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## MMBT3906 Silicon PNP Transistor General Purpose Amp, Surface Mount

**Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$ , Note 1 unless otherwise specified)

|  |                                     |
|--|-------------------------------------|
| Collector–Emitter Voltage, $V_{CEO}$ .....                         | 40V                                 |
| Collector–Base Voltage, $V_{CBO}$ .....                            | 40V                                 |
| Emitter–Base Voltage, $V_{EBO}$ .....                              | 5V                                  |
| Continuous Collector Current, $I_C$ .....                          | 200mA                               |
| Total Device Dissipation (Note 2), $P_D$ .....                     | 350mW                               |
| Derate above $+25^\circ\text{C}$ .....                             | 2.8mW/ $^\circ\text{C}$             |
| Thermal Resistance, Junction–to–Ambient (Note 2), $R_{thJA}$ ..... | 375 $^\circ\text{C}/\text{W}$       |
| Operating Junction Temperature Range, $T_J$ .....                  | $-55^\circ$ to $+150^\circ\text{C}$ |
| Storage Temperature Range, $T_{stg}$ .....                         | $-55^\circ$ to $+150^\circ\text{C}$ |

Note 1. These are steady–state limits and are based on a maximum junction temperature of  $+150^\circ\text{C}$ .

Note 2. Device is mounted on FR–4 PCB 1.6 inch x 1.6 inch x 0.06 inch.

**Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

| Parameter                            | Symbol        | Test Conditions                              | Min  | Typ | Max  | Unit |
|--------------------------------------|---------------|--|------|-----|------|------|
| <b>OFF Characteristics</b>           |               |  |      |     |      |      |
| Collector–Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C = 1\text{mA}$ , $I_B = 0$ , Note 3      | 40   | –   | –    | V    |
| Collector–Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = 10\mu\text{A}$ , $I_E = 0$            | 40   | –   | –    | V    |
| Emitter–Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E = 10\mu\text{A}$ , $I_C = 0$            | 5    | –   | –    | V    |
| Base Cut–Off Current                 | $I_{BL}$      | $V_{CE} = 30\text{V}$ , $V_{BE} = 3\text{V}$ | –    | –   | 50   | nA   |
| Collector Cutoff Current             | $I_{CEX}$     | $V_{CE} = 30\text{V}$ , $V_{BE} = 3\text{V}$ | –    | –   | 50   | nA   |
| <b>ON Characteristics</b>            |               |  |      |     |      |      |
| DC Current Gain (Note 3)             | $h_{FE}$      | $V_{CE} = 1\text{V}$ , $I_C = 0.1\text{mA}$  | 60   | –   | –    |      |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 1\text{mA}$    | 80   | –   | –    |      |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 10\text{mA}$   | 100  | –   | 300  |      |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 50\text{mA}$   | 60   | –   | –    |      |
|                                      |               | $V_{CE} = 1\text{V}$ , $I_C = 100\text{mA}$  | 30   | –   | –    |      |
| Collector–Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 10\text{mA}$ , $I_B = 1\text{mA}$     | –    | –   | 0.25 | V    |
|                                      |               | $I_C = 50\text{mA}$ , $I_B = 5\text{mA}$     | –    | –   | 0.40 | V    |
| Base–Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C = 10\text{mA}$ , $I_B = 1\text{mA}$     | 0.65 | –   | 0.85 | V    |
|                                      |               | $I_C = 50\text{mA}$ , $I_B = 5\text{mA}$     | –    | –   | 0.95 | V    |

Note 3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

**Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

| Parameter                           | Symbol    | Test Conditions   | Min | Typ | Max | Unit |
|-------------------------------------|-----------|---|-----|-----|-----|------|
| <b>Small-Signal Characteristics</b> |           |   |     |     |     |      |
| Current Gain-Bandwidth Product      | $f_T$     | $I_C = 10\text{mA}, V_{CE} = 20\text{V}, f = 100\text{MHz}$   | 250 | -   | -   | MHz  |
| Output Capacitance                  | $C_{obo}$ | $V_{CB} = 5\text{V}, I_E = 0, f = 100\text{kHz}$  | -   | -   | 4.5 | pF   |
| Input Capacitance                   | $C_{ibo}$ | $V_{EB} = 0.5\text{V}, I_C = 0, f = 100\text{kHz}$  | -   | -   | 10  | pF   |
| Noise Figure                        | NF        | $V_{CE} = 5\text{V}, I_C = 100\mu\text{A}, R_S = 1\text{k}\Omega, f = 10\text{Hz to } 15.7\text{kHz}$ | -   | -   | 4   | dB   |
| <b>Switching Characteristics</b>    |           |   |     |     |     |      |
| Delay Time                          | $t_d$     | $V_{CC} = 3\text{V}, V_{BE} = 0.5\text{V}, I_C = 10\text{mA}, I_{B1} = 1\text{mA}$                    | -   | -   | 35  | ns   |
| Rise Time                           | $t_r$     |   | -   | -   | 35  | ns   |
| Storage Time                        | $t_s$     | $V_{CC} = 3\text{V}, I_C = 10\text{mA}, I_{B1} = I_{B2} = 1\text{mA}$                                 | -   | -   | 225 | ns   |
| Fall Time                           | $t_f$     |   | -   | -   | 75  | ns   |

Note 3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

