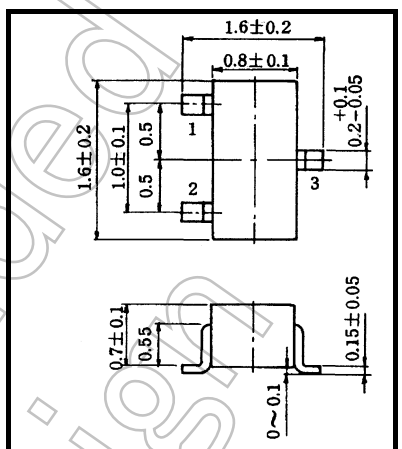
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5096

VHF～UHF Band Low Noise Amplifier Applications

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

Unit: mm



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	7	mA
Collector current	I_C	15	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55 to 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} = 6 V, I_C = 7 mA	7	10	―	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 6 V, I_C = 7 mA, f = 1 GHz	―	13	―	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 6 V, I_C = 7 mA, f = 2 GHz	4.5	7.5	―	
Noise figure	NF (1)	V_{CE} = 6 V, I_C = 3 mA, f = 1 GHz	―	1.4	―	dB
	NF (2)	V_{CE} = 6 V, I_C = 3 mA, f = 2 GHz	―	1.8	3.0	

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} = 6 V, I_C = 7 mA	50	―	160	
Output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz (Note 2)	―	0.5	―	pF
Reverse transfer capacitance	C_{re}		―	0.4	0.85	pF

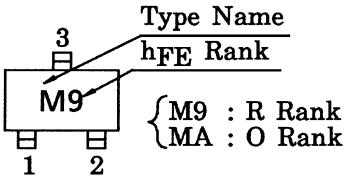
Note 1: h_{FE} classification R: 50 to 100, O: 80 to 160

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

Start of commercial production
1993-10

Not Recommended for New Design

Marking



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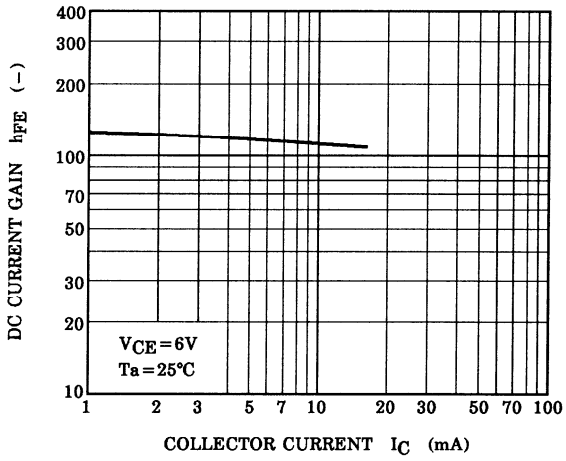
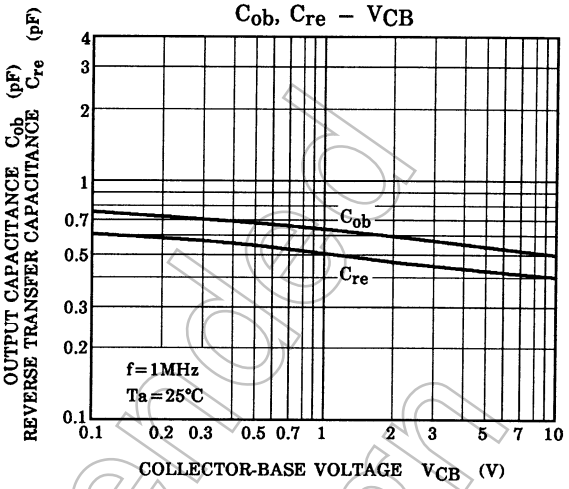
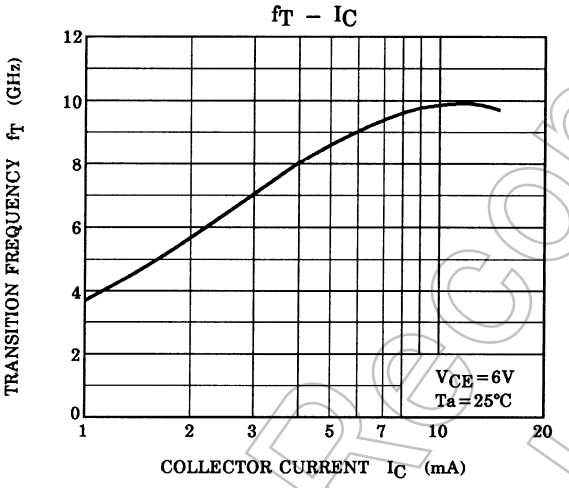
h_{FE} – I_C



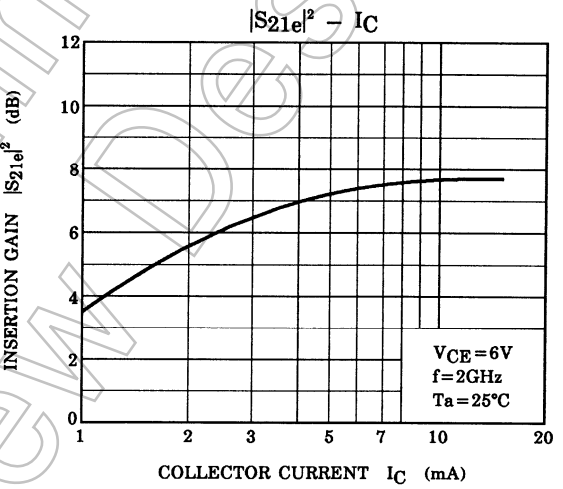
C_{ob}, C_{re} – V_{CB}



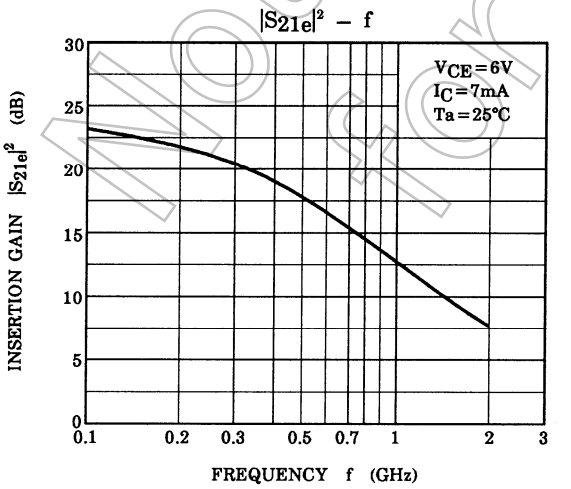
f_T – I_C



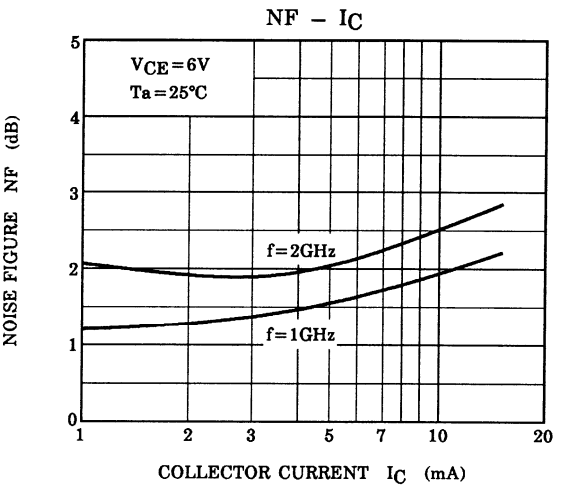
$|S_{21e}|^2$ – I_C



$|S_{21e}|^2$ – f



NF – I_C



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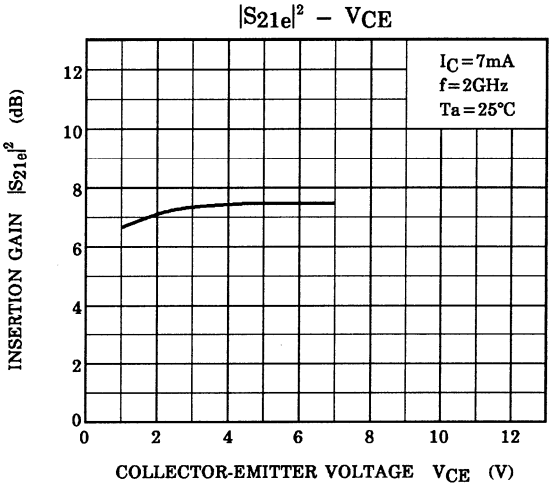
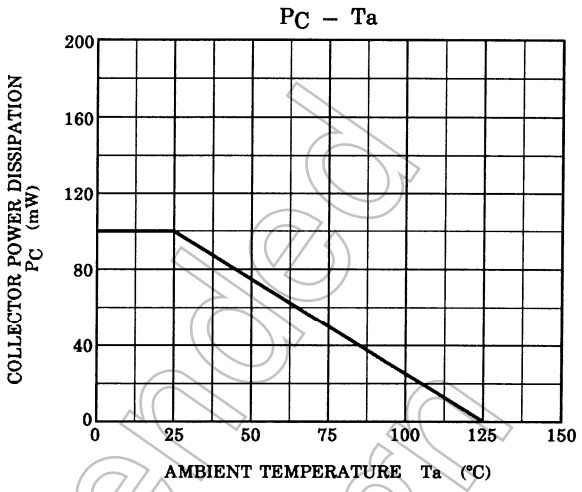




S-Parameter Z_O = 50 Ω, Ta = 25°C

V_{CE} = 6 V, I_C = 3 mA

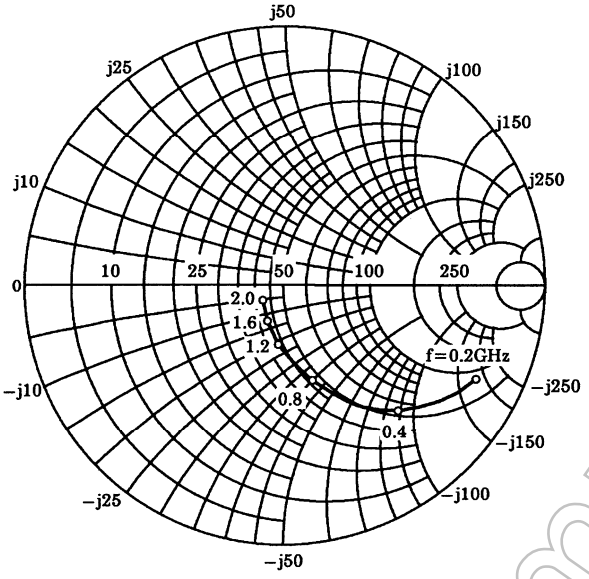
Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.835	–26.1	7.069	150.4	0.046	71.0	0.899	–19.3
400	0.665	–46.5	5.948	130.4	0.076	60.5	0.745	–30.3
600	0.501	–62.7	5.021	115.2	0.095	55.7	0.630	–35.9
800	0.386	–74.3	4.173	104.3	0.111	53.7	0.552	–38.5
1000	0.297	–83.7	3.592	95.6	0.124	53.2	0.500	–39.9
1200	0.226	–92.7	3.140	88.5	0.137	53.6	0.465	–41.1
1400	0.175	–101.9	2.808	82.3	0.152	54.1	0.442	–42.2
1600	0.130	–113.4	2.514	76.6	0.165	54.2	0.421	–43.8
1800	0.103	–128.0	2.293	71.7	0.179	53.9	0.405	–45.7
2000	0.081	–147.4	2.114	67.3	0.193	54.8	0.388	–47.4

V_{CE} = 6 V, I_C = 7 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.668	–40.0	12.306	138.9	0.040	67.3	0.786	–27.0
400	0.427	–64.4	8.852	116.1	0.061	61.6	0.579	–35.0
600	0.280	–79.5	6.591	102.9	0.078	61.8	0.476	–35.9
800	0.193	–89.7	5.191	94.3	0.096	62.5	0.420	–35.0
1000	0.134	–99.3	4.288	87.8	0.112	63.2	0.390	–34.2
1200	0.088	–112.3	3.661	81.9	0.130	63.8	0.374	–34.0
1400	0.056	–129.8	3.232	76.9	0.150	63.4	0.366	–34.8
1600	0.035	–169.0	2.857	72.1	0.168	62.5	0.356	–36.6
1800	0.040	157.0	2.574	68.1	0.185	61.4	0.347	–39.0
2000	0.054	131.5	2.363	64.3	0.203	61.3	0.338	–40.2

Not Recommended for New Design

S_{11e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C
(UNIT : Ω)



S_{21e}
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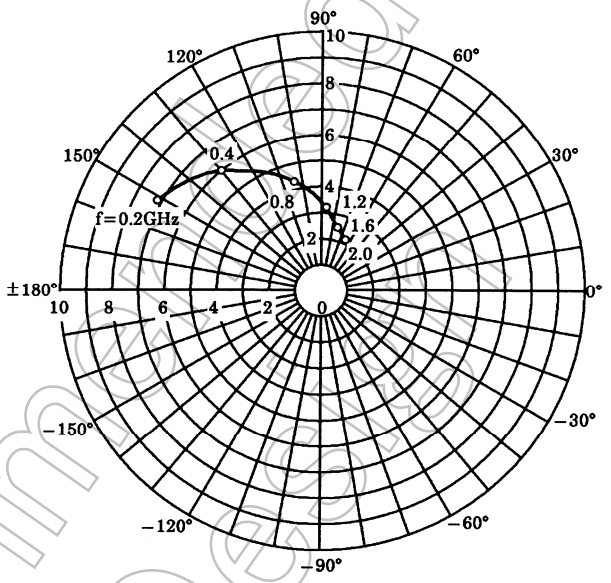

S_{12e}
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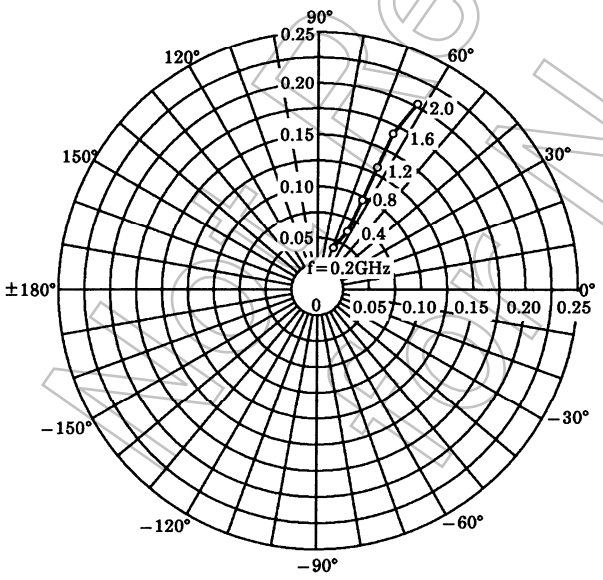
I_C = 7mA
Ta = 25°C



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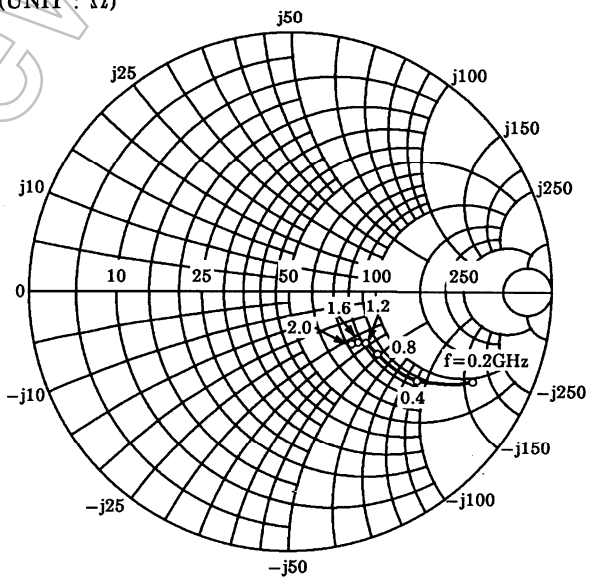

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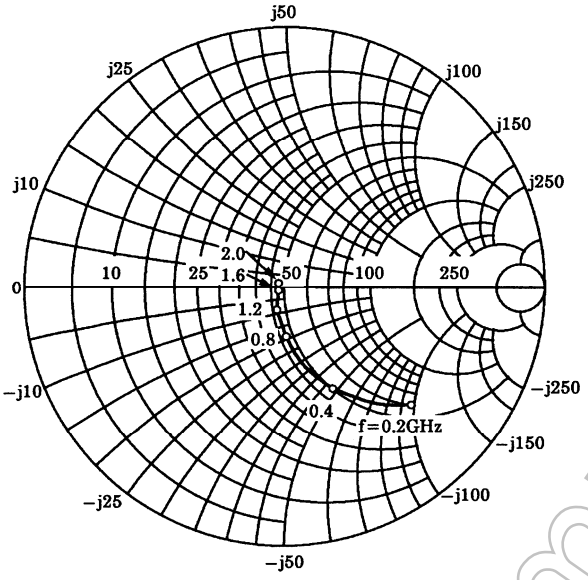

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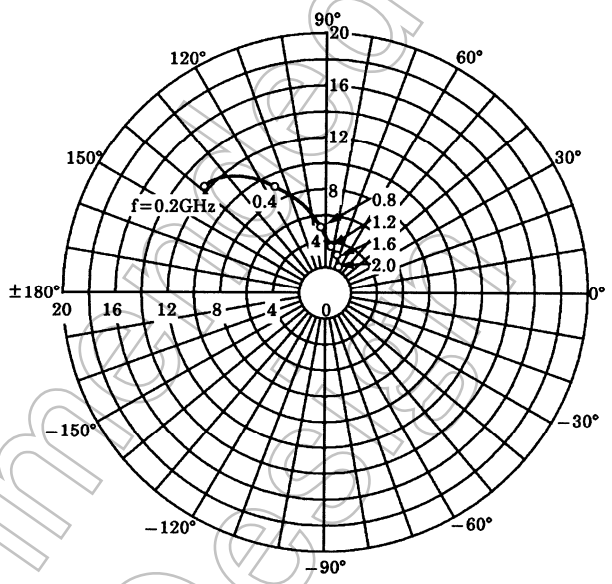

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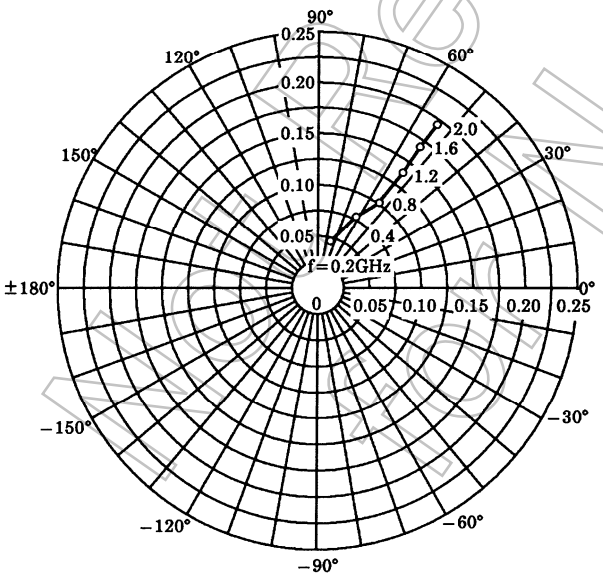

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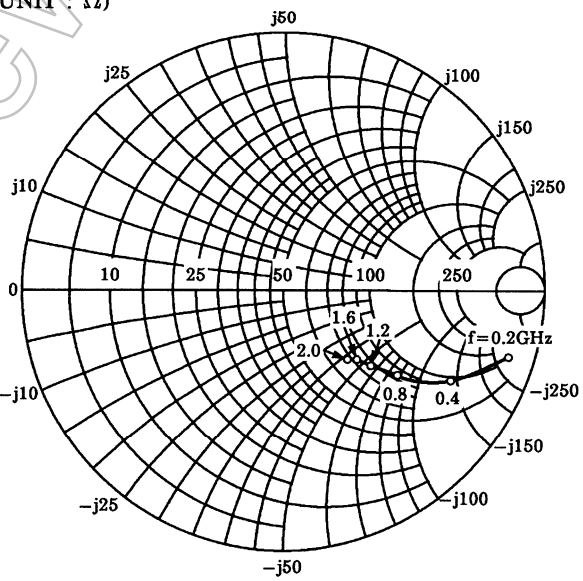

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