



MMBT2222A

SMALL SIGNAL NPN TRANSISTOR

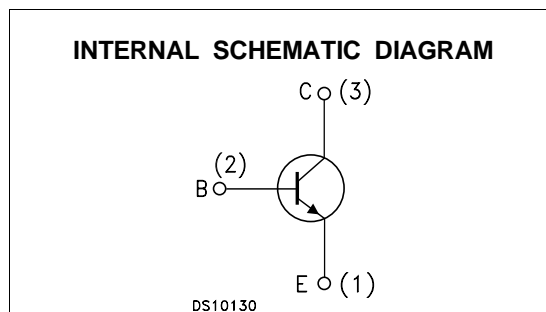
PRELIMINARY DATA

| Type | Marking |
|-----------|---------|
| MMBT2222A | M22 |

- SILICON EPITAXIAL PLANAR NPN TRANSISTOR
- MINIATURE SOT-23 PLASTIC PACKAGE FOR SURFACE MOUNTING CIRCUITS
- TAPE & REEL PACKING
- THE PNP COMPLEMENTARY TYPE IS MMBT2907A

APPLICATIONS

- WELL SUITABLE FOR PORTABLE EQUIPMENT
- SMALL LOAD SWITCH TRANSISTOR WITH HIGH GAIN AND LOW SATURATION VOLTAGE



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|---|------------|------|
| V_{CE0} | Collector-Emitter Voltage ($I_E = 0$) | 75 | V |
| V_{CEO} | Collector-Emitter Voltage ($I_B = 0$) | 40 | V |
| V_{EBO} | Emitter-Base Voltage ($I_C = 0$) | 6 | V |
| I_C | Collector Current | 0.6 | A |
| I_{CM} | Collector Peak Current ($t_p < 5$ ms) | 0.8 | A |
| P_{tot} | Total Dissipation at $T_{amb} = 25$ °C | 350 | mW |
| T_{stg} | Storage Temperature | -65 to 150 | °C |
| T_j | Max. Operating Junction Temperature | 150 | °C |

MMBT2222A

THERMAL DATA

| | | | | |
|-----------------|-------------------------------------|-----|-------|------|
| $R_{thj-amb}$ • | Thermal Resistance Junction-Ambient | Max | 357.1 | °C/W |
|-----------------|-------------------------------------|-----|-------|------|

• Device mounted on a PCB area of 1 cm².

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|------------------------|--|--|-----------------------------------|------|------------|--------------------------------------|
| I _{CEX} | Collector Cut-off Current (V _{BE} = -3 V) | V _{CE} = 60 V | | | 10 | nA |
| I _{BEX} | Base Cut-off Current (V _{BE} = -3 V) | V _{CE} = 60 V | | | 20 | nA |
| I _{CBO} | Collector Cut-off Current (I _E = 0) | V _{CB} = 75 V V _{CB} = 75 V T _j = 150 °C | | | 10 10 | nA μA |
| I _{EBO} | Emitter Cut-off Current (I _C = 0) | V _{EB} = 3 V | | | 15 | nA |
| V _{(BR)CEO} * | Collector-Emitter Breakdown Voltage (I _B = 0) | I _C = 10 mA | 40 | | | V |
| V _{(BR)CBO} | Collector-Base Breakdown Voltage (I _E = 0) | I _C = 10 μA | 75 | | | V |
| V _{(BR)EBO} | Emitter-Base Breakdown Voltage (I _C = 0) | I _E = 10 μA | 6 | | | V |
| V _{CE(sat)} * | Collector-Emitter Saturation Voltage | I _C = 150 mA I _C = 500 mA I _B = 15 mA I _B = 50 mA | | | 0.3 1 | V V |
| V _{BE(sat)} * | Collector-Base Saturation Voltage | I _C = 150 mA I _C = 500 mA I _B = 15 mA I _B = 50 mA | 0.6 | | 1.2 2 | V V |
| h _{FE} * | DC Current Gain | I _C = 0.1 mA I _C = 1 mA I _C = 10 mA I _C = 150 mA I _C = 150 mA I _C = 500 mA V _{CE} = 10 V V _{CE} = 10 V V _{CE} = 10 V V _{CE} = 10 V V _{CE} = 1 V V _{CE} = 10 V | 35 50 75 100 50 40 | | 300 | |
| f _T | Transition Frequency | I _C = 20 mA V _{CE} = 20V f = 100MHz | | 270 | | MHz |
| C _{CBO} | Collector-Base Capacitance | I _E = 0 V _{CB} = 10 V f = 1 MHz | | 4 | 8 | pF |
| C _{EBO} | Emitter-Base Capacitance | I _C = 0 V _{EB} = 0.5 V f = 1MHz | | 20 | 25 | pF |
| NF | Noise Figure | I _C = 0.1 mA V _{CE} = 10 V f = 1 KHz Δf = 200 Hz R _G = 1 KΩ | | 4 | | dB |
| h _{ie} * | Input Impedance | V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz | 2 0.25 | | 8 1.25 | KΩ KΩ |
| h _{re} * | Reverse Voltage Ratio | V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz | | | 8 4 | 10 ⁻⁴ 10 ⁻⁴ |
| h _{fe} * | Small Signal Current Gain | V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz | 50 75 | | 300 375 | |
| h _{oe} * | Output Admittance | V _{CE} = 10 V I _C = 1 mA f = 1 KHz V _{CE} = 10 V I _C = 10 mA f = 1 KHz | 5 25 | | 35 200 | μS μS |

* Pulsed: Pulse duration = 300 μs, duty cycle ≤ 2 %

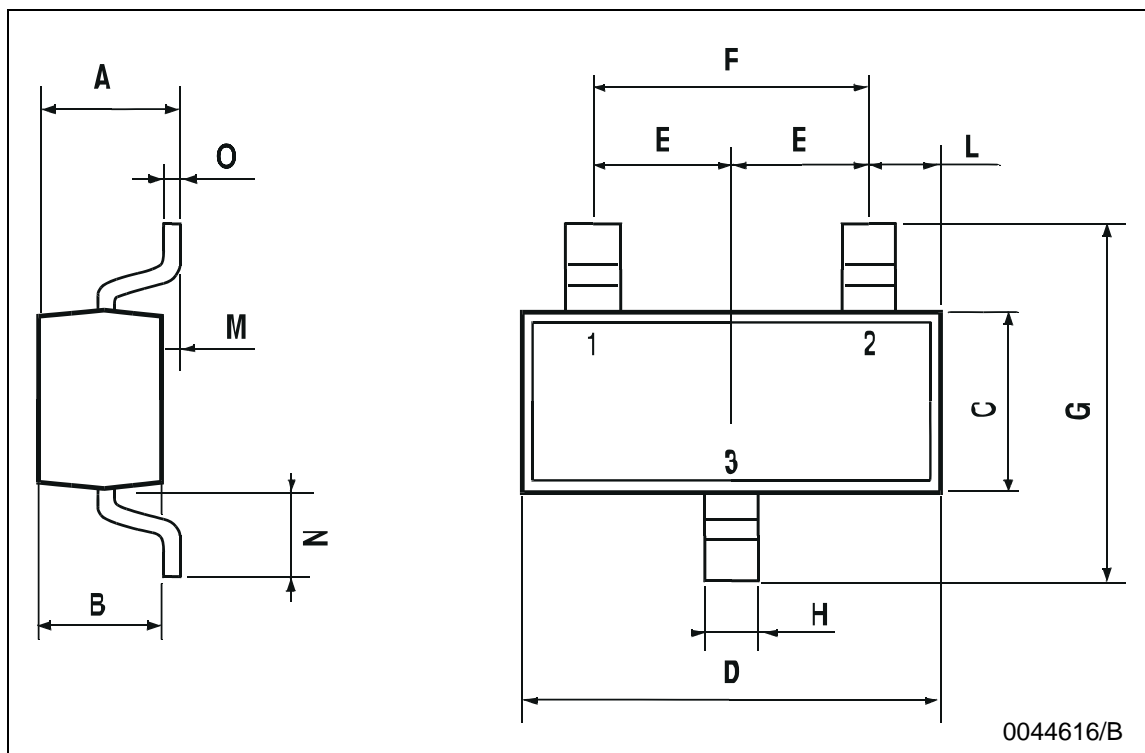
ELECTRICAL CHARACTERISTICS (Continued)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------|--------------|---|------|------|------|------|
| t_d | Delay Time | $I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$ $V_{CC} = 30 \text{ V}$ | | 5 | 10 | ns |
| t_r | Rise Time | | | 12 | 25 | ns |
| t_s | Storage Time | $I_C = 150 \text{ mA}$ $I_{B1} = - I_{B2} = 15 \text{ mA}$ $V_{CC} = 30 \text{ V}$ | | 185 | 225 | ns |
| t_f | Fall Time | | | 24 | 60 | ns |

* Pulsed: Pulse duration = 300 μs , duty cycle $\leq 2\%$

SOT-23 MECHANICAL DATA

| DIM. | mm | | | mils | | |
|------|------|------|------|-------|------|------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 0.85 | | 1.1 | 33.4 | | 43.3 |
| B | 0.65 | | 0.95 | 25.6 | | 37.4 |
| C | 1.20 | | 1.4 | 47.2 | | 55.1 |
| D | 2.80 | | 3 | 110.2 | | 118 |
| E | 0.95 | | 1.05 | 37.4 | | 41.3 |
| F | 1.9 | | 2.05 | 74.8 | | 80.7 |
| G | 2.1 | | 2.5 | 82.6 | | 98.4 |
| H | 0.38 | | 0.48 | 14.9 | | 18.8 |
| L | 0.3 | | 0.6 | 11.8 | | 23.6 |
| M | 0 | | 0.1 | 0 | | 3.9 |
| N | 0.3 | | 0.65 | 11.8 | | 25.6 |
| O | 0.09 | | 0.17 | 3.5 | | 6.7 |



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