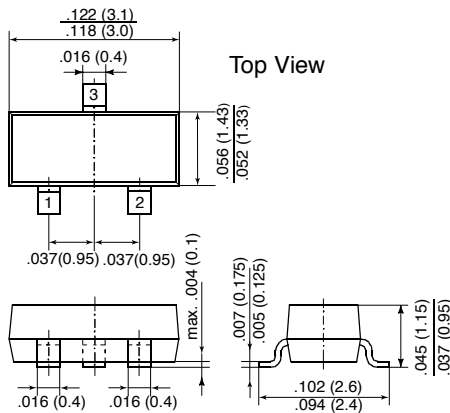


MMBT4403

SMALL SIGNAL TRANSISTORS (PNP)

SOT-23



Dimensions in inches and (millimeters)

Pin configuration

1 = Base, 2 = Emitter, 3 = Collector.

FEATURES

- ◆ PNP Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- ◆ As complementary type, the NPN transistor MMBT4401 is recommended.
- ◆ This transistor is also available in the TO-92 case with the type designation 2N4403.



MECHANICAL DATA

Case: SOT-23 Plastic Package

Weight: approx. 0.008g

Marking code: 2T

MAXIMUM RATINGS AND THERMAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

| | SYMBOL | VALUE | UNIT |
|--|-----------------|-------------------|-------------|
| Collector-Base Voltage | $-V_{CBO}$ | 40 | Volts |
| Collector-Emitter Voltage | $-V_{CEO}$ | 40 | Volts |
| Emitter-Base Voltage | $-V_{EBO}$ | 5.0 | Volts |
| Collector Current | $-I_C$ | 600 | mA |
| Power Dissipation FR-5 Board,* $T_A=25^\circ\text{C}$ Derate above 25°C | P_{tot} | 225 1.8 | mW mW/°C |
| Power Dissipation Alumina Substrate,** $T_A=25^\circ\text{C}$ Derate above 25°C | P_{tot} | 300 2.4 | mW mW/°C |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | FR-5 Board | 556 |
| | | Alumina Substrate | 417 |
| Junction Temperature | T_j | 150 | °C |
| Storage Temperature Range | T_s | -55 to +150 | °C |

*FR-5 = 1.0 x 0.75 x 0.062 in.

**Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

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ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

| | SYMBOL | MIN. | MAX. | UNIT |
|--|----------------|------|------|------------|
| Collector-Base Breakdown Voltage at $-I_C = 0.1 \text{ mA}$, $I_E = 0$ | $-V_{(BR)CBO}$ | 40 | – | Volts |
| Collector-Emitter Breakdown Voltage ⁽¹⁾ at $-I_C = 1 \text{ mA}$, $I_B = 0$ | $-V_{(BR)CEO}$ | 40 | – | Volts |
| Emitter-Base Breakdown Voltage at $-I_E = 0.1 \text{ mA}$, $I_C = 0$ | $-V_{(BR)EBO}$ | 5.0 | – | Volts |
| Collector-Emitter Saturation Voltage ⁽¹⁾ at $-I_C = 150 \text{ mA}$, $-I_B = 15 \text{ mA}$ | $-V_{CEsat}$ | – | 0.40 | Volts |
| at $-I_C = 500 \text{ mA}$, $-I_B = 50 \text{ mA}$ | $-V_{CEsat}$ | – | 0.75 | Volts |
| Base-Emitter Saturation Voltage ⁽¹⁾ at $-I_C = 150 \text{ mA}$, $-I_B = 15 \text{ mA}$ | $-V_{BEsat}$ | 0.75 | 0.95 | Volts |
| at $-I_C = 500 \text{ mA}$, $-I_B = 50 \text{ mA}$ | $-V_{BEsat}$ | – | 1.30 | Volts |
| Collector-Emitter Cutoff Current at $-V_{EB} = 0.4 \text{ V}$, $-V_{CE} = 35 \text{ V}$ | $-I_{CEX}$ | – | 100 | nA |
| Emitter-Base Cutoff Current at $-V_{EB} = 0.4 \text{ V}$, $-V_{CE} = 35 \text{ V}$ | $-I_{BEV}$ | – | 100 | nA |
| DC Current Gain at $-V_{CE} = 1 \text{ V}$, $-I_C = 0.1 \text{ mA}$ | h_{FE} | 30 | – | – |
| at $-V_{CE} = 1 \text{ V}$, $-I_C = 1 \text{ mA}$ | h_{FE} | 60 | – | – |
| at $-V_{CE} = 1 \text{ V}$, $-I_C = 10 \text{ mA}$ | h_{FE} | 100 | – | – |
| at $-V_{CE} = 2 \text{ V}$, $-I_C = 150 \text{ mA}$ | h_{FE} | 100 | 300 | – |
| at $-V_{CE} = 2 \text{ V}$, $-I_C = 500 \text{ mA}$ | h_{FE} | 20 | – | – |
| Input Impedance at $-V_{CE} = 10 \text{ V}$, $-I_C = 1 \text{ mA}$, $f = 1 \text{ kHz}$ | h_{ie} | 1.5 | 15 | k Ω |
| Current Gain-Bandwidth Product at $-V_{CE} = 10 \text{ V}$, $-I_C = 20 \text{ mA}$, $f = 100 \text{ MHz}$ | f_T | 200 | – | MHz |
| Collector-Base Capacitance at $-V_{CB} = 10 \text{ V}$, $I_E = 0$, $f = 1 \text{ MHz}$ | C_{CBO} | – | 8.5 | pF |
| Emitter-Base Capacitance at $-V_{EB} = 0.5 \text{ V}$, $I_C = 0$, $f = 1 \text{ MHz}$, | C_{EBO} | – | 30 | pF |

NOTES:

(1) Pulse test: pulse width $\leq 300\mu$ duty cycle $\leq 2\%$

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ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified

| | SYMBOL | MIN. | MAX. | UNIT |
|---|----------|---------------------|-------------------|---------------|
| Voltage Feedback Ratio at $-V_{CE} = 10\text{ V}$, $-I_C = 1\text{ mA}$, $f = 1\text{ kHz}$ | h_{re} | $0.1 \cdot 10^{-4}$ | $8 \cdot 10^{-4}$ | – |
| Small Signal Current Gain at $-V_{CE} = 10\text{ V}$, $-I_C = 1\text{ mA}$, $f = 1\text{ kHz}$ | h_{fe} | 60 | 500 | – |
| Output Admittance at $-V_{CE} = 1\text{ V}$, $-I_C = 1\text{ mA}$, $f = 1\text{ kHz}$ | h_{oe} | 1.0 | 100 | μS |
| Delay Time at $-I_{B1} = 15\text{ mA}$, $-I_C = 150\text{ mA}$, $-V_{CC} = 30\text{ V}$, $-V_{EB} = 2\text{ V}$ | t_d | – | 15 | ns |
| Rise Time at $-I_{B1} = 15\text{ mA}$, $-I_C = 150\text{ mA}$, $-V_{CC} = 30\text{ V}$, $-V_{EB} = 2\text{ V}$ | t_r | – | 20 | ns |
| Storage Time at $I_{B1} = -I_{B2} = 15\text{ mA}$, $-I_C = 150\text{ mA}$, $-V_{CC} = 30\text{ V}$ | t_s | – | 225 | ns |
| Fall Time at $I_{B1} = -I_{B2} = 15\text{ mA}$, $-I_C = 150\text{ mA}$, $-V_{CC} = 30\text{ V}$ | t_f | – | 30 | ns |

SWITCHING TIME EQUIVALENT TEST CIRCUIT

FIGURE 1 - TURN-ON TIME

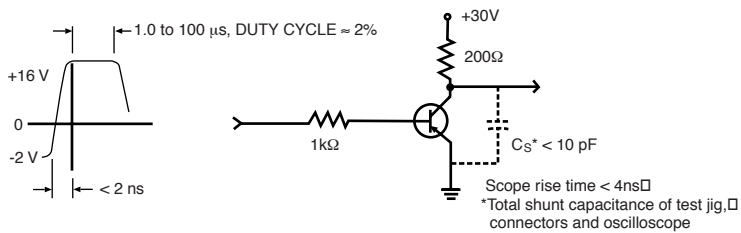


FIGURE 2 - TURN-OFF TIME

