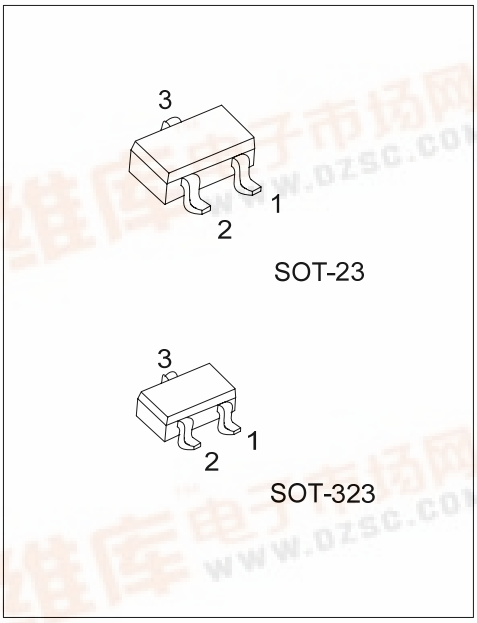
# MMBT3904

**NPN SILICON TRANSISTOR**

## GENERAL PURPOSE APPLIATION




*Pb-free plating product number: MMBT3904L

## ■ FEATURES

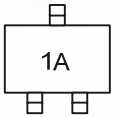
* Collector-Emitter Voltage: $V_{CEO}$=40V
* Collector Dissipation: $P_D$(MAX)=350mW
* Complementary to UTC MMBT3906

## ■ ORDERING INFORMATION

| Order Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Normal | Lead Free Plating | | 1 | 2 | 3 | |
| MMBT3904-AE3-R | MMBT3904L-AE3-R | SOT-23 | E | B | C | Tape Reel |
| MMBT3904-AL3-R | MMBT3904L-AL3-R | SOT-323 | E | B | C | Tape Reel |

| | |
|---|---|
| MMBT3904L-AE3-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Lead Plating | (1) R: Tape Reel<br>(2) AE3: SOT-23, AL3: SOT-323<br>(3) L: Lead Free Plating, Blank: Pb/Sn |

## ■ MARKING



## ■ ABSOLUTE MAXIMUM RATING ( Ta=25℃, unless otherwise specified )

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 60 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | V |
| Collector Current | $I_C$ | 200 | mA |
| Collector Dissipation | $P_C$ | 350 | mW |
| Junction Temperature | $T_J$ | +150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55 ~ +150 | ℃ |

Note Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ ELECTRICAL CHARACTERISTICS (Ta=25℃, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Collector Cut-off Current | $I_{CEX}$ | $V_{CE}$=30V, $V_{EB}$=3V | | | 50 | nA |
| Base Cut-off Current | $I_{BL}$ | $V_{CE}$=30V, $V_{EB}$=3V | | | 50 | nA |
| Collector-base breakdown voltage | $V_{CBO}$ | $I_C$=10μA, $I_E$=0 | 60 | | | V |
| Collector-emitter breakdown voltage (note) | $V_{CEO}$ | $I_C$=1mA, $I_B$=0 | 40 | | | V |
| Emitter-base breakdown voltage | $V_{EBO}$ | $I_E$=10μA, $I_C$=0 | 6 | | | V |
| DC current gain (note) | $h_{FE}1$ | $V_{CE}$=1V, $I_C$=0.1mA | 40 | | | |
| | $h_{FE}2$ | $V_{CE}$=1V, $I_C$=1mA | 70 | | | |
| | $h_{FE}3$ | $V_{CE}$=1V, $I_C$=10mA | 100 | | 300 | |
| | $h_{FE}4$ | $V_{CE}$=1V, $I_C$=50mA | 60 | | | |
| | $h_{FE}5$ | $V_{CE}$=1V, $I_C$=100mA | 30 | | | |
| Collector-emitter saturation voltage (note) | $V_{CE(SAT)}1$ | $I_C$=10mA, $I_B$=1mA | | | 0.2 | V |
| | $V_{CE(SAT)}2$ | $I_C$=50mA, $I_B$=5mA | | | 0.3 | V |
| Base-emitter saturation voltage (note) | $V_{BE(SAT)}1$ | $I_C$=10mA, $I_B$=1mA | 0.65 | | 0.85 | V |
| | $V_{BE(SAT)}2$ | $I_C$=50mA, $I_B$=5mA | | | 0.95 | V |
| Current gain bandwidth product | $f_T$ | $V_{CE}$=20V, $I_C$=10mA, f=100MHz | 300 | | | MHz |
| Output Capacitance | $C_{ob}$ | $V_{CB}$=5V, $I_E$=0, f=1MHz | | | 4 | pF |
| Turn on time | $t_{ON}$ | $V_{CC}$=3V, $V_{BE}$=0.5V, $I_C$=10mA, $I_B1$=1mA | | | 70 | ns |
| Turn off time | $t_{OFF}$ | $I_B1$=$1_B2$=1mA | | | 250 | ns |

Note: Pulse test: PW<=300μs, Duty Cycle<=2%

## ■ TYPICAL CHARACTERISTICS