

NPN 3 GHz wideband transistor



BFW92A

N AMER PHILIPS/DISCRETE

69E D

DESCRIPTION

NPN transistor in a plastic SOT37 envelope.

It is primarily intended for use in amplifiers in the 40 to 860 MHz range.

The BFW92A is the successor to the BFW92 and offers high power gain and improved noise behaviour.

PINNING

PIN	DESCRIPTION
Code: BFW92A/02	
1	base
2	emitter
3	collector

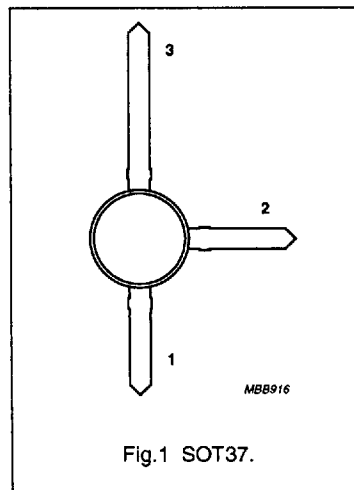


Fig.1 SOT37.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	25	V
V_{CEO}	collector-emitter voltage	open base	—	15	V
I_C	DC collector current		—	25	mA
P_{tot}	total power dissipation	up to $T_s = 155^\circ\text{C}$ (note 1)	—	300	mW
f_T	transition frequency	$I_C = 25\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_j = 25^\circ\text{C}$	2.8	—	GHz
C_{re}	feedback capacitance	$I_C = 0$; $V_{CE} = 5\text{ V}$; $f = 1\text{ MHz}$	0.45	—	pF
G_{UM}	maximum unilateral power gain	$I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 800\text{ MHz}$; $T_{amb} = 25^\circ\text{C}$	13	—	dB
F	noise figure	$I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $Z_S = 60\ \Omega$; $f = 800\text{ MHz}$; $T_{amb} = 25^\circ\text{C}$	2.5	—	dB
V_O	output voltage	$d_{im} = -60\text{ dB}$; $I_C = 14\text{ mA}$; $V_{CE} = 10\text{ V}$; $R_L = 75\ \Omega$; $T_{amb} = 25^\circ\text{C}$; $f_{(p+q-r)} = 793.25\text{ MHz}$	150	—	mV

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	—	25	V
V_{CEO}	collector-emitter voltage	open base	—	15	V
V_{EBO}	emitter-base voltage	open collector	—	2.5	V
I_C	DC collector current		—	25	mA
I_{CM}	peak collector current	$f > 1$ MHz	—	50	mA
P_{tot}	total power dissipation	up to $T_s = 155$ °C (note 1)	—	200	mW
T_{stg}	storage temperature		−65	150	°C
T_j	junction temperature		—	175	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j-s}$	thermal resistance from junction to soldering point	up to $T_s = 155$ °C (note 1)	65 K/W

Note

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

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CHARACTERISTICS

 $T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 10\text{ V}$	—	—	50	nA
h_{FE}	DC current gain	$I_C = 2\text{ mA}; V_{CE} = 1\text{ V}$	25	90	—	
		$I_C = 25\text{ mA}; V_{CE} = 1\text{ V}$	25	90	—	
f_T	transition frequency	$I_C = 25\text{ mA}; V_{CE} = 5\text{ V};$ $f = 500\text{ MHz}$	—	2.8	—	GHz
C_c	collector capacitance	$I_E = 0; V_{CB} = 10\text{ V}; f = 1\text{ MHz}$	—	0.75	—	pF
C_e	emitter capacitance	$I_C = 0; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	—	1.4	—	pF
C_{re}	feedback capacitance	$I_C = 0; V_{CE} = 5\text{ V}; f = 1\text{ MHz}$	—	0.45	—	pF
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 14\text{ mA}; V_{CE} = 10\text{ V};$ $f = 800\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$	—	13	—	dB
F	noise figure	$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}; Z_S = 60\text{ }\Omega;$ $f = 800\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$	—	2.5	—	dB
V_O	output voltage	see Fig.2 and note 2	—	150	—	mV

Notes

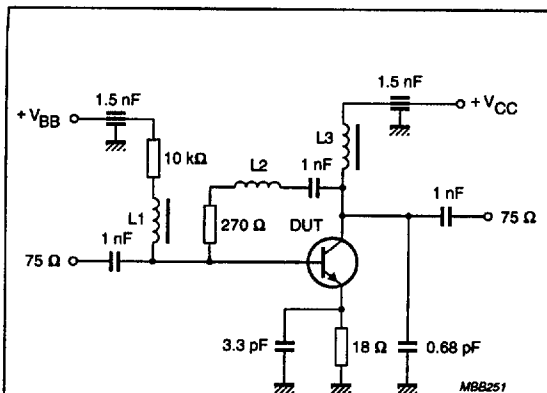
- G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$ dB.
- $d_{im} = -60\text{ dB}$ (DIN 45004B); $I_C = 14\text{ mA}; V_{CE} = 10\text{ V}; R_L = 75\text{ }\Omega; T_{amb} = 25\text{ }^{\circ}\text{C};$
 $V_p = V_O$ at $d_{im} = -60\text{ dB}; f_p = 795.25\text{ MHz};$
 $V_q = V_O - 6\text{ dB}; f_q = 803.25\text{ MHz};$
 $V_r = V_O - 6\text{ dB}; f_r = 805.25\text{ MHz};$
measured at $f_{(p+q-r)} = 793.25\text{ MHz}.$

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$L1 = L3 = 5 \mu\text{H}$ microchoke.

$L2 = 3$ turns 0.4 mm copper wire; winding pitch 1 mm ; internal diameter 3 mm .

Fig.2 Intermodulation distortion and second order intermodulation MATV test circuit.

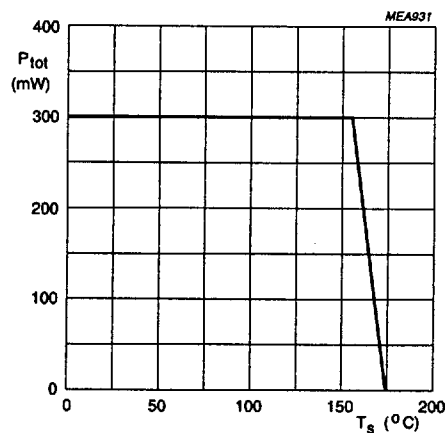
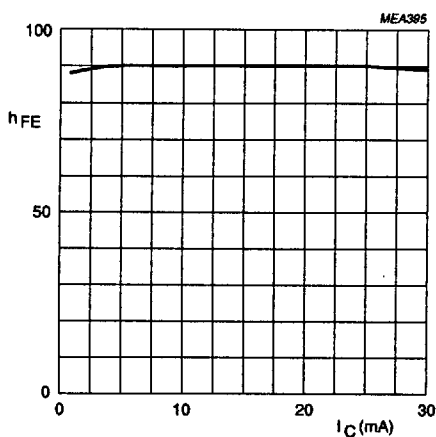
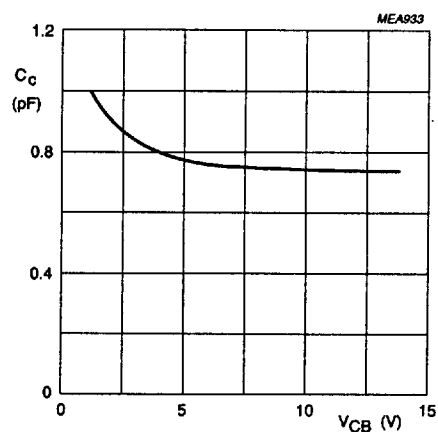


Fig.3 Power derating curve.



$V_{CE} = 5 \text{ V}$; $T_J = 25^\circ\text{C}$.

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



$I_E = I_B = 0$; $T_J = 25^\circ\text{C}$.

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

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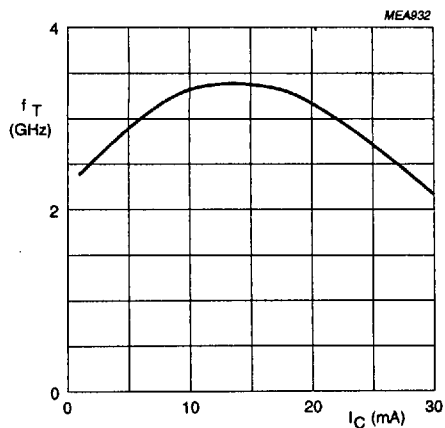
 $V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C.

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

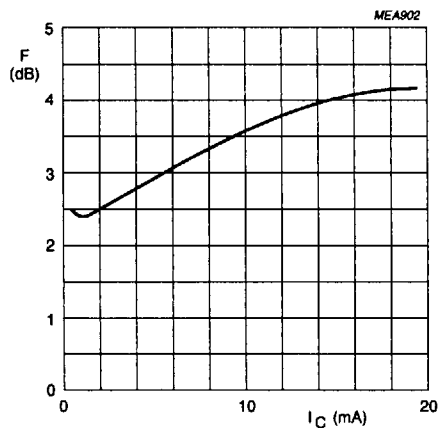
 $V_{CE} = 5$ V; $Z_S = 60$ Ω ; $f = 800$ MHz; $T_{amb} = 25$ °C.

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

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Table 1 Common emitter scattering parameters, $I_C = 10$ 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	0.732	-24.5	24.394	158.2	0.009	77.9	0.948	-9.2	41.0
100	0.566	-54.9	19.367	134.5	0.019	69.6	0.825	-16.5	32.4
200	0.354	-85.2	12.518	113.3	0.030	65.3	0.695	-19.5	25.4
300	0.267	-105.8	9.038	102.5	0.037	64.1	0.638	-19.8	21.7
400	0.227	-122.7	7.018	95.0	0.047	69.2	0.611	-20.4	19.2
500	0.191	-139.7	5.705	89.1	0.057	70.3	0.598	-21.5	17.2
600	0.176	-154.7	4.835	84.9	0.063	69.8	0.588	-23.2	15.7
700	0.171	-158.2	4.207	81.2	0.075	70.4	0.585	-24.7	14.4
800	0.160	-175.9	3.696	78.0	0.083	71.1	0.581	-26.6	13.3
900	0.163	174.5	3.309	72.6	0.092	71.1	0.575	-28.3	12.2
1000	0.171	157.0	2.994	70.2	0.102	70.3	0.571	-30.1	11.4
1200	0.196	144.7	2.536	63.9	0.121	69.7	0.557	-34.3	9.9
1400	0.224	132.4	2.258	58.7	0.137	69.4	0.546	-39.2	8.8
1600	0.236	122.3	1.979	52.1	0.155	68.9	0.539	-44.7	7.7
1800	0.265	109.3	1.774	48.5	0.174	67.9	0.540	-49.7	6.8
2000	0.312	102.0	1.629	43.1	0.190	66.5	0.535	-54.3	6.1
2200	0.337	91.1	1.536	38.4	0.205	65.2	0.516	-59.4	5.6
2400	0.375	89.0	1.420	31.5	0.226	64.8	0.494	-65.9	4.9
2600	0.413	84.5	1.290	28.8	0.246	62.7	0.483	-74.1	4.2
2800	0.421	76.9	1.269	25.1	0.260	61.6	0.493	-81.9	4.1
3000	0.430	70.8	1.163	20.2	0.281	61.7	0.496	-87.9	3.4

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Table 2 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	0.649	-30.8	30.938	153.2	0.008	75.2	0.925	-11.0	40.6
100	0.464	-63.5	22.135	127.6	0.017	68.4	0.773	-17.7	31.9
200	0.288	-94.7	13.474	108.1	0.027	68.8	0.652	-18.4	25.4
300	0.216	-117.2	9.483	98.3	0.036	70.3	0.608	-18.2	21.8
400	0.183	-135.0	7.274	91.7	0.046	72.6	0.588	-18.9	19.2
500	0.170	-148.5	5.883	86.8	0.055	73.5	0.577	-20.2	17.3
600	0.161	-160.5	4.956	82.9	0.065	73.3	0.572	-21.8	15.7
700	0.156	-171.5	4.300	79.1	0.075	73.6	0.569	-23.5	14.5
800	0.153	177.8	3.799	75.5	0.084	73.4	0.566	-25.4	13.4
900	0.153	166.3	3.384	71.8	0.094	73.1	0.563	-27.2	12.3
1000	0.160	155.2	3.045	68.8	0.103	72.5	0.559	-29.0	11.4
1200	0.190	139.5	2.570	63.1	0.122	71.6	0.547	-33.4	9.9
1400	0.222	129.8	2.276	57.6	0.140	70.5	0.536	-38.5	8.8
1600	0.240	122.0	2.008	52.0	0.158	69.9	0.531	-44.1	7.8
1800	0.257	112.3	1.806	47.8	0.176	68.7	0.527	-49.4	6.8
2000	0.288	101.3	1.651	42.4	0.195	67.4	0.520	-54.3	6.1
2200	0.331	93.6	1.548	38.4	0.212	66.0	0.504	-59.6	5.6
2400	0.371	88.7	1.443	32.0	0.231	65.3	0.481	-66.3	5.0
2600	0.391	84.8	1.327	29.3	0.253	63.2	0.468	-74.4	4.3
2800	0.404	78.7	1.295	24.3	0.269	61.7	0.471	-82.7	4.1
3000	0.427	70.9	1.189	19.6	0.291	61.4	0.475	-89.6	3.5