

TOSHIBA**MT3S04AT**

TENTATIVE

TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

MT3S04AT

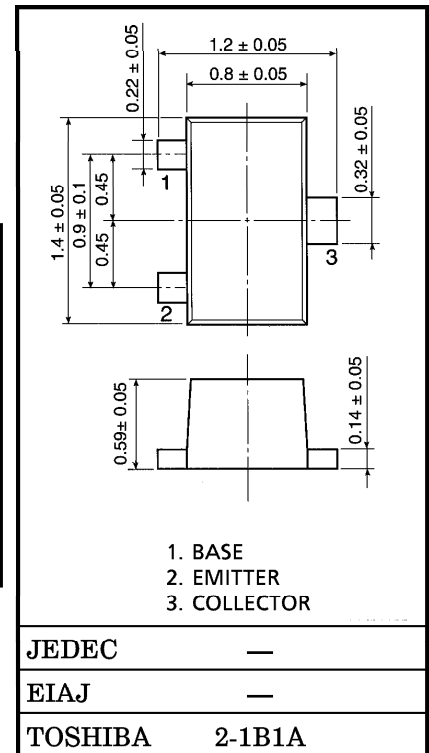
VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

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 $f = 1 \text{ GHz}$)

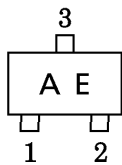
MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|-----------------------------|-----------|---------|------------------|
| Collector-Base Voltage | V_{CB0} | 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} | -55~125 | $^\circ\text{C}$ |



Weight : 0.0022 g

MARKING

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 | |

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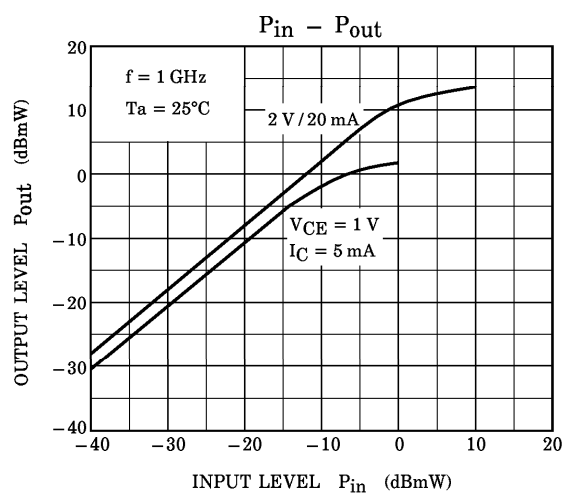
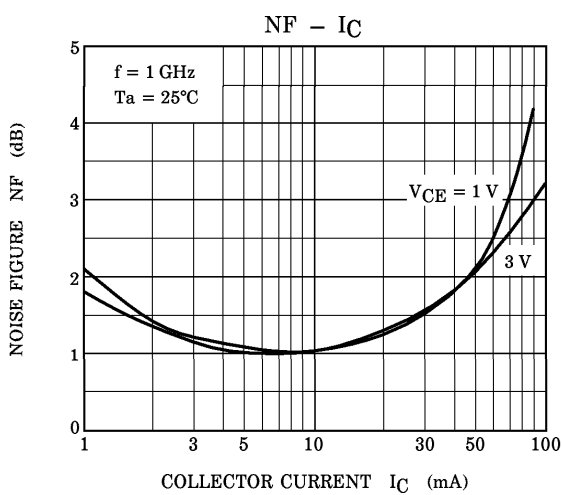
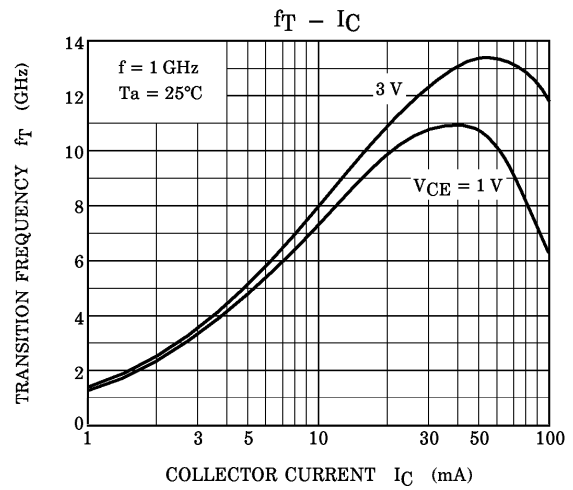
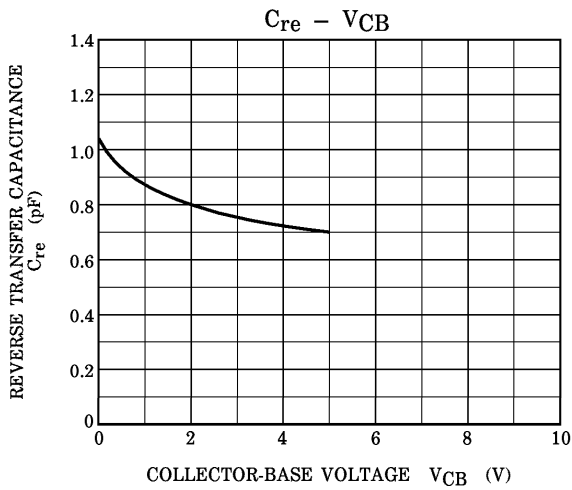
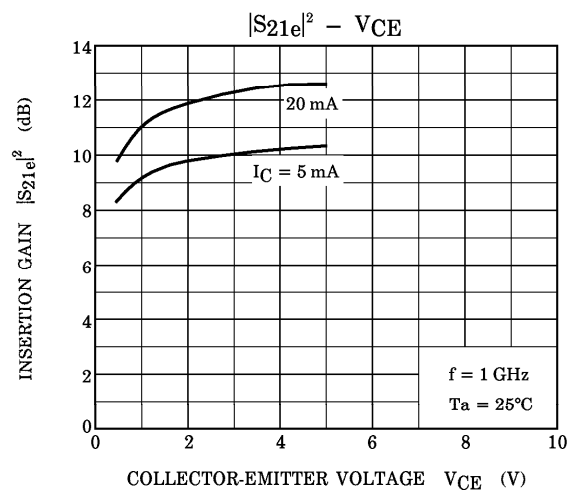
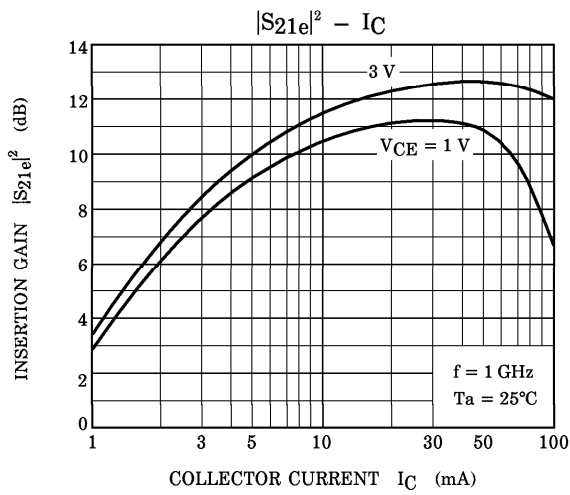
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| 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 |

