TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5098

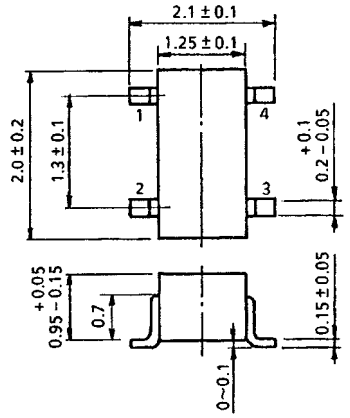
VHF~UHF Band Low Noise Amplifier Applications

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

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}	−55~125	°C

Unit: mm



USQ

1, 3. EMITTER
2. BASE
4. COLLECTOR

JEDEC	—
JEITA	—
TOSHIBA	2-2K1A

Weight: 0.006 g (typ.)

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	

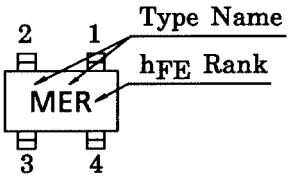
Electrical Characteristics (Ta = 25°C)

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}		—	0.34	0.75	pF

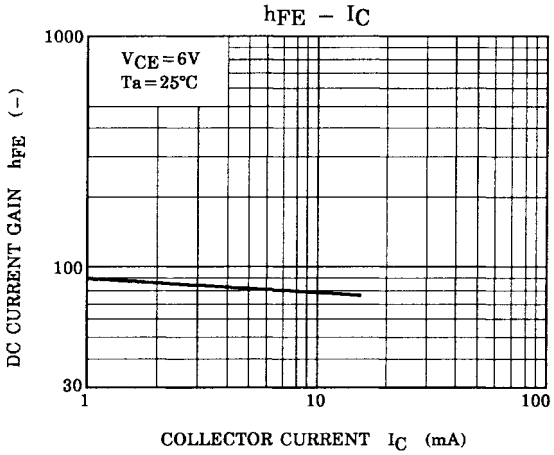
Note 1: h_{FE} classification R: 50~100, O: 80~160

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

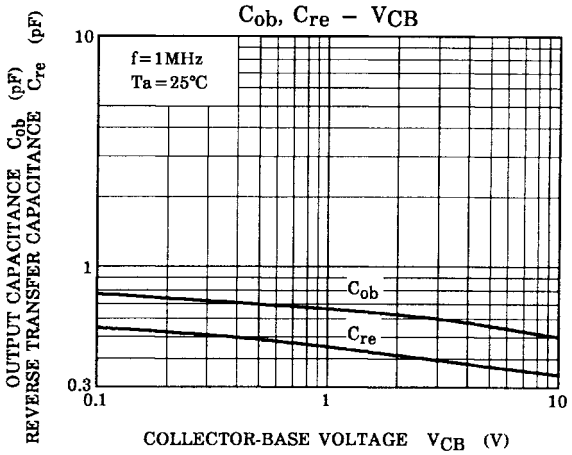
Marking



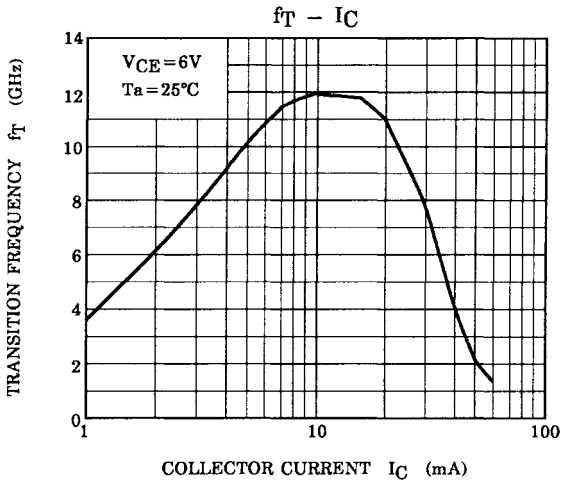
h_{FE} – I_C



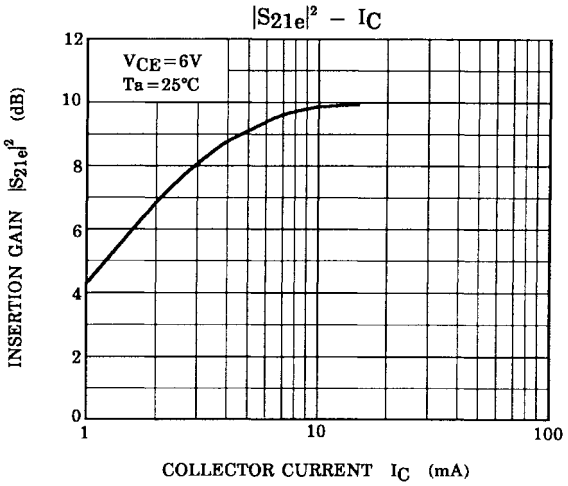
C_{ob}, C_{re} – V_{CB}



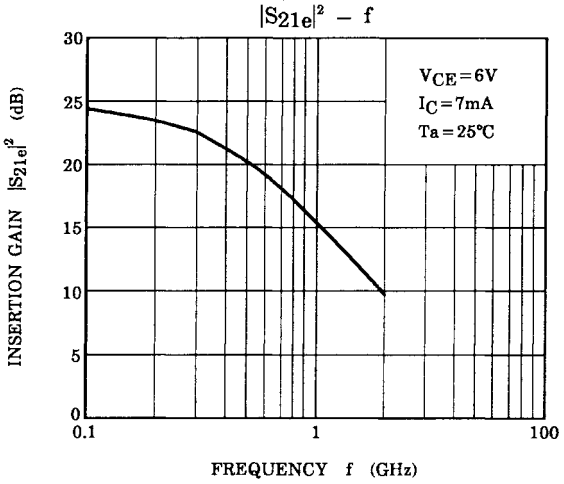
f_T – I_C



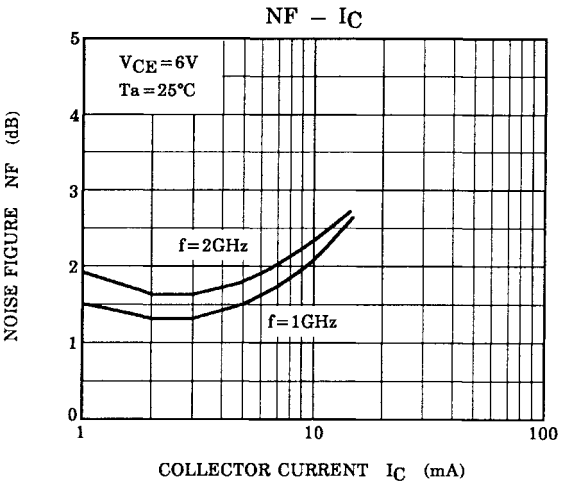
$|S_{21e}|^2$ – I_C

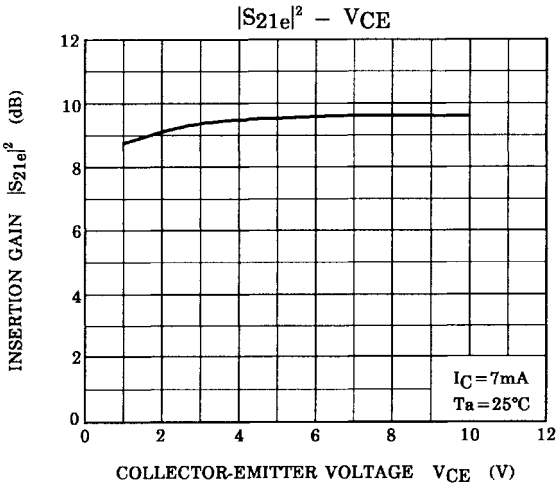


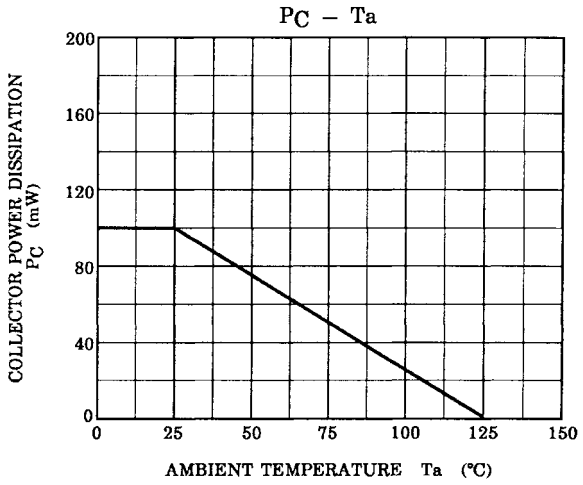
$|S_{21e}|^2$ – f



NF – I_C







S-Parameter Z_O = 50 Ω, Ta = 25°C

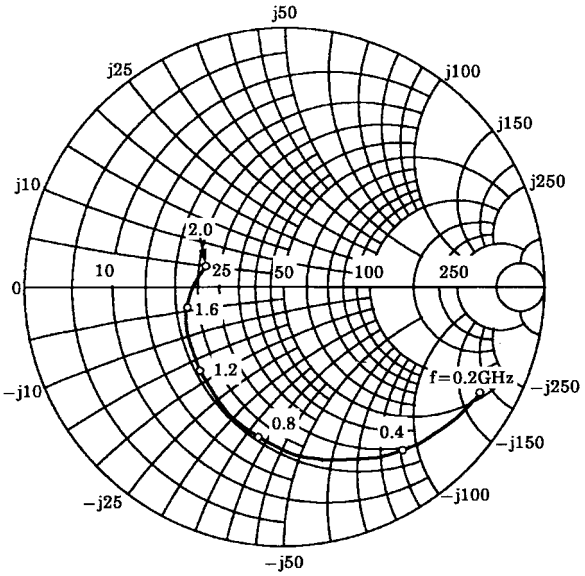
V_{CE} = 5 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.870	–27.8	8.387	159.6	0.041	76.0	0.962	–20.1
400	0.791	–54.0	7.700	141.8	0.074	63.5	0.876	–38.7
600	0.692	–77.8	6.701	125.7	0.097	54.2	0.774	–54.4
800	0.599	–99.2	5.798	112.6	0.113	47.9	0.677	–67.7
1000	0.518	–118.1	4.928	102.0	0.122	43.8	0.596	–78.6
1200	0.462	–135.9	4.239	93.5	0.129	40.7	0.524	–87.8
1400	0.406	–151.0	3.692	86.5	0.132	39.7	0.463	–95.9
1600	0.376	–166.0	3.256	80.5	0.137	39.6	0.420	–102.4
1800	0.334	179.9	2.897	75.9	0.143	39.9	0.382	–107.7
2000	0.305	166.3	2.623	71.3	0.147	40.7	0.350	–111.0

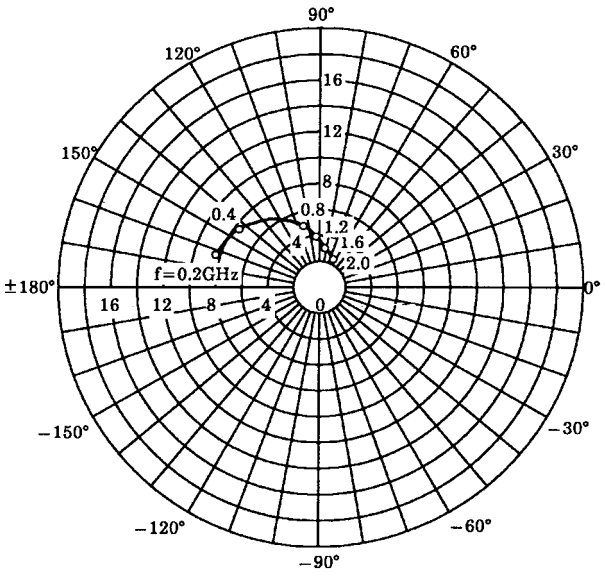
V_{CE} = 5 V, I_C = 10 mA

Frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.737	–42.4	14.597	150.5	0.037	70.4	0.900	–28.4
400	0.625	–77.4	11.757	128.3	0.060	58.8	0.735	–50.2
600	0.521	–105.4	9.204	112.6	0.074	52.5	0.600	–65.3
800	0.455	–128.8	7.420	101.5	0.085	50.0	0.503	–77.3
1000	0.412	–147.7	6.078	92.9	0.093	49.5	0.433	–86.9
1200	0.388	–165.4	5.105	86.1	0.100	49.3	0.376	–95.4
1400	0.370	179.0	4.377	80.9	0.108	50.4	0.330	–102.8
1600	0.360	165.6	3.855	76.2	0.116	51.4	0.295	–108.7
1800	0.348	151.3	3.441	72.3	0.126	52.3	0.265	–113.4
2000	0.333	137.7	3.114	68.4	0.135	53.2	0.238	–115.5

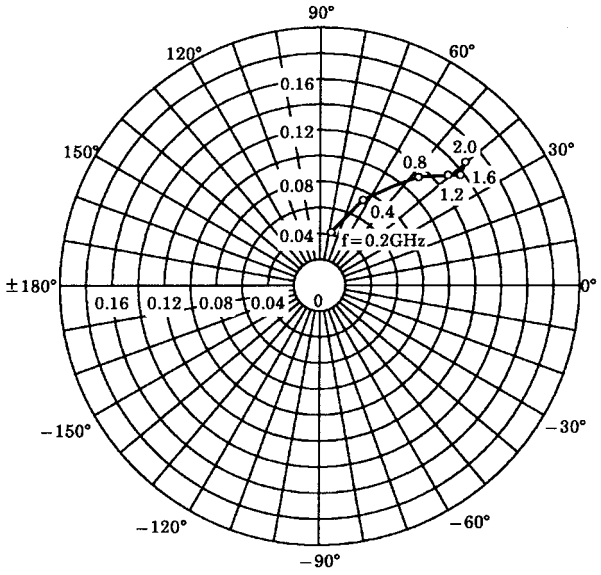
S_{11e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C
(Unit : Ω)



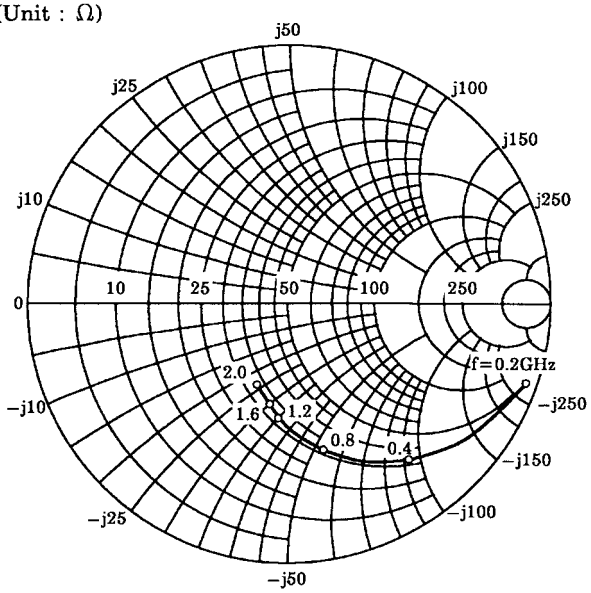
S_{21e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C



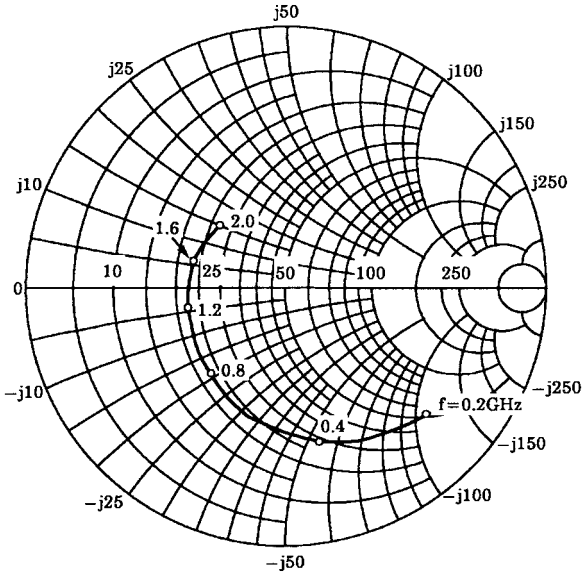
S_{12e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C



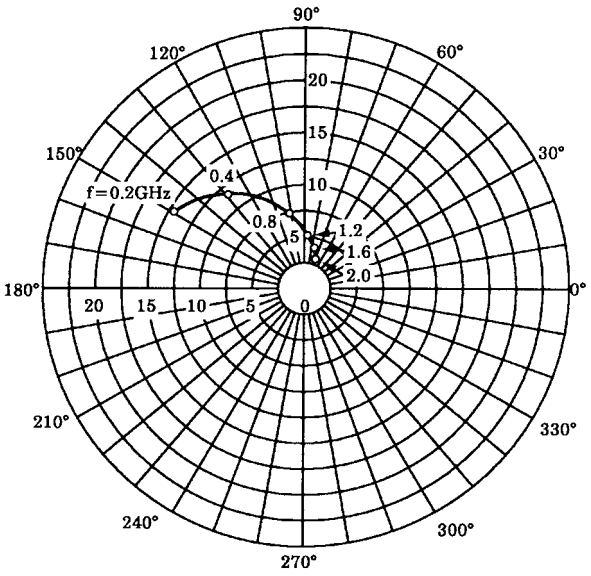
S_{22e}
V_{CE} = 6V
I_C = 3mA
Ta = 25°C
(Unit : Ω)



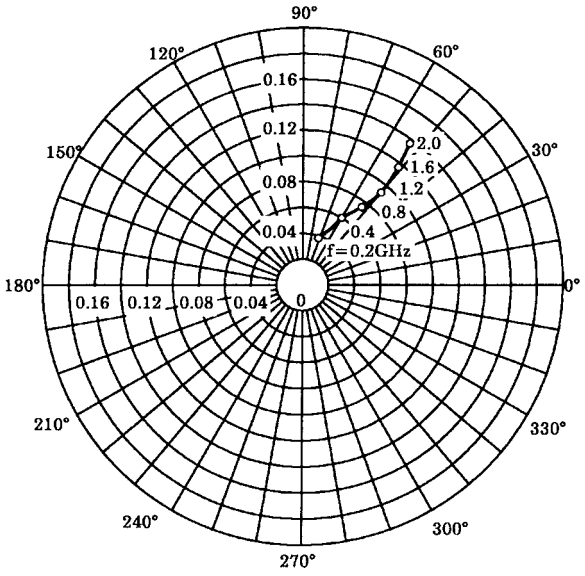
S_{11e}
V_{CE} = 6V
I_C = 7mA
Ta = 25°C
(Unit : Ω)



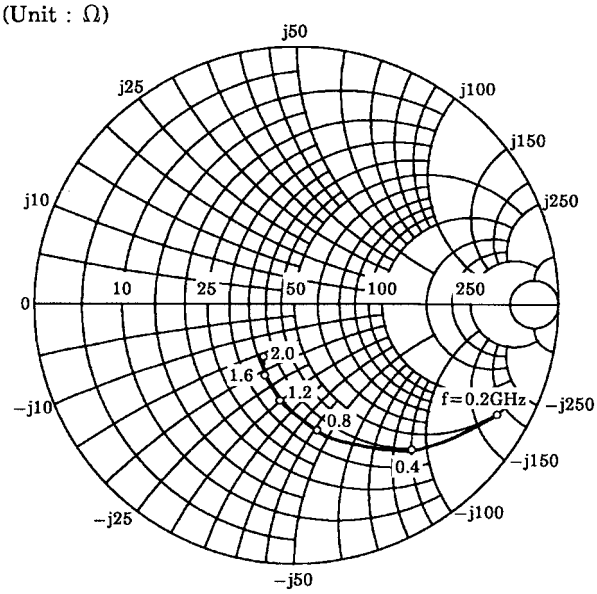
S_{21e}
V_{CE} = 6V
I_C = 7mA
Ta = 25°C



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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