

NPN 7 GHz wideband transistor



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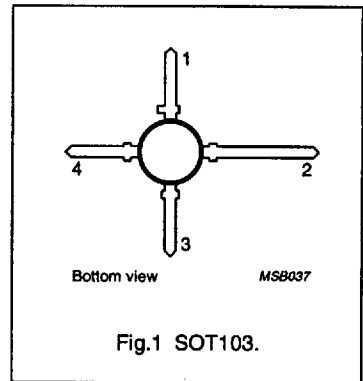
DESCRIPTION

NPN transistor in a 4-lead dual-emitter plastic SOT103 envelope.

It is designed for wideband applications in the GHz range, such as satellite TV systems (SATV) and repeater amplifiers in fibre-optic systems. The device features a very high transition frequency, high gain and a very low noise figure up to high frequencies.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	emitter
4	base



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	-	-	10	V
I_C	DC collector current		-	-	100	mA
P_{tot}	total power dissipation	up to $T_s = 136\text{ }^\circ\text{C}$ (note 1)	-	-	700	mW
h_{FE}	DC current gain	$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}; T_j = 25\text{ }^\circ\text{C}$	40	110	-	
f_T	transition frequency	$I_C = 50\text{ mA}; V_{CE} = 8\text{ V}; f = 2\text{ GHz}; T_{amb} = 25\text{ }^\circ\text{C}$	-	7.5	-	GHz
G_{UM}	maximum unilateral power gain	$I_C = 50\text{ mA}; V_{CE} = 8\text{ V}; f = 2\text{ GHz}; T_{amb} = 25\text{ }^\circ\text{C}$	-	11	-	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	-	20	V
V_{CEO}	collector-emitter voltage	open base	-	10	V
V_{EBO}	emitter-base voltage	open collector	-	2.5	V
I_C	DC collector current		-	100	mA
P_{tot}	total power dissipation	up to $T_s = 136\text{ }^\circ\text{C}$ (note 1)	-	700	mW
T_{stg}	storage temperature		-65	150	$^\circ\text{C}$
T_j	junction temperature		-	175	$^\circ\text{C}$

Note

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

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THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th(j-s)}$	thermal resistance from junction to soldering point	up to $T_s = 136\text{ °C}$ (note 1)	55 K/W

Note

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

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 5\text{ V}$	–	–	100	nA
h_{FE}	DC current gain	$I_C = 50\text{ mA}; V_{CE} = 5\text{ V}$	40	110	–	
C_c	collector capacitance	$I_E = I_B = 0; V_{CB} = 8\text{ V}; f = 1\text{ MHz}$	–	1.5	–	pF
C_e	emitter capacitance	$I_C = I_C = 0; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$	–	3.3	–	pF
C_{fb}	feedback capacitance	$I_C = 0; V_{CE} = 8\text{ V}; f = 1\text{ MHz}$	–	0.85	–	pF
f_T	transition frequency	$I_C = 50\text{ mA}; V_{CE} = 8\text{ V}; f = 2\text{ GHz};$ $T_{amb} = 25\text{ °C}$	–	7.5	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 50\text{ mA}; V_{CE} = 8\text{ V}; f = 2\text{ GHz};$ $T_{amb} = 25\text{ °C}$	–	11	–	dB
F	noise figure	$I_C = 15\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz};$ $T_{amb} = 25\text{ °C}; Z_S = \text{opt.}$	–	1.4	–	dB
		$I_C = 50\text{ mA}; V_{CE} = 8\text{ V}; f = 800\text{ MHz};$ $T_{amb} = 25\text{ °C}; Z_S = \text{opt.}$	–	1.9	–	dB
V_O	output voltage	note 2	–	700	–	mV
d_2	second order intermodulation distortion	note 3	–	–55	–	dB

Notes

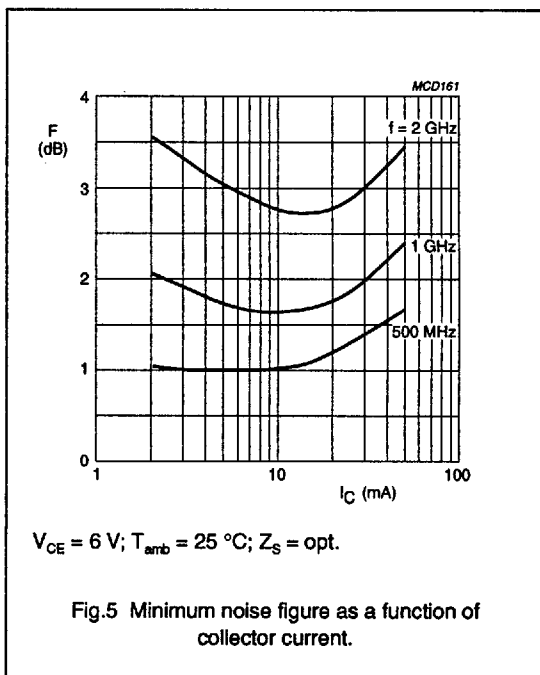
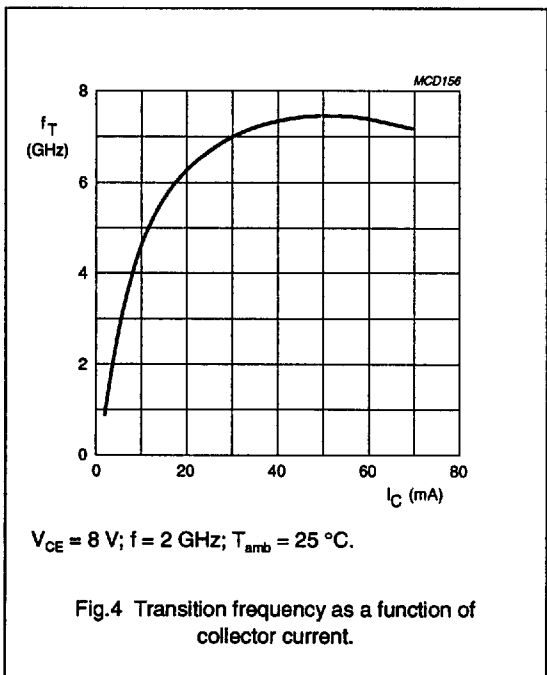
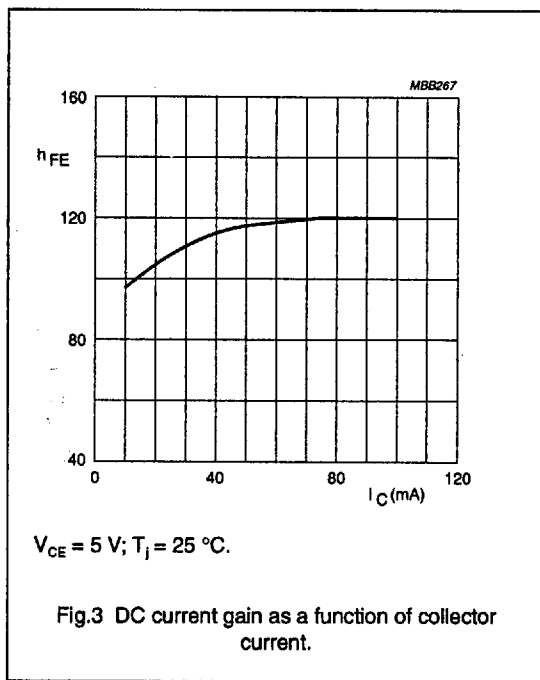
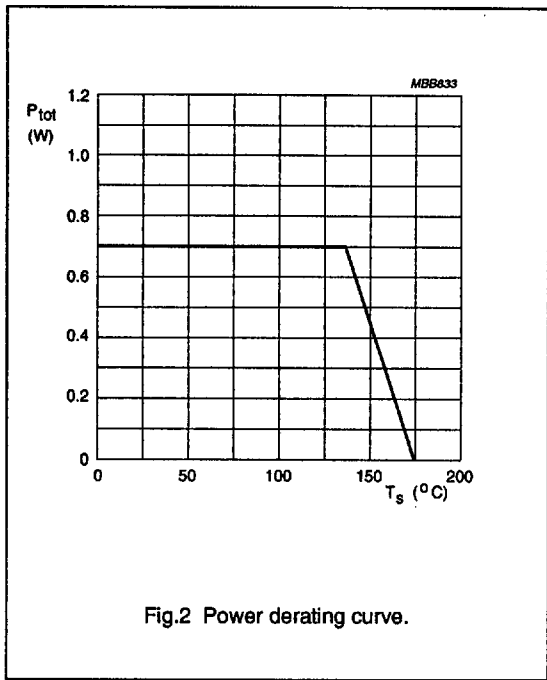
- G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$ dB.
- $d_{im} = -60\text{ dB}; I_C = 70\text{ mA}; V_{CE} = 8\text{ V}; R_L = 75\ \Omega; f_{(p+q)} = 793.25\text{ MHz.}$
- $I_C = 50\text{ mA}; V_{CE} = 8\text{ V}; V_o = 50\text{ dBmV}; f_{(p+q)} = 810\text{ MHz.}$

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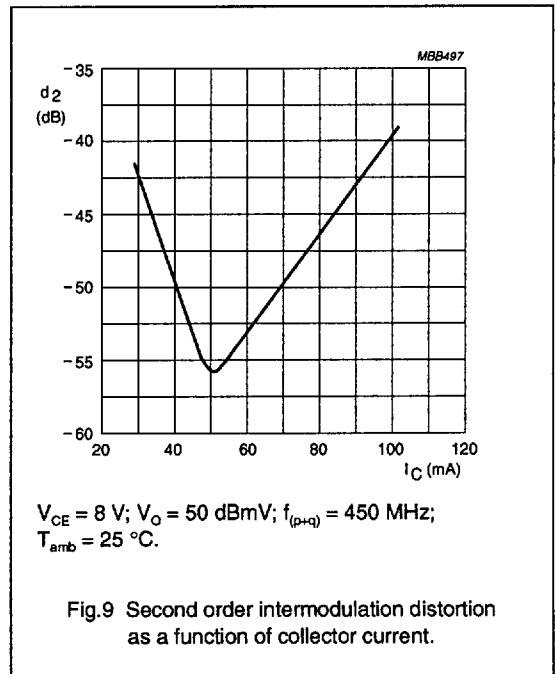
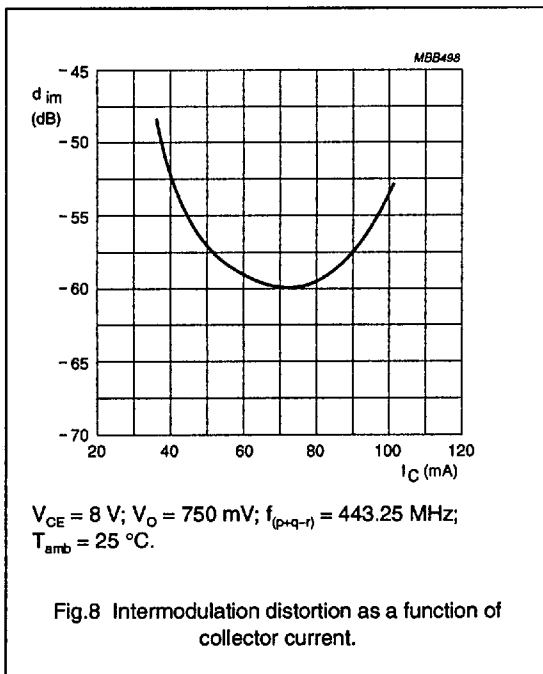
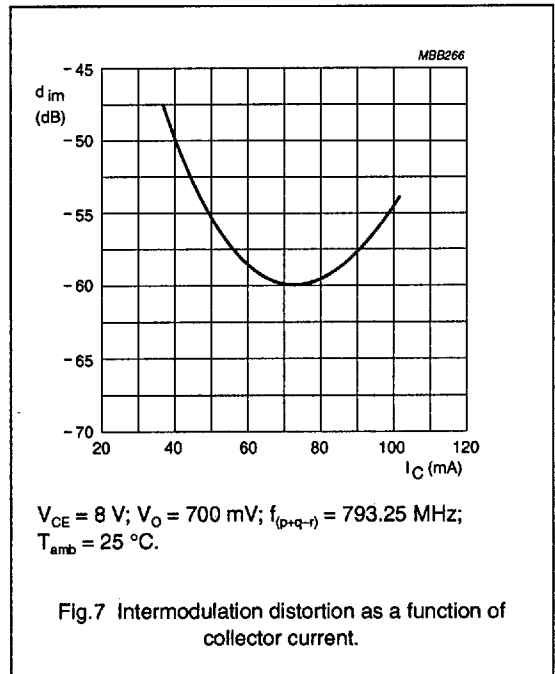
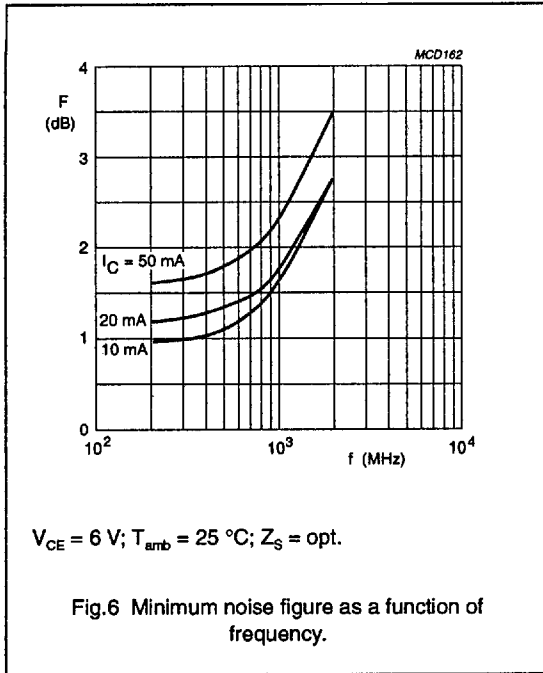


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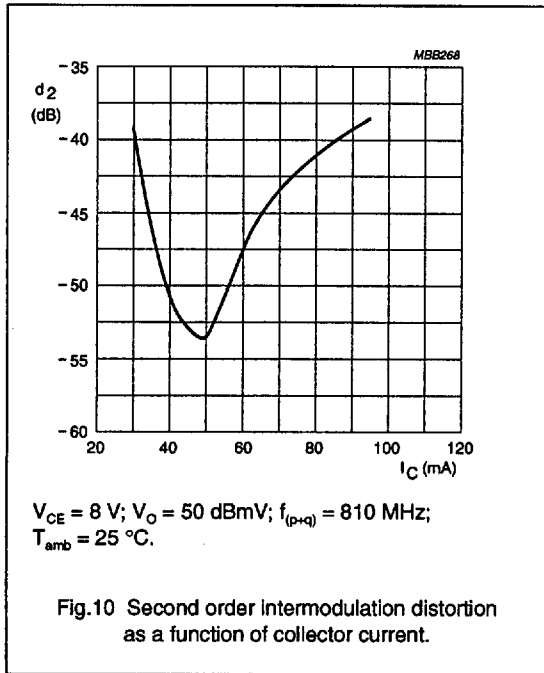
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Table 1 Common emitter scattering parameters, $I_C = 30$ mA; $V_{CE} = 8$ V

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	0.405	-88.9	48.469	148.5	0.012	65.3	0.820	-36.4	39.3
100	0.580	-133.6	31.901	121.8	0.021	48.9	0.554	-70.7	33.4
200	0.658	-158.9	18.336	103.8	0.027	46.4	0.356	-100.3	28.3
300	0.684	-170.0	12.623	94.8	0.031	48.5	0.286	-117.9	25.1
400	0.693	-176.3	9.610	88.6	0.036	51.6	0.258	-129.4	22.8
500	0.698	178.4	7.755	83.6	0.042	54.4	0.246	-136.7	21.0
600	0.702	174.4	6.520	79.4	0.048	55.8	0.239	-141.8	19.5
700	0.701	170.7	5.609	75.4	0.054	56.9	0.233	-145.4	18.2
800	0.703	167.0	4.950	72.0	0.060	57.8	0.229	-148.4	17.1
900	0.702	163.6	4.427	68.5	0.067	58.0	0.225	-151.6	16.1
1000	0.704	160.5	3.978	65.4	0.073	58.4	0.222	-154.9	15.2
1200	0.719	154.1	3.353	59.2	0.086	58.0	0.230	-161.6	13.9
1400	0.734	148.3	2.884	53.1	0.097	56.6	0.247	-167.0	12.8
1600	0.737	143.5	2.517	47.3	0.110	55.3	0.259	-168.6	11.7
1800	0.737	137.8	2.292	40.5	0.124	52.6	0.267	-170.1	10.9
2000	0.741	132.0	2.064	35.0	0.137	49.9	0.273	-174.1	10.1
2200	0.764	126.9	1.877	29.9	0.149	48.5	0.283	180.0	9.6
2400	0.790	122.9	1.738	25.9	0.160	47.0	0.308	175.4	9.5
2600	0.801	119.6	1.598	20.2	0.171	44.0	0.340	173.3	9.1
2800	0.806	115.1	1.510	14.4	0.181	41.0	0.361	171.7	8.7
3000	0.804	109.9	1.403	8.8	0.195	38.4	0.368	169.3	8.1

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Table 2 Common emitter scattering parameters, $I_C = 50 \text{ mA}$; $V_{CE} = 8 \text{ V}$

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	0.398	-113.3	57.101	143.7	0.010	63.2	0.757	-44.1	39.6
100	0.598	-147.3	34.668	117.1	0.017	50.5	0.489	-82.1	33.9
200	0.666	-166.5	19.217	100.8	0.022	52.2	0.327	-113.7	28.7
300	0.685	-175.0	13.102	92.9	0.028	56.0	0.279	-131.2	25.4
400	0.695	179.8	9.942	87.2	0.034	59.0	0.263	-142.2	23.1
500	0.699	175.5	7.998	82.5	0.041	61.2	0.256	-148.6	21.3
600	0.702	171.9	6.728	78.6	0.047	62.1	0.252	-153.2	19.8
700	0.698	168.4	5.790	74.8	0.054	62.5	0.248	-156.2	18.4
800	0.699	164.7	5.112	71.5	0.061	62.7	0.244	-159.1	17.3
900	0.701	161.8	4.562	68.1	0.068	62.5	0.241	-162.0	16.4
1000	0.703	158.8	4.093	65.2	0.075	62.2	0.240	-165.1	15.5
1200	0.717	152.8	3.453	59.1	0.088	60.9	0.248	-171.2	14.2
1400	0.734	147.3	2.959	53.5	0.100	59.0	0.266	-175.9	13.1
1600	0.733	142.8	2.594	47.6	0.113	57.0	0.274	-177.1	12.0
1800	0.733	136.9	2.353	40.8	0.128	54.0	0.279	-178.4	11.1
2000	0.739	131.2	2.131	35.1	0.142	50.6	0.283	177.7	10.4
2200	0.765	126.2	1.928	30.4	0.155	49.1	0.294	172.2	9.9
2400	0.791	122.2	1.796	26.3	0.165	47.2	0.319	168.3	9.8
2600	0.802	119.6	1.645	21.0	0.175	43.9	0.348	166.8	9.4
2800	0.801	115.0	1.551	15.2	0.186	40.8	0.366	165.6	8.9
3000	0.804	110.0	1.450	10.3	0.200	38.0	0.369	163.3	8.4