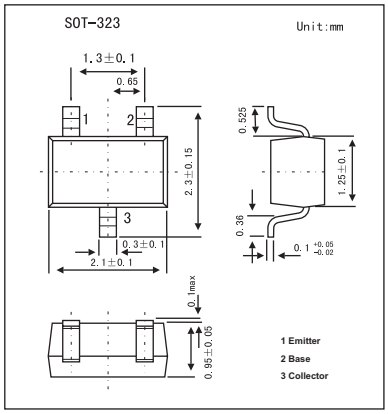
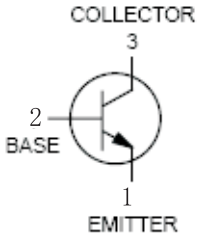
# General Purpose Transistor

# MMBT3906W




## Features

- General purpose transistor.
- Pb?Free package is available.




## Absolute Maximum Ratings Ta = 25℃

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CEO}$ | -40 | V |
| Collector-base voltage | $V_{CBO}$ | -40 | V |
| Emitter-base voltage | $V_{EBO}$ | -5 | V |
| Collector current | $I_C$ | -200 | mA |
| Total Device Dissipation FR-5 Board | $P_D$ | 150 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 833 | ℃/W |
| Junction temperature | $T_j$ | 150 | ℃ |
| Storage temperature | $T_{stg}$ | -55 to +150 | ℃ |

# MMBT3906W

## ■ Electrical Characteristics Ta = 25℃

| Parameter | Symbol | Testconditons | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C$ = -1.0 mA, $I_B$ = 0 | -40 | | | V |
| Collector-base breakdown voltage | $V_{(BR)CBO}$ | $I_C$ = -10 μA, $I_E$ = 0 | -40 | | | V |
| Emitter-base breakdown voltage | $V_{(BR)EBO}$ | $I_E$ = -10 μA, $I_C$ = 0 | -5 | | | V |
| Base cutoff current | $I_{BL}$ | $V_{CE}$ = -30 V, $V_{EB}$ = -3.0 V | | | -50 | nA |
| Collector cutoff current | $I_{CEX}$ | $V_{CE}$ = -30 V, $V_{EB}$ = -3.0 V | | | -50 | nA |
| DC current gain * | $H_{FE}$ | $I_C$ = -0.1 mA, $V_{CE}$ = -1.0 V<br>$I_C$ = -1.0 mA, $V_{CE}$ = -1.0 V<br>$I_C$ = -10 mA, $V_{CE}$ = -1.0 V<br>$I_C$ = -50 mA, $V_{CE}$ = -1.0 V<br>$I_C$ = -100 mA, $V_{CE}$ = -1.0 V | 60<br>80<br>100<br>60<br>30 | | 300 | |
| Collector-emitter saturation voltage * | $V_{CE(sat)}$ | $I_C$ = -10 mA, $I_B$ = -1.0 mA | | | -0.25 | V |
| | | $I_C$ = -50 mA, $I_B$ = -5.0 mA | | | -0.4 | |
| Base-emitter saturation voltage * | $V_{BE(sat)}$ | $I_C$ = -10 mA, $I_B$ = -1.0 mA | -0.65 | | -0.85 | |
| | | $I_C$ = -50 mA, $I_B$ = -5.0 mA | | | -0.95 | |
| Current-gain-bandwidth product | $f_T$ | $I_C$ = -10 mA, $V_{CE}$ = -20 V, f = 100 MHz | 250 | | | MHz |
| Output capacitance | $C_{obo}$ | $V_{CB}$ = -5.0 V, $I_E$ = 0, f = 1.0 MHz | | | 4.5 | pF |
| Input capacitance | $C_{ibo}$ | $V_{EB}$ = -0.5 V, $I_C$ = 0, f = 1.0 MHz | | | 10 | pF |
| Input impedance | $h_{ie}$ | $V_{CE}$ = -10 V, $I_C$ = -1.0 mA, f = 1.0 kHz | 2.0 | | 12 | kΩ |
| Voltage feedback ratio | $h_{re}$ | $V_{CE}$ = -10 V, $I_C$ = -1.0 mA, f = 1.0 kHz | 0.1 | | 10 | $X10^{-4}$ |
| Small-signal current gain | $h_{fe}$ | $V_{CE}$ = -10 V, $I_C$ = -1.0 mA, f = 1.0 kHz | 100 | | 400 | |
| Output admittance | $h_{oe}$ | $V_{CE}$ = -10 V, $I_C$ = -1.0 mA, f = 1.0 kHz | 3.0 | | 60 | μmhos |
| Noise figure | NF | $V_{CE}$ = -5.0 V, $I_C$ = -100 μA, $R_S$ = 1.0 kΩ, f = 1.0 kHz | | | 4.0 | dB |
| Delay time | $t_d$ | $V_{CC}$ = -3.0 V, $V_{BE}$ = 0.5 V | | | 35 | ns |
| Rise time | $t_r$ | $I_C$ = -10 mA, $I_{B1}$ = -1.0 mA | | | 35 | ns |
| Storage time | $t_s$ | $V_{CC}$ = -3.0 V, $I_C$ = -10 mA | | | 225 | ns |
| Fall time | $t_f$ | $I_{B1}$ = $I_{B2}$ = -1.0 mA | | | 75 | ns |

* Pulse test: pulse width ⩽ 300 μs, duty cycle ⩽ 2.0%.

## ■ Marking

| Marking | 2A |
|---|---|