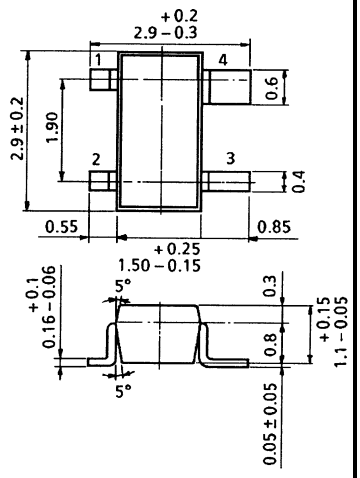
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5097

VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

- Low noise figure, high gain.
- NF = 1.8dB, $|S_{21e}|^2$ = 10dB (f = 2 GHz)



JEDEC	—
JEITA	—
TOSHIBA	2-3J1C

Weight: 0.012 g (typ.)

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	150	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

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	12.5	15.5	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 6 V, I_C = 7 mA, f = 2 GHz	7	10	—	
Noise figure	NF (1)	V_{CE} = 6 V, I_C = 3 mA, f = 1 GHz	—	1.3	2.5	dB
	NF (2)	V_{CE} = 6 V, I_C = 3 mA, f = 2 GHz	—	1.8	3.0	

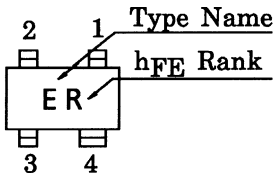
Electrical Characteristics (Ta = 25°C)

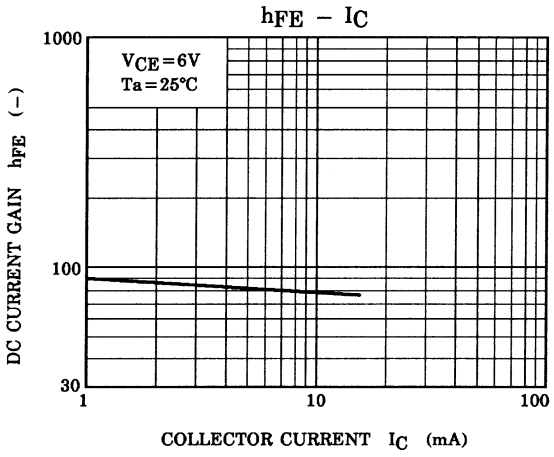
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 10 V, I_E = 0	—	—	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	1	μA
DC current gain	h_{FE} (Note 1)	V_{CE} = 6 V, I_C = 7 mA	50	—	160	
Output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz (Note 2)	—	0.5	0.9	pF
Reverse transfer capacitance	C_{re}		—	0.35	0.85	pF

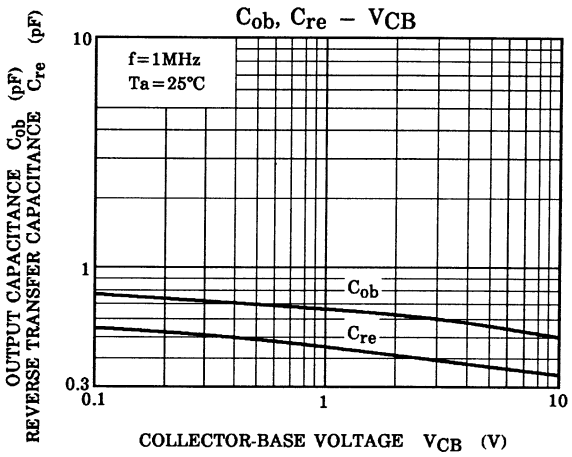
Note 1: h_{FE} classification R: 50~100, O: 80~160

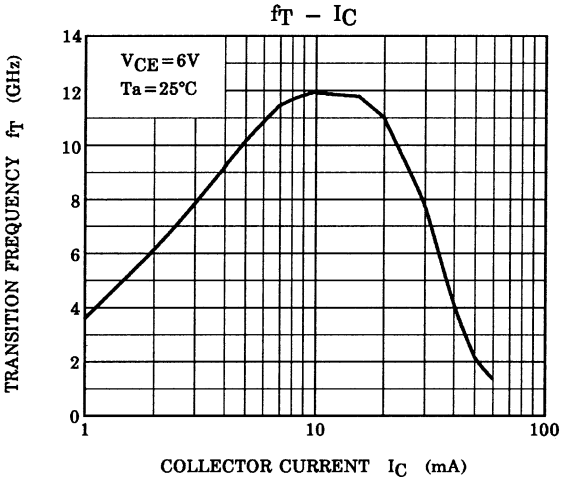
Note 2: C_{re} is measured by 3 terminal method with capacitance bridge.

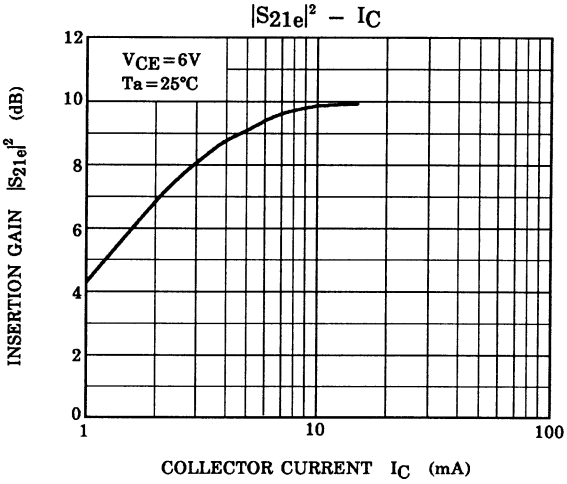
Marking

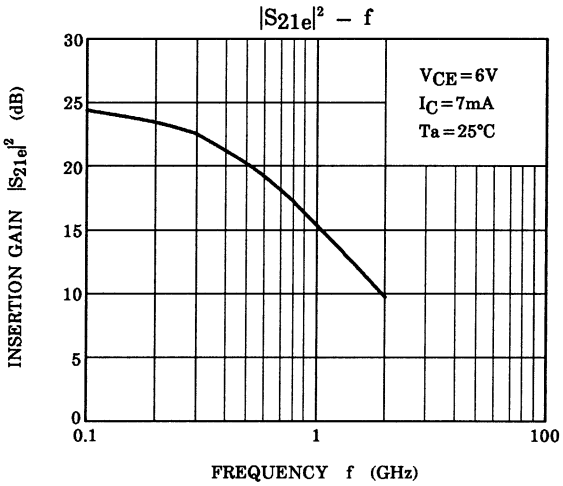


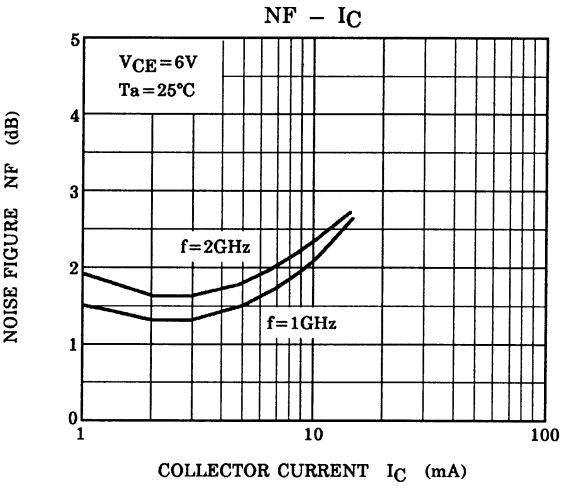

hFE – IC
VCE=6V
Ta=25°C
DC CURRENT GAIN hFE (–)
1000
100
30
1
10
100
COLLECTOR CURRENT IC (mA)

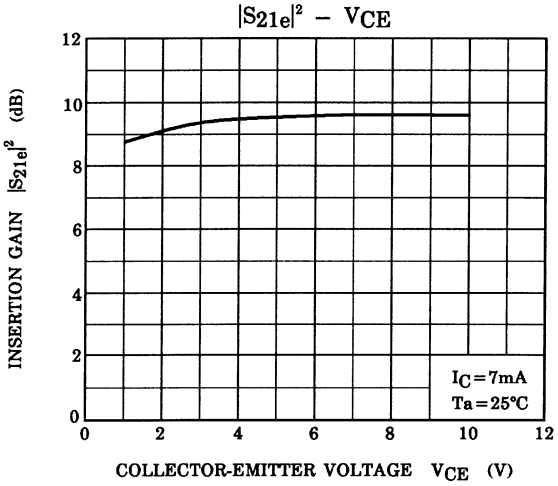

Cob, Cre – VCB
f=1MHz
Ta=25°C
OUTPUT CAPACITANCE Cob (pF)
REVERSE TRANSFER CAPACITANCE Cre (pF)
10
1
0.3
0.1
1
10
Cob
Cre
COLLECTOR-BASE VOLTAGE VCB (V)

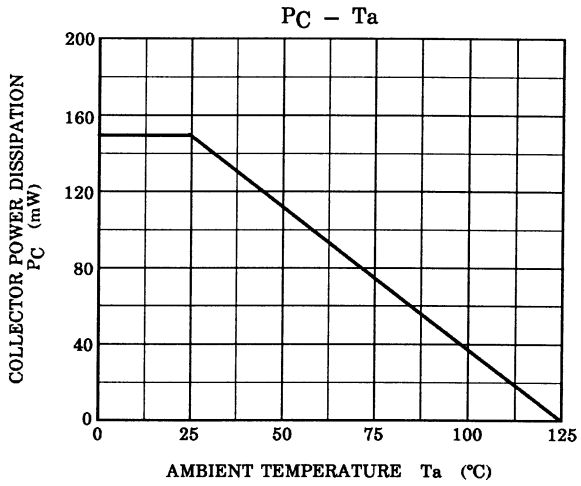

fT – IC
VCE=6V
Ta=25°C
TRANSITION FREQUENCY fT (GHz)
14
12
10
8
6
4
2
0
1
10
100
COLLECTOR CURRENT IC (mA)


|S21e|2 – IC
VCE=6V
Ta=25°C
INSERTION GAIN |S21e|2 (dB)
12
10
8
6
4
2
0
1
10
100
COLLECTOR CURRENT IC (mA)


|S21e|2 – f
VCE=6V
IC=7mA
Ta=25°C
INSERTION GAIN |S21e|2 (dB)
30
25
20
15
10
5
0
0.1
1
100
FREQUENCY f (GHz)


NF – IC
VCE=6V
Ta=25°C
NOISE FIGURE NF (dB)
5
4
3
2
1
0
f=2GHz
f=1GHz
1
10
100
COLLECTOR CURRENT IC (mA)





S-Parameter Z_O = 50 Ω, Ta = 25°C

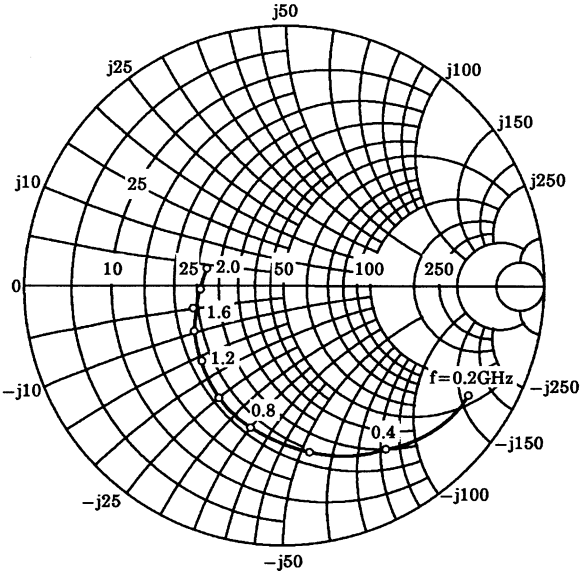
V_{CE} = 6 V, I_C = 3 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.831	–29.9	8.685	158.4	0.040	75.6	0.961	–20.4
400	0.744	–57.7	7.706	139.0	0.071	63.6	0.871	–38.7
600	0.653	–81.5	6.564	123.7	0.093	54.8	0.772	–54.2
800	0.565	–102.8	5.604	111.1	0.108	48.4	0.681	–67.0
1000	0.501	–121.2	4.788	101.3	0.117	45.1	0.608	–77.4
1200	0.441	–137.8	4.120	92.9	0.124	42.7	0.547	–86.4
1400	0.396	–153.1	3.583	85.9	0.129	42.0	0.496	–94.0
1600	0.363	–166.2	3.156	80.3	0.135	42.0	0.459	–100.7
1800	0.330	–179.2	2.820	75.4	0.141	42.7	0.430	–106.1
2000	0.314	–167.4	2.533	70.7	0.147	43.5	0.407	–110.8

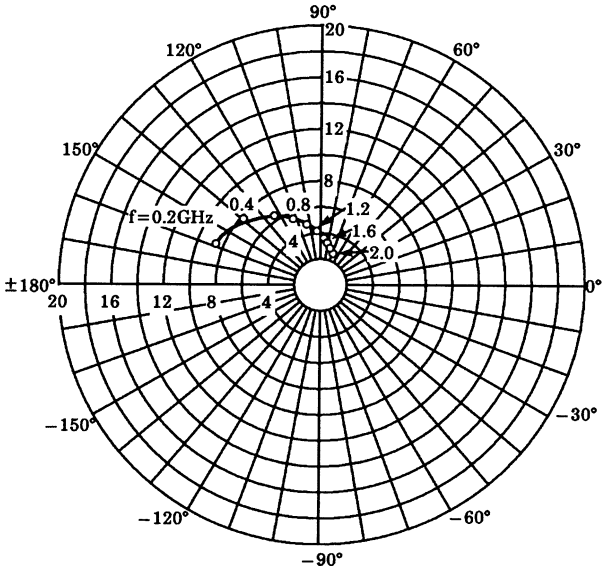
V_{CE} = 6 V, I_C = 10 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.696	–46.2	15.000	148.1	0.036	70.3	0.893	–29.1
400	0.570	–83.4	11.651	125.1	0.058	59.4	0.726	–50.2
600	0.488	–111.0	8.996	110.5	0.072	54.8	0.596	–64.8
800	0.432	–133.1	7.207	100.0	0.083	52.8	0.508	–76.0
1000	0.403	–150.9	5.938	91.9	0.093	53.0	0.446	–85.0
1200	0.378	–167.1	4.989	85.3	0.101	53.1	0.401	–92.9
1400	0.364	177.9	4.292	79.9	0.110	54.0	0.363	–100.0
1600	0.348	164.4	3.761	75.3	0.120	54.7	0.336	–105.7
1800	0.339	151.5	3.353	71.1	0.130	55.7	0.314	–110.2
2000	0.334	138.6	3.015	67.2	0.140	56.2	0.296	–114.1

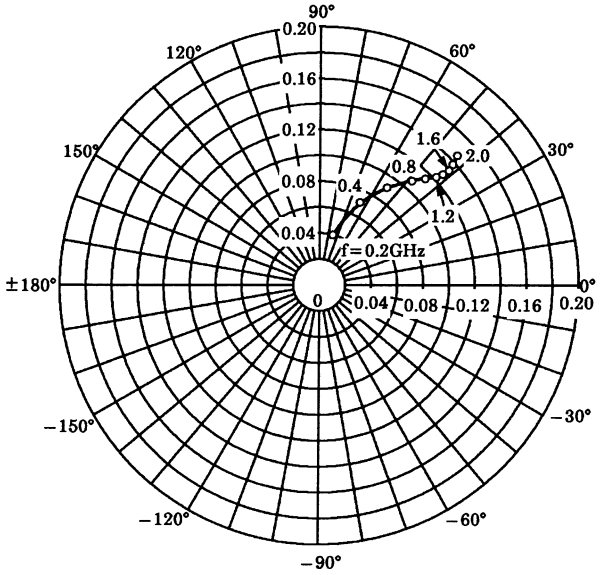
S_{11e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C
(Unit : Ω)



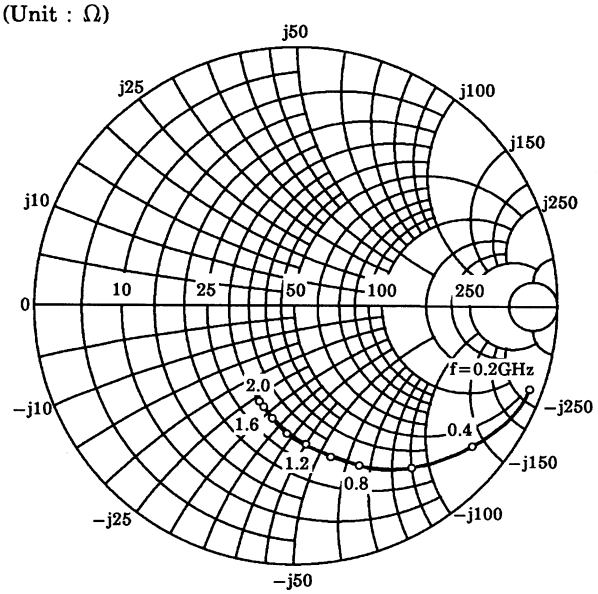
S_{21e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C



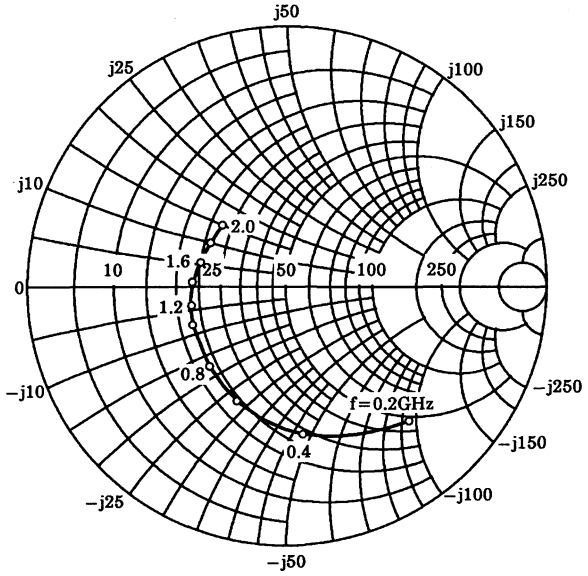
S_{12e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C



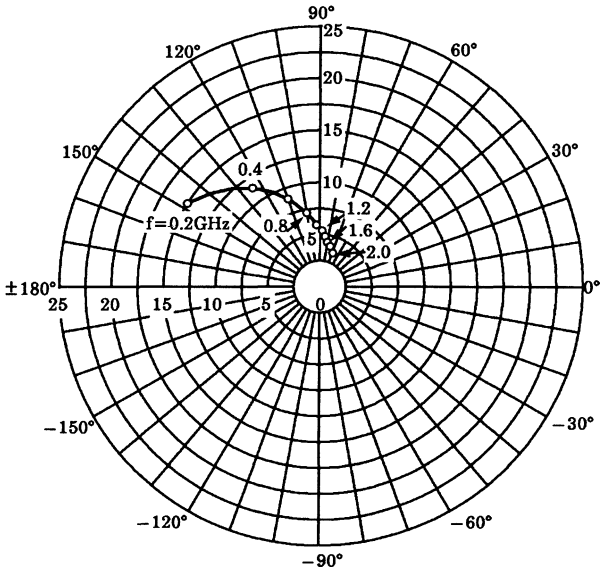
S_{22e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C
(Unit : Ω)



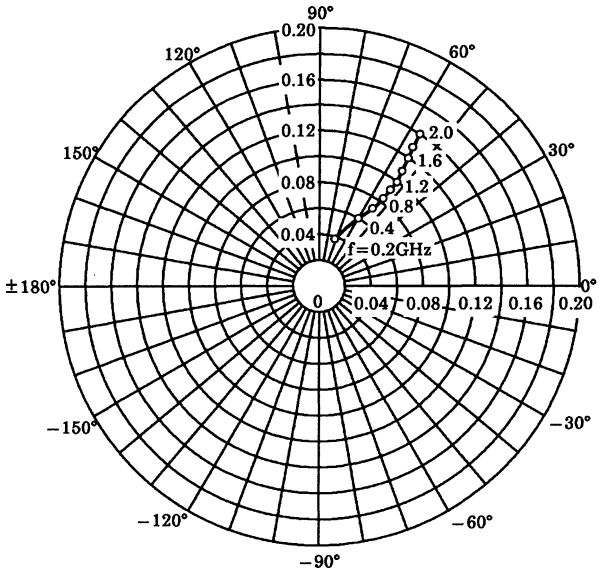
S_{11e}
V_{CE} = 6V
I_C = 7mA
Ta = 25°C
(Unit : Ω)



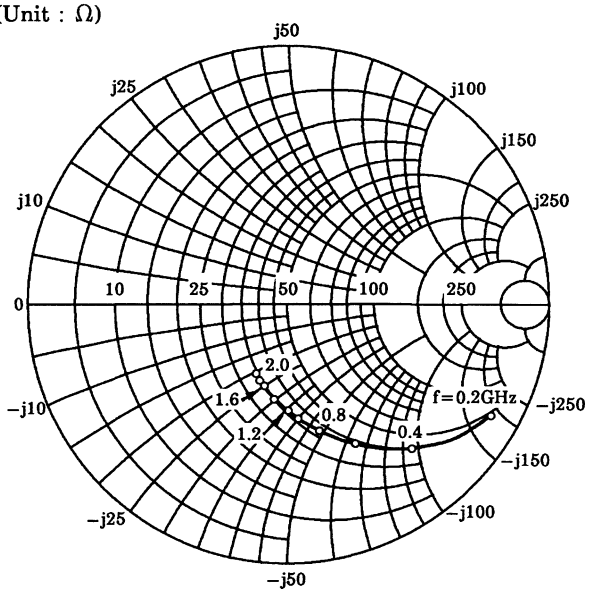
S_{21e}
V_{CE} = 6V
I_C = 7mA
Ta = 25°C



S_{12e}
V_{CE} = 6V
I_C = 7mA
Ta = 25°C



S_{22e}
V_{CE} = 6V
I_C = 7mA
Ta = 25°C
(Unit : Ω)



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