

# 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  $V_{CE} = 40V$
- Collector current  $I_C = 600mA$
- 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

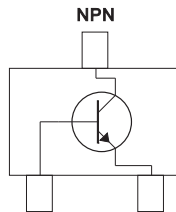
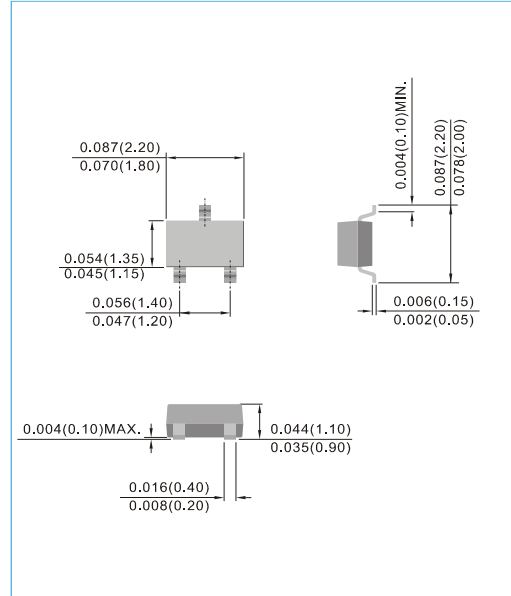


Fig.34



### 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        | $^{\circ}C/W$ |
| Junction Temperature                     | $T_J$           | -55 to 150 | $^{\circ}C$   |
| Storage Temperature                      | $T_{STG}$       | -55 to 150 | $^{\circ}C$   |

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              | $V_{(BR)CBO}$ | $I_C=10\mu A, I_E=0$                         | 75   | -    | -        | V        |
| Emitter - Base Breakdown Voltage                | $V_{(BR)EBO}$ | $I_E=10\mu A, I_C=0$                         | 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       |
|                                                 | $I_{CBO}$     | $V_{CE}=60V, I_E=0, T_J=125^{\circ}C$        | -    | -    | 10<br>10 | nA<br>uA |
| Emitter Cutoff Current                          | $I_{EBO}$     | $V_{EB}=3.0V, I_C=0,$                        | -    | -    | 100      | nA       |
| DC Current Gain                                 | $h_{FE}$      | $I_C=0.1mA, V_{CE}=10V$                      | 35   | -    | -        | -        |
|                                                 |               | $I_C=1.0mA, V_{CE}=10V$                      | 50   | -    | -        |          |
|                                                 |               | $I_C=10mA, V_{CE}=10V$                       | 75   | -    | -        |          |
|                                                 |               | $I_C=10mA, V_{CE}=10V, T_J=125^{\circ}C$     | 35   | -    | -        |          |
|                                                 |               | $I_C=150mA, V_{CE}=10V$ (Note 2)             | 100  | -    | 300      |          |
|                                                 |               | $I_C=150mA, V_{CE}=1V$ (Note 2)              | 50   | -    | -        |          |
| Collector - Emitter Saturation Voltage (Note 2) | $V_{CE(SAT)}$ | $I_C=150mA, I_B=15mA$                        | -    | -    | 0.3      | V        |
|                                                 |               | $I_C=500mA, I_B=50mA$                        | -    | -    | 1.0      |          |
| Base - Emitter Saturation Voltage (Note 2)      | $V_{BE(SAT)}$ | $I_C=150mA, I_B=15mA$                        | 0.6  | -    | 1.2      | V        |
|                                                 |               | $I_C=500mA, I_B=50mA$                        | -    | -    | 2.0      |          |
| 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                                      | $t_d$         | $V_{CC}=3V, V_{BE}=-5V, I_C=150mA, I_B=15mA$ | -    | -    | 10       | ns       |
| Rise Time                                       | $t_r$         | $V_{CC}=3V, V_{BE}=-5V, I_C=150mA, I_B=15mA$ | -    | -    | 25       | ns       |
| Storage Time                                    | $t_s$         | $V_{CC}=30V, I_C=150mA, I_{B1}=I_{B2}=15mA$  | -    | -    | 225      | ns       |
| Fall Time                                       | $t_f$         | $V_{CC}=30V, I_C=150mA, I_{B1}=I_{B2}=15mA$  | -    | -    | 60       | ns       |

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

## SWITCHING TIME EQUIVALENT TEST CIRCUITS

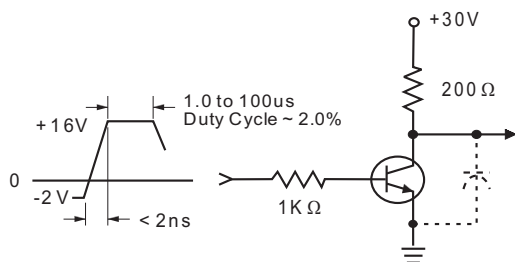


Fig. 1 Turn-On Time

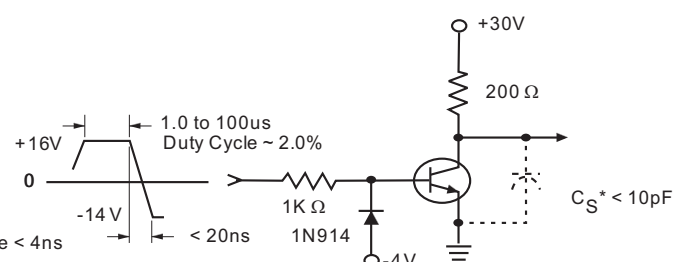
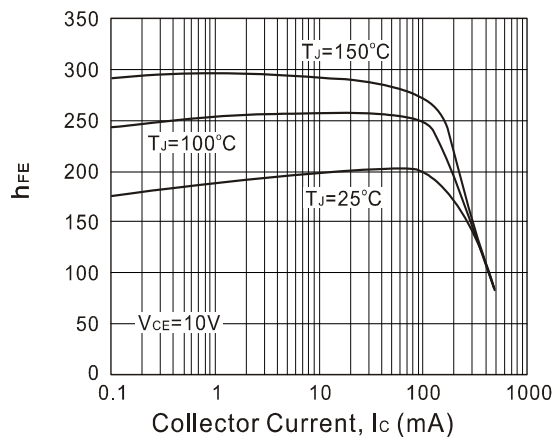


Fig. 2 Turn-Off Time

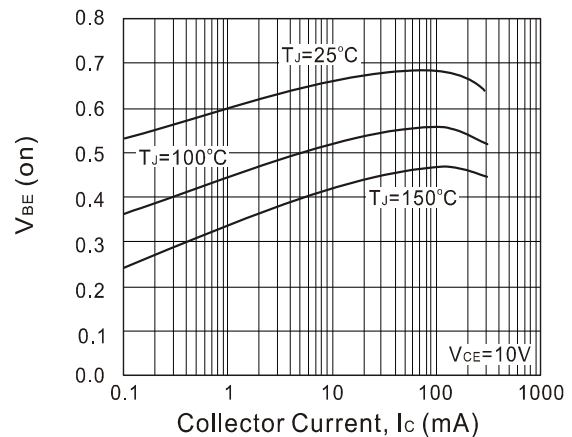
\* Total shunt capacitance of test jig, connectors, and oscilloscope

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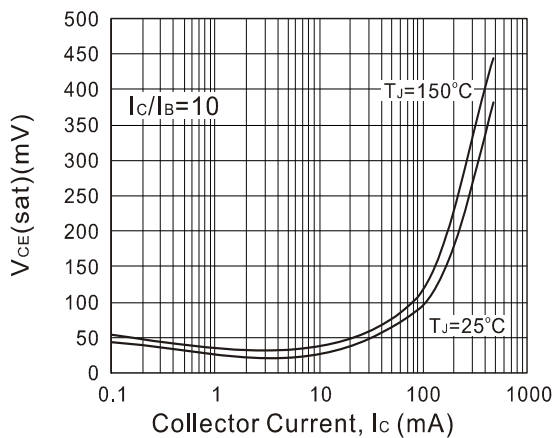
## ELECTRICAL CHARACTERISTICS CURVE



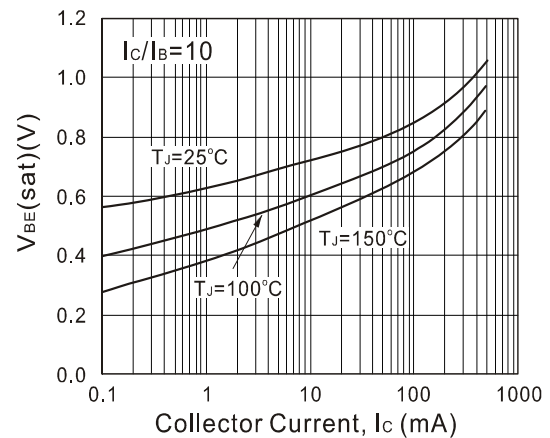
**Fig. 3. Typical  $h_{FE}$  vs Collector Current**



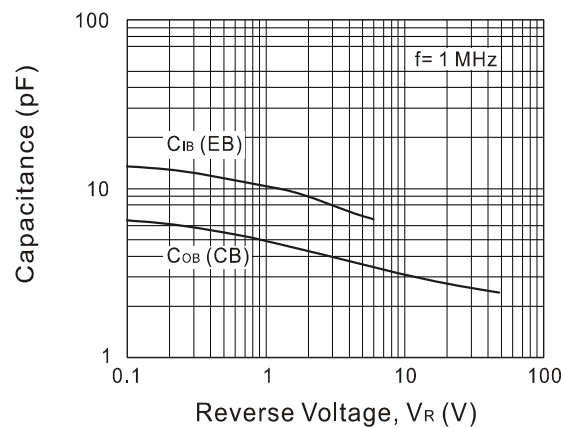
**Fig. 4. Typical  $V_{BE}$  vs Collector Current**



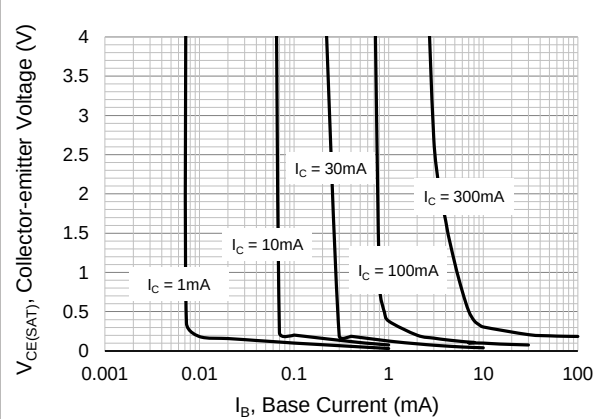
**Fig. 5. Typical  $V_{CE(sat)}$  vs Collector Current**



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



**Fig. 7. Typical Capacitances vs Reverse Voltage**



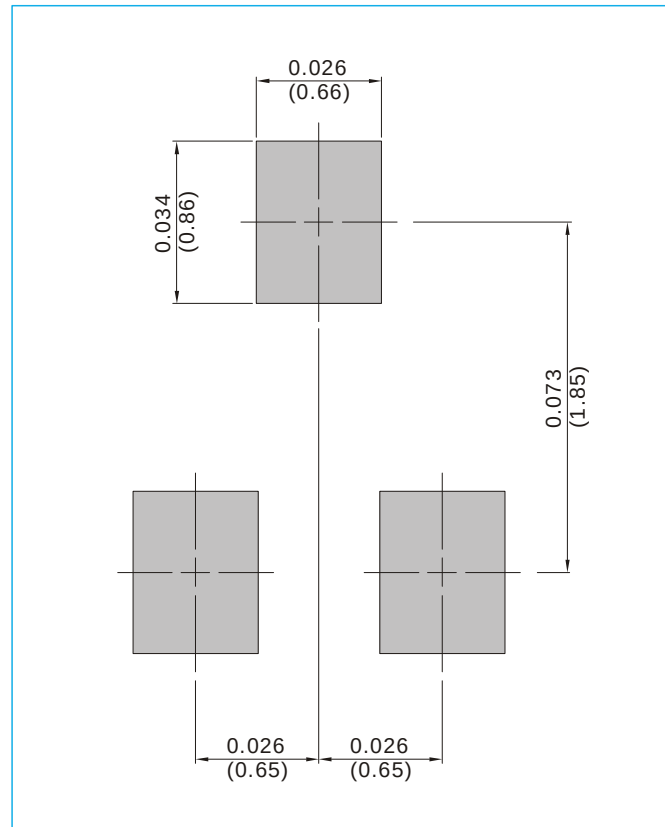
**Fig. 8. Typical Collector Saturation Region**

# MMBT2222AW

## 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

# MMBT2222AW

## Part No\_packing code\_Version

MMBT2222AW\_R1\_00001

MMBT2222AW\_R2\_00001

For example :

RB500V-40\_R2\_00001

Part No.

Serial number

Version code means HF

Packing size code means 13"

Packing type means T/R

| Packing Code XX                      |                      |                                  |                      | Version Code XXXXX |                      |                                       |
|--------------------------------------|----------------------|----------------------------------|----------------------|--------------------|----------------------|---------------------------------------|
| Packing type                         | 1 <sup>st</sup> Code | Packing size code                | 2 <sup>nd</sup> Code | HF or RoHS         | 1 <sup>st</sup> Code | 2 <sup>nd</sup> ~5 <sup>th</sup> 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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