

# MMBT3904M

## MMBT3904M NPN General Purpose Transistor

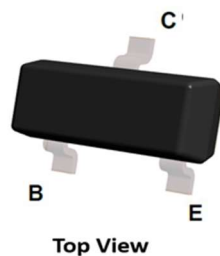
### General description

- NPN General Purpose Transistor

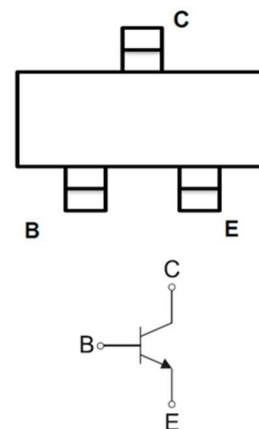
### FEATURES

- SOT-723 General Purpose Transistors.
- $V_{CEO}$  40V
- $I_C$  200mA
- $P_C$  100mW
- Complementary to MMBT3906M
- Small Outline Surface Mount Package.
- RoHS Compliant / Green EMC.

|         |           |
|---------|-----------|
| Type    | MMBT3904M |
| Marking | 1N        |



SOT-723



### Absolute Maximum Ratings( $T_a=25^\circ\text{C}$ )

| Parameter                                   | Symbol          | Limit    | Unit               |
|---------------------------------------------|-----------------|----------|--------------------|
| Collector-Base Voltage                      | $V_{CBO}$       | 60       | V                  |
| Collector-Emitter Voltage                   | $V_{CEO}$       | 40       | V                  |
| Emitter-Base Voltage                        | $V_{EBO}$       | 6        | V                  |
| Collector Current -Continuous               | $I_C$           | 0.2      | A                  |
| Power Dissipation                           | $P_C$           | 0.1      | W                  |
| Thermal Resistance from Junction to Ambient | $R_{\theta JA}$ | 1250     | $^\circ\text{C/W}$ |
| Junction Temperature                        | $T_J$           | 150      | $^\circ\text{C}$   |
| Storage Temperature                         | $T_{STG}$       | -55~+150 | $^\circ\text{C}$   |

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## ELECTRICAL CHARACTERISTICS @ 25°C Unless Otherwise Specified

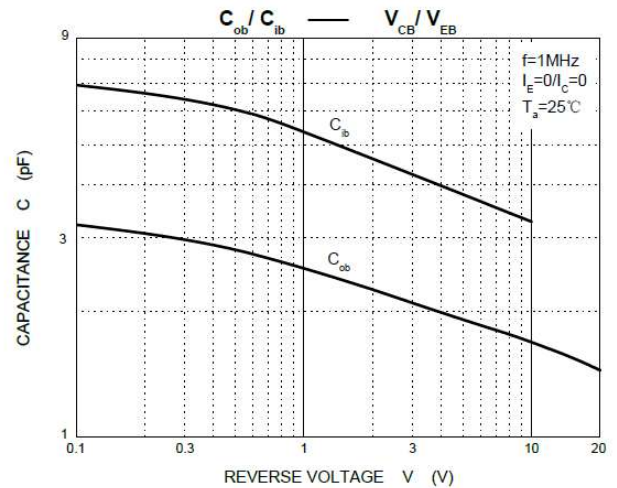
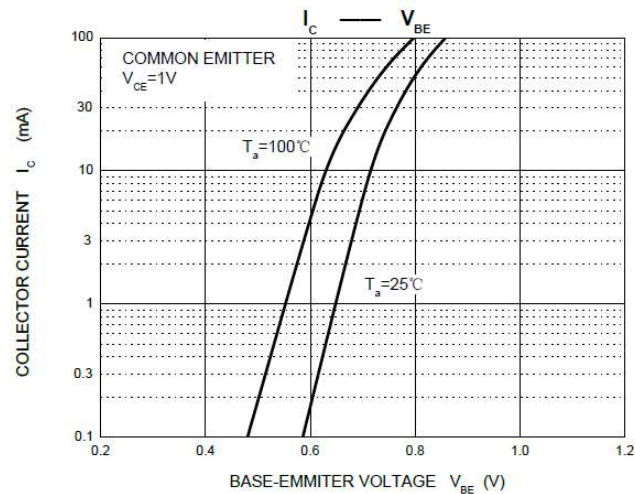
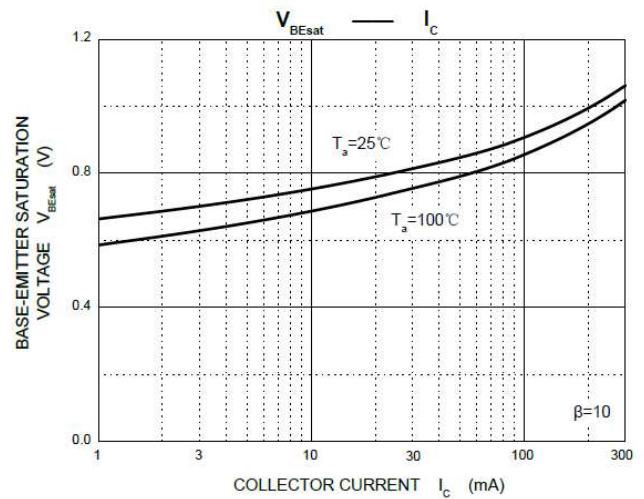
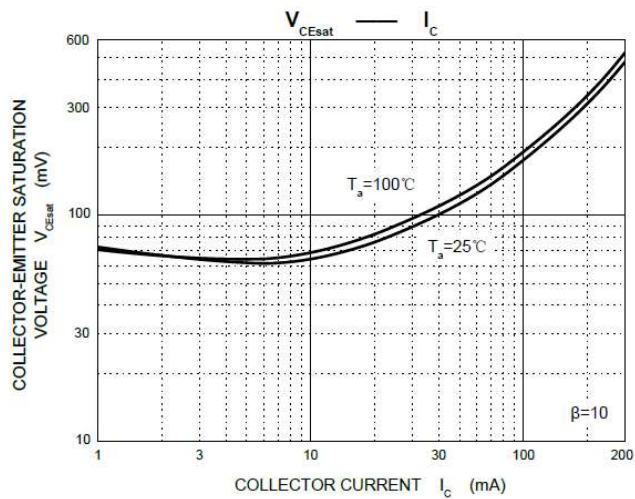
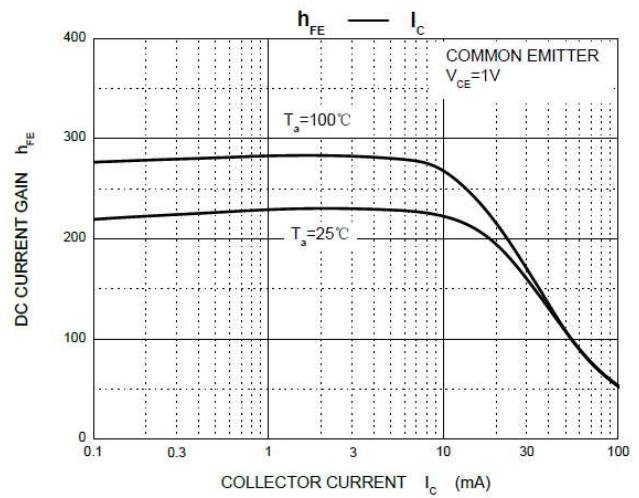
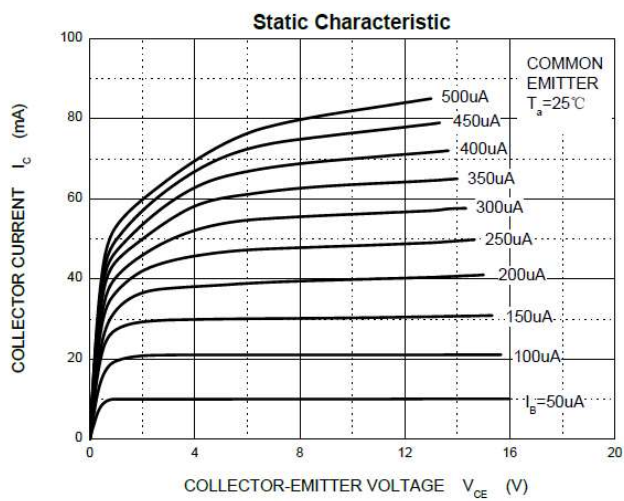
| Parameter                            | Symbol        | Conditions                                   | Min  | Typ | Max  | Units |
|--------------------------------------|---------------|----------------------------------------------|------|-----|------|-------|
| Collector-base breakdown voltage     | $V_{(BR)CBO}$ | $I_C=10\mu A, I_E=0$                         | 60   |     |      | V     |
| Collector-emitter breakdown voltage  | $V_{(BR)CEO}$ | $I_C=1mA, I_B=0$                             | 40   |     |      | V     |
| Emitter-base breakdown voltage       | $V_{(BR)EBO}$ | $I_E=10\mu A, I_C=0$                         | 6    |     |      | V     |
| Collector cut-off current            | $I_{CEX}$     | $V_{CE}=30V, V_{EB(off)}=3V$                 |      |     | 50   | nA    |
| Emitter cut-off current              | $I_{EBO}$     | $V_{EB}=5V, I_C=0$                           |      |     | 100  | nA    |
| DC current gain                      | $h_{FE}$      | $V_{CE}=1V, I_C=0mA$                         | 40   |     |      |       |
|                                      |               | $V_{CE}=1V, I_C=1mA$                         | 70   |     |      |       |
|                                      |               | $V_{CE}=1V, I_C=10mA$                        | 100  |     | 300  |       |
|                                      |               | $V_{CE}=1V, I_C=50mA$                        | 60   |     |      |       |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C=10mA, I_B=1mA$                          |      |     | 0.2  | V     |
|                                      |               | $I_C=50mA, I_B=5mA$                          |      |     | 0.3  | V     |
| Base-emitter saturation voltage      | $V_{BE(sat)}$ | $I_C=10mA, I_B=1mA$                          | 0.65 |     | 0.85 | V     |
|                                      |               | $I_C=50mA, I_B=5mA$                          |      |     | 0.95 | V     |
| Transition frequency                 | $f_T$         | $V_{CE}=20V, I_C=10mA, f=100MHz$             | 300  |     |      | MHz   |
| Output capacitance                   | $C_{ob}$      | $V_{CB}=5V, I_E=0, f=1MHz$                   |      |     | 4    | pF    |
| Input capacitance                    | $C_{ib}$      | $V_{EB}=0.5V, I_C=0, f=1MHz$                 |      |     | 8    | pF    |
| Noise figure                         | NF            | $V_{CE}=5V, I_C=0.1mA, f=1MHz, R_S=1k\Omega$ |      |     | 5    | dB    |

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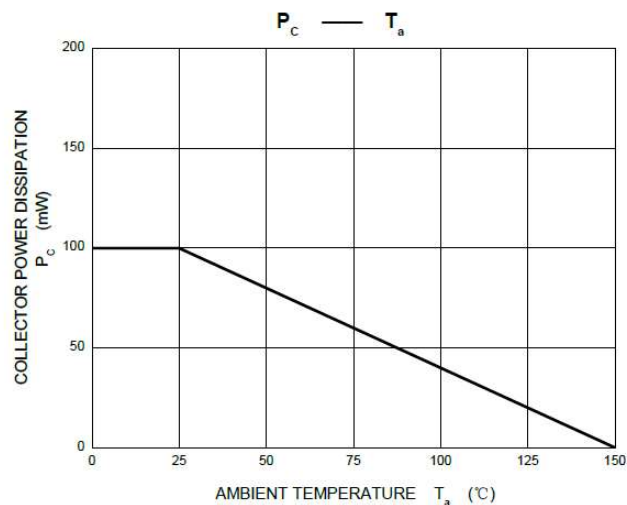
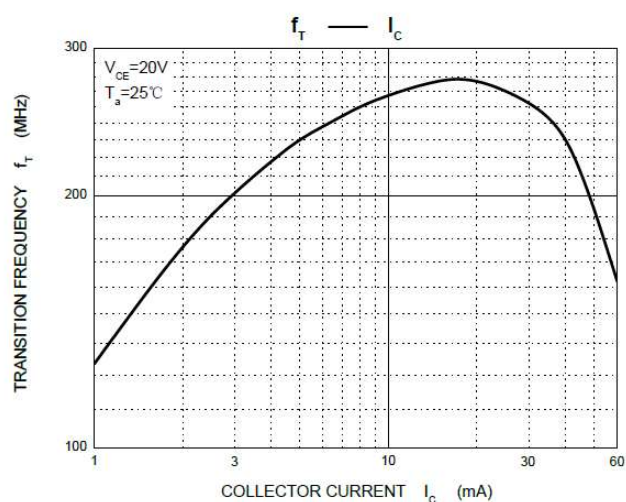
| Parameter    | Symbol | Conditions                                                | Min | Typ | Max | Units |
|--------------|--------|-----------------------------------------------------------|-----|-----|-----|-------|
| Delay time   | $t_d$  | $V_{CC}=3V, V_{BE(off)}=-0.5V,$<br>$I_C=10mA, I_{B1}=1mA$ |     |     | 35  | ns    |
| Rise time    | $t_r$  |                                                           |     |     | 25  | ns    |
| Storage time | $t_s$  | $V_{CC}=3V, I_C=10mA, I_{B1}=I_{B2}=1mA$                  |     |     | 200 | ns    |
| Fall time    | $t_f$  |                                                           |     |     | 50  | ns    |

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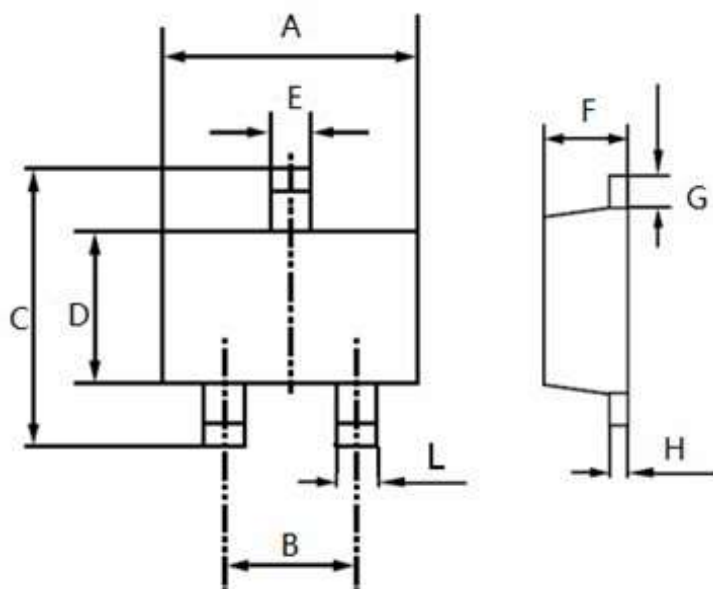
## TYPICAL CHARACTERISTICS



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## PACKAGE DIMENSIONS



| Symbol | Dimensions In Millimeters |       |
|--------|---------------------------|-------|
|        | Min                       | Max   |
| A      | 1.100                     | 1.300 |
| B      | 0.8typ                    |       |
| C      | 1.100                     | 1.300 |
| D      | 0.700                     | 0.900 |
| E      | 0.200                     | 0.300 |
| F      | 0.400                     | 0.500 |
| G      | 0.150                     | 0.250 |
| H      | 0.060                     | 0.160 |
| L      | 0.150                     | 0.250 |

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