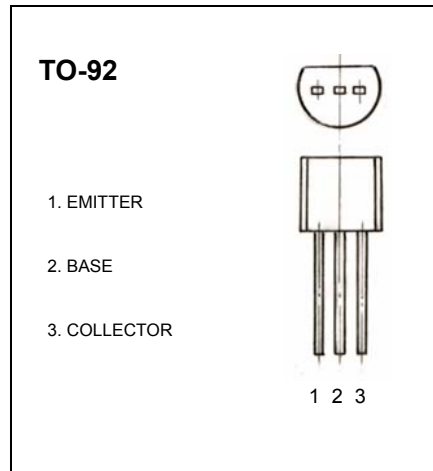




**2N3904** TRANSISTOR (NPN)

**FEA TURE**

- NPN silicon epitaxial planar transistor for switching and Amplifier applications
- As complementary type, the PNP transistor 2N3906 is Recommended
- This transistor is also available in the SOT-23 case with the type designation MMBT3904



**MAXIMUM RATINGS (T<sub>A</sub>=25°C unless otherwise noted)**

| Symbol           | Parameter                     | Value   | Units |
|------------------|-------------------------------|---------|-------|
| V <sub>CB0</sub> | Collector-Base Voltage        | 60      | V     |
| V <sub>CEO</sub> | Collector-Emitter Voltage     | 40      | V     |
| V <sub>EBO</sub> | Emitter-Base Voltage          | 6       | V     |
| I <sub>C</sub>   | Collector Current -Continuous | 0.2     | A     |
| P <sub>C</sub>   | Collector Power Dissipation   | 0.625   | W     |
| T <sub>J</sub>   | Junction Temperature          | 150     | °C    |
| T <sub>stg</sub> | Storage Temperature           | -55-150 | °C    |

**ELECTRICAL CHARACTERISTICS (T<sub>amb</sub>=25°C unless otherwise specified)**

| Parameter                            | Symbol               | Test conditions  | MIN | TYP | MAX  | UNIT |
|--------------------------------------|----------------------|--|-----|-----|------|------|
| Collector-base breakdown voltage     | V <sub>(BR)CBO</sub> | I <sub>C</sub> =10μA, I <sub>E</sub> =0  | 60  |     |      | V    |
| Collector-emitter breakdown voltage  | V <sub>(BR)CEO</sub> | I <sub>C</sub> = 1mA, I <sub>B</sub> =0  | 40  |     |      | V    |
| Emitter-base breakdown voltage       | V <sub>(BR)EBO</sub> | I <sub>E</sub> = 10μA, I <sub>C</sub> =0   | 6   |     |      | V    |
| Collector cut-off current            | I <sub>CBO</sub>     | V <sub>CB</sub> =60V, I <sub>E</sub> =0  |     |     | 0.1  | μA   |
| Collector cut-off current            | I <sub>CEO</sub>     | V <sub>CE</sub> = 40V, I <sub>B</sub> =0   |     |     | 0.1  | μA   |
| Emitter cut-off current              | I <sub>EBO</sub>     | V <sub>EB</sub> = 5V, I <sub>C</sub> =0  |     |     | 0.1  | μA   |
| DC current gain                      | h <sub>FE1</sub>     | V <sub>CE</sub> =1V, I <sub>C</sub> =10mA  | 100 |     | 400  |      |
|                                      | h <sub>FE2</sub>     | V <sub>CE</sub> =1V, I <sub>C</sub> =50mA  | 60  |     |      |      |
|                                      | h <sub>FE3</sub>     | V <sub>CE</sub> =1V, I <sub>C</sub> =100mA   | 30  |     |      |      |
| Collector-emitter saturation voltage | V <sub>CE(sat)</sub> | I <sub>C</sub> =50mA, I <sub>B</sub> =5mA  |     |     | 0.3  | V    |
| Base-emitter saturation voltage      | V <sub>BE(sat)</sub> | I <sub>C</sub> =50mA, I <sub>B</sub> =5mA  |     |     | 0.95 | V    |
| Transition frequency                 | f <sub>T</sub>       | V <sub>CE</sub> =20V, I <sub>C</sub> =10mA, f=100MHz                                   | 300 |     |      | MHz  |
| Delay Time                           | t <sub>d</sub>       | V <sub>CC</sub> =3V, V <sub>BE</sub> =0.5V, I <sub>C</sub> =10mA, I <sub>B1</sub> =1mA |     |     | 35   | ns   |
| Rise Time                            | t <sub>r</sub>       |  |     |     | 35   | ns   |
| Storage Time                         | t <sub>s</sub>       | V <sub>CC</sub> =3V, I <sub>C</sub> =10mA  |     |     | 200  | ns   |
| Fall Time                            | t <sub>f</sub>       | I <sub>B1</sub> =I <sub>B2</sub> =1mA  |     |     | 50   | ns   |

**CLASSIFICATION OF h<sub>FE1</sub>**

| Rank  | O       | Y       | G       |
|-------|---------|---------|---------|
| Range | 100-200 | 200-300 | 300-400 |