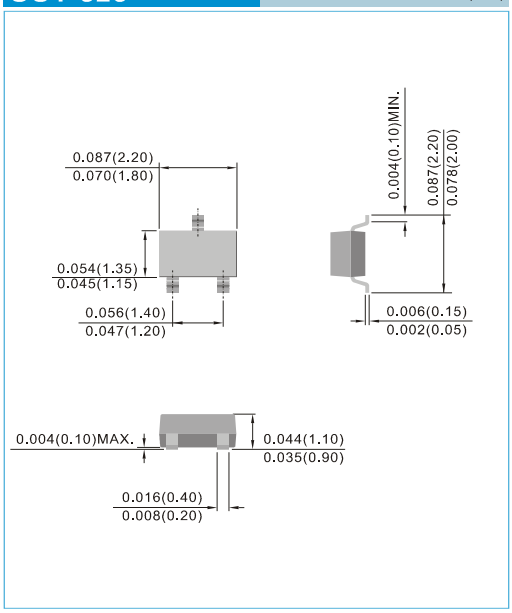
# MMBT2222AW

## NPN GENERAL PURPOSE SWITCHING TRANSISTOR

**VOLTAGE** 40 Volt **POWER** 150 mWatt

**SOT-323** Unit : inch(mm)




### FEATURES

- NPN epitaxial silicon, planar design
- Collector-emitter voltage VCE = 40V
- Collector current IC = 600mA
- Lead free in compliance with EU RoHS 2011/65/EU directive
- Green molding compound as per IEC61249 Std. . (Halogen Free)

### MECHANICAL DATA

- Case: SOT-323, Plastic
- Terminals: Solderable per MIL-STD-750, Method 2026
- Apporx. Weight: 0.0001 ounce, 0.005 gram
- Marking: M2A

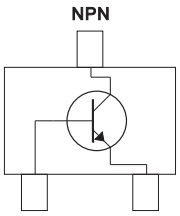



Fig.34

### ABSOLUTE RATINGS

| PARAMETER | Symbol | Value | Units |
|---|---|---|---|
| Collector - Emitter Voltage | $V_{CEO}$ | 40 | V |
| Collector - Base Voltage | $V_{CBO}$ | 75 | V |
| Emitter - Base Voltage | $V_{EBO}$ | 6.0 | V |
| Collector Current - Continuous | $I_C$ | 600 | mA |

### THERMAL CHARACTERISTICS

| PARAMETER | Symbol | Value | Units |
|---|---|---|---|
| Max Power Dissipation (Note 1) | $P_{TOT}$ | 150 | mW |
| Thermal Resistance , Junction to Ambient | $R_{\theta JA}$ | 830 | °C/W |
| Junction Temperature | $T_J$ | -55 to 150 | °C |
| Storage Temperature | $T_{STG}$ | -55 to 150 | °C |

Note 1: Transistor mounted on FR-5 board 1.0 x 0.75 x 0.062 in.

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## ELECTRICAL CHARACTERISTICS

| PARAMETER | Symbol | Test Condition | MIN. | TYP. | MAX. | Units |
|---|---|---|---|---|---|---|
| Collector - Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C$=1.0mA, $I_B$=0 | 40 | - | - | V |
| Collector - Base Breakdown Voltage | $V_{(BR)CBO}$ | $I_C$=10uA, $I_E$=0 | 75 | - | - | V |
| Emitter - Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E$=10uA, $I_C$=0 | 6.0 | - | - | V |
| Base Cutoff Current | $I_{BL}$ | $V_{CE}$=60V, $V_{EB}$=3.0V | - | - | 20 | nA |
| Collector Cutoff Current | $I_{CEX}$ | $V_{CE}$=60V, $V_{EB}$=3.0V | - | - | 10 | nA |
| | $I_{CBO}$ | $V_{CE}$=60V, $I_E$=0,<br>$V_{CE}$=60V, $I_E$=0,$T_J$=125°C | - | - | 10<br>10 | nA<br>uA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$=3.0V, $I_C$=0, | - | - | 100 | nA |
| DC Current Gain | $h_{FE}$ | $I_C$=0.1mA, $V_{CE}$=10V<br>$I_C$=1.0mA, $V_{CE}$=10V<br>$I_C$=10mA, $V_{CE}$=10V<br>$I_C$=10mA, $V_{CE}$=10V,$T_J$=125°C<br>$I_C$=150mA, $V_{CE}$=10V (Note 2)<br>$I_C$=150mA, $V_{CE}$=1V (Note 2)<br>$I_C$=500mA, $V_{CE}$=10V (Note 2) | 35<br>50<br>75<br>35<br>100<br>50<br>40 | -<br>-<br>-<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>300<br>-<br>- | - |
| Collector - Emitter Saturation Voltage (Note 2) | $V_{CE(SAT)}$ | $I_C$=150mA, $I_B$=15mA<br>$I_C$=500mA, $I_B$=50mA | - | - | 0.3<br>1.0 | V |
| Base - Emitter Saturation Voltage (Note 2) | $V_{BE(SAT)}$ | $I_C$=150mA, $I_B$=15mA<br>$I_C$=500mA, $I_B$=50mA | 0.6<br>- | -<br>- | 1.2<br>2.0 | V |
| Collector - Base Capacitance | $C_{CBO}$ | $V_{CB}$=10V, $I_E$=0, f=1MHz | - | - | 8.0 | pF |
| Emitter - Base Capacitance | $C_{EBO}$ | $V_{CB}$=0.5V, $I_C$=0, f=1MHz | - | - | 25 | pF |
| Delay Time | td | $V_{CC}$=3V,$V_{BE}$=-5V,<br>$I_C$=150mA,$I_B$=15mA | - | - | 10 | ns |
| Rise Time | tr | $V_{CC}$=3V,$V_{BE}$=-5V,<br>$I_C$=150mA,$I_B$=15mA | - | - | 25 | ns |
| Storage Time | ts | $V_{CC}$=30V,$I_C$=150mA<br>$I_{B1}$=$I_{B2}$=15mA | - | - | 225 | ns |
| Fall Time | tf | $V_{CC}$=30V,$I_C$=150mA<br>$I_{B1}$=$I_{B2}$=15mA | - | - | 60 | ns |

Note 2: Pulse Test: Pulse Width < 300 us, Duty Cycle < 2.0%.

### SWITCHING TIME EQUIVALENT TEST CIRCUITS

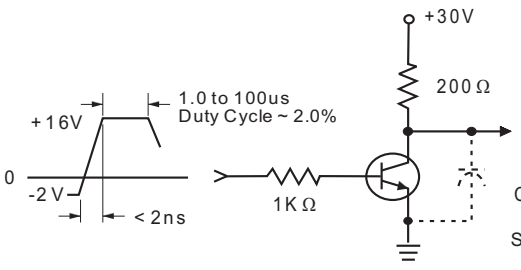


Fig. 1 Turn-On Time

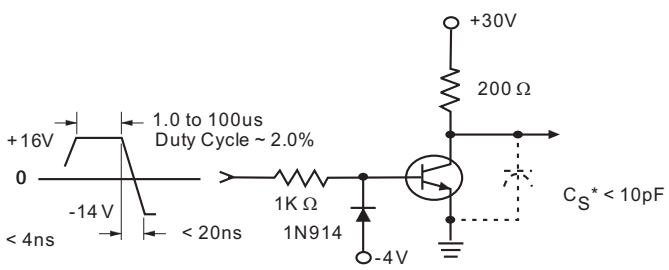


Fig. 2 Turn-Off Time

* Total shunt capacitance of test jig, connectors, and oscilloscope

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## ELECTRICAL CHARACTERISTICS CURVE

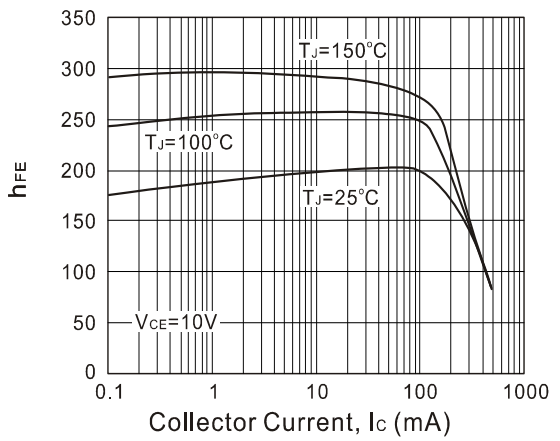


Fig. 3. Typical $h_{FE}$ vs Collector Current

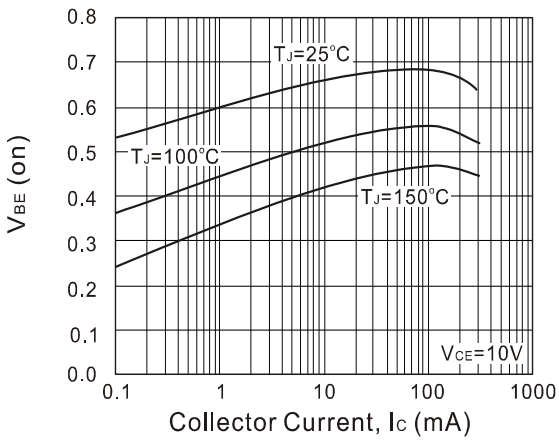


Fig. 4. Typical $V_{BE}$ vs Collector Current

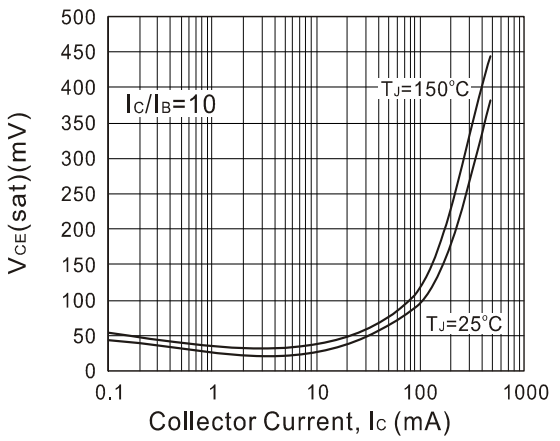


Fig. 5. Typical $V_{CE}$ (sat) vs Collector Current

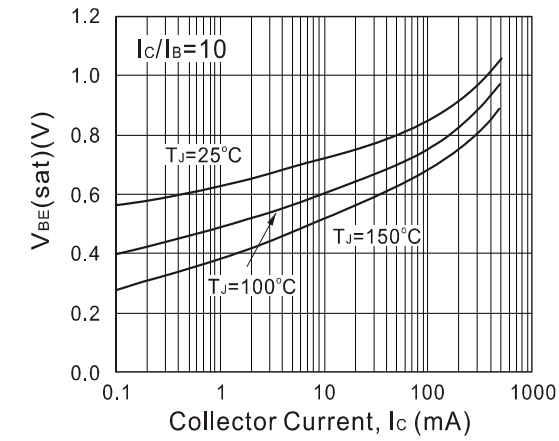


Fig. 6. Typical $V_{BE}$ (sat) vs Collector Current

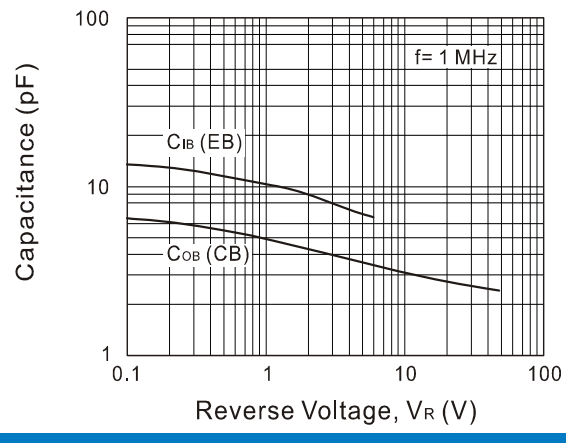


Fig. 7. Typical Capacitances vs Reverse Voltage

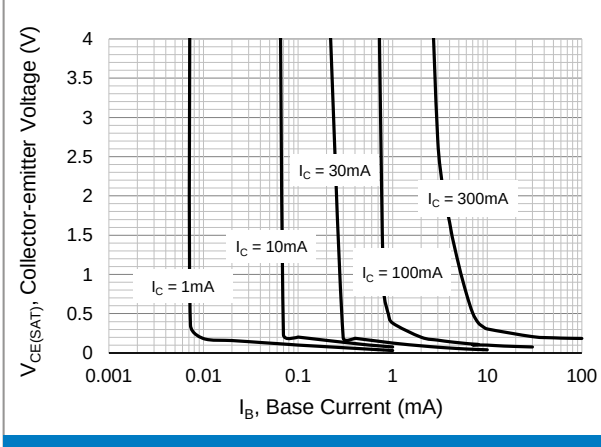


Fig. 8. Typical Collector Saturation Region

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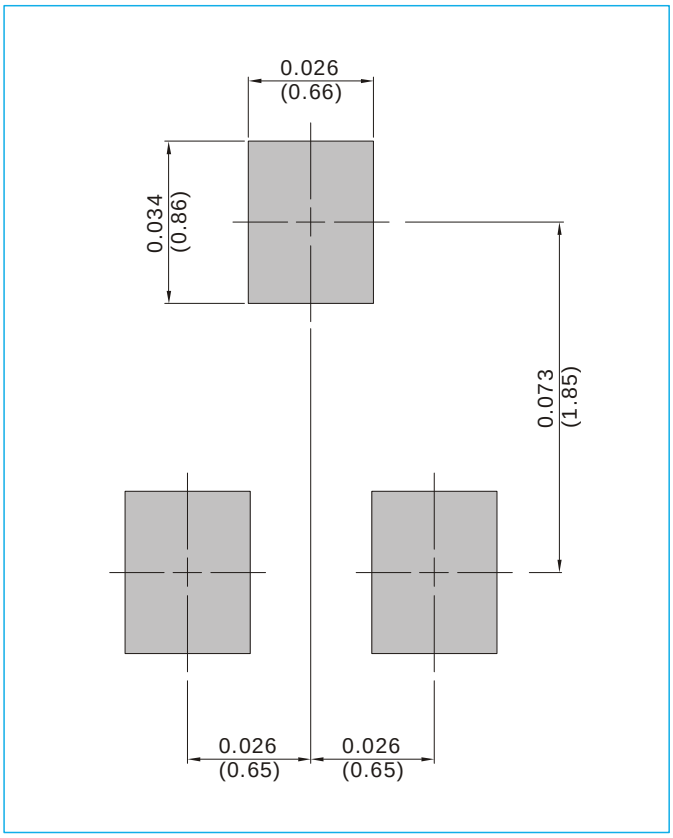
## MOUNTING PAD LAYOUT

SOT-323 Unit：inch(mm)




## ORDER INFORMATION

- Packing information

  T/R - 12K per 13" plastic Reel

  T/R - 3K per 7" plastic Reel

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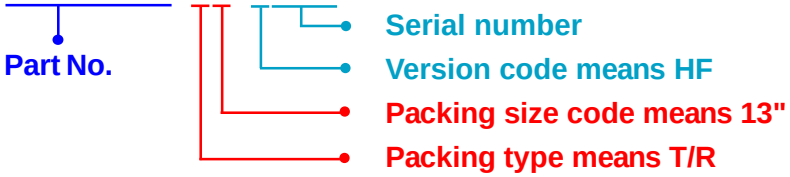
**Part No_packing code_Version**

MMBT2222AW_R1_00001

MMBT2222AW_R2_00001

**For example :**

**RB500V-40_R2_00001**




| Packing Code XX | | | | Version Code XXXXX | | |
|---|---|---|---|---|---|---|
| Packing type | 1st Code | Packing size code | 2nd Code | HF or RoHS | 1st Code | 2nd~5th Code |
| Tape and Ammunition Box (T/B) | A | N/A | 0 | HF | 0 | serial number |
| Tape and Reel (T/R) | R | 7" | 1 | RoHS | 1 | serial number |
| Bulk Packing (B/P) | B | 13" | 2 | | | |
| Tube Packing (T/P) | T | 26mm | X | | | |
| Tape and Reel (Right Oriented) (TRR) | S | 52mm | Y | | | |
| Tape and Reel (Left Oriented) (TRL) | L | PANASERT T/B CATHODE UP (PBCU) | U | | | |
| FORMING | F | PANASERT T/B CATHODE DOWN (PBCD) | D | | | |

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