



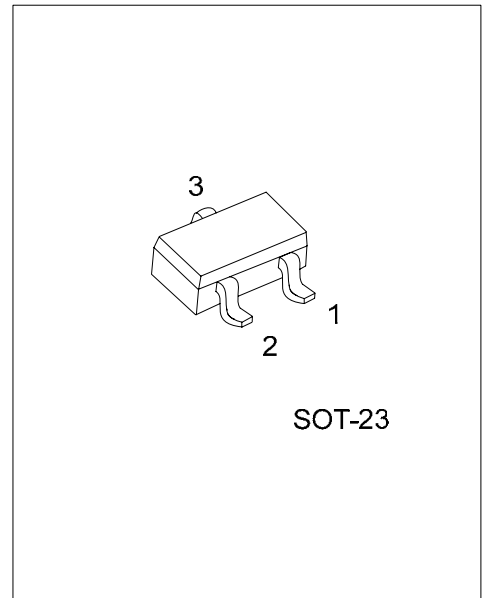
## MMBT4403

**PNP SILICON TRANSISTOR**

### PNP GENERAL PURPOSE AMPLIFIER

#### DESCRIPTION

The UTC **MMBT4403** is designed for use as a general purpose amplifier and switch requiring collector currents up to 500mA.



SOT-23

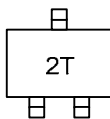
\*Pb-free plating product number: MMBT4403L

#### ORDERING INFORMATION

| Order Number   |                   | Package | Pin Assignment |   |   | Packing   |
|----------------|-------------------|---------|----------------|---|---|-----------|
| Normal         | Lead Free Plating |         | 1              | 2 | 3 |           |
| MMBT4403-AE3-R | MMBT4403-AE3-R    | SOT-23  | E              | B | C | Tape Reel |

|  |  |
|--|--|
| <p>MMBT4403L-AE3-R</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Lead Plating</p> | <p>(1) R: Tape Reel<br/>(2) AE3: SOT-23<br/>(3) L: Lead Free Plating, Blank: Pb/Sn</p> |
|--|--|

#### MARKING



# MMBT4403

## PNP SILICON TRANSISTOR

■ ABSOLUTE MAXIMUM RATING (Ta=25 , unless otherwise specified)

| PARAMETER                                   | SYMBOL    | RATINGS    | UNIT |
|---|-----------|------------|------|
| Collector-Base Voltage                      | $V_{CBO}$ | 40         | V    |
| Collector-Emitter Voltage                   | $V_{CEO}$ | 40         | V    |
| Emitter-Base Voltage                        | $V_{EBO}$ | 5          | V    |
| Collector Current-Continuous                | $I_C$     | 600        | mA   |
| Total Device Dissipation<br>Derate above 25 | $P_C$     | 350        | mW   |
|   |           | 2.8        | mW/  |
| Junction Temperature                        | $T_J$     | 150        |      |
| Storage Temperature                         | $T_{STG}$ | -55 ~ +150 |      |

Note 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

■ THERMAL CHARACTERISTICS (Ta=25 , unless otherwise specified)

| CHARACTERISTIC                          | SYMBOL        | RATINGS | UNIT |
|---|---------------|---------|------|
| Thermal Resistance, Junction to Ambient | $\theta_{JA}$ | 357     | /W   |

■ ELECTRICAL CHARACTERISTICS (Ta=25 , unless otherwise specified)

| PARAMETER                                  | SYMBOL         | TEST CONDITIONS                   | MIN                  | TYP | MAX  | UNIT             |
|--|----------------|-----------------------------------|----------------------|-----|------|------------------|
| <b>OFF CHARACTERISTICS</b>                 |                |                                   |                      |     |      |                  |
| Collector-Emitter Breakdown Voltage (Note) | $BV_{CEO}$     | $I_C=1mA, I_B=0$                  | 40                   |     |      | V                |
| Collector-Base Breakdown Voltage           | $BV_{CBO}$     | $I_C=0.1mA, I_E=0$                | 40                   |     |      | V                |
| Emitter-Base Breakdown Voltage             | $BV_{EBO}$     | $I_E=0.1mA, I_C=0$                | 5                    |     |      | V                |
| Collector Cut-off Current                  | $I_{CEX}$      | $V_{CE}=35V, V_{EB}=0.4V$         |                      |     | 0.1  | $\mu A$          |
| Base Cut-off Current                       | $I_{BEX}$      | $V_{CE}=35V, V_{BE}=0.4V$         |                      |     | 0.1  | $\mu A$          |
| <b>ON CHARACTERISTICS*</b>                 |                |                                   |                      |     |      |                  |
| DC Current Gain                            | $h_{FE1}$      | $V_{CE}=1V, I_C=0.1mA$            | 30                   |     |      |                  |
|  | $h_{FE2}$      | $V_{CE}=1V, I_C=1mA$              | 60                   |     |      |                  |
|  | $h_{FE3}$      | $V_{CE}=1V, I_C=10mA$             | 100                  |     |      |                  |
|  | $h_{FE4}$      | $V_{CE}=2V, I_C=150mA$ (Note)     | 100                  |     | 300  |                  |
|  | $h_{FE5}$      | $V_{CE}=2V, I_C=500mA$ (Note)     | 20                   |     |      |                  |
| Collector-Emitter Saturation Voltage       | $V_{CE(SAT1)}$ | $I_C=150mA, I_B=15mA$             |                      |     | 0.4  | V                |
|  | $V_{CE(SAT2)}$ | $I_C=500mA, I_B=50mA$             |                      |     | 0.75 | V                |
| Base-Emitter Saturation Voltage            | $V_{BE(SAT1)}$ | $I_C=150mA, I_B=15mA$ (Note)      | 0.75                 |     | 0.95 | V                |
|  | $V_{BE(SAT2)}$ | $I_C=500mA, I_B=50mA$             |                      |     | 1.3  | V                |
| <b>SMALL SIGNAL CHARACTERISTICS</b>        |                |                                   |                      |     |      |                  |
| Transition Frequency                       | $f_T$          | $V_{CE}=10V, I_C=20mA, f=100MHz$  | 200                  |     |      | MHz              |
| Collector-Base Capacitance                 | $C_{cb}$       | $V_{CB}=10V, I_E=0, f=140kHz$     |                      |     | 8.5  | pF               |
| Emitter-Base Capacitance                   | $C_{eb}$       | $V_{BE}=0.5V, I_C=0, f=140kHz$    |                      |     | 30   | pF               |
| Input Impedance                            | $h_{IE}$       | $V_{CE}=10V, I_C=1mA, f=1kHz$     | 1.5                  |     | 15   | k $\Omega$       |
| Voltage Feedback Ratio                     | $h_{RE}$       | $V_{CE}=10V, I_C=1mA, f=1kHz$     | 0.1                  |     | 8    | $\times 10^{-4}$ |
| Small-Signal Current Gain                  | $h_{FE}$       | $V_{CE}=10V, I_C=1mA, f=1kHz$     | 60                   |     | 500  |                  |
| Output Admittance                          | $h_{OE}$       | $V_{CE}=10V, I_C=1mA, f=1kHz$     | 1.0                  |     | 100  | $\mu mhos$       |
| <b>SWITCHING CHARACTERISTICS</b>           |                |                                   |                      |     |      |                  |
| Delay Time                                 | $t_D$          | $V_{CC}=30V, I_C=150mA, I_B=15mA$ |                      |     | 15   | ns               |
| Rise Time                                  | $t_R$          |                                   |                      |     | 20   | ns               |
| Storage Time                               | $t_S$          | $V_{CC}=30V, I_C=150mA$           |                      |     | 225  | ns               |
| Fall Time                                  | $t_F$          |                                   | $I_{B1}=I_{B2}=15mA$ |     |      | 30               |

Note Pulse test: Pulse Width $\leq$ 300 $\mu s$ , Duty Cycle $\leq$ 2%



■ TEST CIRCUIT

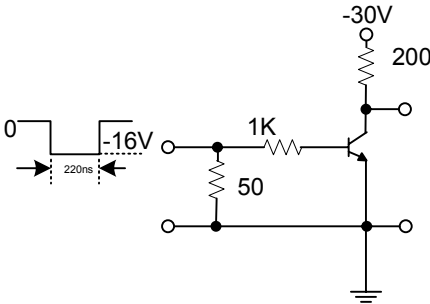


Figure 1. Saturated Turn-On Switching Timer

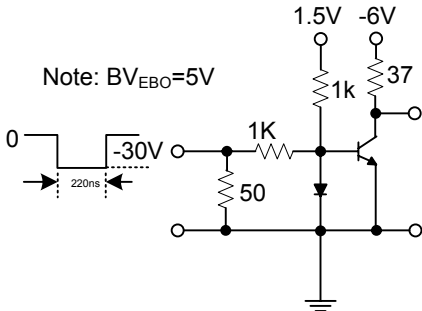
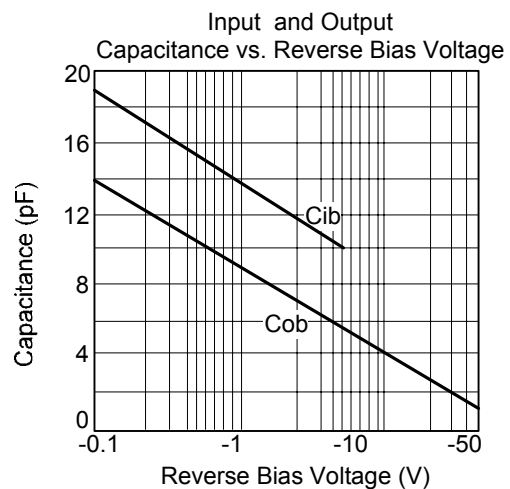
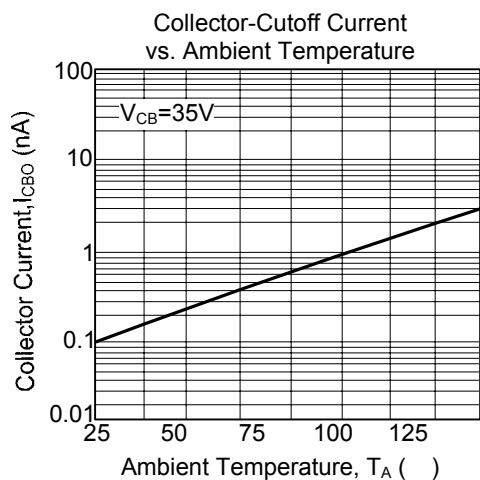
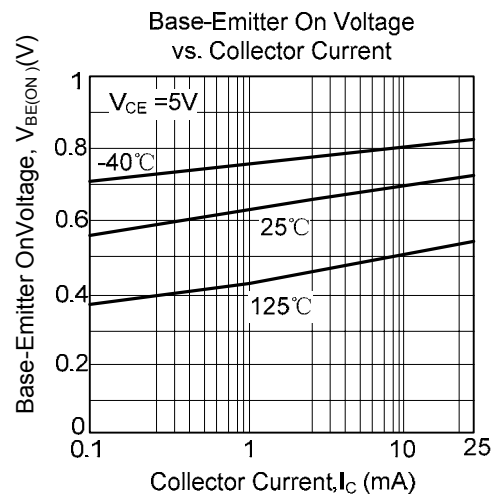
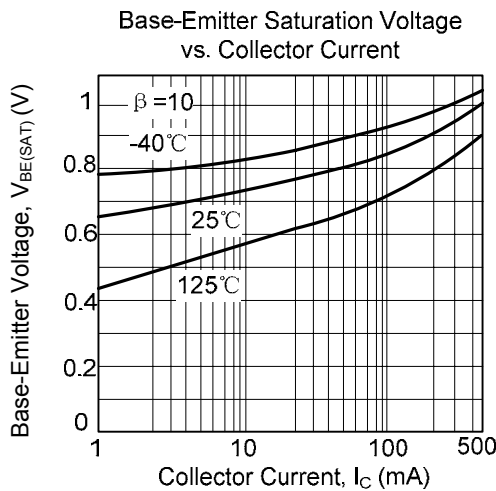
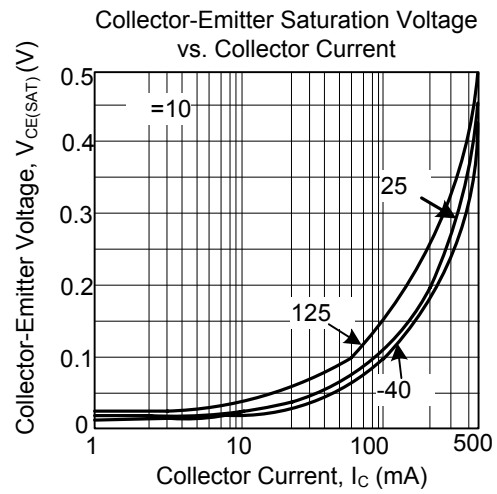
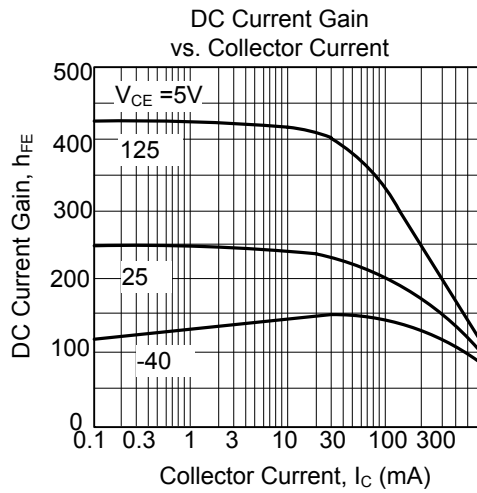


Figure 2. Saturated Turn-Off Switching Timer

### TYPICAL CHARACTERISTICS



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