PNP 5 GHz wideband transistor

BFT92

DESCRIPTION

PNP transistor in a plastic SOT23 envelope.

It is primarily intended for use in RF wideband amplifiers, such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analyzers, etc. The transistor features low intermodulation distortion and high power gain; due to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

NPN complements are BFR92 and BFR92A.

PINNING

PIN	DESCRIPTION
Code: W1p	
1	base
2	emitter
3	collector

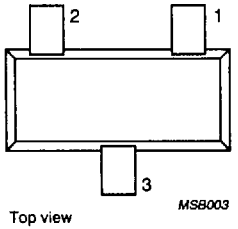

Fig.1 SOT23.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	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		–	–25	mA
P_{tot}	total power dissipation	up to T_s = 70 °C (note 1)	–	300	mW
f_T	transition frequency	I_C = –14 mA; V_{CE} = –10 V; f = 500 MHz	5	–	GHz
C_{re}	feedback capacitance	I_C = –2 mA; V_{CE} = –10 V; f = 1 MHz	0.7	–	pF
G_{UM}	maximum unilateral power gain	I_C = –14 mA; V_{CE} = –10 V; f = 500 MHz; T_{amb} = 25 °C	18	–	dB
F	noise figure	I_C = –5 mA; V_{CE} = –10 V; f = 500 MHz; T_{amb} = 25 °C	2.5	–	dB
d_{im}	intermodulation distortion	I_C = –14 mA; V_{CE} = –10 V; R_L = 75 Ω; V_O = 150 mV; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 493.25 MHz	–60	–	dB

Note

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

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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	–	–2	V
I_C	DC collector current		–	–25	mA
I_{CM}	peak collector current	f > 1 MHz	–	–35	mA
P_{tot}	total power dissipation	up to T_s = 70 °C (note 1)	–	300	mW
T_{stg}	storage temperature		–65	150	°C
T_j	junction temperature		–	150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	up to T_s = 70 °C (note 1)	260 K/W

Note

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

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CHARACTERISTICS

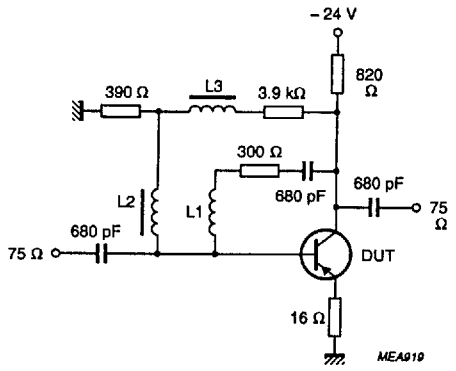
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = −10 V	–	–	−50	nA
h_{FE}	DC current gain	I_C = −14 mA; V_{CE} = −10 V	20	50	–	
f_T	transition frequency	I_C = −14 mA; V_{CE} = −10 V; f = 500 MHz	–	5	–	GHz
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = −10 V; f = 1 MHz	–	0.75	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = −0.5 V; f = 1 MHz	–	0.8	–	pF
C_{re}	feedback capacitance	I_C = −2 mA; V_{CE} = −10 V; f = 1 MHz	–	0.7	–	pF
G_{UM}	maximum unilateral power gain (note 1)	I_C = −14 mA; V_{CE} = −10 V; f = 500 MHz; T_{amb} = 25 °C	–	18	–	dB
F	noise figure	I_C = −5 mA; V_{CE} = −10 V; f = 500 MHz; T_{amb} = 25 °C	–	2.5	–	dB
V_O	output voltage	note 2	–	150	–	mV

Notes

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.

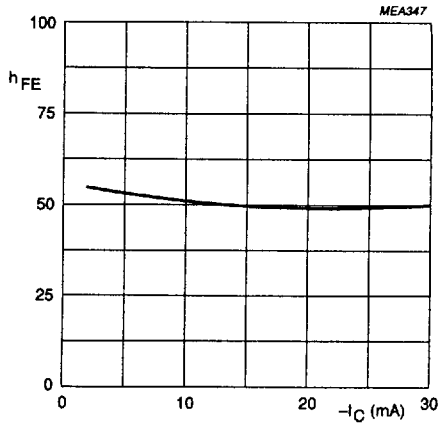
2. d_{im} = −60 dB (DIN 45004B); I_C = −14 mA; V_{CE} = −10 V; R_L = 75 Ω;
   $V_p = V_O$ at d_{im} = −60 dB; f_p = 495.25 MHz;
   $V_q = V_O$ −6 dB; f_q = 503.25 MHz;
   $V_r = V_O$ −6 dB; f_r = 505.25 MHz;
   measured at $f_{(p+q-r)}$ = 493.25 MHz.



L2 = L3 = 5 μH Ferroxcube choke, catalogue number 3122 108 20150.

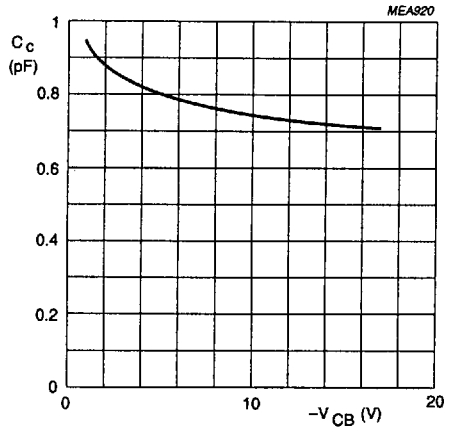
L1 = 4 turns 0.35 mm copper wire; winding pitch 1 mm; internal diameter 4 mm.

Fig.2 Intermodulation distortion test circuit.



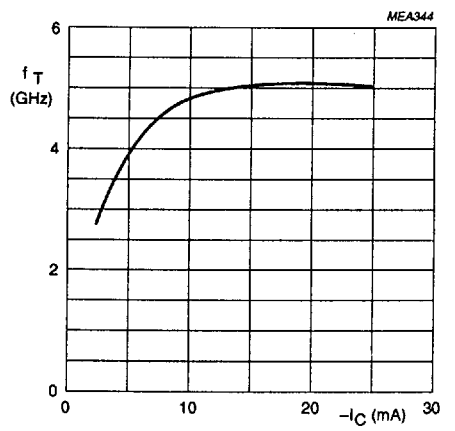
V_{CE} = –10 V; T_j = 25 °C.

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



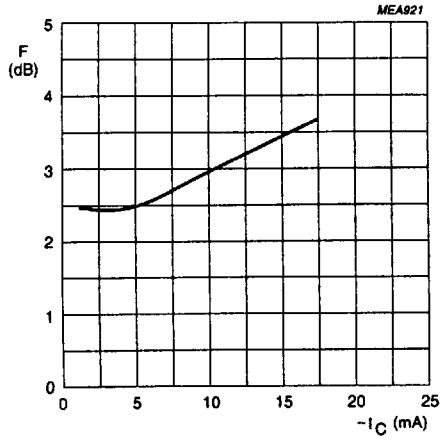
$I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

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



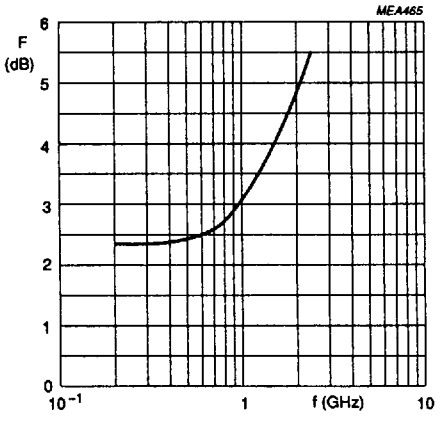
V_{CE} = –10 V; f = 500 MHz; T_j = 25 °C.

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



V_{CE} = −10 V; Z_S = opt.; f = 500 MHz; T_{amb} = 25 °C.

Fig.6 Minimum noise figure as a function of collector current.



I_C = −2 mA; V_{CE} = −10 V; Z_S = opt.; T_{amb} = 25 °C.

Fig.7 Minimum noise figure as a function of frequency.

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Table 1 Common emitter scattering parameters, $I_C = -15$ 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	0.475	−21.7	19.699	163.2	0.010	81.5	0.937	−9.0	36.2
100	0.428	−51.1	16.745	143.8	0.022	72.4	0.836	−19.1	30.6
200	0.355	−86.3	12.160	123.0	0.036	67.0	0.675	−26.6	24.9
300	0.316	−109.2	9.143	110.8	0.048	66.7	0.579	−28.4	21.5
400	0.297	−124.4	7.231	102.7	0.057	67.3	0.525	−28.5	19.0
500	0.287	−135.0	5.962	96.8	0.068	68.2	0.494	−28.5	17.1
600	0.281	−143.0	5.069	92.1	0.078	69.1	0.476	−28.6	15.6
700	0.275	−149.2	4.409	88.1	0.088	69.7	0.465	−28.8	14.3
800	0.269	−155.1	3.904	84.5	0.098	70.2	0.459	−29.1	13.2
900	0.264	−160.7	3.504	81.1	0.109	70.3	0.453	−29.4	12.2
1000	0.265	−165.8	3.177	78.1	0.119	70.4	0.449	−30.1	11.3
1200	0.273	−174.7	2.700	72.7	0.138	70.3	0.442	−31.6	9.9
1400	0.286	179.0	2.375	67.8	0.158	70.2	0.437	−33.6	8.8
1600	0.285	174.0	2.123	63.1	0.177	69.7	0.437	−35.5	7.8
1800	0.284	168.0	1.918	59.1	0.195	69.4	0.434	−37.6	6.9
2000	0.296	159.9	1.762	55.1	0.215	68.8	0.425	−39.6	6.2
2200	0.325	153.8	1.642	51.7	0.235	68.2	0.411	−42.3	5.6
2400	0.351	150.6	1.554	47.6	0.256	67.4	0.400	−46.5	5.2
2600	0.359	148.9	1.451	44.4	0.273	66.7	0.394	−50.8	4.6
2800	0.365	144.1	1.396	41.8	0.294	66.5	0.393	−53.9	4.2
3000	0.381	137.2	1.334	38.4	0.316	65.6	0.382	−56.7	3.9