N-P-N 1 GHz WIDEBAND TRANSISTOR

N-P-N transistor in a plastic SOT-23 envelope. It is intended for a wide range of v.h.f. and u.h.f. applications in thick and thin-film circuits.

The BFS17A is the successor to the BFS17 and offers a higher power gain and an improved noise behaviour.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	175	°C
D.C. current gain I_C = 2 mA; V_{CE} = 1 V	h_{FE}	20 to 150		
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2,8	GHz
Noise figure I_C = 2 mA; V_{CE} = 5 V; f = 800 MHz	F	typ.	2,5	dB
Output voltage at d_{im} = −60 dB V_{CE} = 10 V; I_C = 14 mA; Z_L = 75 Ω $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150	mV
Maximum unilateral power gain at f = 800 MHz V_{CE} = 10 V; I_C = 14 mA	G_{UM}	typ.	13,5	dB

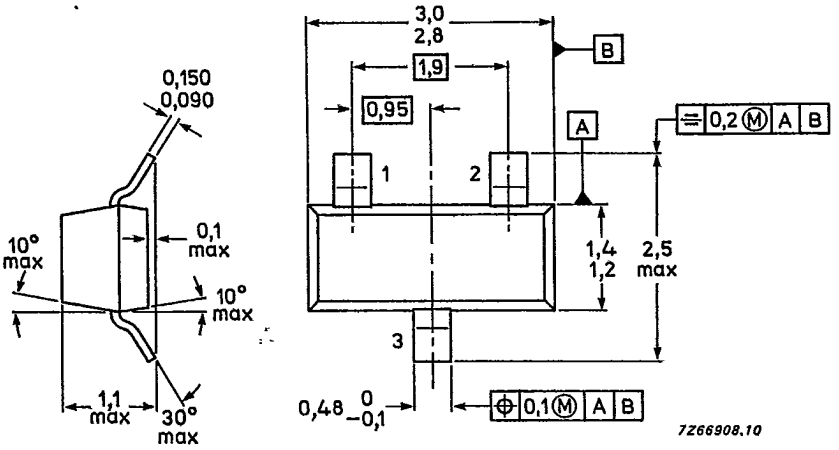
MECHANICAL DATA (see Fig. 1).

If required, the R-version (reverse pinning) is available on request.

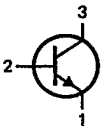
MECHANICAL DATA
Fig. 1 SOT-23.

Dimensions in mm

Marking code
BFS17A = E2



TOP VIEW



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value)	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 25 °C*	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−65 to + 150 °C
→ Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient*	$R_{th\ j\text{-}a}$	=	430 K/W

* Mounted on a ceramic substrate of 8 mm x 10 mm x 0,7 mm.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 2 mA; V_{CE} = 1 V I_C = 25 mA; V_{CE} = 1 V	h_{FE}	20 to 150 min. 20	
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2,8 GHz
Collector capacitance at f = 1 MHz I_E = 0; V_{CB} = 10 V	C_c	typ.	0,7 pF
Emitter capacitance at f = 1 MHz I_C = 0; V_{EB} = 0,5 V	C_e	typ.	1,25 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,6 pF
Maximum unilateral power gain (s_{re} assumed to be zero) $G_{UM} = 10 \log \frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$ I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz	G_{UM}	typ.	13,5 dB
Noise figure at f = 800 MHz I_C = 2 mA; V_{CE} = 5 V; Z_S = 60 Ω; T_{amb} = 25 °C	F	typ.	2,5 dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6,3: 3-tone) I_C = 14 mA; V_{CE} = 10 V; Z_L = 75 Ω $V_p = V_o$; f_p = 795,25 MHz $V_q = V_o$ −6 dB; f_q = 803,25 MHz $V_r = V_o$ −6 dB; f_r = 805,25 MHz Measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150 mV

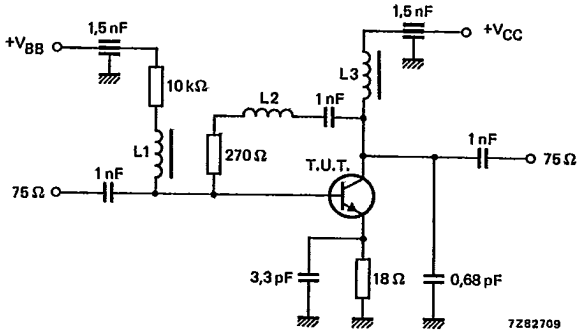


Fig. 2 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH Ferroxcube choke.
L2 = 3 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm.

s-parameters (common emitter) at V_{CE} = 5 V; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{ie}	s_{oe}	G_{UM} dB
2	40	0,94/ −11,1°	6,50/173,0°	0,01/83,1°	1,00/ −4,1°	45,7
	100	0,89/ −27,6°	6,22/158,7°	0,03/74,1°	0,96/ −9,8°	34,0
	200	0,79/ −50,3°	5,38/143,2°	0,06/63,8°	0,89/−16,0°	25,7
	500	0,50/−103,1°	3,37/107,0°	0,09/47,1°	0,68/−24,3°	14,5
	800	0,43/−130,7°	2,43/ 93,1°	0,11/47,9°	0,64/−28,0°	10,9
	1000	0,43/−148,2°	2,08/ 84,5°	0,12/50,1°	0,62/−32,6°	9,3
	1200	0,41/−172,5°	1,73/ 75,8°	0,13/51,6°	0,54/−31,6°	7,1
5	40	0,84/ −19,0°	14,43/167,4°	0,01/80,2°	0,98/ −7,6°	42,5
	100	0,74/ −45,0°	12,92/147,3°	0,03/67,8°	0,89/−16,9°	32,5
	200	0,60/ −75,6°	9,60/128,6°	0,05/58,6°	0,75/−23,1°	25,3
	500	0,38/−133,5°	4,94/ 98,3°	0,07/54,6°	0,52/−23,7°	15,9
	800	0,35/−158,6°	3,25/ 86,5°	0,09/60,3°	0,52/−25,6°	12,2
	1000	0,37/−171,2°	2,71/ 79,9°	0,11/62,7°	0,50/−30,1°	10,5
	1200	0,41/+166,1°	2,31/ 73,4°	0,12/64,3°	0,43/−24,8°	8,9
10	40	0,73/ −28,7°	23,50/160,9°	0,01/76,3°	0,95/−11,7°	41,0
	100	0,59/ −64,1°	18,60/136,3°	0,02/63,7°	0,79/−22,4°	31,6
	200	0,46/ −99,8°	12,38/117,6°	0,04/58,6°	0,62/−26,1°	25,0
	500	0,35/−156,4°	5,64/ 92,5°	0,06/62,4°	0,44/−20,2°	16,5
	800	0,34/−175,1°	3,67/ 82,7°	0,09/67,9°	0,46/−22,2°	12,8
	1000	0,36/+175,8°	3,00/ 76,7°	0,11/69,3°	0,44/−26,6°	11,1
	1200	0,43/+158,2°	2,56/ 71,6°	0,13/70,6°	0,38/−19,1°	9,7
14	40	0,65/ −35,6°	28,67/156,8°	0,01/74,8°	0,93/−13,7°	40,5
	100	0,52/ −75,9°	20,73/131,2°	0,02/62,5°	0,74/−24,3°	31,2
	200	0,41/−113,1°	13,17/113,0°	0,03/60,3°	0,57/−25,8°	24,9
	500	0,35/−164,2°	5,85/ 90,3°	0,06/65,2°	0,42/−17,6°	16,8
	800	0,34/−179,4°	3,76/ 81,3°	0,09/70,6°	0,44/−20,1°	13,0
	1000	0,37/+173,9°	3,04/ 75,8°	0,11/71,7°	0,43/−24,8°	11,2
	1200	0,44/+154,6°	2,63/ 69,7°	0,13/72,4°	0,38/−17,0°	10,0
20	40	0,58/ −44,3°	33,42/152,4°	0,01/72,4°	0,90/−15,8°	39,6
	100	0,45/ −89,5°	22,57/125,6°	0,02/61,8°	0,69/−25,0°	30,9
	200	0,38/−125,9°	13,53/108,7°	0,03/62,5°	0,53/−24,2°	24,8
	500	0,35/−171,5°	5,80/ 87,8°	0,06/68,0°	0,42/−15,0°	16,7
	800	0,35/+176,2°	3,68/ 79,4°	0,09/72,5°	0,44/−18,4°	12,8
	1000	0,38/+170/1°	3,01/ 74,2°	0,11/73,5°	0,43/−23,1°	11,1
	1200	0,46/+153,2°	2,63/ 69,3°	0,12/74,1°	0,38/−15,8°	10,1

s-parameters (common emitter) at V_{CE} = 10 V; typical values.

I_C mA	f MHz	s_{ie}	s_{fe}	s_{ie}	s_{oe}	G_{UM} dB
2	40	0,94/ −10,5°	6,35/173,2°	0,01/83,2°	1,00/ −3,5°	45,5
	100	0,89/ −26,1°	6,15/159,7°	0,03/74,7°	0,97/ −8,7°	34,6
	200	0,80/ −47,7°	5,37/144,2°	0,05/64,9°	0,91/−13,8°	26,5
	500	0,51/ −98,2°	3,40/108,9°	0,08/48,8°	0,72/−21,3°	15,1
	800	0,42/−126,1°	2,45/ 94,6°	0,10/50,0°	0,69/−25,0°	11,4
	1000	0,41/−144,2°	2,09/ 85,6°	0,11/52,1°	0,66/−29,0°	9,7
	1200	0,39/−170,5°	1,76/ 77,1°	0,12/53,1°	0,59/−28,1°	7,5
5	40	0,85/ −18,0°	14,09/168,2°	0,01/81,0°	0,99/ −6,3°	44,0
	100	0,76/ −41,4°	12,61/149,1°	0,03/69,2°	0,91/−14,4°	33,3
	200	0,61/ −70,9°	9,69/130,0°	0,04/60,1°	0,79/−19,9°	26,0
	500	0,38/−126,8°	5,04/ 99,2°	0,07/54,9°	0,57/−20,6°	16,5
	800	0,33/−152,2°	3,35/ 87,9°	0,08/61,2°	0,57/−22,7°	12,7
	1000	0,35/−165,9°	2,75/ 81,0°	0,10/64,0°	0,55/−26,4°	10,9
	1200	0,39/+168,5°	2,35/ 74,1°	0,11/65,4°	0,49/−22,3°	9,3
10	40	0,76/−25,9 °	22,67/161,9°	0,01/76,6°	0,96/ −9,8°	42,1
	100	0,63/ −57,9°	18,55/138,5°	0,02/65,1°	0,83/−19,2°	32,5
	200	0,47/ −91,5°	12,47/119,0°	0,03/59,8°	0,67/−22,4°	25,6
	500	0,33/−151,1°	5,82/ 93,0°	0,06/62,2°	0,50/−17,7°	17,1
	800	0,31/−169,4°	3,78/ 83,6°	0,08/68,4°	0,51/−19,6°	13,3
	1000	0,33/−178,6°	3,10/ 77,9°	0,10/70,0°	0,50/−23,5°	11,6
	1200	0,39/+158,8°	2,65/ 71,9°	0,12/70,8°	0,45/−17,8°	10,1
14	40	0,70/ −30,8°	27,63/158,1°	0,01/74,7°	0,95/−11,6°	41,5
	100	0,55/ −67,6°	20,66/133,4°	0,02/63,8°	0,78/−20,9°	32,0
	200	0,42/−102,5°	13,42/115,4°	0,03/60,9°	0,62/−22,4°	25,5
	500	0,32/−158,3°	5,97/ 91,4°	0,06/65,1°	0,48/−15,7°	17,1
	800	0,31/−174,4°	3,88/ 81,8°	0,08/70,5°	0,50/−18,3°	13,5
	1000	0,34/+177,7°	3,14/ 76,7°	0,10/71,9°	0,49/−22,2°	11,6
	1200	0,40/+156,0°	2,71/ 70,2°	0,12/72,3°	0,44/−15,9°	10,3
20	40	0,65/ −37,4°	32,19/154,4°	0,01/73,2°	0,92/−13,4°	40,8
	100	0,49/ −76,7°	22,74/127,9°	0,02/62,7°	0,73/−21,8°	31,7
	200	0,38/−112,6°	13,78/110,5°	0,03/62,3°	0,59/−21,1°	25,3
	500	0,32/−164,7°	6,05/ 88,6°	0,06/67,4°	0,47/−13,6°	17,2
	800	0,31/−179,0°	3,84/ 80,1°	0,08/72,4°	0,50/−16,8°	13,4
	1000	0,34/+173,5°	3,14/ 75,1°	0,10/73,1°	0,49/−21,0°	11,6
	1200	0,40/+155,0°	2,69/ 69,8°	0,12/73,6°	0,44/−14,7°	10,3

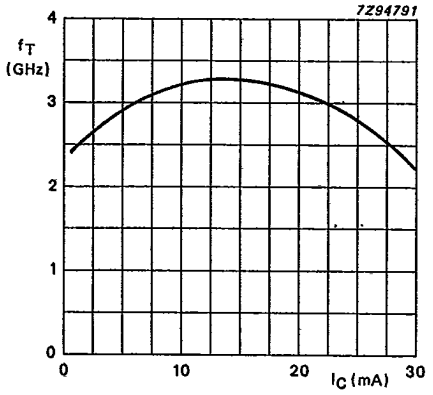


Fig. 3 V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C; typical values.

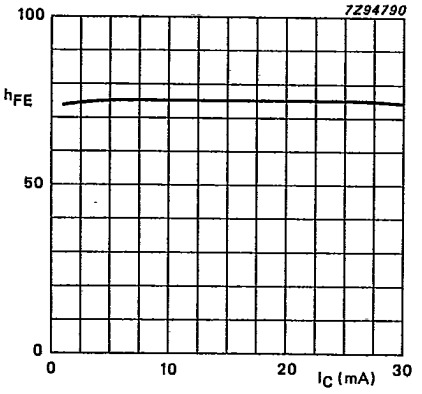


Fig. 4 V_{CE} = 1 V; T_{amb} = 25 °C; typical values.

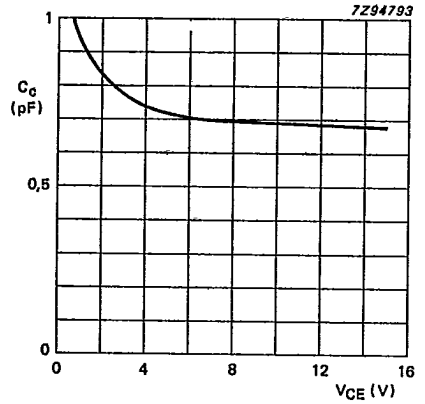


Fig. 5 I_E = 0; f = 1 MHz; T_{amb} = 25 °C; typical values.

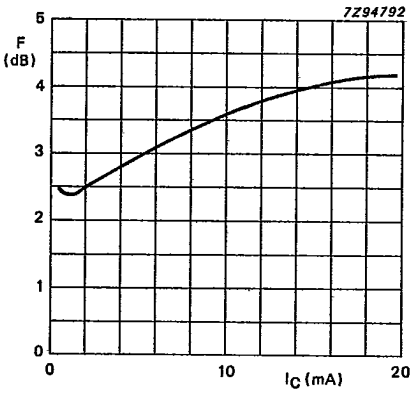


Fig. 6 V_{CE} = 5 V; T_{amb} = 25 °C; f = 800 MHz; Z_S = 60 Ω; typical values.