

TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

2SC5093

VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

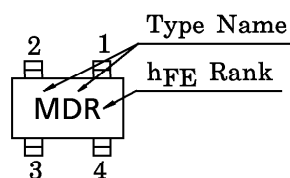
Unit in mm

- Low Noise Figure, High Gain.
- $NF=1.8dB$, $|S_{21e}|^2=9.5dB$ ($f=2GHz$)

MAXIMUM RATINGS ($T_a = 25^\circ C$)

CHARACTERISTIC	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	20	mA
Collector Current	I_C	40	mA
Collector Power Dissipation	P_C	100	mW
Junction Temperature	T_j	125	$^\circ C$
Storage Temperature Range	T_{stg}	$-55 \sim 125$	$^\circ C$

MARKING



1, 3. EMITTER	
2. BASE	
4. COLLECTOR	
USQ	
JEDEC	—
EIAJ	—
TOSHIBA	2-2K1A

Weight : 0.006g

MICROWAVE CHARACTERISTICS ($T_a = 25^\circ C$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Transition Frequency	f_T	$V_{CE}=8V, I_C=20mA$	7	10	—	GHz
Insertion Gain	$ S_{21e} ^2 (1)$	$V_{CE}=8V, I_C=20mA, f=1GHz$	12	15	—	dB
	$ S_{21e} ^2 (2)$	$V_{CE}=8V, I_C=20mA, f=2GHz$	6.5	9.5	—	
Noise Figure	NF (1)	$V_{CE}=8V, I_C=5mA, f=1GHz$	—	1.4	2.5	dB
	NF (2)	$V_{CE}=8V, I_C=5mA, f=2GHz$	—	1.8	3	

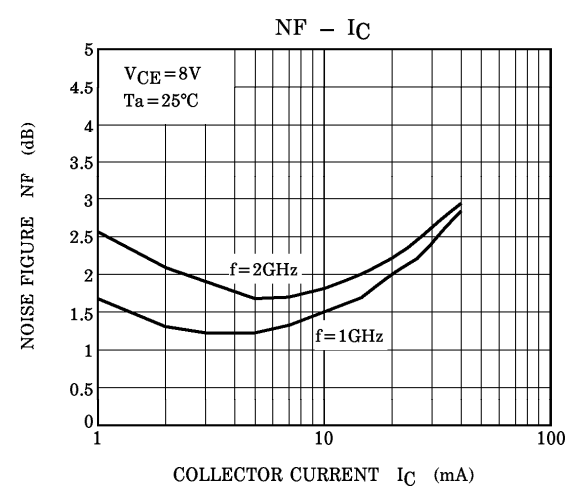
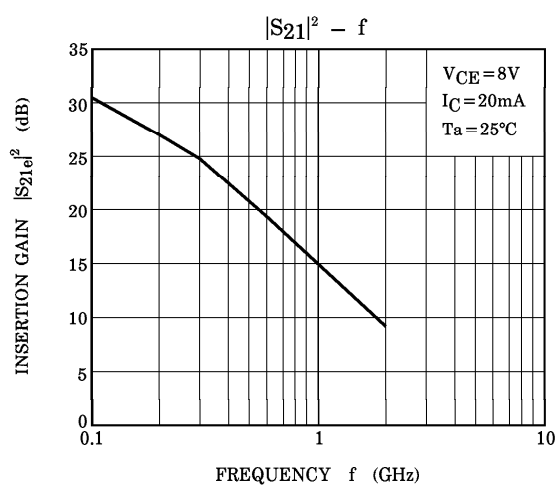
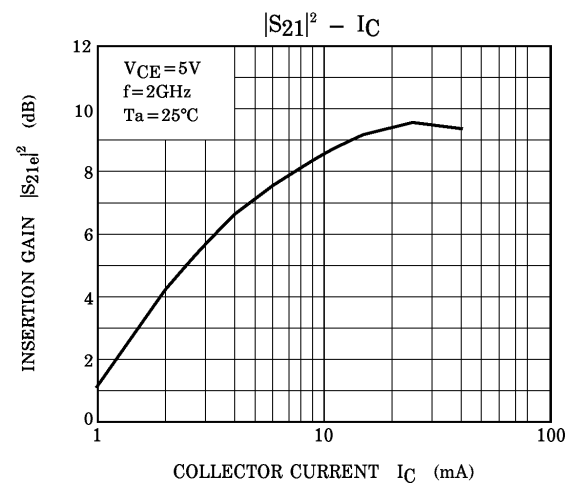
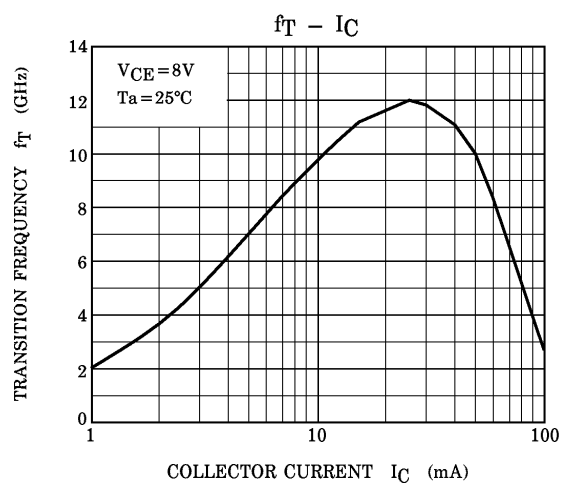
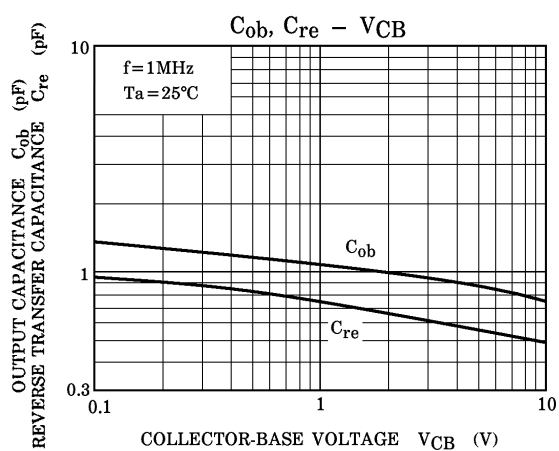
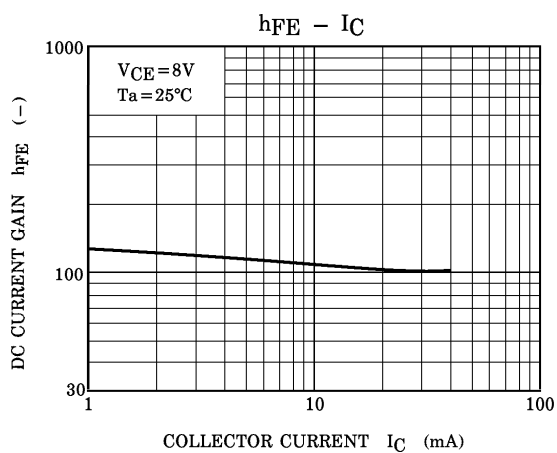
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ C$)

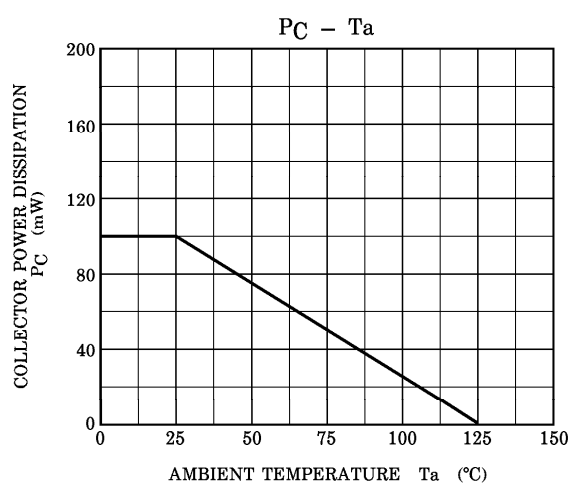
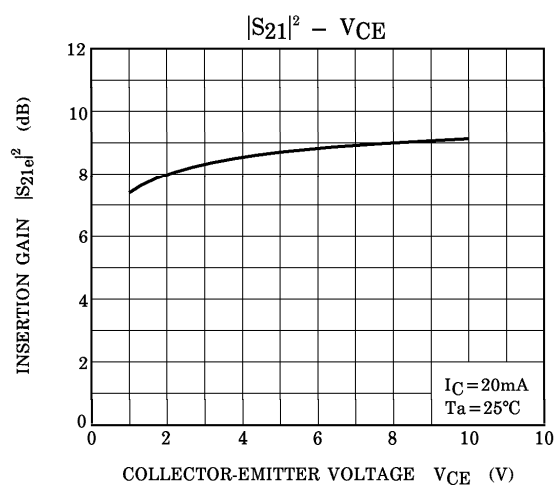
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	$V_{CB}=10V, I_E=0$	—	—	1	μA
Emitter Cut-off Current	I_{EBO}	$V_{EB}=1V, I_C=0$	—	—	1	μA
DC Current Gain	h_{FE} (Note 1)	$V_{CE}=8V, I_C=20mA$	50	—	160	—
Output Capacitance	C_{ob}	$V_{CB}=15V, I_E=0, f=1MHz$	—	0.65	1.05	pF
Reverse Transfer Capacitance	C_{re}		—	0.45	0.95	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.

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S-Parameter $Z_0 = 50\Omega$, $T_a = 25^\circ\text{C}$

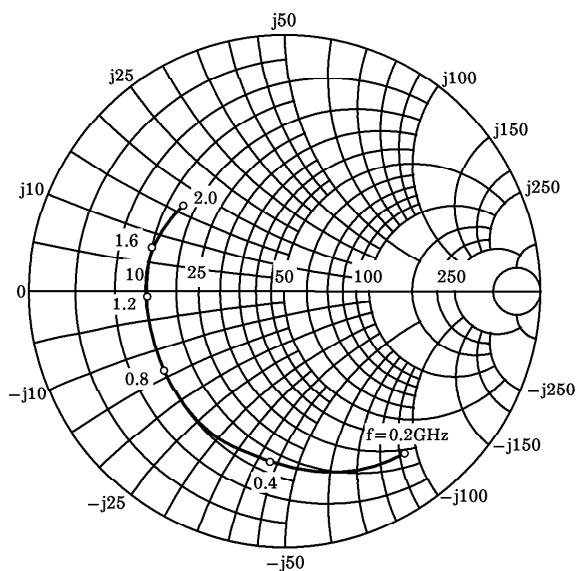
$V_{CE} = 8\text{V}$, $I_C = 5\text{mA}$

frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.801	-54.4	12.628	145.4	0.047	63.2	0.864	-32.2
400	0.696	-95.6	9.664	121.9	0.072	48.8	0.675	-54.2
600	0.617	-124.7	7.307	106.2	0.083	42.3	0.543	-68.4
800	0.585	-146.3	5.779	95.1	0.090	39.3	0.456	-79.6
1000	0.554	-163.0	4.674	86.8	0.095	39.5	0.400	-88.6
1200	0.545	-176.5	3.902	80.0	0.099	40.4	0.357	-96.8
1400	0.529	171.3	3.350	75.0	0.103	42.5	0.323	-104.5
1600	0.529	161.1	2.929	70.0	0.108	44.8	0.299	-111.0
1800	0.527	150.4	2.612	66.1	0.116	47.1	0.277	-116.5
2000	0.513	141.0	2.366	62.1	0.122	49.6	0.258	-120.3

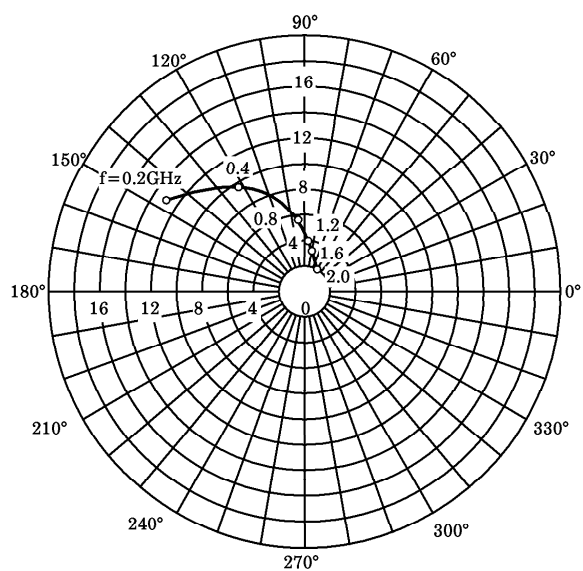
$V_{CE} = 8\text{V}$, $I_C = 20\text{mA}$

frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.556	-95.4	23.034	126.0	0.032	55.7	0.629	-53.5
400	0.521	-137.0	13.888	105.1	0.045	52.0	0.407	-75.8
600	0.505	-160.0	9.597	94.2	0.054	54.0	0.311	-89.3
800	0.505	-174.7	7.272	86.8	0.064	56.4	0.263	-101.3
1000	0.508	172.6	5.797	81.0	0.075	59.0	0.233	-112.0
1200	0.519	163.1	4.800	76.5	0.085	60.4	0.208	-122.9
1400	0.518	153.4	4.119	72.8	0.095	62.0	0.189	-132.7
1600	0.525	144.3	3.603	69.1	0.106	63.2	0.172	-141.7
1800	0.532	135.6	3.231	66.4	0.119	63.8	0.153	-149.3
2000	0.523	125.9	2.952	62.8	0.131	64.6	0.131	-153.9

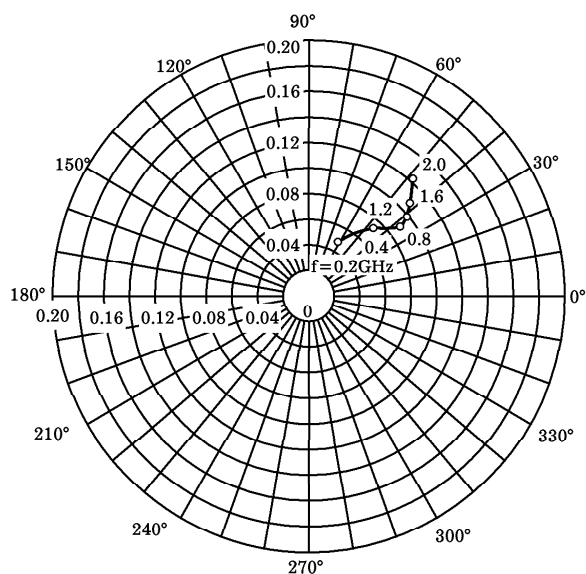
S_{11e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$
 (Unit : Ω)



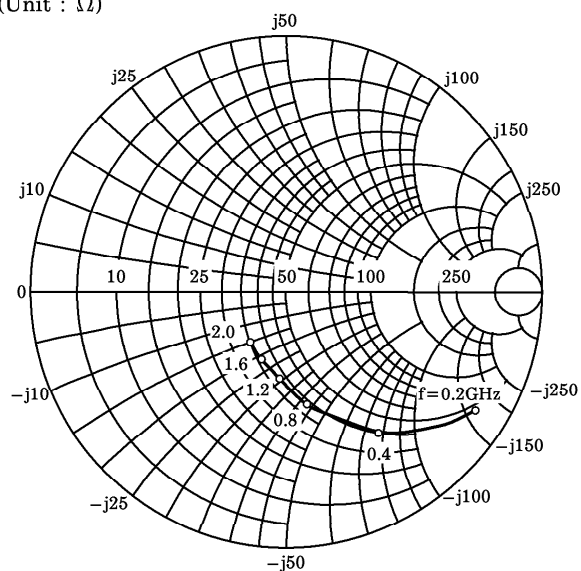
S_{21e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$



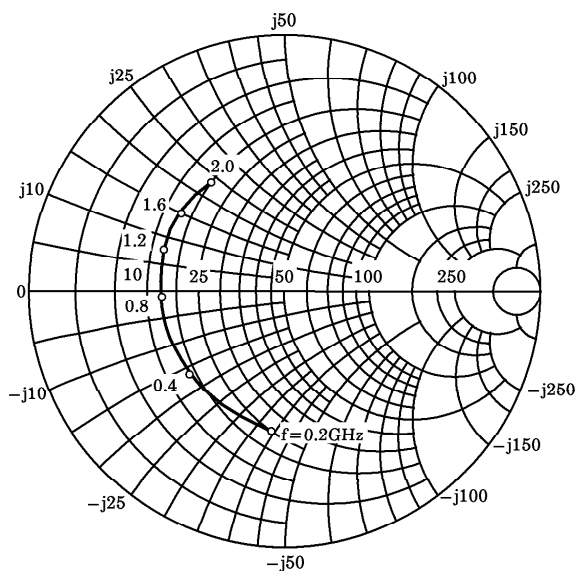
S_{12e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$



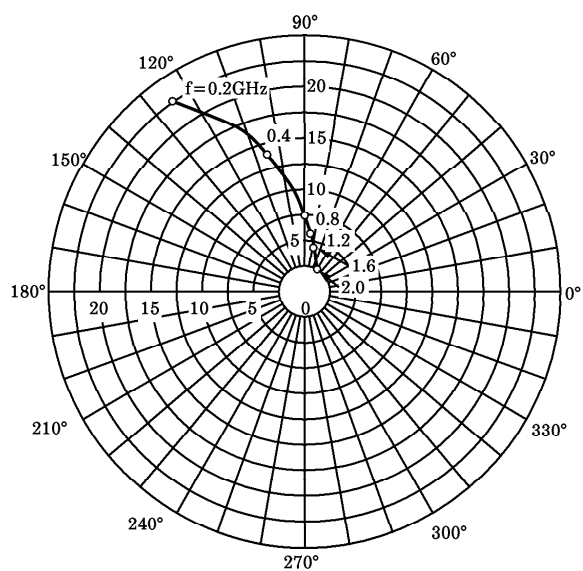
S_{22e}
 $V_{CE}=8V$
 $I_C=5mA$
 $T_a=25^\circ C$
 (Unit : Ω)



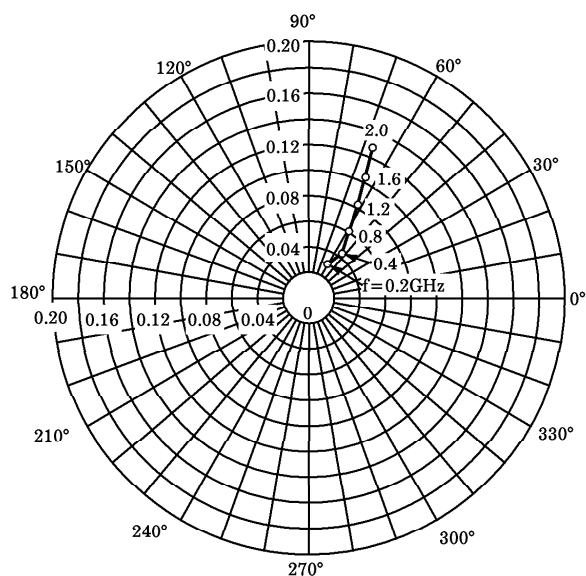
S_{11e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$
 (Unit : Ω)



S_{21e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$



S_{12e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$



S_{22e}
 $V_{CE} = 8V$
 $I_C = 20mA$
 $T_a = 25^\circ C$
 (Unit : Ω)

