

TENTATIVE

TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

MT3S04AT

VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

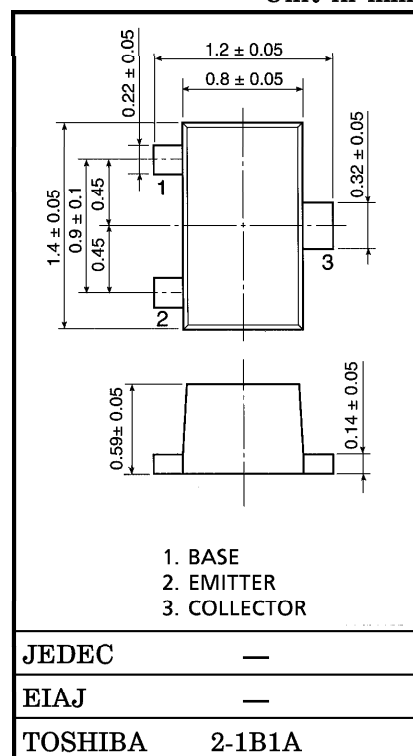
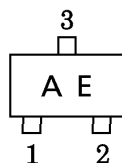
Unit in mm

- Low Noise Figure : $NF = 1.2 \text{ dB}$ (at $f = 1 \text{ GHz}$)
- High Gain : $\text{Gain} = 12.5 \text{ dB}$ (at $f = 1 \text{ GHz}$)

MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	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	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	$-55 \sim 125$	$^\circ\text{C}$

MARKING



Weight : 0.0022 g

MICROWAVE CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Transition Frequency	$f_T(1)$	$V_{CE} = 1 \text{ V}, I_C = 5 \text{ mA}$	2	5	—	GHz
	$f_T(2)$	$V_{CE} = 3 \text{ V}, I_C = 7 \text{ mA}$	5	7	—	
Insertion Gain	$ S_{21e} ^2(1)$	$V_{CE} = 1 \text{ V}, I_C = 5 \text{ mA}, f = 1 \text{ GHz}$	—	9.5	—	dB
	$ S_{21e} ^2(2)$	$V_{CE} = 3 \text{ V}, I_C = 20 \text{ mA}, f = 1 \text{ GHz}$	7.5	12.5	—	
Noise Figure	NF (1)	$V_{CE} = 1 \text{ V}, I_C = 5 \text{ mA}, f = 1 \text{ GHz}$	—	1.3	2.2	dB
	NF (2)	$V_{CE} = 3 \text{ V}, I_C = 7 \text{ mA}, f = 1 \text{ GHz}$	—	1.2	2	

000707EAA2

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

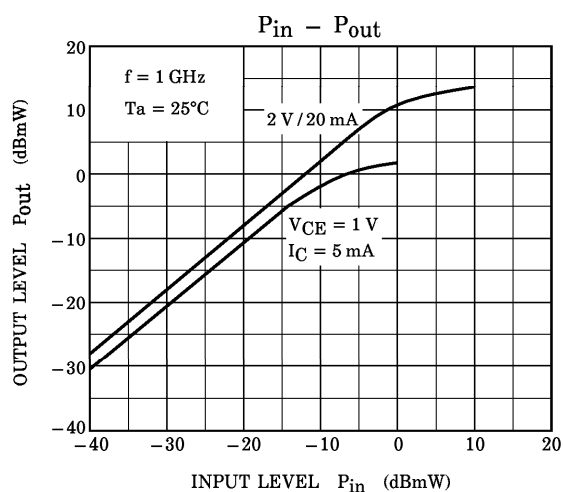
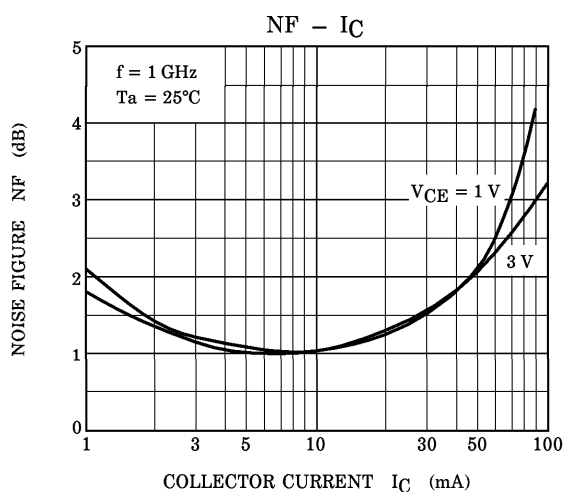
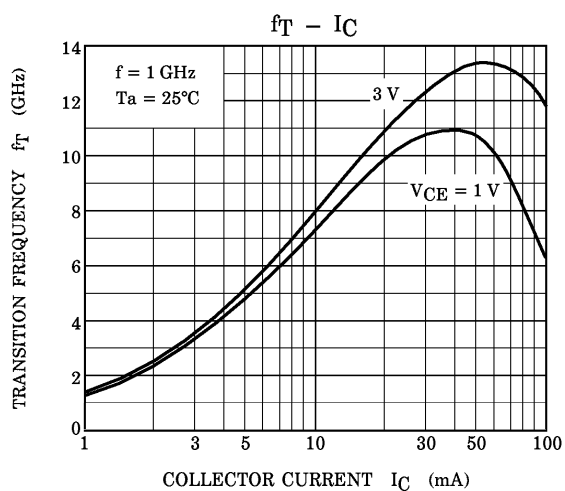
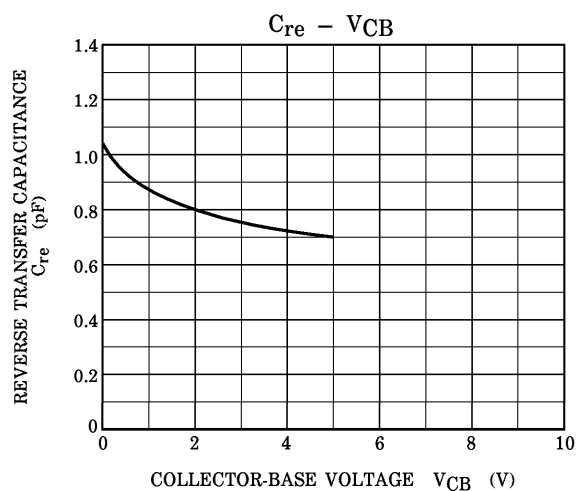
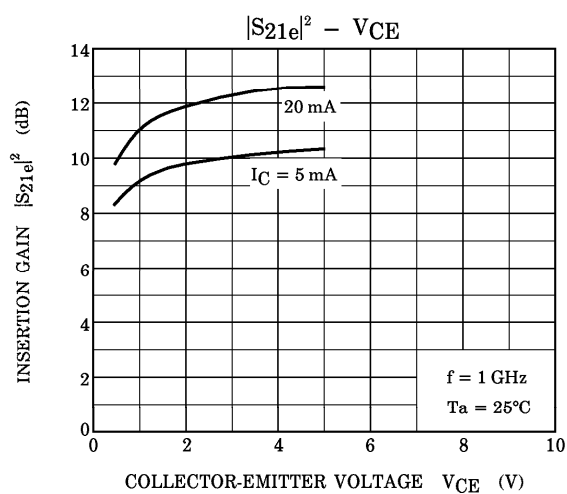
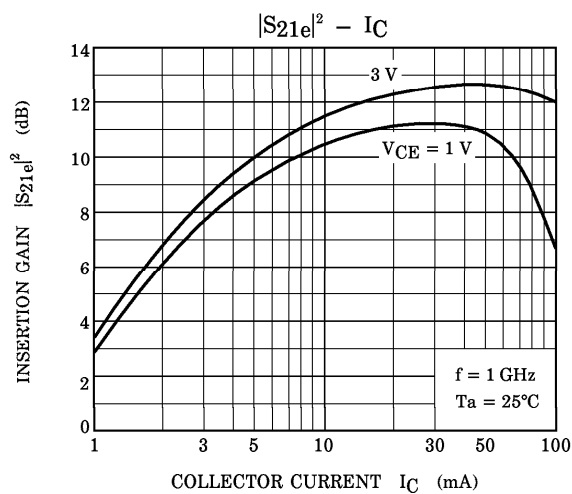
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	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 electrostatic sensitivity. Please handle with caution.



MT3S04AT

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

frequency (MHz)	S11		S21		S12		S22		S21 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

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

frequency (MHz)	S11		S21		S12		S22		S21 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