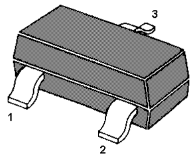
# MMBT2222 / MMBT2222A

## NPN Silicon Epitaxial Planar Transistor

for switching and amplifier applications




1. Base 2. Emitter 3. Collector
SOT-23 Plastic Package

**Absolute Maximum Ratings ($T_a$ = 25 °C)**

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector Base Voltage | MMBT2222 | $V_{CBO}$ | 60 | V |
| | MMBT2222A | | 75 | |
| Collector Emitter Voltage | MMBT2222 | $V_{CEO}$ | 30 | V |
| | MMBT2222A | | 40 | |
| Emitter Base Voltage | MMBT2222 | $V_{EBO}$ | 5 | V |
| | MMBT2222A | | 6 | |
| Collector Current | | $I_C$ | 600 | mA |
| Power Dissipation | | $P_{tot}$ | 350 | mW |
| Junction Temperature | | $T_j$ | 150 | °C |
| Storage Temperature Range | | $T_{stg}$ | - 55 to + 150 | °C |

**Characteristics at $T_a$ = 25 °C**

| Parameter | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| DC Current Gain | | | | | |
| at $V_{CE}$ = 10 V, $I_C$ = 0.1 mA | | $h_{FE}$ | 35 | - | - |
| at $V_{CE}$ = 10 V, $I_C$ = 1 mA | | $h_{FE}$ | 50 | - | - |
| at $V_{CE}$ = 10 V, $I_C$ = 10 mA | | $h_{FE}$ | 75 | - | - |
| at $V_{CE}$ = 1 V, $I_C$ = 150 mA | | $h_{FE}$ | 50 | - | - |
| at $V_{CE}$ = 10 V, $I_C$ = 150 mA | | $h_{FE}$ | 100 | 300 | - |
| at $V_{CE}$ = 10 V, $I_C$ = 500 mA | MMBT2222 | $h_{FE}$ | 30 | - | - |
| | MMBT2222A | $h_{FE}$ | 40 | - | - |
| Collector Base Cutoff Current | | | | | |
| at $V_{CB}$ = 50 V | MMBT2222 | $I_{CBO}$ | - | 10 | nA |
| at $V_{CB}$ = 60 V | MMBT2222A | | - | 10 | |
| Emitter Base Cutoff Current<br>at $V_{EB}$ = 3 V | | $I_{EBO}$ | - | 100 | nA |
| Collector Base Breakdown Voltage | | | | | |
| at $I_C$ = 10 µA | MMBT2222 | $V_{(BR)CBO}$ | 60 | - | V |
| | MMBT2222A | | 75 | - | |
| Collector Emitter Breakdown Voltage | | | | | |
| at $I_C$ = 10 mA | MMBT2222 | $V_{(BR)CEO}$ | 30 | - | V |
| | MMBT2222A | | 40 | - | |
| Emitter Base Breakdown Voltage | | | | | |
| at $I_E$ = 10 µA | MMBT2222 | $V_{(BR)EBO}$ | 5 | - | V |
| | MMBT2222A | | 6 | - | |
| Collector Emitter Saturation Voltage | | | | | |
| at $I_C$ = 150 mA, $I_B$ = 15 mA | MMBT2222 | $V_{CE(sat)}$ | - | 0.4 | V |
| | MMBT2222A | | - | 0.3 | |
| at $I_C$ = 500 mA, $I_B$ = 50 mA | MMBT2222 | | - | 1.6 | |
| | MMBT2222A | | - | 1 | |
| Base Emitter Saturation Voltage | | | | | |
| at $I_C$ = 150 mA, $I_B$ = 15 mA | MMBT2222 | $V_{BE(sat)}$ | - | 1.3 | V |
| | MMBT2222A | | 0.6 | 1.2 | |
| at $I_C$ = 500 mA, $I_B$ = 50 mA | MMBT2222 | | - | 2.6 | |
| | MMBT2222A | | - | 2 | |
| Transition Frequency<br>at $V_{CE}$ = 20 V, -$I_E$ = 20 mA, f = 100 MHz | | $f_T$ | 300 | - | MHz |
| Collector Output Capacitance<br>at $V_{CB}$ = 10 V, f = 100 KHz | | $C_{ob}$ | - | 8 | pF |
| Delay Time<br>at $V_{CC}$ = 30 V, $V_{BE(OFF)}$ = 0.5 V, $I_C$ = 150 mA, $I_{B1}$ = 15 mA | | $t_d$ | - | 10 | ns |
| Rise Time<br>at $V_{CC}$ = 30 V, $V_{BE(OFF)}$ = 0.5 V, $I_C$ = 150 mA, $I_{B1}$ = 15 mA | | $t_r$ | - | 25 | ns |
| Storage Time<br>at $V_{CC}$ = 30 V, $I_C$ = 150 mA, $I_{B1}$ = -$I_{B2}$ = 15 mA | | $t_{stg}$ | - | 225 | ns |
| Fall Time<br>at $V_{CC}$ = 30 V, $I_C$ = 150 mA, $I_{B1}$ = -$I_{B2}$ = 15 mA | | $t_f$ | - | 60 | ns |

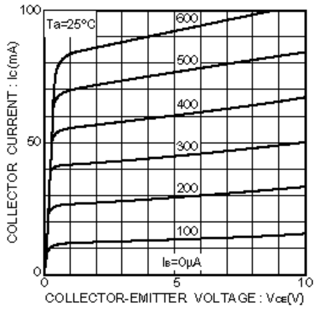



Fig.1 Grounded emitter output characteristics

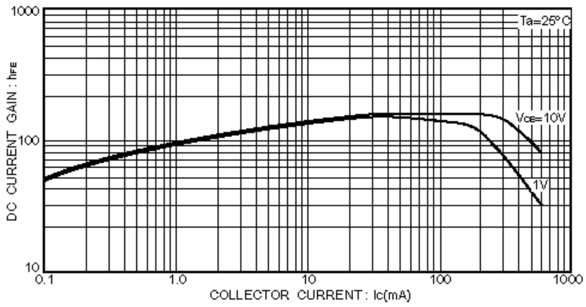



Fig.3 DC current gain vs. collector current(I)

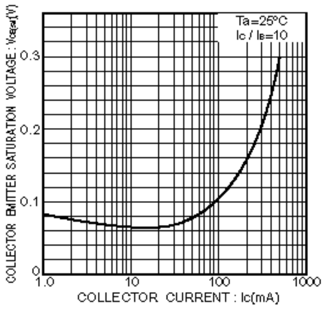



Fig.2 Collector-emitter saturation voltage vs. collector current

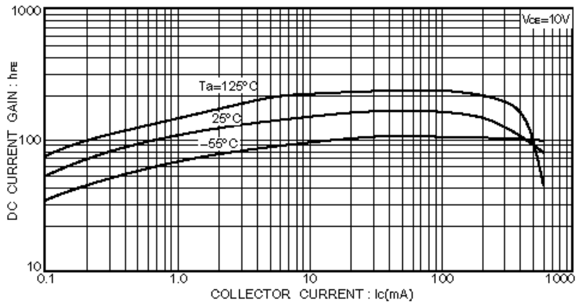



Fig.4 DC current gain vs. collector current(II)

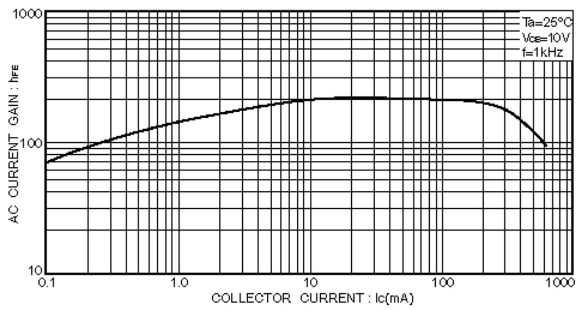



Fig.5 AC current gain vs. collector current

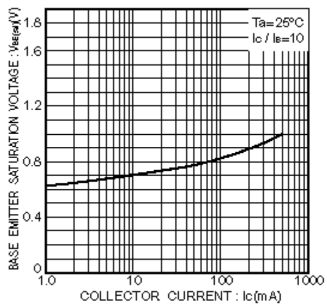



Fig.6 Base-emitter saturation voltage vs. collector current

**Fig.7 Pc-Ta**