New Jersey Semi-Conductor Products, Inc.

20 STERN AVE.
SPRINGFIELD, NEW JERSEY 07081
U.S.A.

TELEPHONE: (973) 376-2922
(212) 227-6005
FAX: (973) 376-8960

NPN 3.5 GHz wideband transistor

BFR94A

DESCRIPTION

NPN resistance-stabilized transistor in a SOT122E capstan envelope.

It features extremely low cross modulation, intermodulation and second order intermodulation distortion. Due to its high transition frequency, it has a high power gain, in conjunction with good wideband properties, and low noise up to high frequencies.

It is primarily intended for CATV and MATV applications.

The BFR94A is a replacement for the BFR94. The SOT122E footprint is similar to that of the SOT48, used for the BFR94.

PINNING

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

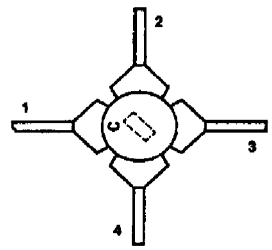

Fig.1 SOT122E.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	30	V
V_{CEO}	collector-emitter voltage	open base	–	25	V
I_C	DC collector current		–	150	mA
P_{tot}	total power dissipation	up to T_c = 145 °C; f > 1 MHz	–	3.5	W
f_T	transition frequency	I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_j = 25 °C	3.5	–	GHz
F	noise figure	I_C = 90 mA; V_{CE} = 20 V; f = 200 MHz; T_{amb} = 25 °C	8	10	dB
d_{im}	intermodulation distortion	I_C = 90 mA; V_{CE} = 20 V; V_O = 60 dBmV; $f_{(p+q-r)}$ = 194.25 MHz	−63	–	dB
d_2	second order intermodulation distortion	I_C = 90 mA; V_{CE} = 20 V; V_O = 48 dBmV; $f_p + f_q$ = 210 MHz	–	−56	dB

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	30	V
V_{CEO}	collector-emitter voltage	open base	–	25	V
V_{CER}	collector-emitter voltage	R_{BE} = 100 Ω	–	35	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	DC collector current		–	150	mA
I_{CM}	peak collector current	f > 1 MHz	–	300	mA
P_{tot}	total power dissipation	up to T_c = 145 °C; f > 1 MHz	–	3.5	W
T_{stg}	storage temperature		−65	200	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j-c}$	thermal resistance from junction to case	15 K/W

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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} = 20 V	–	–	50	μA
h_{FE}	DC current gain	I_C = 50 mA; V_{CE} = 20 V	30	–	–	
		I_C = 150 mA; V_{CE} = 20 V	30	–	–	
f_T	transition frequency	I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz	–	3.5	–	GHz
		I_C = 150 mA; V_{CE} = 20 V; f = 500 MHz	–	3.5	–	GHz
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 20 V; f = 1 MHz	–	3.5	–	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	12	–	pF
C_{re}	feedback capacitance	I_C = 10 mA; V_{CE} = 20 V; f = 1 MHz	–	1.3	–	pF
C_{cs}	collector-stud capacitance	f = 1 MHz	–	2	–	pF
G_{UM}	maximum unilateral power gain (note 1)	I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_{amb} = 25 °C	–	13.5	–	dB
F	noise figure	I_C = 90 mA; V_{CE} = 20 V; f = 200 MHz; T_{amb} = 25 °C	–	8	10	dB
		I_C = 90 mA; V_{CE} = 20 V; f = 500 MHz; T_{amb} = 25 °C	–	5	–	dB
d_{im}	intermodulation distortion	note 2	–	−63	–	dB
d_2	second order intermodulation distortion	note 3	–	–	−56	dB
V_O	output voltage	see Fig.2 and note 4	–	700	–	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. I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω;
   $V_p = V_O$ = 60 dBmV at f_p = 196.25 MHz;
   $V_q = V_O$ −6 dB at f_q = 203.25 MHz;
   $V_r = V_O$ −6 dB at f_r = 205.25 MHz;
   measured at $f_{(p+q-r)}$ = 194.25 MHz.
3. I_C = 90 mA; V_{CE} = 20 V;
   f_p = 66 MHz; f_q = 144 MHz; $f_p + f_q$ = 210 MHz; V_O = 48 dBmV.
4. d_{im} = −60 dB (DIN 45004B); I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω; T_{amb} = 25 °C;
   $V_p = V_O$ 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.