

TENTATIVE

TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL PLANAR TYPE

# MT3S03AT

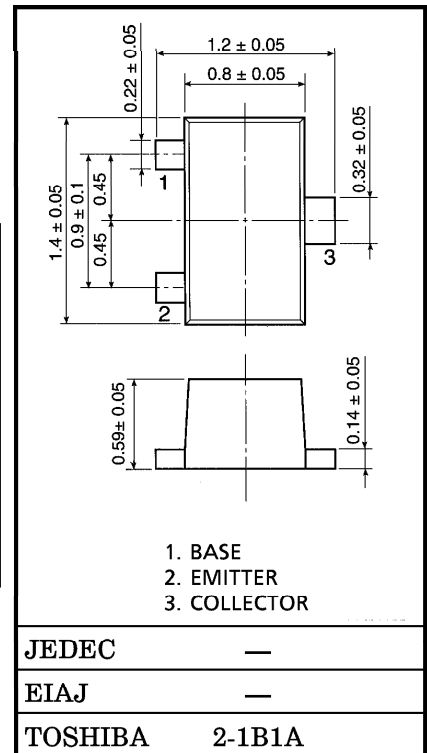
VHF~UHF BAND LOW NOISE AMPLIFIER APPLICATIONS

Unit in mm

- Low Noise Figure : NF = 1.4 dB (at f = 2 GHz)
- High Gain : Gain = 8 dB (at f = 2 GHz)

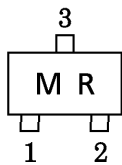
MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC              | SYMBOL           | RATING  | UNIT |
|-----------------------------|------------------|---------|------|
| Collector-Base Voltage      | V <sub>CB0</sub> | 10      | V    |
| Collector-Emitter Voltage   | V <sub>CEO</sub> | 5       | V    |
| Emitter-Base Voltage        | V <sub>EB0</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   |



Weight : 0.0022 g

MARKING



MICROWAVE CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC       | 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  |      |

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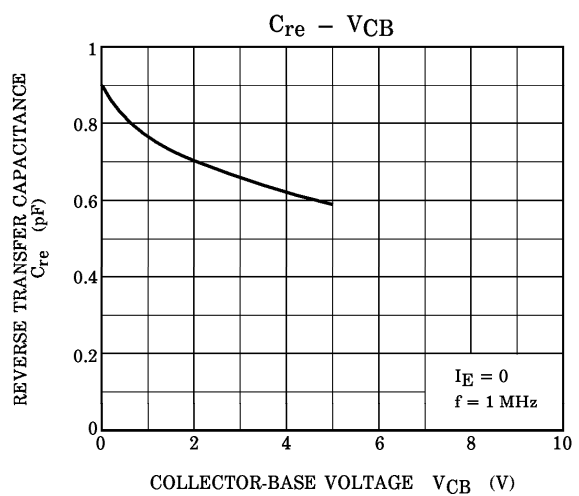
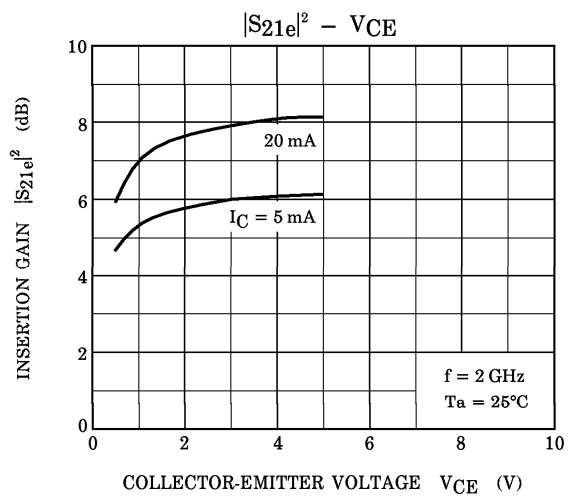
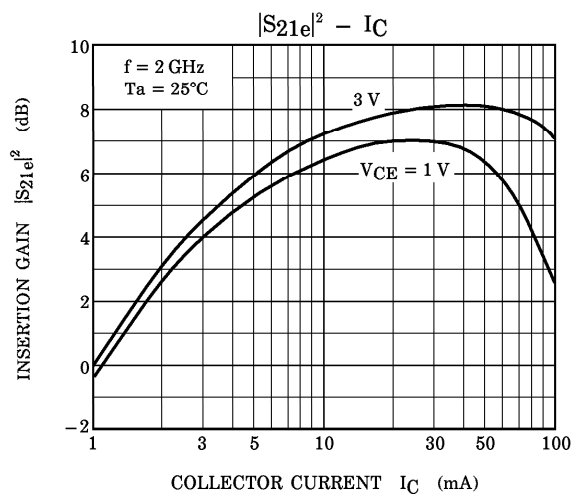
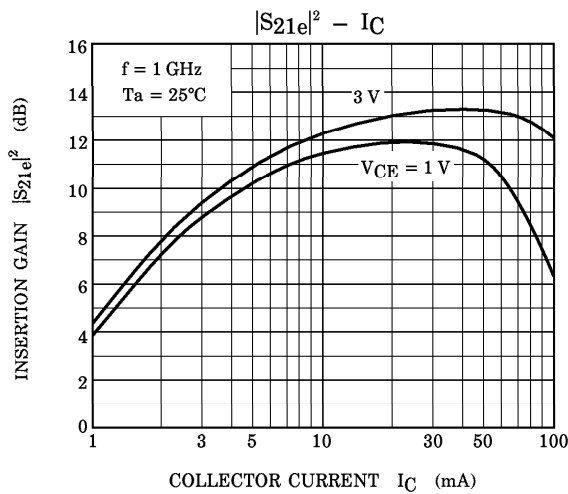
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

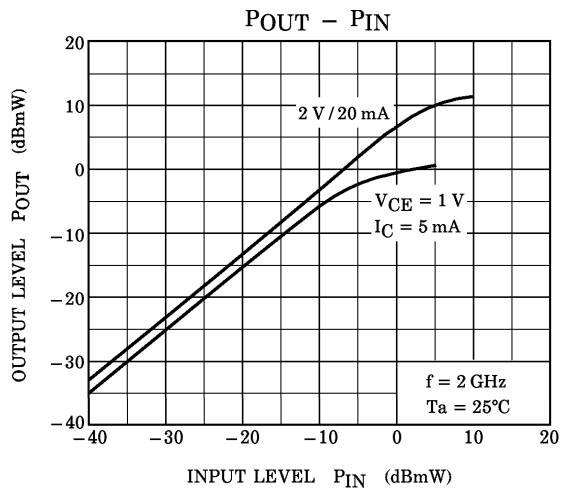
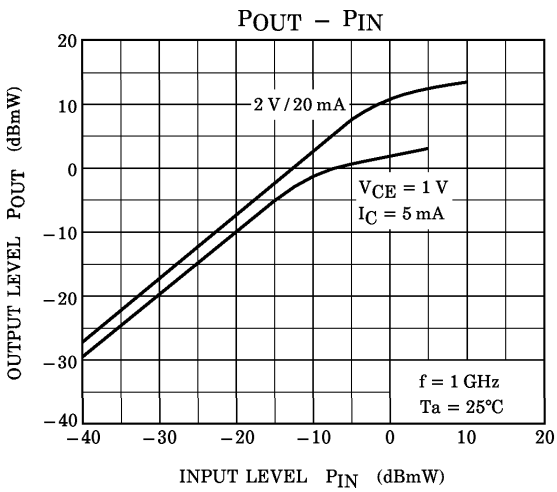
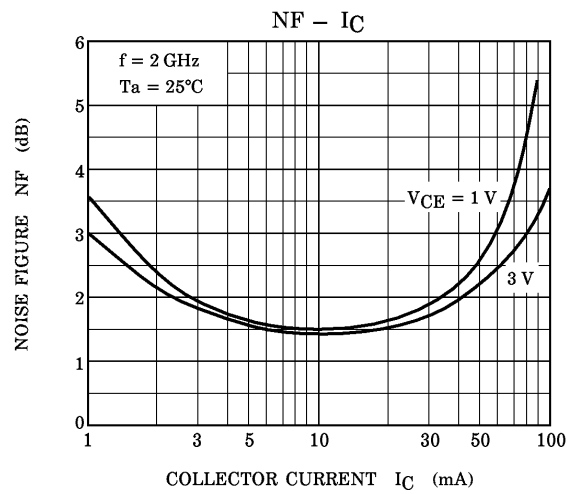
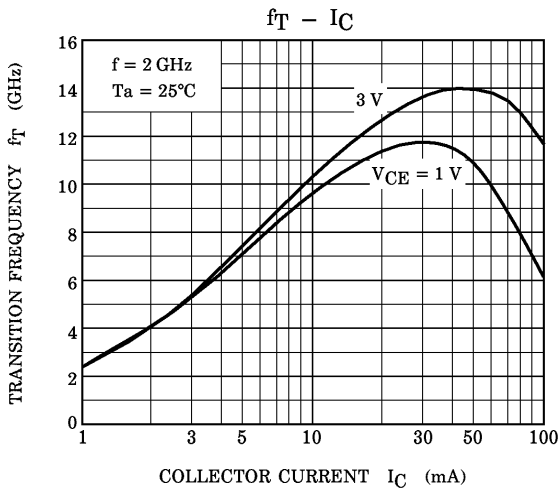
| CHARACTERISTIC               | SYMBOL          | TEST CONDITION                                                 | MIN. | TYP. | MAX. | UNIT |
|------------------------------|-----------------|----------------------------------------------------------------|------|------|------|------|
| Collector Cut-off Current    | ICBO            | V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0                      | —    | —    | 0.1  | μA   |
| Emitter Cut-off Current      | IEBO            | V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0                      | —    | —    | 1    | μA   |
| DC Current Gain              | h <sub>FE</sub> | V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA                   | 80   | —    | 160  | —    |
| Reverse Transfer Capacitance | C <sub>re</sub> | V <sub>CB</sub> = 1 V, I <sub>E</sub> = 0, f = 1 MHz<br>(Note) | —    | 0.75 | 1.1  | pF   |

(Note) : C<sub>re</sub> is measured by 3 terminal method with capacitance bridge.

**CAUTION**

This device electrostatic sensitivity. Please handle with caution.





## MT3S03AT

V<sub>CE</sub> = 1 V, I<sub>C</sub> = 5 mA, f = 100~2000 MHz Step 100 MHz

| frequency<br>(MHz) | S11      |          | S21      |          | S12      |          | S22      |          | S <sub>21</sub>   <sup>2</sup><br>(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<br>(MHz) | S11      |          | S21      |          | S12      |          | S22      |          | S <sub>21</sub>   <sup>2</sup><br>(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                                   |