

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

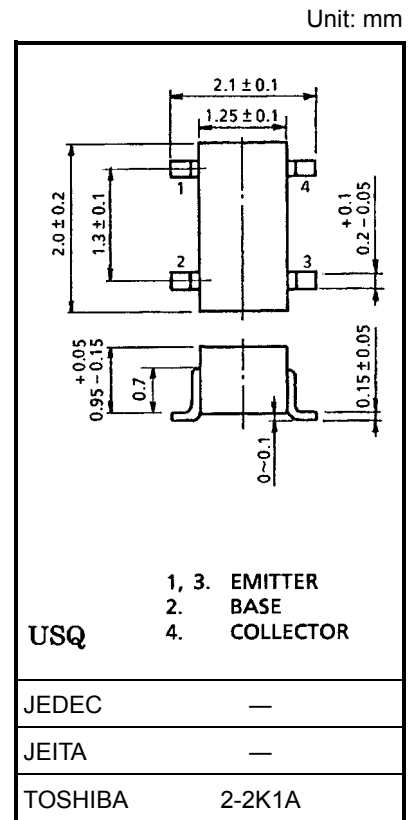
2SC5098

VHF~UHF Band Low Noise Amplifier Applications

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

Maximum Ratings ($T_a = 25^\circ\text{C}$)

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	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55~125	$^\circ\text{C}$



Microwave Characteristics ($T_a = 25^\circ\text{C}$)

Weight: 0.006 g (typ.)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2$ (1)	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$, $f = 1\text{GHz}$	12.5	15.5	—	dB
	$ S_{21e} ^2$ (2)	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$, $f = 2\text{GHz}$	7	10	—	
Noise figure	NF (1)	$V_{CE} = 6\text{V}$, $I_C = 3\text{mA}$, $f = 1\text{GHz}$	—	1.3	2.5	dB
	NF (2)	$V_{CE} = 6\text{V}$, $I_C = 3\text{mA}$, $f = 2\text{GHz}$	—	1.8	3.0	

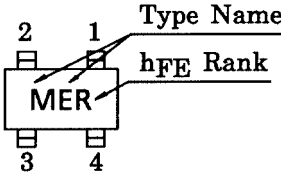
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

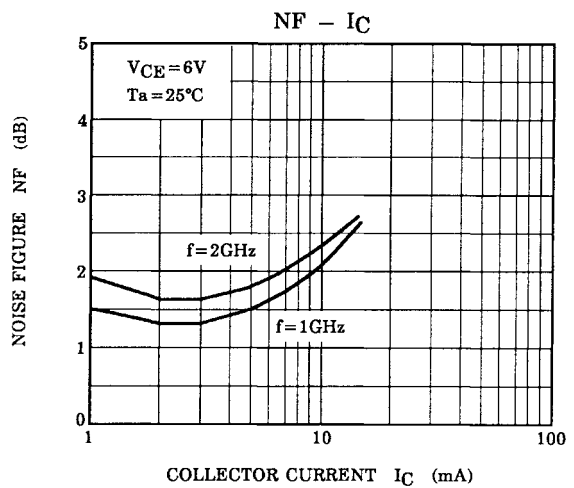
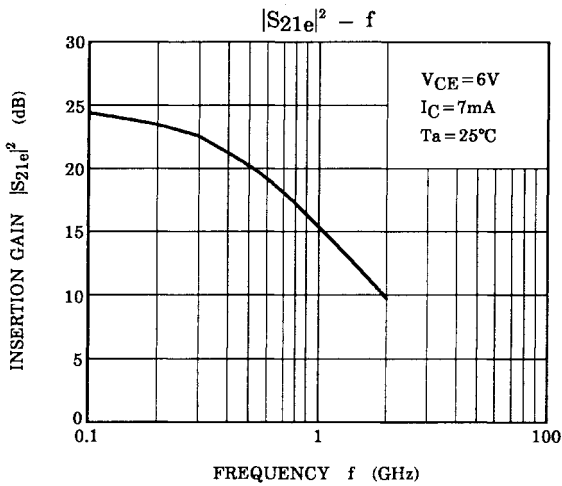
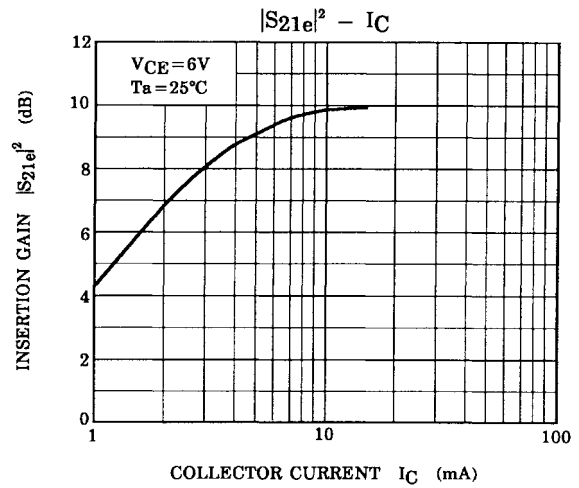
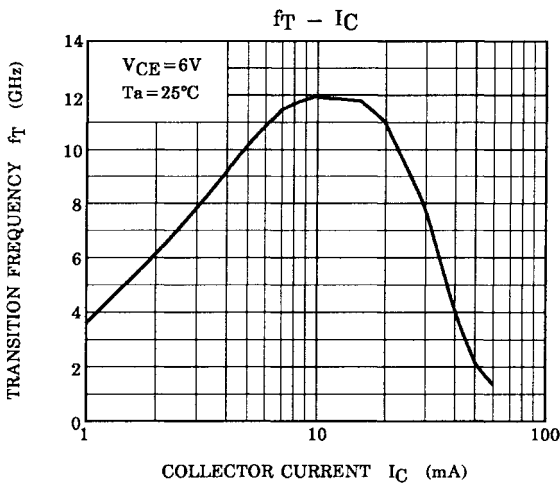
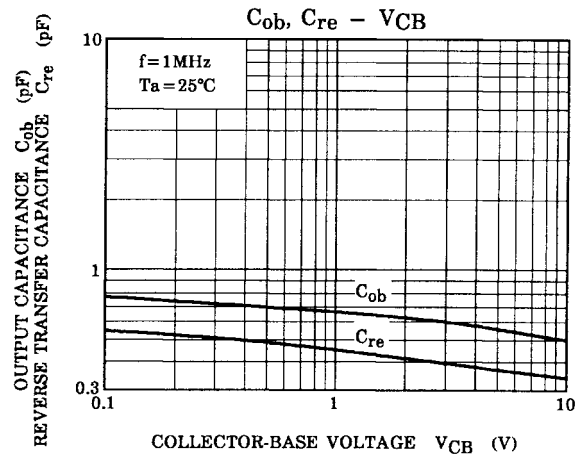
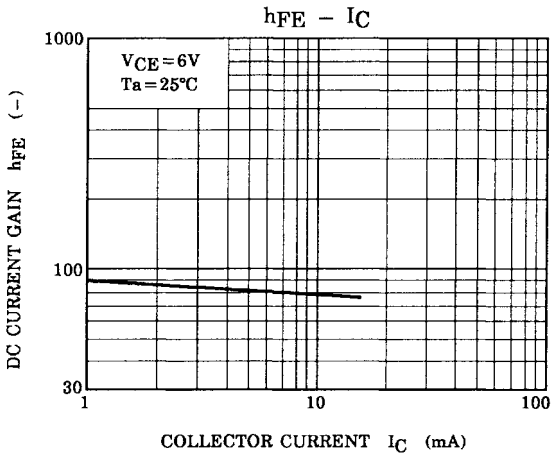
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 10\text{V}$, $I_E = 0$	—	—	1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{V}$, $I_C = 0$	—	—	1	μA
DC current gain	h_{FE} (Note 1)	$V_{CE} = 6\text{V}$, $I_C = 7\text{mA}$	50	—	160	
Output capacitance	C_{ob}	$V_{CB} = 10\text{V}$, $I_E = 0$, $f = 1\text{MHz}$ (Note 2)	—	0.5	0.9	pF
Reverse transfer capacitance	C_{re}		—	0.34	0.75	pF

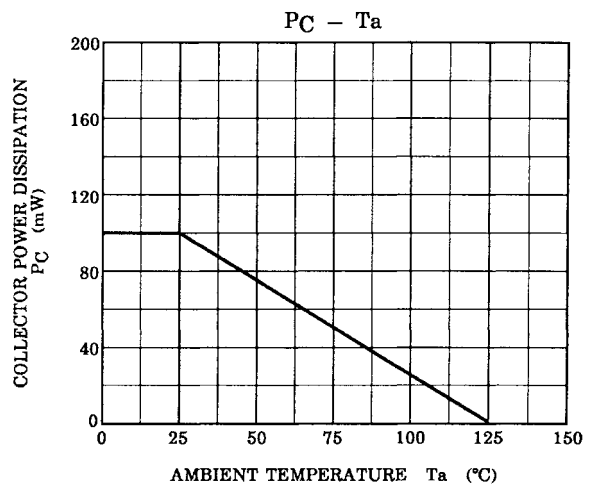
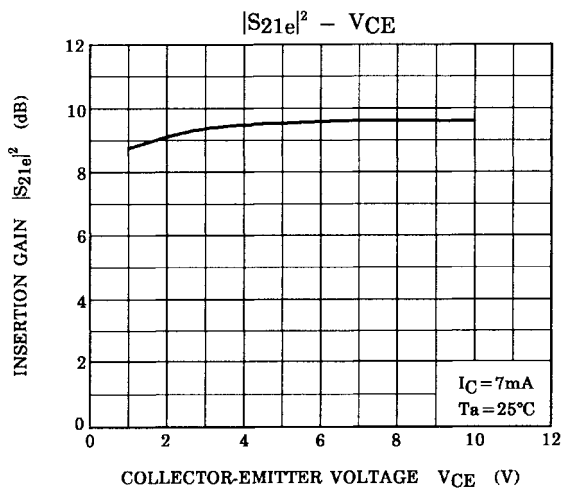
Note 1: h_{FE} classification R: 50~100, O: 80~160

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

Marking







S-Parameter $Z_O = 50 \Omega, T_a = 25^\circ\text{C}$

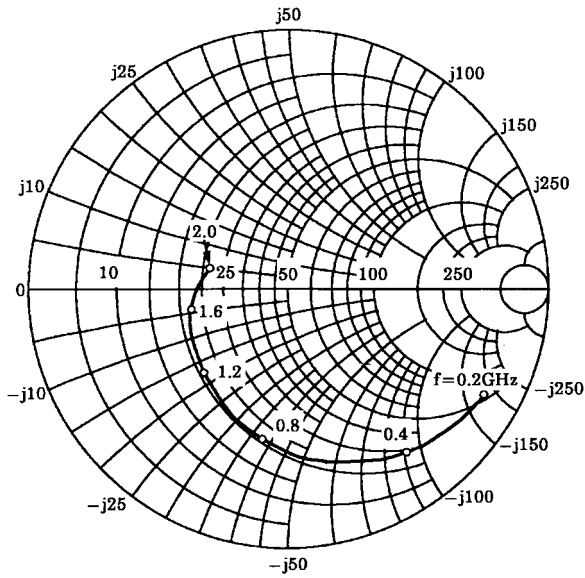
$V_{CE} = 5 \text{ V}, I_C = 5 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	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

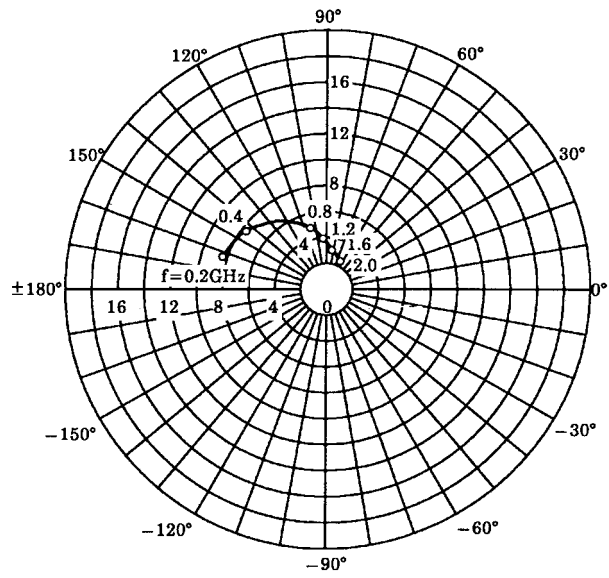
$V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}$

Frequency (MHz)	S11		S21		S12		S22	
	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

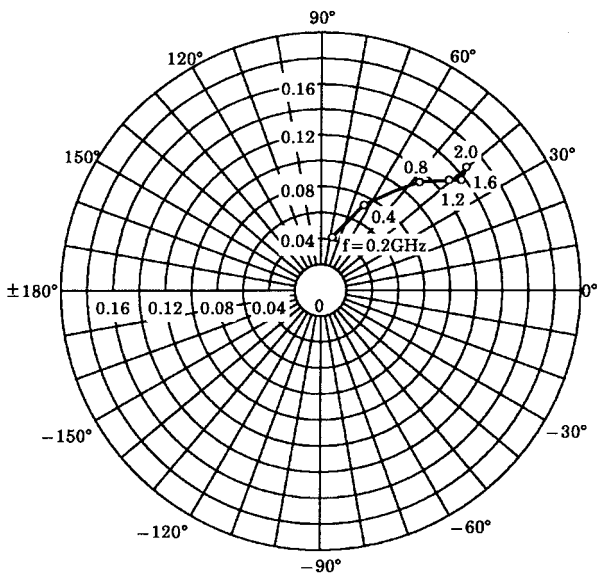
S11e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



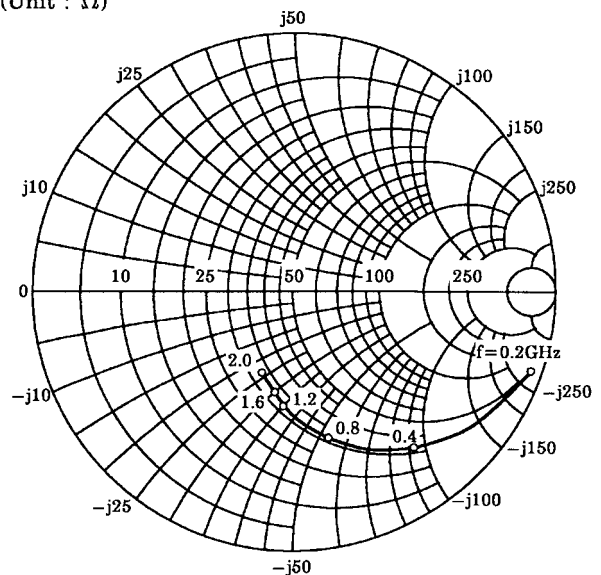
S21e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$



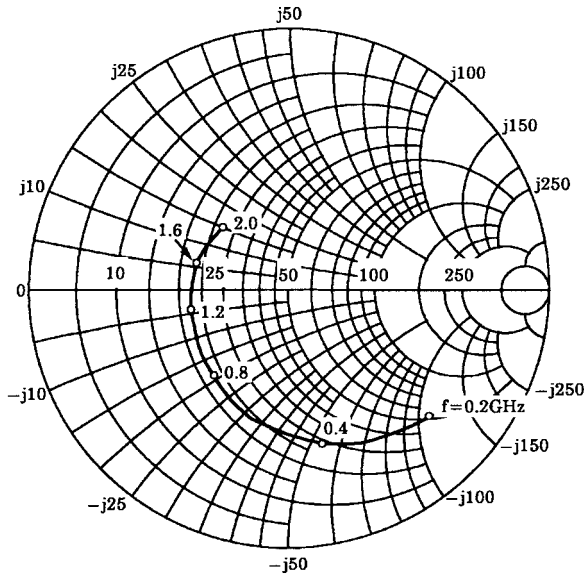
S12e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$



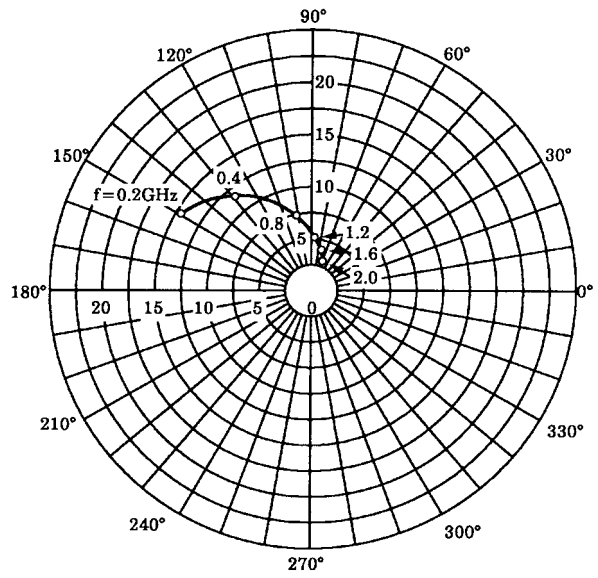
S22e
 $V_{CE} = 6V$
 $I_C = 3mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



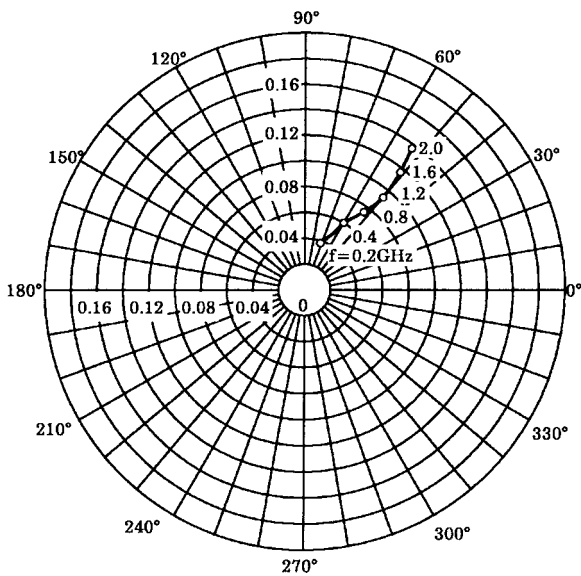
S11e
 $V_{CE} = 6V$
 $I_C = 7mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



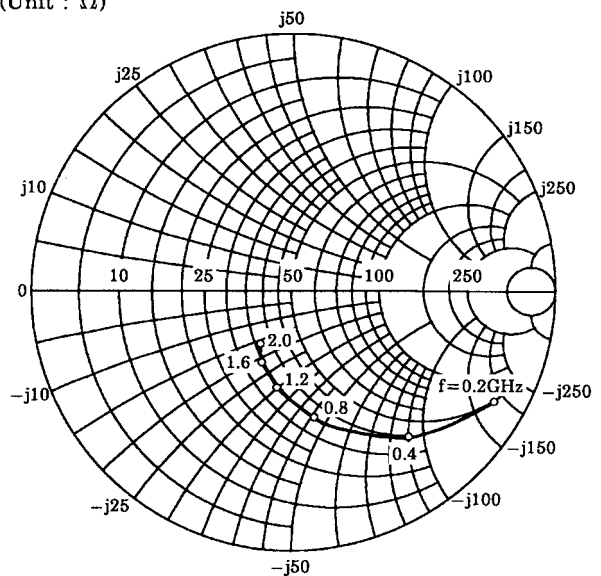
S21e
 $V_{CE} = 6V$
 $I_C = 7mA$
 $T_a = 25^\circ C$



S12e
 $V_{CE} = 6V$
 $I_C = 7mA$
 $T_a = 25^\circ C$



S22e
 $V_{CE} = 6V$
 $I_C = 7mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



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