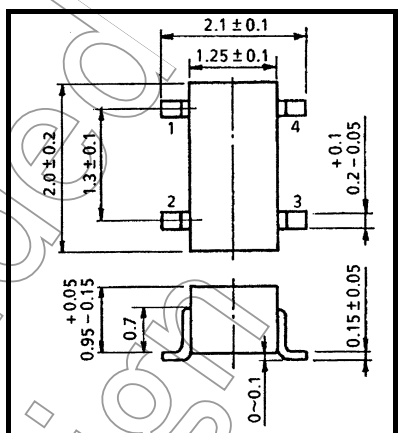
TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

2SC5319

VHF~UHF Band Low Noise Amplifier Applications

- Low noise figure: NF = 1.3dB (f = 2 GHz)
- High gain: $|S_{21e}|^2$ = 11.5dB (f = 2 GHz)

Unit: mm



1, 3	EMITTER
2	COLLECTOR
4	BASE
USQ	

JEDEC	—
JEITA	—
TOSHIBA	2-2K1A

Weight: 6 mg (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	8	V
Collector-emitter voltage	V_{CEO}	5	V
Emitter-base voltage	V_{EBO}	1.5	V
Collector current	I_C	20	mA
Base current	I_B	10	mA
Collector power dissipation	P_C	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55 to 125	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Microwave Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f_T	V_{CE} = 3 V, I_C = 15 mA	13	16	—	GHz
Insertion gain	$\|S_{21e}\|^2$ (1)	V_{CE} = 3 V, I_C = 15 mA, f = 1 GHz	14.5	17	—	dB
	$\|S_{21e}\|^2$ (2)	V_{CE} = 3 V, I_C = 15 mA, f = 2 GHz	8.5	11.5	—	
Noise figure	NF (1)	V_{CE} = 3 V, I_C = 5 mA, f = 1 GHz	—	0.9	1.8	dB
	NF (2)	V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz	—	1.3	2.2	

Electrical Characteristics (Ta = 25°C)

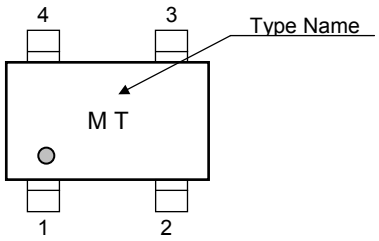
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 6 V, I_E = 0	—	—	1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 1 V, I_C = 0	—	—	1	μA
DC current gain	h_{FE}	V_{CE} = 3 V, I_C = 15 mA	50	—	250	—
Output capacitance	C_{ob}	V_{CB} = 2.5 V, I_E = 0, f = 1 MHz (Note)	—	0.6	—	pF
Reverse transfer capacitance	C_{re}		—	0.4	0.85	pF

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

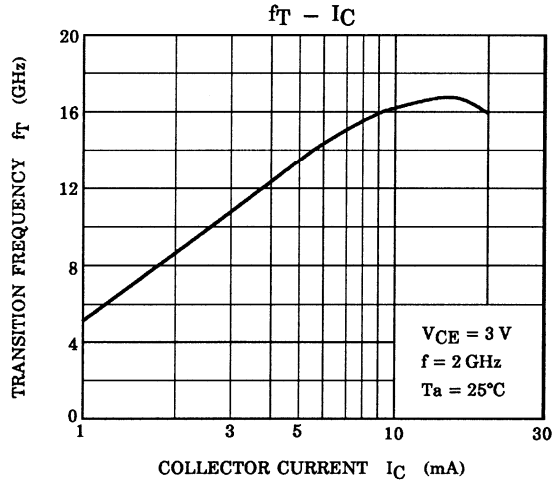
Caution

This device is sensitive to electrostatic discharge. Please handle with caution.

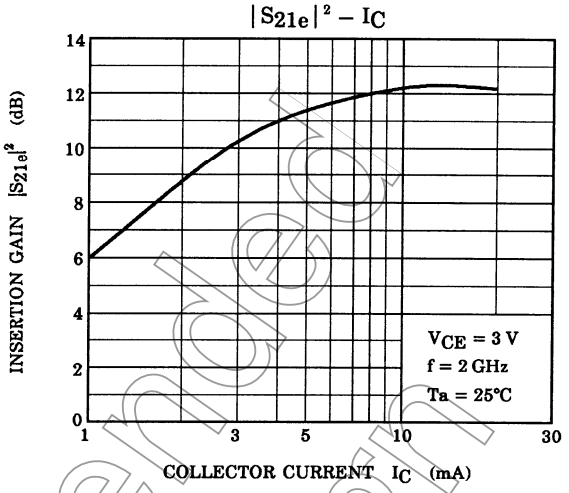
Marking



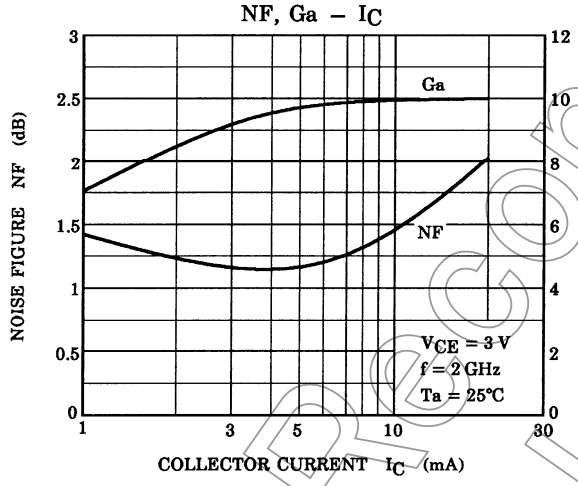
f_T – I_C



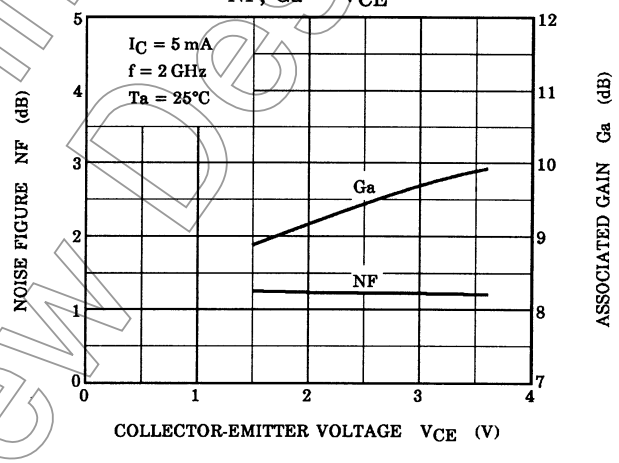
$|S_{21e}|^2$ – I_C



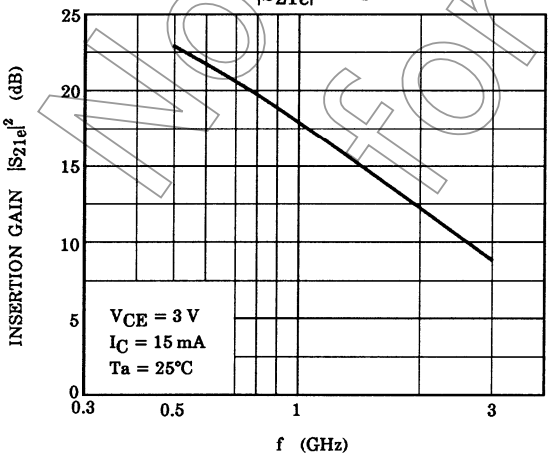
NF, Ga – I_C



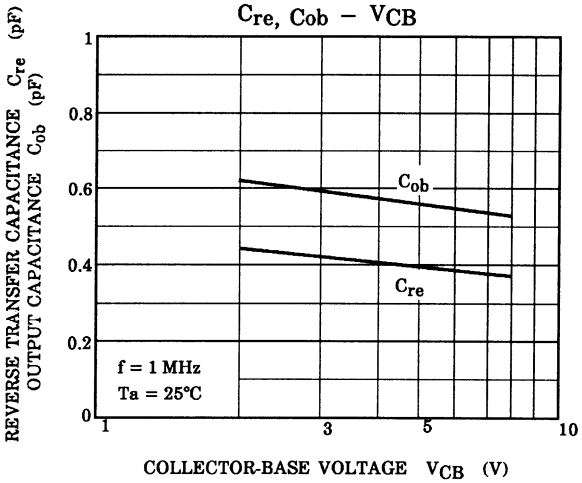
NF, Ga – V_{CE}



$|S_{21e}|^2$ – f



C_{re}, C_{ob} – V_{CB}



S-Parameter $Z_O = 50\ \Omega$, Ta = 25°C

$V_{CE} = 3$ V, $I_C = 1$ mA

f	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
800	0.838	−52.3	3.011	134.2	0.146	56.2	0.880	−38.1
900	0.813	−57.7	2.956	130.8	0.161	53.4	0.854	−40.8
1000	0.793	−62.3	2.839	125.4	0.174	49.5	0.842	−44.8
1100	0.780	−67.0	2.758	122.9	0.183	46.4	0.811	−47.9
1200	0.736	−72.6	2.584	116.6	0.194	42.6	0.798	−51.6
1300	0.733	−77.0	2.597	115.6	0.198	39.5	0.778	−54.5
1400	0.709	−82.4	2.500	109.2	0.202	38.0	0.760	−57.6
1500	0.688	−87.2	2.414	105.8	0.206	36.1	0.739	−60.7
1600	0.686	−89.8	2.331	102.2	0.213	35.7	0.728	−63.5
1700	0.668	−93.8	2.229	100.1	0.228	34.4	0.713	−66.2
1800	0.643	−97.7	2.201	95.4	0.236	30.4	0.707	−69.3
1900	0.619	−102.6	2.094	90.4	0.236	27.4	0.698	−71.5
2000	0.589	−107.3	2.003	90.5	0.239	24.9	0.686	−74.7
2100	0.593	−107.8	1.941	84.9	0.236	23.0	0.678	−76.7
2200	0.560	−112.4	1.864	86.0	0.240	22.5	0.666	−79.6
2300	0.564	−116.6	1.942	79.1	0.247	19.6	0.668	−81.8
2400	0.590	−119.3	1.753	81.6	0.239	16.5	0.656	−84.0

$V_{CE} = 3$ V, $I_C = 3$ mA

f	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
800	0.634	−83.6	6.442	118.6	0.113	48.4	0.682	−56.4
900	0.606	−91.1	6.105	114.7	0.121	45.7	0.644	−59.7
1000	0.587	−96.3	5.681	110.0	0.126	42.8	0.613	−64.2
1100	0.562	−101.2	5.375	107.1	0.131	40.8	0.582	−66.9
1200	0.528	−108.0	4.899	102.1	0.133	38.6	0.555	−70.9
1300	0.524	−113.7	4.756	100.3	0.135	37.7	0.532	−74.0
1400	0.504	−118.2	4.473	96.2	0.137	37.6	0.507	−77.1
1500	0.470	−124.2	4.223	93.0	0.140	37.0	0.489	−79.7
1600	0.480	−127.2	4.049	90.2	0.144	37.3	0.477	−82.4
1700	0.459	−128.9	3.813	88.8	0.150	35.8	0.459	−85.3
1800	0.445	−134.4	3.662	84.7	0.153	33.9	0.457	−87.7
1900	0.428	−140.0	3.441	81.0	0.153	33.3	0.442	−89.9
2000	0.424	−143.1	3.329	81.0	0.152	32.5	0.436	−92.4
2100	0.404	−145.6	3.149	77.3	0.153	33.0	0.432	−94.1
2200	0.385	−149.3	3.041	77.5	0.157	33.0	0.420	−97.2
2300	0.407	−156.7	2.999	71.6	0.159	31.6	0.421	−98.4
2400	0.437	−155.7	2.808	74.0	0.157	31.8	0.413	−100.6

V_{CE} = 3 V, I_C = 5 mA

f	S11		S21		S12		S22	
(MHz)	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
800	0.539	−101.6	7.906	110.6	0.093	47.0	0.557	−66.6
900	0.512	−109.5	7.361	106.9	0.098	45.0	0.516	−70.0
1000	0.498	−114.8	6.733	102.6	0.102	43.5	0.486	−74.0
1100	0.472	−122.2	6.308	100.0	0.105	42.9	0.455	−76.7
1200	0.461	−126.3	5.709	95.8	0.108	41.9	0.431	−80.0
1300	0.450	−131.8	5.487	94.0	0.109	41.9	0.411	−82.8
1400	0.439	−136.7	5.146	90.4	0.112	42.6	0.392	−86.0
1500	0.413	−143.8	4.796	87.9	0.116	42.8	0.377	−88.3
1600	0.435	−146.5	4.593	85.4	0.121	43.3	0.368	−90.9
1700	0.411	−146.6	4.305	83.9	0.126	42.5	0.355	−93.4
1800	0.402	−153.7	4.099	80.0	0.128	41.5	0.354	−95.7
1900	0.386	−159.0	3.870	77.6	0.129	41.5	0.343	−97.9
2000	0.386	−161.9	3.729	77.2	0.131	41.4	0.340	−99.9
2100	0.369	−164.5	3.519	74.1	0.133	42.4	0.337	−101.7
2200	0.368	−168.2	3.407	74.2	0.138	42.6	0.332	−104.1
2300	0.378	−172.1	3.339	69.1	0.140	41.8	0.334	−105.2
2400	0.398	−170.2	3.153	71.0	0.140	42.4	0.328	−107.2

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