

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5094

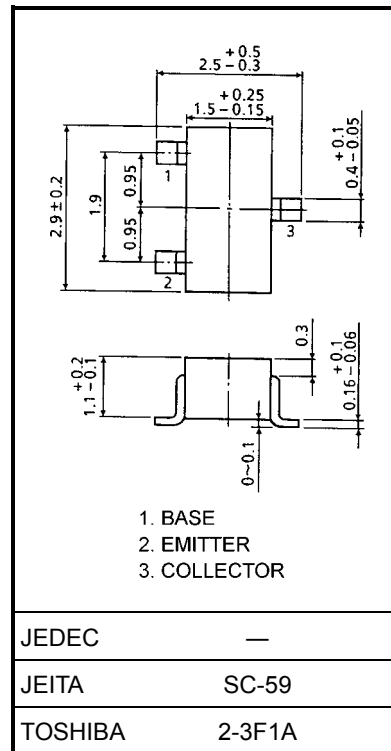
VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

- Low noise figure, high gain.
- $NF = 1.8\text{dB}$, $|S_{21e}|^2 = 7.5\text{dB}$ ($f = 2\text{ GHz}$)

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.)

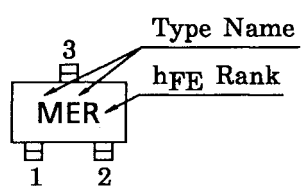
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2 (1)$	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$, $f = 1\text{ GHz}$	—	13	—	dB
	$ S_{21e} ^2 (2)$	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$, $f = 2\text{ GHz}$	4.5	7.5	—	
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	

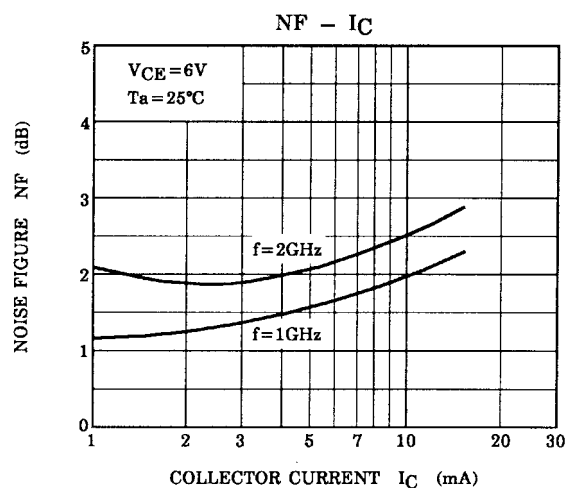
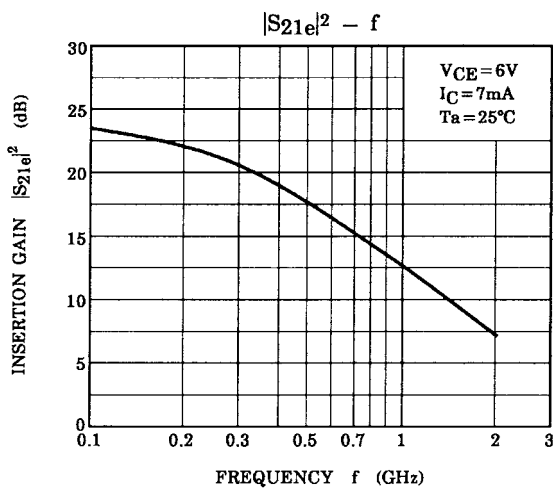
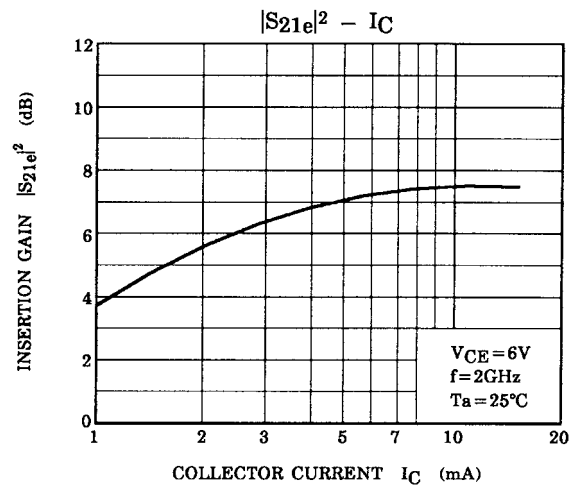
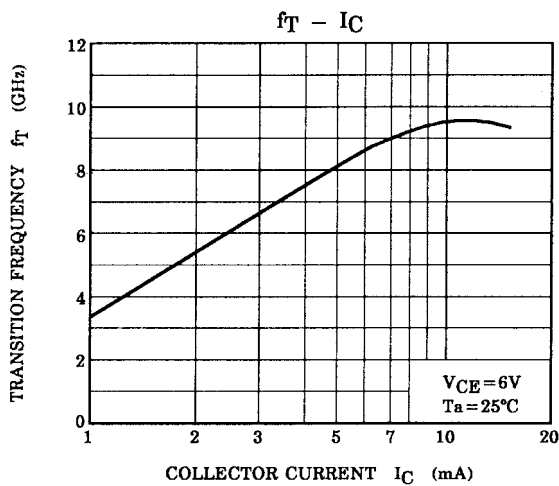
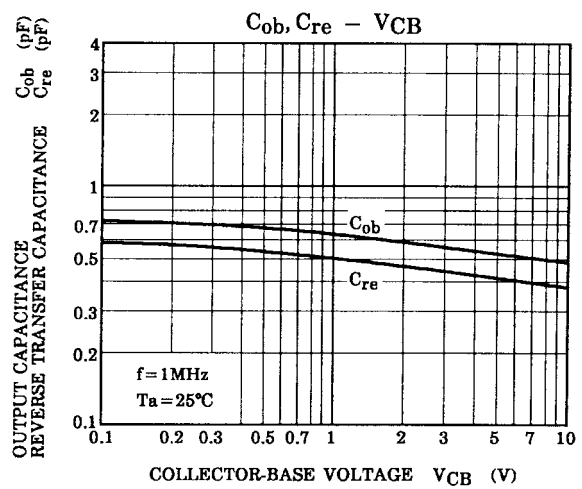
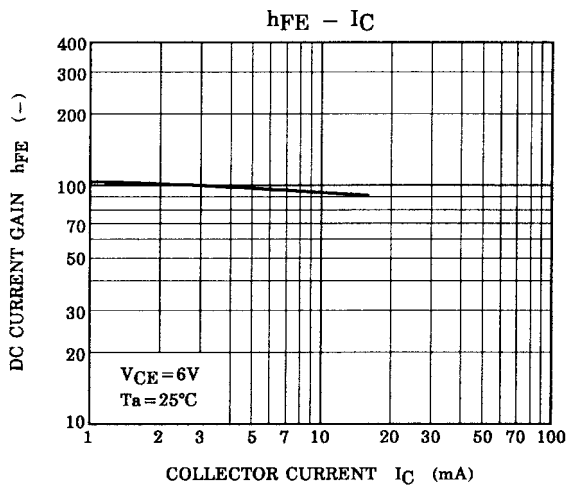
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

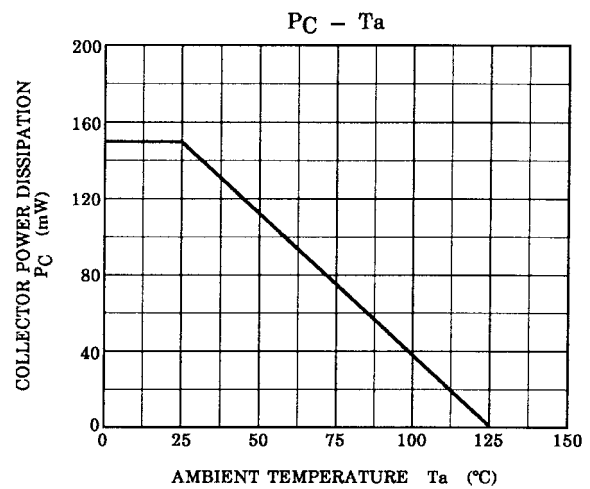
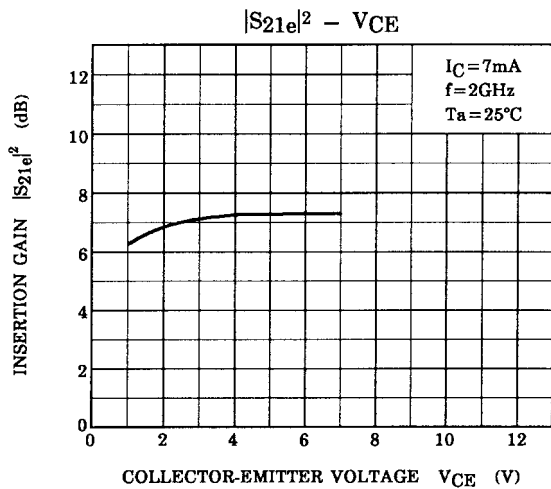
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{ V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{ V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE} (Note 1)	$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$	50	—	160	
Output capacitance	C_{ob}	$V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$ (Note 2)	—	0.5	—	pF
Reverse transfer capacitance	C_{re}		—	0.4	0.85	pF

Note 1: h_{FE} classification R: 50~100, O: 80~160Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

Marking







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

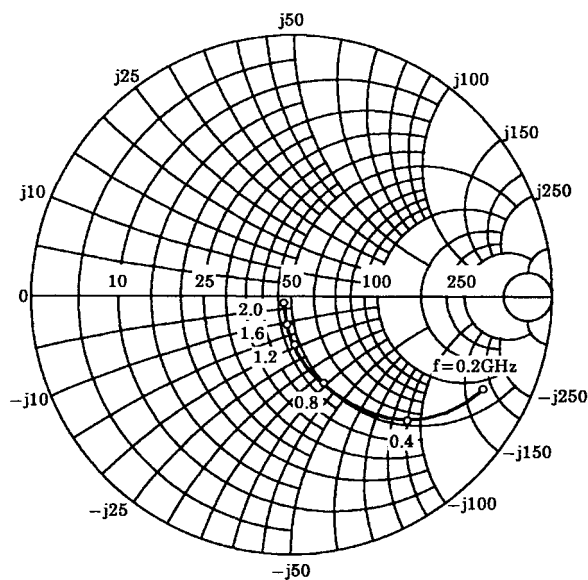
$V_{CE} = 6\text{ V}$, $I_C = 3\text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.817	-25.8	7.113	150.2	0.044	71.4	0.898	-18.6
400	0.647	-46.3	6.028	129.5	0.073	61.8	0.746	-28.7
600	0.477	-61.4	5.061	113.9	0.092	57.2	0.636	-33.4
800	0.356	-71.3	4.197	102.8	0.108	55.7	0.565	-35.4
1000	0.265	-78.9	3.583	93.9	0.123	55.3	0.518	-36.8
1200	0.194	-85.6	3.135	86.7	0.137	55.7	0.486	-37.5
1400	0.136	-90.5	2.778	80.2	0.153	55.8	0.467	-38.8
1600	0.093	-97.7	2.490	74.4	0.169	55.3	0.449	-40.4
1800	0.058	-109.0	2.260	69.6	0.183	54.8	0.433	-42.6
2000	0.028	-134.7	2.089	65.2	0.199	55.2	0.418	-43.9

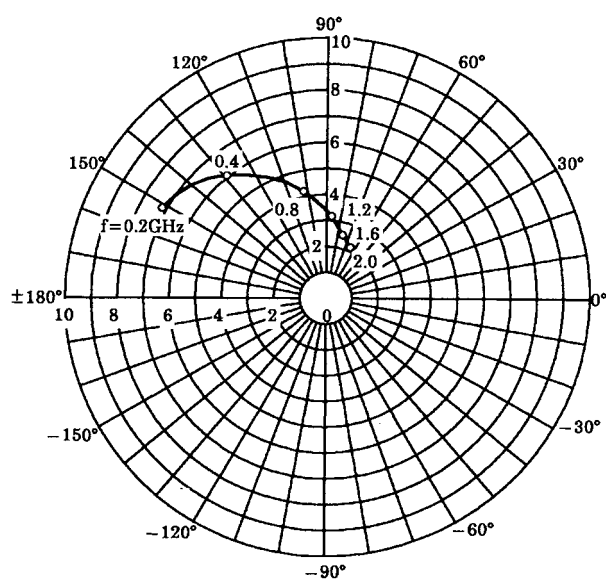
$V_{CE} = 6\text{ V}$, $I_C = 7\text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.630	-39.7	12.332	138.1	0.037	68.5	0.783	-25.6
400	0.392	-64.1	8.847	114.7	0.059	64.3	0.586	-31.8
600	0.248	-78.3	6.514	101.4	0.077	64.1	0.495	-32.0
800	0.161	-87.5	5.094	92.6	0.096	64.7	0.449	-31.2
1000	0.105	-95.3	4.213	85.9	0.114	64.9	0.423	-30.5
1200	0.060	-106.3	3.589	80.3	0.133	65.0	0.412	-30.8
1400	0.028	-121.7	3.139	74.9	0.154	64.0	0.406	-32.1
1600	0.021	-158.4	2.786	70.1	0.173	62.5	0.398	-34.0
1800	0.035	171.6	2.498	66.0	0.190	61.2	0.387	-36.7
2000	0.054	144.0	2.300	62.3	0.210	60.7	0.377	-38.4

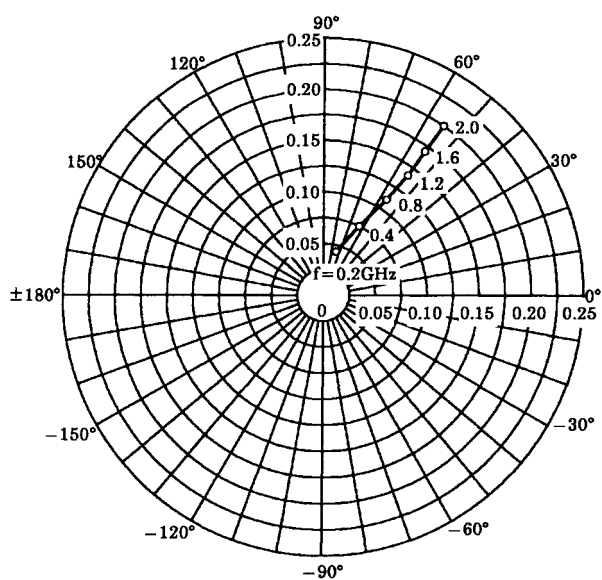
S_{11e}
 $V_{CE}=6V$
 $I_C=3mA$
 $T_a=25^\circ C$
 (UNIT : Ω)



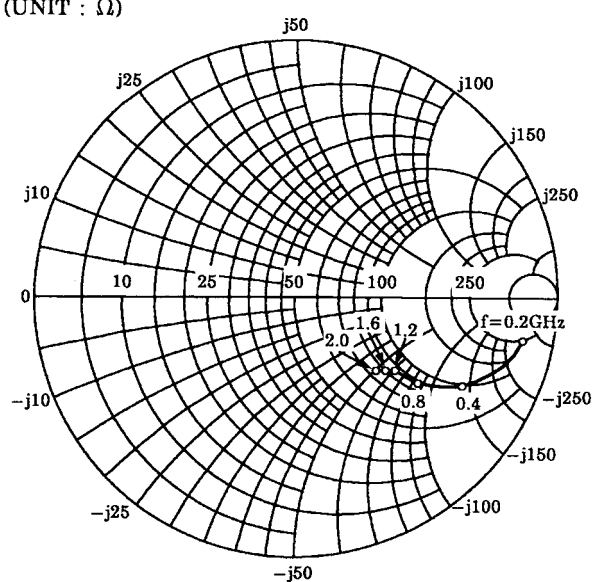
S_{21e}
 $V_{CE}=6V$
 $I_C=3mA$
 $T_a=25^\circ C$



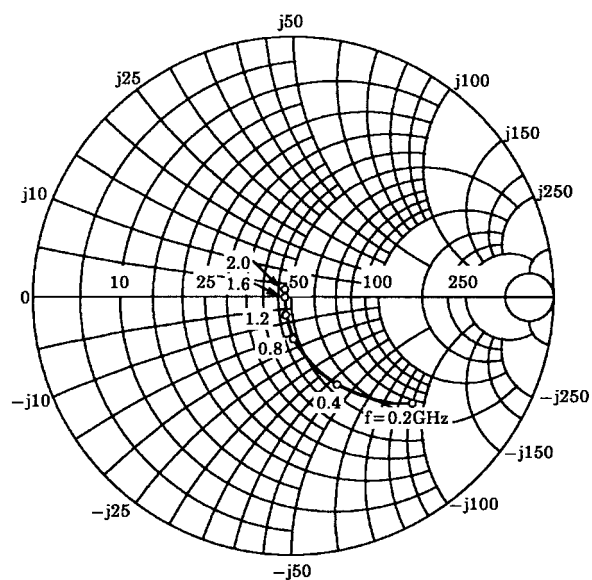
S_{12e}
 $V_{CE}=6V$
 $I_C=3mA$
 $T_a=25^\circ C$



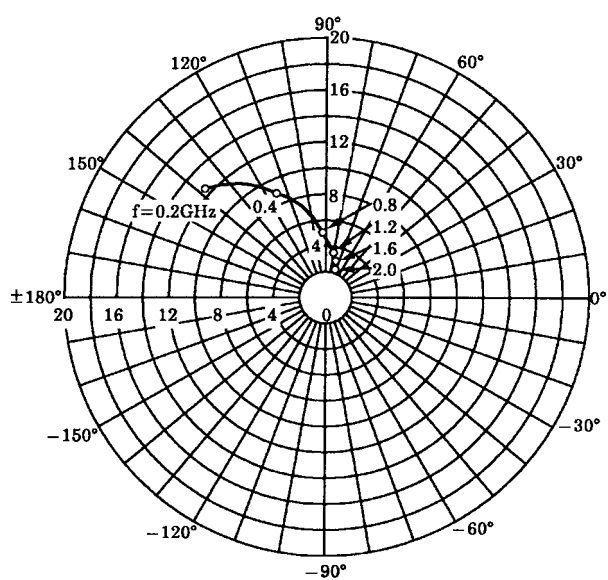
S_{22e}
 $V_{CE}=6V$
 $I_C=3mA$
 $T_a=25^\circ C$
 (UNIT : Ω)



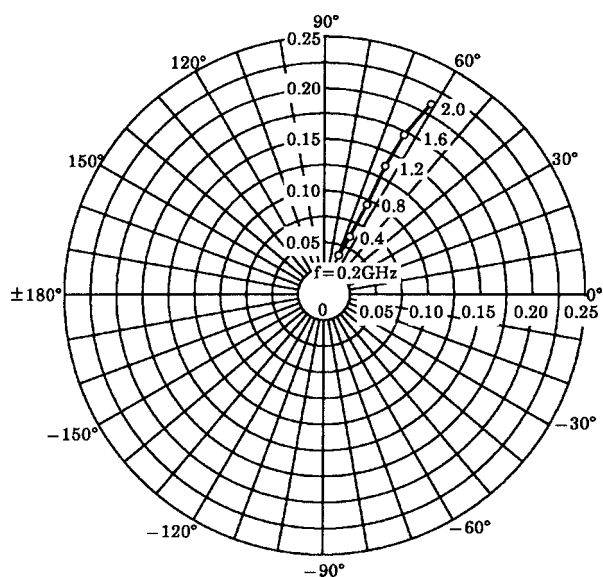
S_{11e}
 $V_{CE} = 6V$
 $I_C = 7mA$
 $T_a = 25^\circ C$
 (UNIT : Ω)



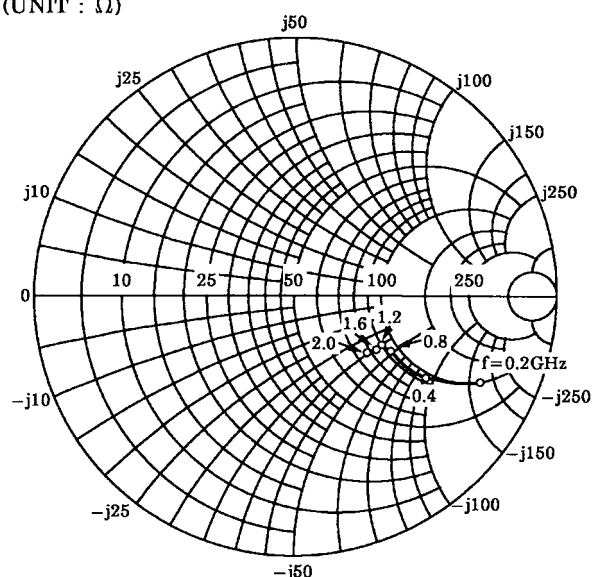
S_{21e}
 $V_{CE} = 6V$
 $I_C = 7mA$
 $T_a = 25^\circ C$



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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