TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC4317

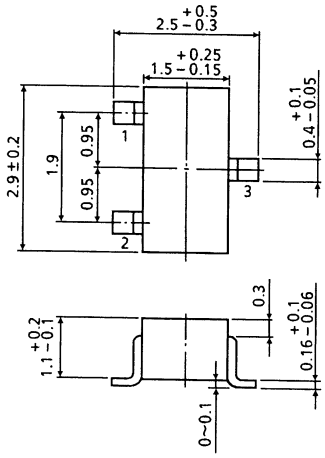
VHF~UHF Band Low Noise Amplifier Applications

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

Maximum Ratings (Ta = 25°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	150	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

Unit: mm



1. BASE
2. EMITTER
3. COLLECTOR

JEDEC	—
JEITA	SC-59
TOSHIBA	2-3F1A

Weight: 0.012 g (typ.)

Microwave Characteristics (Ta = 25°C)

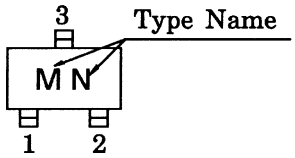
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	V_{CE} = 8 V, I_C = 20 mA	7	10	—	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 8 V, I_C = 20 mA, f = 1 GHz	10	13	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 8 V, I_C = 20 mA, f = 2 GHz	—	7	—	
Noise figure	NF (1)	V_{CE} = 8 V, I_C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

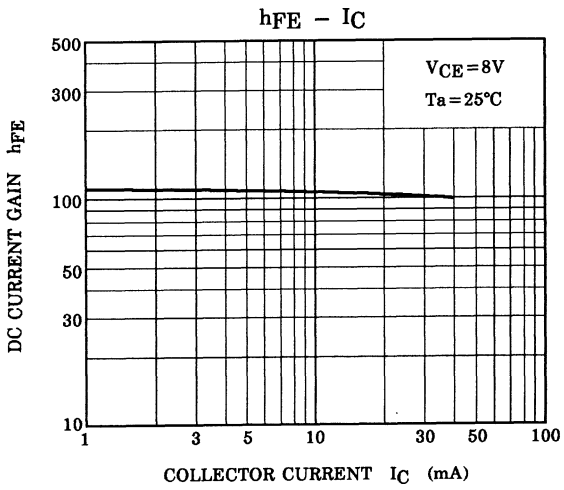
Electrical Characteristics (Ta = 25°C)

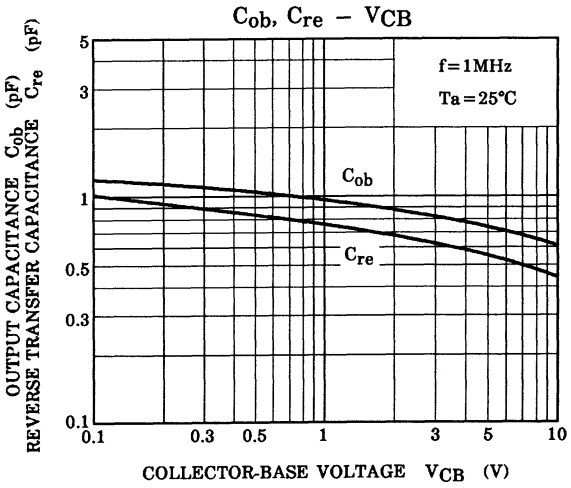
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 10 V, I_E = 0	—	—	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	1	μA
DC current gain	h_{FE}	V_{CE} = 8 V, I_C = 20 mA	50	—	250	
Output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz (Note)	—	0.65	—	pF
Reverse transfer capacitance	C_{re}		—	0.45	0.9	pF

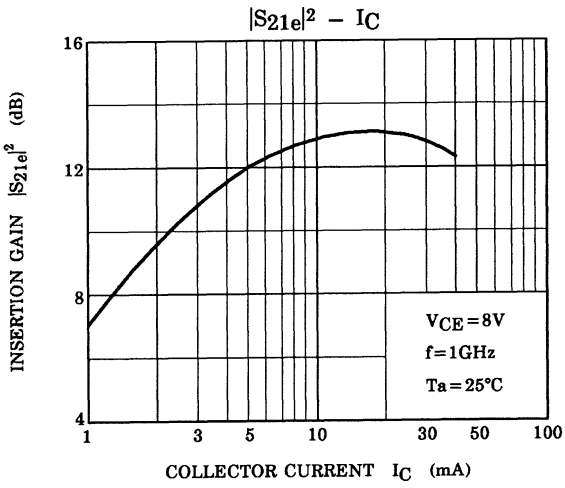
Note: C_{re} is measured by 3 terminal method with capacitance bridge.

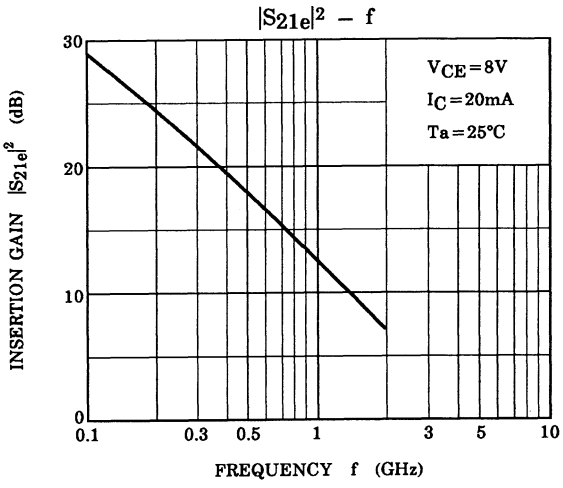
Marking

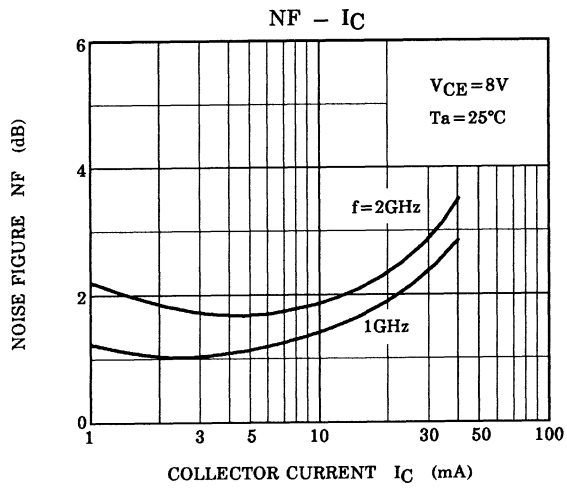


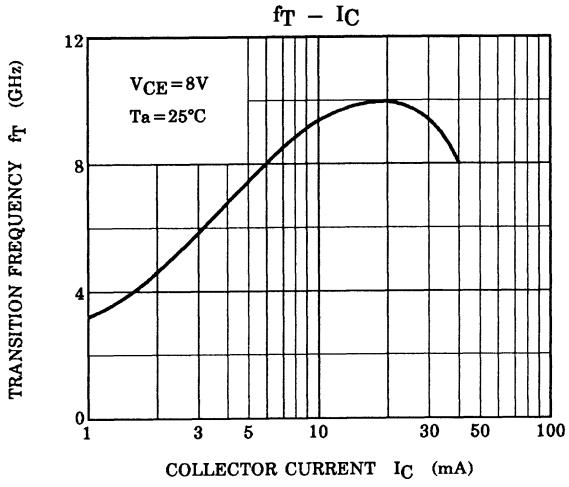

hFE – IC
VCE=8V
Ta=25°C
DC CURRENT GAIN hFE
COLLECTOR CURRENT IC (mA)

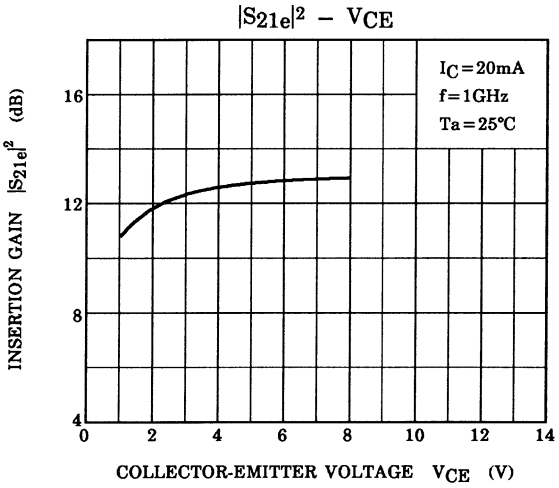

Cob, Cre – VCB
f=1MHz
Ta=25°C
Cob
Cre
OUTPUT CAPACITANCE Cob (pF)
REVERSE TRANSFER CAPACITANCE Cre (pF)
COLLECTOR-BASE VOLTAGE VCB (V)

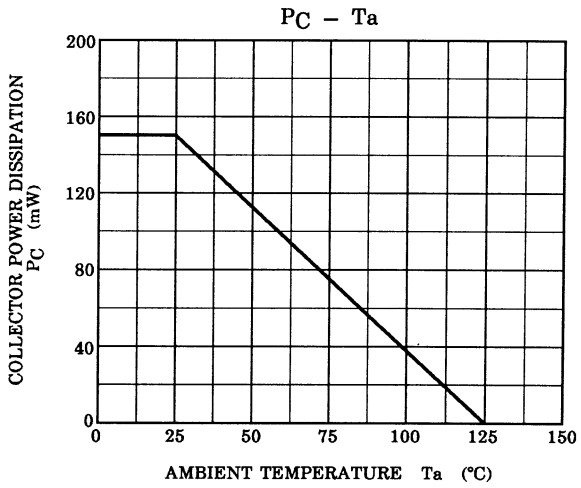

|S21e|2 – IC
VCE=8V
f=1GHz
Ta=25°C
INSERTION GAIN |S21e|2 (dB)
COLLECTOR CURRENT IC (mA)


|S21e|2 – f
VCE=8V
IC=20mA
Ta=25°C
INSERTION GAIN |S21e|2 (dB)
FREQUENCY f (GHz)


NF – IC
VCE=8V
Ta=25°C
f=2GHz
1GHz
NOISE FIGURE NF (dB)
COLLECTOR CURRENT IC (mA)


fT – IC
VCE=8V
Ta=25°C
TRANSITION FREQUENCY fT (GHz)
COLLECTOR CURRENT IC (mA)





S-Parameter Z_O = 50 Ω, Ta = 25°C

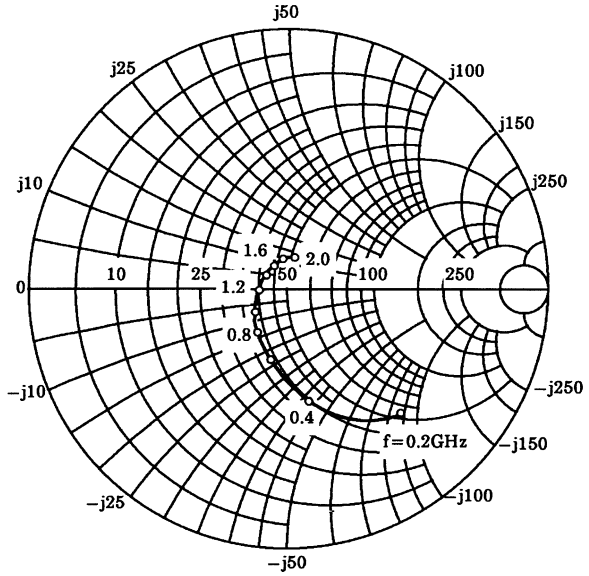
V_{CE} = 8 V, I_C = 5 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.649	–46.9	11.454	139.7	0.044	67.8	0.823	–26.1
400	0.426	–78.5	8.028	116.2	0.068	61.0	0.623	–36.4
600	0.282	–100.9	5.965	102.6	0.085	60.4	0.513	–39.5
800	0.192	–122.5	4.688	92.7	0.103	61.5	0.452	–40.3
1000	0.131	–147.7	3.856	85.4	0.121	62.6	0.422	–41.1
1200	0.099	–175.5	3.308	78.9	0.140	63.2	0.406	–42.0
1400	0.096	145.6	2.871	72.7	0.159	63.2	0.404	–43.5
1600	0.091	116.0	2.562	68.0	0.179	63.0	0.402	–45.9
1800	0.111	93.4	2.341	62.9	0.199	62.5	0.406	–49.1
2000	0.115	78.3	2.106	59.5	0.218	62.0	0.409	–53.1

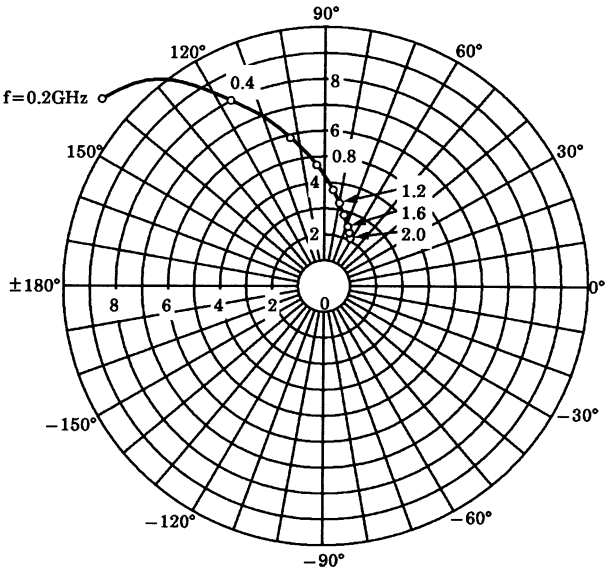
V_{CE} = 8 V, I_C = 20 mA

Frequency	S11		S21		S12		S22	
MHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
200	0.278	–78.9	18.400	118.0	0.031	71.1	0.586	–33.3
400	0.138	–120.1	10.350	99.6	0.053	73.5	0.426	–32.4
600	0.088	–159.6	7.137	90.4	0.076	74.1	0.379	–30.1
800	0.084	157.2	5.433	83.4	0.100	73.9	0.361	–29.1
1000	0.096	122.5	4.401	78.0	0.123	73.1	0.356	–29.7
1200	0.117	99.7	3.719	73.0	0.147	71.5	0.357	–31.3
1400	0.141	84.9	3.216	67.9	0.170	69.9	0.364	–33.6
1600	0.152	69.0	2.849	63.9	0.192	68.3	0.372	–37.0
1800	0.167	59.2	2.577	59.6	0.215	66.3	0.381	–41.3
2000	0.169	49.4	2.304	56.3	0.235	64.7	0.386	–46.3

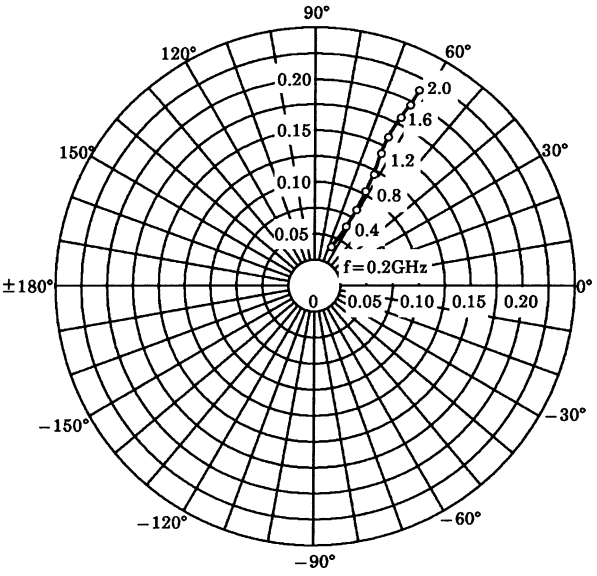
S_{11e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



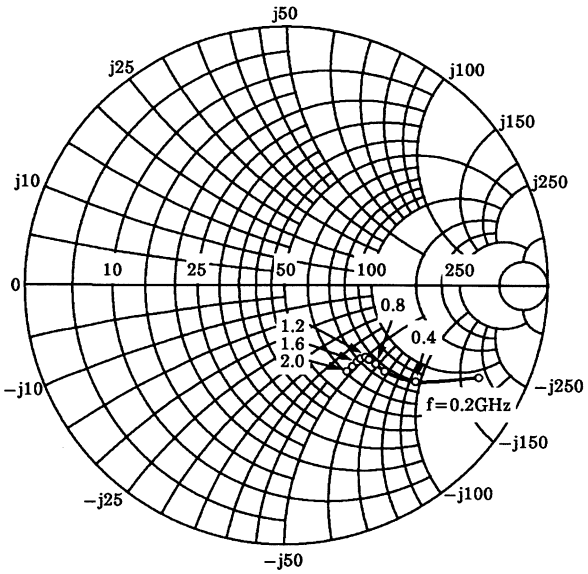
S_{21e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C



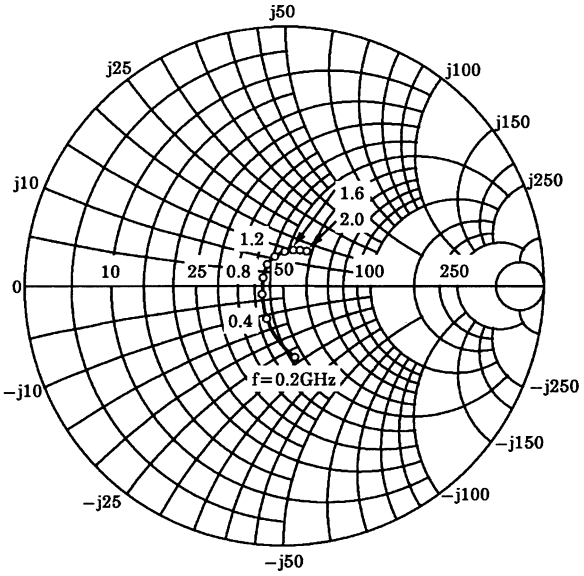
S_{12e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C



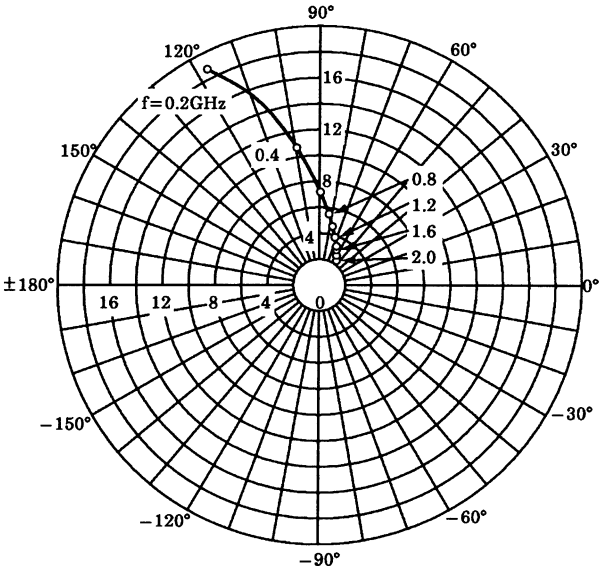
S_{22e}
V_{CE} = 8V
I_C = 5mA
Ta = 25°C
(UNIT : Ω)



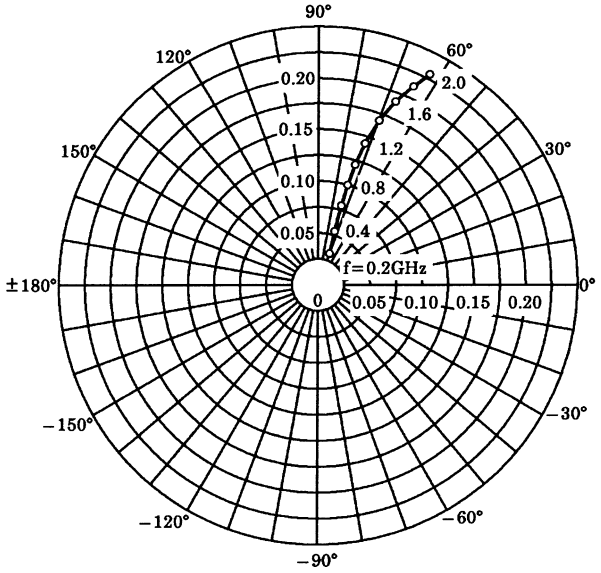
S_{11e}
V_{CE} = 8V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



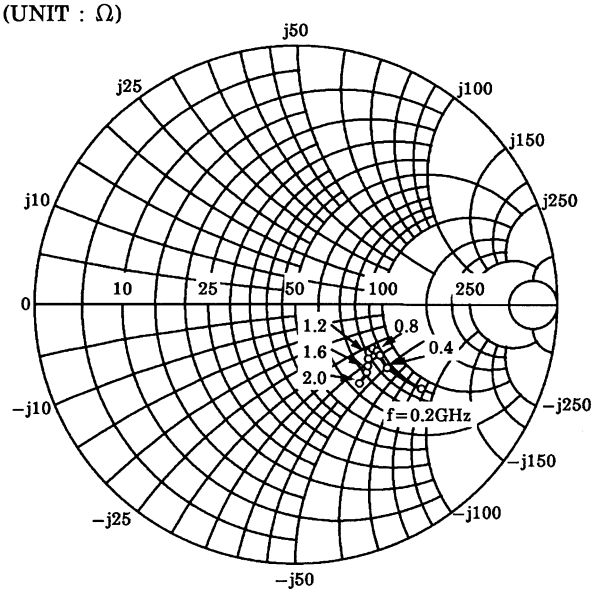
S_{21e}
V_{CE} = 8V
I_C = 20mA
Ta = 25°C



S_{12e}
V_{CE} = 8V
I_C = 20mA
Ta = 25°C



S_{22e}
V_{CE} = 8V
I_C = 20mA
Ta = 25°C
(UNIT : Ω)



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