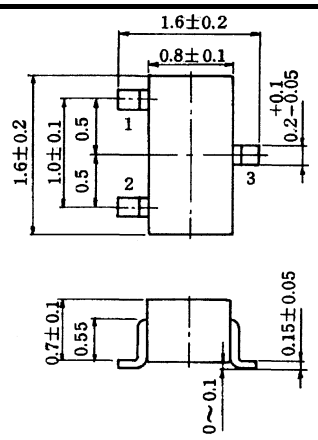
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5091

VHF~UHF Band Low Noise Amplifier Applications

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

Unit: mm



1. BASE
2. EMITTER
3. COLLECTOR

SSM

JEDEC	—
JEITA	—
TOSHIBA	2-2H1A

Weight: 2.4 mg (typ.)

Absolute Maximum Ratings (Ta = 25°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	°C
Storage temperature range	T_{stg}	−55~125	°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).

Microwave Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	V_{CE} = 8 V, I_C = 20 mA	7	10	—	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 8 V, I_C = 20 mA, f = 1 GHz	10	13	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 8 V, I_C = 20 mA, f = 2 GHz	—	7	—	
Noise figure	NF (1)	V_{CE} = 8 V, I_C = 5 mA, f = 1 GHz	—	1.1	2.5	dB
	NF (2)	V_{CE} = 8 V, I_C = 5 mA, f = 2 GHz	—	1.7	—	

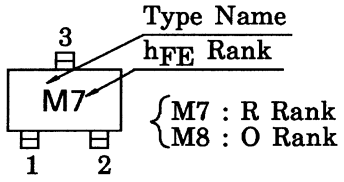
Electrical Characteristics (Ta = 25°C)

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

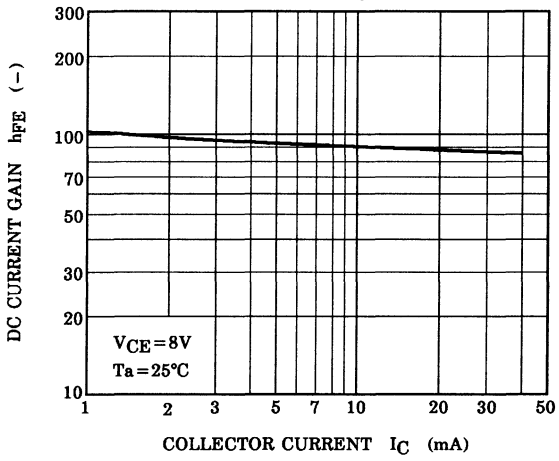
Note 1: h_{FE} classification R: 50~100, O: 80~160

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

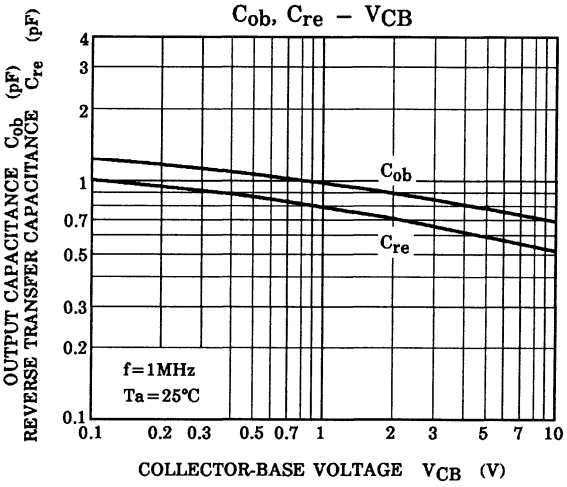
Marking



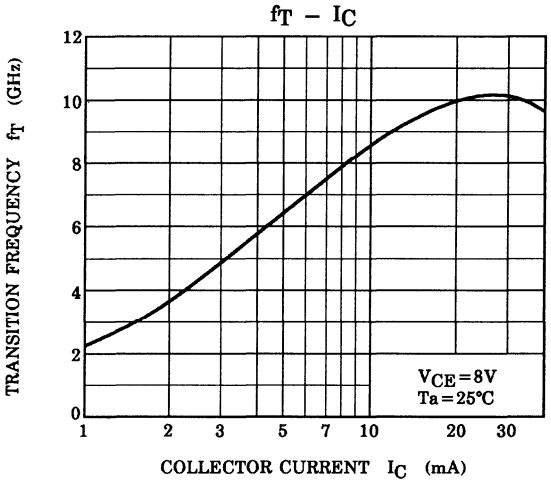
h_{FE} – I_C



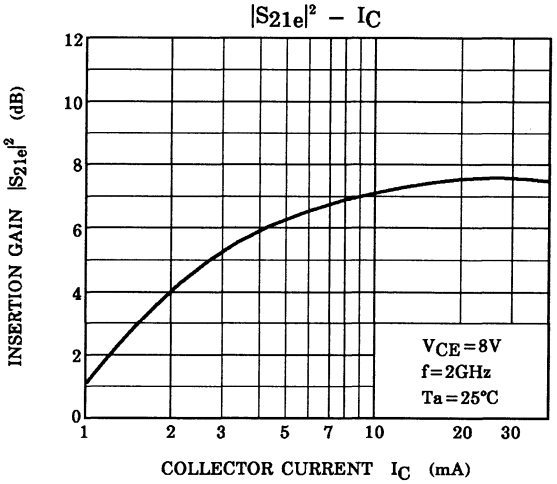
C_{ob}, C_{re} – V_{CB}



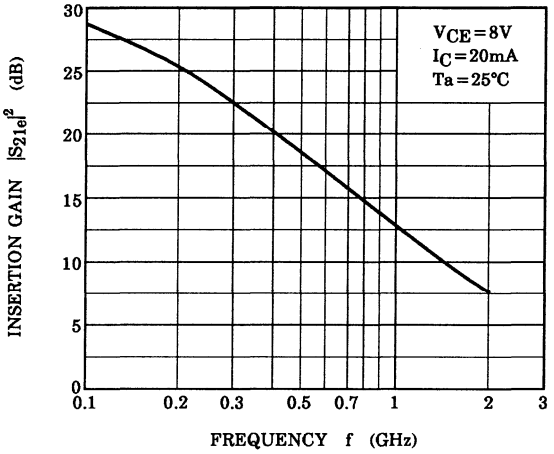
f_T – I_C



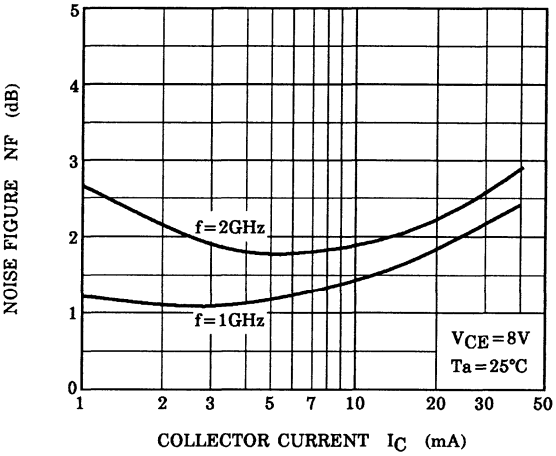
$|S_{21e}|^2$ – I_C

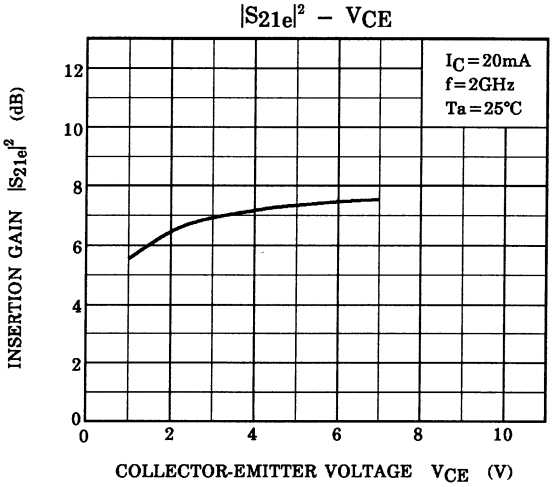


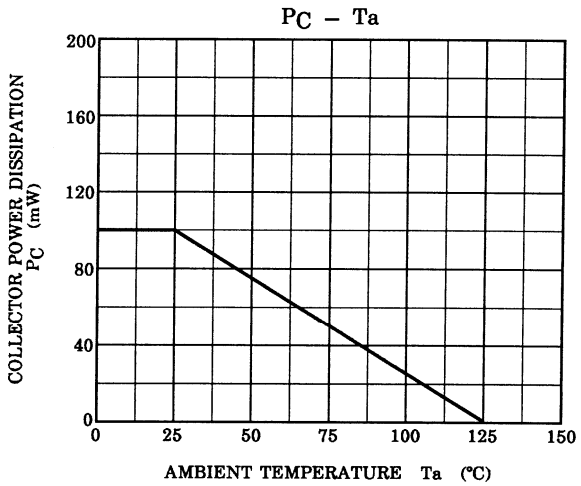
$|S_{21e}|^2$ – f



NF – I_C







S-Parameter Z_O = 50 Ω, Ta = 25°C

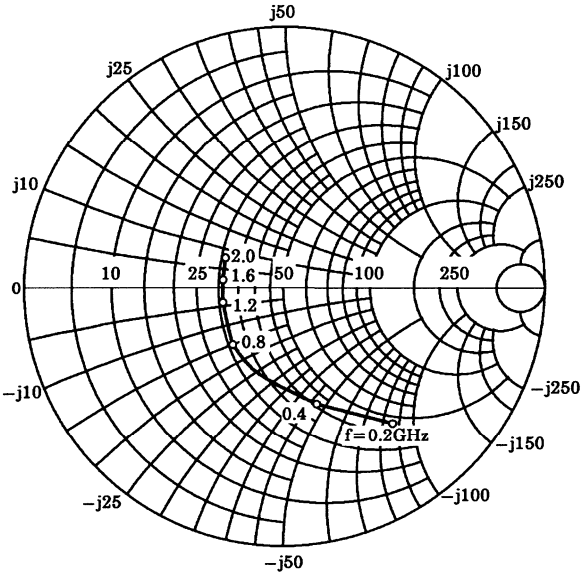
V_{CE} = 8 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
(MHz)	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

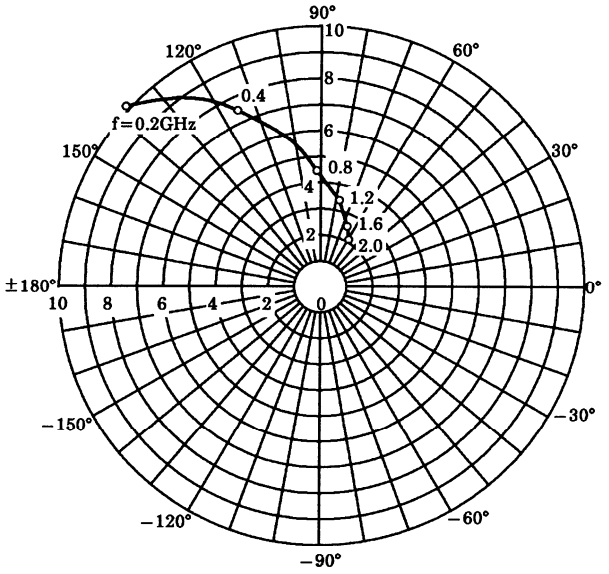
V_{CE} = 8 V, I_C = 20 mA

Frequency	S11		S21		S12		S22	
(MHz)	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

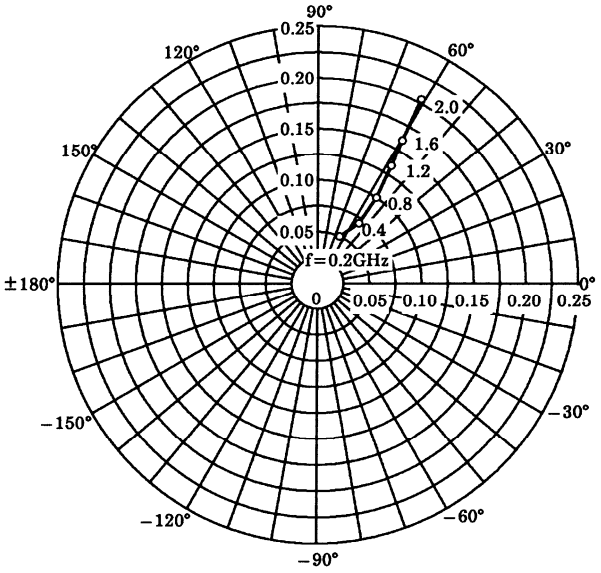
S_{11e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



S_{21e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C



S_{12e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C



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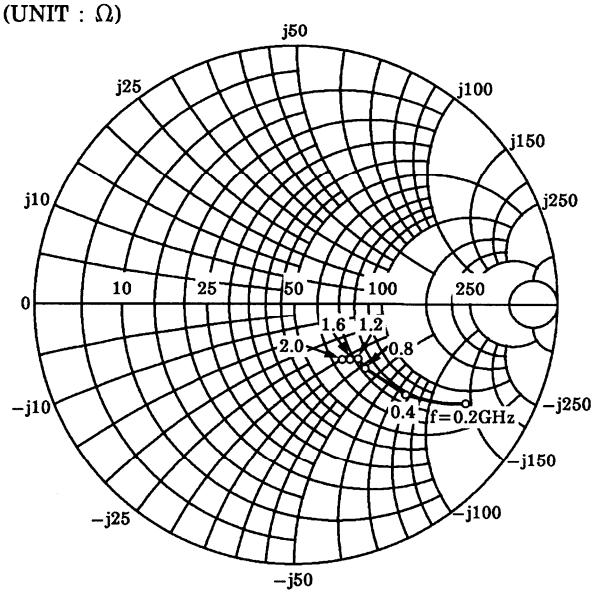
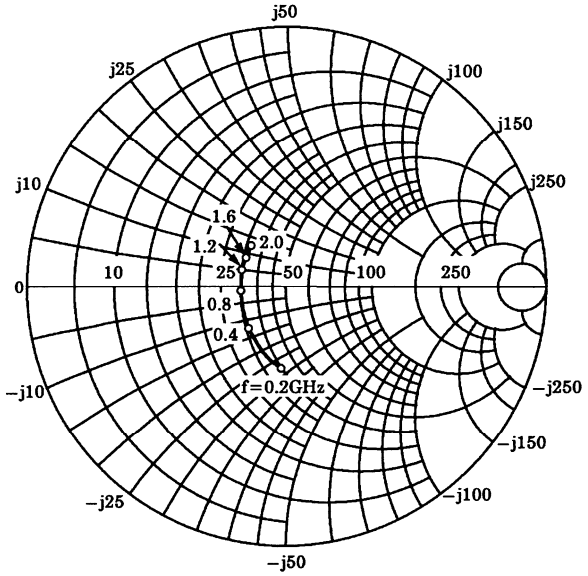


S_{11e}
V_{CE} = 8V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



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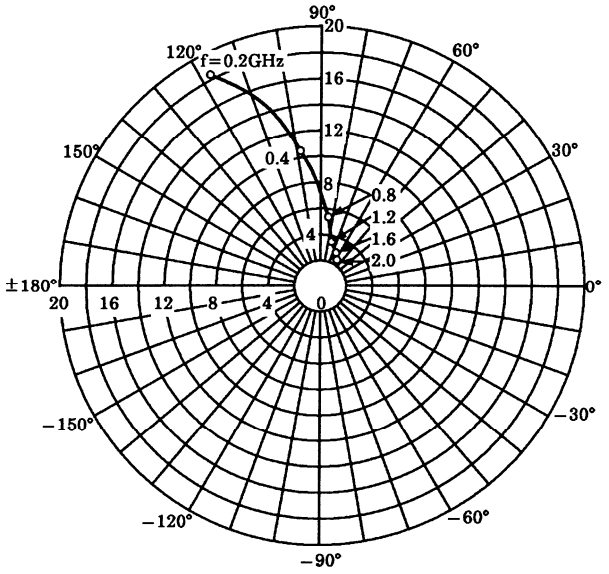

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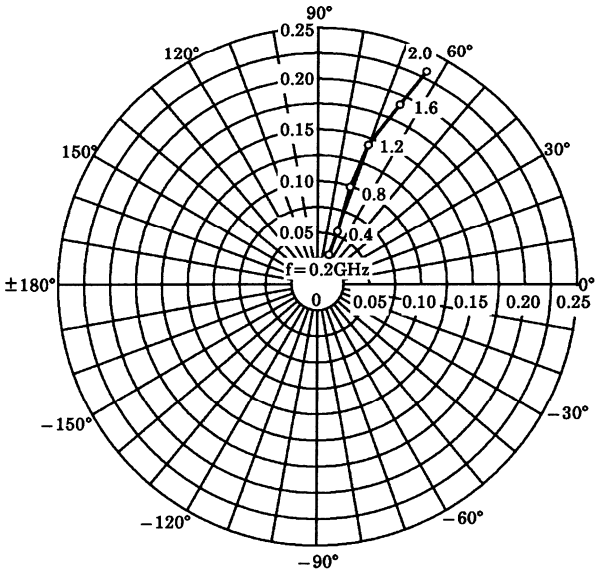

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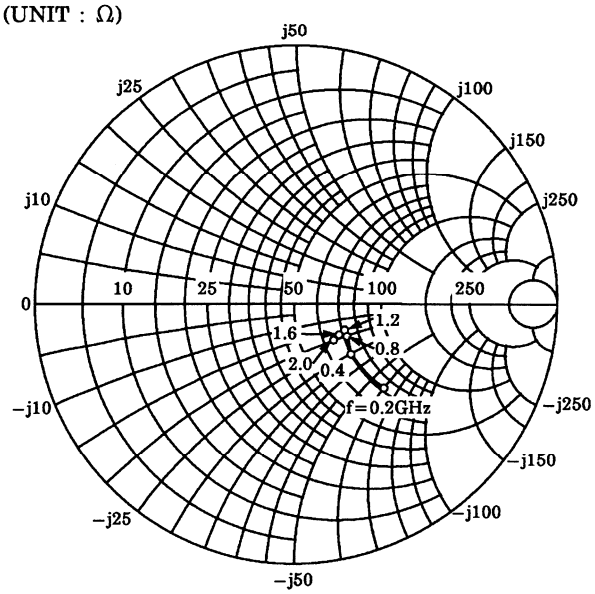

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