

Preliminary

TOSHIBA Transistor Silicon NPN Epitaxial Planar Type

MT3S04AT

VHF~UHF Band Low Noise Amplifier Applications

- Low noise figure: NF = 1.2dB (at f = 1 GHz)
- High gain: gain = 12.5dB (at f = 1 GHz)

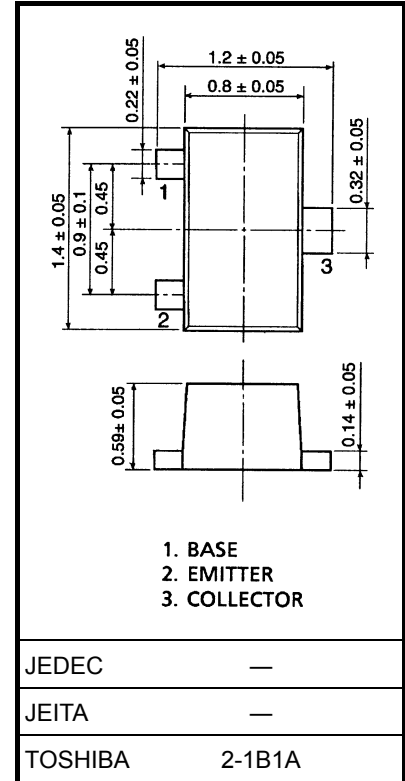
Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V _{CBO}	10	V
Collector-emitter voltage	V _{CEO}	5	V
Emitter-base voltage	V _{EBO}	2	V
Collector current	I _C	40	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}	-55~125	°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.

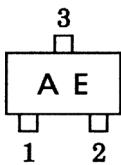
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm



Weight: 0.0022 g (typ.)

Marking



Microwave Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Transition frequency	f _T (1)	V _{CE} = 1 V, I _C = 5 mA	2	5	—	GHz
	f _T (2)	V _{CE} = 3 V, I _C = 7 mA	5	7	—	
Insertion gain	S _{21e} ² (1)	V _{CE} = 1 V, I _C = 5 mA, f = 1 GHz	—	9.5	—	dB
	S _{21e} ² (2)	V _{CE} = 3 V, I _C = 20 mA, f = 1 GHz	7.5	12.5	—	
Noise figure	NF (1)	V _{CE} = 1 V, I _C = 5 mA, f = 1 GHz	—	1.3	2.2	dB
	NF (2)	V _{CE} = 3 V, I _C = 7 mA, f = 1 GHz	—	1.2	2	

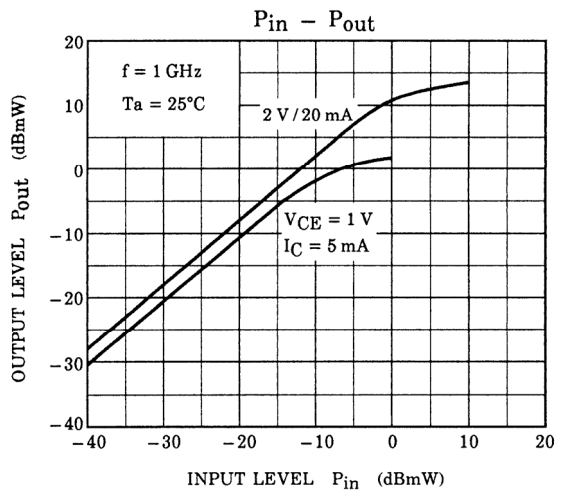
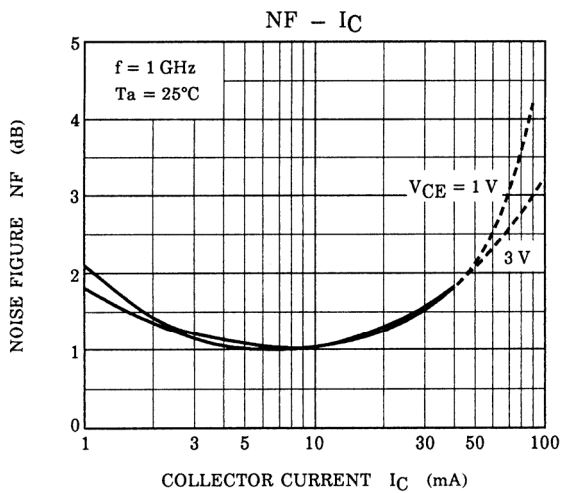
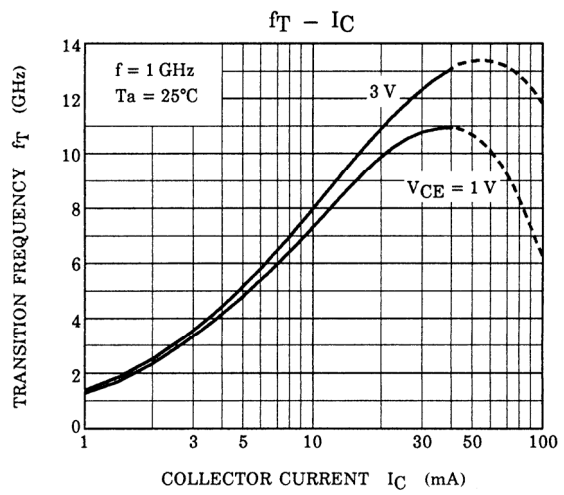
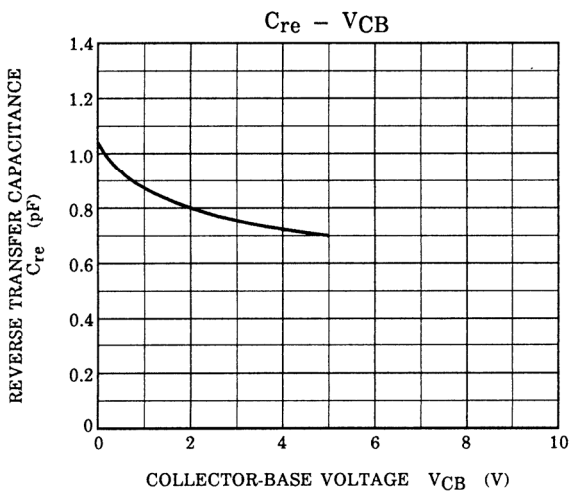
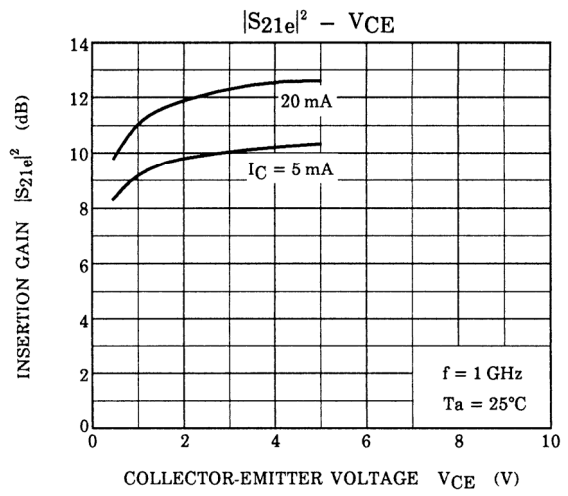
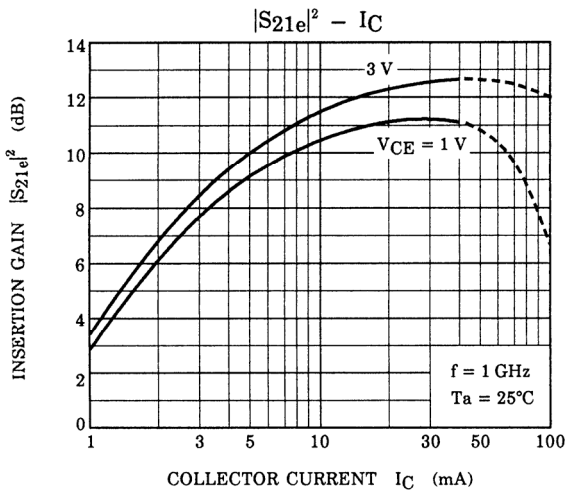
Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	$V_{CB} = 5\text{ V}, I_E = 0$	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 1\text{ V}, I_C = 0$	—	—	1	μA
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)	—	0.8	1.15	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.



MT3S04AT

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

Frequency (MHz)	S11		S21		S12		S22		$ S_{21} ^2$ (dB)
	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	
100	0.816	-48.89	13.75	149.67	0.049	64.97	0.852	-30.42	22.76
200	0.686	-85.00	10.54	128.17	0.076	51.20	0.653	-51.66	20.45
300	0.610	-109.35	8.12	115.66	0.090	45.33	0.505	-64.15	18.20
400	0.559	-126.76	6.48	107.22	0.098	43.17	0.405	-73.06	16.23
500	0.526	-139.44	5.37	100.75	0.105	43.43	0.339	-79.36	14.60
600	0.516	-149.53	4.56	96.01	0.111	44.45	0.293	-84.60	13.18
700	0.501	-157.99	3.98	92.10	0.118	45.80	0.261	-88.72	12.00
800	0.493	-165.14	3.54	88.53	0.124	47.29	0.236	-91.79	10.98
900	0.486	-171.28	3.20	85.67	0.131	49.22	0.217	-94.32	10.09
1000	0.490	-176.87	2.90	82.78	0.139	51.08	0.201	-97.21	9.24
1100	0.484	178.22	2.66	80.10	0.146	52.49	0.190	-99.41	8.51
1200	0.484	174.28	2.49	77.64	0.155	54.22	0.181	-101.16	7.91
1300	0.480	170.08	2.33	75.44	0.164	55.64	0.174	-103.20	7.35
1400	0.473	166.43	2.19	72.97	0.173	56.93	0.167	-103.80	6.82
1500	0.473	162.63	2.06	70.84	0.182	57.73	0.166	-104.40	6.27
1600	0.469	158.99	1.97	68.89	0.192	59.02	0.160	-105.95	5.88
1700	0.473	155.89	1.89	67.16	0.203	59.92	0.158	-107.11	5.53
1800	0.464	152.54	1.81	65.21	0.215	60.32	0.161	-107.08	5.15
1900	0.463	149.55	1.74	63.48	0.226	60.67	0.161	-107.22	4.83
2000	0.464	146.87	1.68	61.59	0.238	60.90	0.162	-108.95	4.53

$V_{CE} = 2\text{ V}$, $I_C = 20\text{ mA}$, $f = 100\sim 2000\text{ MHz}$ Step 100 MHz

Frequency (MHz)	S11		S21		S12		S22		$ S_{21} ^2$ (dB)
	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	Mag.	Ang. (°)	
100	0.536	-90.31	29.46	129.33	0.029	59.49	0.596	-59.40	29.39
200	0.462	-130.75	17.64	110.31	0.042	58.05	0.370	-86.77	24.93
300	0.445	-149.81	12.32	102.15	0.053	61.13	0.268	-102.96	21.81
400	0.433	-161.41	9.41	97.08	0.064	64.57	0.215	-116.12	19.47
500	0.427	-169.45	7.64	93.09	0.076	67.06	0.183	-126.70	17.66
600	0.427	-176.63	6.40	90.18	0.089	68.69	0.164	-135.72	16.12
700	0.423	177.97	5.53	87.75	0.101	69.89	0.150	-143.08	14.86
800	0.422	173.10	4.88	85.47	0.114	70.55	0.138	-149.03	13.77
900	0.418	168.35	4.39	83.32	0.127	70.97	0.129	-154.68	12.85
1000	0.425	164.00	3.97	81.32	0.141	71.09	0.121	-160.16	11.97
1100	0.419	160.48	3.64	79.52	0.154	71.23	0.113	-164.23	11.21
1200	0.411	157.05	3.38	77.68	0.168	71.16	0.106	-168.21	10.59
1300	0.409	154.44	3.15	76.21	0.181	71.02	0.100	-171.05	9.96
1400	0.404	150.35	2.96	74.27	0.195	70.62	0.091	-173.86	9.44
1500	0.404	147.01	2.80	72.39	0.209	70.10	0.084	-175.05	8.93
1600	0.398	143.59	2.65	70.94	0.223	69.74	0.077	-178.11	8.46
1700	0.392	140.49	2.53	69.29	0.238	69.22	0.071	-178.40	8.05
1800	0.390	137.58	2.44	67.83	0.252	68.32	0.064	-173.59	7.74
1900	0.382	134.91	2.31	66.00	0.266	67.50	0.058	-169.49	7.28
2000	0.375	132.78	2.24	64.34	0.280	66.58	0.055	-168.62	7.02

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20070701-EN GENERAL

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