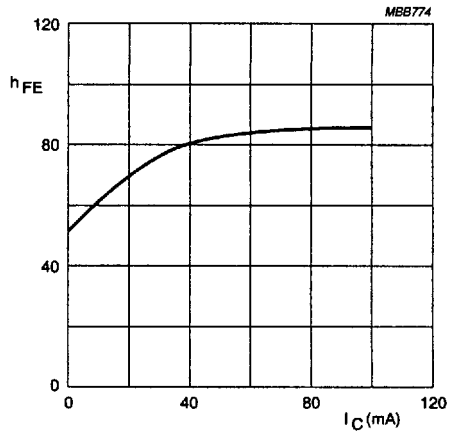
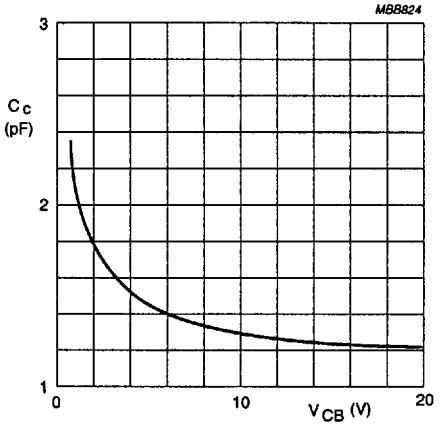


Fig.3 Power derating curve.



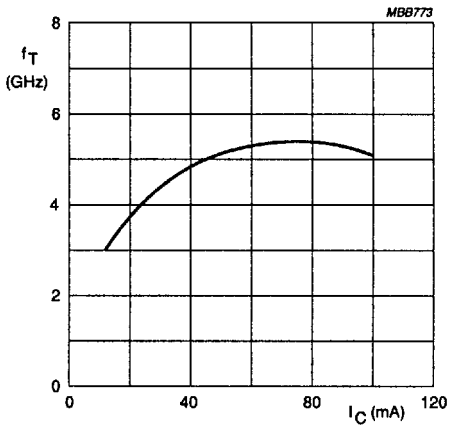
V_{CE} = 10 V; T_j = 25 °C.

Fig.4 DC current gain as a function of collector current.



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

Fig.5 Collector capacitance as a function of collector-base voltage.



V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C.

Fig.6 Transition frequency as a function of collector current.

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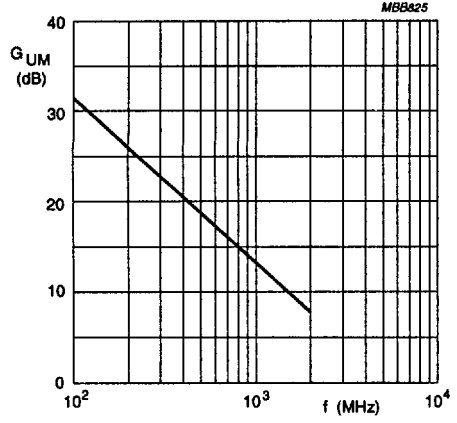
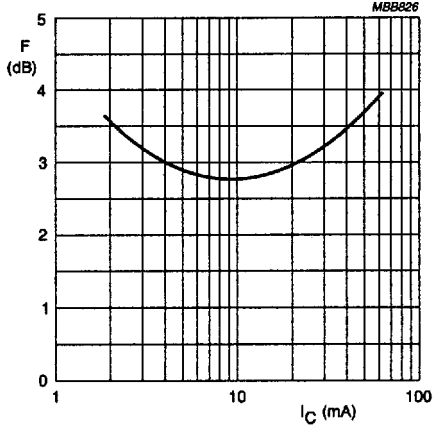


I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C.

Fig.7 Maximum unilateral power gain as a function of frequency.



V_{CE} = 10 V; f = 1 MHz; T_{amb} = 25 °C.

Fig.8 Minimum noise figure as a function of collector current.

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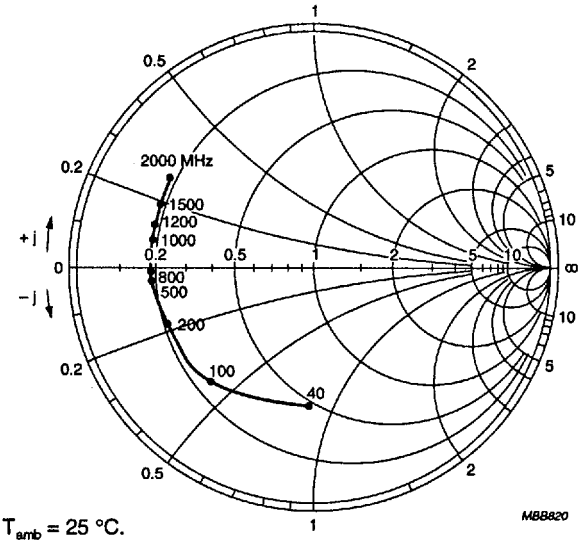
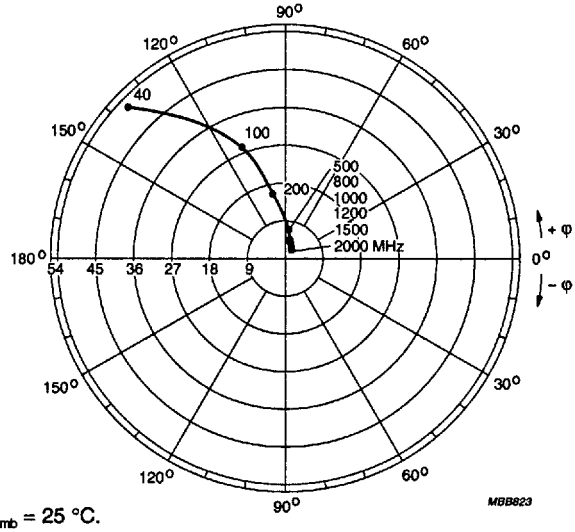


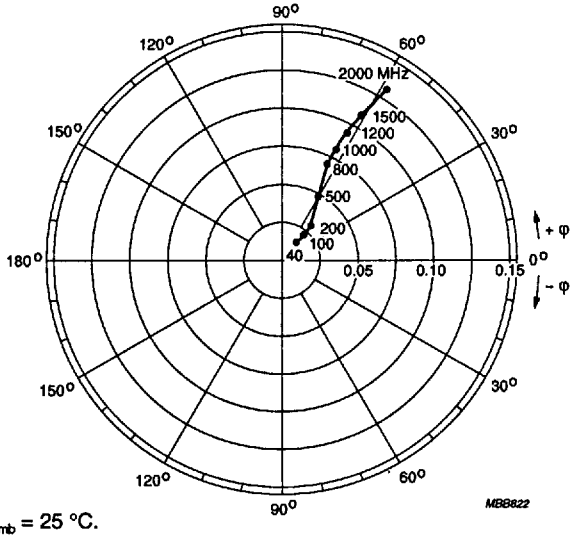
I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C.

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



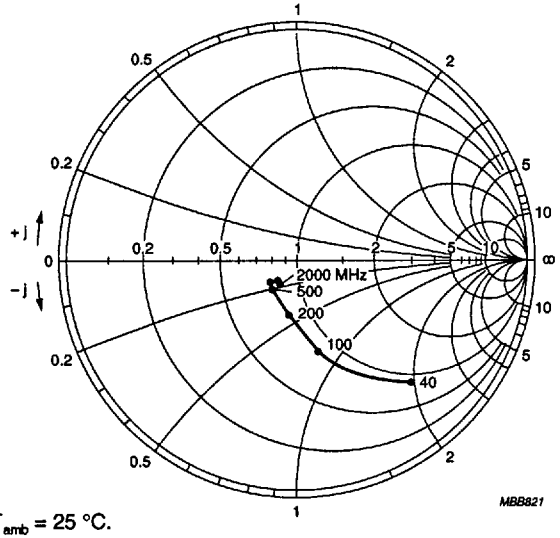
I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C.

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



I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C.

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



I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C.

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

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Table 1 Common emitter scattering parameters, I_C = 50 mA; V_{CE} = 5 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	0.465	−121.9	50.515	138.8	0.010	62.4	0.750	−44.8	38.7
100	0.656	−153.2	28.622	113.6	0.016	48.5	0.437	−76.5	32.5
200	0.706	−168.1	15.449	99.8	0.021	53.2	0.260	−99.5	27.1
300	0.726	−174.5	10.464	93.6	0.026	57.0	0.200	−112.4	23.8
400	0.734	−178.3	7.933	89.2	0.032	62.5	0.176	−120.1	21.5
500	0.737	178.8	6.380	85.8	0.038	64.2	0.164	−125.3	19.6
600	0.736	176.7	5.327	83.0	0.043	65.4	0.159	−129.0	18.0
700	0.736	174.3	4.601	80.5	0.049	67.2	0.153	−131.1	16.7
800	0.733	172.3	4.060	78.0	0.056	69.1	0.152	−132.6	15.6
900	0.731	170.1	3.624	76.0	0.062	69.0	0.152	−133.9	14.6
1000	0.734	167.8	3.273	73.8	0.068	70.3	0.152	−134.0	13.8
1200	0.739	164.2	2.746	69.8	0.081	69.9	0.158	−135.4	12.3
1400	0.744	161.0	2.366	65.8	0.091	69.9	0.164	−136.0	11.1
1600	0.742	157.9	2.085	61.4	0.104	70.6	0.170	−135.5	10.0
1800	0.733	154.1	1.880	57.7	0.119	69.4	0.176	−136.7	9.0
2000	0.732	150.6	1.710	54.3	0.129	69.6	0.185	−138.8	8.1
2200	0.744	147.1	1.569	51.0	0.140	68.9	0.196	−142.0	7.6
2400	0.744	144.8	1.411	47.7	0.150	68.3	0.213	−144.8	6.7
2600	0.734	142.4	1.324	44.6	0.164	68.0	0.235	−145.9	6.0
2800	0.715	139.0	1.240	39.8	0.174	66.1	0.252	−146.2	5.3
3000	0.703	134.6	1.181	37.2	0.186	66.2	0.262	−147.8	4.7

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Table 2 Common emitter scattering parameters, I_C = 50 mA; V_{CE} = 10 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	0.474	−106.0	52.454	138.8	0.0110	58.3	0.757	−40.6	39.2
100	0.632	−145.0	29.510	113.5	0.0170	41.4	0.435	−67.4	32.5
200	0.672	−164.0	15.987	99.9	0.0210	48.3	0.246	−83.0	27.0
300	0.690	−171.0	10.971	92.9	0.0270	57.4	0.179	−90.2	23.8
400	0.701	−176.0	8.224	89.2	0.0320	57.7	0.148	−95.2	21.3
500	0.700	−178.0	6.528	86.3	0.0360	63.2	0.133	−98.9	19.3
600	0.697	178.0	5.589	82.4	0.0430	65.4	0.124	−101.0	17.9
700	0.709	175.8	4.752	79.8	0.0490	64.5	0.119	−103.0	16.6
800	0.696	173.1	4.216	77.4	0.0550	67.3	0.117	−104.0	15.4
900	0.709	171.6	3.724	75.5	0.0600	65.5	0.116	−106.0	14.5
1000	0.704	168.6	3.391	72.6	0.0660	67.6	0.117	−107.0	13.6
1200	0.712	165.7	2.817	68.2	0.0780	67.6	0.122	−111.0	12.1
1400	0.720	162.2	2.464	64.9	0.0890	67.0	0.129	−114.0	11.1
1600	0.711	158.2	2.131	59.7	0.101	67.1	0.138	−116.0	9.71
1800	0.707	154.8	1.944	55.7	0.114	66.7	0.145	−118.0	8.88
2000	0.725	151.3	1.766	53.4	0.124	66.4	0.152	−123.0	8.28
2200	0.719	147.0	1.624	48.3	0.133	66.2	0.164	−130.0	7.49
2400	0.720	144.4	1.474	46.2	0.142	64.7	0.182	−135.0	6.69
2600	0.718	142.8	1.351	40.9	0.155	64.7	0.206	−138.0	5.95
2800	0.709	138.9	1.265	36.6	0.165	62.7	0.220	−140.0	5.29
3000	0.700	135.1	1.207	33.6	0.174	63.4	0.230	−143.0	4.79