

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5092

VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

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

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

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).

JEDEC	—
JEITA	—
TOSHIBA	2-3J1C

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	$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$	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)$	$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$, $f = 2\text{ GHz}$	6.5	9.5	—	
Noise figure	NF (1)	$V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$	—	1.4	2.5	dB
	NF (2)	$V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$, $f = 2\text{ GHz}$	—	1.8	3	

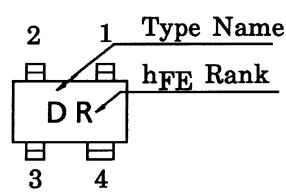
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

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)	$V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$	50	—	160	
Output capacitance	C_{ob}	$V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$ (Note 2)	—	0.7	1.1	pF
Reverse transfer capacitance	C_{re}		—	0.45	0.95	pF

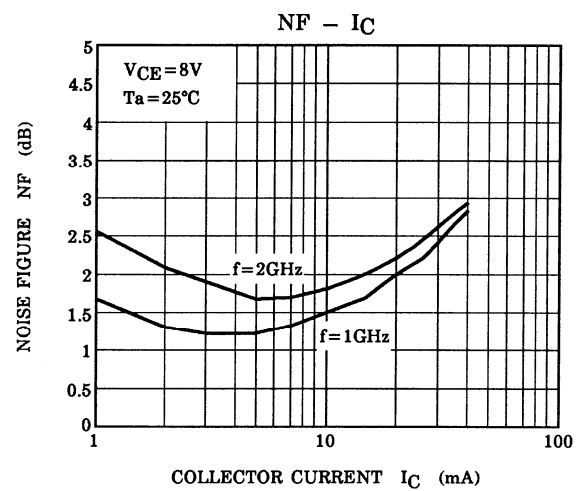
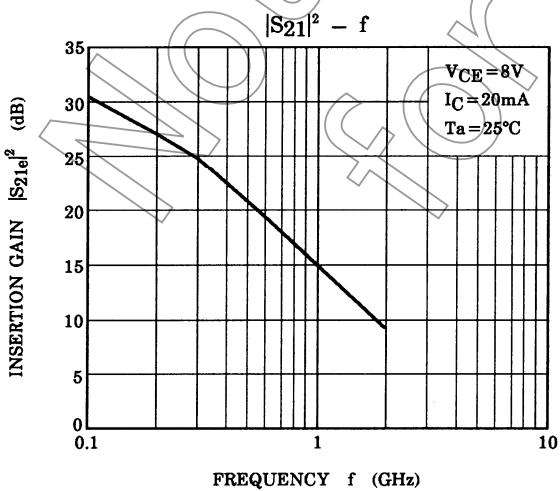
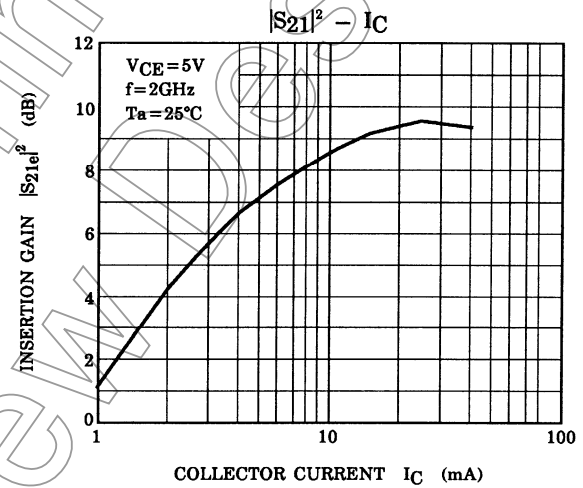
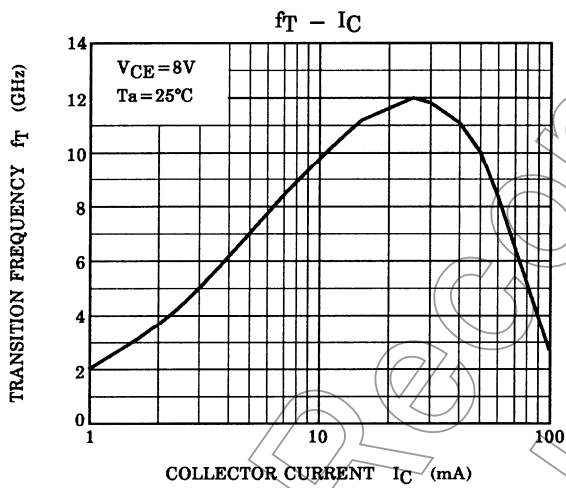
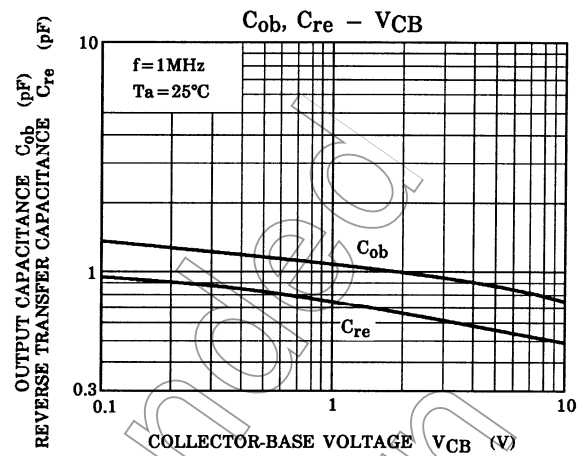
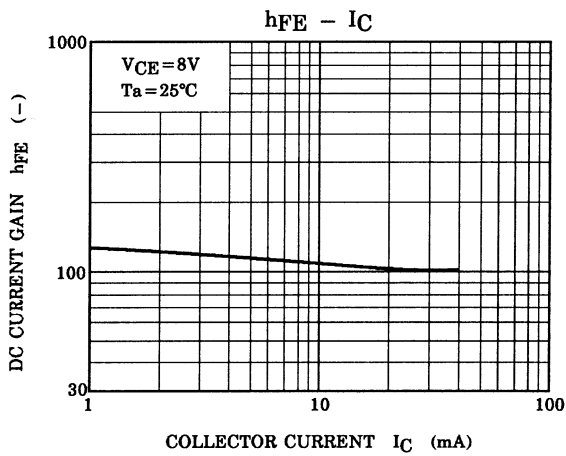
Note 1: h_{FE} classification R: 50~100, O: 80~160

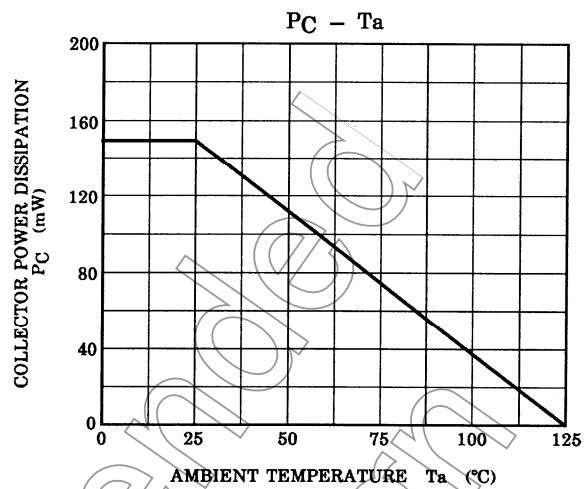
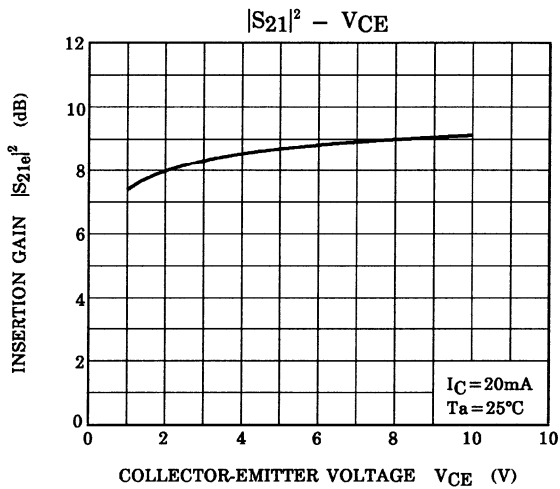
Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

Marking



Not Recommended
for New Design





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

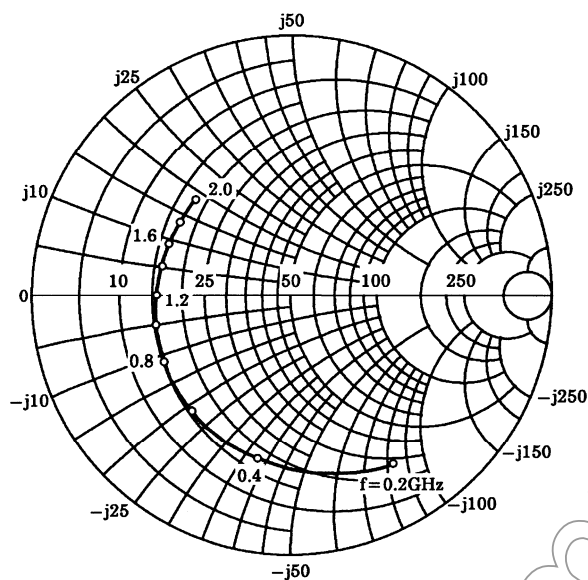
$V_{CE} = 8 \text{ V}$, $I_C = 5 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.767	-58.9	12.888	143.5	0.049	62.8	0.856	-34.5
400	0.655	-102.2	9.480	119.3	0.073	48.7	0.663	-57.5
600	0.605	-130.0	7.087	104.6	0.086	43.1	0.535	-72.7
800	0.567	-150.4	5.577	93.9	0.093	40.7	0.456	-84.3
1000	0.547	-166.4	4.548	86.0	0.098	41.1	0.407	-93.8
1200	0.533	-179.7	3.798	79.3	0.103	42.5	0.373	-102.4
1400	0.528	-169.1	3.268	76.9	0.109	44.1	0.346	-110.3
1600	0.519	-158.4	2.856	69.3	0.116	46.6	0.328	-117.4
1800	0.520	-148.3	2.551	65.1	0.124	48.9	0.314	-123.0
2000	0.524	-138.7	2.290	61.1	0.133	51.1	0.303	-128.3

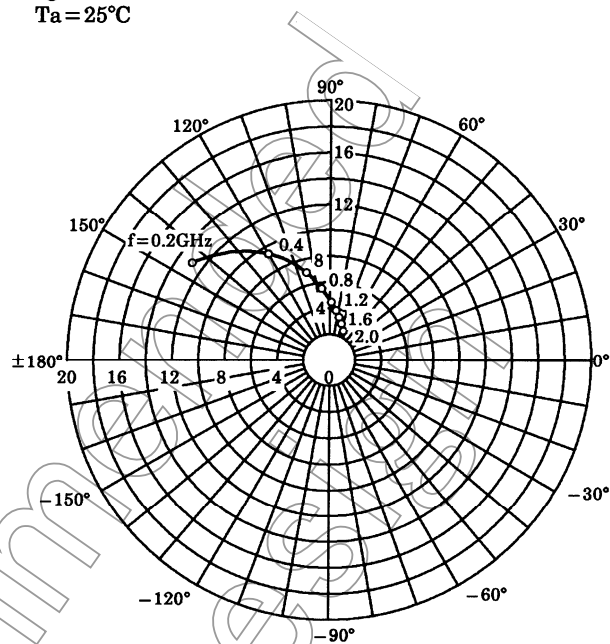
$V_{CE} = 8 \text{ V}$, $I_C = 20 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.540	-106.8	23.009	123.0	0.033	56.9	0.605	-57.8
400	0.521	-147.5	13.445	102.7	0.045	54.9	0.392	-81.2
600	0.521	-167.1	9.277	92.8	0.057	57.9	0.309	-95.5
800	0.525	-178.9	7.029	85.7	0.069	60.0	0.271	-107.3
1000	0.526	-168.8	5.651	80.0	0.082	62.5	0.250	-117.9
1200	0.529	-158.7	4.688	75.6	0.094	63.4	0.236	-127.6
1400	0.531	-148.5	4.011	71.6	0.106	64.5	0.225	-136.2
1600	0.536	-140.4	3.531	68.1	0.119	65.1	0.214	-143.8
1800	0.539	-131.7	3.159	64.7	0.133	65.5	0.201	-149.8
2000	0.540	-122.8	2.842	61.8	0.147	65.7	0.190	-154.8

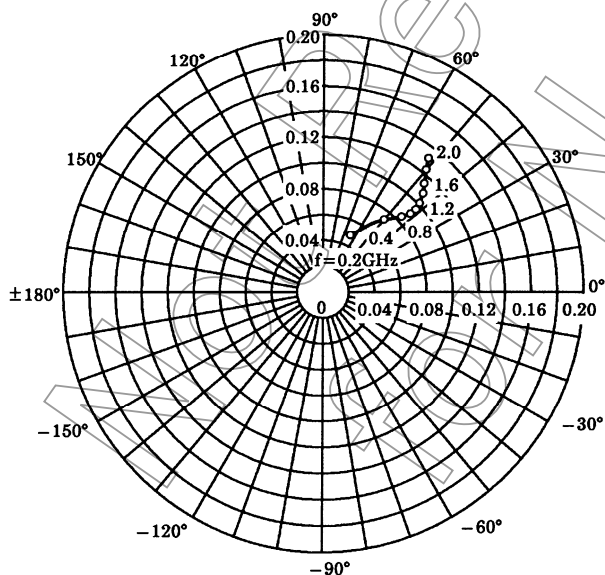
S_{11e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



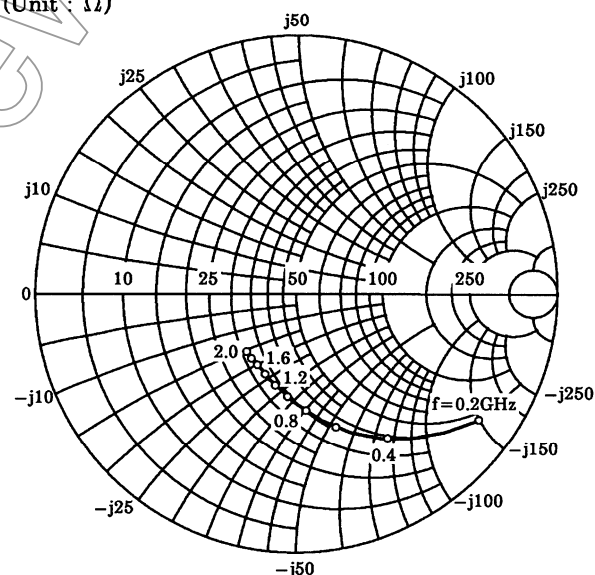
S_{21e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$



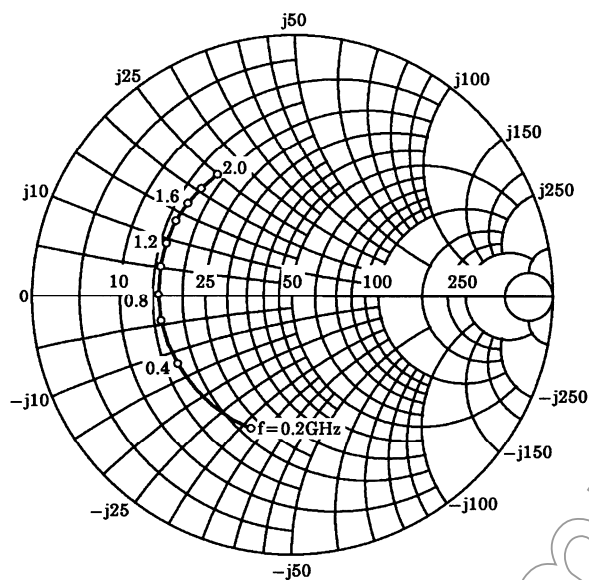
S_{12e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$



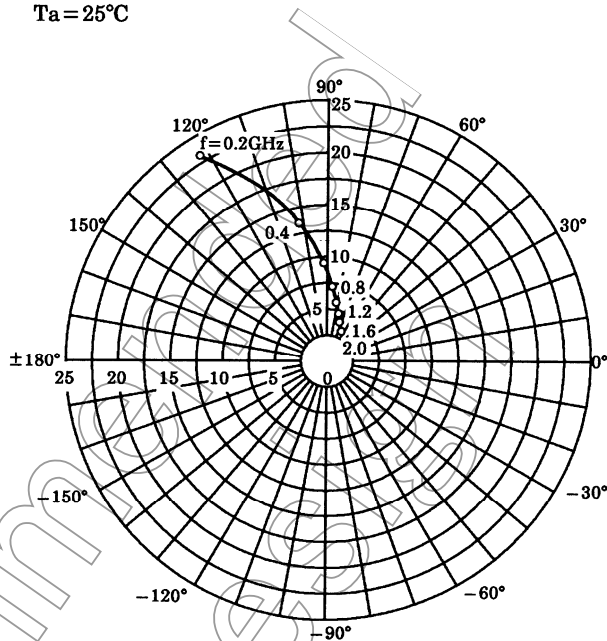
S_{22e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



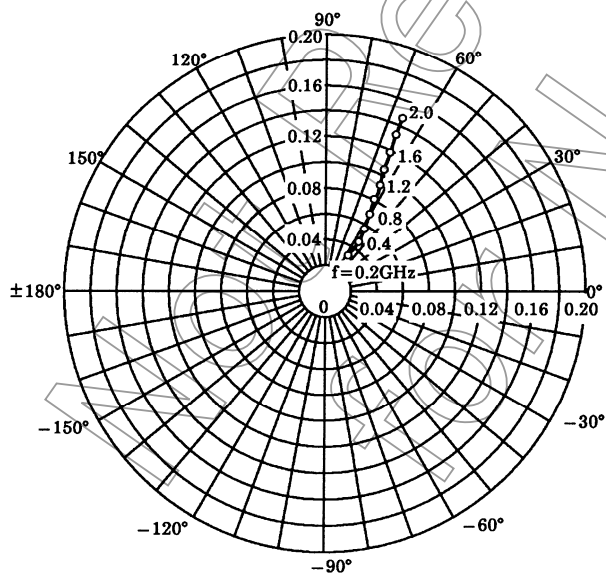
S_{11e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



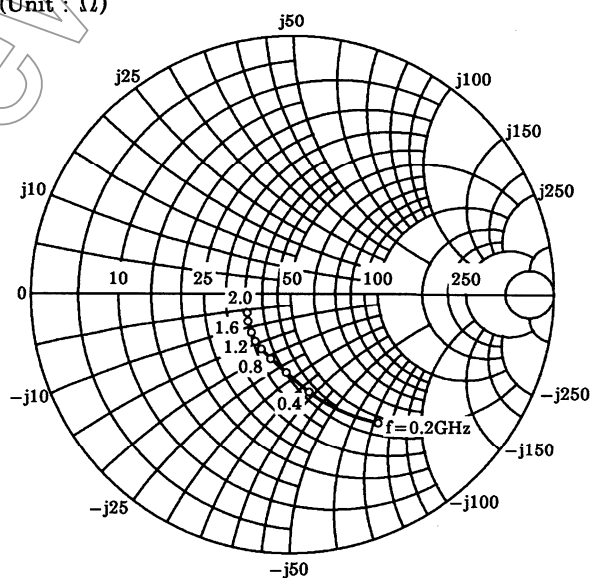
S_{21e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$



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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