

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC4320

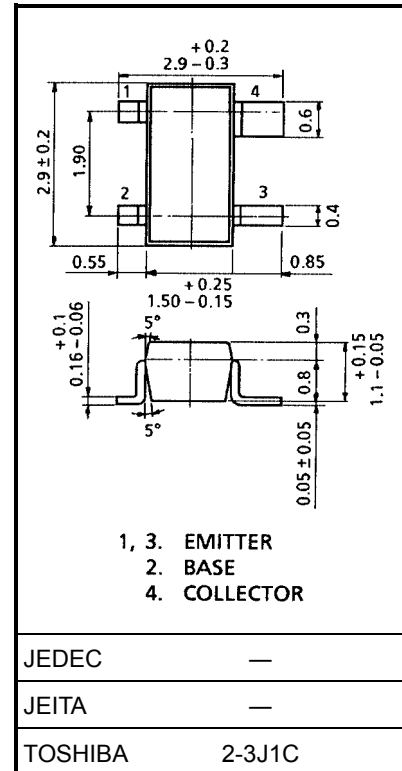
VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

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

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

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	150	mW
Junction temperature	T_j	125	$^\circ\text{C}$
Storage temperature range	T_{stg}	$-55\sim 125$	$^\circ\text{C}$

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

Weight: 0.012 g (typ.)

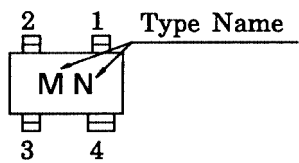
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2 (1)$	$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$, $f = 1\text{ GHz}$	12	15	—	dB
	$ S_{21e} ^2 (2)$	$V_{CE} = 8\text{ V}$, $I_C = 20\text{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

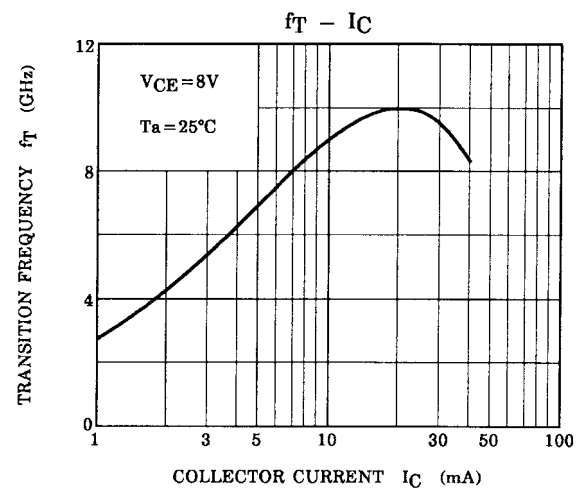
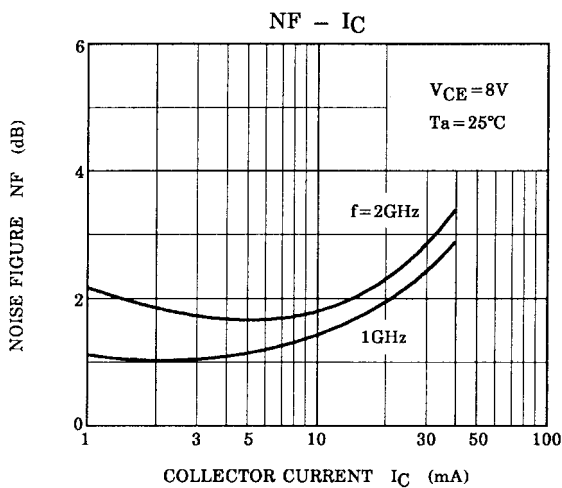
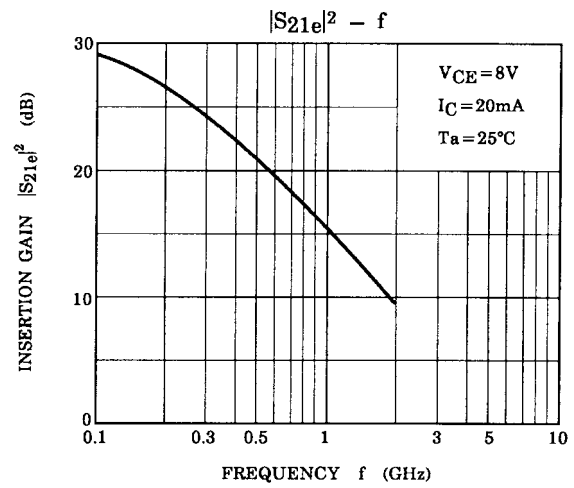
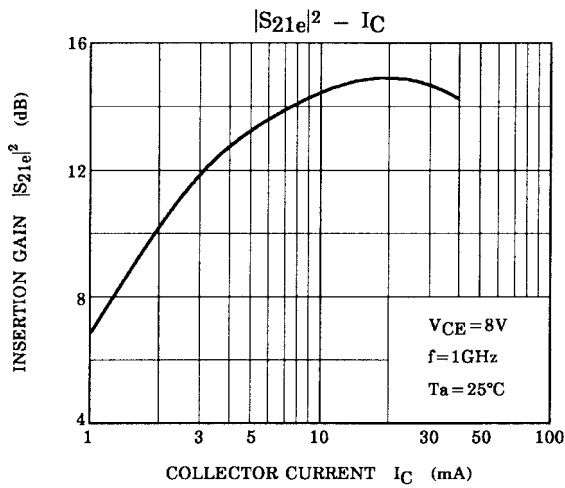
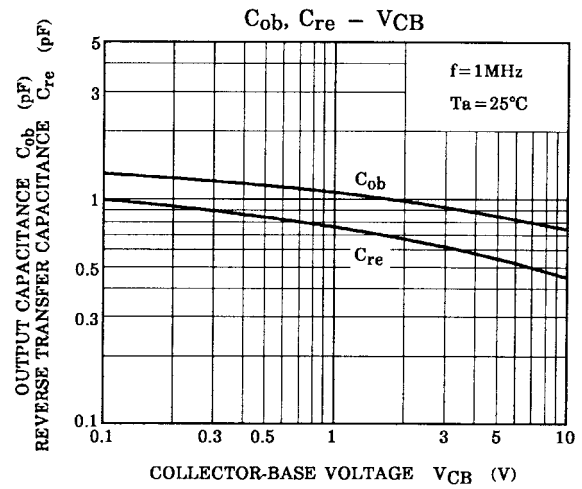
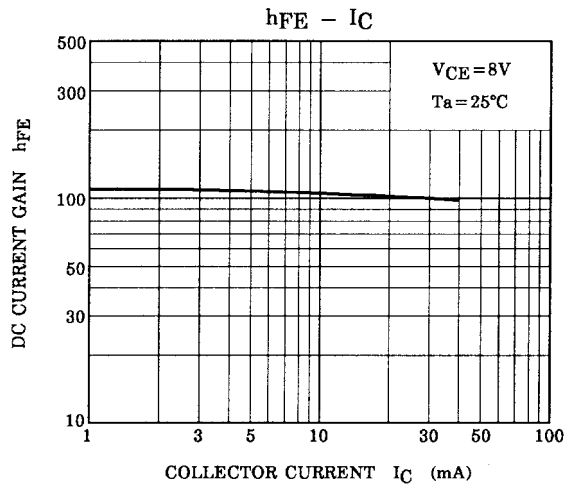
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

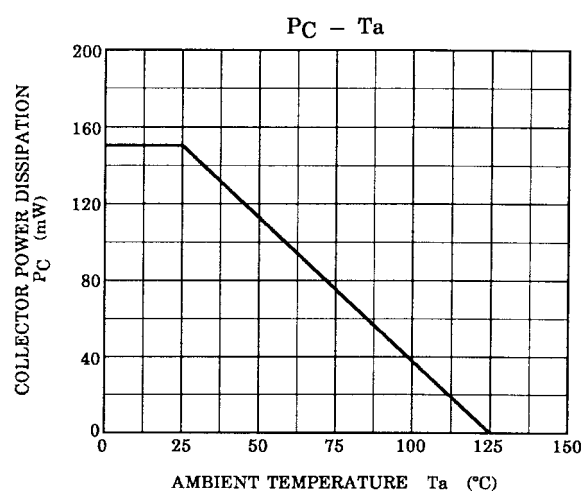
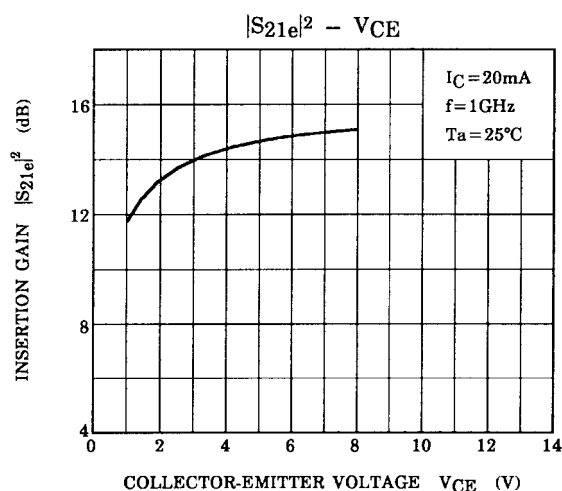
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{ V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{ V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE}	$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$	50	—	250	
Output capacitance	C_{ob}	$V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$ (Note)	—	0.75	—	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 $Z_0 = 50\ \Omega$, $T_a = 25^\circ\text{C}$

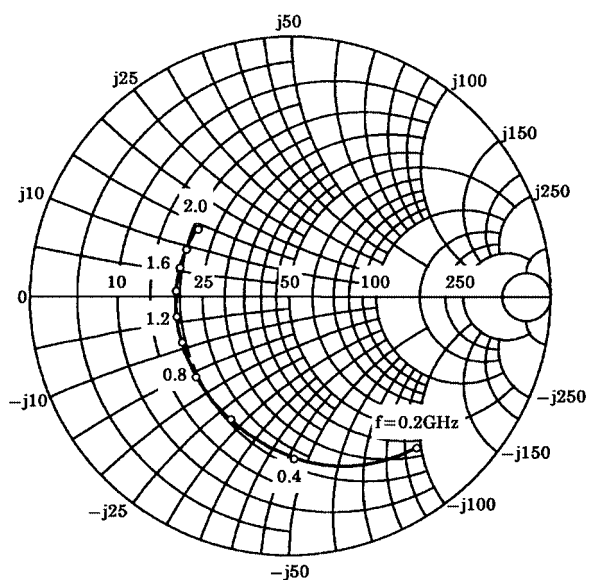
$V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$

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

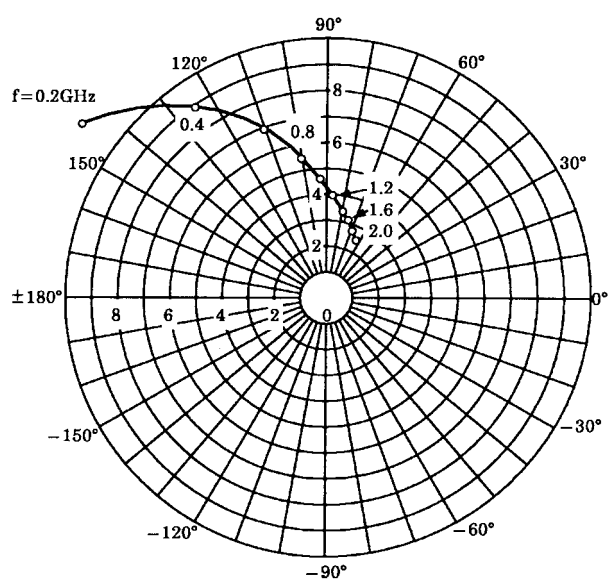
$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$

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

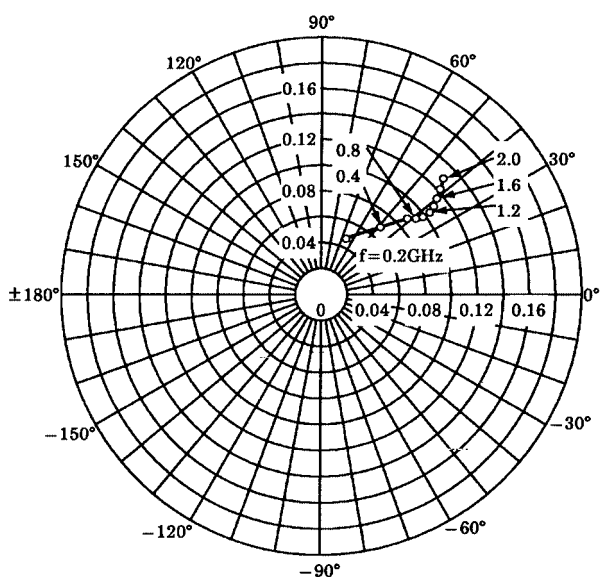
S_{11e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$
 (UNIT : Ω)



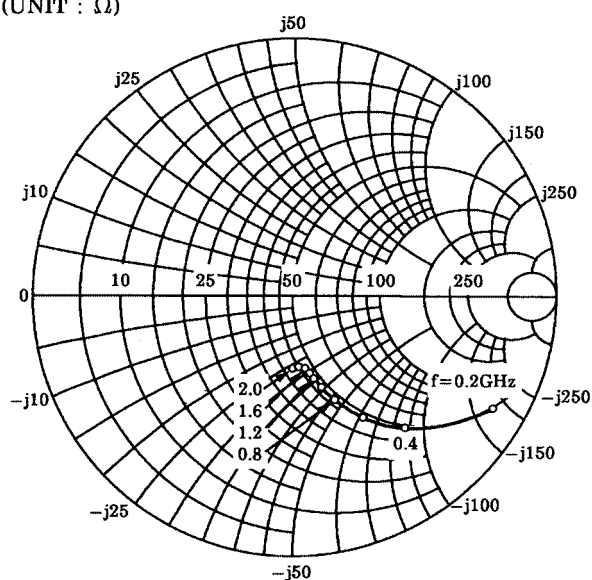
S_{21e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$



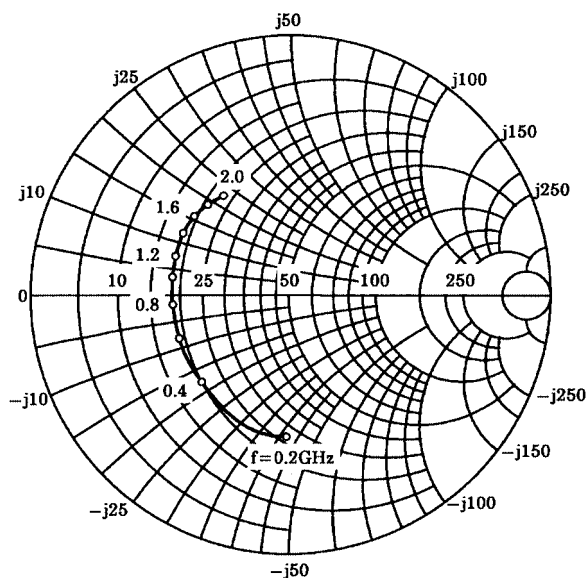
S_{12e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$



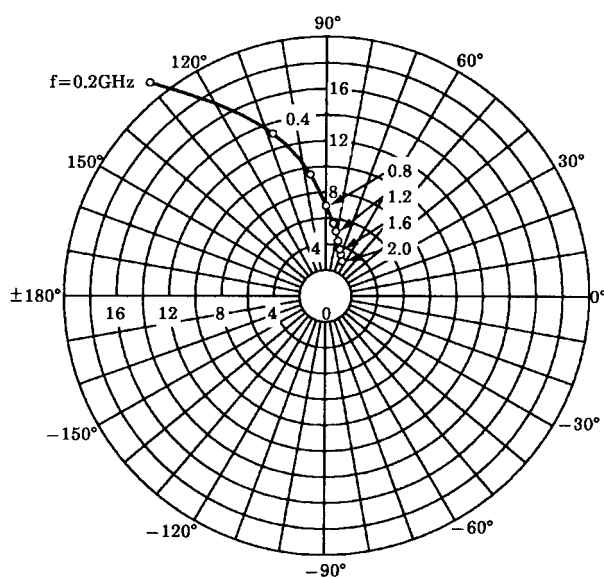
S_{22e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$
 (UNIT : Ω)



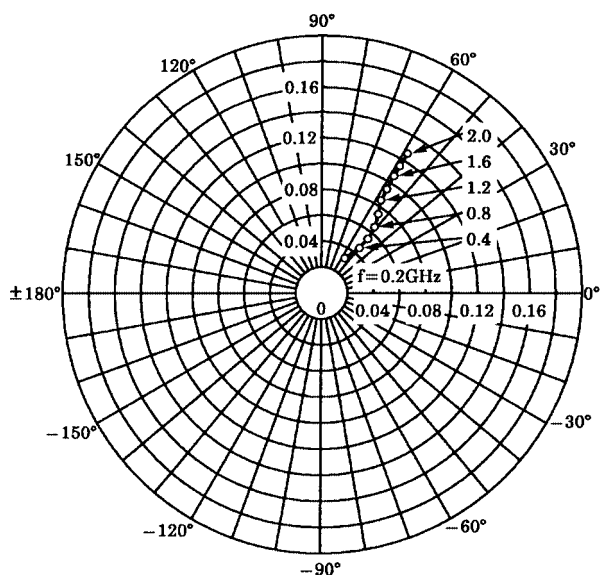
S_{11e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$
 (UNIT : Ω)



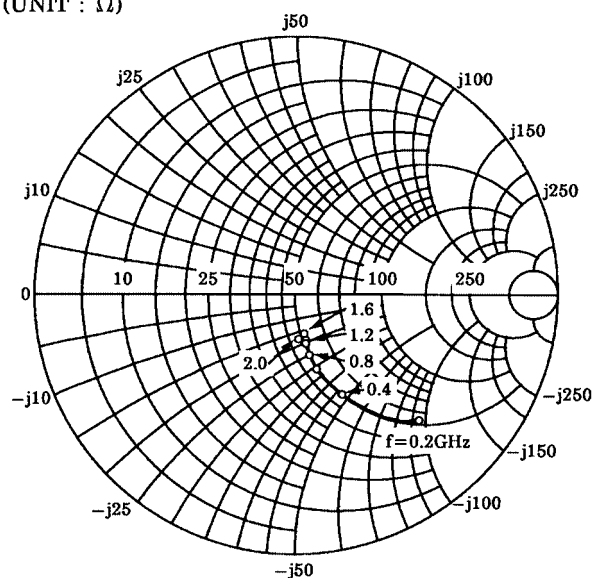
S_{21e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$



S_{12e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$



S_{22e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$
 (UNIT : Ω)



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