TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC4321

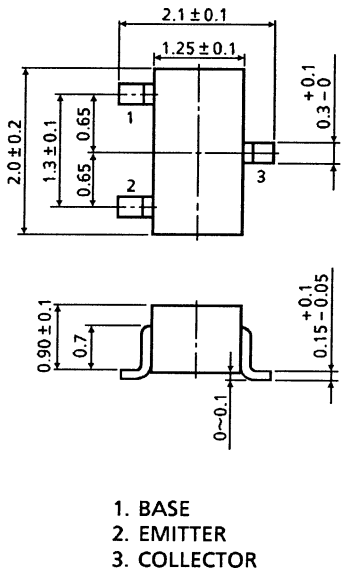
VHF~UHF Band Low Noise Amplifier Applications

- Low noise figure, high gain.
- NF = 1.1dB, $|S_{21e}|^2$ = 13dB (f = 1 GHz)

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	10	V
Emitter-base voltage	V_{EBO}	1.5	V
Base current	I_B	20	mA
Collector current	I_C	40	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

Unit: mm



JEDEC	—
JEITA	SC-70
TOSHIBA	2-2E1A

Weight: 0.006 g (typ.)

Microwave Characteristics (Ta = 25°C)

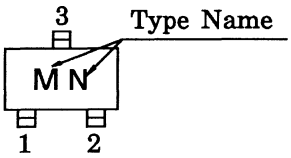
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	V_{CE} = 8 V, I_C = 20 mA	7	10	—	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 8 V, I_C = 20 mA, f = 1 GHz	10	13	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 8 V, I_C = 20 mA, f = 2 GHz	—	7	—	
Noise figure	NF (1)	V_{CE} = 8 V, I_C = 5 mA, f = 1 GHz	—	1.1	2.5	dB
	NF (2)	V_{CE} = 8 V, I_C = 5 mA, f = 2 GHz	—	1.7	—	

Electrical Characteristics (Ta = 25°C)

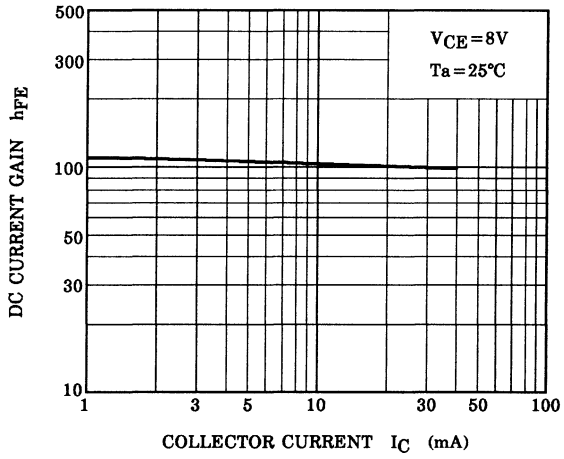
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 10 V, I_E = 0	—	—	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	1	μA
DC current gain	h_{FE}	V_{CE} = 8 V, I_C = 20 mA	50	—	250	
Output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz (Note)	—	0.65	—	pF
Reverse transfer capacitance	C_{re}		—	0.45	0.9	pF

Note: C_{re} is measured by 3 terminal method with capacitance bridge.

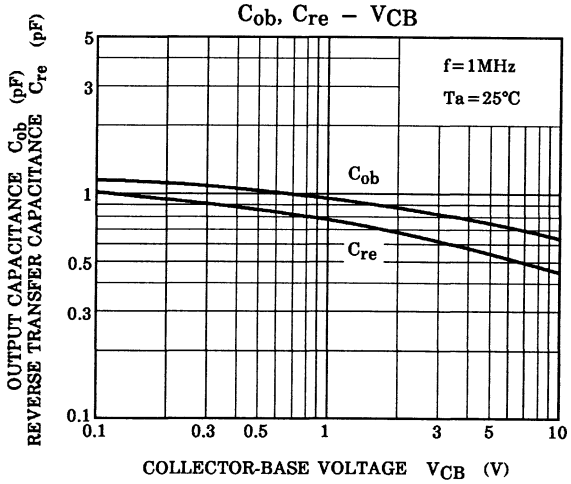
Marking



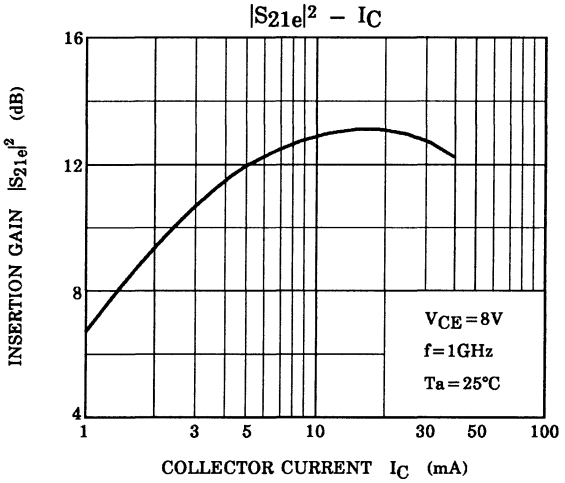
h_{FE} – I_C



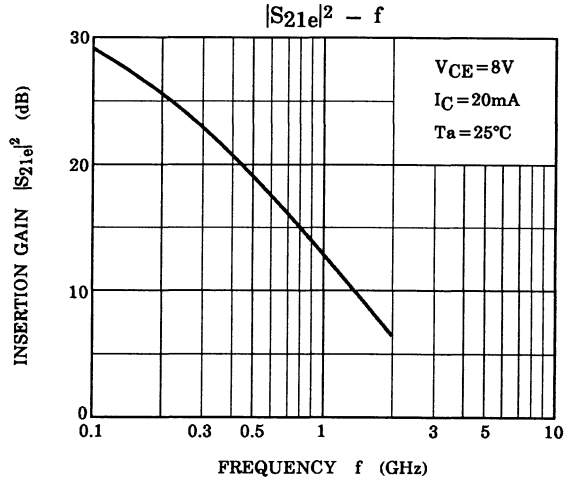
C_{ob}, C_{re} – V_{CB}



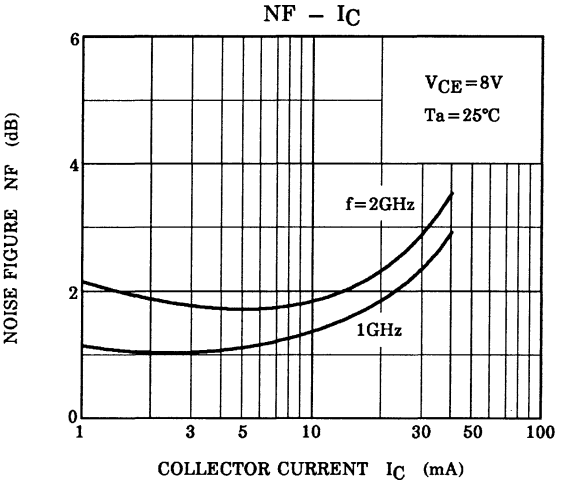
$|S_{21e}|^2$ – I_C



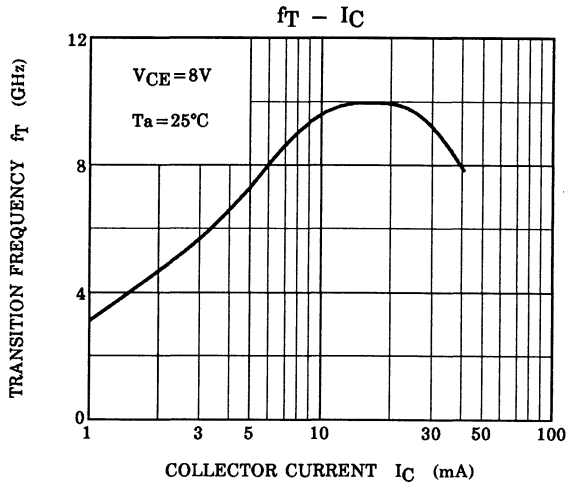
$|S_{21e}|^2$ – f

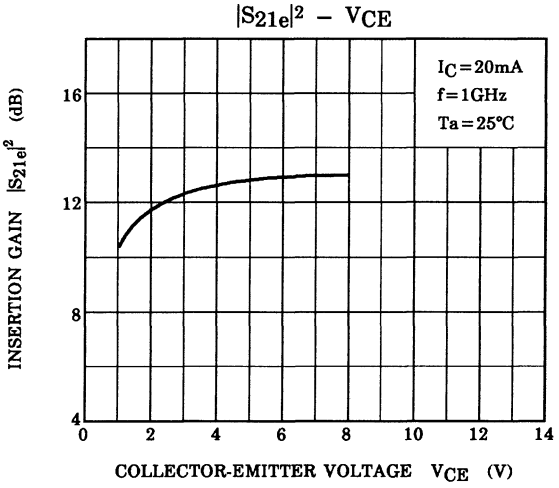


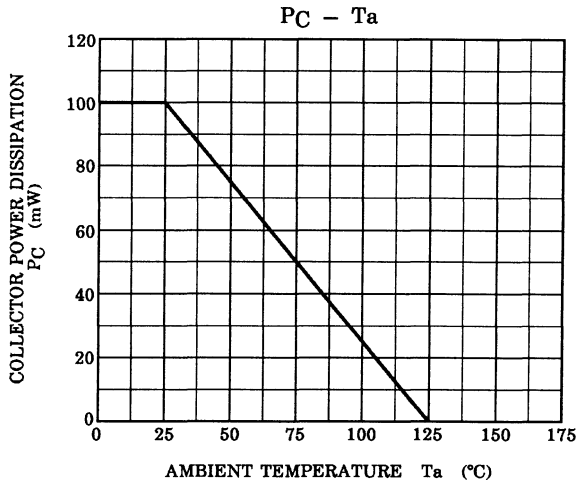
NF – I_C



f_T – I_C







S-Parameter Z_O = 50 Ω, Ta = 25°C

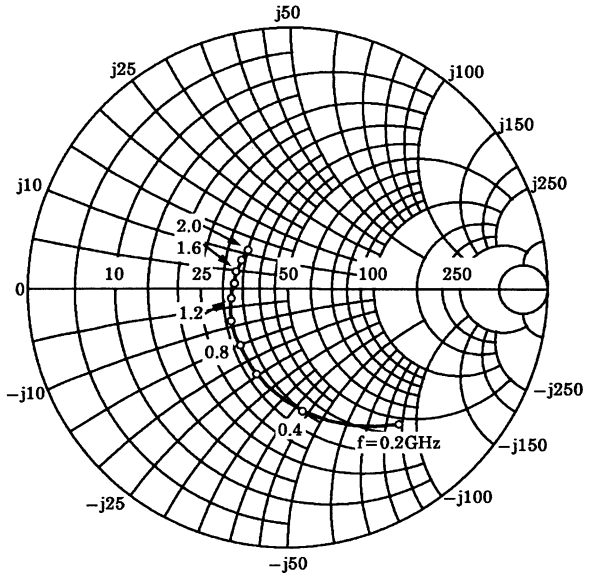
V_{CE} = 8 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.680	–49.6	11.448	140.0	0.048	67.0	0.820	–28.4
400	0.478	–83.2	8.076	116.6	0.073	59.6	0.613	–41.1
600	0.353	–108.3	5.992	102.7	0.092	59.1	0.495	–46.2
800	0.281	–129.2	4.711	93.0	0.109	60.1	0.428	–48.9
1000	0.240	–149.0	3.875	85.8	0.127	61.1	0.389	–51.0
1200	0.216	–169.1	3.294	79.6	0.146	62.1	0.364	–53.3
1400	0.202	175.1	2.876	73.8	0.166	62.6	0.350	–55.6
1600	0.194	158.9	2.572	69.0	0.186	62.6	0.339	–58.4
1800	0.193	142.9	2.349	64.5	0.207	62.4	0.332	–61.7
2000	0.202	130.9	2.128	61.1	0.227	62.3	0.325	–65.7

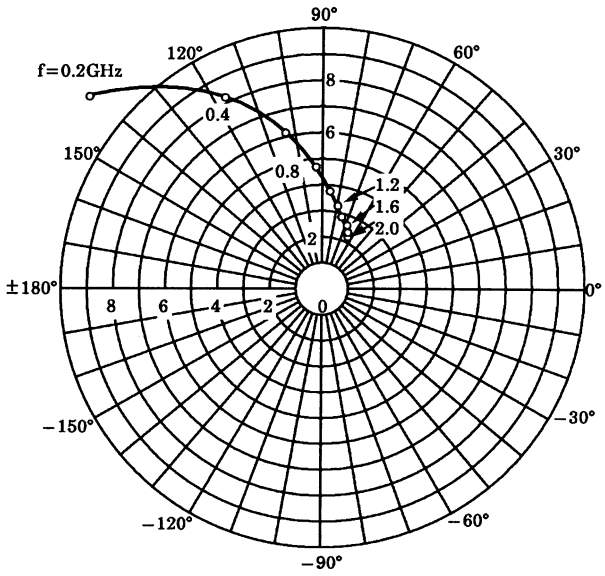
V_{CE} = 8 V, I_C = 20 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.332	–83.7	18.406	118.0	0.034	68.8	0.565	–38.2
400	0.212	–123.3	10.378	100.0	0.057	71.1	0.393	–39.9
600	0.173	–150.7	7.130	90.7	0.080	73.0	0.336	–39.3
800	0.157	–175.3	5.442	84.3	0.104	73.0	0.309	–39.6
1000	0.161	167.5	4.394	79.1	0.128	72.4	0.295	–41.0
1200	0.162	149.7	3.728	74.3	0.152	71.7	0.285	–43.2
1400	0.169	138.2	3.240	69.5	0.175	70.5	0.280	–46.0
1600	0.177	125.9	2.877	65.7	0.200	68.9	0.278	–48.9
1800	0.178	113.5	2.595	61.8	0.223	67.4	0.279	–53.0
2000	0.190	104.3	2.352	58.6	0.246	65.8	0.275	–57.8

S_{11e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



S_{21e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C



S_{12e}
V_{CE} = 8V
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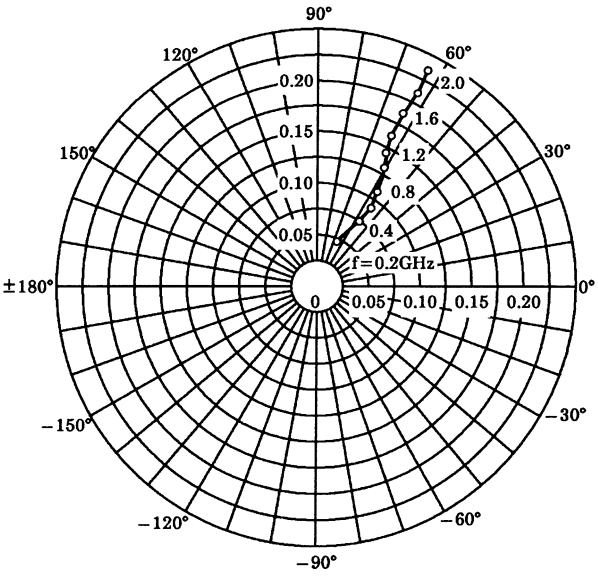

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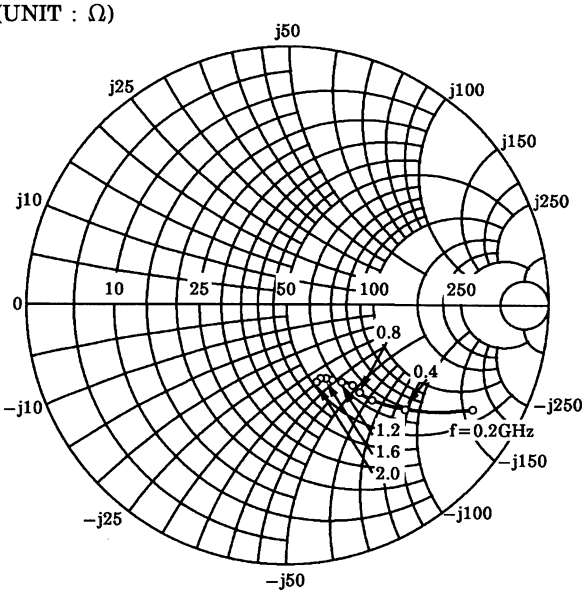
Ta = 25°C
(UNIT : Ω)



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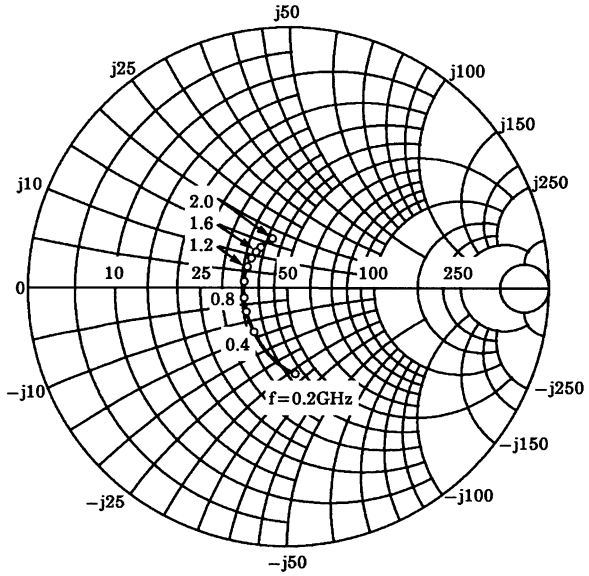
V_{CE} = 8V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



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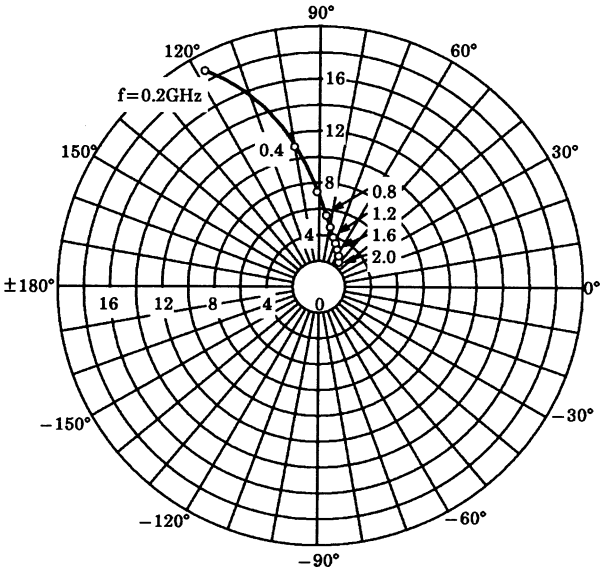

S_{12e}
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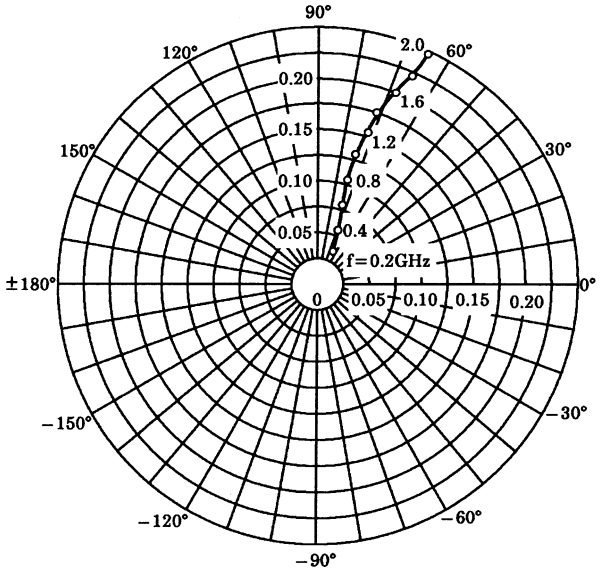

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I_C = 20mA
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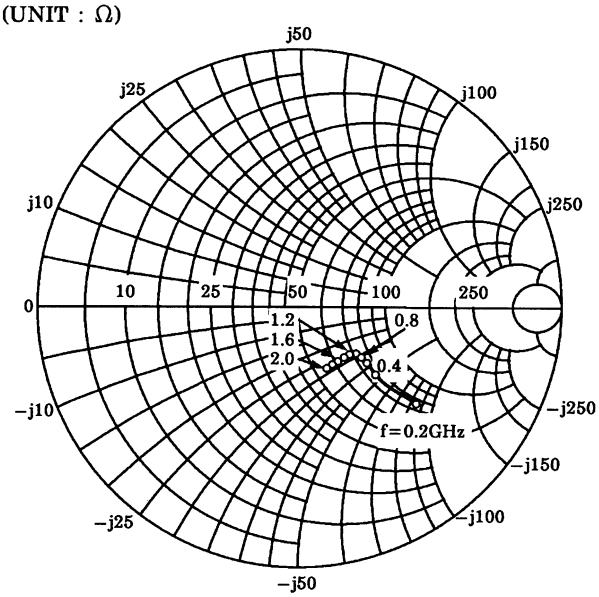

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