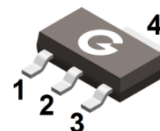
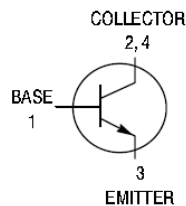


### Features

- Epitaxial planar die construction
- Ideal for low power amplification and switching
- Complementary PNP type available TMMBT3906R
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 standards for high reliability

**HF**



**SOT-223**

### Mechanical Data

- Case: SOT-223
- Molding compound: UL flammability classification rating 94V-0
- Terminals: Tin-plated; solderability per MIL-STD-202, Method 208

### Ordering Information

| Part Number | Package | Shipping Quantity      | Marking Code |
|-------------|---------|------------------------|--------------|
| TMMBT3904R  | SOT-223 | 4000 pcs / Tape & Reel | 1AM          |

### Maximum Ratings (@ T<sub>A</sub> = 25°C unless otherwise specified)

| Parameter                           | Symbol           | Value | Unit |
|-------------------------------------|------------------|-------|------|
| Collector-Base Breakdown Voltage    | V <sub>CBO</sub> | 60    | V    |
| Collector-Emitter Breakdown Voltage | V <sub>CEO</sub> | 40    | V    |
| Emitter-Base Breakdown Voltage      | V <sub>EBO</sub> | 6     | V    |
| Collector Current (Continuous)      | I <sub>C</sub>   | 0.2   | A    |
| Collector Current –Peak Pulse Width | I <sub>CM</sub>  | 0.2   | A    |
| Peak Base Current                   | I <sub>BM</sub>  | 0.1   | A    |

### Thermal Characteristics

| Parameter                                | Symbol           | Value      | Unit |
|------------------------------------------|------------------|------------|------|
| Power Dissipation (Collector) *1         | P <sub>D</sub>   | 1.15       | W    |
| Thermal Resistance (Junction-to-Ambient) | R <sub>θJA</sub> | 108        | °C/W |
| Junction Temperature                     | T <sub>J</sub>   | -55 ~ +150 | °C   |
| Storage Temperature Range                | T <sub>STG</sub> | -55 ~ +150 | °C   |

Note1: Device mounted on a printed-circuit board, single-sided copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>

### Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                            | Symbol        | Test Condition                                                     | Min. | Typ. | Max. | Unit |
|--------------------------------------|---------------|--------------------------------------------------------------------|------|------|------|------|
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = 10\mu\text{A}$ , $I_E = 0$                                  | 60   | -    | -    | V    |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C = 100\mu\text{A}$ , $I_B = 0$                                 | 40   | -    | -    | V    |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E = 10\mu\text{A}$ , $I_C = 0$                                  | 6    | -    | -    | V    |
| Collector Cut-off Current            | $I_{CBO}$     | $V_{CB} = 30\text{V}$ , $I_E = 0$                                  | -    | -    | 50   | nA   |
| Base Cut-off Current                 | $I_{EBO}$     | $V_{EB} = 6\text{V}$ , $I_C = 0$                                   | -    | -    | 50   | nA   |
| DC Current Gain                      | $h_{FE}$      | $V_{CE} = 1\text{V}$ , $I_C = 0.1\text{mA}$                        | 60   | -    | -    | -    |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 1\text{mA}$                          | 80   | -    | -    | -    |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 10\text{mA}$                         | 100  | -    | 300  | -    |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 50\text{mA}$                         | 60   | -    | -    | -    |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 100\text{mA}$                        | 30   | -    | -    | -    |
| Collector-emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 10\text{mA}$ , $I_B = 1\text{mA}$                           | -    | -    | 0.2  | V    |
|                                      |               | $I_C = 50\text{mA}$ , $I_B = 5\text{mA}$                           | -    | -    | 0.3  | V    |
| Base-emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C = 10\text{mA}$ , $I_B = 1\text{mA}$                           | 0.65 | -    | 0.85 | V    |
|                                      |               | $I_C = 50\text{mA}$ , $I_B = 5\text{mA}$                           | -    | -    | 0.95 | V    |
| Output Capacitance                   | $C_{OBO}$     | $V_{CB} = 5\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$               | -    | -    | 4    | pF   |
| Input Capacitance                    | $C_{IBO}$     | $I_C = 0$ , $V_{EB} = 0.5\text{V}$ , $f = 1\text{MHz}$             | -    | -    | 8    | pF   |
| Transition Frequency                 | $f_T$         | $I_C = 10\text{mA}$ , $V_{CE} = 20\text{V}$<br>$f = 100\text{MHz}$ | 300  | -    | -    | MHz  |
| Delay Time                           | $t_d$         | $V_{CC} = 3\text{V}$ , $V_{BE} = -0.5\text{V}$                     | -    | -    | 35   | ns   |
| Rise Time                            | $t_r$         | $I_C = 10\text{mA}$ , $I_{B1} = 1\text{mA}$                        | -    | -    | 35   | ns   |
| Storage Time                         | $t_s$         | $V_{CC} = 3\text{V}$ , $I_C = 10\text{mA}$                         | -    | -    | 200  | ns   |
| Fall Time                            | $t_f$         | $I_{B1} = I_{B2} = 1\text{mA}$                                     | -    | -    | 50   | ns   |

Ratings and Characteristic Curves (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)

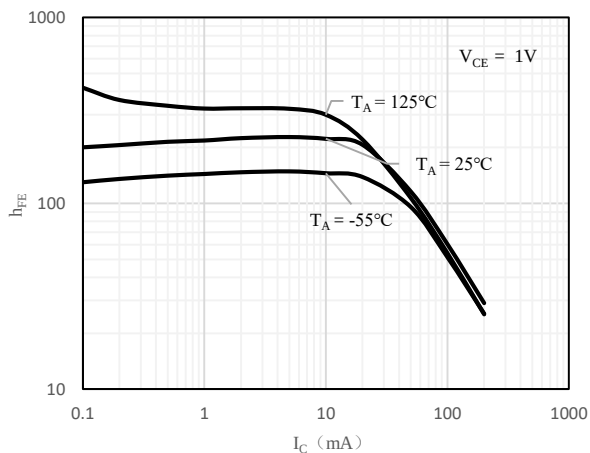


Fig 1  $h_{FE}$  vs.  $I_C$

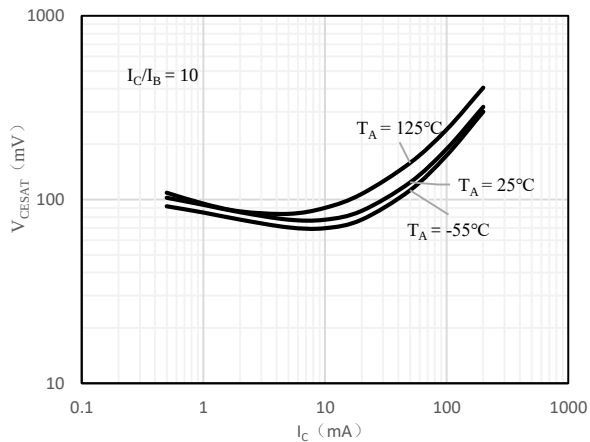


Fig 2  $V_{CE(sat)}$  vs.  $I_C$

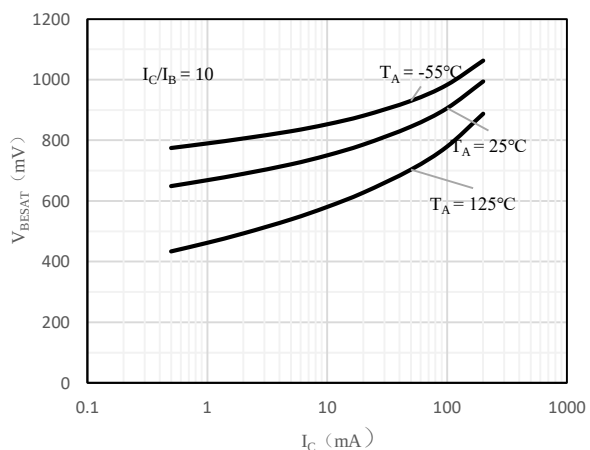


Fig 3  $V_{BE(sat)}$  vs.  $I_C$

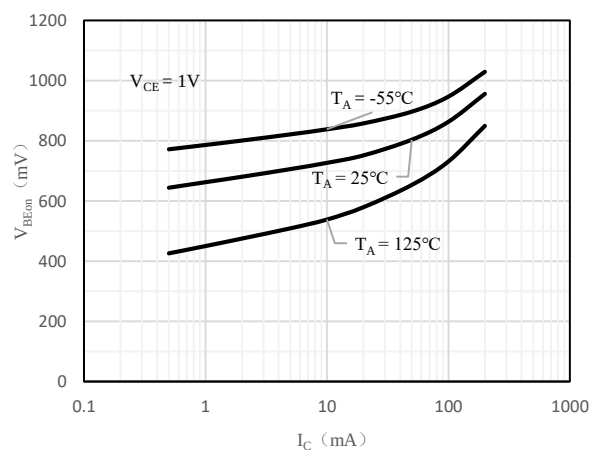


Fig 4  $V_{BE(on)}$  vs.  $I_C$

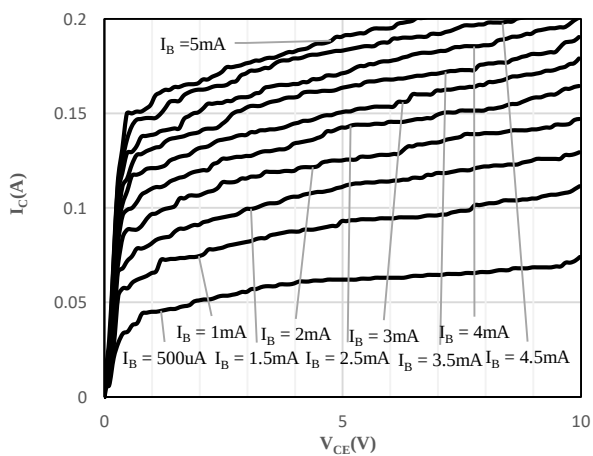


Fig 5  $I_C$  vs.  $V_{CE}$

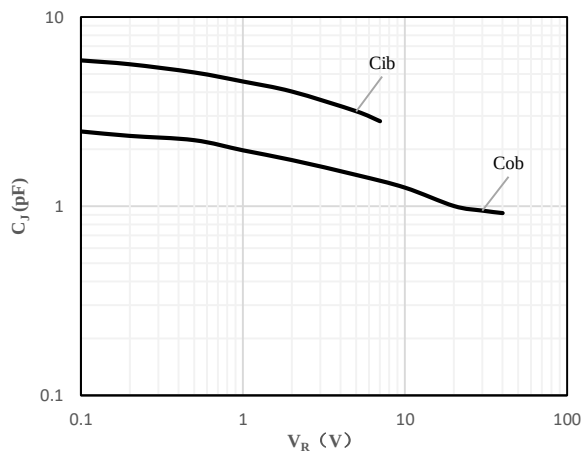
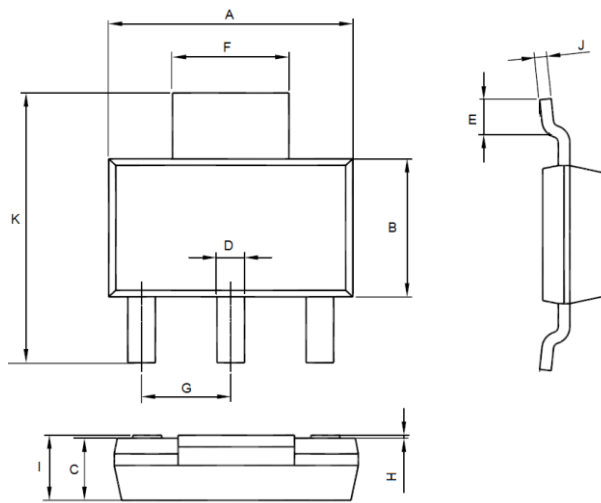


Fig 6  $C_J$  vs.  $V_R$

**Package Outline Dimensions** (Unit: mm)



| SOT-223   |      |      |
|-----------|------|------|
| Dimension | Min. | Max. |
| A         | 6.10 | 6.50 |
| B         | 3.30 | 3.70 |
| C         | 1.50 | 1.70 |
| D         | 0.66 | 0.82 |
| E         | 0.90 | 1.15 |
| F         | 2.90 | 3.10 |
| G         | 2.20 | 2.40 |
| H         | 0.02 | 0.10 |
| I         | 1.52 | 1.80 |
| J         | 0.20 | 0.40 |
| K         | 6.70 | 7.30 |

**Mounting Pad Layout** (Unit: mm)

**SOT-223**

