

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

# 2SC4320

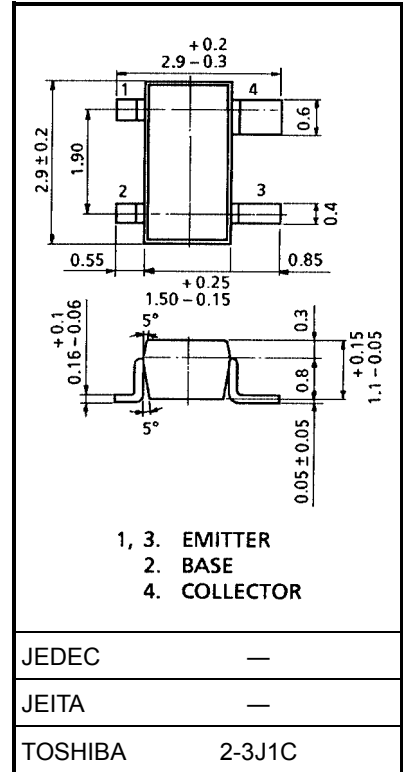
VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

- Low noise figure, high gain.
- $NF = 1.1\text{dB}$ ,  $|S_{21e}|^2 = 15\text{dB}$  ( $f = 1\text{GHz}$ )

### 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	$P_C$	150	mW
Junction temperature	$T_j$	125	°C
Storage temperature range	$T_{stg}$	-55~125	°C



### Microwave Characteristics (Ta = 25°C)

Weight: 0.012 g (typ.)

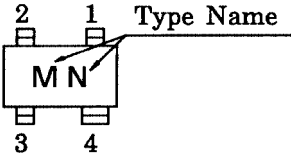
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	$f_T$	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2$ (1)	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$ , $f = 1\text{GHz}$	12	15	—	dB
	$ S_{21e} ^2$ (2)	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$ , $f = 2\text{GHz}$	—	9	—	
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	—	

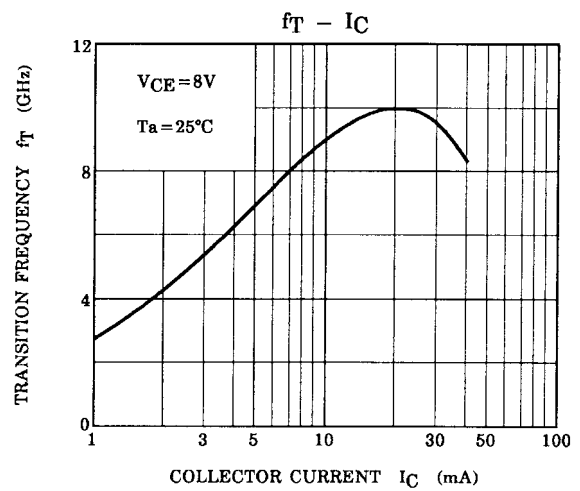
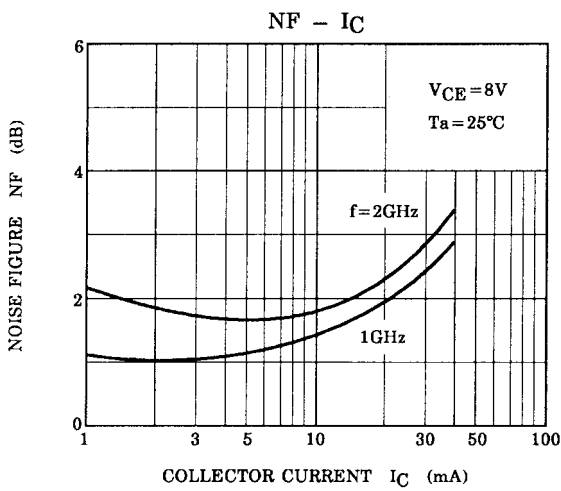
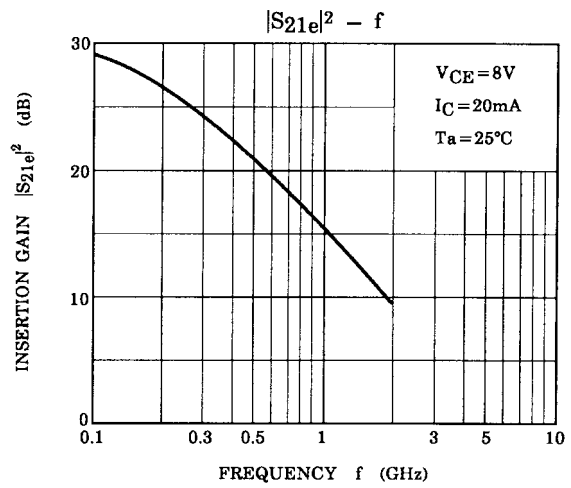
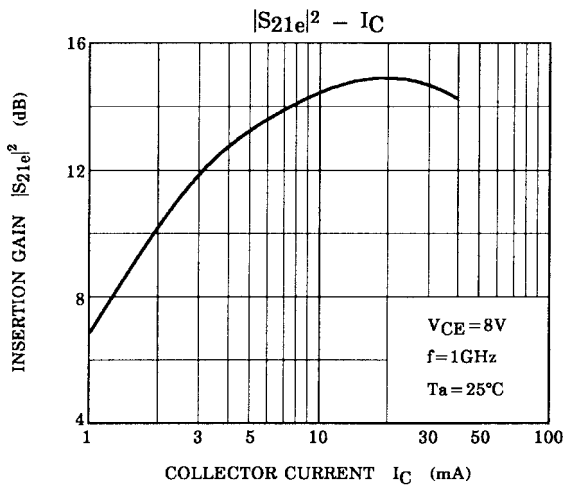
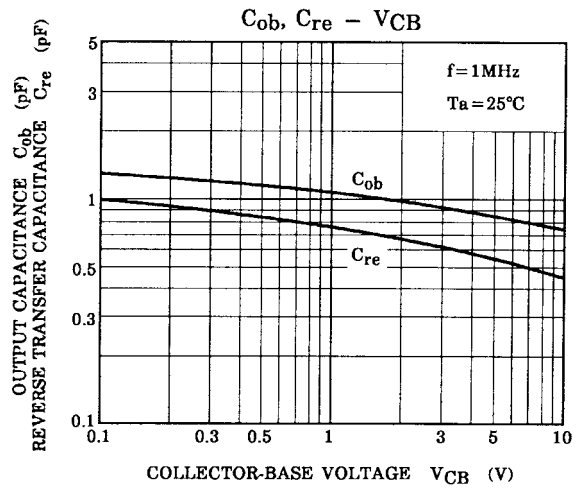
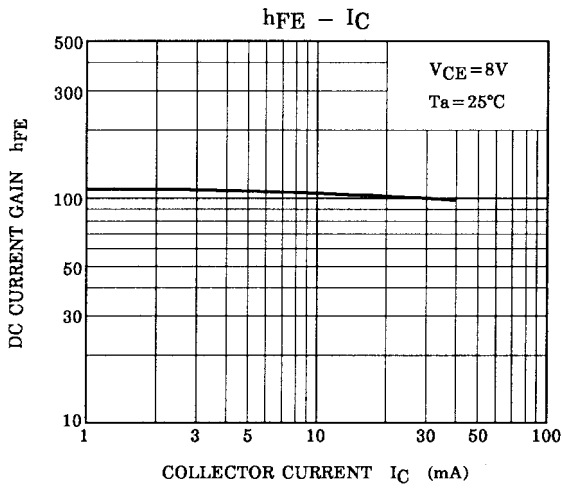
### Electrical Characteristics (Ta = 25°C)

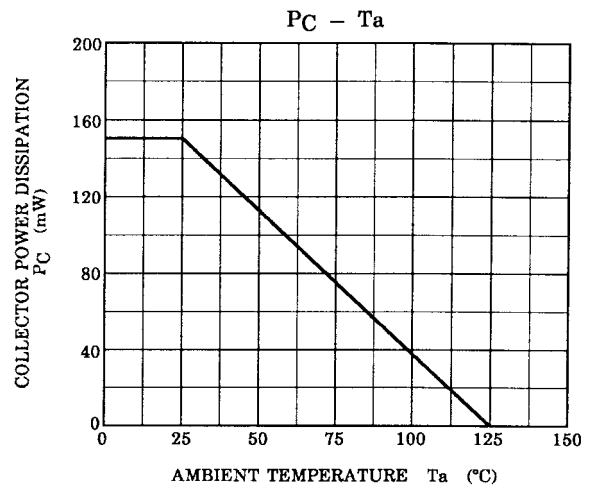
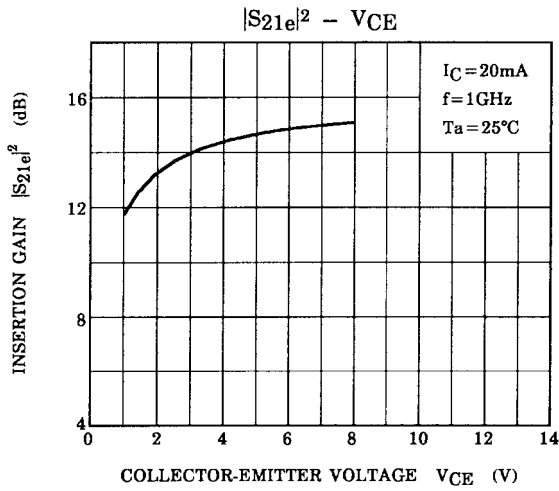
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 10\text{V}$ , $I_E = 0$	—	—	1	μA
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 1\text{V}$ , $I_C = 0$	—	—	1	μA
DC current gain	$h_{FE}$	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$	50	—	250	
Output capacitance	$C_{ob}$	$V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$ (Note)	—	0.75	—	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  $Z_O = 50 \Omega, T_a = 25^\circ\text{C}$**

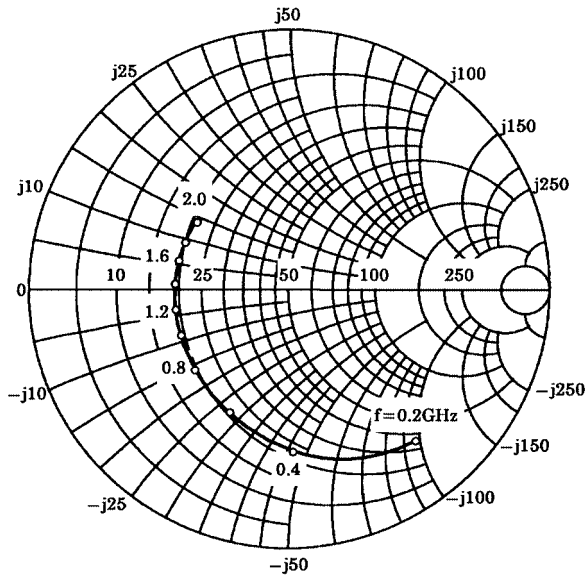
**$V_{CE} = 8 \text{ V}, I_C = 5 \text{ mA}$**

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.764	-49.6	11.754	147.1	0.047	64.2	0.869	-29.4
400	0.624	-87.9	8.966	124.6	0.072	48.9	0.669	-48.3
600	0.532	-115.7	6.947	110.5	0.084	42.1	0.526	-59.5
800	0.485	-137.5	5.581	100.4	0.091	39.3	0.429	-66.6
1000	0.446	-155.0	4.636	92.9	0.097	38.6	0.370	-71.3
1200	0.441	-169.2	4.003	86.3	0.102	38.8	0.330	-75.3
1400	0.432	177.1	3.487	80.1	0.107	39.6	0.305	-77.6
1600	0.426	166.1	3.144	75.1	0.114	40.1	0.288	-80.7
1800	0.431	154.4	2.900	70.0	0.119	41.9	0.276	-83.9
2000	0.425	145.2	2.652	65.5	0.127	43.1	0.272	-87.3

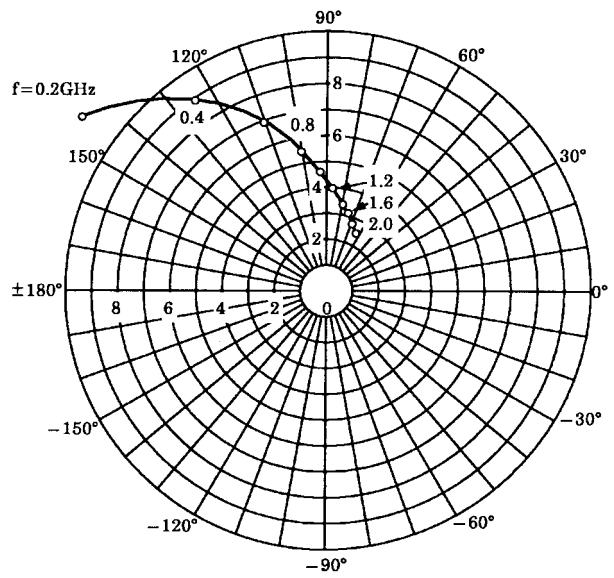
**$V_{CE} = 8 \text{ V}, I_C = 20 \text{ mA}$**

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.540	-90.3	21.037	129.7	0.033	55.7	0.670	-46.8
400	0.479	-134.8	13.017	108.7	0.046	50.0	0.417	-64.5
600	0.461	-159.4	9.230	98.1	0.054	51.2	0.297	-71.9
800	0.454	-176.0	7.117	90.5	0.063	54.1	0.230	-75.4
1000	0.454	170.7	5.816	85.1	0.073	56.1	0.191	-76.7
1200	0.452	160.0	4.944	79.8	0.084	57.9	0.168	-77.0
1400	0.461	149.1	4.299	74.7	0.094	58.7	0.156	-75.7
1600	0.459	140.7	3.838	70.6	0.105	59.0	0.151	-75.8
1800	0.461	131.9	3.483	66.0	0.117	59.4	0.154	-76.6
2000	0.450	124.2	3.171	61.8	0.130	59.0	0.161	-79.3

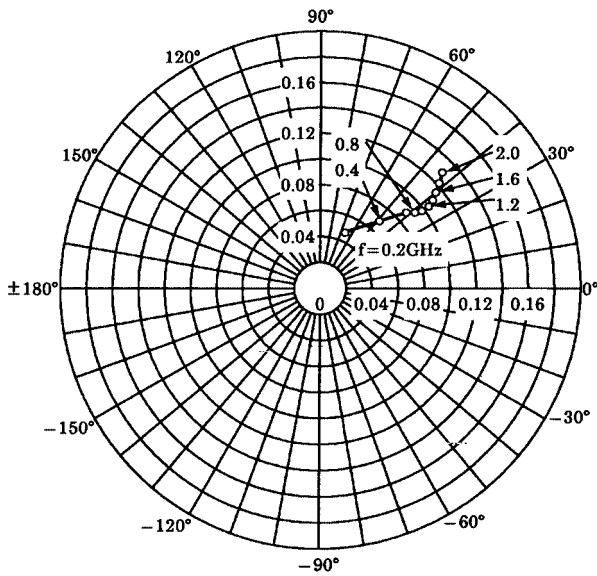
**S11e**  
**VCE=8V**  
**IC=5mA**  
**Ta=25°C**  
**(UNIT : Ω)**



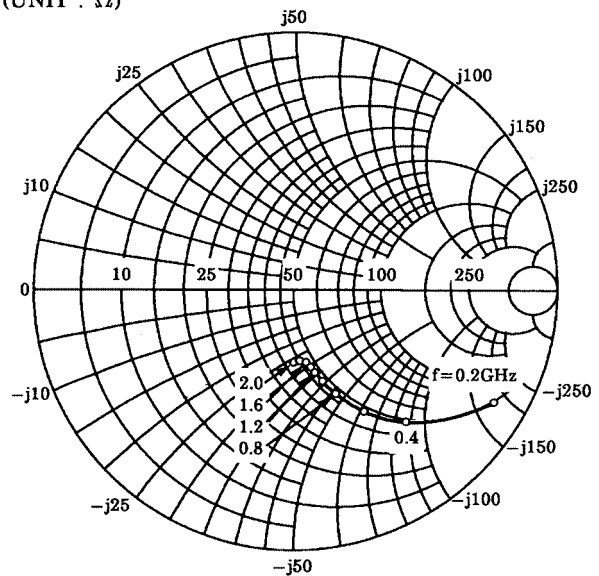
**S21e**  
**VCE=8V**  
**IC=5mA**  
**Ta=25°C**



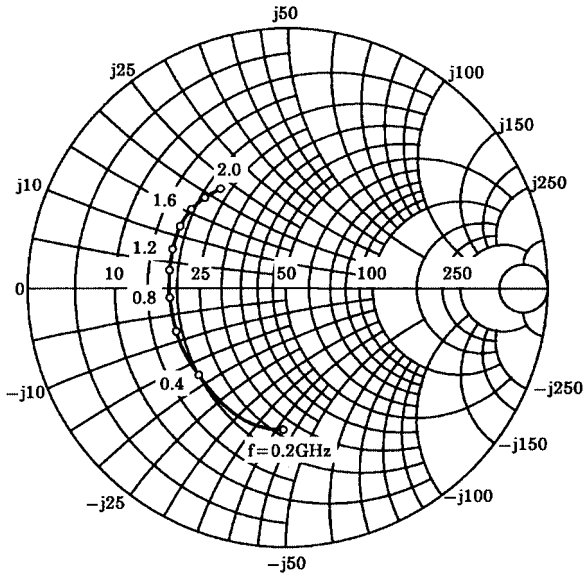
**S12e**  
**VCE=8V**  
**IC=5mA**  
**Ta=25°C**



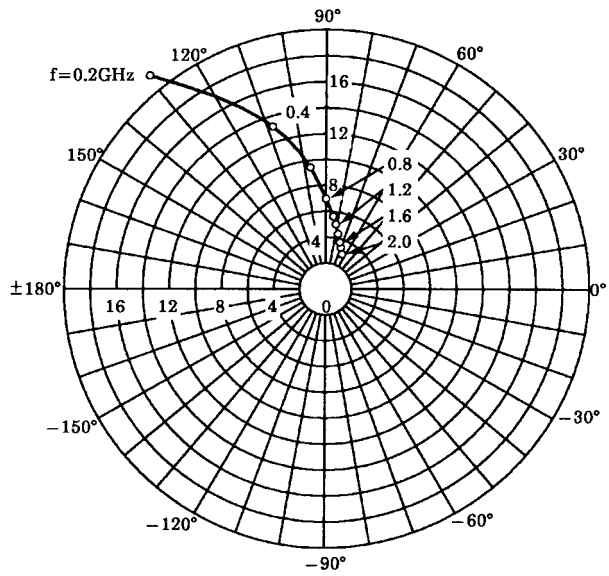
**S22e**  
**VCE=8V**  
**IC=5mA**  
**Ta=25°C**  
**(UNIT : Ω)**



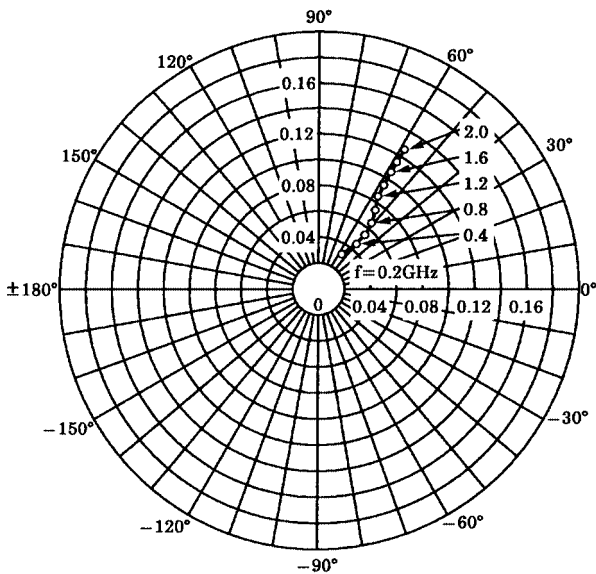
S11e  
 VCE=8V  
 IC=20mA  
 Ta=25°C  
 (UNIT : Ω)



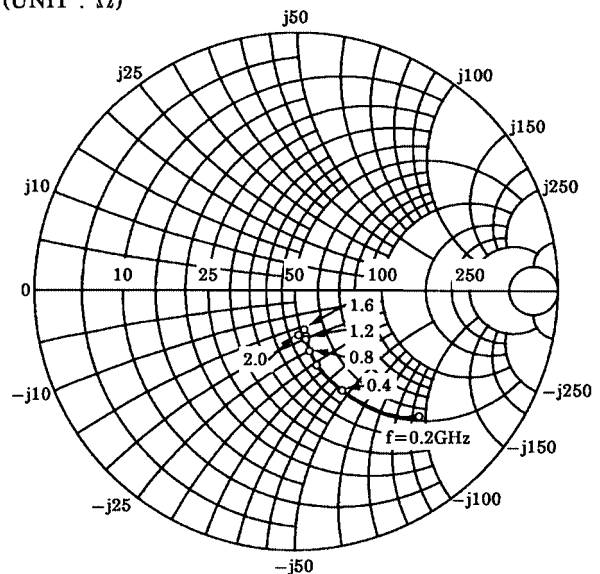
S21e  
 VCE=8V  
 IC=20mA  
 Ta=25°C



S12e  
 VCE=8V  
 IC=20mA  
 Ta=25°C



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



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