

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5090

VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

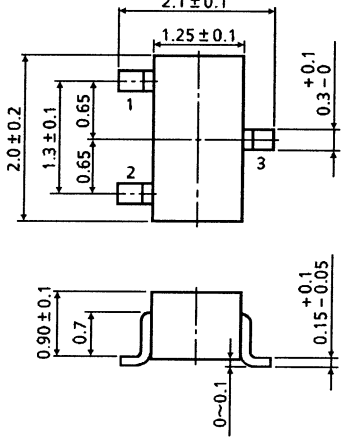
- Low noise figure, high gain.
- $NF = 1.1\text{dB}$, $|S_{21e}|^2 = 13\text{dB}$ ($f = 1\text{GHz}$)

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	100	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).

		1. BASE 2. EMITTER 3. COLLECTOR
JEDEC	—	
JEITA	SC-70	
TOSHIBA	2-2E1A	

Weight: 0.006 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)$	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$, $f = 1\text{GHz}$	10	13	—	dB
	$ S_{21e} ^2 (2)$	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$, $f = 2\text{GHz}$	—	7	—	
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	—	

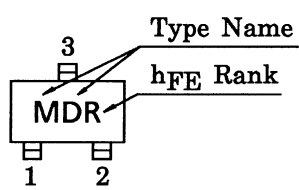
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

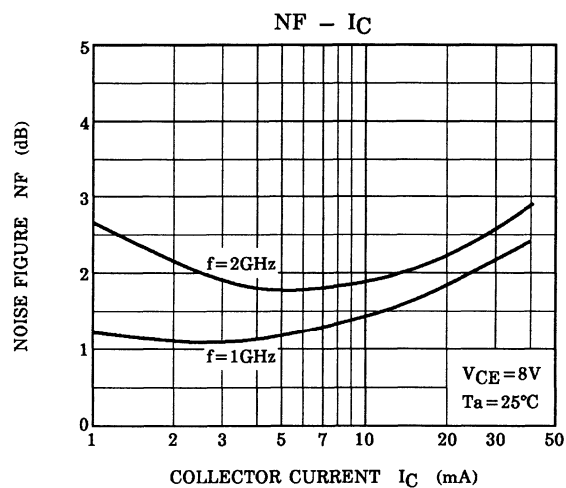
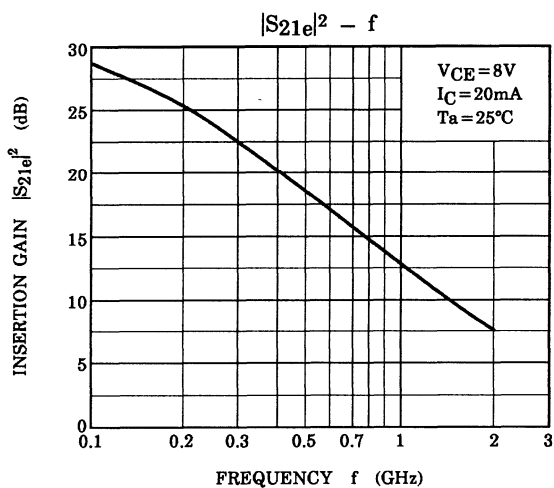
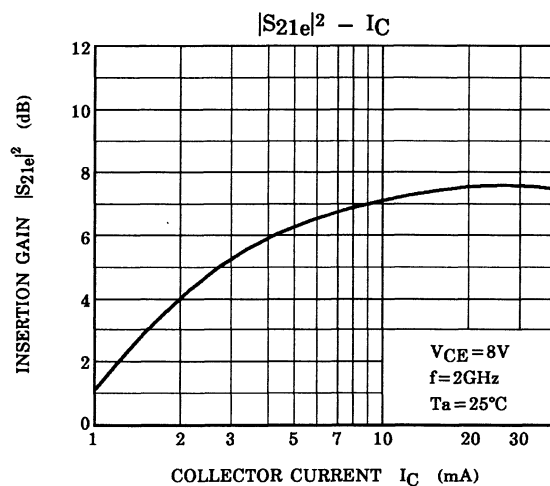
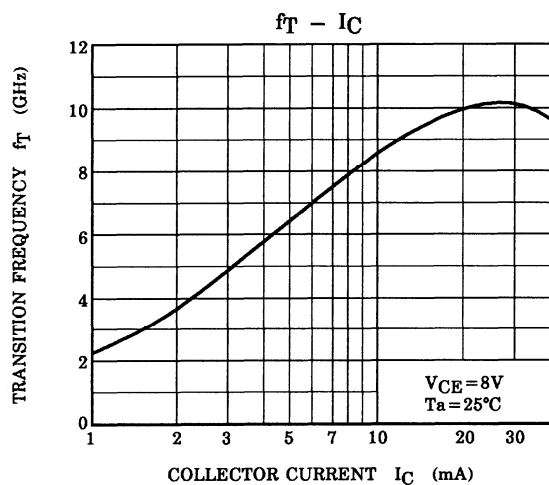
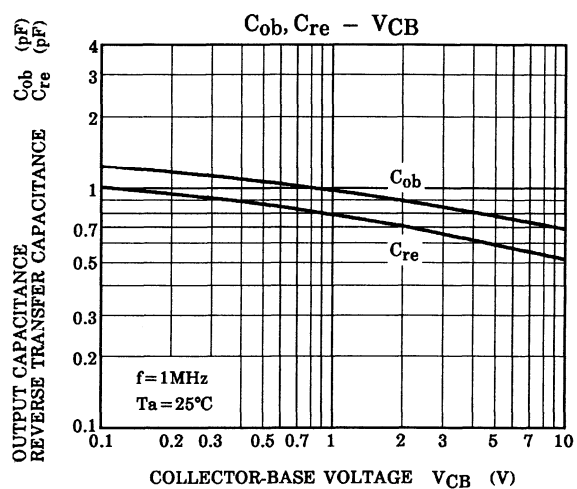
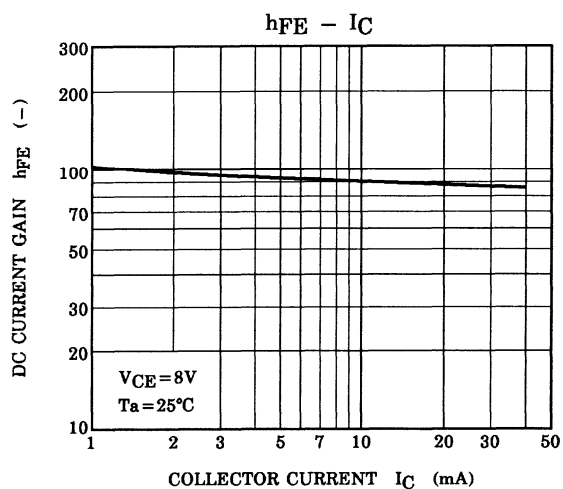
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE} (Note 1)	$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$	50	—	160	
Output capacitance	C_{ob}	$V_{CB} = 10\text{V}$, $I_E = 0$, $f = 1\text{MHz}$ (Note 2)	—	0.7	—	pF
Reverse transfer capacitance	C_{re}		—	0.5	0.95	pF

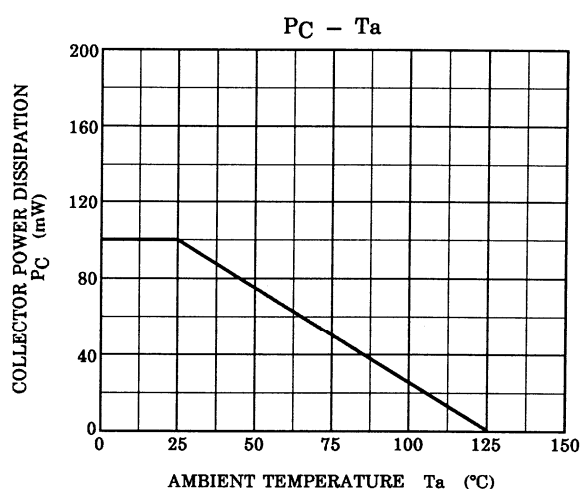
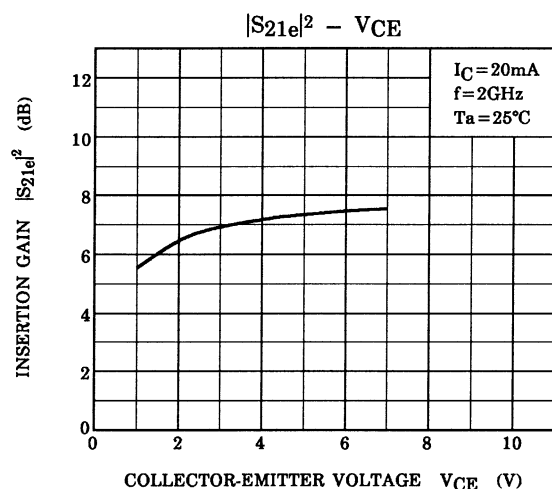
Note 1: h_{FE} classification R: 50~100, O: 80~160

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

Marking







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

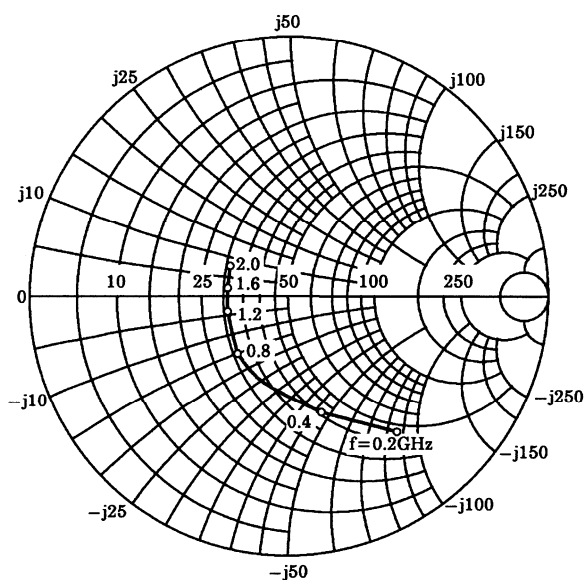
$V_{CE} = 8 \text{ V}$, $I_C = 5 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.683	-50.1	10.186	138.3	0.049	62.0	0.773	-30.0
400	0.462	-86.9	7.472	114.6	0.071	54.3	0.556	-39.6
600	0.343	-113.1	5.618	100.9	0.086	53.8	0.448	-41.7
800	0.282	-133.6	4.407	91.7	0.101	55.3	0.392	-41.6
1000	0.249	-151.0	3.663	84.7	0.115	57.2	0.360	-41.7
1200	0.236	-166.6	3.128	78.7	0.131	58.9	0.339	-41.7
1400	0.233	179.7	2.759	73.1	0.150	60.1	0.330	-42.8
1600	0.234	168.3	2.457	68.2	0.168	60.0	0.319	-45.0
1800	0.238	158.6	2.224	63.4	0.185	60.0	0.311	-47.9
2000	0.251	149.6	2.038	59.4	0.203	60.4	0.302	-50.2

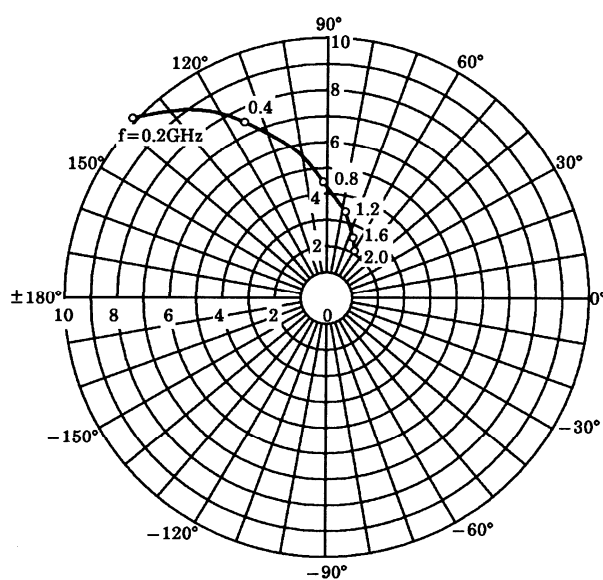
$V_{CE} = 8 \text{ V}$, $I_C = 20 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.319	-91.9	18.338	116.7	0.033	65.3	0.494	-43.5
400	0.213	-134.2	10.303	99.2	0.054	68.9	0.312	-42.4
600	0.185	-160.0	7.111	90.3	0.076	70.8	0.258	-37.6
800	0.176	-178.2	5.415	84.3	0.098	71.2	0.236	-34.3
1000	0.174	167.8	4.400	79.2	0.120	71.1	0.228	-32.0
1200	0.178	156.8	3.712	74.8	0.143	70.3	0.226	-31.5
1400	0.186	147.5	3.236	70.3	0.168	68.7	0.226	-32.8
1600	0.194	139.7	2.874	66.3	0.190	66.6	0.223	-35.9
1800	0.199	133.7	2.583	62.6	0.211	64.9	0.216	-39.0
2000	0.215	127.8	2.369	58.8	0.232	63.5	0.211	-41.9

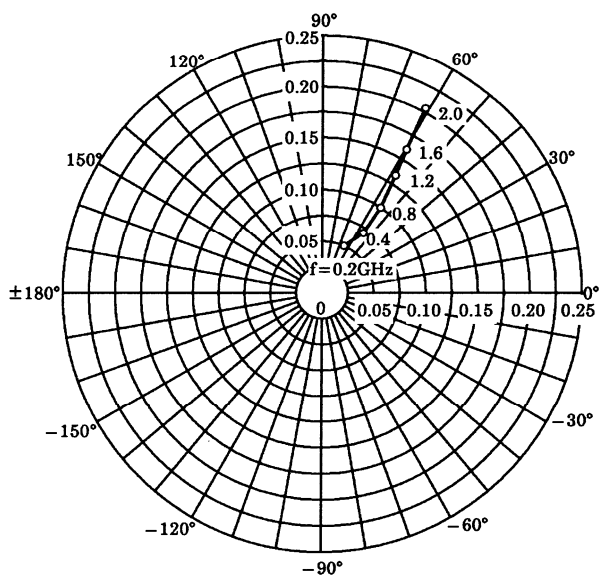
S_{11e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$
 (UNIT : Ω)



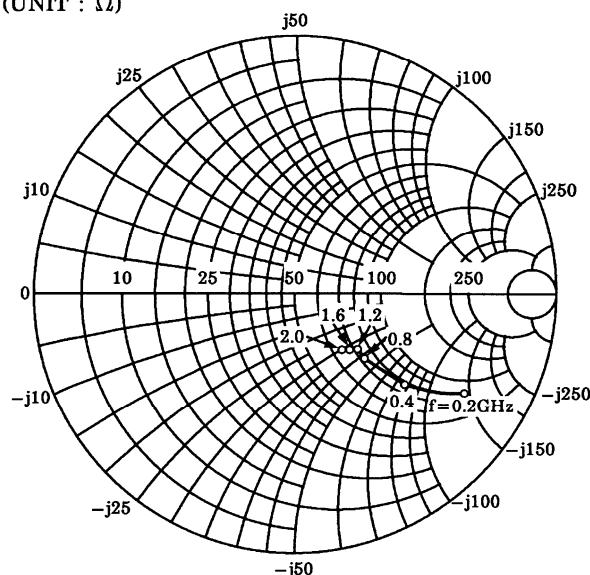
S_{21e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$



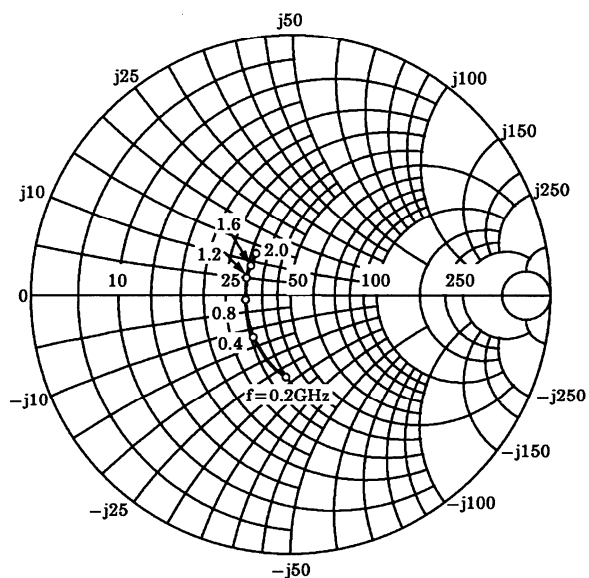
S_{12e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$



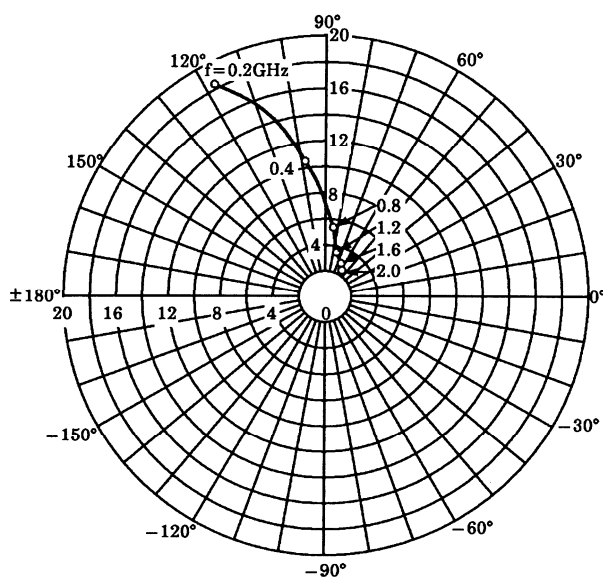
S_{22e}
 $V_{CE} = 8V$
 $I_C = 5mA$
 $T_a = 25^\circ C$
 (UNIT : Ω)



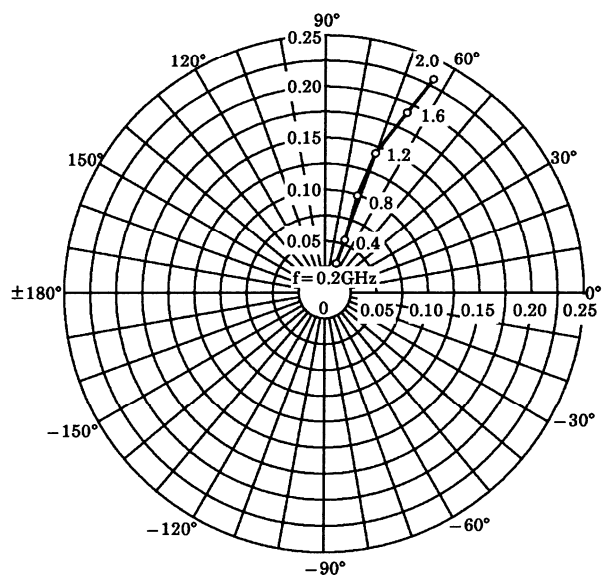
S_{11e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$
 (UNIT : Ω)



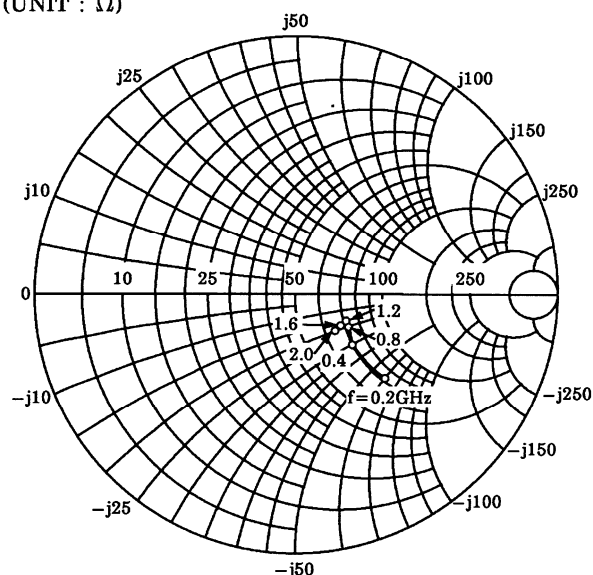
S_{21e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$



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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