



# MMDT3904TB6

## DUAL NPN GENERAL PURPOSE SWITCHING TRANSISTOR

**VOLTAGE** 40 Volt **POWER** 225 mWatt

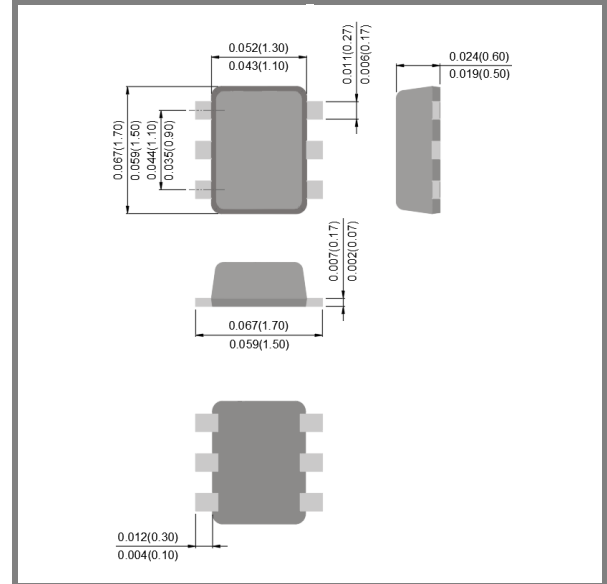
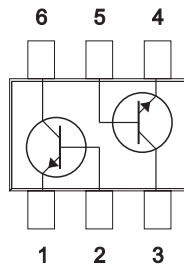
**SOT-563 Dimension** **Unit: inch(mm)**

### FEATURES

- NPN epitaxial silicon, planar design
- Collector-emitter voltage  $V_{CE} = 40V$
- Collector current  $I_C = 200mA$
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### MECHANICAL DATA

- Case : SOT-563, Plastic
- Terminals : Solderable per MIL-STD-750, Method 2026
- Approx. Weight : 0.0026 grams.
- Marking : TX



### ABSOLUTE RATINGS

| Parameter                      | Symbol    | Value | Units |
|--------------------------------|-----------|-------|-------|
| Collector - Emitter Voltage    | $V_{CEO}$ | 40    | V     |
| Collector - Base Voltage       | $V_{CBO}$ | 60    | V     |
| Emitter - Base Voltage         | $V_{EBO}$ | 6.0   | V     |
| Collector Current - Continuous | $I_C$     | 200   | mA    |

### THERMAL CHARACTERISTICS

| Parameter                                | Symbol          | Value      | Units         |
|--|-----------------|------------|---------------|
| Max Power Dissipation (Note 1)           | $P_{TOT}$       | 225        | mW            |
| Thermal Resistance , Junction to Ambient | $R_{\theta JA}$ | 625        | $^{\circ}C/W$ |
| Junction Temperature                     | $T_J$           | -55 to 150 | $^{\circ}C$   |
| Storage Temperature                      | $T_{STG}$       | -55 to 150 | $^{\circ}C$   |

Note 1: Transistor mounted on FR-5 board 1.0 x 0.75 x 0.062 in.



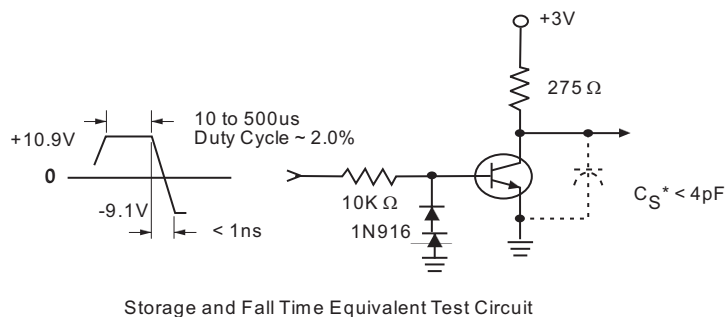
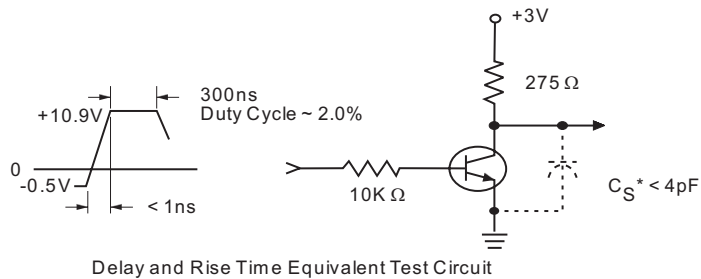
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## ELECTRICAL CHARACTERISTICS

| Parameter                                       | Symbol        | Test Condition   | Min.                        | Typ.                  | Max.                    | Units |
|---|---------------|--|-----------------------------|-----------------------|-------------------------|-------|
| Collector - Emitter Breakdown Voltage           | $V_{(BR)CEO}$ | $I_C=1.0mA, I_B=0$   | 40                          | -                     | -                       | V     |
| Collector - Base Breakdown Voltage              | $V_{(BR)CBO}$ | $I_C=10\mu A, I_E=0$   | 60                          | -                     | -                       | V     |
| Emitter - Base Breakdown Voltage                | $V_{(BR)EBO}$ | $I_E=10\mu A, I_C=0$   | 6.0                         | -                     | -                       | V     |
| Base Cutoff Current                             | $I_{BI}$      | $V_{CE}=30V, V_{EB}=3.0V$  | -                           | -                     | 50                      | nA    |
| Collector Cutoff Current                        | $I_{CEX}$     | $V_{CE}=30V, V_{EB}=3.0V$  | -                           | -                     | 50                      | nA    |
| DC Current Gain (Note 2)                        | $h_{FE}$      | $I_C=0.1mA, V_{CE}=1.0V$<br>$I_C=1.0mA, V_{CE}=1.0V$<br>$I_C=10mA, V_{CE}=1.0V$<br>$I_C=50mA, V_{CE}=1.0V$<br>$I_C=100mA, V_{CE}=1.0V$ | 40<br>70<br>100<br>60<br>30 | -<br>-<br>-<br>-<br>- | -<br>-<br>300<br>-<br>- | -     |
| Collector - Emitter Saturation Voltage (Note 2) | $V_{CE(SAT)}$ | $I_C=10mA, I_B=1.0mA$<br>$I_C=50mA, I_B=5.0mA$   | -                           | -                     | 0.2<br>0.3              | V     |
| Base - Emitter Saturation Voltage (Note 2)      | $V_{BE(SAT)}$ | $I_C=10mA, I_B=1.0mA$<br>$I_C=50mA, I_B=5.0mA$   | 0.65<br>-                   | -<br>-                | 0.85<br>0.95            | V     |
| Collector - Base Capacitance                    | $C_{CBO}$     | $V_{CB}=5V, I_E=0, f=1MHz$   | -                           | -                     | 4.0                     | pF    |
| Emitter - Base Capacitance                      | $C_{EBO}$     | $V_{CB}=0.5V, I_C=0, f=1MHz$   | -                           | -                     | 8.0                     | pF    |
| Delay Time                                      | $t_d$         | $V_{CC}=3V, V_{BE}=0.5V,$<br>$I_C=10mA, I_B=1.0mA$   | -                           | -                     | 35                      | ns    |
| Rise Time                                       | $t_r$         | $V_{CC}=3V, V_{BE}=0.5V,$<br>$I_C=10mA, I_B=1.0mA$   | -                           | -                     | 35                      | ns    |
| Storage Time                                    | $t_s$         | $V_{CC}=3V, I_C=10mA$<br>$I_{B1}=I_{B2}=1.0mA$   | -                           | -                     | 200                     | ns    |
| Fall Time                                       | $t_f$         | $V_{CC}=3V, I_C=10mA$<br>$I_{B1}=I_{B2}=1.0mA$   | -                           | -                     | 50                      | ns    |

Note 2: Pulse Test: Pulse Width < 300 us, Duty Cycle < 2.0%.

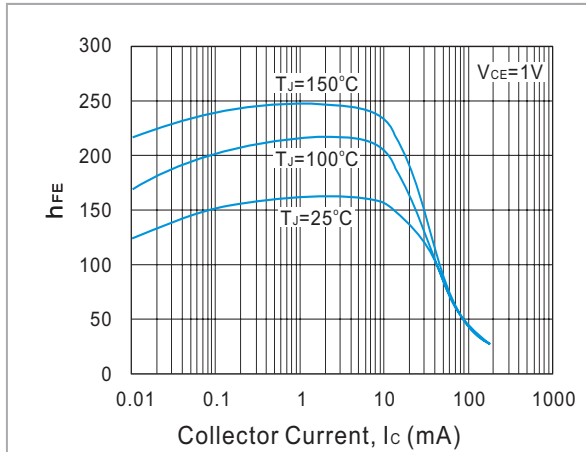
### SWITCHING TIME EQUIVALENT TEST CIRCUITS



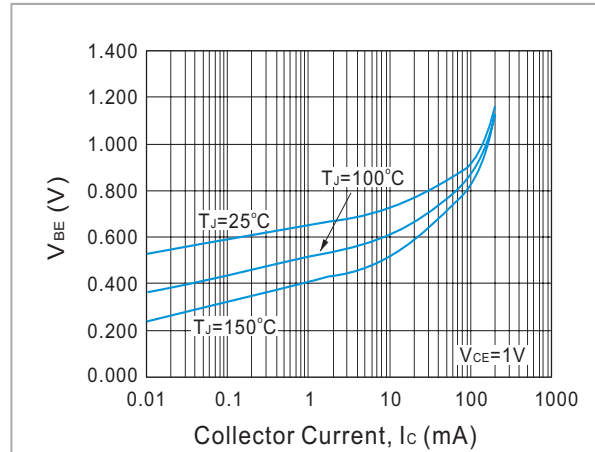


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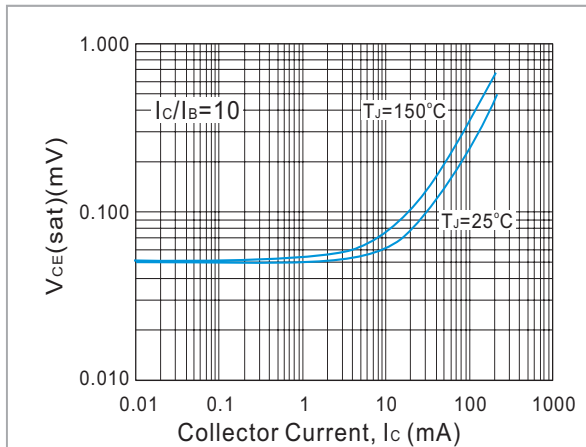
## ELECTRICAL CHARACTERISTICS CURVE



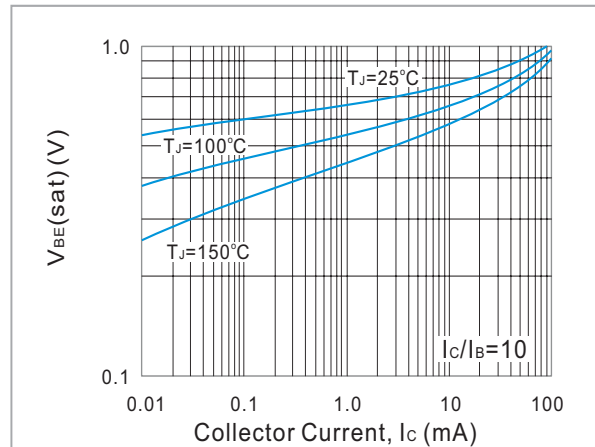
**Fig. 1. Typical  $h_{FE}$  vs. Collector Current**



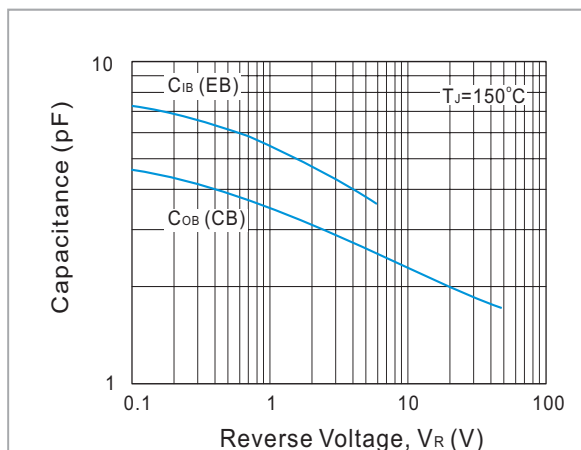
**Fig. 2. Typical  $V_{BE}$  vs. Collector Current**



**Fig. 3. Typical  $V_{CE(sat)}$  vs. Collector Current**



**Fig. 4. Typical  $V_{BE(sat)}$  vs Collector Current**

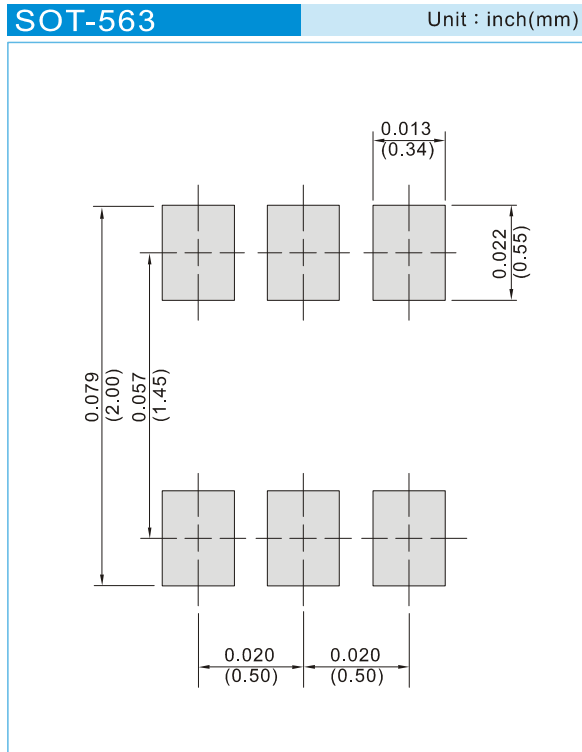


**Fig. 5. Typical Capacitances vs. Reverse Voltage**



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## MOUNTING PAD LAYOUT



## ORDER INFORMATION

- Packing information

T/R - 4K per 7" plastic Reel

T/R - 10K per 13" plastic Reel



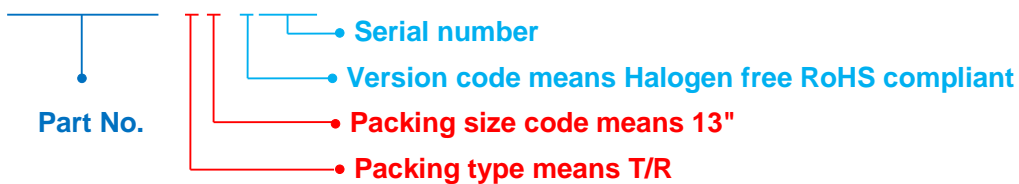
# MMDT3904TB6

## Part No.\_packing code\_Version

MMDT3904TB6\_R1\_00001  
MMDT3904TB6\_R2\_00001  
MMDT3904TB6\_R1\_00002  
MMDT3904TB6\_R2\_00002

For example :

**RB500V-40\_R2\_00001**



| Packing Code <b>XX</b>               |                      |                                  |                      | Version Code <b>X</b>       |                      | Serial number<br><b>XXXX</b>          |
|--------------------------------------|----------------------|----------------------------------|----------------------|-----------------------------|----------------------|---------------------------------------|
| Packing type                         | 1 <sup>st</sup> Code | Packing size code                | 2 <sup>nd</sup> Code | HSF Level                   | 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>             | Halogen free RoHS compliant | <b>0</b>             | serial number                         |
| Tape and Reel (T/R)                  | <b>R</b>             | 7"                               | <b>1</b>             | RoHS compliant              | <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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