



# MMBTH10

## VHF/UHF NPN SILICON TRANSISTOR

**VOLTAGE** 25 Volts **POWER** 225 mW

### FEATURES

- NPN Silicon

1. High frequency performance  
 2. Low noise  
 3. High reliability  
 4. Low cost

### MECHANICAL DATA

Case : SOT-23, Plastic

Terminals : Solderable per MIL-STD-750, Method 2026

Approx weight : 0.0081 gram

Tape width : 12mm

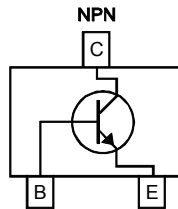
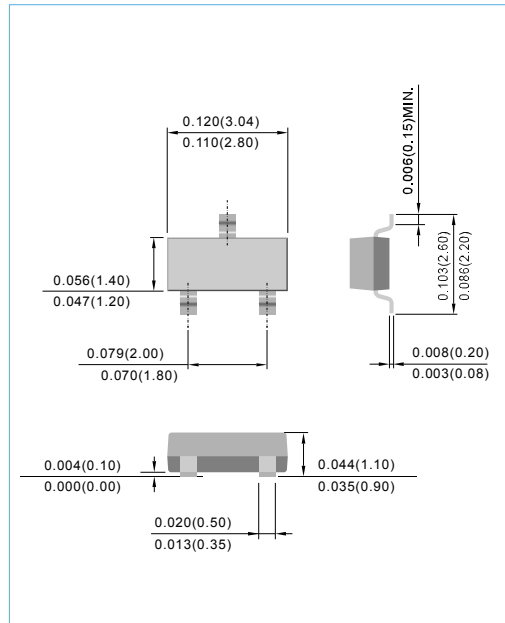


Fig.34(TOP VIEW)

### SOT-23

Unit : inch(mm)



### MAXIMUM RATINGS

| RATING                    | SYMBOL    | VALUE | UNIT |
|---------------------------|-----------|-------|------|
| Collector-Emitter Voltage | $V_{CE0}$ | 25    | Vdc  |
| Collector-Base Voltage    | $V_{CB0}$ | 30    | Vdc  |
| Emitter-Base Voltage      | $V_{EB0}$ | 3.0   | Vdc  |

### THERMAL CHARACTERISTICS

| CHARACTERISTIC   | SYMBOL          | MAX.        | UNITS                        |
|--|-----------------|-------------|------------------------------|
| Total Device Dissipation FR-5 Board (Note 1)<br>$T_A=25^{\circ}\text{C}$<br>Derate above $25^{\circ}\text{C}$        | $P_D$           | 225<br>1.8  | mW<br>mW/ $^{\circ}\text{C}$ |
| Thermal Resistance Junction to Ambient<br>(Note 1)   | $R_{\theta JA}$ | 556         | $^{\circ}\text{C}/\text{W}$  |
| Total Device Dissipation Alumina Substrate<br>(Note 2) $T_A=25^{\circ}\text{C}$<br>Derate above $25^{\circ}\text{C}$ | $P_D$           | 300<br>2.4  | mW<br>mW/ $^{\circ}\text{C}$ |
| Thermal Resistance Junction to Ambient<br>(Note 2)   | $R_{\theta JA}$ | 417         | $^{\circ}\text{C}/\text{W}$  |
| Junction and Storage Temperature Range   | $T_J, T_{STG}$  | -55 to +150 | $^{\circ}\text{C}$           |

Note 1. FR-5 = 1.0 x 0.75 x 0.062 in

2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina



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## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise noted)

| CHARACTERISTIC  | SYMBOL               | MIN | TYP | MAX  | UNIT             |
|---|----------------------|-----|-----|------|------------------|
| <b>OFF CHARACTERISTICS</b>  |                      |     |     |      |                  |
| Collector-Emitter Breakdown Voltage<br>(I <sub>c</sub> =1.0mA <sub>dc</sub> , I <sub>B</sub> =0)                        | V <sub>(BR)CEO</sub> | 25  | -   | -    | V <sub>dc</sub>  |
| Collector-Base Breakdown Voltage<br>(I <sub>c</sub> =100μA <sub>dc</sub> , I <sub>E</sub> =0)                           | V <sub>(BR)CBO</sub> | 30  | -   | -    | V <sub>dc</sub>  |
| Emitter-Base Breakdown Voltage<br>(I <sub>E</sub> =10μA <sub>dc</sub> , I <sub>c</sub> =0)                              | V <sub>(BR)EBO</sub> | 3.0 | -   | -    | V <sub>dc</sub>  |
| Collector Cutoff Current<br>(V <sub>CB</sub> =25V <sub>dc</sub> , I <sub>E</sub> =0)                                    | I <sub>CBO</sub>     | -   | -   | 100  | nA <sub>dc</sub> |
| Emitter Cutoff Current<br>(V <sub>EB</sub> =2.0V <sub>dc</sub> , I <sub>c</sub> =0)                                     | I <sub>EBO</sub>     | -   | -   | 100  | nA <sub>dc</sub> |
| <b>ON CHARACTERISTICS</b>   |                      |     |     |      |                  |
| DC Current Gain (I <sub>c</sub> =4.0mA <sub>dc</sub> , V <sub>CE</sub> =10V <sub>dc</sub> )                             | h <sub>FE</sub>      | 60  | -   | -    | -                |
| Collector-Emitter Saturation Voltage<br>(I <sub>c</sub> =4.0mA <sub>dc</sub> , I <sub>B</sub> =0.4mA <sub>dc</sub> )    | V <sub>CE(sat)</sub> | -   | -   | 0.5  | V <sub>dc</sub>  |
| Base-Emitter On Voltage<br>(I <sub>c</sub> =4.0mA <sub>dc</sub> , V <sub>CE</sub> =10V <sub>dc</sub> )                  | V <sub>BE</sub>      | -   | -   | 0.95 | V <sub>dc</sub>  |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>   |                      |     |     |      |                  |
| Current-Gain-Bandwidth Product<br>(I <sub>c</sub> =4.0mA <sub>dc</sub> , V <sub>CE</sub> =10V <sub>dc</sub> , f=100MHz) | f <sub>T</sub>       | 650 | -   | -    | MHz              |
| Collector-Base Capacitance<br>(V <sub>CB</sub> =10V <sub>dc</sub> , I <sub>E</sub> =0, f=1.0MHz)                        | C <sub>cb</sub>      | -   | -   | 0.7  | pF               |
| Common-Base Feedback Capacitance<br>(V <sub>CB</sub> =10V <sub>dc</sub> , I <sub>E</sub> =0, f=1.0MHz)                  | C <sub>rb</sub>      | -   | -   | 0.65 | pF               |
| Collector-Base Time Constant<br>(I <sub>c</sub> =4.0mA <sub>dc</sub> , V <sub>CB</sub> =10V <sub>dc</sub> , f=31.8MHz)  | rb'C <sub>c</sub>    | -   | -   | 9.0  | ps               |



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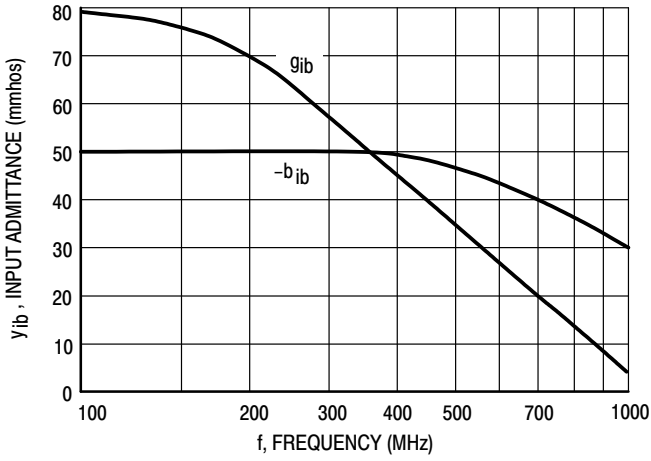


Figure 1. Rectangular Form

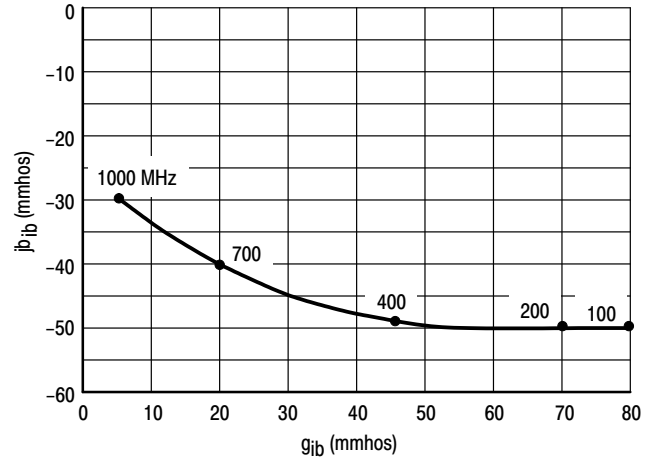


Figure 2. Polar Form

## yfb, FORWARD TRANSFER ADMITTANCE

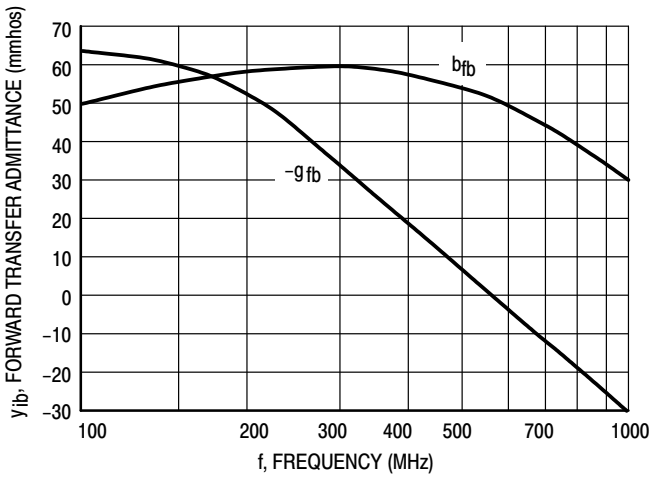


Figure 3. Rectangular Form

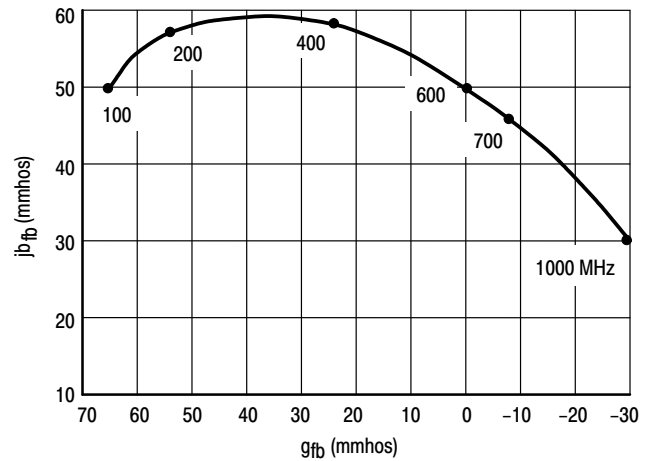


Figure 4. Polar Form



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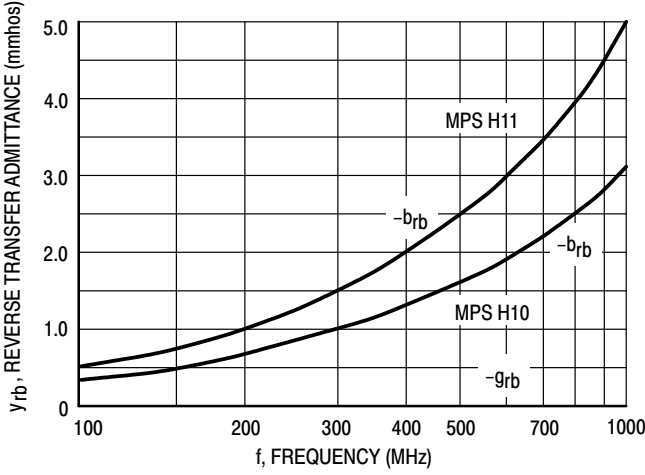


Figure 5. Rectangular Form

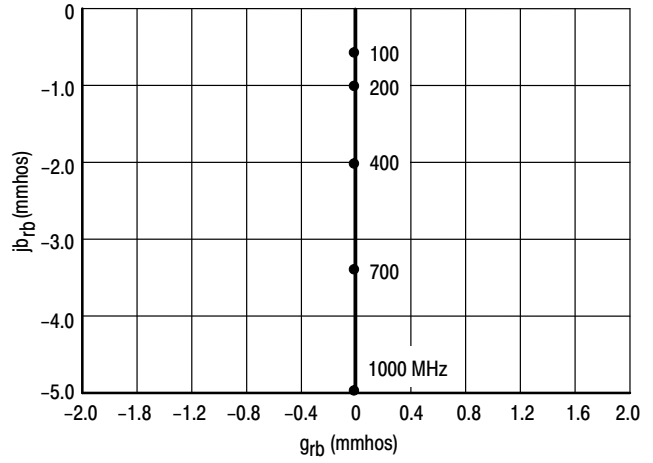


Figure 6. Polar Form

## y<sub>ob</sub>: OUTPUT ADMITTANCE

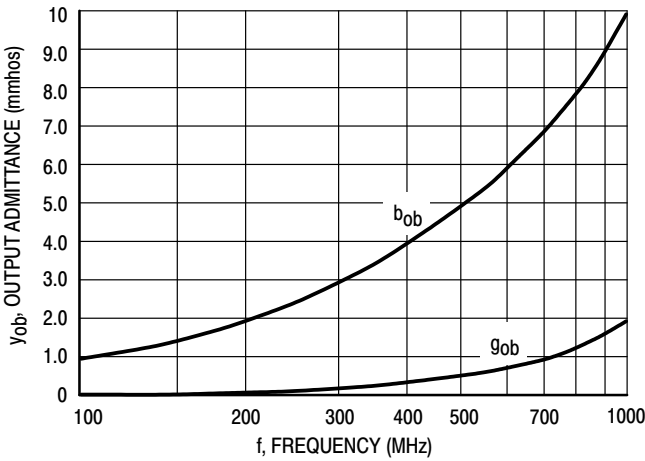


Figure 7. Rectangular Form

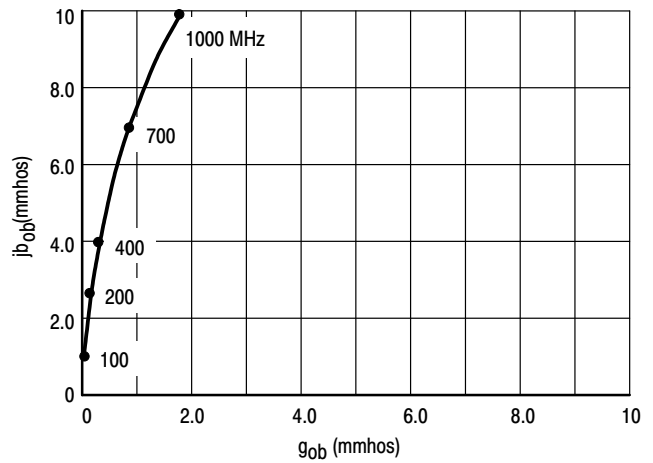
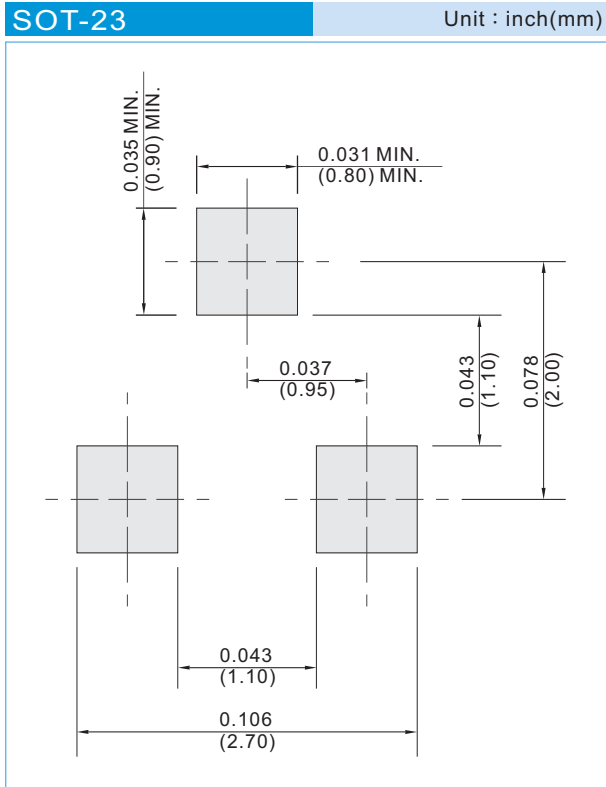


Figure 8. Polar Form



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## MOUNTING PAD LAYOUT



## ORDER INFORMATION

- Packing information
  - T/R - 12K per 13" plastic Reel
  - T/R - 3K per 7" plastic Reel



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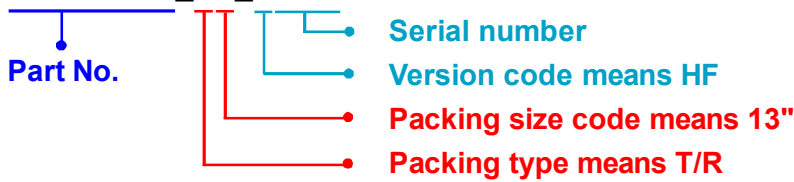
## Part No\_packing code\_Version

MMBTH10\_R1\_00001

MMBTH10\_R2\_00001

For example :

**RB500V-40\_R2\_00001**



| Packing Code <b>XX</b>               |                      |                                  |                      | Version Code <b>XXXXX</b> |                      |                                       |
|--------------------------------------|----------------------|----------------------------------|----------------------|---------------------------|----------------------|---------------------------------------|
| Packing type                         | 1 <sup>st</sup> Code | Packing size code                | 2 <sup>nd</sup> Code | HF or RoHS                | 1 <sup>st</sup> Code | 2 <sup>nd</sup> ~5 <sup>th</sup> Code |
| Tape and Ammunition Box (T/B)        | <b>A</b>             | N/A                              | <b>0</b>             | <b>HF</b>                 | <b>0</b>             | serial number                         |
| Tape and Reel (T/R)                  | <b>R</b>             | 7"                               | <b>1</b>             | <b>RoHS</b>               | <b>1</b>             | serial number                         |
| Bulk Packing (B/P)                   | <b>B</b>             | 13"                              | <b>2</b>             |                           |                      |                                       |
| Tube Packing (T/P)                   | <b>T</b>             | 26mm                             | <b>X</b>             |                           |                      |                                       |
| Tape and Reel (Right Oriented) (TRR) | <b>S</b>             | 52mm                             | <b>Y</b>             |                           |                      |                                       |
| Tape and Reel (Left Oriented) (TRL)  | <b>L</b>             | PANASERT T/B CATHODE UP (PBCU)   | <b>U</b>             |                           |                      |                                       |
| FORMING                              | <b>F</b>             | PANASERT T/B CATHODE DOWN (PBCD) | <b>D</b>             |                           |                      |                                       |



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