

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5097

VHF~UHF Band Low Noise Amplifier Applications

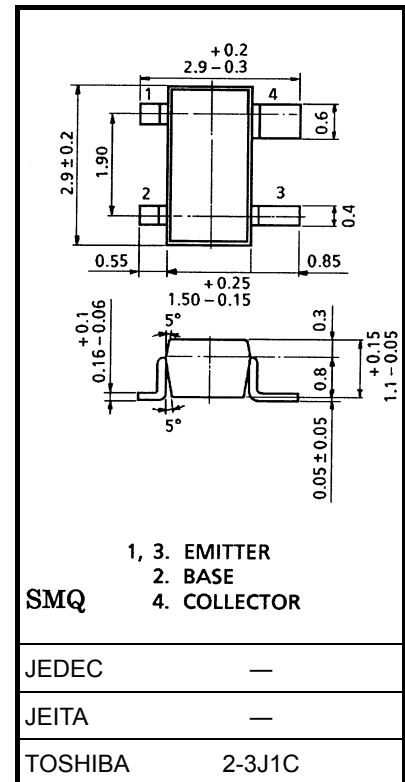
- Low noise figure, high gain.
- $NF = 1.8\text{dB}$, $|S_{21e}|^2 = 10\text{dB}$ ($f = 2\text{GHz}$)

Absolute 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}	-55~125	$^\circ\text{C}$

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm



Weight: 0.012 g (typ.)

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

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)	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$, $f = 1\text{GHz}$	12.5	15.5	—	dB
	$ S_{21e} ^2$ (2)	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$, $f = 2\text{GHz}$	7	10	—	
Noise figure	NF (1)	$V_{CE} = 6\text{V}$, $I_C = 3\text{mA}$, $f = 1\text{GHz}$	—	1.3	2.5	dB
	NF (2)	$V_{CE} = 6\text{V}$, $I_C = 3\text{mA}$, $f = 2\text{GHz}$	—	1.8	3.0	

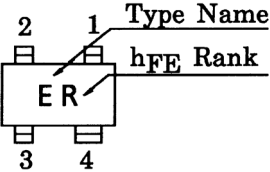
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

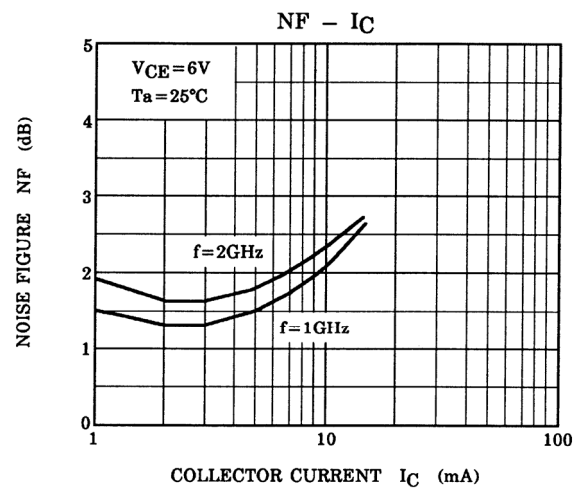
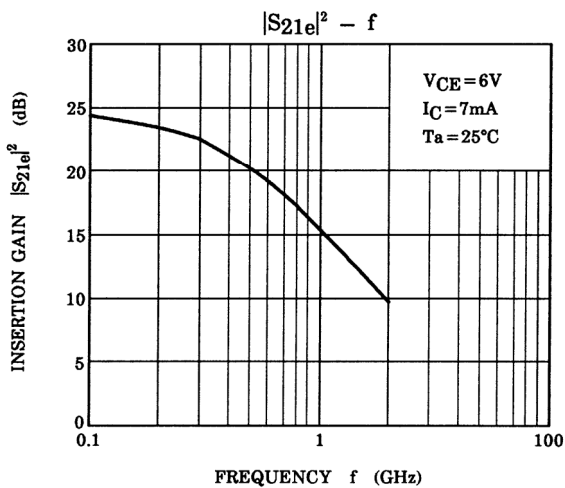
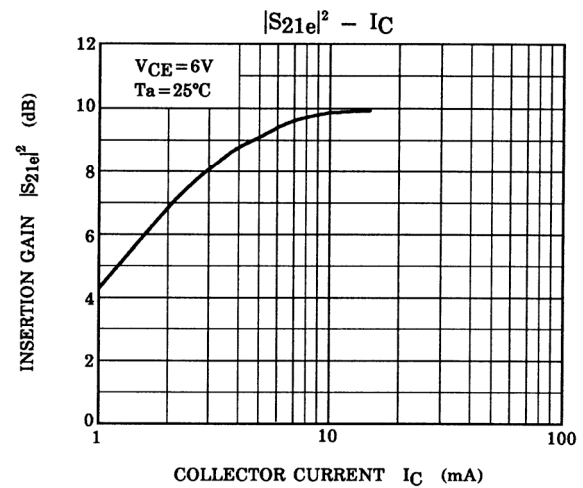
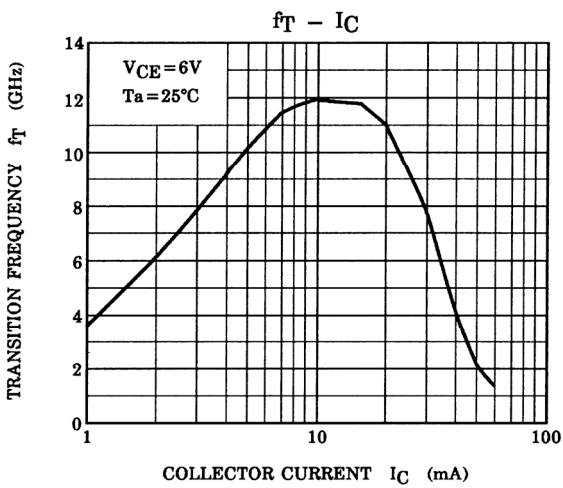
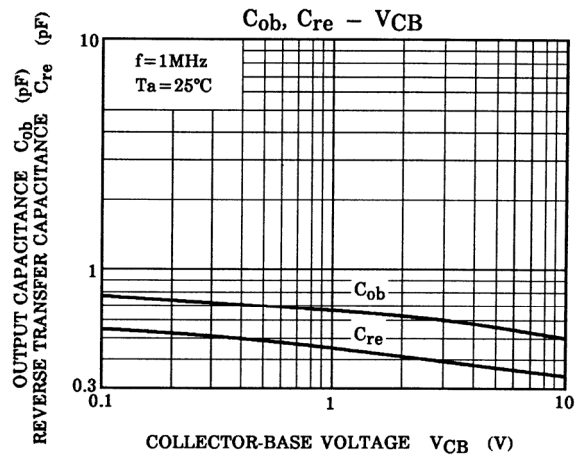
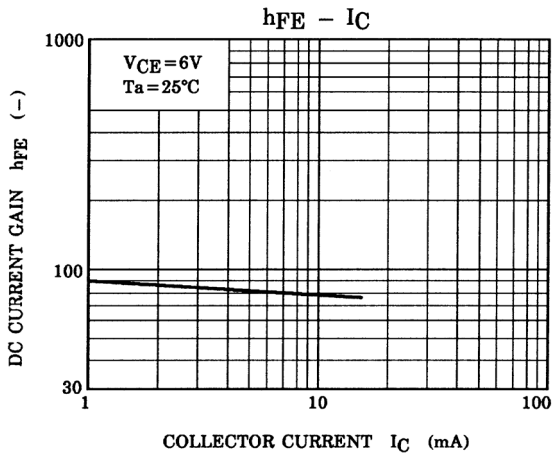
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE} (Note 1)	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$	50	—	160	
Output capacitance	C_{ob}	$V_{CB} = 10\text{V}$, $I_E = 0$, $f = 1\text{MHz}$ (Note 2)	—	0.5	0.9	pF
Reverse transfer capacitance	C_{re}		—	0.35	0.85	pF

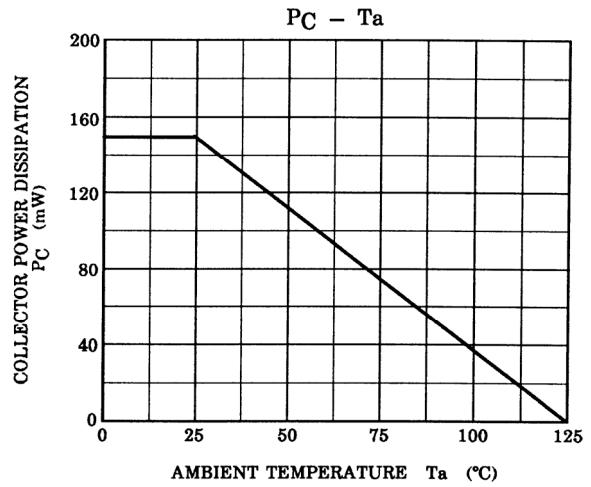
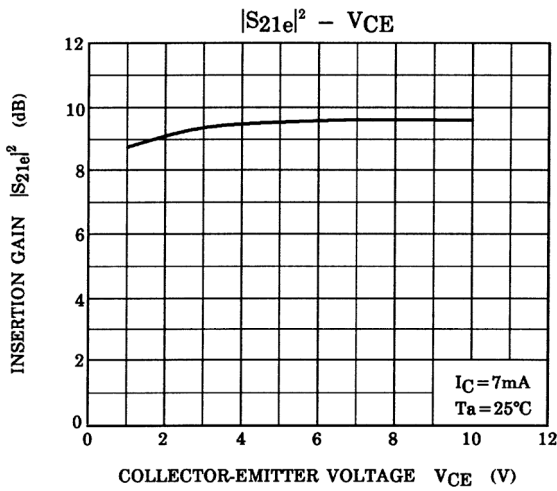
Note 1: h_{FE} classification R: 50~100, O: 80~160

Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

Marking







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

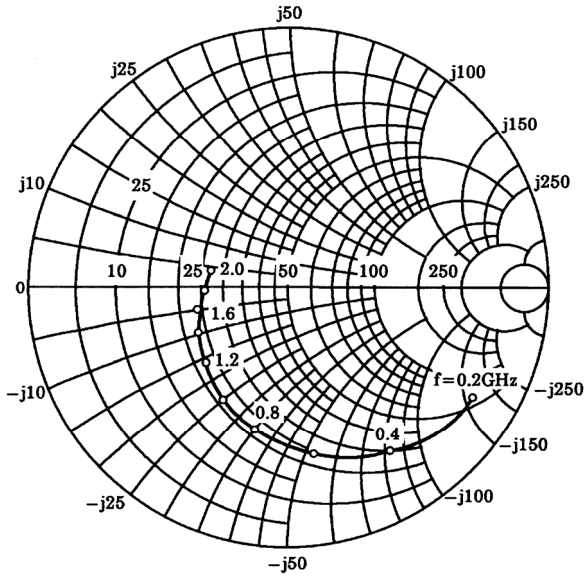
$V_{CE} = 6 \text{ V}, I_C = 3 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.831	-29.9	8.685	158.4	0.040	75.6	0.961	-20.4
400	0.744	-57.7	7.706	139.0	0.071	63.6	0.871	-38.7
600	0.653	-81.5	6.564	123.7	0.093	54.8	0.772	-54.2
800	0.565	-102.8	5.604	111.1	0.108	48.4	0.681	-67.0
1000	0.501	-121.2	4.788	101.3	0.117	45.1	0.608	-77.4
1200	0.441	-137.8	4.120	92.9	0.124	42.7	0.547	-86.4
1400	0.396	-153.1	3.583	85.9	0.129	42.0	0.496	-94.0
1600	0.363	-166.2	3.156	80.3	0.135	42.0	0.459	-100.7
1800	0.330	-179.2	2.820	75.4	0.141	42.7	0.430	-106.1
2000	0.314	-167.4	2.533	70.7	0.147	43.5	0.407	-110.8

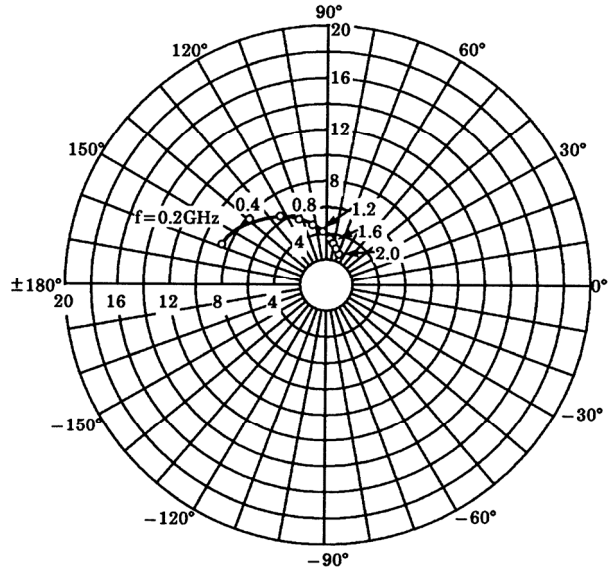
$V_{CE} = 6 \text{ V}, I_C = 10 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.696	-46.2	15.000	148.1	0.036	70.3	0.893	-29.1
400	0.570	-83.4	11.651	125.1	0.058	59.4	0.726	-50.2
600	0.488	-111.0	8.996	110.5	0.072	54.8	0.596	-64.8
800	0.432	-133.1	7.207	100.0	0.083	52.8	0.508	-76.0
1000	0.403	-150.9	5.938	91.9	0.093	53.0	0.446	-85.0
1200	0.378	-167.1	4.989	85.3	0.101	53.1	0.401	-92.9
1400	0.364	177.9	4.292	79.9	0.110	54.0	0.363	-100.0
1600	0.348	164.4	3.761	75.3	0.120	54.7	0.336	-105.7
1800	0.339	151.5	3.353	71.1	0.130	55.7	0.314	-110.2
2000	0.334	138.6	3.015	67.2	0.140	56.2	0.296	-114.1

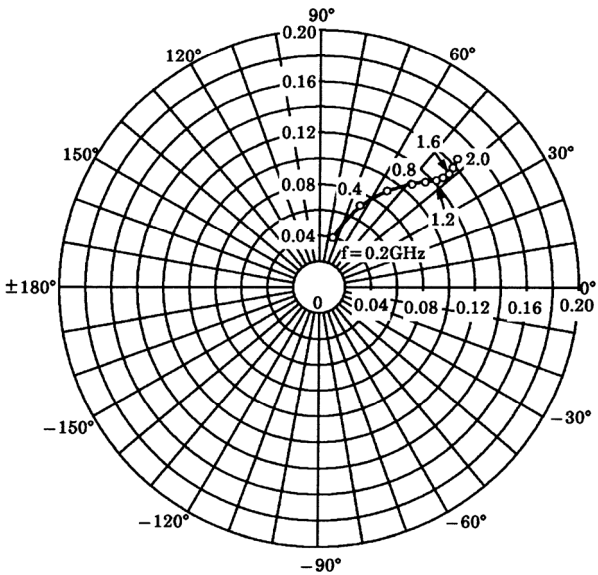
S11e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



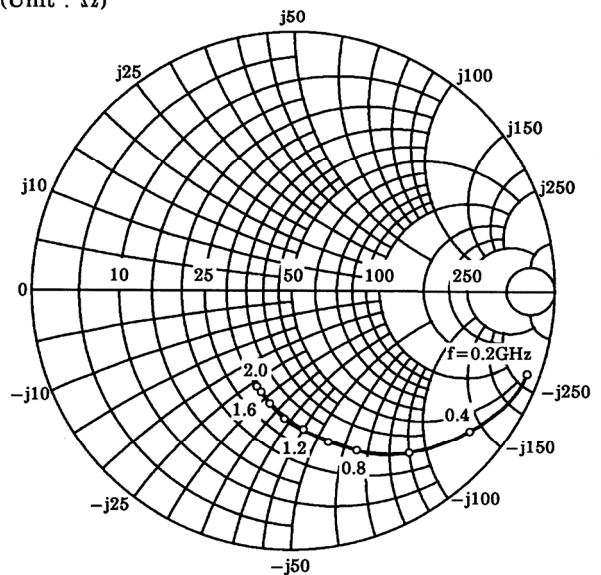
S21e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$



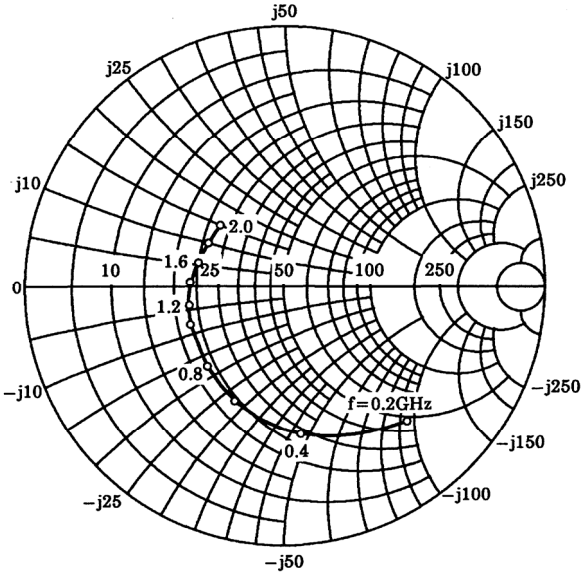
S12e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$



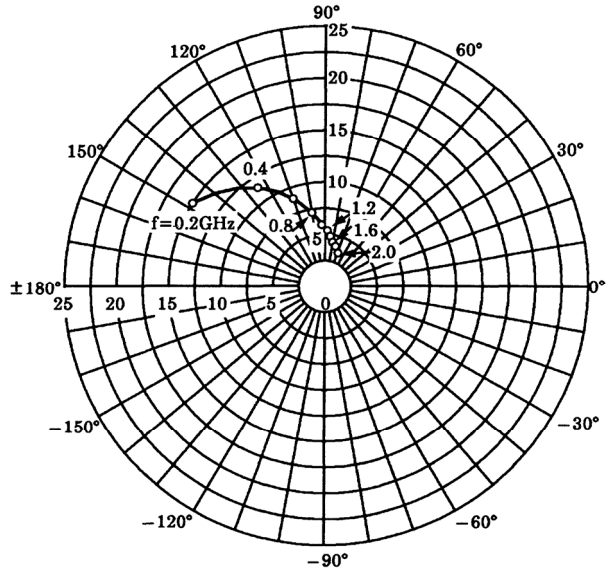
S22e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



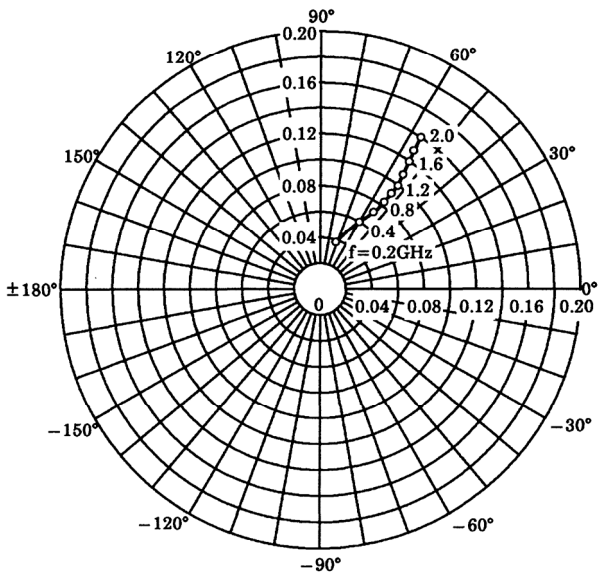
S11e
 VCE = 6V
 IC = 7mA
 Ta = 25°C
 (Unit : Ω)



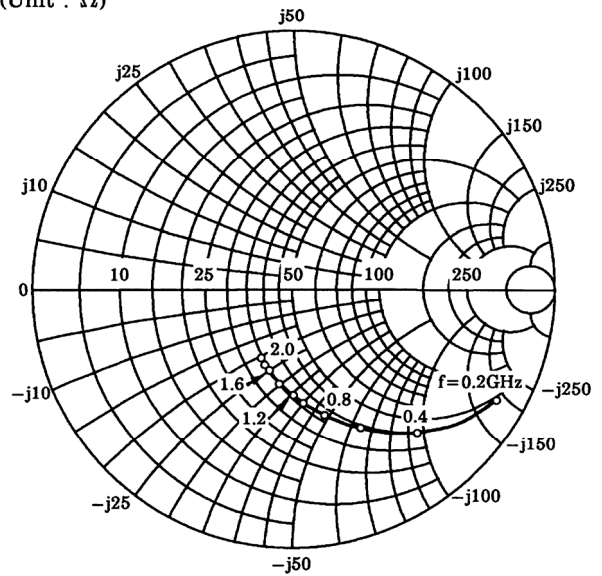
S21e
 VCE = 6V
 IC = 7mA
 Ta = 25°C



S12e
 VCE = 6V
 IC = 7mA
 Ta = 25°C



S22e
 VCE = 6V
 IC = 7mA
 Ta = 25°C
 (Unit : Ω)



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