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## Features

- $BV_{CEO} > 20V$
- $BV_{CBO} > 20V$
- $I_C = 3.0A$  High Continuous Current
- $h_{FE} > 400$  @ 2A and Low Saturation Voltage
- $V_{CE(sat)} < 450mV$  at 3A
- Complementary PNP Type: DIODES™ FZT789B
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.**

<https://www.diodes.com/quality/product-definitions/>

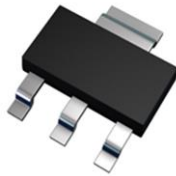
## Mechanical Data

- Package: SOT223
- Package 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 @3
- Weight: 0.112 grams (Approximate)

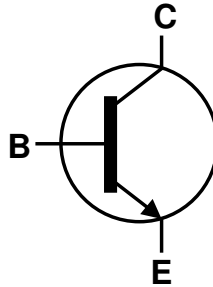
## Applications

- Darlington replacements
- Flash gun converters and battery powered circuits

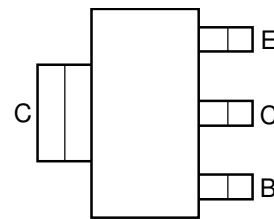
SOT223 (Type DN)



Top View



Device Symbol



Top View  
Pin-Out

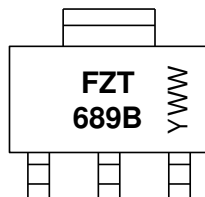
## Ordering Information (Note 4)

| Part Number | Package          | Marking | Reel Size (inches) | Tape Width (mm) | Packing |         |
|-------------|------------------|---------|--------------------|-----------------|---------|---------|
|             |                  |         |                    |                 | Qty.    | Carrier |
| FZT689BTA   | SOT223 (Type DN) | FZT689B | 7                  | 12              | 1,000   | Reel    |

- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  2. See <https://www.diodes.com/quality/lead-free/> 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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information

SOT223 (Type DN)



FZT689B = Product Type Marking Code  
 YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 3 = 2023)  
 WW or  $\bar{W}W$  = Week Code (01 to 53)

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

| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | 20    | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | 20    | V    |
| Emitter-Base Voltage         | V <sub>EB0</sub> | 7     | V    |
| Continuous Collector Current | I <sub>C</sub>   | 3     | A    |
| Peak Pulse Current           | I <sub>CM</sub>  | 8     | A    |

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

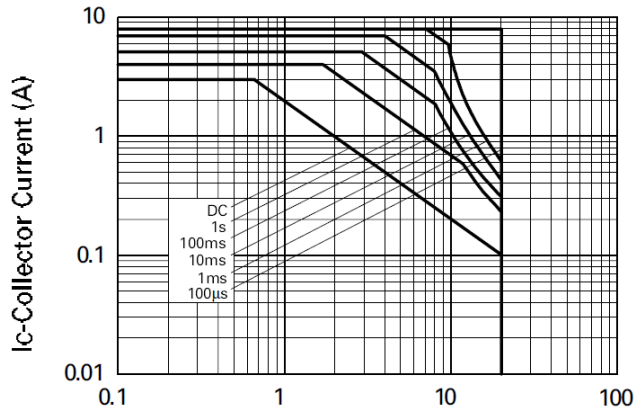
| Characteristic                          | Symbol                            | Value       | Unit |
|-----------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation                       | P <sub>D</sub>                    | 3           | W    |
|                                         |                                   | 2           |      |
|                                         |                                   | 1.6         |      |
|                                         |                                   | 1.2         |      |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | 41.7        | °C/W |
|                                         |                                   | 62.5        |      |
|                                         |                                   | 78.1        |      |
|                                         |                                   | 104         |      |
| Thermal Resistance Junction to Lead     | R <sub>θJL</sub>                  | 12.9        |      |
| Operating and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 10)

| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--------------------------------------------|---------|-------|------|-------------|
| Electrostatic Discharge — Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge — Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
- For a device mounted with the collector lead on 50mm × 50mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  - Same as Note 5, except the device is mounted on 25mm × 25mm 2oz copper.
  - Same as Note 5, except the device is mounted on 25mm × 25mm 1oz copper.
  - Same as Note 5, except the device is mounted on minimum recommended pad layout.
  - Thermal resistance from junction to solder-point (at the end of the collector lead).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics and Derating Information



VCE - Collector Emitter Voltage (V)  
Figure 1. Safe Operating Area

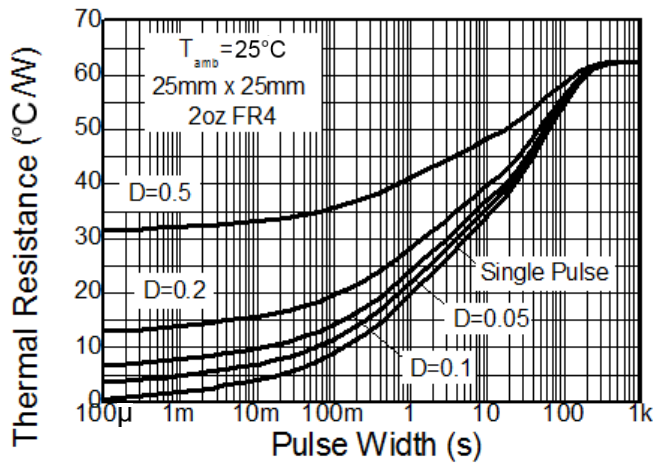


Figure 2. Transient Thermal Impedance

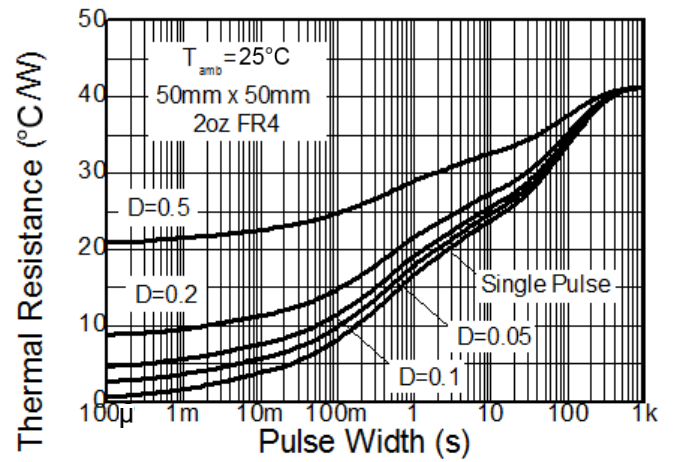


Figure 3. Transient Thermal Impedance

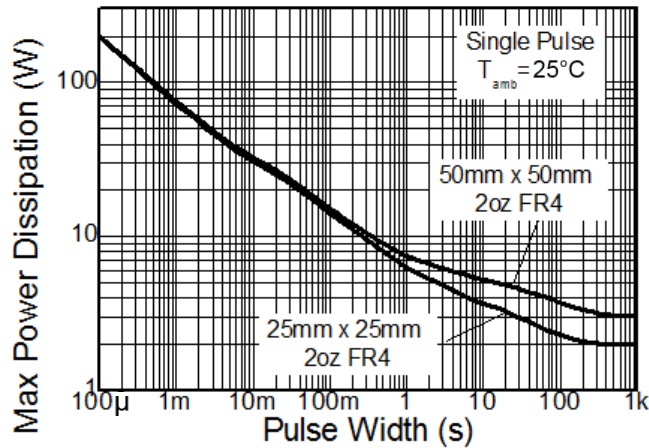


Figure 4. Pulse Power Dissipation

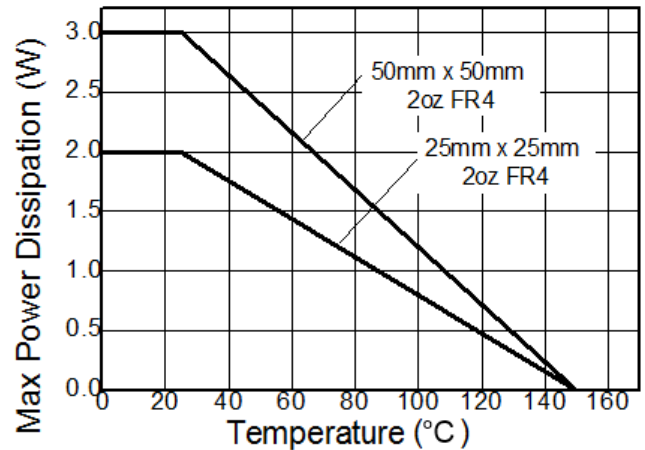


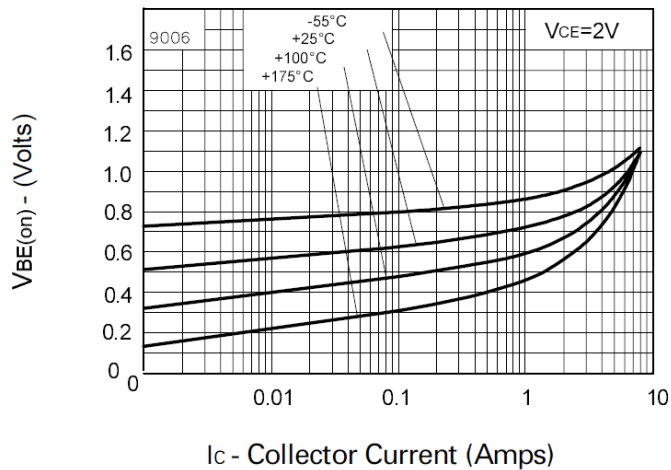
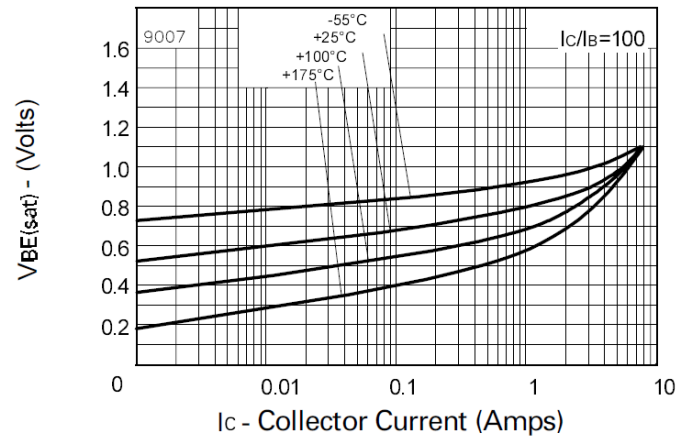
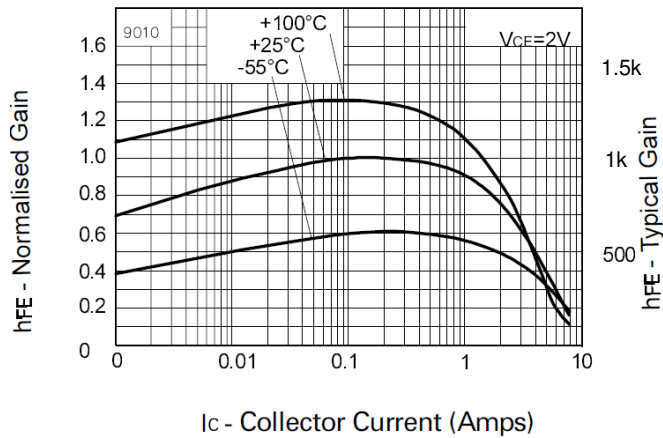
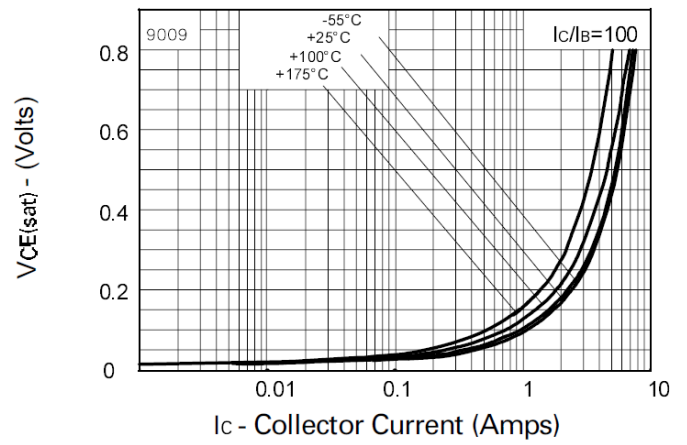
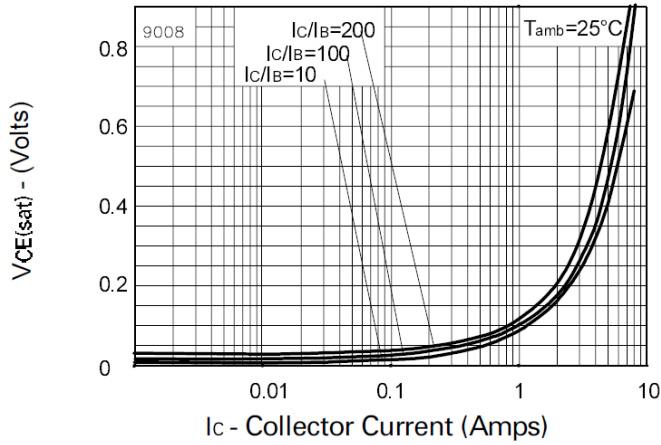
Figure 5. Derating Curve

**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>    | 20  | —   | —   | V    | I <sub>C</sub> = 100μA                                                                      |
| Collector-Emitter Breakdown Voltage (Note 11)  | BV <sub>CEO</sub>    | 20  | —   | —   | V    | I <sub>C</sub> = 10mA                                                                       |
| Emitter-Base Breakdown Voltage                 | BV <sub>EBO</sub>    | 7   | —   | —   | V    | I <sub>E</sub> = 100μA                                                                      |
| Collector-Base Cut-Off Current                 | I <sub>CBO</sub>     | —   | —   | 50  | nA   | V <sub>CB</sub> = 16V                                                                       |
| Emitter Cut-Off Current                        | I <sub>EBO</sub>     | —   | —   | 50  | nA   | V <sub>EB</sub> = 6V                                                                        |
| DC Current Gain (Note 11)                      | h <sub>FE</sub>      | 500 | —   | —   | —    | I <sub>C</sub> = 0.1A, V <sub>CE</sub> = 2V                                                 |
|                                                |                      | 400 | —   | —   |      | I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V                                                   |
|                                                |                      | 150 | —   | —   |      | I <sub>C</sub> = 6A, V <sub>CE</sub> = 2V                                                   |
| Collector-Emitter Saturation Voltage (Note 11) | V <sub>CE(sat)</sub> | —   | —   | 100 | mV   | I <sub>C</sub> = 0.1A, I <sub>B</sub> = 0.5mA                                               |
|                                                |                      | —   | —   | 500 |      | I <sub>C</sub> = 2A, I <sub>B</sub> = 10mA                                                  |
|                                                |                      | —   | —   | 450 |      | I <sub>C</sub> = 3A, I <sub>B</sub> = 20mA                                                  |
| Base-Emitter Saturation Voltage (Note 11)      | V <sub>BE(sat)</sub> | —   | —   | 0.9 | V    | I <sub>C</sub> = 1A, I <sub>B</sub> = 10mA                                                  |
| Base-Emitter Turn-On Voltage (Note 11)         | V <sub>BE(on)</sub>  | —   | —   | 0.9 | V    | I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V                                                   |
| Input Capacitance                              | C <sub>ibo</sub>     | —   | 200 | —   | pF   | V <sub>EB</sub> = 0.5V, f = 1MHz                                                            |
| Output Capacitance                             | C <sub>obo</sub>     | —   | 16  | —   | pF   | V <sub>CB</sub> = 10V, f = 1MHz                                                             |
| Current Gain-Bandwidth Product                 | f <sub>T</sub>       | 150 | —   | —   | MHz  | V <sub>CE</sub> = 5V, I <sub>C</sub> = 50mA, f = 50MHz                                      |
| Turn-On Time                                   | t <sub>on</sub>      | —   | 30  | —   | ns   | V <sub>CC</sub> = 10V, I <sub>C</sub> = 500mA,<br>I <sub>B1</sub> = -I <sub>B2</sub> = 50mA |
| Turn-Off Time                                  | t <sub>off</sub>     | —   | 800 | —   | ns   |                                                                                             |

Note: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

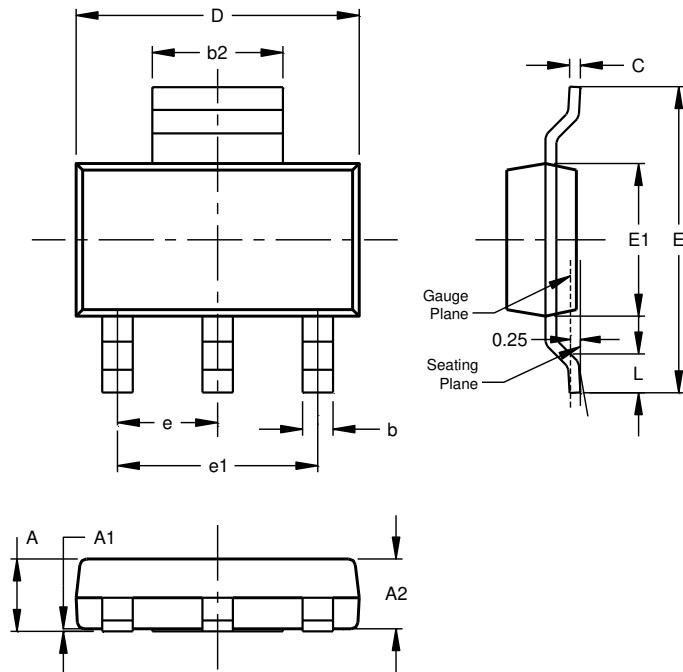
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT223 (Type DN)

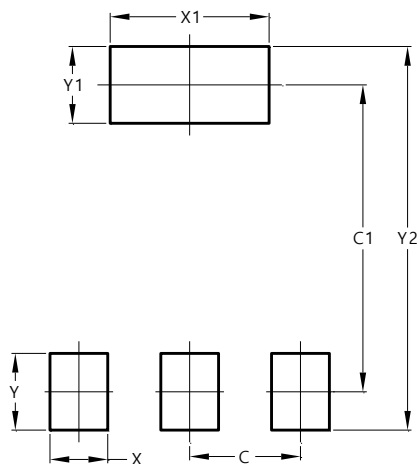


| SOT223 (Type DN)     |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | --   | 1.70 | --   |
| A1                   | 0.01 | 0.15 | --   |
| A2                   | 1.50 | 1.68 | 1.60 |
| b                    | 0.60 | 0.80 | 0.70 |
| b2                   | 2.90 | 3.10 | --   |
| c                    | 0.20 | 0.32 | --   |
| D                    | 6.30 | 6.70 | --   |
| E                    | 6.70 | 7.30 | --   |
| E1                   | 3.30 | 3.70 | --   |
| e                    | --   | --   | 2.30 |
| e1                   | --   | --   | 4.60 |
| L                    | 0.85 | --   | --   |
| All Dimensions in mm |      |      |      |

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT223 (Type DN)



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.30          |
| C1         | 6.40          |
| X          | 1.20          |
| X1         | 3.30          |
| Y          | 1.60          |
| Y1         | 1.60          |
| Y2         | 8.00          |

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