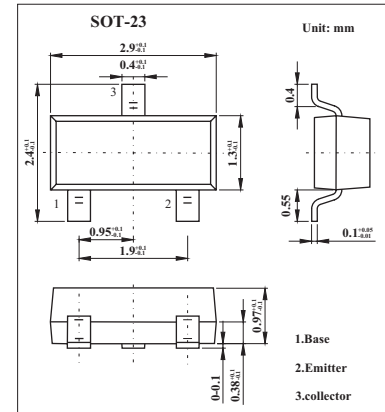


## NPN Transistors

### KMBT3904(MMBT3904)

#### ■ Features

- Epitaxial planar die construction



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

| Parameter                      | Symbol    | Rating     | 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                |
| Collector Power Dissipation    | $P_C$     | 0.2        | W                |
| Junction Temperature           | $T_J$     | 150        | $^\circ\text{C}$ |
| Storage Temperature            | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

#### ■ Electrical Characteristics $T_a = 25^\circ\text{C}$

| Parameter                            | Symbol        | Testconditons   | Min | Typ | Max  | Unit          |
|--------------------------------------|---------------|---|-----|-----|------|---------------|
| Collecto- base breakdown voltage     | $V_{CBO}$     | $I_C = 100 \mu\text{A}$ , $I_E = 0$                               | 60  |     |      | V             |
| Collector- emitter breakdown voltage | $V_{CEO}$     | $I_C = 1 \text{mA}$ , $I_B = 0$                                   | 40  |     |      | V             |
| Emitter - base breakdown voltage     | $V_{EBO}$     | $I_E = 10 \mu\text{A}$ , $I_C = 0$                                | 6   |     |      | V             |
| Collector cut-off current            | $I_{CBO}$     | $V_{CB} = 60 \text{V}$ , $I_E = 0$                                |     |     | 0.1  | $\mu\text{A}$ |
| Collector cut-off current            | $I_{CEO}$     | $V_{CE} = 30 \text{V}$ , $V_{BE(off)} = 3\text{V}$                |     |     | 50   | nA            |
| Emitter cut-off current              | $I_{EBO}$     | $V_{EB} = 5 \text{V}$ , $I_C = 0$                                 |     |     | 0.1  | $\mu\text{A}$ |
| DC current gain                      | $h_{FE}$      | $V_{CE} = 1\text{V}$ , $I_C = 10\text{mA}$                        | 100 |     | 400  |               |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 50\text{mA}$                        | 60  |     |      |               |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = 50 \text{mA}$ , $I_B = 5\text{mA}$                         |     |     | 0.3  | V             |
| Base - emitter saturation voltage    | $V_{BE(sat)}$ | $I_C = 50 \text{mA}$ , $I_B = 5\text{mA}$                         |     |     | 0.95 | V             |
| Delay time                           | $t_d$         | $V_{CC} = 3.0\text{V}$ , $V_{BE} = -0.5\text{V}$                  |     |     | 35   | ns            |
| Rise time                            | $t_r$         | $I_C = 10\text{mA}$ , $I_{B1} = -I_{B2} = 1.0\text{mA}$           |     |     | 35   |               |
| Storage time                         | $t_s$         | $V_{CC} = 3.0\text{V}$ , $I_C = 10\text{mA}$                      |     |     | 200  | ns            |
| Fall time                            | $t_f$         | $I_{B1} = -I_{B2} = 1.0\text{mA}$                                 |     |     | 50   |               |
| Transition frequency                 | $f_T$         | $V_{CE} = 20\text{V}$ , $I_C = 10\text{mA}$ , $f = 100\text{MHz}$ | 250 |     |      | MHz           |

#### ■ Marking

|         |     |
|---------|-----|
| Marking | 1AM |
|---------|-----|

### KMBT3904(MMBT3904)

■ Typical Characteristics

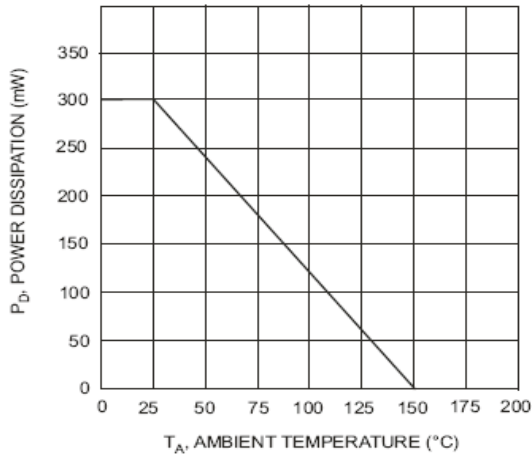


Fig.1 Max Power Dissipation vs Ambient Temperature

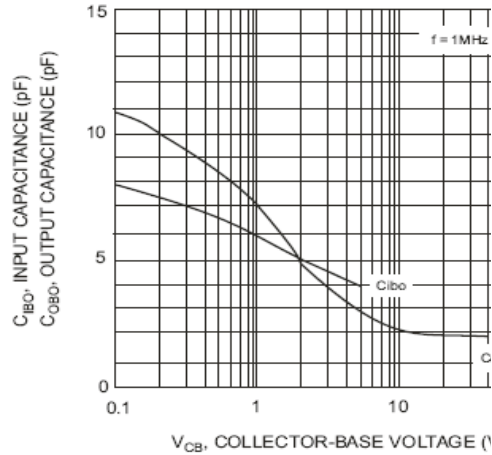


Fig.2 Input and Output Capacitance vs. Collector-Base Voltage

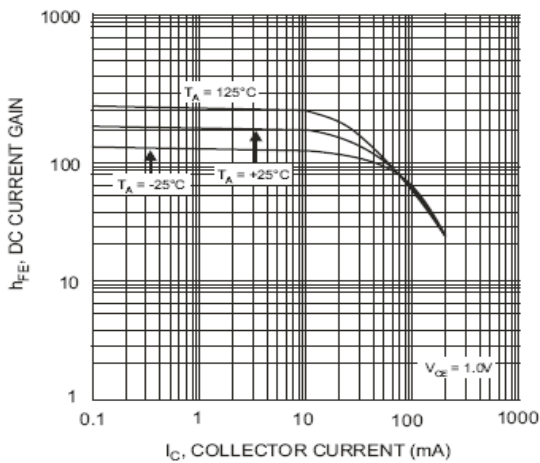


Fig.3 Typical DC Current Gain vs Collector Current

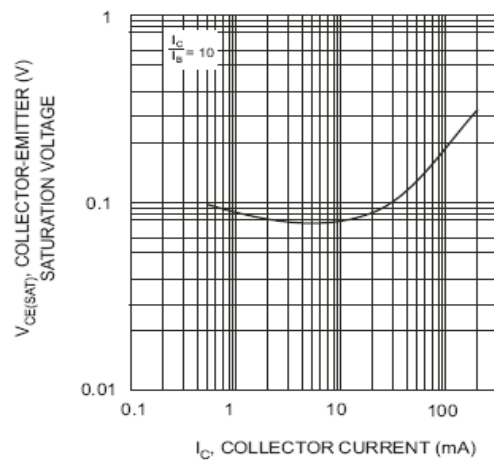


Fig.4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

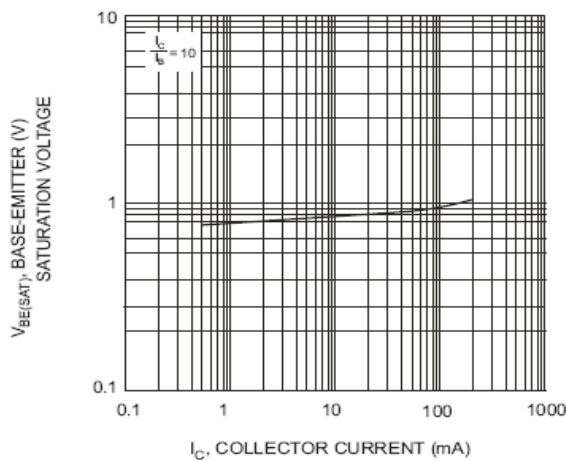


Fig.5 Typical Base-Emitter Saturation Voltage vs. Collector Current