

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

# 2SC4840

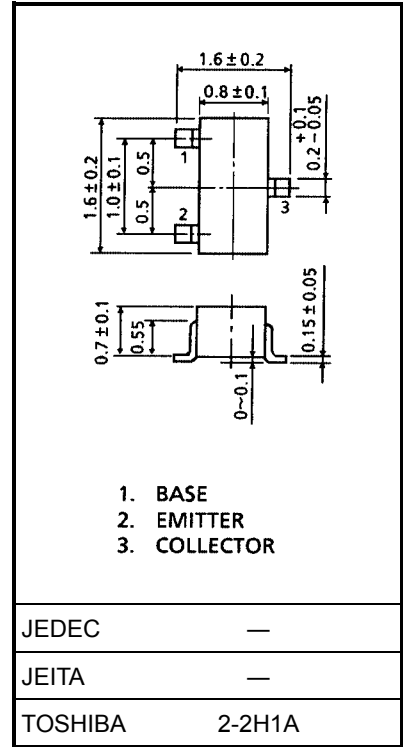
VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

- Low noise figure, high gain.
- $NF = 1.1\text{dB}$ ,  $|S_{21e}|^2 = 13\text{dB}$  ( $f = 1\text{GHz}$ )

### 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	$I_B$	20	mA
Collector current	$I_C$	40	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: 2.4 mg (typ.)

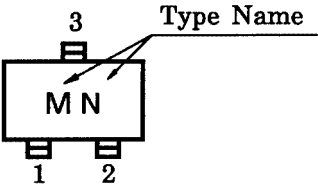
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	$f_T$	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$	7	10	—	GHz
Insertion gain	$ S_{21e} ^2$ (1)	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$ , $f = 1\text{GHz}$	10	13	—	dB
	$ S_{21e} ^2$ (2)	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$ , $f = 2\text{GHz}$	—	7	—	
Noise figure	NF (1)	$V_{CE} = 8\text{V}$ , $I_C = 5\text{mA}$ , $f = 1\text{GHz}$	—	1.1	2.5	dB
	NF (2)	$V_{CE} = 8\text{V}$ , $I_C = 5\text{mA}$ , $f = 2\text{GHz}$	—	1.7	—	

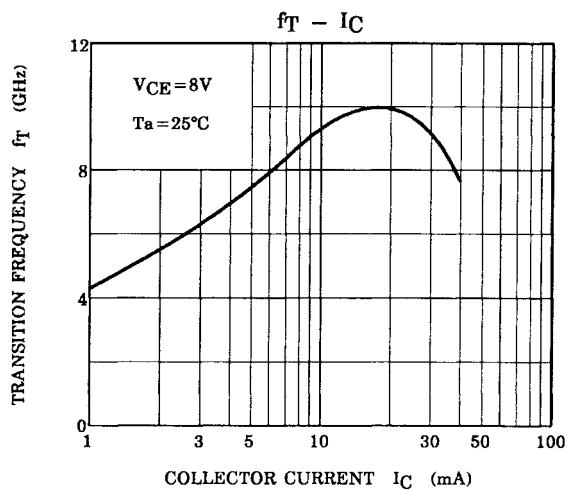
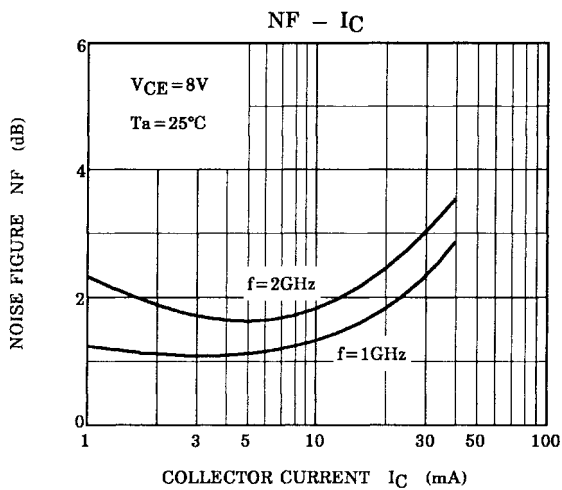
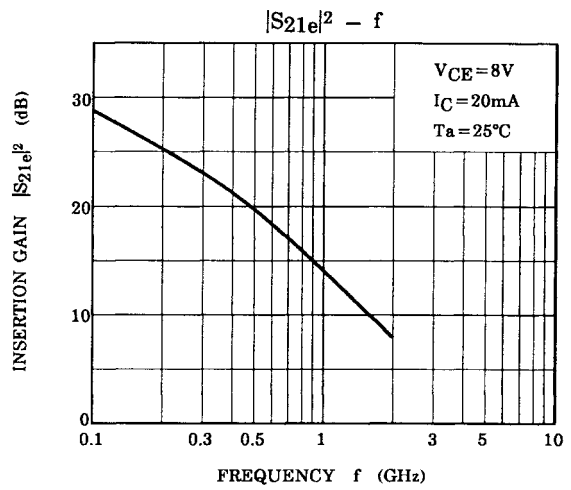
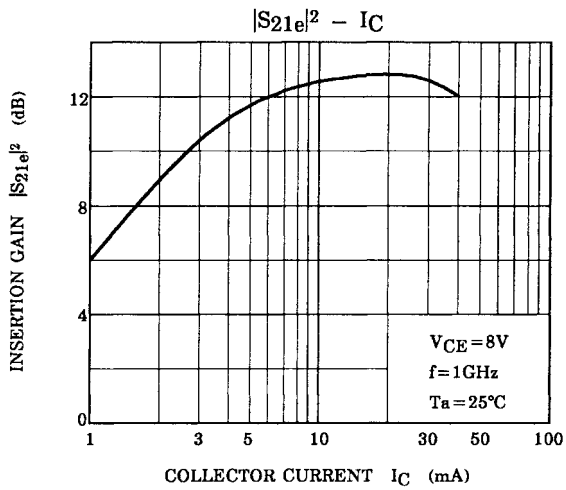
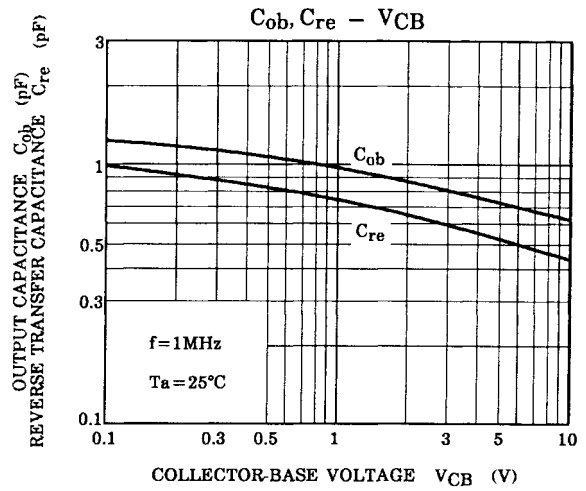
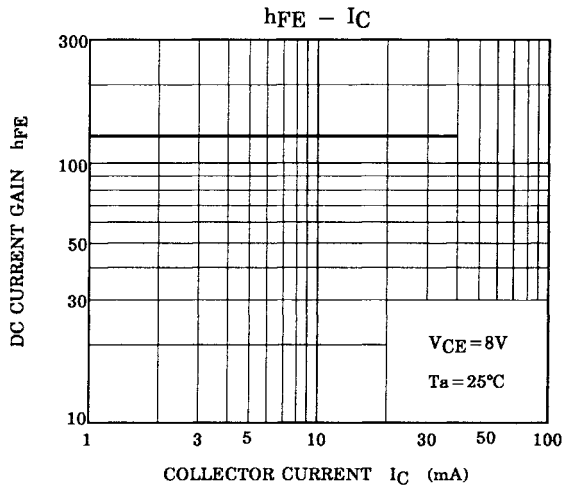
### Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

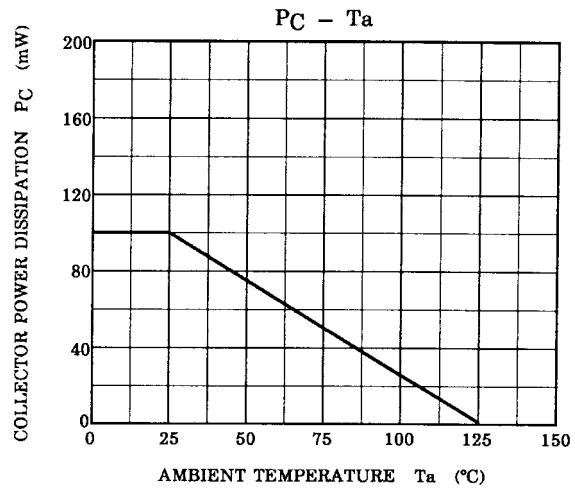
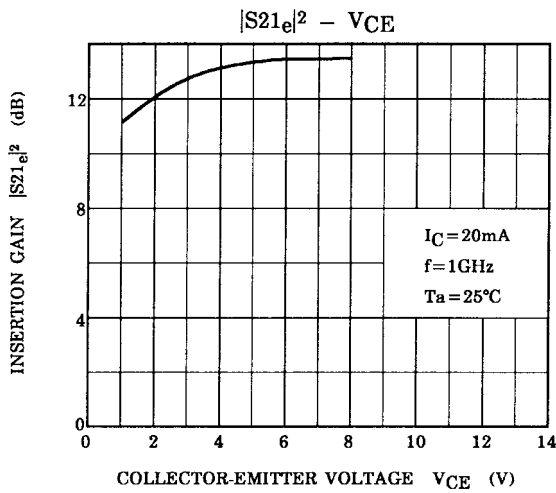
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 10\text{V}$ , $I_E = 0$	—	—	1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 1\text{V}$ , $I_C = 0$	—	—	1	$\mu\text{A}$
DC current gain	$h_{FE}$	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$	50	—	250	
Output capacitance	$C_{ob}$	$V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$ (Note)	—	0.6	—	pF
Reverse transfer capacitance	$C_{re}$		—	0.45	0.9	pF

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

**Marking**







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

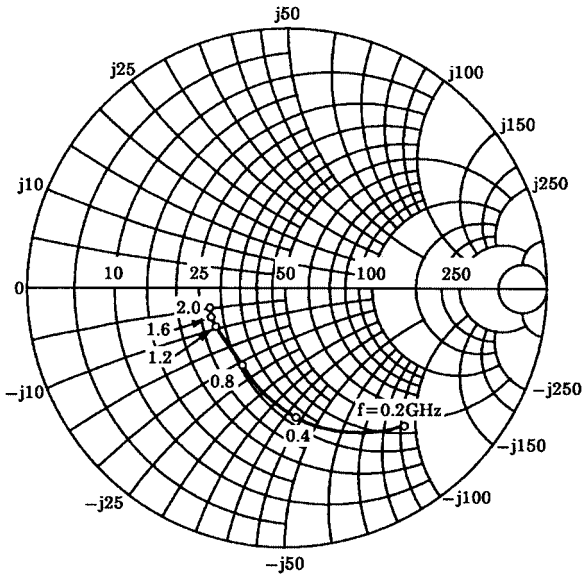
**$V_{CE} = 8 \text{ V}$ ,  $I_C = 5 \text{ mA}$**

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.710	-49.8	10.366	140.1	0.043	63.4	0.805	-24.9
400	0.513	-85.6	7.744	118.2	0.063	55.6	0.609	-32.5
600	0.400	-109.8	5.844	105.6	0.076	55.0	0.507	-33.3
800	0.347	-126.2	4.634	97.8	0.087	57.4	0.456	-32.4
1000	0.319	-138.6	3.851	91.9	0.099	60.2	0.427	-31.8
1200	0.303	-148.0	3.310	87.4	0.112	62.9	0.411	-31.5
1400	0.299	-155.5	2.914	83.3	0.126	64.4	0.401	-32.6
1600	0.294	-160.5	2.610	80.0	0.139	65.9	0.389	-33.8
1800	0.296	-160.3	2.367	77.4	0.153	68.7	0.380	-34.8
2000	0.300	-163.9	2.184	75.0	0.171	69.3	0.376	-36.4

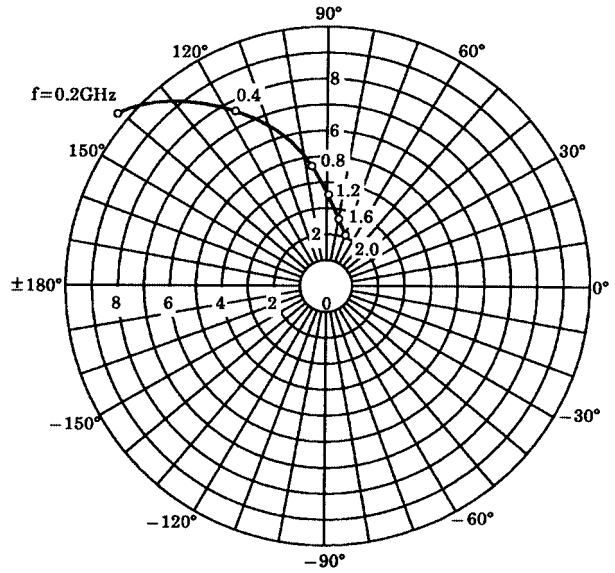
**$V_{CE} = 8 \text{ V}$ ,  $I_C = 20 \text{ mA}$**

Frequency MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.383	-98.8	19.474	117.1	0.043	63.5	0.538	-34.2
400	0.292	-134.7	10.899	100.9	0.063	55.5	0.384	-30.2
600	0.270	-154.3	7.496	93.5	0.076	55.0	0.341	-25.5
800	0.262	-165.3	5.727	88.7	0.087	57.3	0.327	-22.9
1000	0.256	-173.1	4.663	84.6	0.099	60.1	0.321	-21.8
1200	0.254	-178.3	3.972	81.4	0.112	62.7	0.322	-22.3
1400	0.257	178.1	3.462	78.3	0.126	64.4	0.320	-23.7
1600	0.258	176.3	3.088	75.7	0.138	66.0	0.315	-25.3
1800	0.258	176.5	2.786	73.7	0.153	68.5	0.314	-26.2
2000	0.265	177.7	2.569	71.6	0.171	69.4	0.308	-28.3

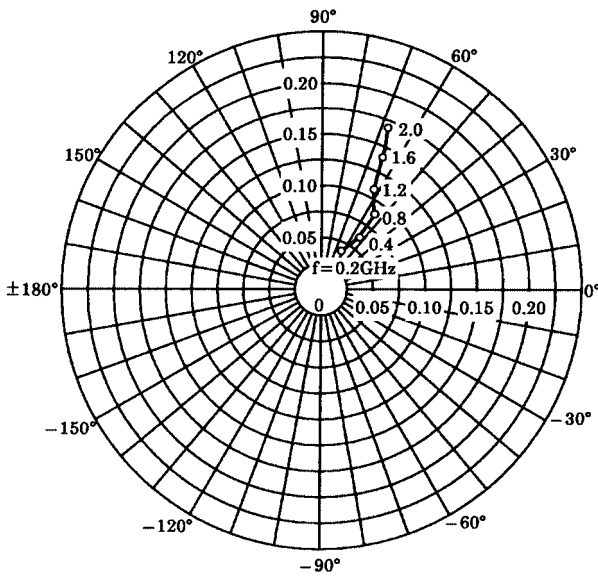
S11e  
 VCE=8V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



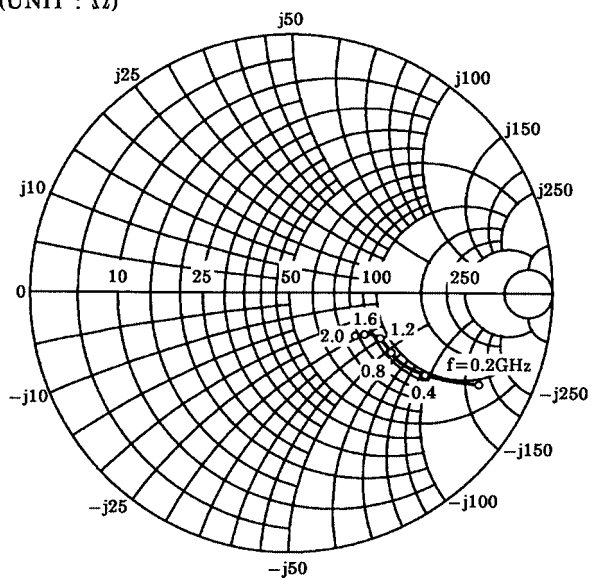
S21e  
 VCE=8V  
 IC=5mA  
 Ta=25°C



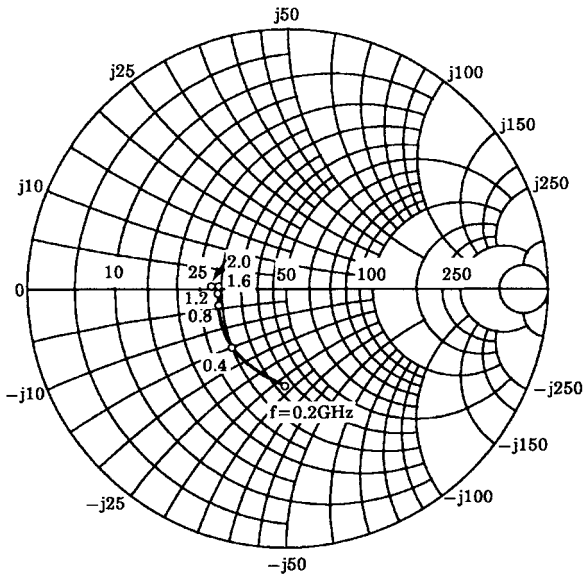
S12e  
 VCE=8V  
 IC=5mA  
 Ta=25°C



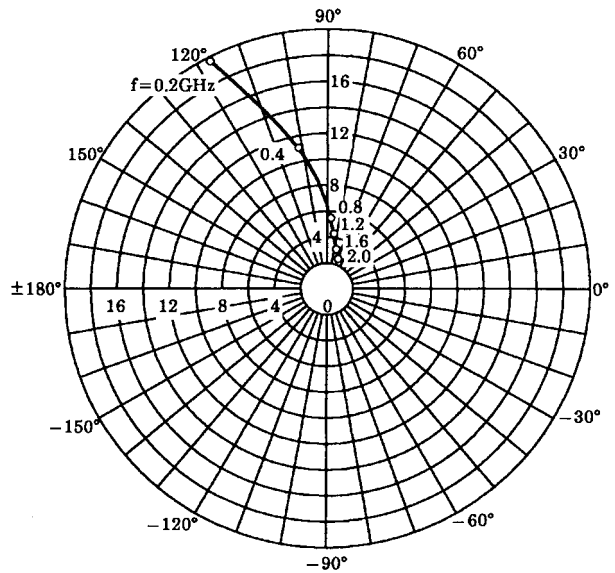
S22e  
 VCE=8V  
 IC=5mA  
 Ta=25°C  
 (UNIT : Ω)



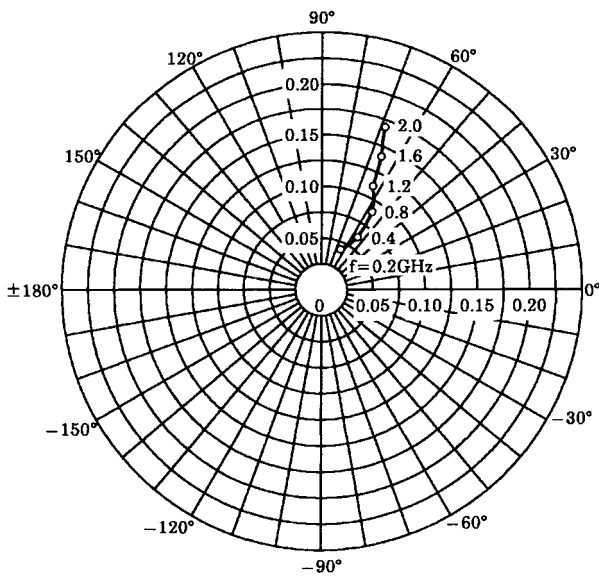
S11e  
 VCE=8V  
 IC=20mA  
 Ta=25°C  
 (UNIT : Ω)



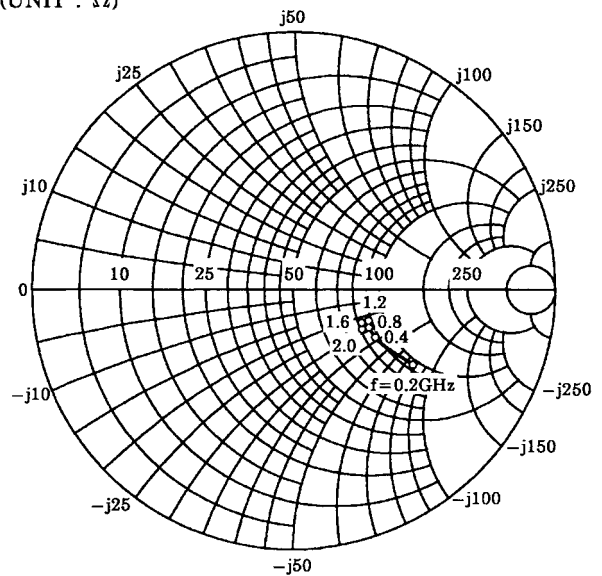
S21e  
 VCE=8V  
 IC=20mA  
 Ta=25°C



S12e  
 VCE=8V  
 IC=20mA  
 Ta=25°C



S22e  
 VCE=8V  
 IC=20mA  
 Ta=25°C  
 (UNIT : Ω)



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