

**60V NPN SILICON PLANAR HIGH PERFORMANCE TRANSISTOR IN SOT223**

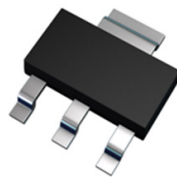
**Features**

- $BV_{CEO} > 60V$
- Maximum continuous current  $I_C = 3A$
- Low Saturation Voltage
- Complementary PNP Type – FZT751
- **Lead-Free Finish; RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**

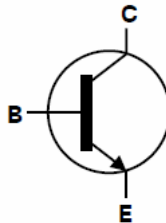
**Mechanical Data**

- Case: SOT223
- Case material: molded plastic. "Green" molding compound.
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 **(63)**
- Weight: 0.112 grams (approximate)

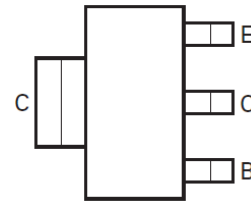
SOT223



Top View



Device Symbol



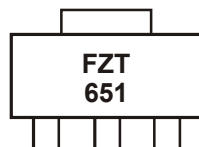
Top View  
Pin-Out

**Ordering Information** (Notes 4 & 5)

| Product   | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-----------|------------|---------|--------------------|-----------------|-------------------|
| FZT651TA  | AEC-Q101   | FZT651  | 7                  | 12              | 1,000             |
| FZT651QTA | Automotive | FZT651  | 7                  | 12              | 1,000             |
| FZT651TC  | AEC-Q101   | FZT651  | 13                 | 12              | 4,000             |
| FZT651QTC | Automotive | FZT651  | 13                 | 12              | 4,000             |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
  5. For packaging details, go to our website at <http://www.diodes.com>

**Marking Information**



FZT651 = Product Type Marking Code

## Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | 80    | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | 60    | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | 7     | V    |
| Continuous Collector Current | I <sub>C</sub>   | 3     | A    |
| Peak Pulse Current           | I <sub>CM</sub>  | 6     | A    |

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

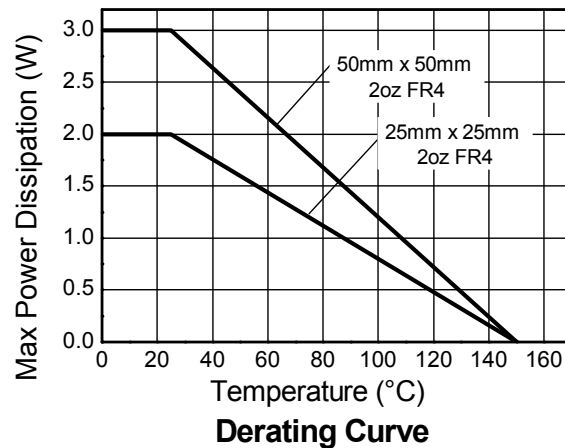
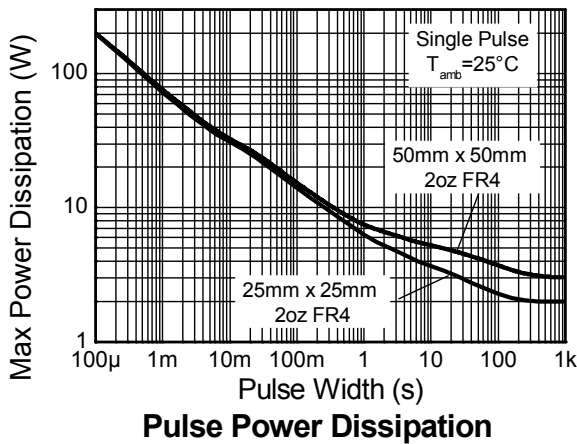
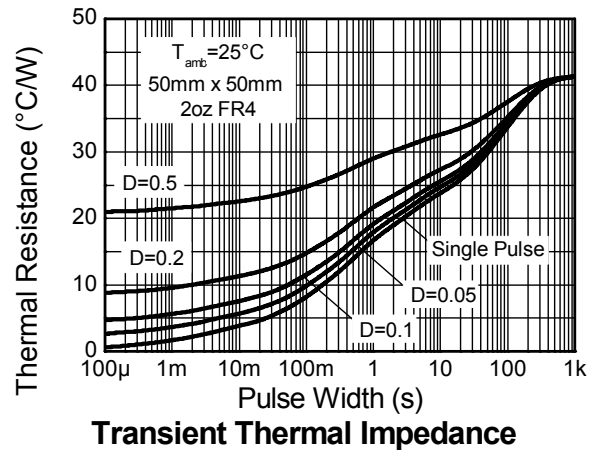
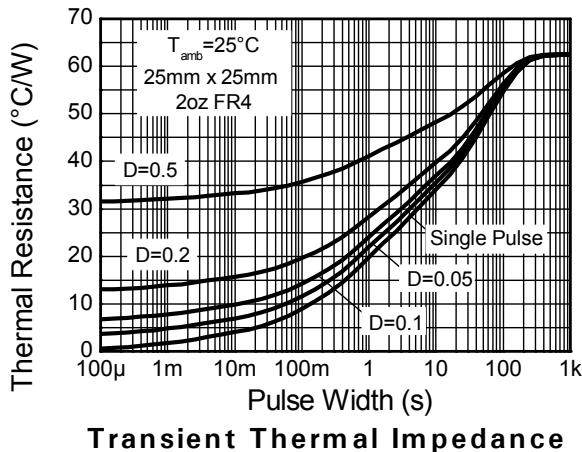
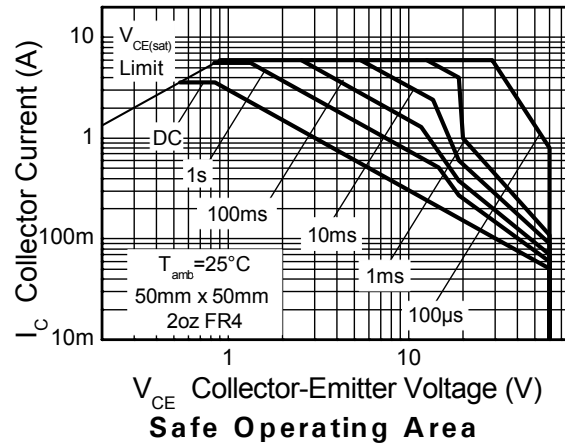
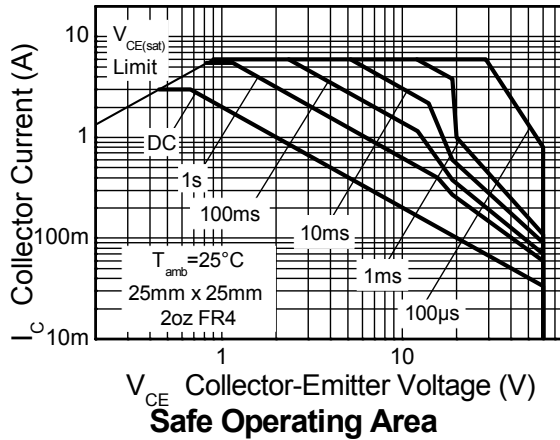
| Characteristic                                 | Symbol                            | Value       | Unit |
|------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation                              | P <sub>D</sub>                    | 2           | W    |
|                                                |                                   | 3           | W    |
| Thermal Resistance, Junction to Ambient        | R <sub>θJA</sub>                  | 62.5        | °C/W |
|                                                |                                   | 41.7        | °C/W |
| Thermal Resistance, Junction to Leads (Note 8) | R <sub>θJL</sub>                  | 12.93       | °C/W |
| Operating and Storage Temperature Range        | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

## ESD Ratings (Note 9)

| Characteristic                             | Symbol  | Value   | Unit | JEDEC Class |
|--------------------------------------------|---------|---------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | ≥ 8,000 | V    | 3B          |
| Electrostatic Discharge - Machine Model    | ESD MM  | ≥ 400   | V    | C           |

- Notes:
6. For a device surface mounted on 25mm X 25mm FR4 PCB with high coverage of single sided 1 oz copper, in still air conditions; device measured when operating in steady state condition.
  7. Same as note (6), except the device is mounted on 50mm X 50mm single sided 2oz weight copper.
  8. Thermal resistance from junction to solder-point (at the end of the collector lead).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics and Derating Information

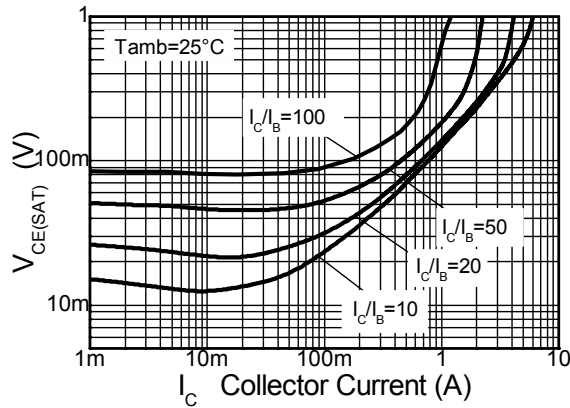


# Electrical Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

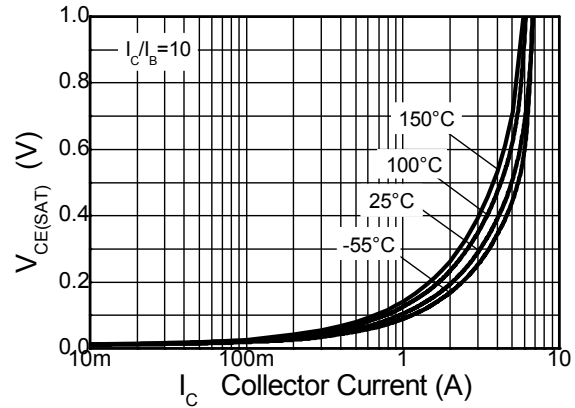
| Characteristic                                 | Symbol               | Min | Typ  | Max  | Unit | Test Condition                                                                             |
|------------------------------------------------|----------------------|-----|------|------|------|--------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage               | BV <sub>CBO</sub>    | 80  | –    | –    | V    | I <sub>C</sub> = 100μA                                                                     |
| Collector-Emitter Breakdown Voltage (Note 10)  | BV <sub>CEO</sub>    | 60  | –    | –    | V    | I <sub>C</sub> = 10mA                                                                      |
| Emitter-Base Breakdown Voltage                 | BV <sub>EBO</sub>    | 7   | –    | –    | V    | I <sub>E</sub> = 100μA                                                                     |
| Collector Cut-off Current                      | I <sub>CBO</sub>     | –   | –    | 0.1  | μA   | V <sub>CB</sub> = 60V                                                                      |
|                                                |                      | –   | –    | 10   |      | V <sub>CB</sub> = 60V, T <sub>A</sub> = 125°C                                              |
| Emitter Cut-off Current                        | I <sub>EBO</sub>     | –   | –    | 100  | nA   | V <sub>EB</sub> = 4V                                                                       |
| Collector-Emitter Saturation Voltage (Note 10) | V <sub>CE(sat)</sub> | –   | 0.12 | 0.3  | V    | I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA                                                |
|                                                |                      | –   | 0.43 | 0.6  |      | I <sub>C</sub> = 3A, I <sub>B</sub> = 300mA                                                |
| Base-Emitter Saturation Voltage (Note 10)      | V <sub>BE(sat)</sub> | –   | 0.9  | 1.25 | V    | I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA                                                |
| Base-Emitter Turn-On Voltage (Note 10)         | V <sub>BE(on)</sub>  | –   | 0.8  | 1.0  | V    | I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V                                                  |
| DC Current Gain (Note 10)                      | h <sub>FE</sub>      | 70  | 200  | –    | –    | I <sub>C</sub> = 50mA, V <sub>CE</sub> = 2V                                                |
|                                                |                      | 100 | 200  | 300  |      | I <sub>C</sub> = 500mA, V <sub>CE</sub> = 2V                                               |
|                                                |                      | 80  | 170  | –    |      | I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V                                                  |
|                                                |                      | 40  | 80   | –    |      | I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V                                                  |
| Current Gain-Bandwidth Product (Note 10)       | f <sub>T</sub>       | 140 | 175  | –    | MHz  | V <sub>CE</sub> = 5V, I <sub>C</sub> = 100mA,<br>f = 100MHz                                |
| Switching Times                                | t <sub>on</sub>      | –   | 45   | –    | ns   | I <sub>C</sub> = 500mA, V <sub>CC</sub> = 10V,<br>I <sub>B1</sub> = I <sub>B2</sub> = 50mA |
|                                                | t <sub>off</sub>     | –   | 800  | –    |      |                                                                                            |
| Output Capacitance (Note 10)                   | C <sub>obp</sub>     | –   | –    | 30   | pF   | V <sub>CB</sub> = 10V, f = 1MHz                                                            |

Notes: 10. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

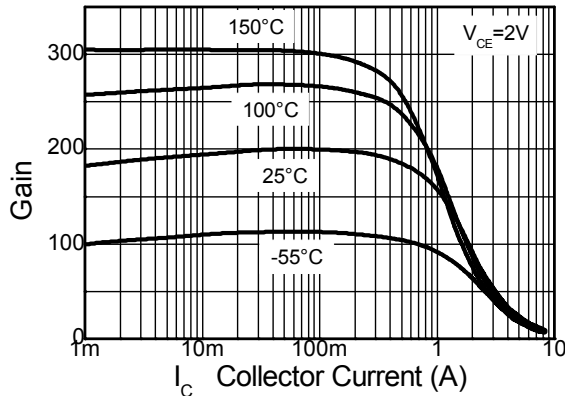
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



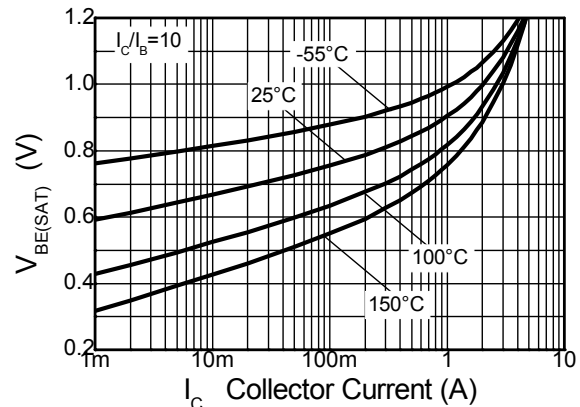
$V_{CE(SAT)} \text{ v } I_C$



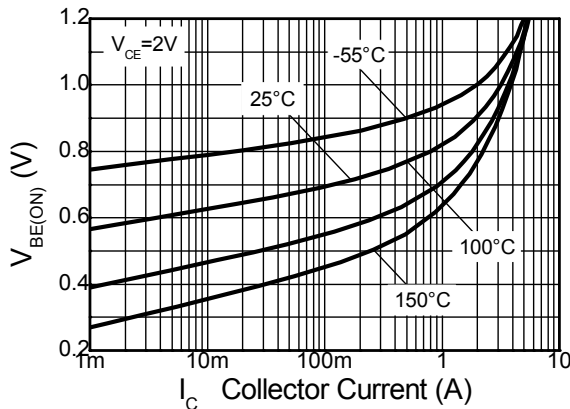
$V_{CE(SAT)} \text{ v } I_C$



$h_{FE} \text{ v } I_C$



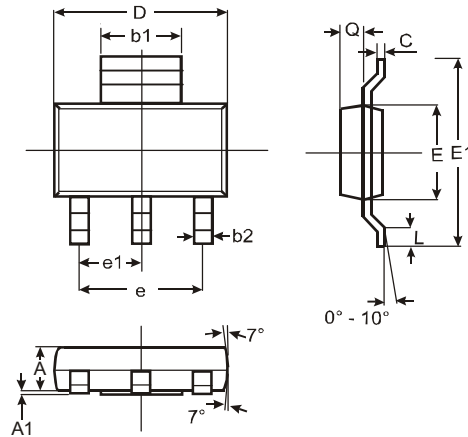
$V_{BE(SAT)} \text{ v } I_C$



$V_{BE(ON)} \text{ v } I_C$

## Package Outline Dimensions

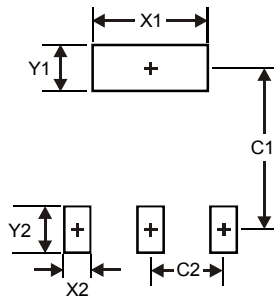
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT223               |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 1.55  | 1.65 | 1.60 |
| A1                   | 0.010 | 0.15 | 0.05 |
| b1                   | 2.90  | 3.10 | 3.00 |
| b2                   | 0.60  | 0.80 | 0.70 |
| C                    | 0.20  | 0.30 | 0.25 |
| D                    | 6.45  | 6.55 | 6.50 |
| E                    | 3.45  | 3.55 | 3.50 |
| E1                   | 6.90  | 7.10 | 7.00 |
| e                    | —     | —    | 4.60 |
| e1                   | —     | —    | 2.30 |
| L                    | 0.85  | 1.05 | 0.95 |
| Q                    | 0.84  | 0.94 | 0.89 |
| All Dimensions in mm |       |      |      |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| X1         | 3.3           |
| X2         | 1.2           |
| Y1         | 1.6           |
| Y2         | 1.6           |
| C1         | 6.4           |
| C2         | 2.3           |

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