

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

# MT3S03AT

VHF~UHF Band Low Noise Amplifier Applications

Unit: mm

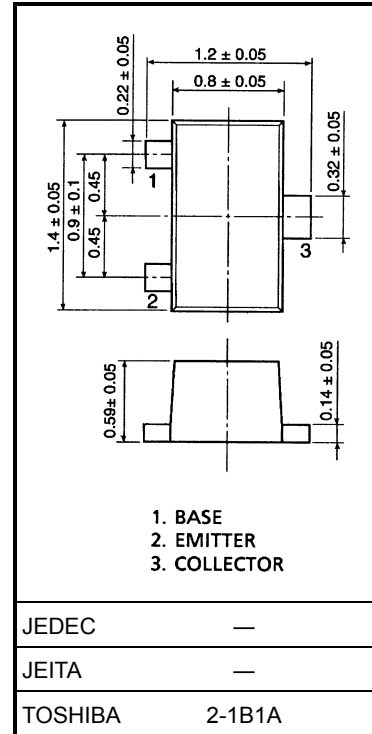
- Low noise figure: NF = 1.4dB (at f = 2 GHz)
- High gain: gain = 8dB (at f = 2 GHz)

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V <sub>CBO</sub>	10	V
Collector-emitter voltage	V <sub>CEO</sub>	5	V
Emitter-base voltage	V <sub>EBO</sub>	2	V
Collector current	I <sub>C</sub>	40	mA
Base current	I <sub>B</sub>	10	mA
Collector power dissipation	P <sub>C</sub>	100	mW
Junction temperature	T <sub>J</sub>	125	°C
Storage temperature range	T <sub>stg</sub>	-55~125	°C

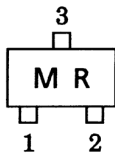
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).



Weight: 0.0022 g (typ.)

### Marking



### Microwave Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f <sub>T</sub> (1)	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA	5	7	—	GHz
	f <sub>T</sub> (2)	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 10 mA	7	10	—	
Insertion gain	S <sub>21e</sub>   <sup>2</sup> (1)	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	—	5.5	—	dB
	S <sub>21e</sub>   <sup>2</sup> (2)	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 20 mA, f = 2 GHz	6	8	—	
Noise figure	NF (1)	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	—	1.7	3	dB
	NF (2)	V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA, f = 2 GHz	—	1.4	2.2	

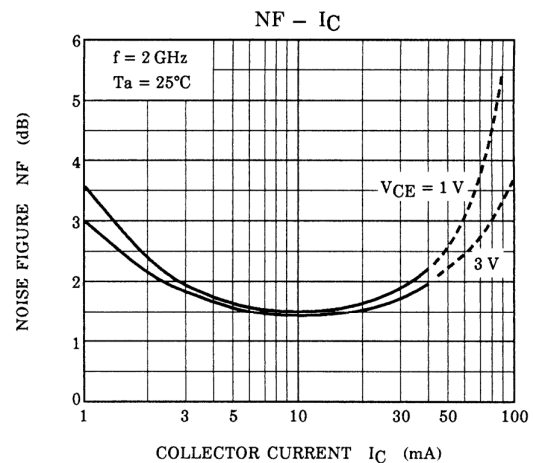
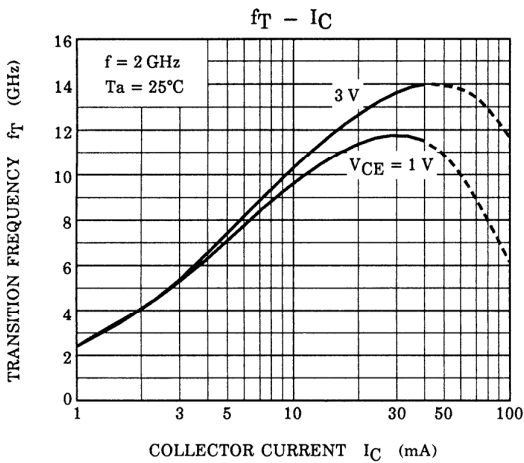
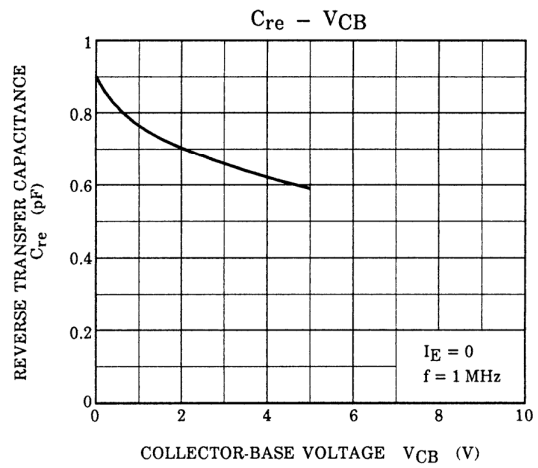
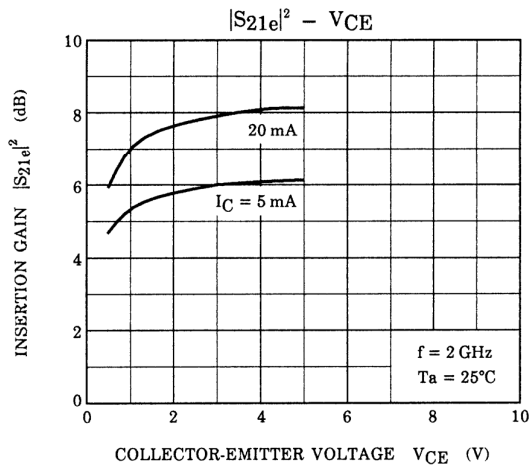
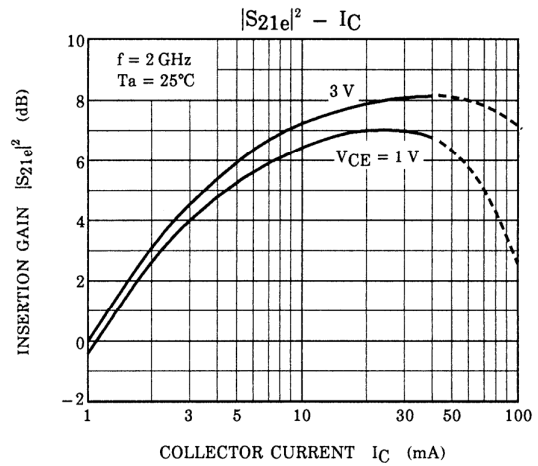
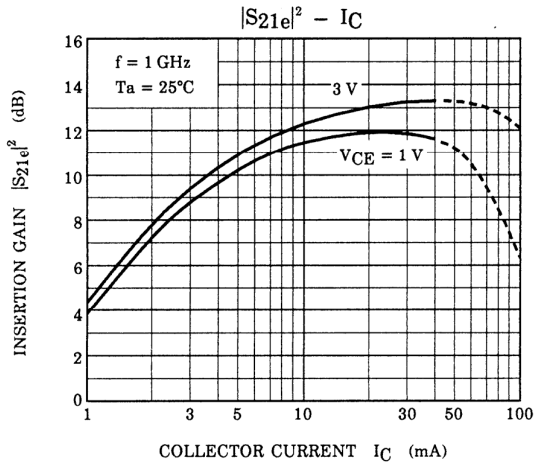
**Electrical Characteristics (Ta = 25°C)**

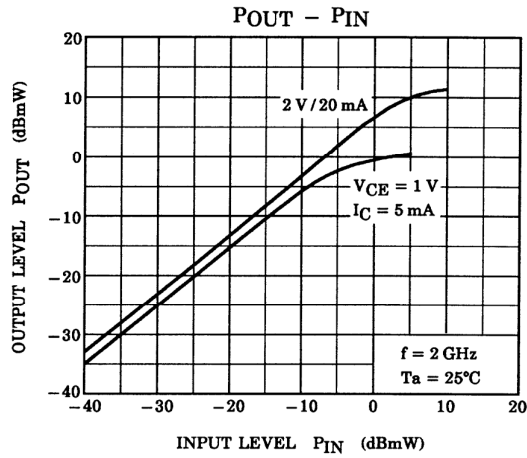
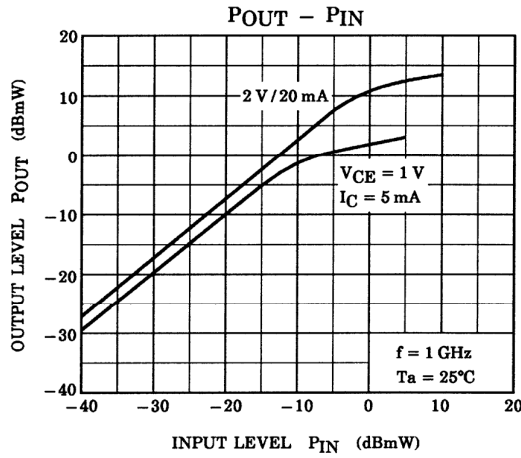
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = 5\text{ V}, I_E = 0$	—	—	0.1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 1\text{ V}, I_C = 0$	—	—	1	$\mu\text{A}$
DC current gain	$h_{FE}$	$V_{CE} = 1\text{ V}, I_C = 5\text{ mA}$	80	—	160	
Reverse transfer capacitance	$C_{re}$	$V_{CB} = 1\text{ V}, I_E = 0, f = 1\text{ MHz}$ (Note)	—	0.75	1.1	$\text{pF}$

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

**Caution**

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





MT3S03AT

$V_{CE} = 1\text{ V}$ ,  $I_C = 5\text{ mA}$ ,  $f = 100\sim 2000\text{ MHz}$  Step 100 MHz

Frequency (MHz)	S11		S21		S12		S22		$ S_{21} ^2$ (dB)
	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	
100	0.829	-42.09	13.97	152.75	0.044	67.95	0.872	-26.75	22.91
200	0.697	-74.86	11.12	131.99	0.071	55.16	0.695	-46.64	20.93
300	0.607	-98.64	8.78	119.37	0.086	48.94	0.548	-58.76	18.87
400	0.537	-116.18	7.10	110.48	0.095	46.46	0.442	-67.42	17.02
500	0.499	-130.11	5.91	103.78	0.102	45.94	0.372	-73.36	15.43
600	0.476	-140.68	5.05	98.73	0.109	46.82	0.320	-78.15	14.07
700	0.459	-149.97	4.42	94.75	0.116	47.94	0.283	-81.90	12.90
800	0.445	-157.67	3.93	91.11	0.123	49.17	0.255	-84.50	11.88
900	0.437	-164.71	3.55	88.00	0.130	50.80	0.233	-86.64	10.99
1000	0.430	-170.88	3.22	85.10	0.138	52.41	0.214	-88.82	10.17
1100	0.424	-176.25	2.96	82.46	0.146	53.41	0.202	-90.56	9.42
1200	0.421	179.03	2.76	80.09	0.154	54.93	0.191	-91.76	8.81
1300	0.413	174.76	2.59	77.80	0.163	56.15	0.181	-93.92	8.26
1400	0.414	170.58	2.43	75.44	0.172	57.35	0.174	-93.26	7.71
1500	0.408	166.41	2.29	73.26	0.181	57.94	0.172	-93.59	7.18
1600	0.407	162.15	2.18	71.49	0.191	59.12	0.165	-94.64	6.76
1700	0.400	158.83	2.08	69.51	0.201	59.83	0.163	-95.43	6.38
1800	0.395	155.08	2.00	67.45	0.213	60.20	0.166	-94.98	6.00
1900	0.394	152.17	1.91	65.71	0.224	60.47	0.167	-95.20	5.63
2000	0.391	148.78	1.85	63.69	0.234	60.42	0.166	-96.54	5.34

**V<sub>CE</sub> = 2 V, I<sub>C</sub> = 20 mA, f = 100~2000 MHz Step 100 MHz**

Frequency (MHz)	S11		S21		S12		S22		S <sub>21</sub>   <sup>2</sup> (dB)
	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	
100	0.537	-80.38	30.70	132.46	0.027	62.04	0.622	-52.35	29.74
200	0.435	-120.48	18.94	112.69	0.040	59.57	0.389	-76.84	25.55
300	0.400	-142.77	13.32	104.00	0.051	62.40	0.276	-90.44	22.49
400	0.384	-154.99	10.24	98.52	0.062	65.36	0.213	-101.30	20.21
500	0.373	-165.10	8.30	94.44	0.074	67.95	0.174	-109.99	18.38
600	0.370	-172.70	6.96	91.41	0.086	69.26	0.149	-117.89	16.85
700	0.367	-178.98	6.01	88.83	0.098	70.37	0.130	-124.15	15.58
800	0.364	175.68	5.32	86.47	0.110	71.06	0.114	-129.15	14.52
900	0.365	170.51	4.77	84.51	0.123	71.31	0.102	-133.86	13.57
1000	0.363	165.94	4.30	82.50	0.136	71.64	0.092	-138.99	12.67
1100	0.362	162.06	3.96	80.56	0.148	71.54	0.083	-142.41	11.95
1200	0.356	158.37	3.66	78.86	0.162	71.29	0.074	-144.85	11.28
1300	0.354	154.54	3.42	77.07	0.174	71.27	0.067	-145.86	10.67
1400	0.347	150.55	3.19	75.49	0.188	70.88	0.059	-144.94	10.09
1500	0.344	147.06	3.02	73.43	0.201	70.44	0.053	-143.48	9.60
1600	0.341	143.15	2.85	72.09	0.214	70.07	0.046	-142.20	9.09
1700	0.334	140.08	2.73	70.46	0.229	69.53	0.042	-137.65	8.72
1800	0.329	136.43	2.61	68.56	0.242	68.74	0.042	-124.50	8.33
1900	0.323	133.53	2.49	67.10	0.256	67.93	0.043	-114.28	7.93
2000	0.320	131.09	2.40	65.14	0.269	66.91	0.044	-110.52	7.61

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20070701-EN GENERAL

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