

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

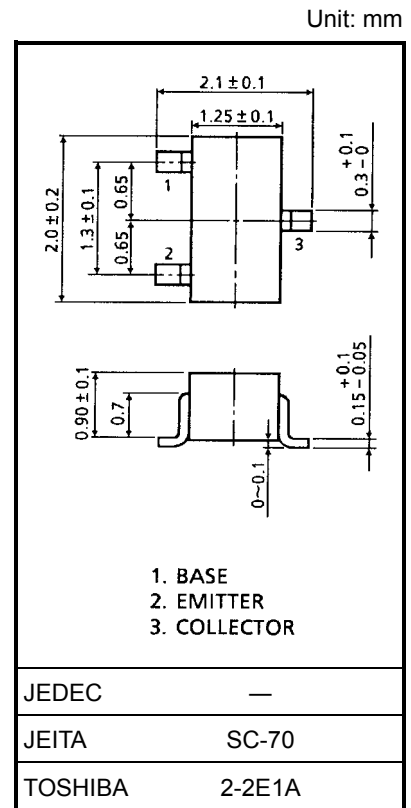
2SC4321

VHF~UHF Band Low Noise Amplifier Applications

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

Maximum Ratings ($T_a = 25^\circ\text{C}$)

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	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55~125	$^\circ\text{C}$



Microwave Characteristics ($T_a = 25^\circ\text{C}$)

Weight: 0.006 g (typ.)

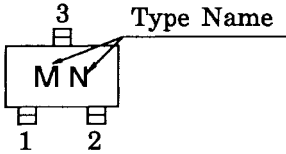
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2$ (1)	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$, $f = 1\text{GHz}$	10	13	—	dB
	$ S_{21e} ^2$ (2)	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$,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

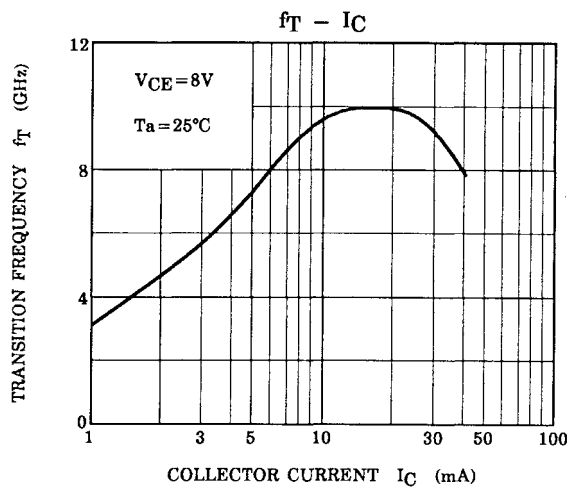
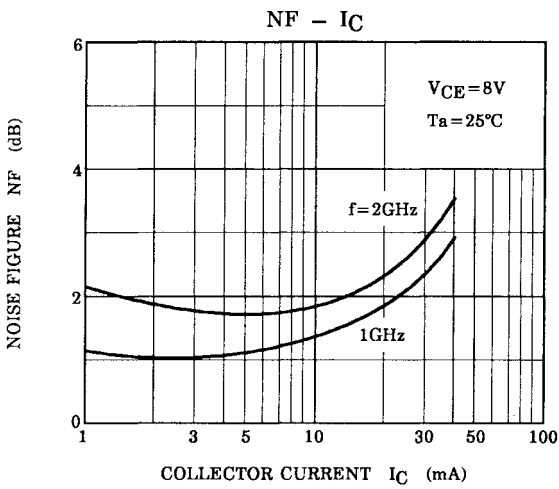
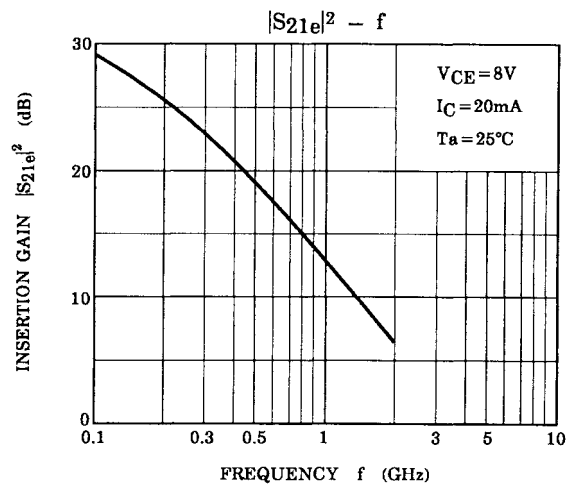
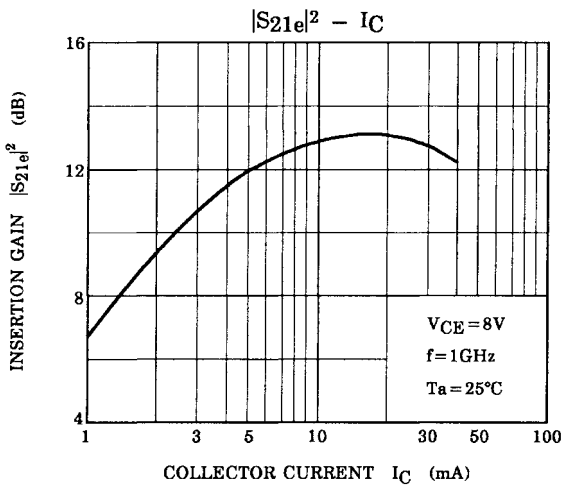
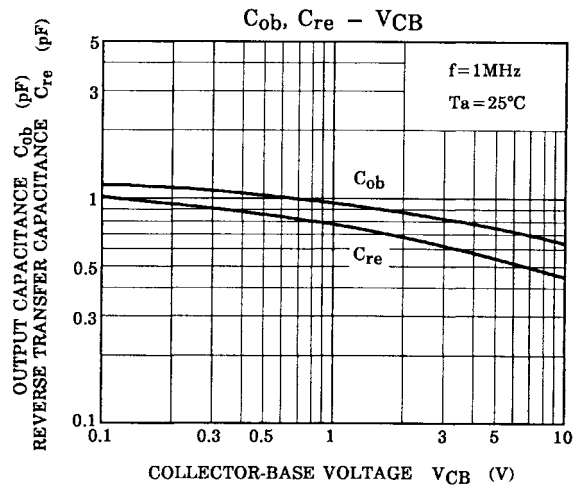
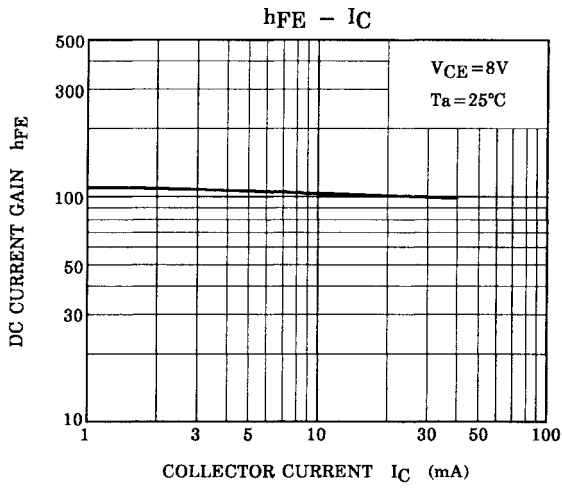
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

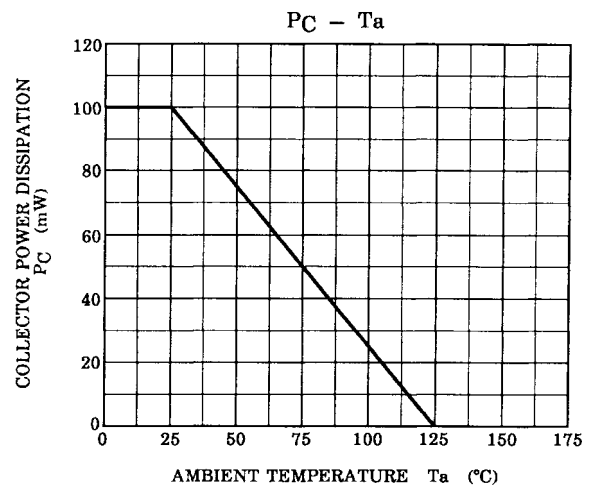
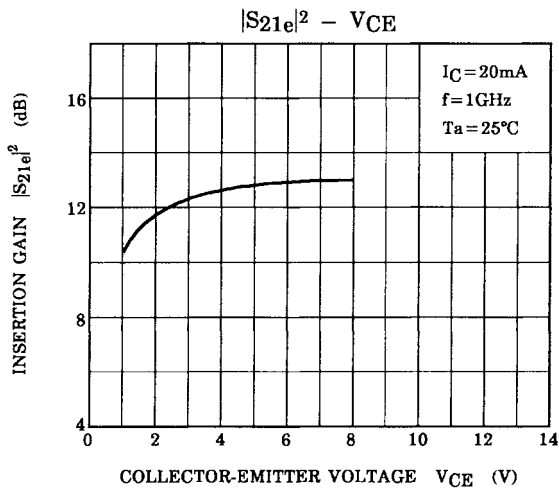
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE}	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$	50	—	250	
Output capacitance	C_{ob}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







S-Parameter $Z_0 = 50 \Omega, T_a = 25^\circ\text{C}$

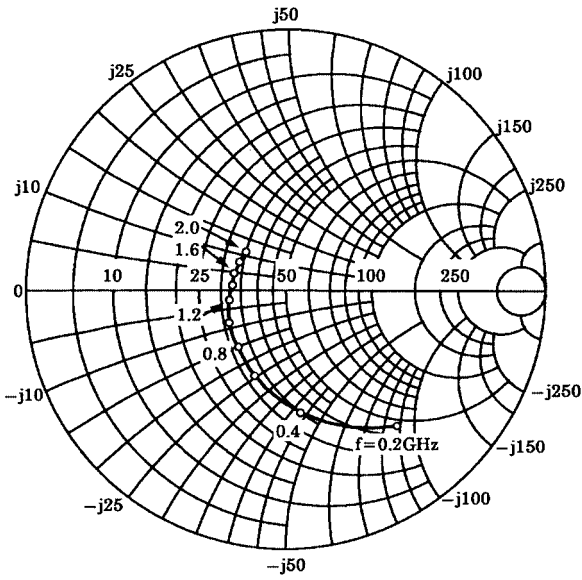
V_{CE} = 8 V, I_C = 5 mA

Frequency MHz	S11		S21		S12		S22	
	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

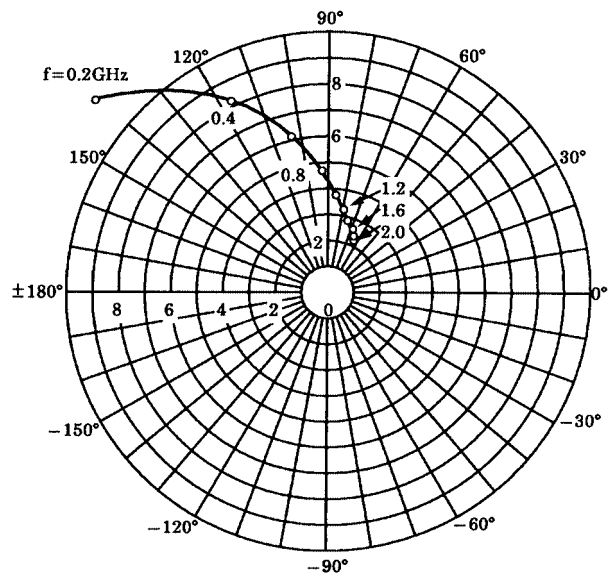
V_{CE} = 8 V, I_C = 20 mA

Frequency MHz	S11		S21		S12		S22	
	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

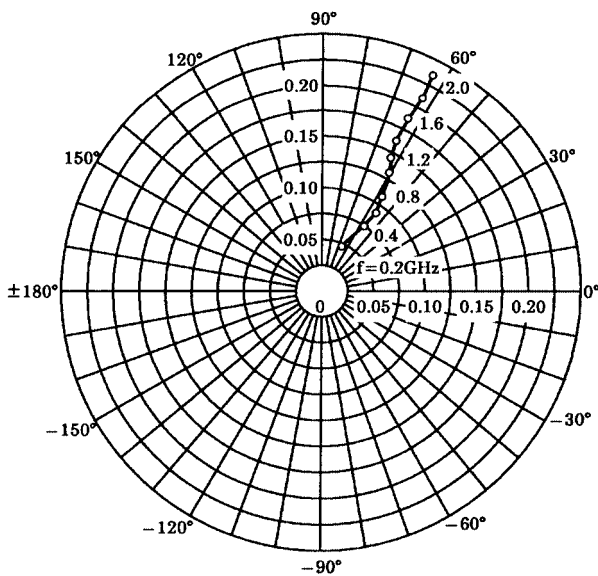
S11e
VCE=8V
IC=5mA
Ta=25°C
 (UNIT : Ω)



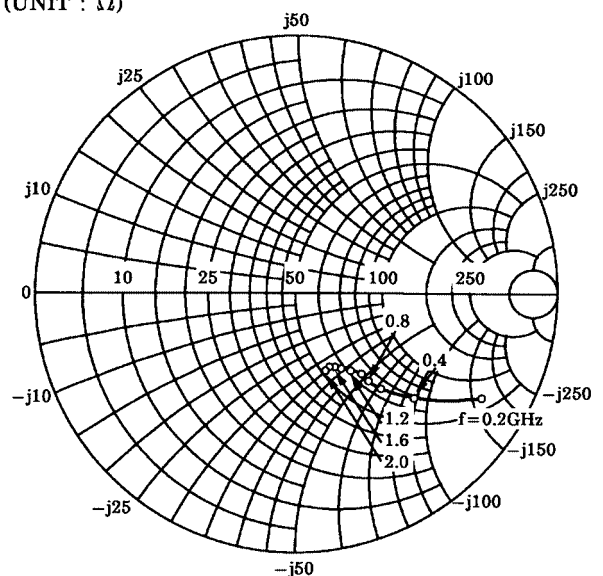
S21e
VCE=8V
IC=5mA
Ta=25°C



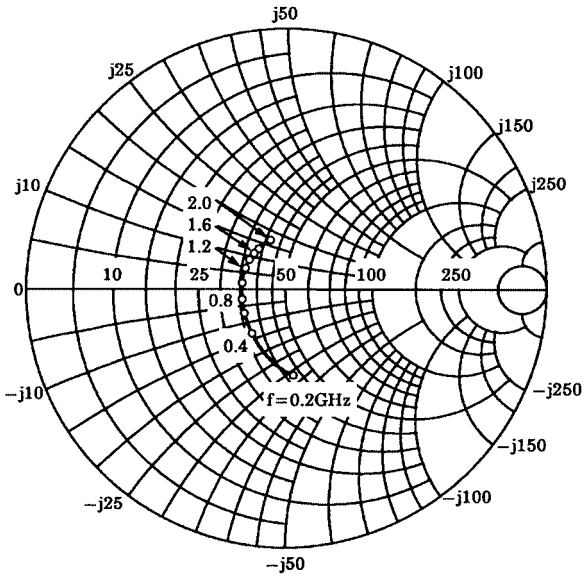
S12e
VCE=8V
IC=5mA
Ta=25°C



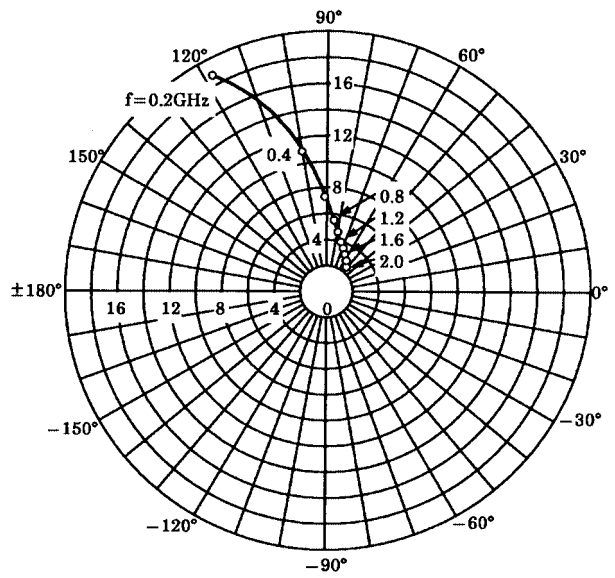
S22e
VCE=8V
IC=5mA
Ta=25°C
 (UNIT : Ω)



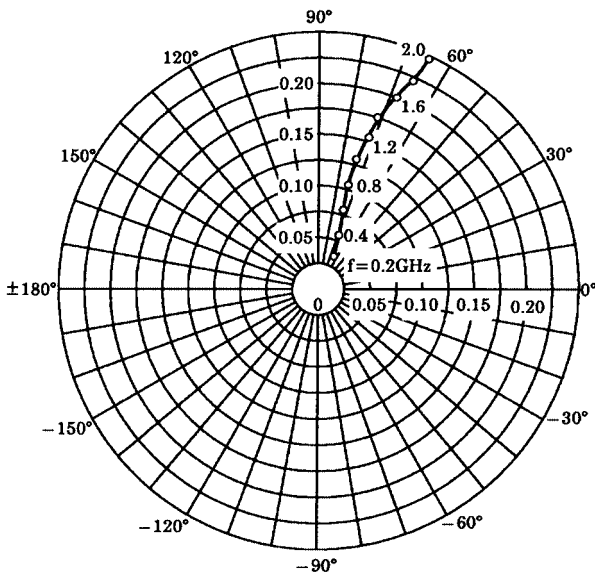
S11e
 VCE=8V
 IC=20mA
 Ta=25°C
 (UNIT : Ω)



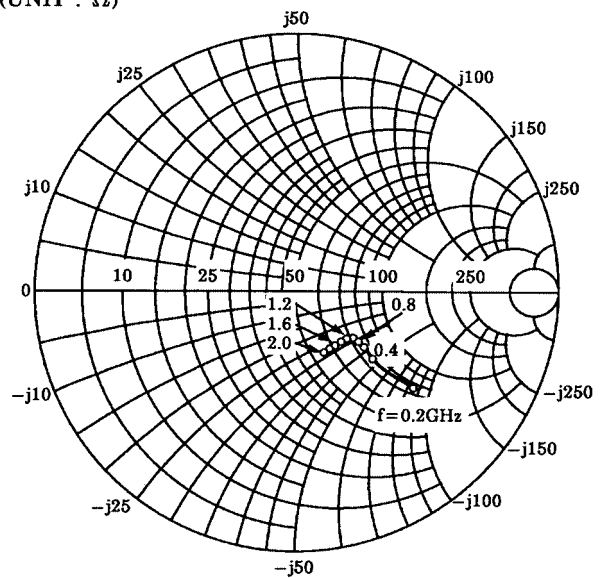
S21e
 VCE=8V
 IC=20mA
 Ta=25°C



S12e
 VCE=8V
 IC=20mA
 Ta=25°C



S22e
 VCE=8V
 IC=20mA
 Ta=25°C
 (UNIT : Ω)



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