

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

# 2SC5085

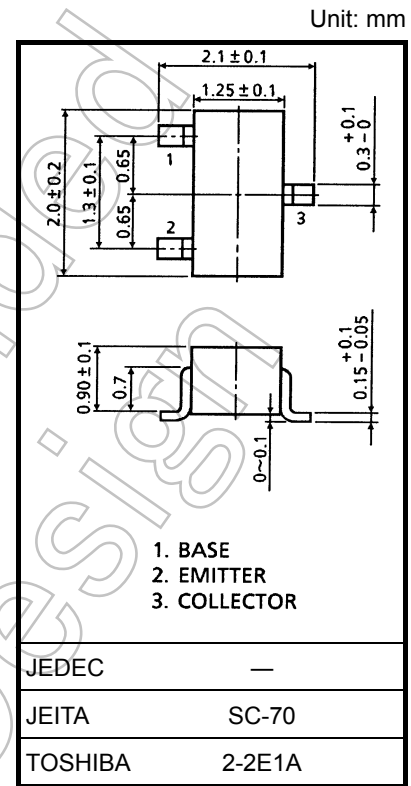
## VHF~UHF Band Low Noise Amplifier Applications

- Low noise figure, high gain.
- $NF = 1.1\text{dB}$ ,  $|S_{21e}|^2 = 11\text{dB}$  ( $f = 1\text{GHz}$ )

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

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	$I_B$	40	mA
Collector current	$I_C$	80	mA
Collector power dissipation	$P_C$	100	mW
Junction temperature	$T_j$	125	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 125	$^\circ\text{C}$

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).



Weight: 0.006 g (typ.)

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	$f_T$	$V_{CE} = 10\text{V}$ , $I_C = 20\text{mA}$	5	7	—	GHz
Insertion gain	$ S_{21e} ^2$ (1)	$V_{CE} = 10\text{V}$ , $I_C = 20\text{mA}$ , $f = 500\text{MHz}$	—	16.5	—	dB
	$ S_{21e} ^2$ (2)	$V_{CE} = 10\text{V}$ , $I_C = 20\text{mA}$ , $f = 1\text{GHz}$	7.5	11	—	
Noise figure	NF (1)	$V_{CE} = 10\text{V}$ , $I_C = 5\text{mA}$ , $f = 500\text{MHz}$	—	1	—	dB
	NF (2)	$V_{CE} = 10\text{V}$ , $I_C = 5\text{mA}$ , $f = 1\text{GHz}$	—	1.1	2	

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

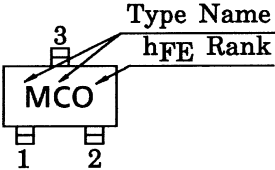
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 10\text{V}$ , $I_E = 0$	—	—	1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 1\text{V}$ , $I_C = 0$	—	—	1	$\mu\text{A}$
DC current gain	$h_{FE}$ (Note 1)	$V_{CE} = 10\text{V}$ , $I_C = 20\text{mA}$	80	—	240	
Output capacitance	$C_{ob}$	$V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$ (Note 2)	—	1.0	—	pF
Reverse transfer capacitance	$C_{re}$		—	0.65	1.15	pF

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

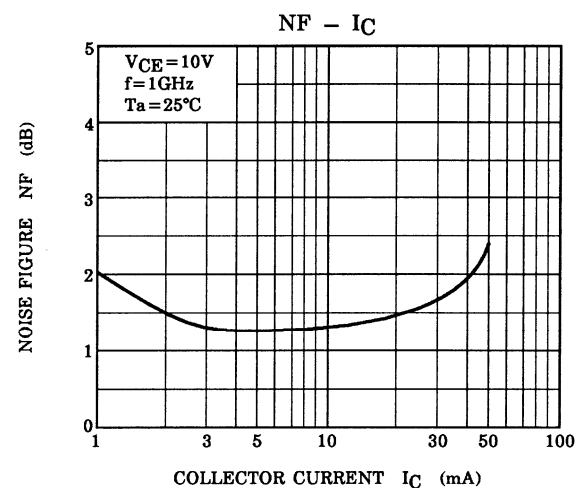
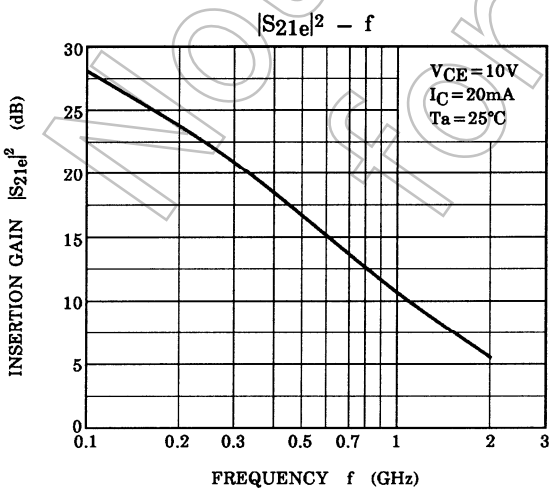
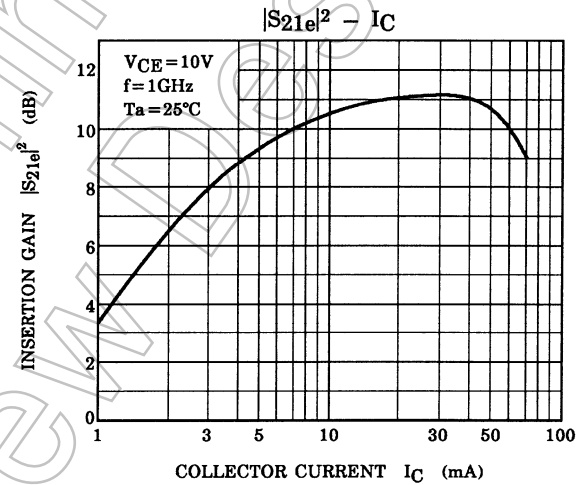
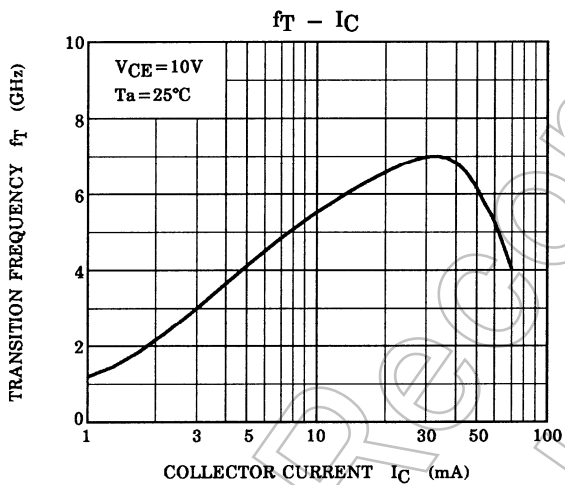
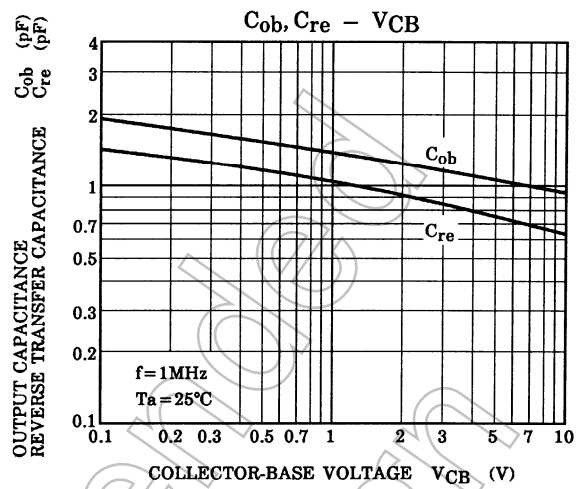
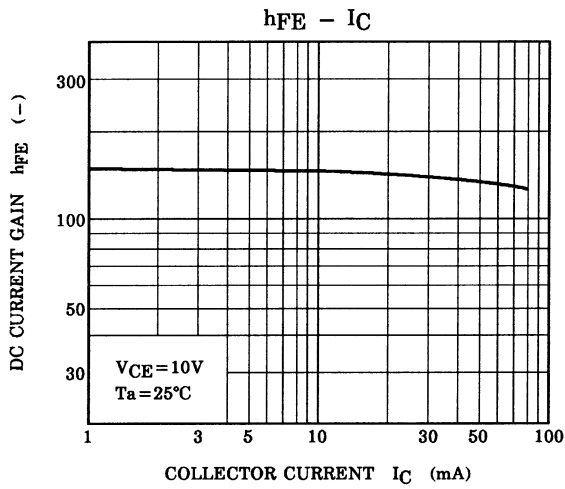
Note 2:  $C_{re}$  is measured by 3 terminal method with capacitance bridge.

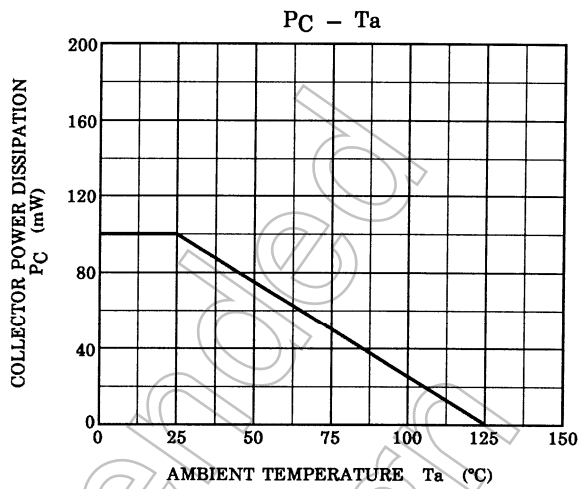
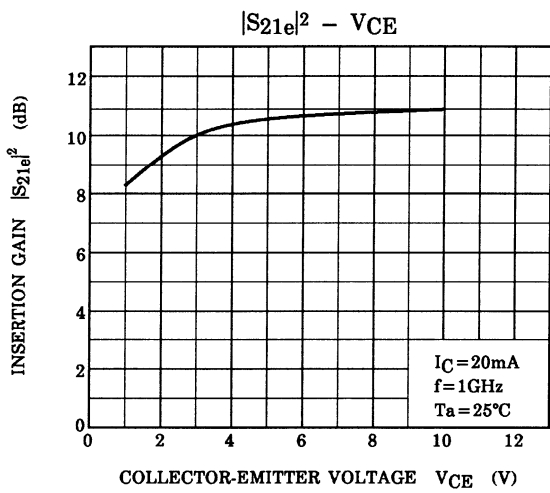
Start of commercial production  
1993-10

Marking



Not Recommended  
for New Design





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

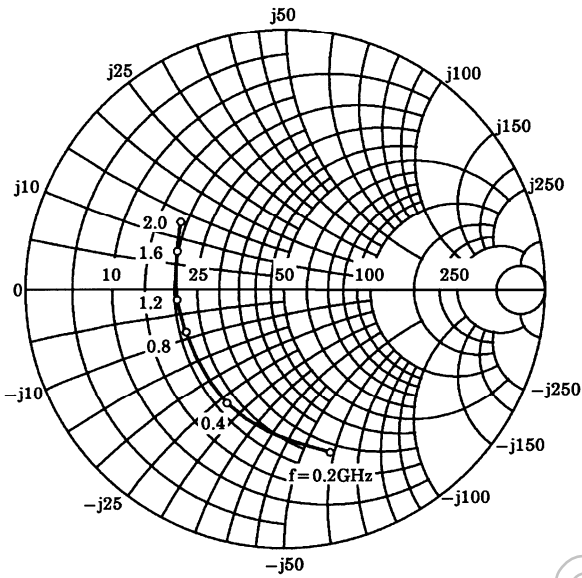
**$V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$**

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.672	-73.0	9.460	128.6	0.052	53.6	0.707	-31.3
400	0.498	-115.9	6.268	105.9	0.068	46.8	0.513	-36.2
600	0.443	-141.7	4.554	93.3	0.078	49.0	0.437	-36.6
800	0.426	-158.7	3.556	84.5	0.088	53.2	0.401	-36.8
1000	0.422	-171.9	2.948	77.5	0.099	57.9	0.383	-38.3
1200	0.428	177.5	2.526	71.1	0.113	62.7	0.373	-40.6
1400	0.437	168.3	2.240	65.5	0.133	65.8	0.367	-43.9
1600	0.449	159.9	1.997	60.1	0.152	67.6	0.362	-48.2
1800	0.464	153.1	1.821	55.0	0.171	68.7	0.358	-52.8
2000	0.485	146.7	1.686	50.9	0.195	70.6	0.350	-57.6

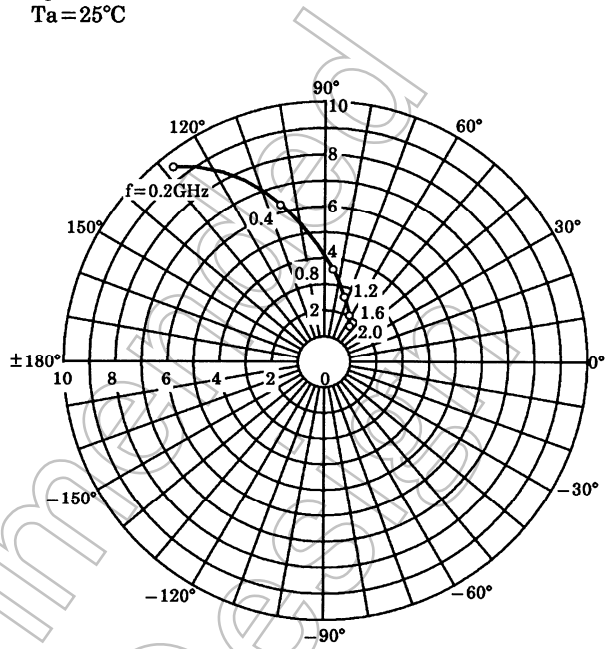
**$V_{CE} = 10 \text{ V}, I_C = 20 \text{ mA}$**

Frequency (MHz)	S11		S21		S12		S22	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.392	-116.4	16.247	109.3	0.034	59.7	0.420	-43.7
400	0.329	-152.1	8.775	94.5	0.054	66.0	0.280	-38.4
600	0.321	-170.6	6.018	86.3	0.075	69.5	0.244	-33.7
800	0.321	177.5	4.598	80.2	0.097	70.7	0.231	-31.7
1000	0.324	167.9	3.767	74.8	0.119	71.2	0.225	-31.3
1200	0.332	160.3	3.191	70.0	0.142	71.3	0.225	-32.7
1400	0.341	153.5	2.812	65.2	0.168	70.0	0.225	-36.2
1600	0.352	146.6	2.502	60.7	0.190	68.4	0.222	-40.3
1800	0.362	142.2	2.264	56.5	0.212	66.8	0.217	-44.9
2000	0.379	137.7	2.092	52.8	0.236	66.3	0.212	-49.4

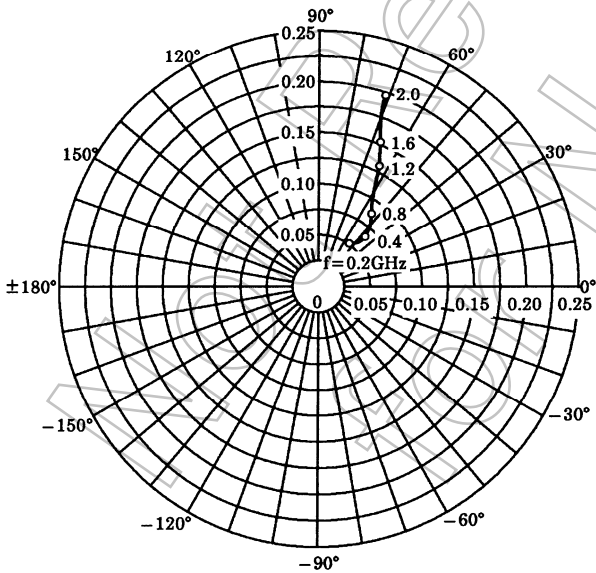
S11e  
 VCE=10V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



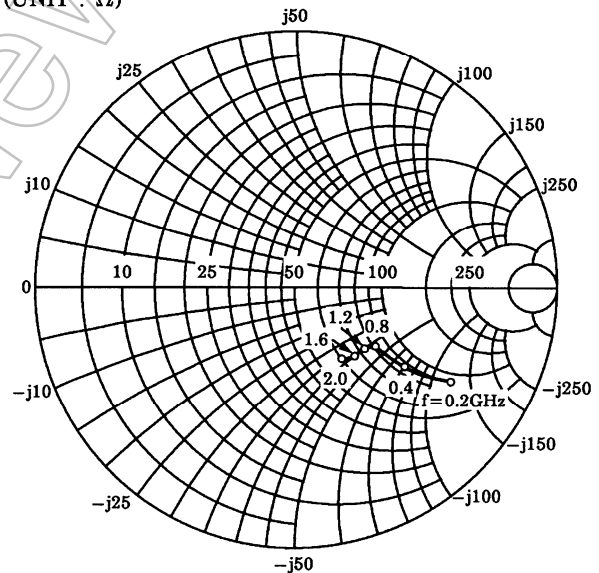
S21e  
 VCE=10V  
 IC=5mA  
 Ta=25°C



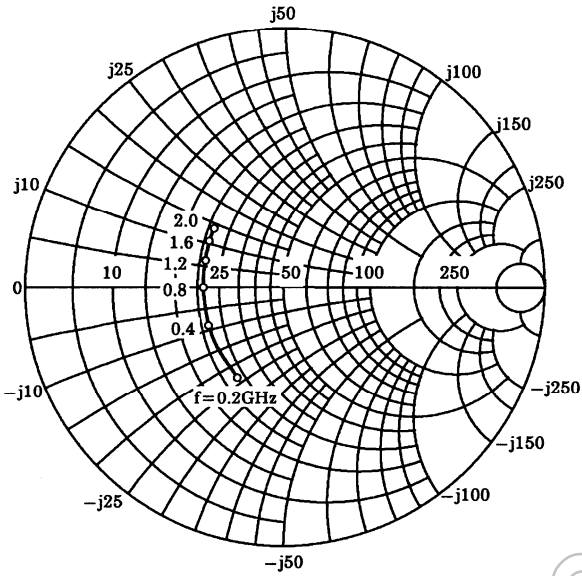
S12e  
 VCE=10V  
 IC=5mA  
 Ta=25°C



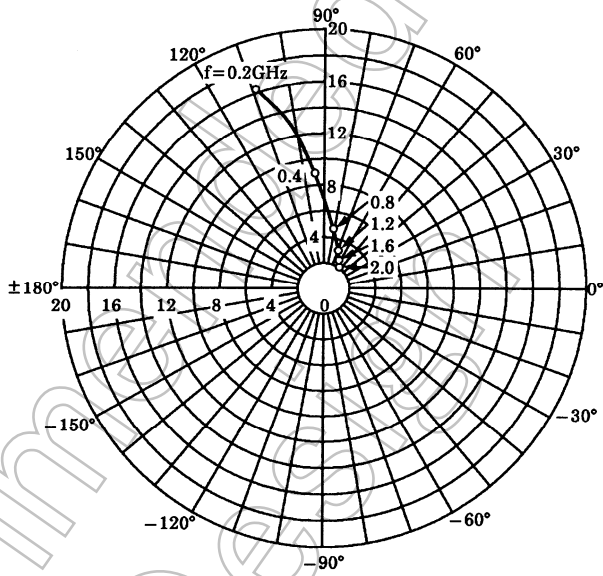
S22e  
 VCE=10V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



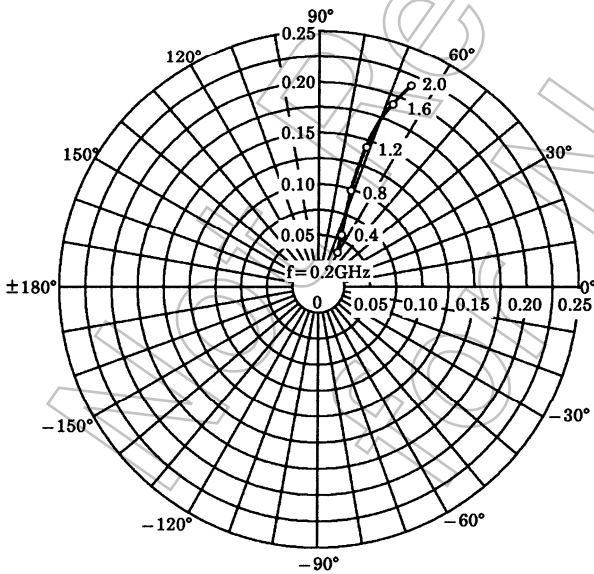
S11e  
 VCE = 10V  
 IC = 20mA  
 Ta = 25°C  
 (UNIT : Ω)



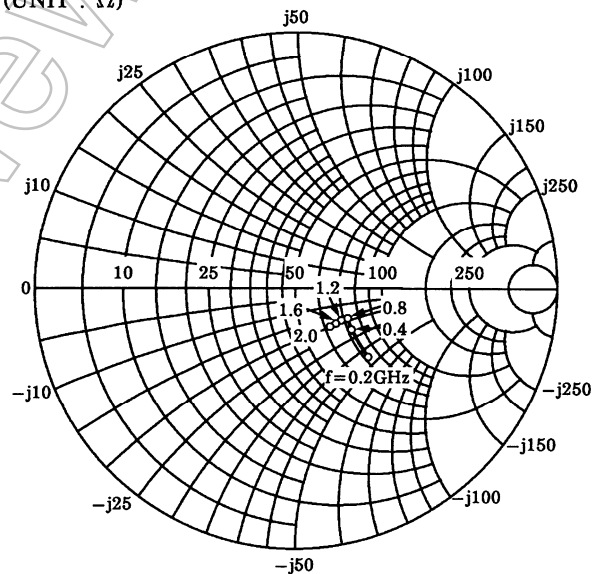
S21e  
 VCE = 10V  
 IC = 20mA  
 Ta = 25°C



S12e  
 VCE = 10V  
 IC = 20mA  
 Ta = 25°C



S22e  
 VCE = 10V  
 IC = 20mA  
 Ta = 25°C  
 (UNIT : Ω)





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