

# FMBZT651

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# FMBZT651

## 60V, 4A NPN Silicon Power Transistor

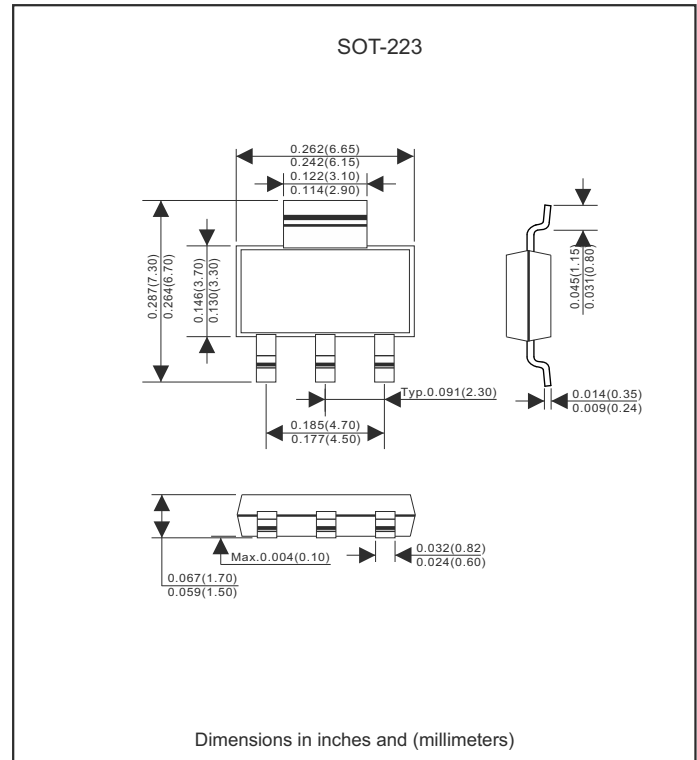
### Features

- Collector - emitter voltage :  $V_{CEO}=60V$ .
- Collector Dissipation :  $P_{D(MAX)}=1.2W$ .
- Low collector-emitter saturation voltage.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.FMBZT651-H.

### Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-223
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.1171 gram

### Package outline



### Maximum ratings (At $T_A=25^{\circ}C$ unless otherwise specified)

| Parameter                  | Symbol          | Ratings    | Unit          |
|----------------------------|-----------------|------------|---------------|
| Collector-base voltage     | $V_{CBO}$       | 80         | V             |
| Collector-emitter voltage  | $V_{CEO}$       | 60         | V             |
| Emitter-base voltage       | $V_{EBO}$       | 5          | V             |
| DC collector current       | $I_C$           | 4          | A             |
| Power dissipation (Note 4) | $P_D$           | 1.2        | W             |
| Junction temperature       | $T_J$           | +150       | $^{\circ}C$   |
| Storage temperature        | $T_{STG}$       | -55 ~ +150 | $^{\circ}C$   |
| Junction to ambient        | $R_{\theta JA}$ | 103        | $^{\circ}C/W$ |

Note :

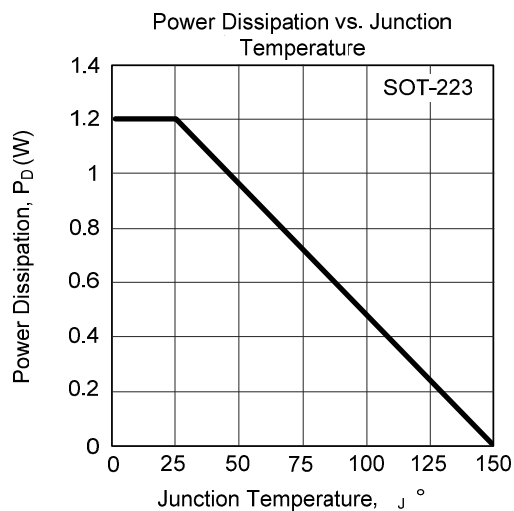
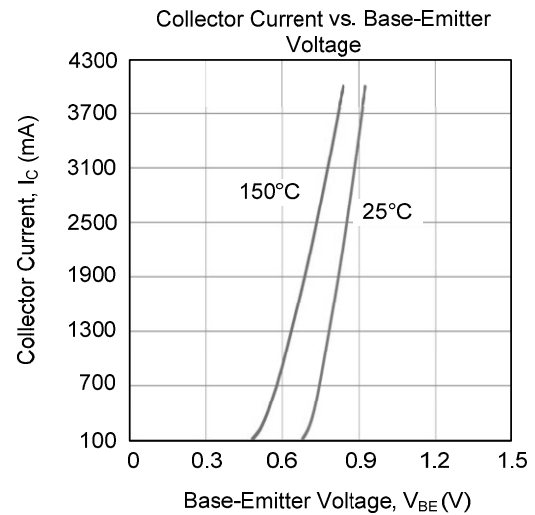
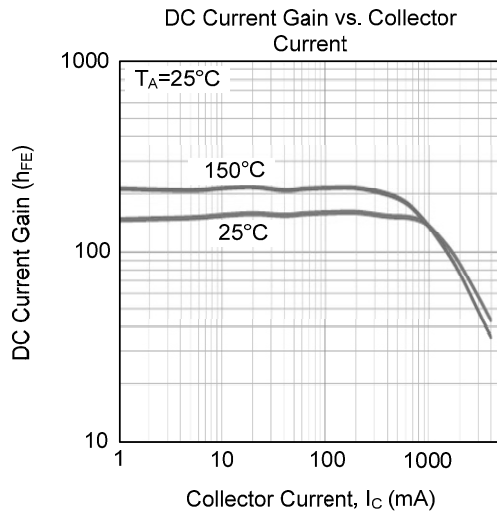
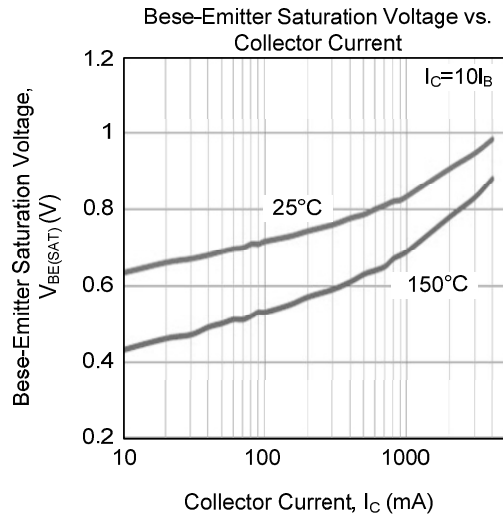
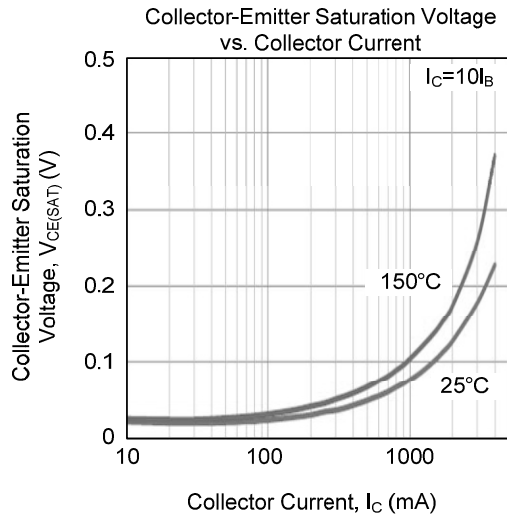
1. Absolute maximum rating are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. These ratings are based on a maximum junction temperature of  $150^{\circ}C$ .
3. These are steady-state time.
4. Device is mounted on FR-4 PCB 36mm x 18mm x 1.5mm; mounting pad for the collector lead minimum  $6cm^2$ .

**FMBZT651****Electrical characteristics** ( $T_A=25^\circ\text{C}$  unless otherwise specified)

| Parameter                            | Conditions                                                 | Symbol        | Min. | Typ. | Max. | Unit |
|--------------------------------------|------------------------------------------------------------|---------------|------|------|------|------|
| Collector base breakdown voltage     | $I_C=100\mu\text{A}$ , $I_E=0$                             | $V_{(BR)CBO}$ | 80   |      |      | V    |
| Collector emitter breakdown voltage  | $I_C=10\text{mA}$ , $I_B=0$                                | $V_{(BR)CEO}$ | 60   |      |      | V    |
| Emitter base breakdown voltage       | $I_E=100\mu\text{A}$ , $I_C=0$                             | $V_{(BR)EBO}$ | 5    |      |      | V    |
| Collector cut off current            | $V_{CB}=80\text{V}$ , $I_E=0$                              | $I_{CBO}$     |      |      | 100  | nA   |
| Emitter cut off current              | $V_{EB}=4\text{V}$ , $I_C=0$                               | $I_{EBO}$     |      |      | 100  | nA   |
| Collector-emitter saturation voltage | $I_C=1\text{A}$ , $I_B=100\text{mA}$                       | $V_{CE(SAT)}$ |      |      | 0.3  | V    |
|                                      | $I_C=2\text{A}$ , $I_B=200\text{mA}$                       |               |      |      | 0.5  |      |
| Base-emitter saturation voltage      | $I_C=1\text{A}$ , $I_B=100\text{mA}$                       | $V_{BE(SAT)}$ |      |      | 1.2  | V    |
| Base-emitter on voltage (Note)       | $I_C=1\text{A}$ , $V_{CE}=2\text{V}$                       | $V_{BE(ON)}$  |      |      | 1.0  | V    |
| DC current gain (Note)               | $V_{CE}=2\text{V}$ , $I_C=50\text{mA}$                     | $h_{FE}$      | 75   |      |      |      |
|                                      | $V_{CE}=2\text{V}$ , $I_C=500\text{mA}$                    |               | 75   |      |      |      |
|                                      | $V_{CE}=2\text{V}$ , $I_C=1\text{A}$                       |               | 75   |      |      |      |
|                                      | $V_{CE}=2\text{V}$ , $I_C=2\text{A}$                       |               | 40   |      |      |      |
| Current gain bandwidth product       | $V_{CE}=5\text{V}$ , $I_E=50\text{mA}$ , $f=100\text{MHZ}$ | $f_T$         | 75   |      |      | MHz  |

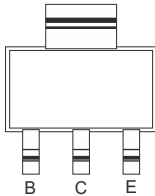
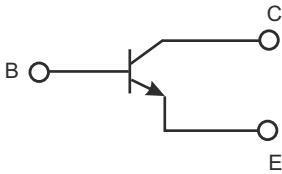
Note : Pulse test : Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

## Rating and characteristic curves (FMBZT651)

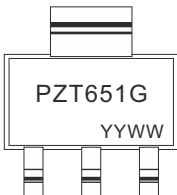


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## Pinning information

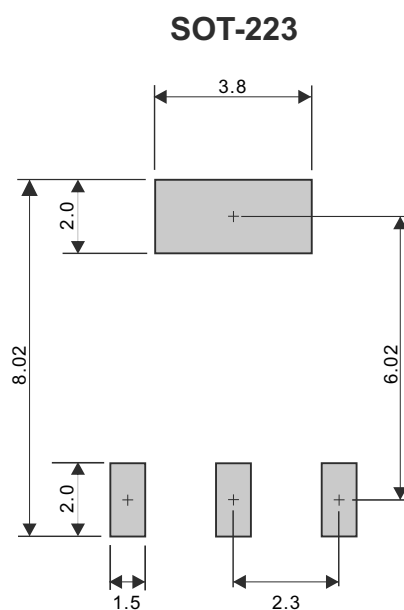
| Pin                                            | Simplified outline                                                                | Symbol                                                                              |
|------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin B Base<br>Pin C Collector<br>Pin E Emitter |  |  |

## Marking

| Type number | Marking code                                                                       |
|-------------|------------------------------------------------------------------------------------|
| FMBZT651    |  |

Date Code : YYWW

## Suggested solder pad layout

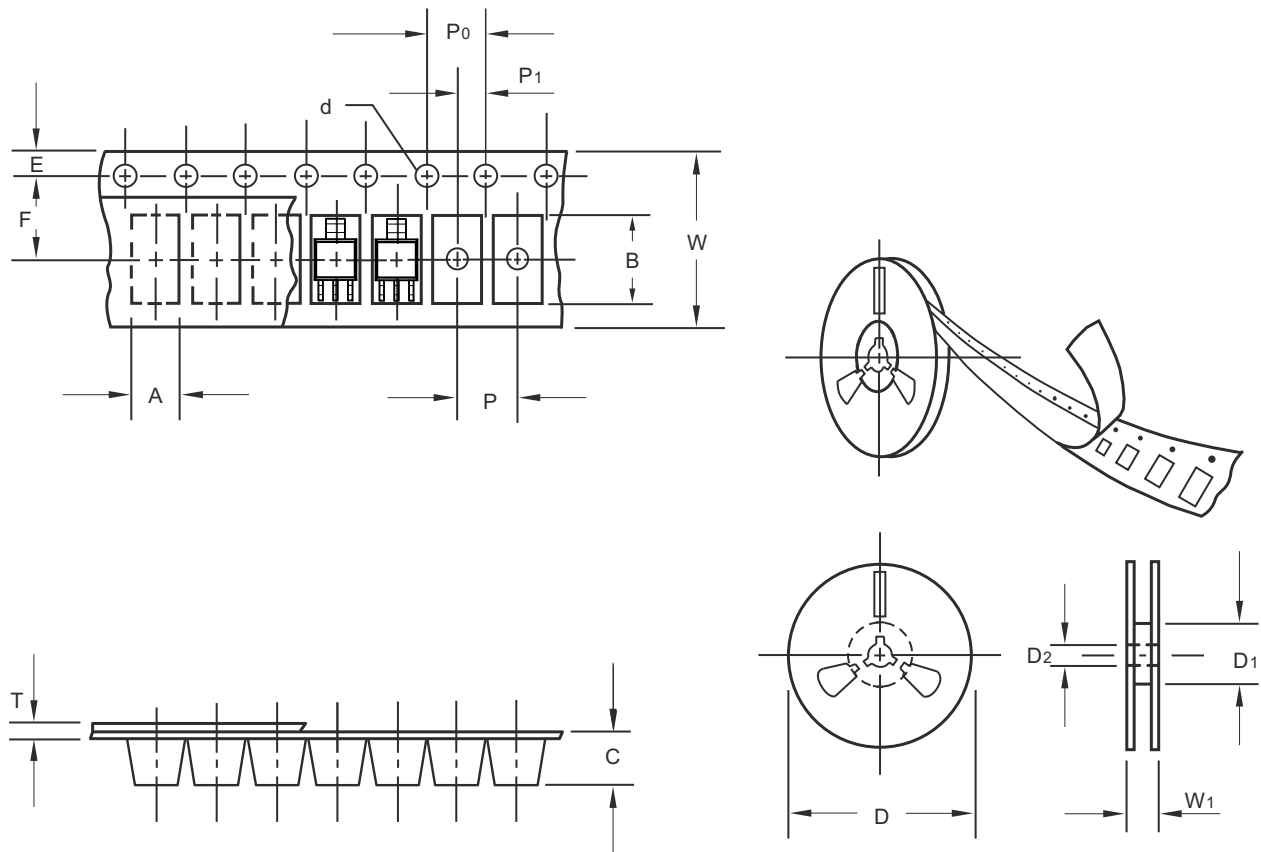


### Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.050\text{mm}$ .
3. The pad layout is for reference purposes only

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## Packing information



unit:mm

| Item                      | Symbol | Tolerance | SOT-223 |
|---------------------------|--------|-----------|---------|
| Carrier width             | A      | 0.1       | 6.765   |
| Carrier length            | B      | 0.1       | 7.335   |
| Carrier depth             | C      | 0.1       | 1.88    |
| Sprocket hole             | d      | 0.1       | 1.50    |
| 13" Reel outside diameter | D      | 2.0       | 330.00  |
| 13" Reel inner diameter   | D1     | min       | 100.00  |
| Feed hole diameter        | D2     | 0.5       | 13.00   |
| Sprocket hole position    | E      | 0.1       | 1.75    |
| Punch hole position       | F      | 0.1       | 5.50    |
| Punch hole pitch          | P      | 0.1       | 8.00    |
| Sprocket hole pitch       | P0     | 0.1       | 4.00    |
| Embossment center         | P1     | 0.1       | 2.00    |
| Overall tape thickness    | T      | 0.1       | 0.29    |
| Tape width                | W      | 0.3       | 12.00   |
| Reel width                | W1     | 0.3       | 17.6    |

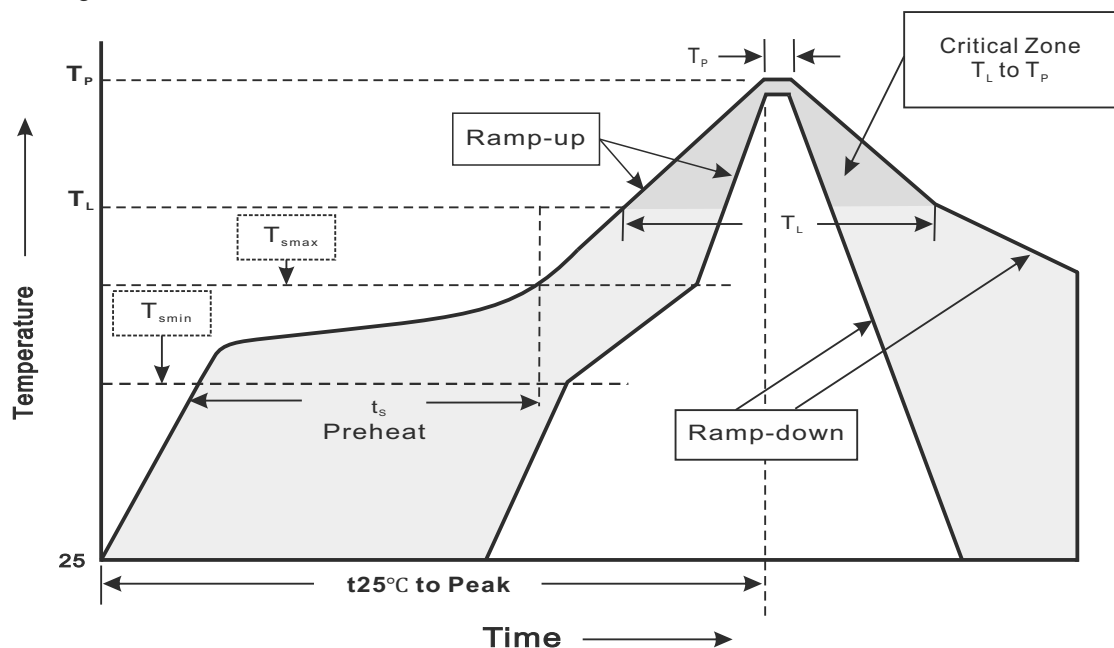
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## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|
| SOT-223 | 13"       | 2,500      | 8.0                     | 5,000     | 335*335*38      | 330             | 350*330*360       | 40,000       |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



## 3.Reflow soldering

| Profile feature                                                                                               | Soldering Condition           |
|---------------------------------------------------------------------------------------------------------------|-------------------------------|
| Average ramp-up rate ( $T_L$ to $T_p$ )                                                                       | < 3°C/sec                     |
| Preheat<br>-Temperature Min ( $T_{smin}$ )<br>-Temperature Max ( $T_{smax}$ )<br>-Time (min to max) ( $t_s$ ) | 150°C<br>200°C<br>60 ~ 120sec |
| $T_{smax}$ to $T_L$<br>-Ramp-up rate                                                                          | < 3°C/sec                     |
| Time maintained above:<br>-Temperature ( $T_L$ )<br>-Time( $T_L$ )                                            | 217°C<br>60 ~ 260 sec         |
| Peak Temperature( $T_p$ )                                                                                     | 255°C -0/+5°C                 |
| Time within 5°C of actual peak Temperature( $T_p$ )                                                           | 10 ~ 30sec                    |
| Ramp-down rate                                                                                                | < 6°C/sec                     |
| Time 25°C to peak temperature                                                                                 | < 6 minutes                   |