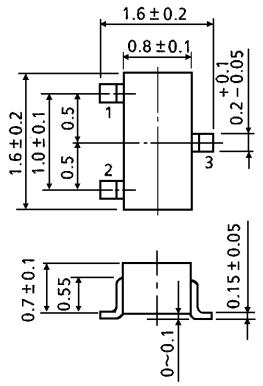
TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

2SC4839

VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

Unit in mm

- Low Noise Figure, High Gain.
- NF = 1.1dB, $|S_{21e}|^2$ = 12dB (f = 1GHz)



1. BASE
2. EMITTER
3. COLLECTOR

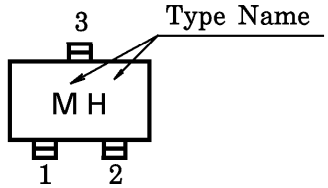
JEDEC	—
EIAJ	—
TOSHIBA	2-2H1A

Weight : 2.4mg

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Collector-Base Voltage	V_{CBO}	20	V
Collector-Emitter Voltage	V_{CEO}	12	V
Emitter-Base Voltage	V_{EBO}	3	V
Collector Current	I_C	80	mA
Base Current	I_B	40	mA
Collector Power Dissipation	P_C	100	mW
Junction Temperature	T_j	125	°C
Storage Temperature Range	T_{stg}	−55~125	°C

Marking



MICROWAVE CHARACTERISTICS (Ta = 25°C)

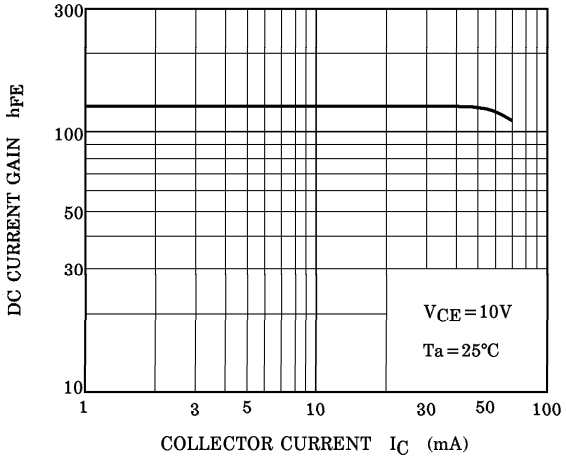
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Transition Frequency	f_T	V_{CE} = 10V, I_C = 20mA	5	7	—	GHz
Insertion Gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 10V, I_C = 20mA, f = 500MHz	—	18	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 10V, I_C = 20mA, f = 1GHz	7.5	12	—	
Noise Figure	NF (1)	V_{CE} = 10V, I_C = 5mA, f = 500MHz	—	1	—	dB
	NF (2)	V_{CE} = 10V, I_C = 5mA, f = 1GHz	—	1.1	2	

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

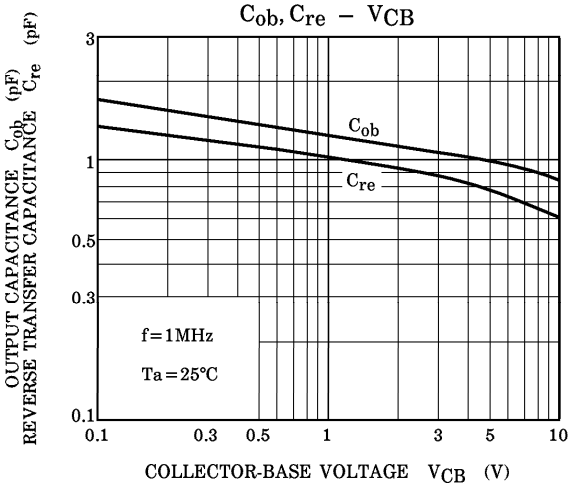
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 10V, I_E = 0	—	—	1	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1V, I_C = 0	—	—	1	μA
DC Current Gain	h_{FE}	V_{CE} = 10V, I_C = 20mA	30	—	250	—
Output Capacitance	C_{ob}	V_{CB} = 10V, I_E = 0, f = 1MHz	—	0.85	—	pF
Reverse Transfer Capacitance	C_{re}	(Note)	—	0.6	1.15	PF

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

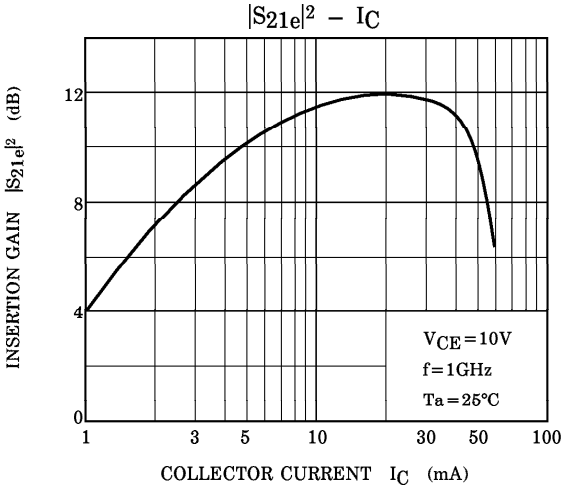
h_{FE} – I_C



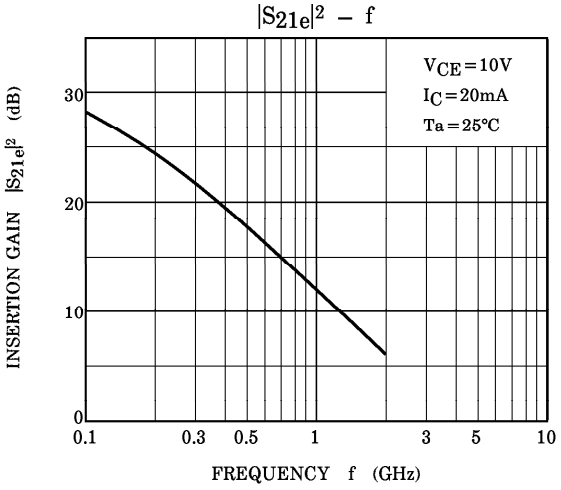
C_{ob}, C_{re} – V_{CB}



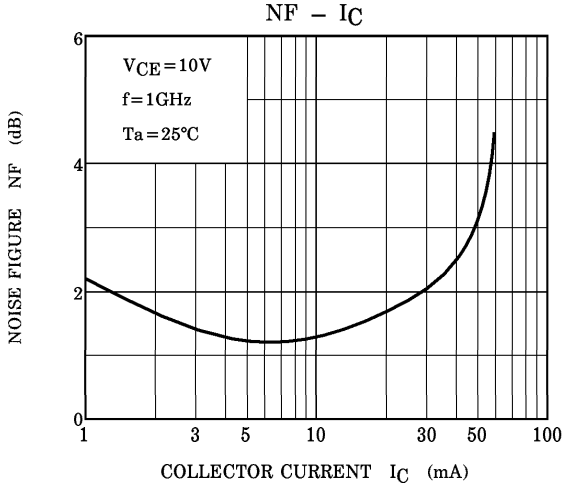
$|S_{21e}|^2$ – I_C



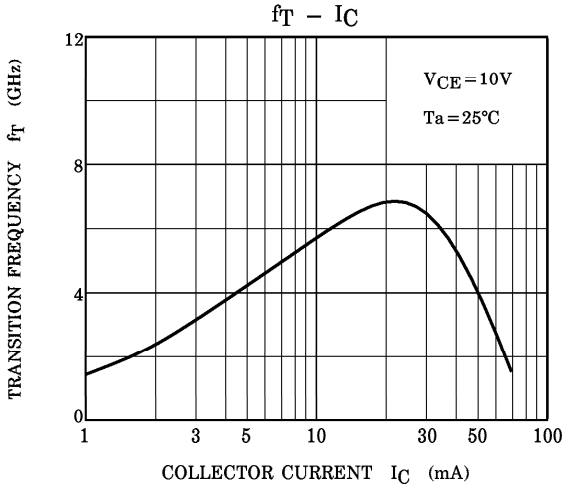
$|S_{21e}|^2$ – f

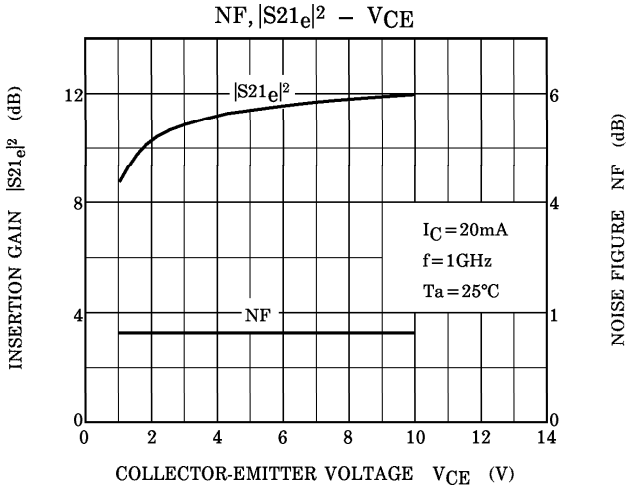


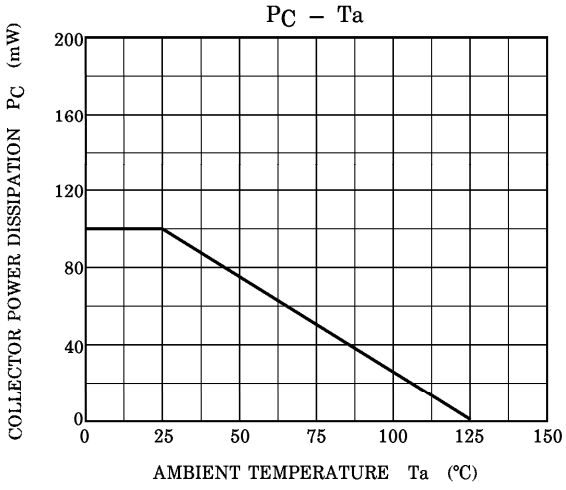
NF – I_C



f_T – I_C







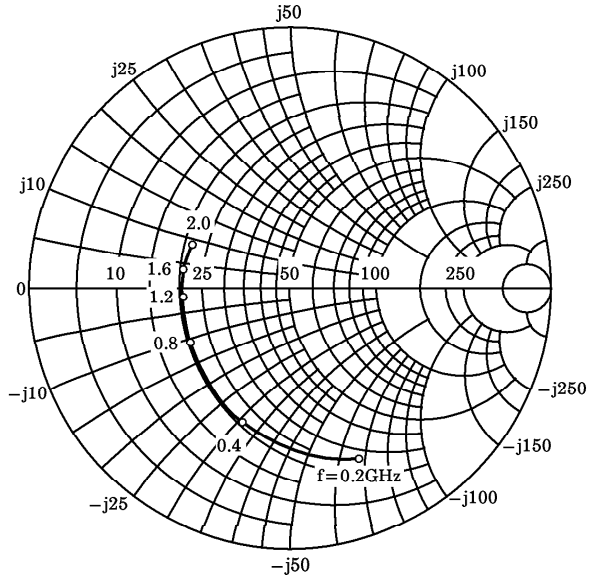
S-PARAMETER $Z_O = 50\Omega$, Ta = 25°C
V_{CE} = 10V, I_C = 5mA

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.705	−67.0	9.702	132.700	0.048	57.9	0.769	−27.9
400	0.536	−109.6	6.665	109.300	0.066	50.8	0.591	−34.7
600	0.467	−135.0	4.880	96.100	0.077	52.3	0.518	−36.9
800	0.440	−151.6	3.799	87.500	0.088	56.2	0.486	−39.0
1000	0.426	−164.9	3.136	80.600	0.100	60.3	0.475	−41..5
1200	0.417	−175.0	2.668	75.000	0.113	64.2	0.469	−44.5
1400	0.412	176.5	2.349	69.800	0.129	67.6	0.469	−47.8
1600	0.405	169.0	2.099	65.100	0.147	70.4	0.470	−51.2
1800	0.399	162.8	1.916	61.100	0.168	72.2	0.474	−54.1
2000	0.393	157.9	1.777	56.900	0.190	73.5	0.474	−57.8

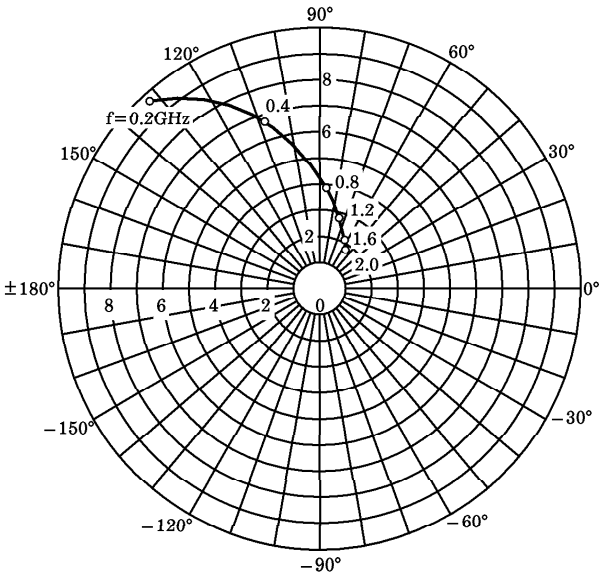
V_{CE} = 10V, I_C = 20mA

FREQUENCY	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.416	−111.00	16.818	111.100	0.032	61.30	0.504	−36.4
400	0.352	−145.90	9.121	95.900	0.051	67.10	0.382	−34.9
600	0.343	−163.20	6.289	87.800	0.070	70.90	0.352	−34.7
800	0.341	−174.70	4.772	81.800	0.090	72.80	0.342	−36.3
1000	0.341	−175.50	3.903	76.400	0.111	73.70	0.341	−39.2
1200	0.338	167.80	3.294	72.300	0.132	73.90	0.346	−41.9
1400	0.333	160.90	2.898	67.800	0.154	73.90	0.349	−45.8
1600	0.325	154.60	2.563	63.800	0.176	73.60	0.355	−49.0
1800	0.314	150.30	2.322	60.300	0.200	72.90	0.361	−51.9
2000	0.301	147.30	2.132	56.600	0.223	72.10	0.363	−55.0

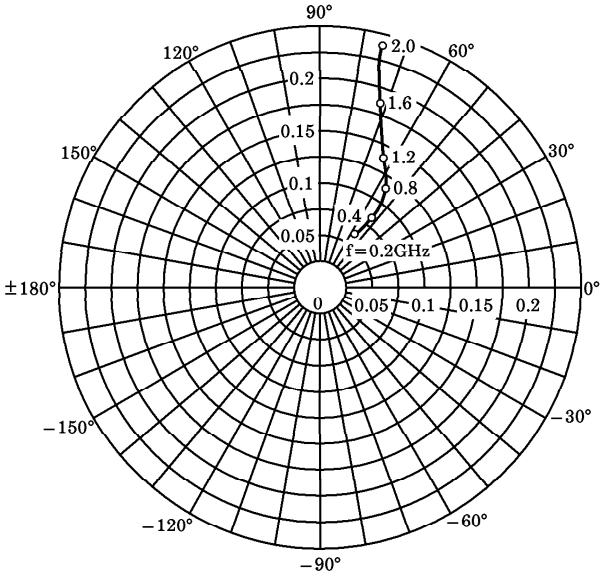
S_{11e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



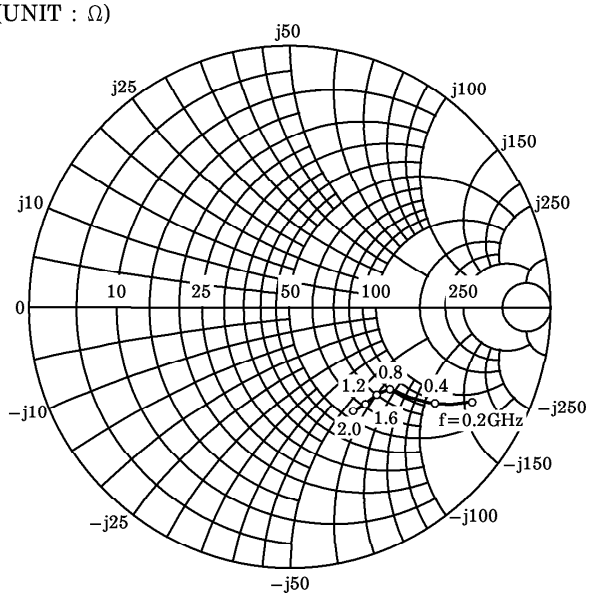
S_{21e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C



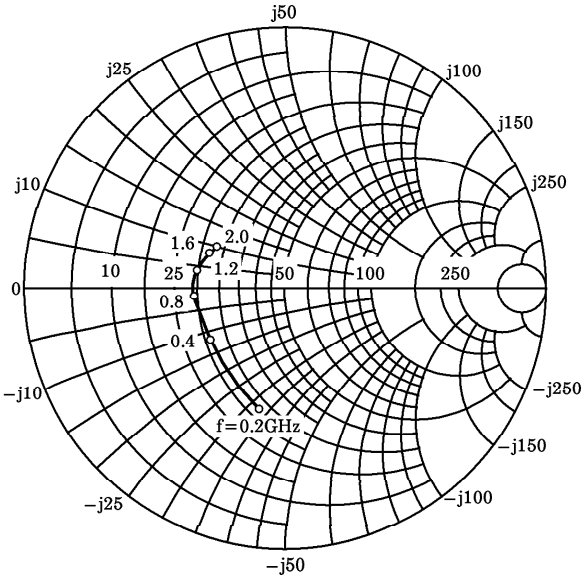
S_{12e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C



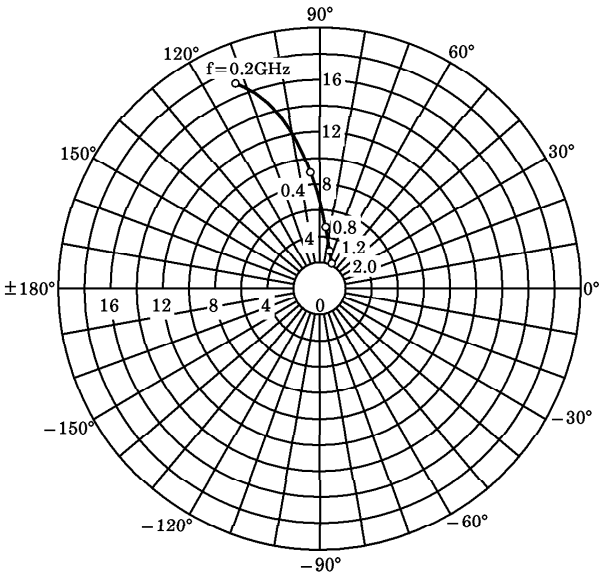
S_{22e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



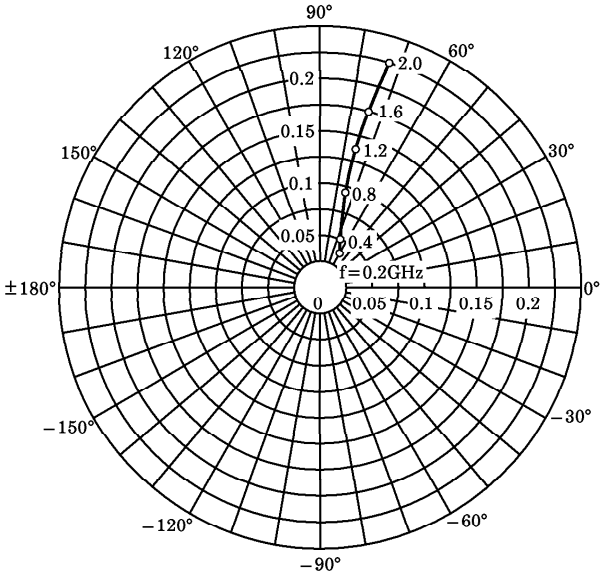
S_{11e}
V_{CE} = 10V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



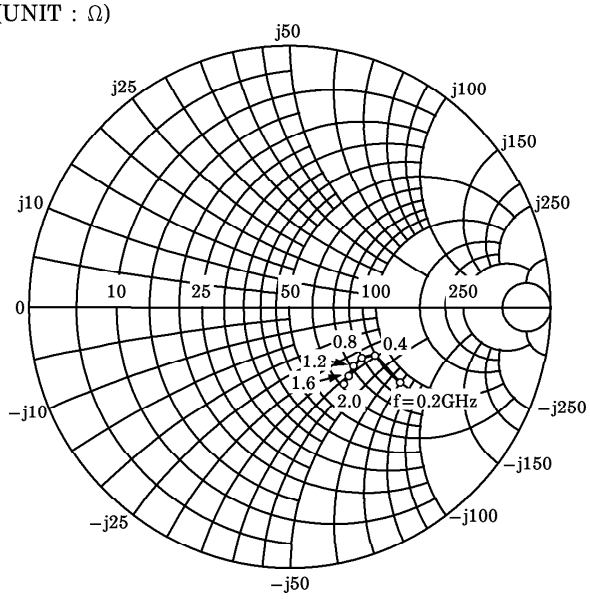
S_{21e}
V_{CE} = 10V
I_C = 20mA
Ta = 25°C



S_{12e}
V_{CE} = 10V
I_C = 20mA
Ta = 25°C



S_{22e}
V_{CE} = 10V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



RESTRICTIONS ON PRODUCT USE

000707EAA

- TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- 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.