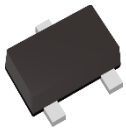
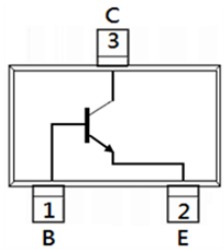
# MMBT3904TB

## NPN General Purpose Switching Transistor

| Voltage | 40V | Current | 200mA |
|---|---|---|---|

SOT-523






## Features

- Silicon NPN planar design
- Collector-Emitter Voltage VCE = 40V
- Collector Current IC = 200mA
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 Standard

## Mechanical Data

- Case : SOT-523 Package
- Terminals : Solderable per MIL-STD-750, Method 2026
- Approx. Weight : 0.002 grams

## Maximum Ratings and Thermal Characteristics ($T_A$=25°C unless otherwise noted)

| PARAMETER | SYMBOL | LIMIT | UNITS |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 60 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | V |
| Collector Current (DC) | $I_C$ | 200 | mA |
| Collector Power Dissipation | $P_D$ | 150 | mW |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55~150 | °C |
| Thermal Resistance from Junction to Ambient(Note 1 ) | $R_{\theta JA}$ | 833 | °C/W |

Note 1 : Mounted on FR4 PCB at 1 inch square copper pad.

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## Electrical Characteristics ($T_A$=25°C unless otherwise noted)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| **OFF Characteristics** | | | | | | |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | $I_C$= 1mA, $I_B$= 0A | 40 | - | - | V |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | $I_C$= 10uA, $I_E$= 0A | 60 | - | - | V |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | $I_E$= 10uA, $I_C$= 0A | 6 | - | - | V |
| Base Cutoff Current | $I_{BL}$ | $V_{CE}$= 30V, $V_{EB}$= 3V | - | - | 50 | nA |
| Collector Cutoff Current | $I_{CEX}$ | $V_{CE}$= 30V, $V_{EB}$= 3V | - | - | 50 | nA |
| **ON characteristics** | | | | | | |
| DC Current Gain(Note 2) | $h_{FE}$ | $V_{CE}$= 1V, $I_C$= 0.1mA | 40 | - | - | - |
| | | $V_{CE}$= 1V, $I_C$= 1mA | 70 | - | - | |
| | | $V_{CE}$= 1V, $I_C$= 10mA | 100 | - | 300 | |
| | | $V_{CE}$= 1V, $I_C$= 50mA | 60 | - | - | |
| | | $V_{CE}$= 1V, $I_C$= 100mA | 30 | - | - | |
| Collector-Emitter Saturation Voltage(Note 2) | $V_{CE(SAT)}$ | $I_C$= 10mA, $I_B$= 1mA | - | - | 200 | mV |
| | | $I_C$= 50mA, $I_B$= 5mA | - | - | 300 | |
| Base-Emitter Saturation voltage(Note 2) | $V_{BE(SAT)}$ | $I_C$= 10mA, $I_B$= 1mA | 650 | - | 850 | mV |
| | | $I_C$= 50mA, $I_B$= 5mA | - | - | 950 | |
| Collector-Base Capacitance | $C_{CBO}$ | $V_{CB}$= 5V $I_E$= 0A, f=1MHz | - | - | 4 | pF |
| Emitter-Base Capacitance | $C_{EBO}$ | $V_{EB}$= 0.5V $I_C$= 0A, f=1MHz | - | - | 8 | pF |
| Delay Time | Td | Vcc= 3V, $V_{BE}$= 0.5V | - | - | 35 | nS |
| Rise Time | Tr | $I_C$= 10mA, $I_B$= 1mA | - | - | 35 | nS |
| Storage Time | Ts | Vcc= 3V, $I_C$= 10mA | - | - | 200 | nS |
| Fall Time | Tf | $I_{B1}$= $I_{B2}$ = 1mA | - | - | 50 | |

Note 2 : Pulse Test: Pulse Width < 300uS , Duty Cycle < 2%

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## TYPICAL CHARACTERISTIC CURVES

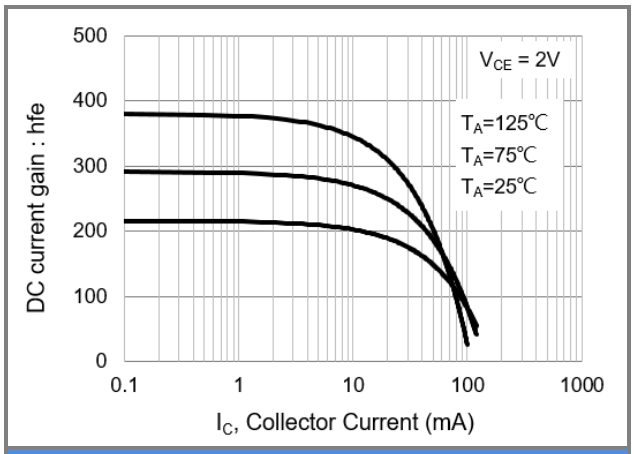


Fig.1 DC Current Gain

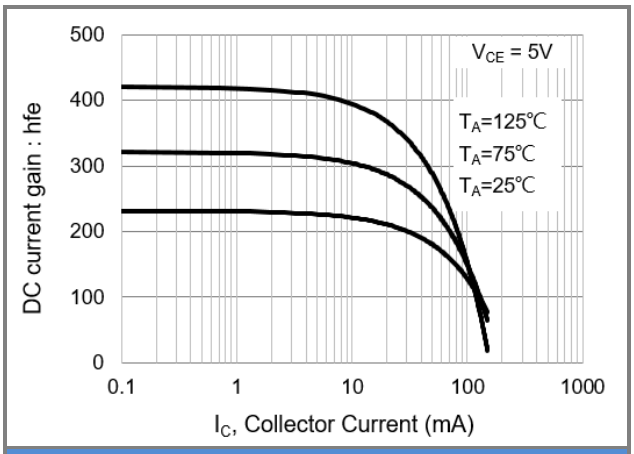


Fig.2 DC Current Gain

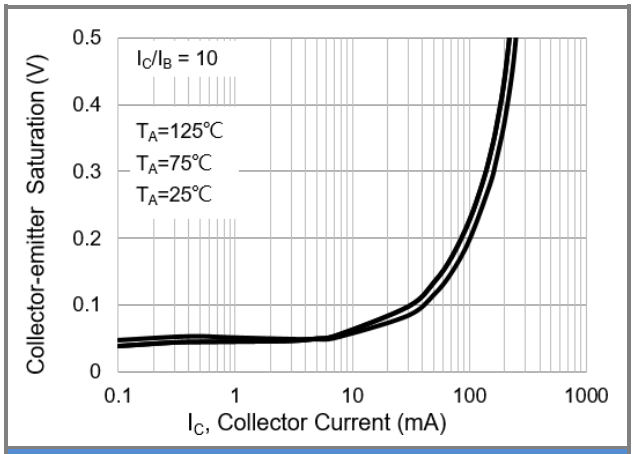


Fig.3 Collector-Emitter Saturation Voltage

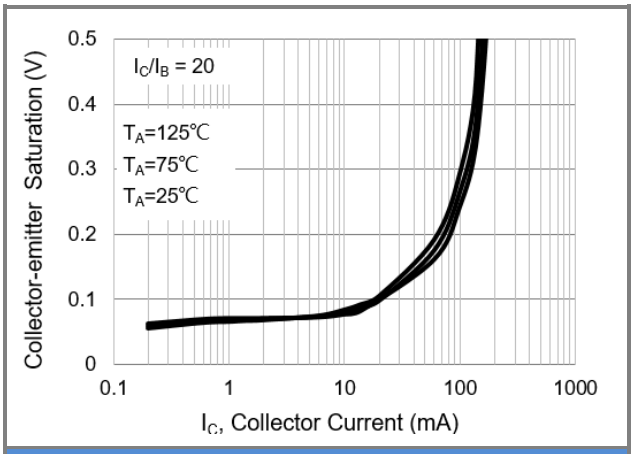


Fig.4 Collector-Emitter Saturation Voltage

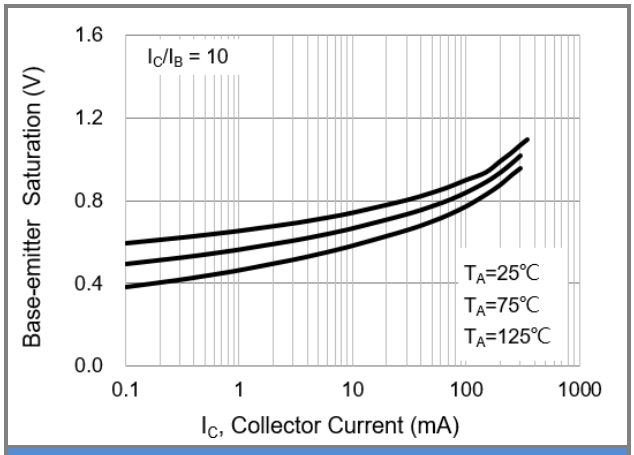


Fig.5 Base-Emitter Saturation Voltage

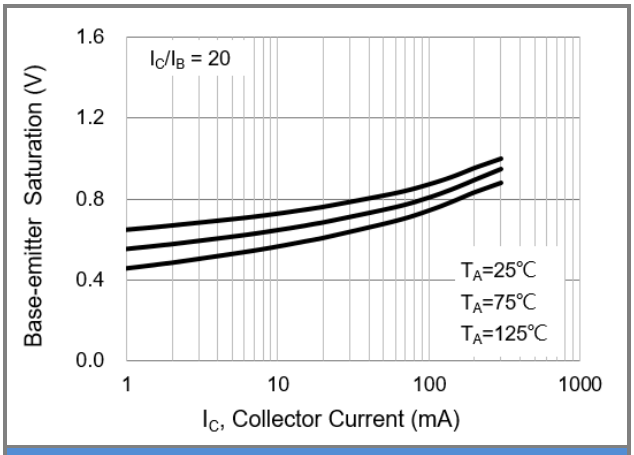


Fig.6 Base-Emitter Saturation Voltage

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## TYPICAL CHARACTERISTIC CURVES

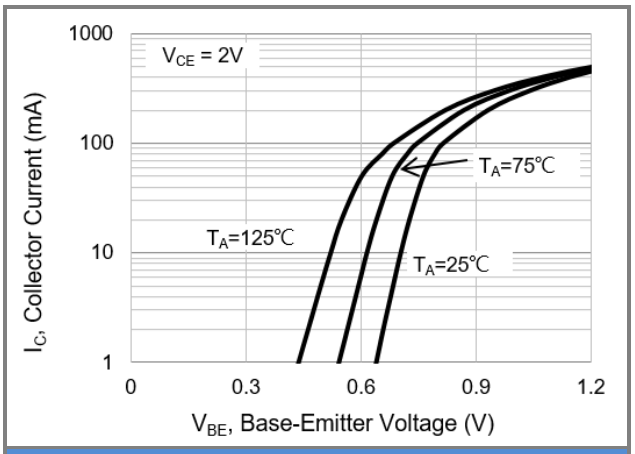



Fig.7 Base-Emitter Voltage

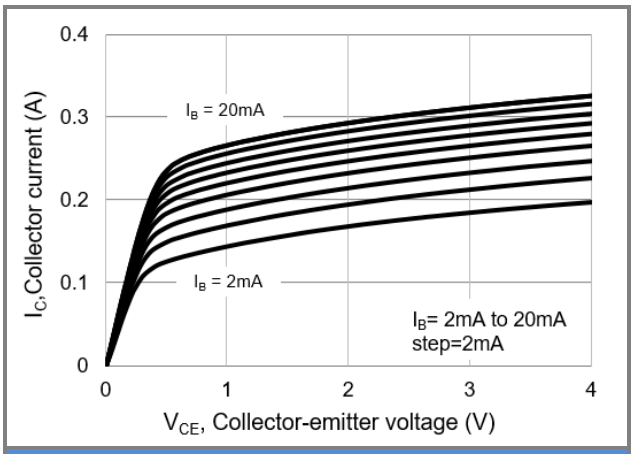



Fig.8 Collector Current

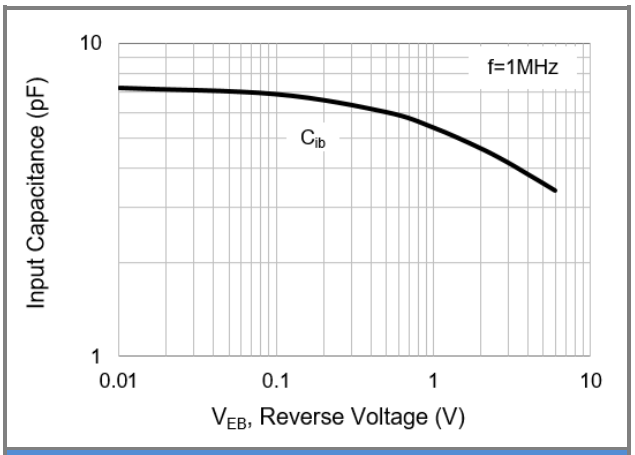



Fig.9 Input Capacitance

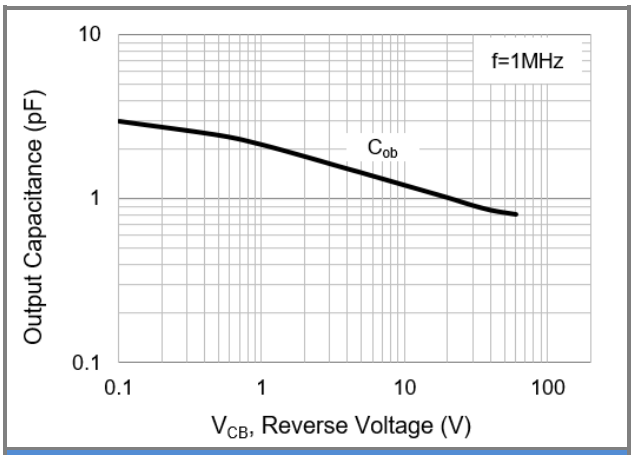



Fig.10 Output Capacitance

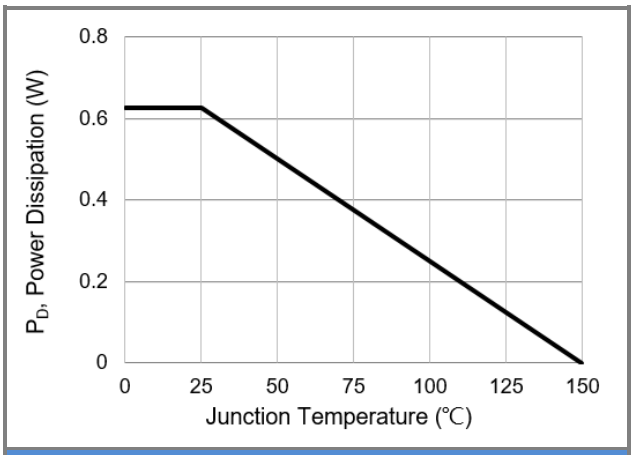



Fig.11 Power Derating Curve

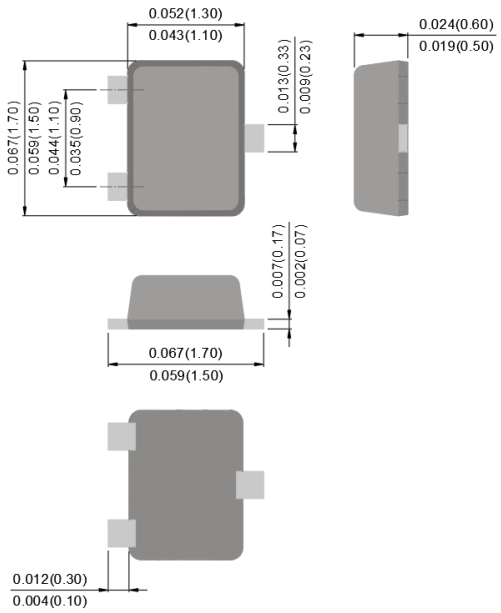
# MMBT3904TB

## Part No. Packing Code Version

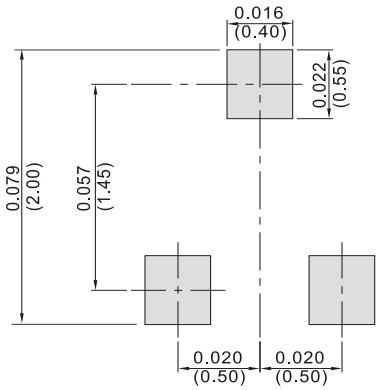
| Part No. Packing Code | Package Type | Packing Type | Marking | Version |
|---|---|---|---|---|
| MMBT3904TB_R1_00001 | SOT-523 | 4K pcs / 7” reel | 4E | Halogen free<br>RoHS compliant |

## Packaging Information & Mounting Pad Layout

SOT-523 Dimension — Unit: inch(mm)




SOT-523 Pad Layout — Unit: inch(mm)



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