

TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

# 2SC4840

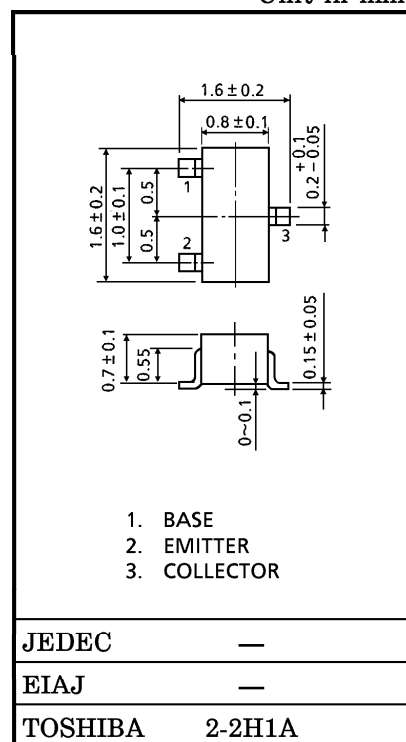
VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

Unit in mm

- Low Noise Figure, High Gain.
- $NF = 1.1\text{dB}$ ,  $|S_{21e}|^2 = 13\text{dB}$  ( $f = 1\text{GHz}$ )

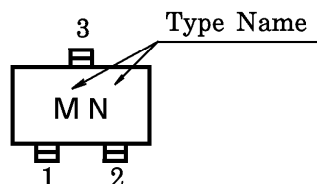
MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

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	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55~125	$^\circ\text{C}$



Weight : 2.4mg

Marking



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

CHARACTERISTIC	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	—	

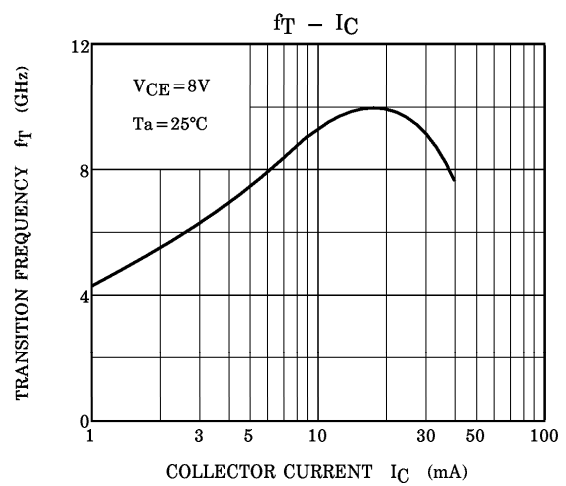
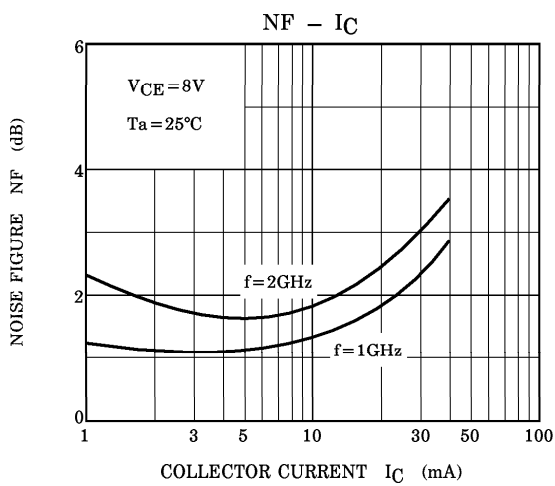
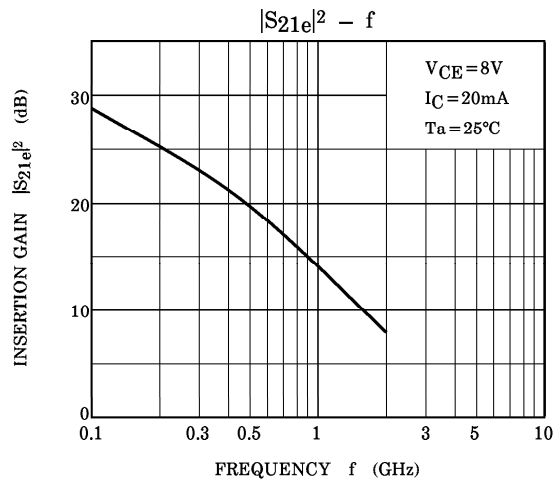
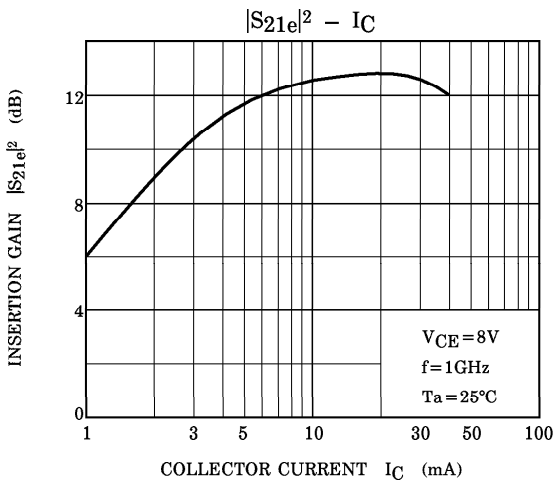
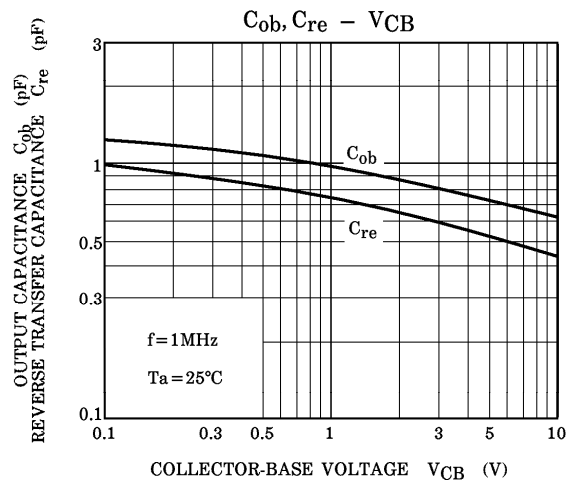
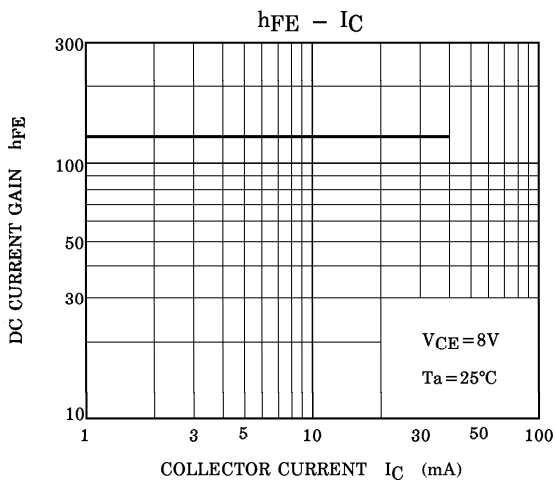
ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

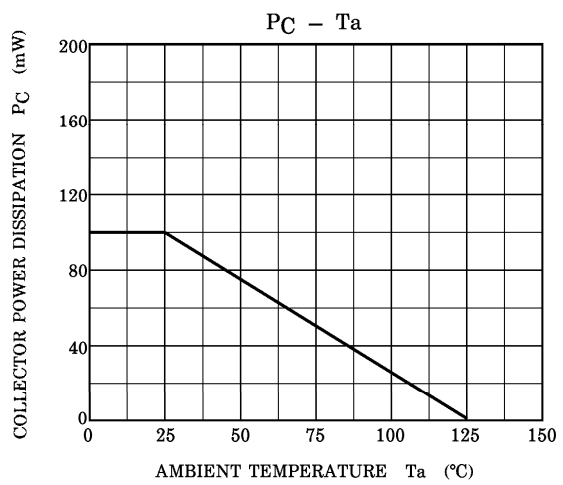
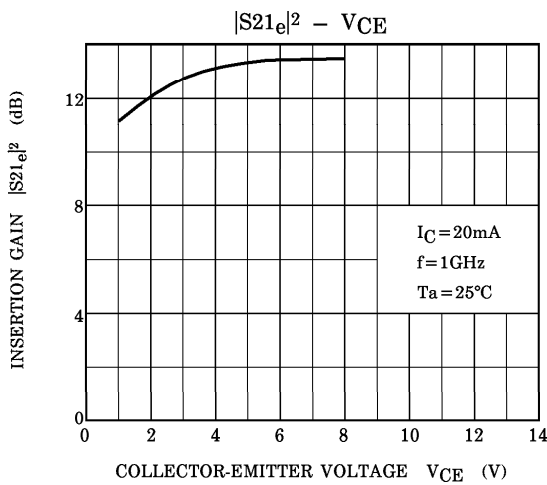
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	$I_{CBO}$	$V_{CB} = 10\text{V}$ , $I_E = 0$	—	—	1	$\mu\text{A}$
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = 1\text{V}$ , $I_C = 0$	—	—	1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = 8\text{V}$ , $I_C = 20\text{mA}$	50	—	250	—
Output Capacitance	$C_{ob}$	$V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$	—	0.6	—	pF
Reverse Transfer Capacitance	$C_{re}$	(Note)	—	0.45	0.9	pF

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

961001EAA2

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.





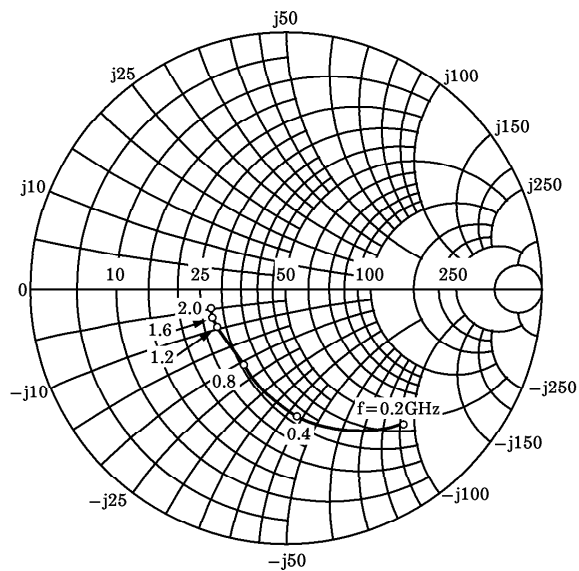
S-PARAMETER  $Z_0 = 50\Omega$ ,  $T_a = 25^\circ\text{C}$   
 $V_{CE} = 8\text{V}$ ,  $I_C = 5\text{mA}$

FREQUENCY MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.710	-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

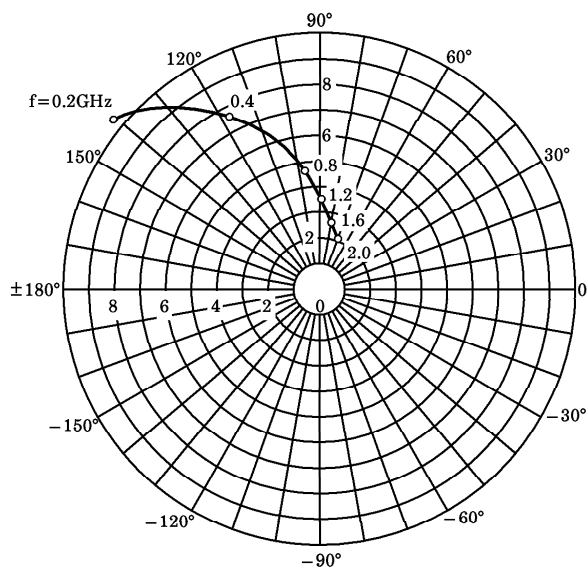
$V_{CE} = 8\text{V}$ ,  $I_C = 20\text{mA}$

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

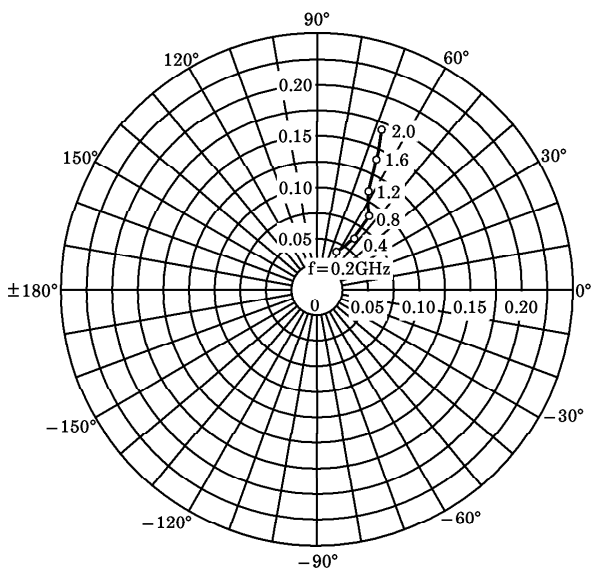
$S_{11e}$   
 $V_{CE}=8V$   
 $I_C=5mA$   
 $T_a=25^\circ C$   
 (UNIT :  $\Omega$ )



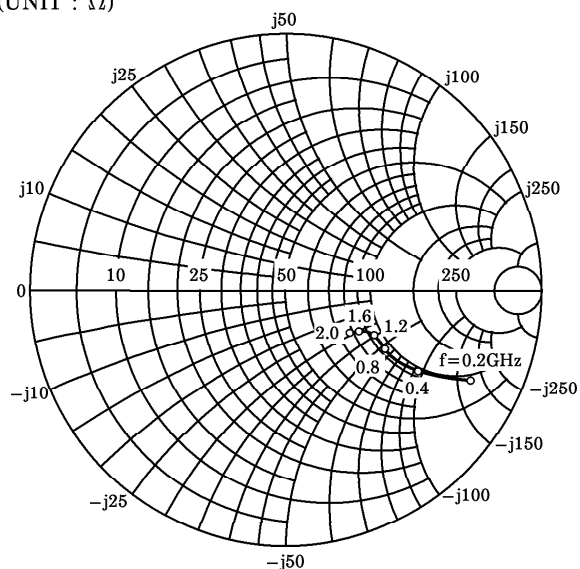
$S_{21e}$   
 $V_{CE}=8V$   
 $I_C=5mA$   
 $T_a=25^\circ C$



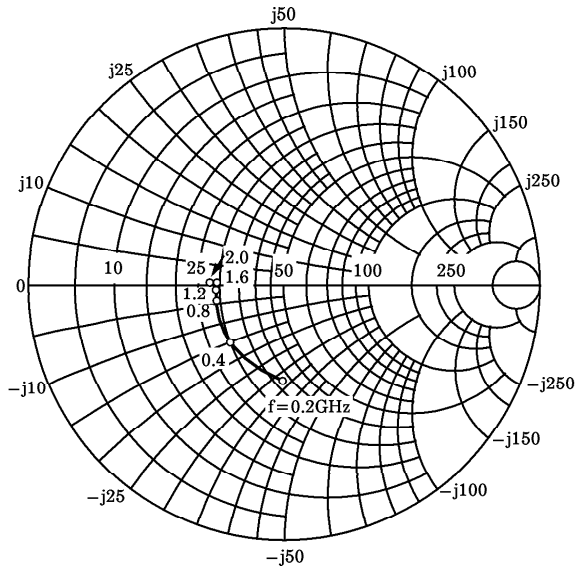
$S_{12e}$   
 $V_{CE}=8V$   
 $I_C=5mA$   
 $T_a=25^\circ C$



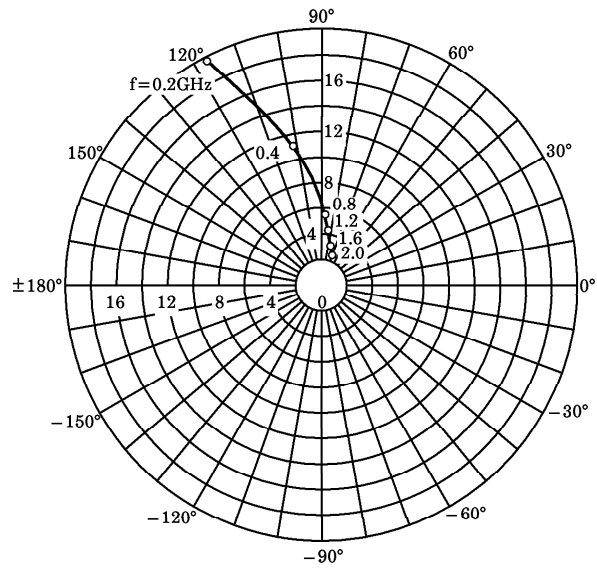
$S_{22e}$   
 $V_{CE}=8V$   
 $I_C=5mA$   
 $T_a=25^\circ C$   
 (UNIT :  $\Omega$ )



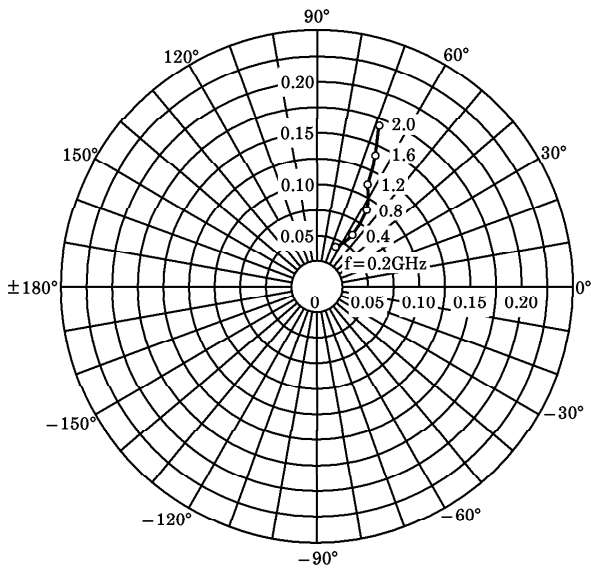
$S_{11e}$   
 $V_{CE} = 8V$   
 $I_C = 20mA$   
 $T_a = 25^\circ C$   
 (UNIT :  $\Omega$ )



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



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



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

