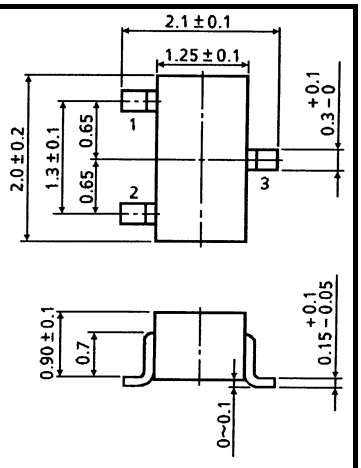
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5065

VHF to UHF Band Low Noise Amplifier Applications

- Low noise figure, high gain.
- NF = 1.1 dB, $|S_{21e}|^2$ = 12 dB (f = 1 GHz)

Unit: mm



1. BASE
2. EMITTER
3. COLLECTOR

USM

JEDEC	—
JEITA	SC-70
TOSHIBA	2-2E1A

Weight: 0.006 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	12	V
Emitter-base voltage	V_{EBO}	3	V
Base current	I_B	15	mA
Collector current	I_C	30	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} = 5 V, I_C = 10 mA	5	7	—	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 5 V, I_C = 10 mA, f = 500 MHz	—	17	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 5 V, I_C = 10 mA, f = 1 GHz	8.5	12	—	
Noise figure	NF (1)	V_{CE} = 5 V, I_C = 3 mA, f = 500 MHz	—	1	—	dB
	NF (2)	V_{CE} = 5 V, I_C = 3 mA, f = 1 GHz	—	1.1	2.0	

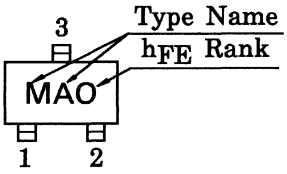
Electrical Characteristics (Ta = 25°C)

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} = 5 V, I_C = 10 mA	80	—	240	—
Output capacitance	C_{ob}	V_{CB} = 5 V, I_E = 0, f = 1 MHz (Note 2)	—	0.7	—	pF
Reverse transfer capacitance	C_{re}		—	0.45	0.9	pF

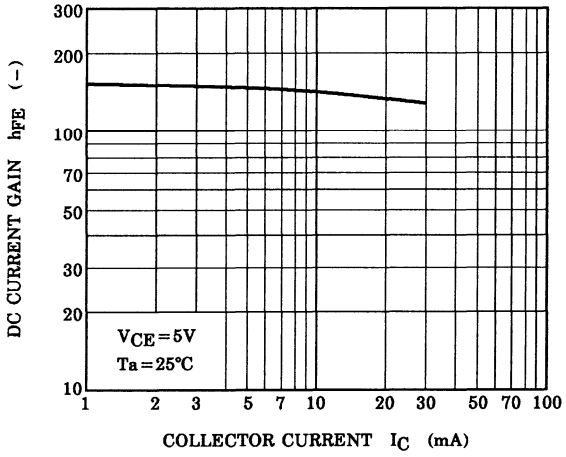
Note 1: h_{FE} classification O: 80 to 160, Y: 120 to 240

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

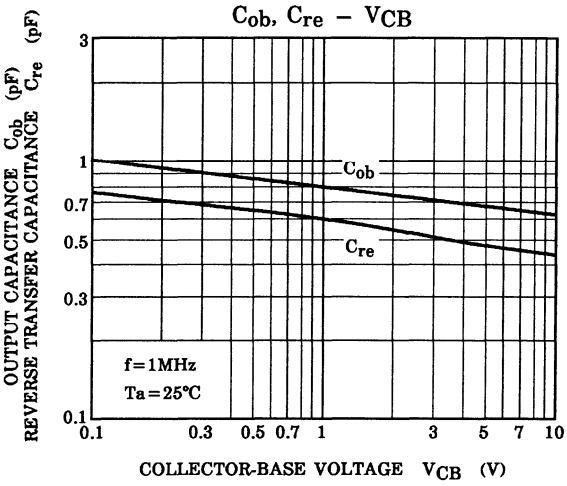
Marking



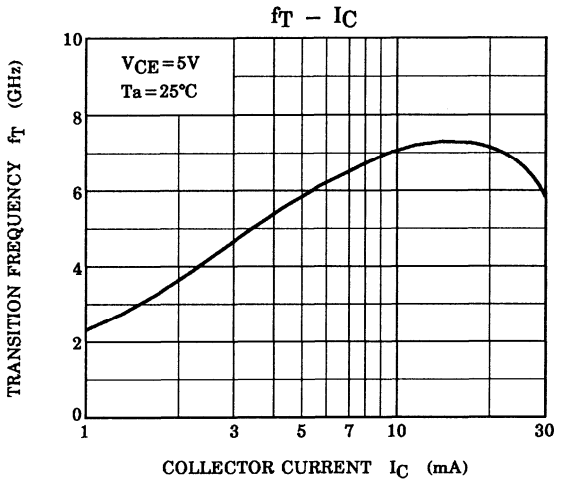
h_{FE} – I_C



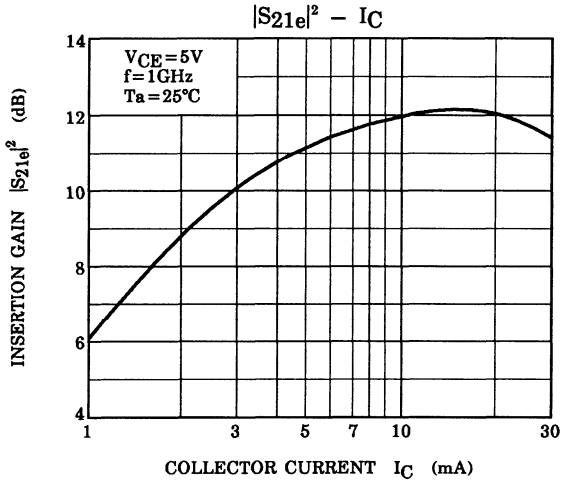
C_{ob}, C_{re} – V_{CB}



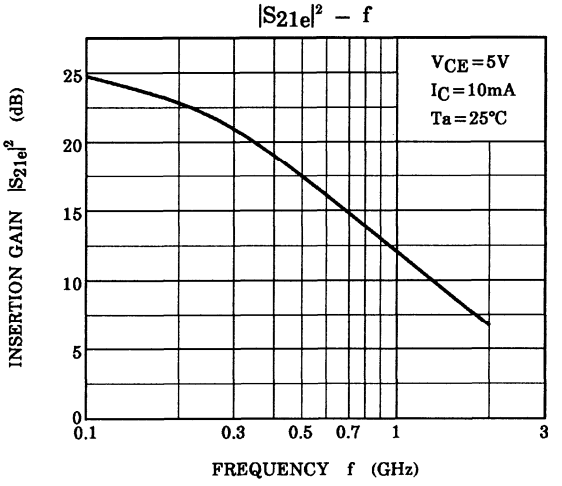
f_T – I_C



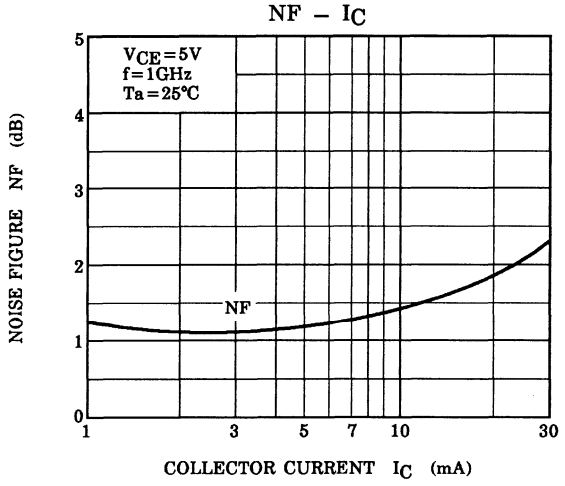
$|S_{21e}|^2$ – I_C

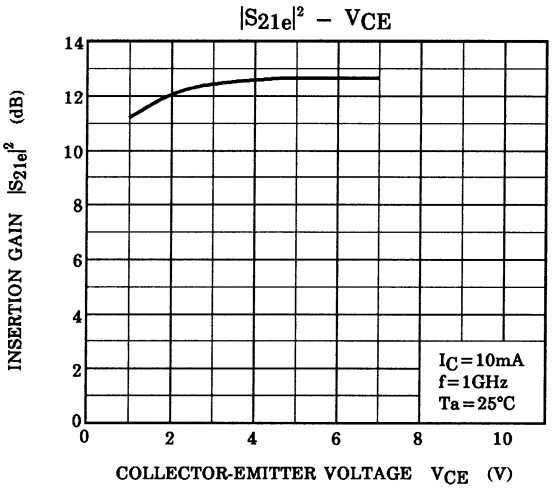


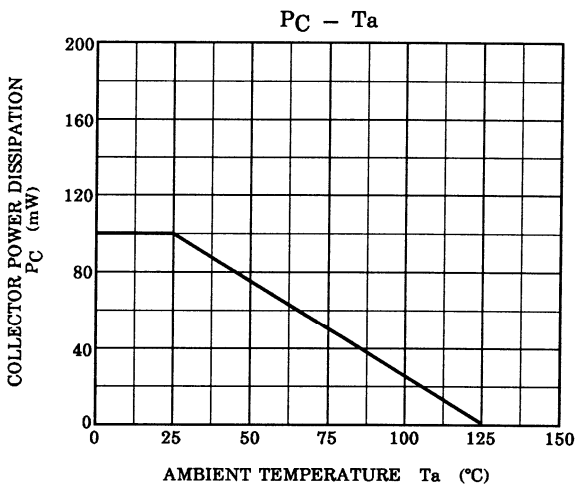
$|S_{21e}|^2$ – f



NF – I_C







S-Parameter $Z_O = 50\ \Omega$, Ta = 25°C

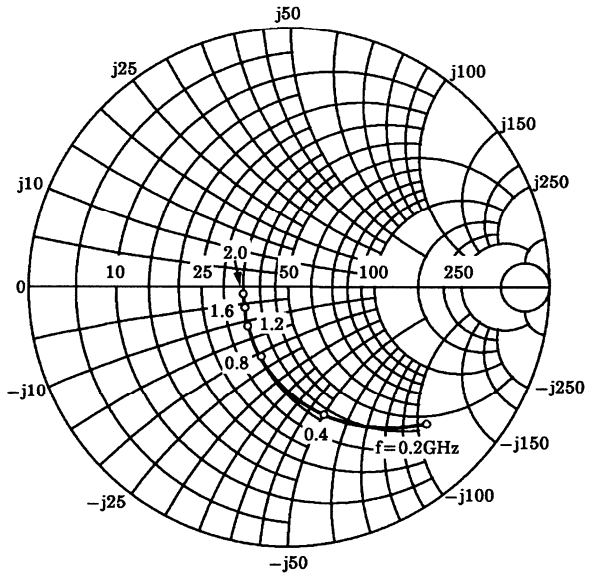
V_{CE} = 5 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.753	–43.7	10.247	140.6	0.040	65.6	0.827	–22.6
400	0.531	–75.1	7.684	117.1	0.060	57.1	0.648	–30.3
600	0.384	–96.4	5.815	103.0	0.074	56.1	0.551	–32.0
800	0.305	–112.6	4.523	93.6	0.086	57.0	0.500	–32.3
1000	0.255	–126.5	3.788	86.3	0.099	58.9	0.472	–32.4
1200	0.224	–138.4	3.244	80.7	0.112	60.2	0.455	–32.2
1400	0.203	–150.1	2.833	75.4	0.127	60.3	0.442	–32.6
1600	0.187	–159.4	2.529	70.6	0.139	60.0	0.434	–33.0
1800	0.174	–166.5	2.283	66.7	0.150	60.3	0.429	–32.6
2000	0.176	–171.2	2.107	63.0	0.164	59.2	0.428	–32.2

V_{CE} = 5 V, I_C = 10 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.591	–58.0	14.955	129.6	0.034	64.3	0.714	–27.5
400	0.367	–90.3	9.581	107.5	0.052	61.9	0.534	–30.8
600	0.260	–110.7	6.781	96.1	0.067	63.9	0.462	–30.1
800	0.209	–126.9	5.207	88.6	0.083	65.2	0.428	–29.2
1000	0.178	–141.8	4.269	82.5	0.100	66.4	0.412	–28.6
1200	0.160	–153.7	3.618	77.7	0.117	66.7	0.403	–28.3
1400	0.150	–166.3	3.152	72.7	0.135	65.4	0.398	–28.8
1600	0.141	–175.2	2.801	68.7	0.149	64.0	0.393	–29.4
1800	0.130	178.2	2.521	65.0	0.163	63.4	0.392	–29.0
2000	0.133	174.0	2.314	61.7	0.179	61.3	0.395	–28.6

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



S_{21e}
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I_C = 5mA
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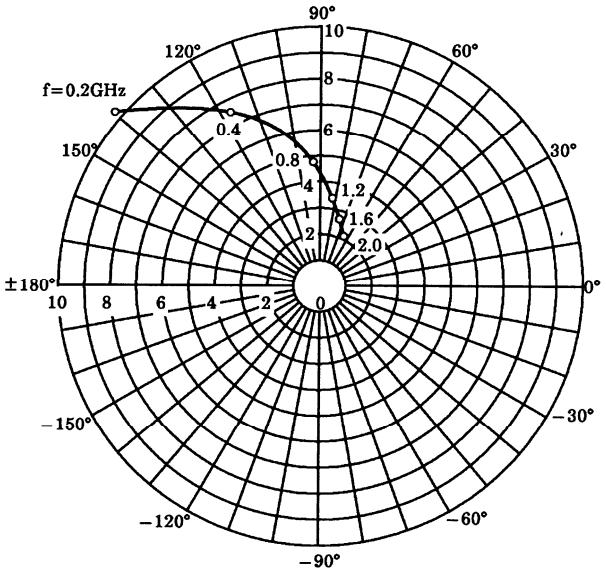

S_{12e}
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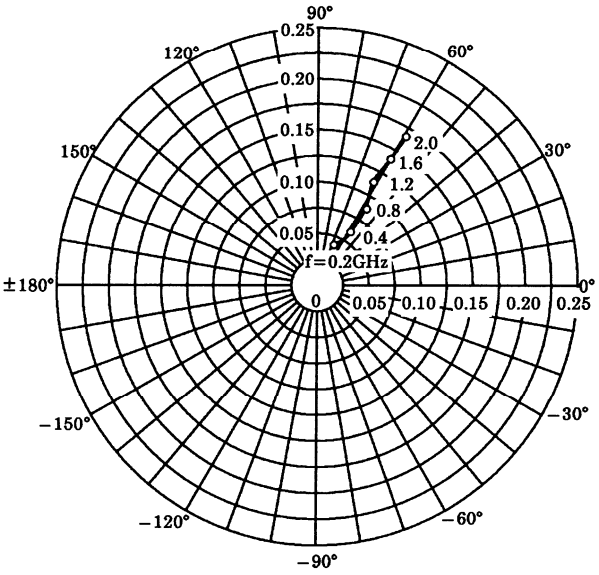

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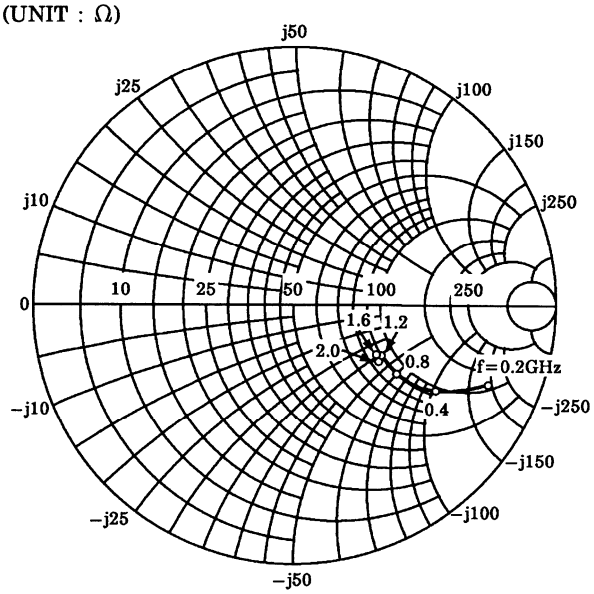

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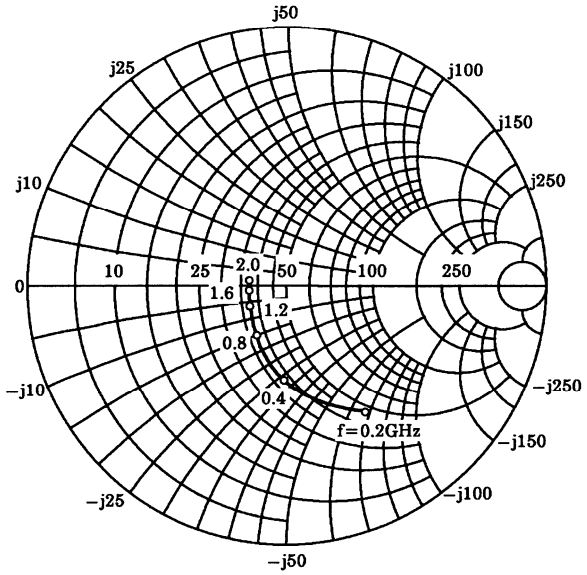

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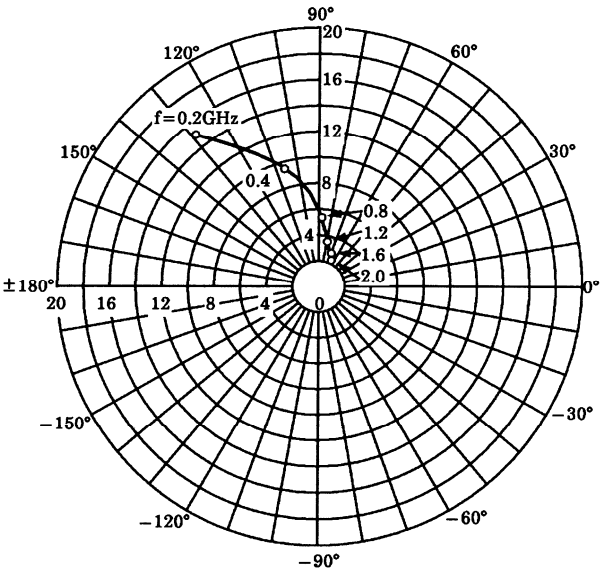

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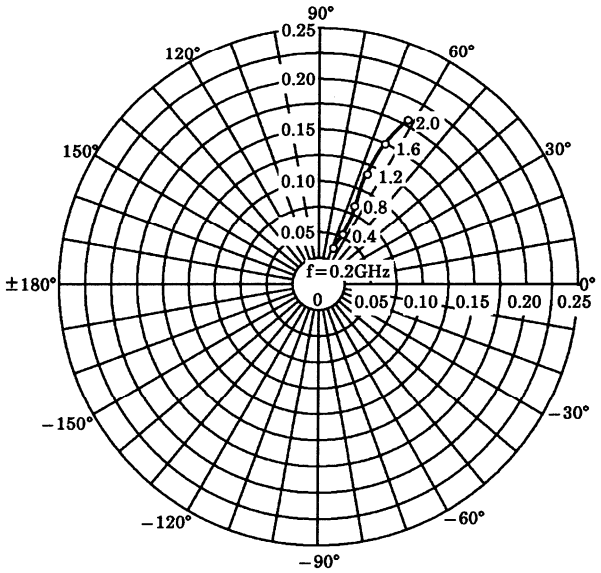

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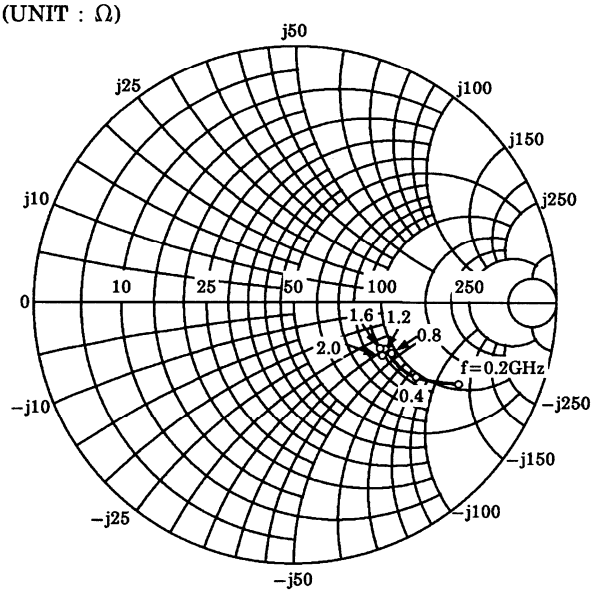

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