



MJE13003

NPN SILICON TRANSISTOR

NPN SILICON POWER TRANSISTOR

DESCRIPTION

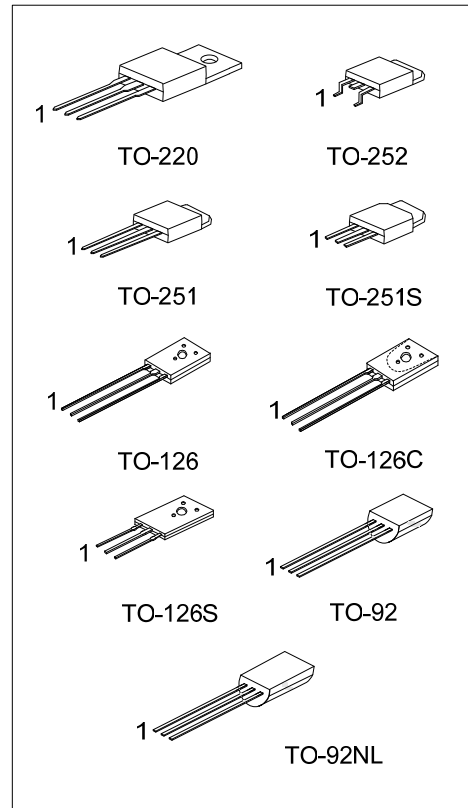
These devices are designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. They are particularly suited for 115 and 220V applications in switch mode.

FEATURES

- * Reverse biased SOA with inductive load @ $T_c=100^\circ\text{C}$
- * Inductive switching matrix 0.5 ~ 1.5 Amp, 25 and 100°C
Typical $t_c = 290\text{ns}$ @ 1A, 100°C .
- * 700V blocking capability

APPLICATIONS

- * Switching regulator's, inverters
- * Motor controls
- * Solenoid/relay drivers
- * Deflection circuits



ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-------------------|-------------------|---------|----------------|---|---|-----------|
| Lead Free | Halogen-Free | | 1 | 2 | 3 | |
| MJE13003L-TA3-T | MJE13003G-TA3-T | TO-220 | B | C | E | Tube |
| MJE13003L-TM3-T | MJE13003G-TM3-T | TO-251 | B | C | E | Tube |
| MJE13003L-TMS-T | MJE13003G-TMS-T | TO-251S | B | C | E | Tube |
| MJE13003L-TN3-R | MJE13003G-TN3-R | TO-252 | B | C | E | Tape Reel |
| MJE13003L-T60-K | MJE13003G-T60-K | TO-126 | B | C | E | Bulk |
| MJE13003L-T6C-A-K | MJE13003G-T6C-A-K | TO-126C | E | C | B | Bulk |
| MJE13003L-T6C-K | MJE13003G-T6C-K | TO-126C | B | C | E | Bulk |
| MJE13003L-T6S-K | MJE13003G-T6S-K | TO-126S | B | C | E | Bulk |
| MJE13003L-T92-B | MJE13003G-T92-B | TO-92 | E | C | B | Tape Box |
| MJE13003L-T92-K | MJE13003G-T92-K | TO-92 | E | C | B | Bulk |
| MJE13003L-T92-F-B | MJE13003G-T92-F-B | TO-92 | B | C | E | Tape Box |
| MJE13003L-T92-F-K | MJE13003G-T92-F-K | TO-92 | B | C | E | Bulk |
| MJE13003L-T9N-B | MJE13003G-T9N-B | TO-92NL | E | C | B | Tape Box |
| MJE13003L-T9N-K | MJE13003G-T9N-K | TO-92NL | E | C | B | Bulk |

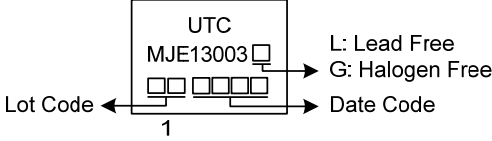
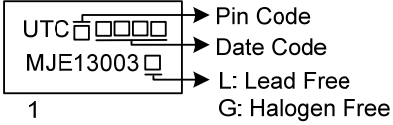
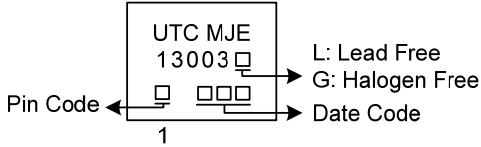
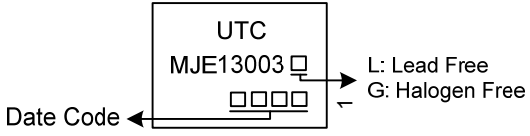
Note: Pin Assignment: B: Base C: Collector E: Emitter

| | |
|--|---|
| <p>MJE13003G-T6C-A-K</p> <p>(1)Packing Type (2)Pin Assignment (3)Package Type (4)Green Package</p> | <p>(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube (2) refer to Pin Assignment (3) TA3: TO-220, TM3: TO-251, TMS: TO-251S, TN3: TO-252, T60: TO-126, T6C: TO-126C, T6S: TO-126S, T92: TO-92, T9N: TO-92NL (4) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

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MARKING

| TO-220 / TO-251 / TO-251S / TO-252 | TO-126 / TO-126C / TO-126S |
|--|---|
|  <p>UTC MJE13003 □</p> <p>Lot Code ← □ □ □ □ → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p> |  <p>UTC □ □ □ □ → Pin Code</p> <p>MJE13003 □ → Date Code</p> <p>← □ □ □ □ → L: Lead Free G: Halogen Free</p> <p>1</p> |
| TO-92 | TO-92NL |
|  <p>UTC MJE □</p> <p>13003 □</p> <p>Pin Code ← □ □ □ □ → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p> |  <p>UTC □</p> <p>MJE13003 □</p> <p>Date Code ← □ □ □ □ → L: Lead Free G: Halogen Free</p> |

■ ABSOLUTE MAXIMUM RATINGS ($T_A=25^\circ\text{C}$, unless otherwise specified.)

| PARAMETER | | SYMBOL | RATINGS | UNIT | | |
|--|--------------------------|---------------------------|---------|---------------------------|------------|------------------|
| Collector-Emitter Voltage | | $V_{CEO(SUS)}$ | 400 | V | | |
| Collector-Base Voltage | | V_{CBO} | 700 | V | | |
| Collector-Emitter Voltage ($V_{BE}=0$) | | V_{CES} | 700 | V | | |
| Emitter Base Voltage | | V_{EBO} | 9 | V | | |
| Collector Current | Continuous | I_C | 1.6 | A | | |
| | Peak (1) | I_{CM} | 3 | | | |
| Base Current | Continuous | I_B | 0.75 | A | | |
| | Peak (1) | I_{BM} | 1.5 | | | |
| Emitter Current | Continuous | I_E | 2.25 | A | | |
| | Peak (1) | I_{EM} | 4.5 | | | |
| Power Dissipation | $T_A=25^\circ\text{C}$ | TO-126/TO-126C TO-126S | P_D | 1.4 | W | |
| | | TO-92/TO-92NL | | 1.1 | W | |
| | | TO-220 | | 2 | W | |
| | | TO-251/TO-251S TO-252 | | 1.56 | W | |
| | | $T_C=25^\circ\text{C}$ | | TO-126/TO-126C TO-126S | 20 | W |
| | TO-92/TO-92NL | | | 1.5 | W | |
| | TO-220 | | | 40 | W | |
| | TO-251/TO-251S TO-252 | | | 25 | W | |
| | Junction Temperature | | | T_J | +150 | $^\circ\text{C}$ |
| | Storage Temperature | | | T_{STG} | -55 ~ +150 | $^\circ\text{C}$ |

Note: 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.

■ ELECTRICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$, unless otherwise specified.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------------------------------|----------------|---|-----|-----|-----|------|
| OFF CHARACTERISTICS (Note) | | | | | | |
| Collector-Emitter Sustaining Voltage | $V_{CEO(SUS)}$ | $I_C=10\text{mA}$, $I_B=0$ | 400 | | | V |
| Collector Cut-Off Current | I_{CBO} | $V_{CB}=700\text{V}$, $I_E=0$ | | | 1 | mA |
| Collector Cutoff Current | I_{CEO} | $V_{CEO}=\text{Rated Value}$, $V_{BE(OFF)}=1.5\text{V}$ | | | 1 | mA |
| | | | | | 5 | |
| Emitter Cutoff Current | I_{EBO} | $V_{EB}=9\text{V}$, $I_C=0$ | | | 1 | mA |
| ON CHARACTERISTICS (Note) | | | | | | |
| DC Current Gain | h_{FE} | $I_C=200\text{mA}$, $V_{CE}=5\text{V}$ | 20 | | 40 | |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_C=1\text{A}$, $I_B=200\text{mA}$ | | | 0.5 | V |

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

■ THERMAL DATA

| PARAMETER | SYMBOL | RATING | UNIT | |
|---------------------|---------------|---------------------------|------|--------------------|
| Junction to Ambient | θ_{JA} | TO-126/TO-126C TO-126S | 89 | $^\circ\text{C/W}$ |
| | | TO-92/TO-92NL | 113 | $^\circ\text{C/W}$ |
| | | TO-220 | 62.5 | $^\circ\text{C/W}$ |
| | | TO-251/TO-251S TO-252 | 80 | $^\circ\text{C/W}$ |

Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

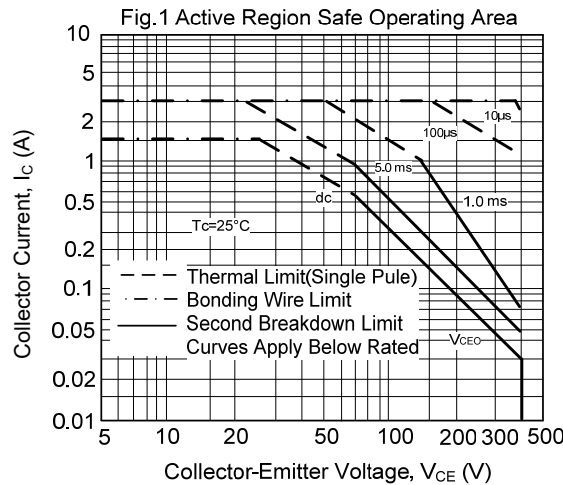
■ SAFE OPERATING AREA INFORMATION

FORWARD BIAS

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

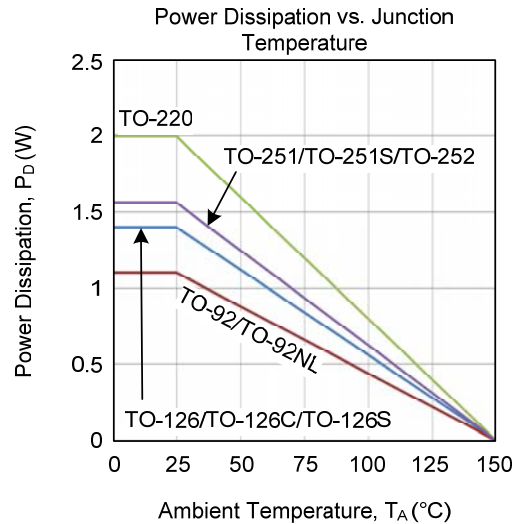
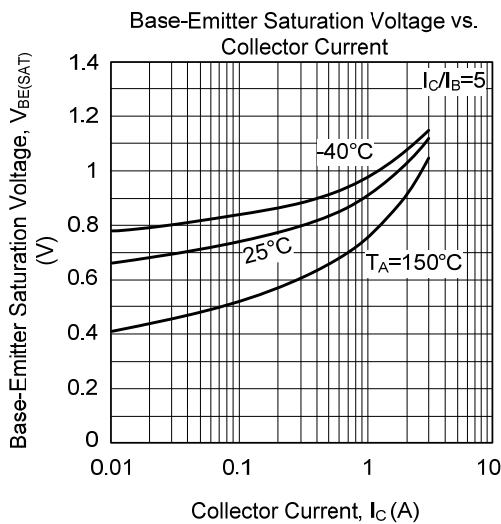
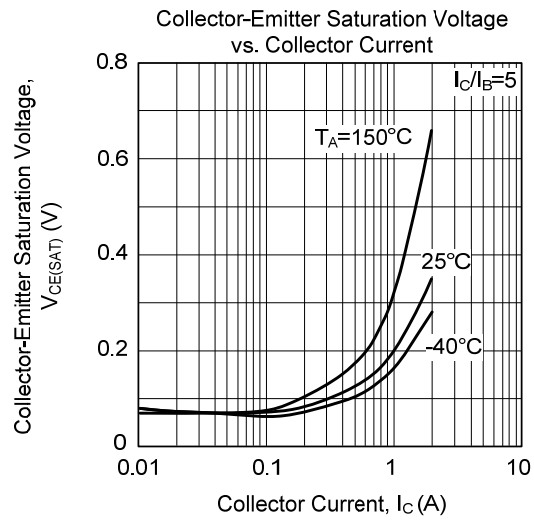
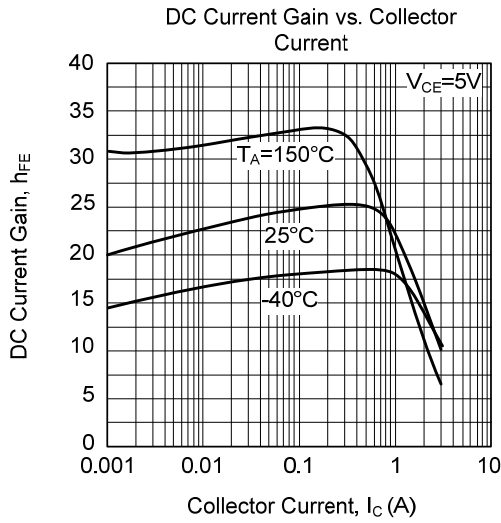
The data of Fig.1 is based on $T_C = 25^\circ\text{C}$; $T_{J(PK)}$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% but must be derated when $T_C \geq 25^\circ\text{C}$. Second breakdown limitations do not derate the same as thermal limitations. Allowable current at the voltages shown on Fig.1.

At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



The Safe Operating Area of Fig.1 are specified ratings (for these devices under the test conditions shown.)

■ TYPICAL CHARACTERISTICS



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