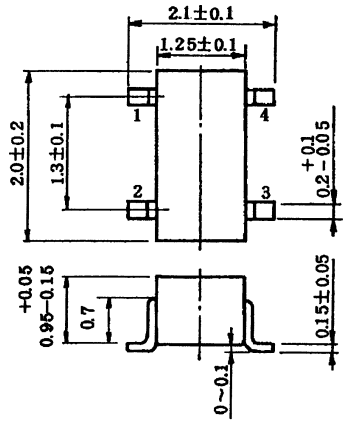
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC4842

VHF~UHF Band Low Noise Amplifier Applications

- Low noise figure, high gain.
- NF = 1.1dB, $|S_{21e}|^2$ = 14dB (f = 1 GHz)

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-2K1A

Weight: 0.006 g (typ.)

Maximum Ratings (Ta = 25°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
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

Microwave Characteristics (Ta = 25°C)

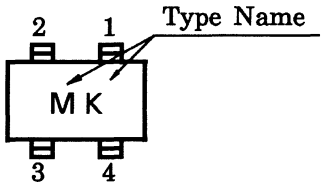
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	V_{CE} = 10 V, I_C = 20 mA	5	7	—	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 10 V, I_C = 20 mA, f = 500 MHz	—	19.5	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 10 V, I_C = 20 mA, f = 1 GHz	10.5	14	—	
Noise figure	NF (1)	V_{CE} = 10 V, I_C = 5 mA, f = 500 MHz	—	1	—	dB
	NF (2)	V_{CE} = 10 V, I_C = 5 mA, f = 1 GHz	—	1.1	2	

Electrical Characteristics (Ta = 25°C)

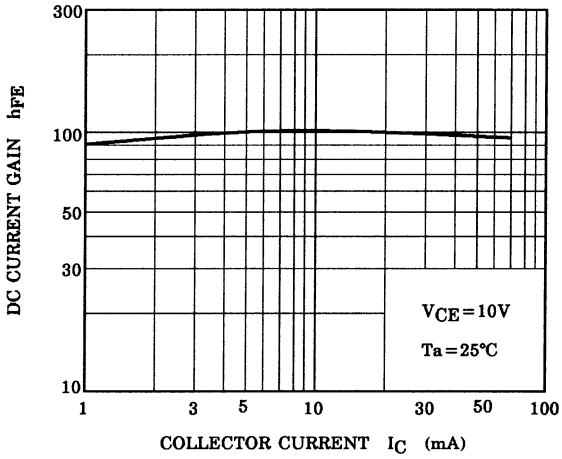
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 10 V, I_E = 0	—	—	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	1	μA
DC current gain	h_{FE}	V_{CE} = 10 V, I_C = 20 mA	30	—	250	
Output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz (Note)	—	0.8	—	pF
Reverse transfer capacitance	C_{re}		—	0.55	1	pF

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

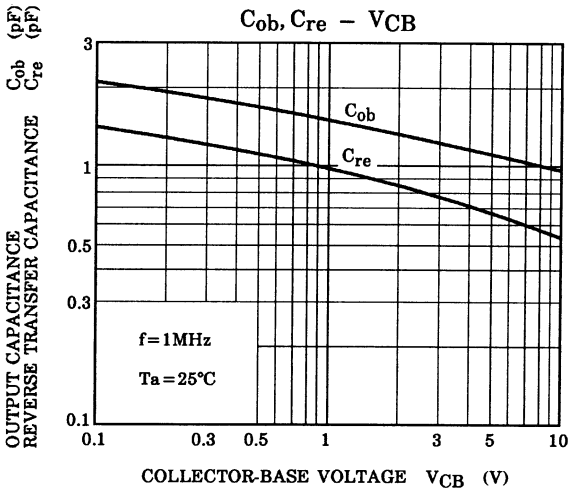
Marking



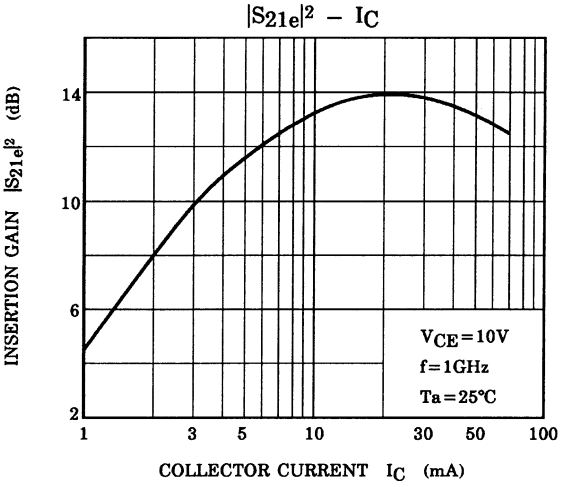
h_{FE} – I_C



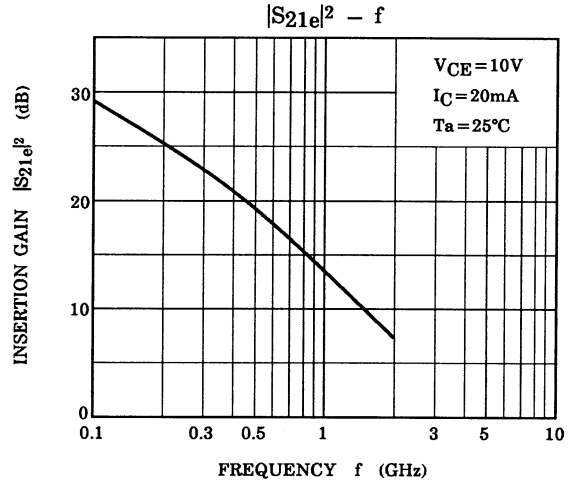
C_{ob}, C_{re} – V_{CB}



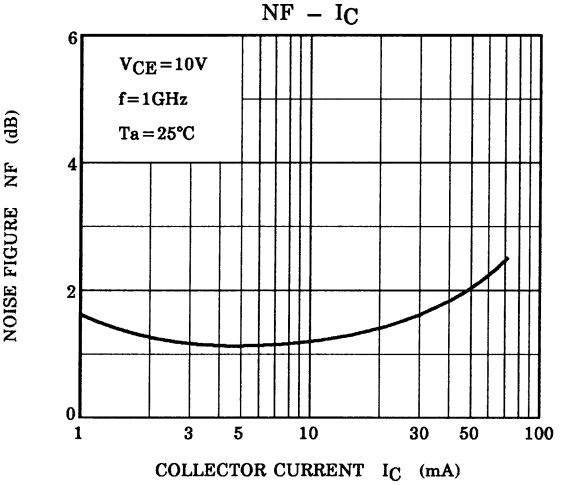
$|S_{21e}|^2$ – I_C



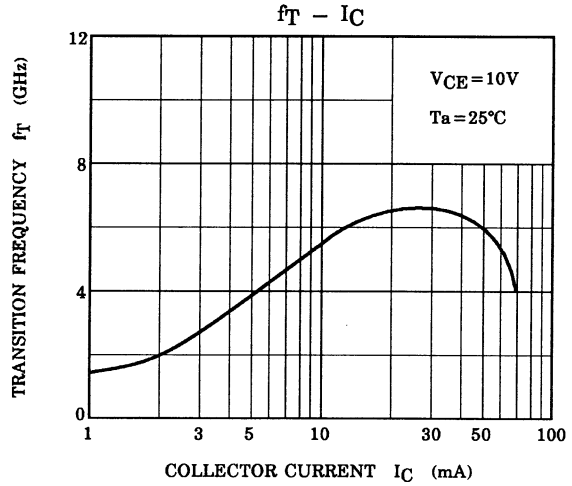
$|S_{21e}|^2$ – f

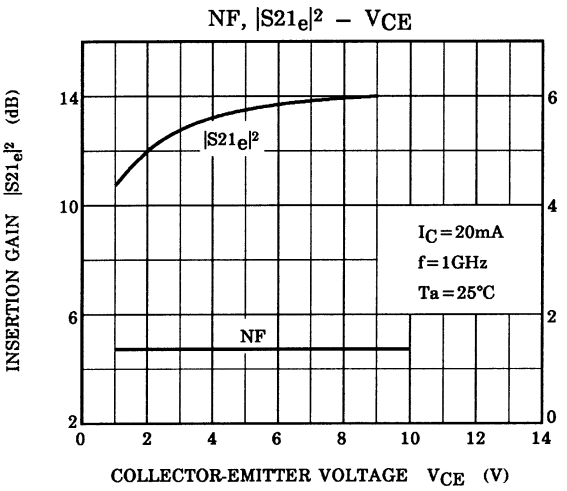


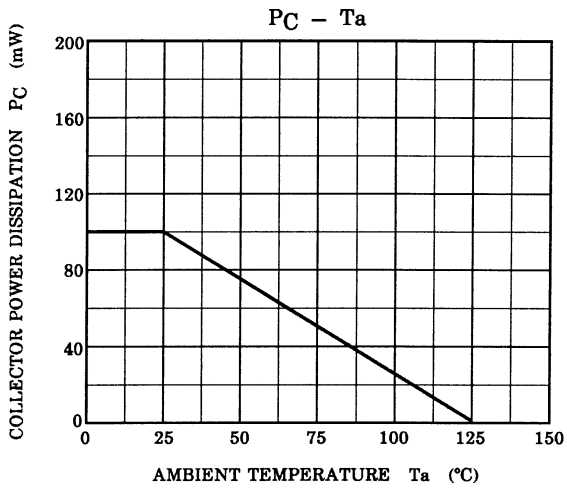
NF – I_C



f_T – I_C







S-Parameter Z_O = 50 Ω, Ta = 25°C

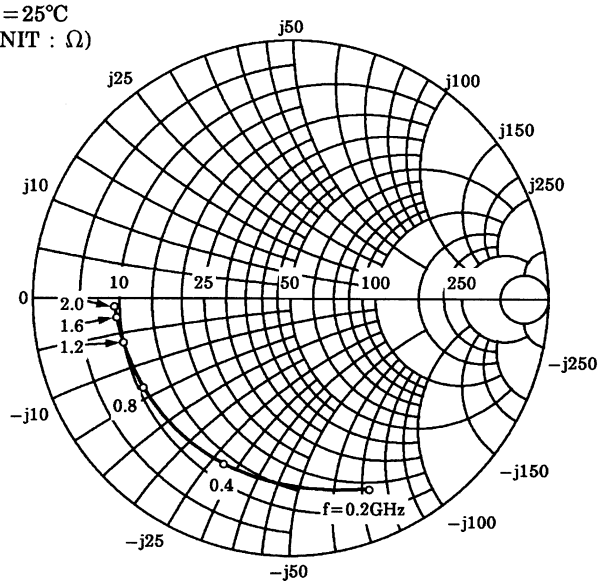
V_{CE} = 10 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.794	–68.9	10.322	137.8	0.048	54.1	0.798	–29.8
400	0.722	–112.7	7.453	114.8	0.065	38.7	0.599	–41.1
600	0.699	–136.4	5.534	101.5	0.070	33.4	0.500	–45.9
800	0.683	–150.6	4.321	92.9	0.072	32.5	0.450	–49.3
1000	0.678	–160.9	3.499	86.1	0.073	33.7	0.425	–53.1
1200	0.680	–168.2	2.967	81.2	0.073	36.5	0.412	–57.1
1400	0.688	–173.8	2.584	76.5	0.074	40.7	0.408	–61.5
1600	0.692	–178.4	2.291	72.6	0.075	45.7	0.406	–66.2
1800	0.702	–177.5	2.071	68.8	0.078	50.8	0.409	–70.6
2000	0.709	–173.7	1.902	64.9	0.082	56.0	0.416	–75.4

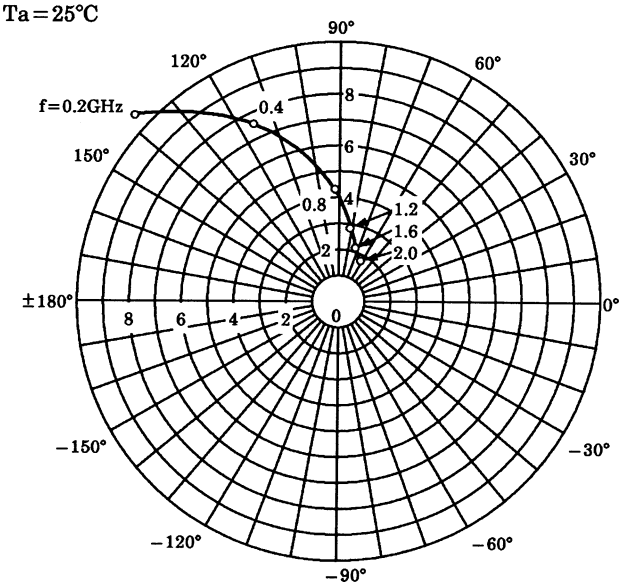
V_{CE} = 10 V, I_C = 20 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.645	–117.4	19.826	117.5	0.029	45.7	0.517	–47.9
400	0.637	–150.2	11.127	100.3	0.037	46.1	0.334	–53.2
600	0.643	–163.3	7.616	91.9	0.043	51.2	0.273	–54.3
800	0.646	–171.5	5.780	86.7	0.050	56.4	0.247	–56.6
1000	0.653	–177.7	4.629	82.0	0.057	60.7	0.237	–60.2
1200	0.662	178.1	3.903	78.7	0.065	64.0	0.235	–64.2
1400	0.668	174.2	3.399	75.0	0.073	66.8	0.237	–69.2
1600	0.678	170.7	3.006	71.7	0.082	69.1	0.241	–74.1
1800	0.679	167.5	2.711	68.7	0.091	71.1	0.248	–78.5
2000	0.631	164.6	2.475	65.2	0.100	72.7	0.259	–83.1

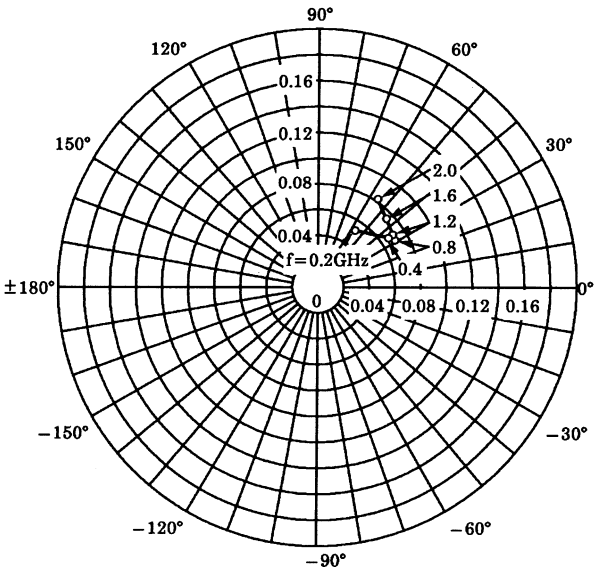
S_{11e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



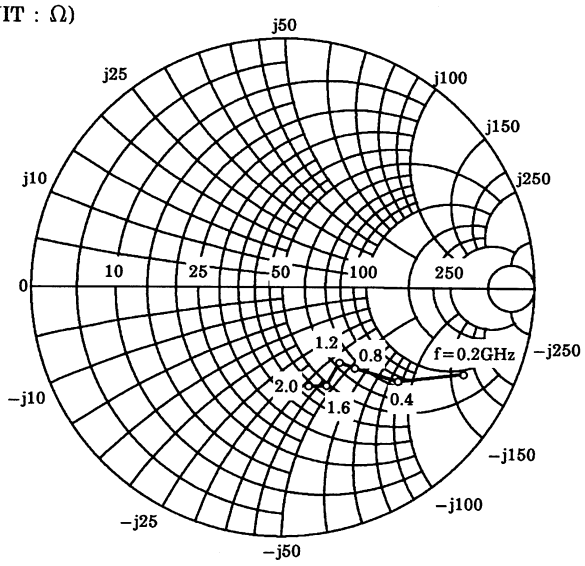
S_{21e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C



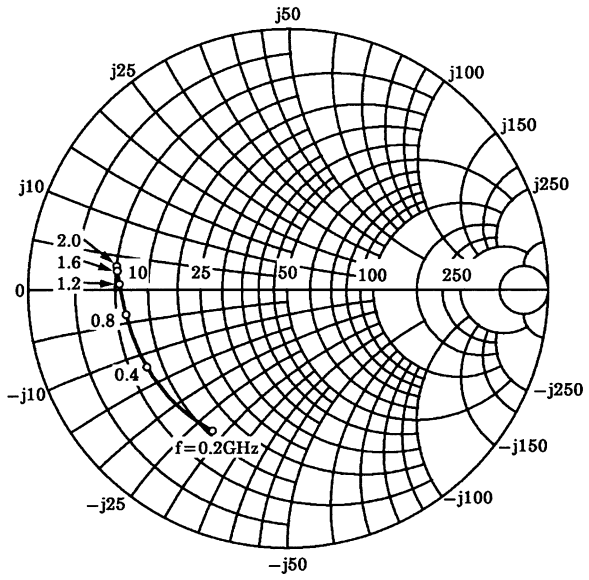
S_{12e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C



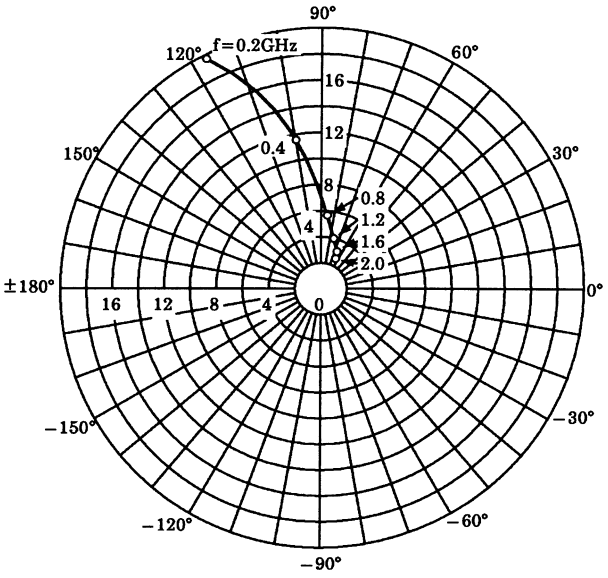
S_{22e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



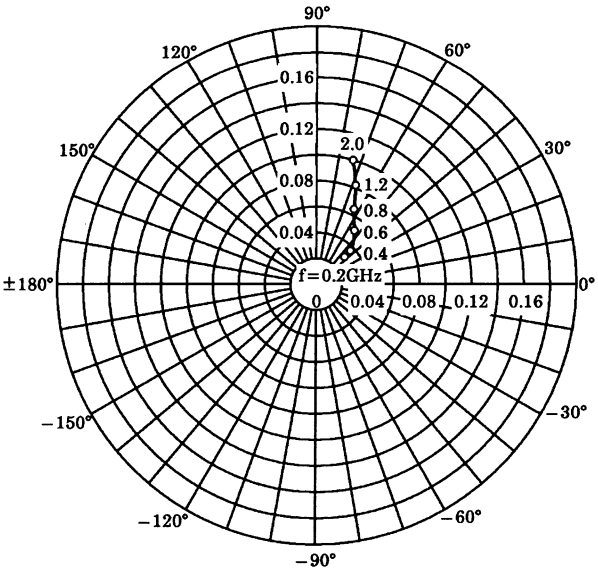
S_{11e}
V_{CE} = 10V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



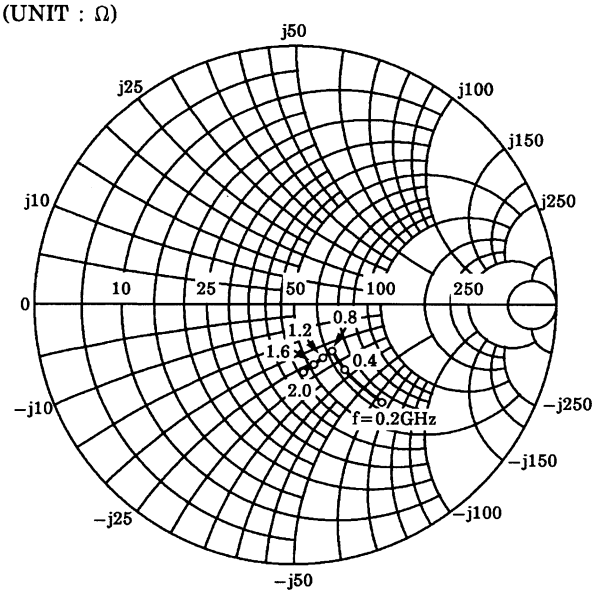
S_{21e}
V_{CE} = 10V
I_C = 20mA
Ta = 25°C



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.