TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

2SC5087

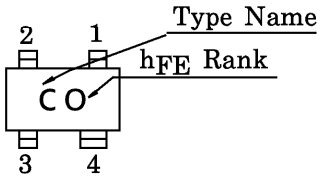
VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

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

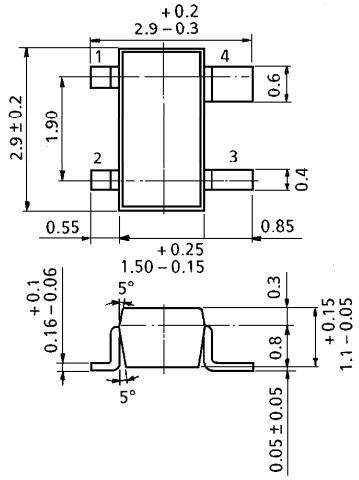
MAXIMUM RATINGS (Ta = 25°C)

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
Base Current	I_B	40	mA
Collector Current	I_C	80	mA
Collector Power Dissipation	P_C	150	mW
Junction Temperature	T_j	125	°C
Storage Temperature Range	T_{stg}	−55~125	°C

MARKING



Unit in mm



1, 3. EMITTER
2. BASE
4. COLLECTOR

JEDEC	—
EIAJ	—
TOSHIBA	2-3J1C

Weight : 0.012g

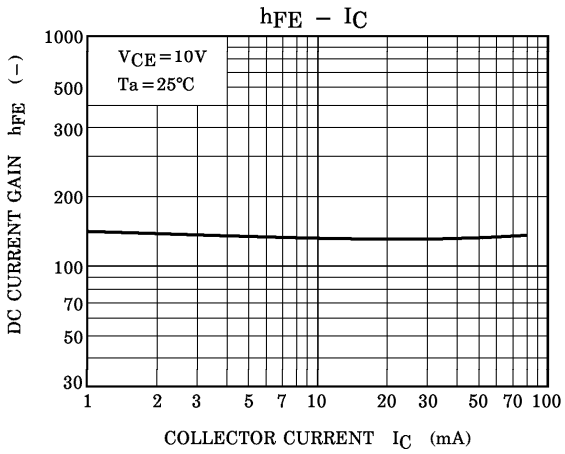
MICROWAVE CHARACTERISTICS (Ta = 25°C)

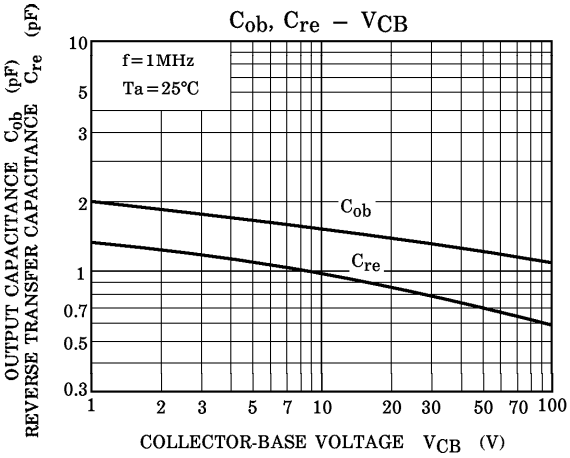
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Transition Frequency	f_T	V_{CE} = 10V, I_C = 20mA	5	7	—	GHz
Insertion Gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 10V, I_C = 20mA, f = 500MHz	—	18	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 10V, I_C = 20mA, f = 1GHz	9.5	13	—	
Noise Figure	NF (1)	V_{CE} = 10V, I_C = 5mA, f = 500MHz	—	1	—	dB
	NF (2)	V_{CE} = 10V, I_C = 5mA, f = 1GHz	—	1.1	2	

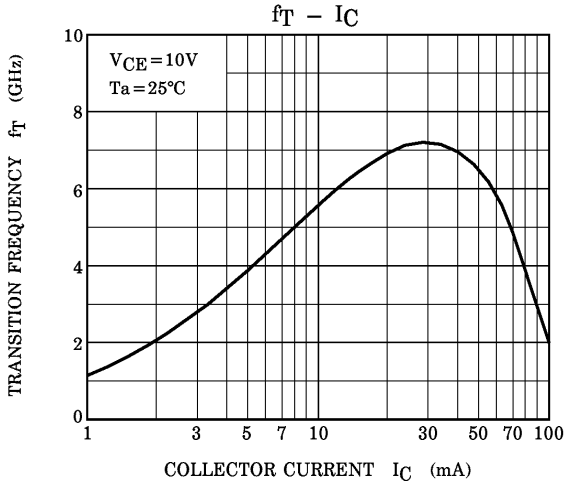
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

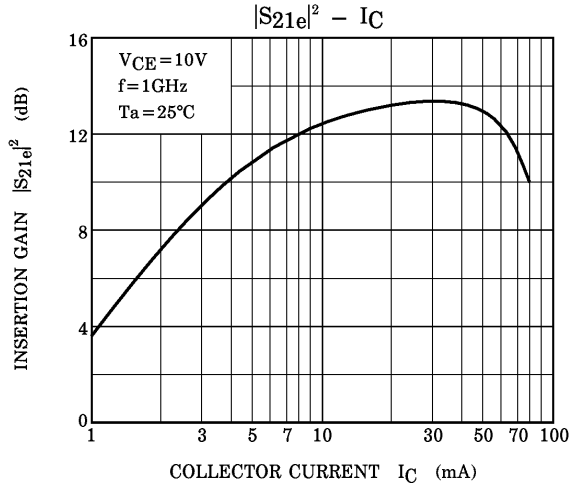
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 10V, I_E = 0	—	—	1	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1V, I_C = 0	—	—	1	μA
DC Current Gain	h_{FE} (Note 1)	V_{CE} = 10V, I_C = 20mA	80	—	240	—
Output Capacitance	C_{ob}	V_{CB} = 10V, I_E = 0, f = 1MHz	—	1.1	1.6	pF
Reverse Transfer Capacitance	C_{re}	(Note 2)	—	0.65	1.05	pF

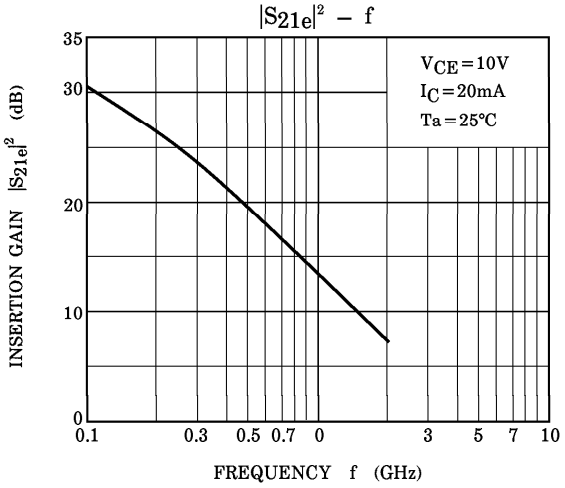
(Note 1) h_{FE} Classification O : 80~160, Y : 120~240
(Note 2) C_{re} is measured by 3 terminal method with capacitance bridge.

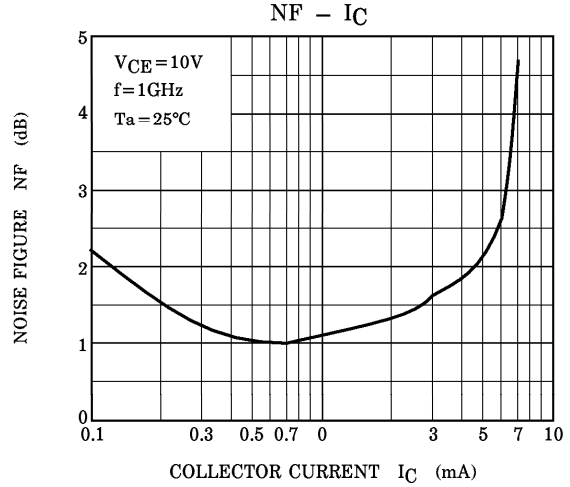

h_{FE} – I_C
V_{CE} = 10V
Ta = 25°C
DC CURRENT GAIN h_{FE} (–)
COLLECTOR CURRENT I_C (mA)

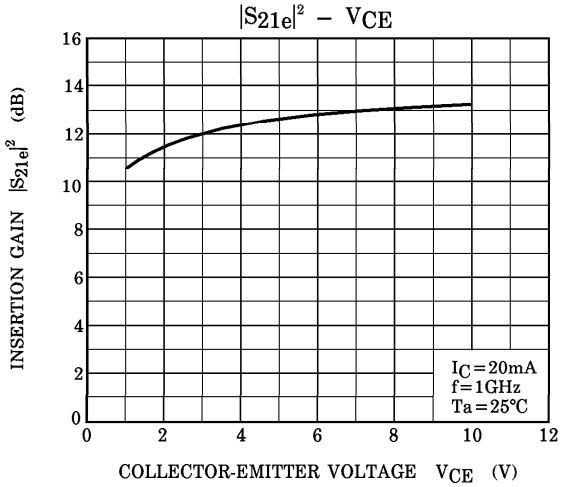

C_{ob}, C_{re} – V_{CB}
f = 1MHz
Ta = 25°C
C_{ob}
C_{re}
OUTPUT CAPACITANCE C_{ob} (pF)
REVERSE TRANSFER CAPACITANCE C_{re} (pF)
COLLECTOR-BASE VOLTAGE V_{CB} (V)

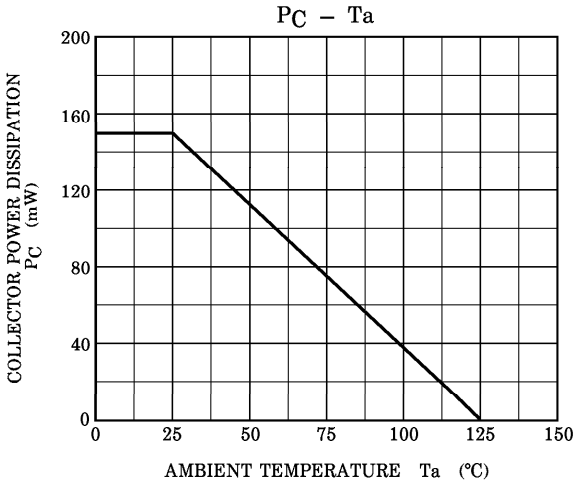

f_T – I_C
V_{CE} = 10V
Ta = 25°C
TRANSITION FREQUENCY f_T (GHz)
COLLECTOR CURRENT I_C (mA)


$|S_{21e}|^2$ – I_C
V_{CE} = 10V
f = 1GHz
Ta = 25°C
INSERTION GAIN $|S_{21e}|^2$ (dB)
COLLECTOR CURRENT I_C (mA)


$|S_{21e}|^2$ – f
V_{CE} = 10V
I_C = 20mA
Ta = 25°C
INSERTION GAIN $|S_{21e}|^2$ (dB)
FREQUENCY f (GHz)


NF – I_C
V_{CE} = 10V
f = 1GHz
Ta = 25°C
NOISE FIGURE NF (dB)
COLLECTOR CURRENT I_C (mA)





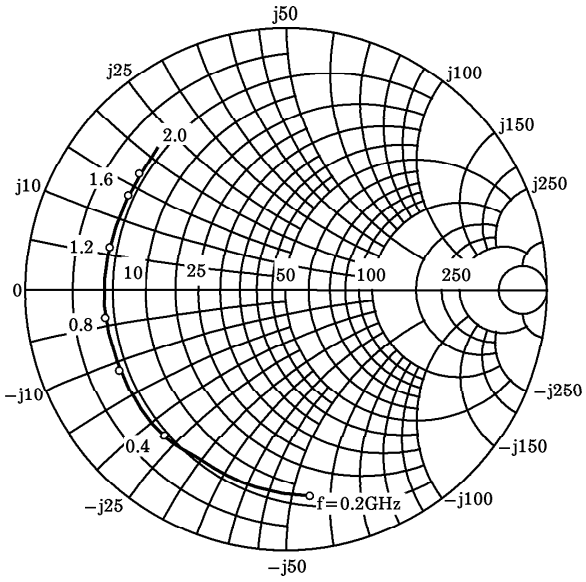
S-Parameter $Z_O = 50\Omega$, Ta = 25°C
V_{CE} = 10V, I_C = 5mA

frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.793	−82.4	11.923	133.4	0.050	52.7	0.788	−36.4
400	0.736	−128.0	7.835	108.5	0.066	38.0	0.584	−53.4
600	0.719	−152.1	5.578	94.5	0.071	34.1	0.490	−63.5
800	0.701	−168.6	4.279	84.4	0.073	33.9	0.445	−72.2
1000	0.698	178.9	3.451	76.6	0.074	36.7	0.424	−80.5
1200	0.697	168.3	2.855	69.9	0.076	40.8	0.413	−88.9
1400	0.699	159.4	2.440	64.0	0.078	46.6	0.404	−97.3
1600	0.703	150.8	2.121	59.3	0.084	52.5	0.401	−105.4
1800	0.713	142.9	1.876	54.5	0.091	58.3	0.398	−112.6
2000	0.722	134.7	1.681	50.3	0.100	63.5	0.398	−119.6

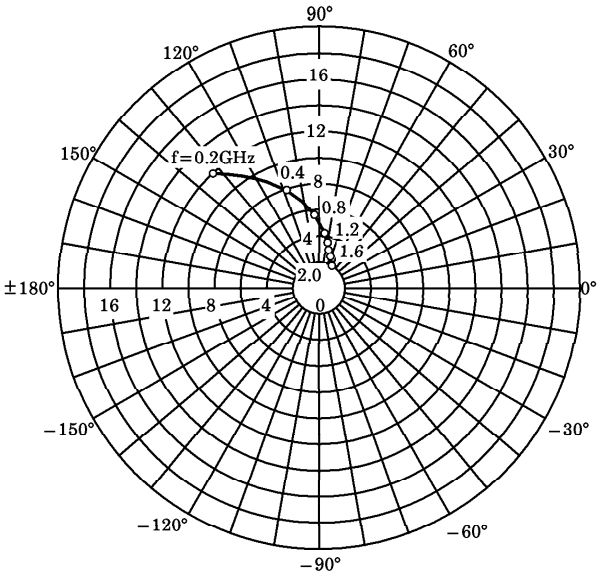
V_{CE} = 10V, I_C = 20mA

frequency	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
200	0.655	−129.4	20.724	113.2	0.031	48.0	0.496	−59.6
400	0.650	−161.5	11.288	95.5	0.040	50.4	0.319	−74.1
600	0.660	−176.3	7.643	86.4	0.049	56.4	0.263	−83.5
800	0.666	172.8	5.758	79.6	0.059	60.0	0.242	−92.9
1000	0.667	164.0	4.605	74.2	0.070	63.6	0.233	−102.0
1200	0.668	156.8	3.809	69.3	0.080	65.9	0.229	−111.0
1400	0.677	148.4	3.277	65.1	0.091	68.2	0.226	−119.1
1600	0.676	141.1	2.862	61.2	0.104	70.0	0.223	−126.5
1800	0.688	133.9	2.559	57.5	0.117	71.2	0.220	−132.4
2000	0.690	126.7	2.303	54.1	0.131	72.4	0.217	−137.8

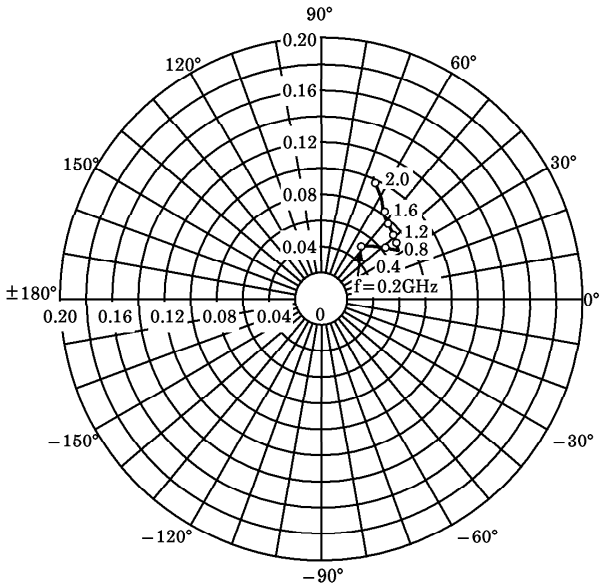
S_{11e}
V_{CE} = 10V
I_C = 5mA
Ta = 25°C
(Unit : Ω)



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



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



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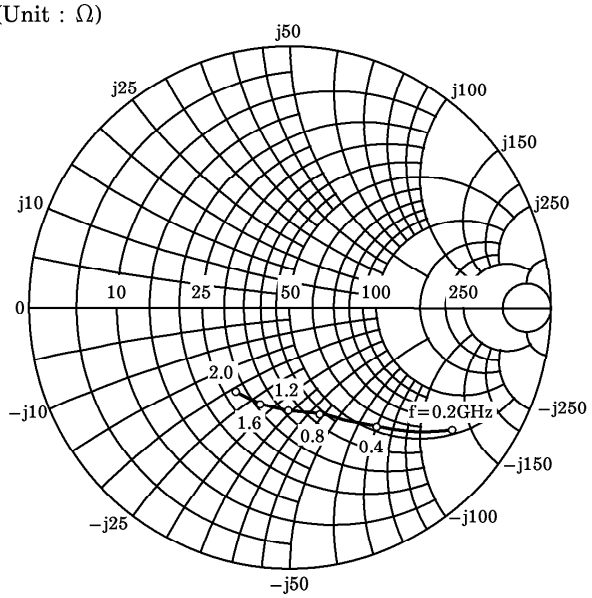

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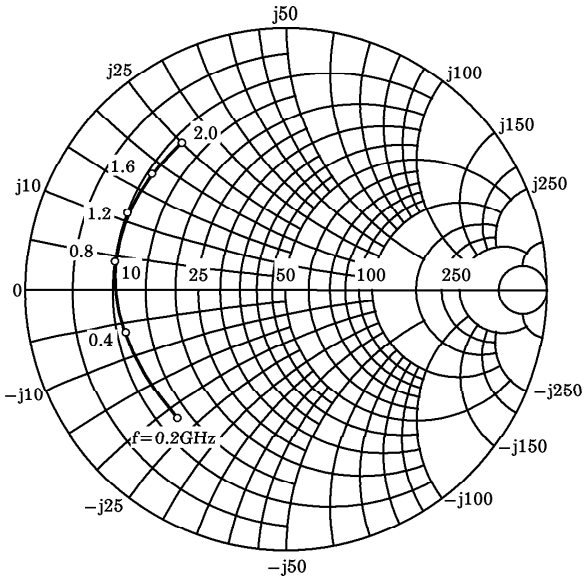

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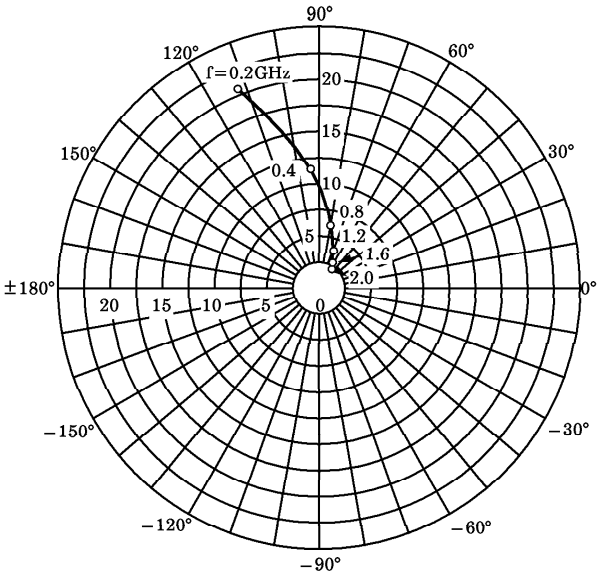

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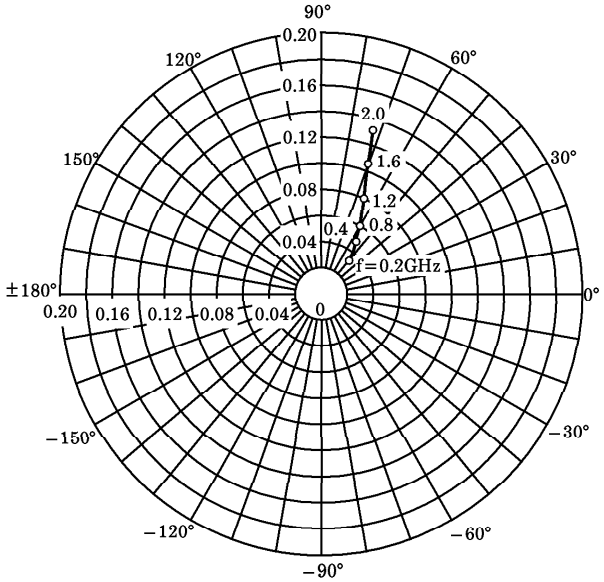

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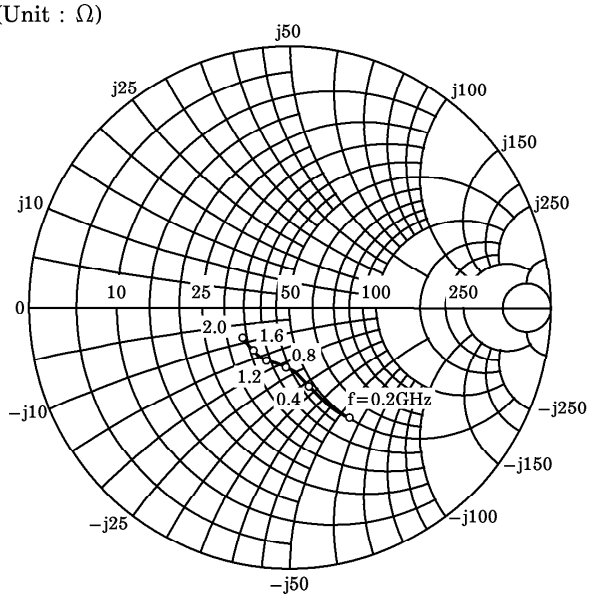

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