

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC4324

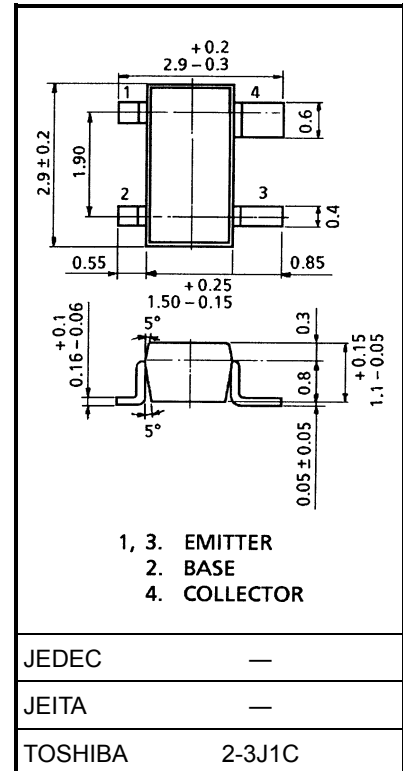
VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

- Low noise figure, high gain.
- $NF = 1.8\text{dB}$, $|S_{21e}|^2 = 9.5\text{dB}$ ($f = 2\text{ GHz}$)

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	7	mA
Collector current	I_C	15	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.)

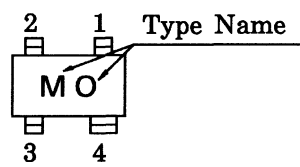
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2 (1)$	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$, $f = 1\text{ GHz}$	—	15	—	dB
	$ S_{21e} ^2 (2)$	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$, $f = 2\text{ GHz}$	6.5	9.5	—	
Noise figure	NF (1)	$V_{CE} = 6\text{ V}$, $I_C = 3\text{ mA}$, $f = 1\text{ GHz}$	—	1.4	—	dB
	NF (2)	$V_{CE} = 6\text{ V}$, $I_C = 3\text{ mA}$, $f = 2\text{ GHz}$	—	1.8	3.0	

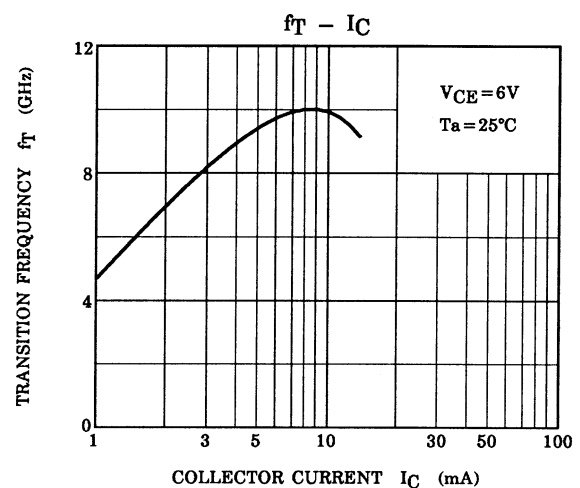
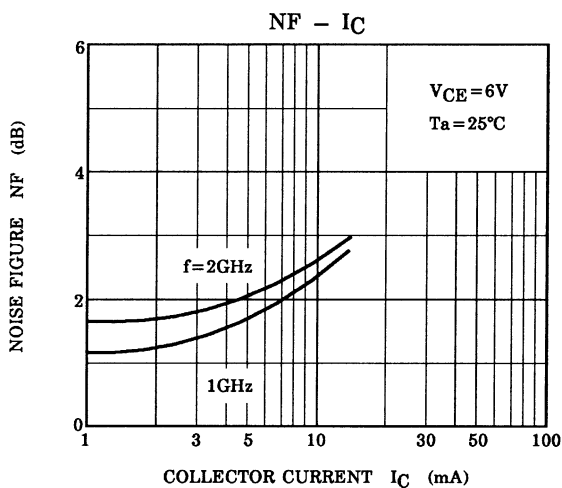
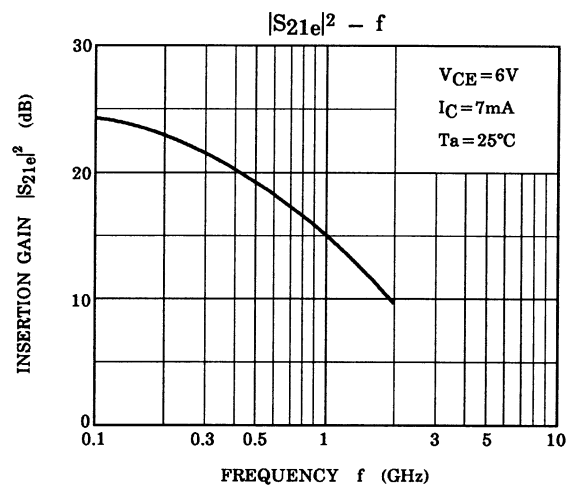
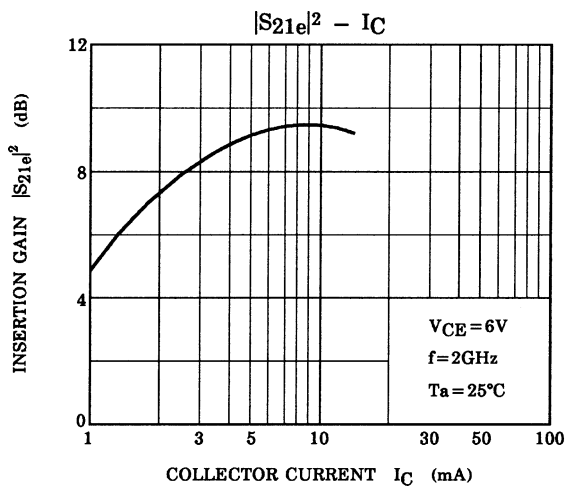
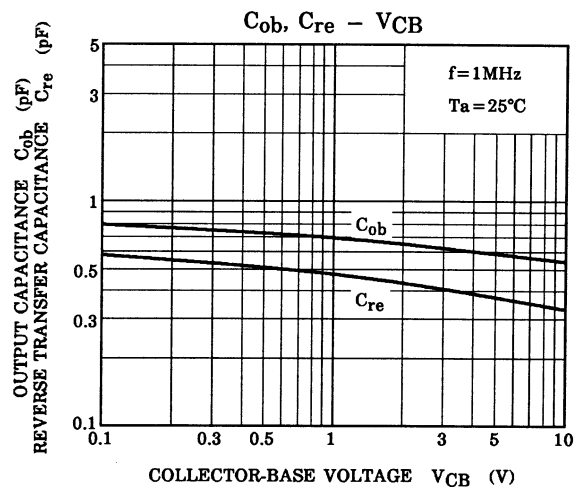
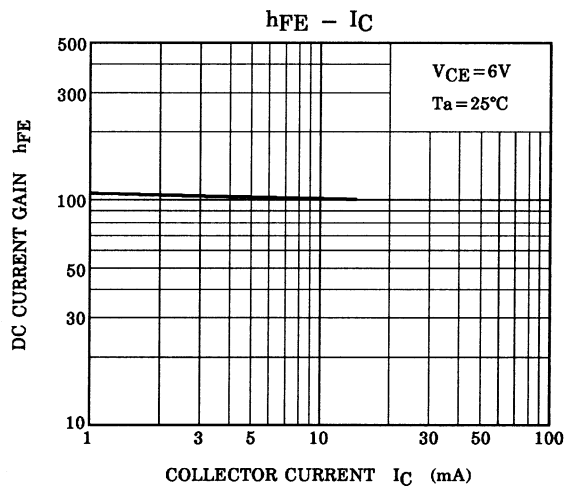
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

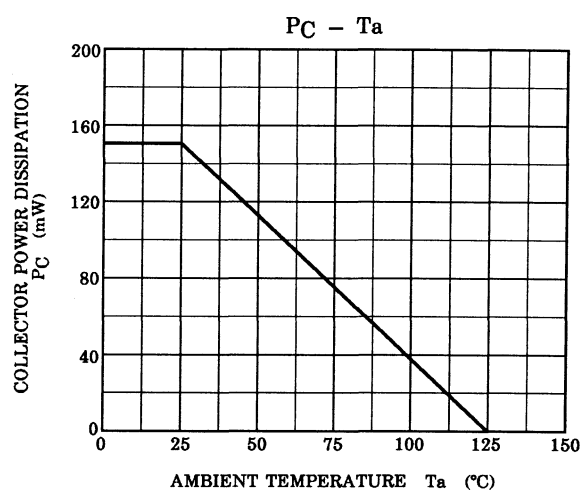
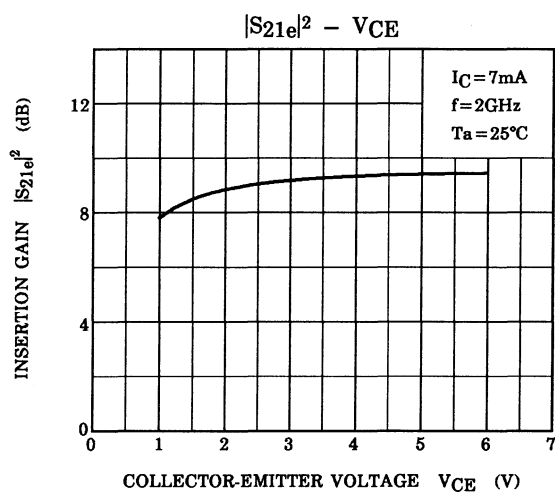
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{ V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{ V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE}	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$	50	—	250	
Output capacitance	C_{ob}	$V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$ (Note)	—	0.55	—	pF
Reverse transfer capacitance	C_{re}		—	0.35	0.8	pF

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

Marking







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

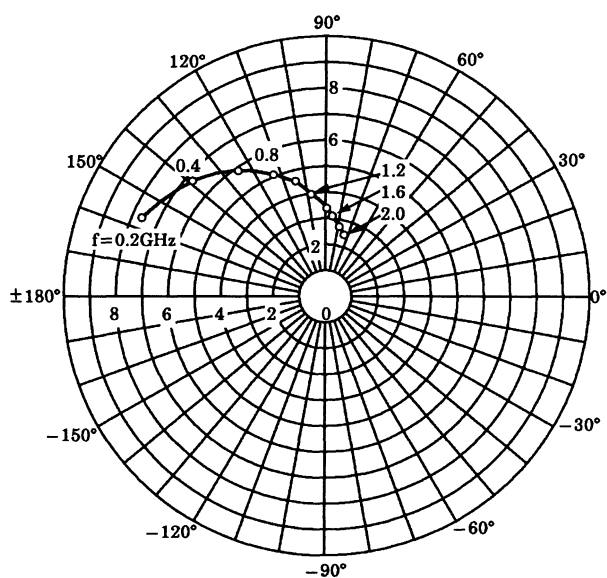
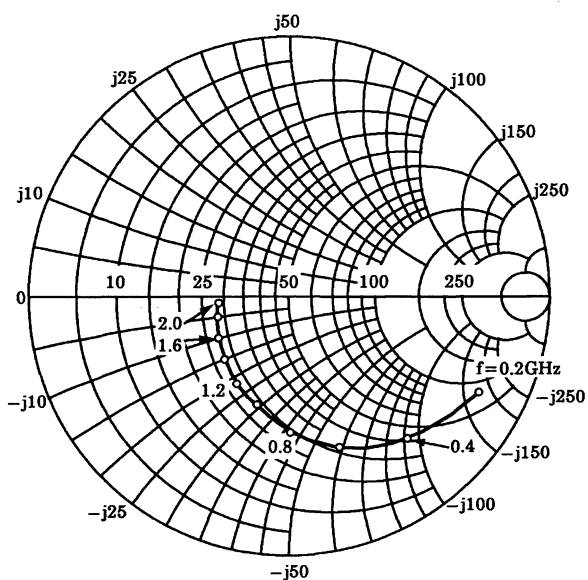
$V_{CE} = 6\text{ V}$, $I_C = 3\text{ mA}$

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.831	-26.6	7.776	156.8	0.042	74.0	0.939	-19.5
400	0.719	-50.1	6.775	139.2	0.074	61.6	0.833	-35.5
600	0.618	-70.8	5.857	125.4	0.097	52.5	0.724	-48.1
800	0.515	-88.5	5.063	113.9	0.111	46.5	0.627	-58.0
1000	0.434	-104.0	4.381	105.3	0.122	42.3	0.553	-65.6
1200	0.374	-119.2	3.886	97.2	0.130	39.6	0.495	-71.6
1400	0.332	-134.7	3.425	89.8	0.137	37.8	0.453	-76.1
1600	0.293	-147.5	3.135	84.4	0.145	36.5	0.423	-81.0
1800	0.267	-163.2	2.926	78.2	0.150	35.8	0.397	-85.1
2000	0.248	-175.3	2.709	73.7	0.157	35.7	0.382	-89.4

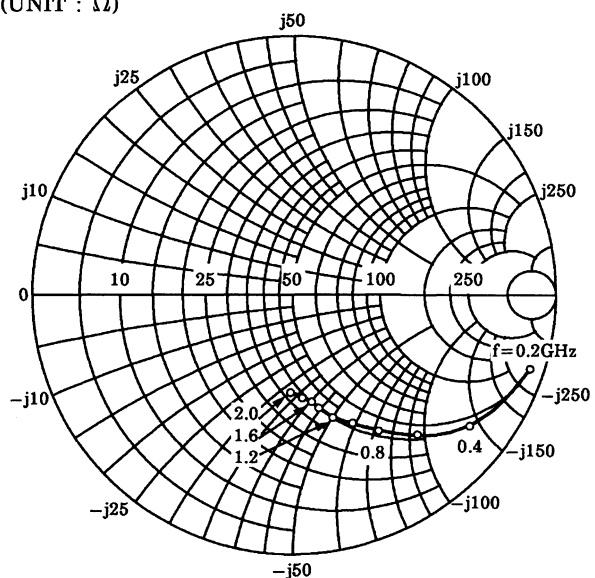
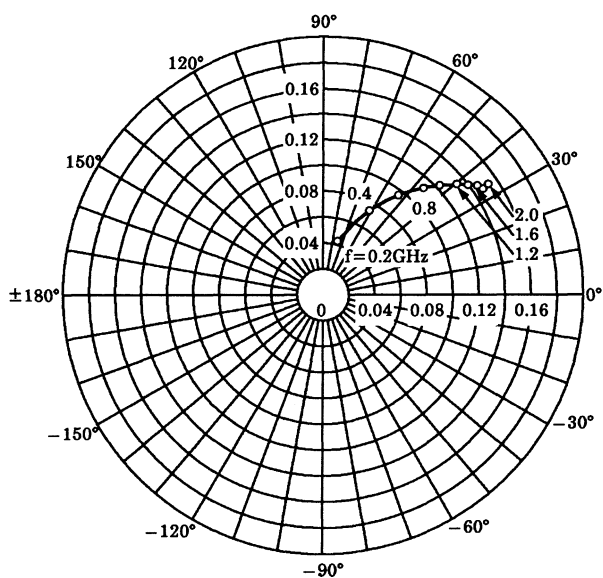
$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.683	-43.5	13.639	148.7	0.037	68.4	0.876	-27.8
400	0.541	-78.5	10.619	126.8	0.060	55.8	0.688	-46.4
600	0.437	-105.5	8.350	112.6	0.072	49.8	0.547	-57.7
800	0.365	-128.4	6.752	102.1	0.082	47.6	0.447	-65.1
1000	0.319	-148.8	5.640	94.4	0.090	47.0	0.383	-70.0
1200	0.293	-166.3	4.877	87.5	0.098	47.1	0.338	-73.3
1400	0.280	174.4	4.248	81.3	0.107	46.9	0.308	-75.4
1600	0.269	162.3	3.813	76.4	0.116	47.4	0.292	-78.0
1800	0.272	148.6	3.489	70.8	0.124	47.5	0.283	-80.3
2000	0.264	137.2	3.182	66.5	0.134	47.6	0.278	-83.7

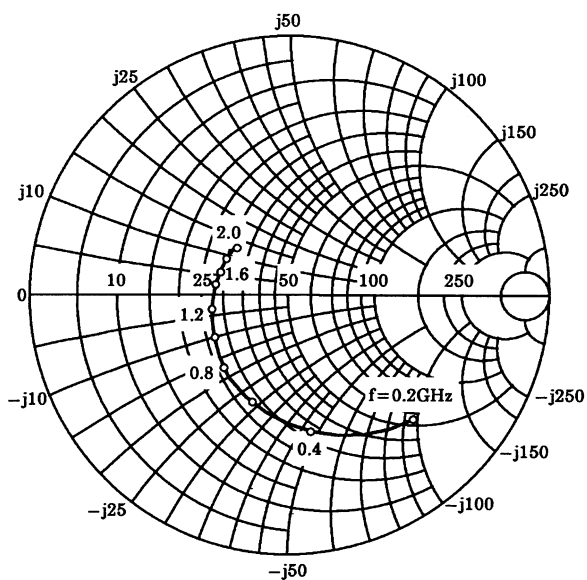
S21e
VCE=6V
IC=3mA
Ta=25°C



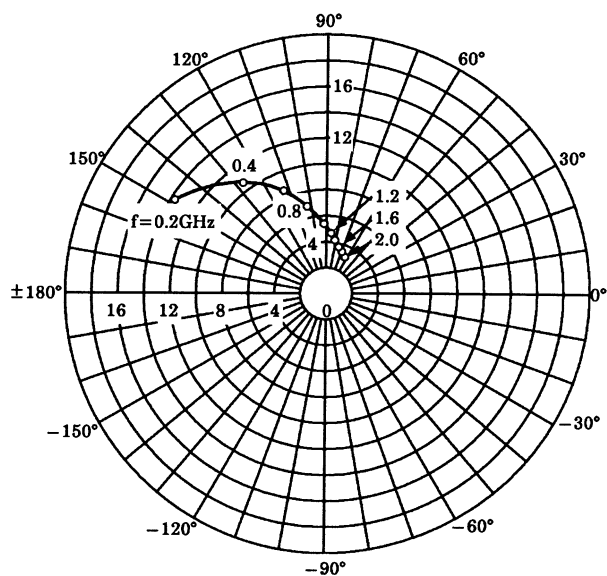
S22e
V_{CE} = 6V
I_C = 3mA
T_a = 25°C
(UNIT : Ω)



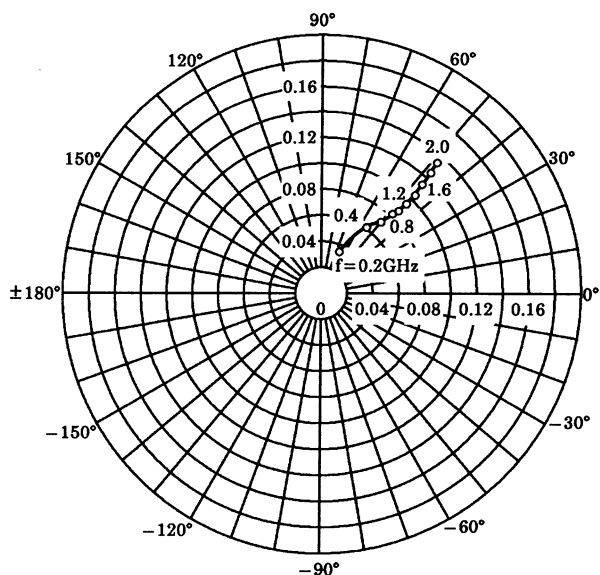
S_{11e}
 $V_{CE}=6V$
 $I_C=7mA$
 $T_a=25^\circ C$
 (UNIT : Ω)



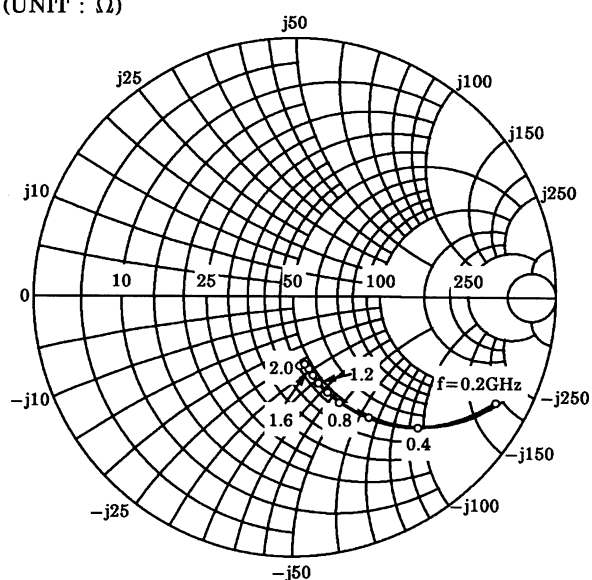
S_{21e}
 $V_{CE}=6V$
 $I_C=7mA$
 $T_a=25^\circ C$



S_{12e}
 $V_{CE}=6V$
 $I_C=7mA$
 $T_a=25^\circ C$



S_{22e}
 $V_{CE}=6V$
 $I_C=7mA$
 $T_a=25^\circ C$
 (UNIT : Ω)



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