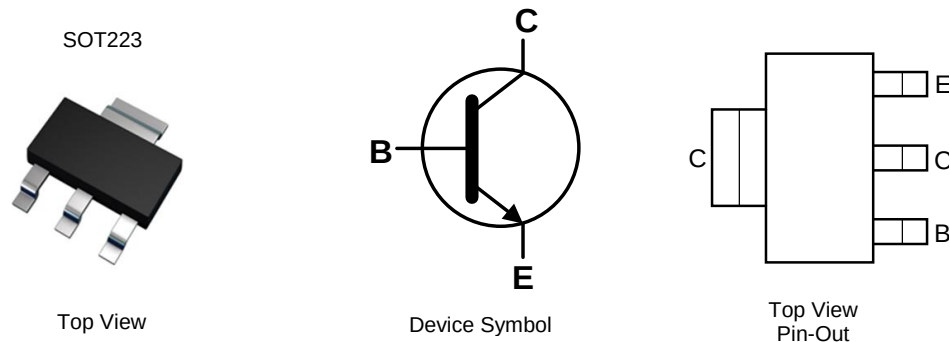


## Features

- $BV_{CEO} > 100V$
- $I_C = 2A$  High Continuous Current
- $I_{CM} = 6A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(SAT)} < 300mV @ 1A$
- Complementary PNP Type: FZT753
- **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@3
- Weight: 0.112 grams (Approximate)

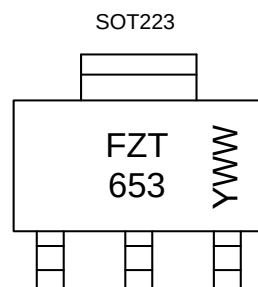


## Ordering Information (Notes 4 & 5)

| Product   | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Peel |
|-----------|------------|---------|--------------------|-----------------|-------------------|
| FZT653TA  | AEC-Q101   | FZT653  | 7                  | 12              | 1,000             |
| FZT653QTA | Automotive | FZT653  | 7                  | 12              | 1,000             |
| FZT653TC  | AEC-Q101   | FZT653  | 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/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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. For more information, please refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](http://www.diodes.com/product_compliance_definitions.html).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



FZT 653 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 6 = 2016)  
 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> | 120   | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | 100   | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | 7     | V    |
| Continuous Collector Current | I <sub>C</sub>   | 2     | A    |
| Peak Pulse Current           | I <sub>CM</sub>  | 6     | A    |

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

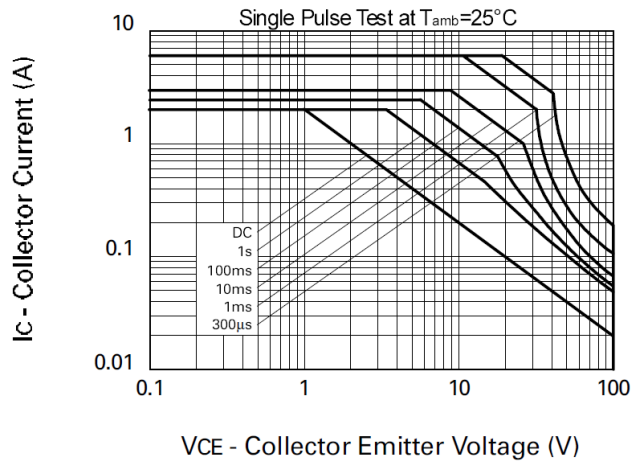
| Characteristic                          | Symbol                            | Value       | Unit |
|-----------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation                       | P <sub>D</sub>                    | 3           | W    |
|                                         |                                   | 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 11)

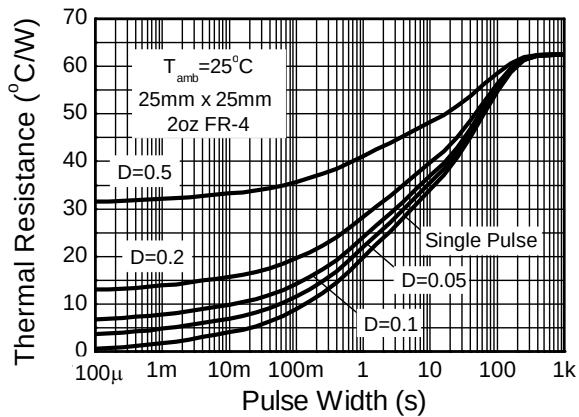
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--------------------------------------------|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model 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

- Notes:
- For a device mounted with the collector lead on 50mm x 50mm 2oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  - Same as Note 6, except the device is mounted on 25mm x 25mm 2oz copper.
  - Same as Note 6, except the device is mounted on 25mm x 25mm 1oz copper.
  - Same as Note 6, 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.

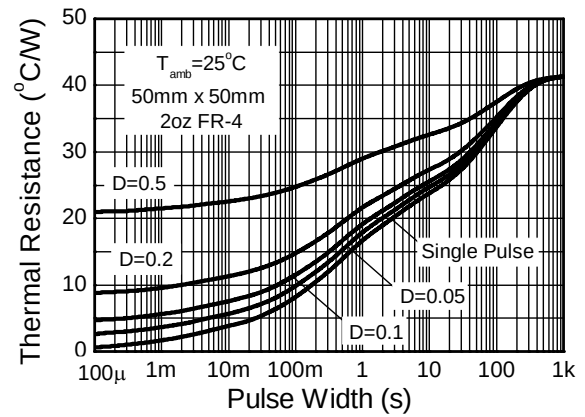
## Thermal Characteristics and Derating Information



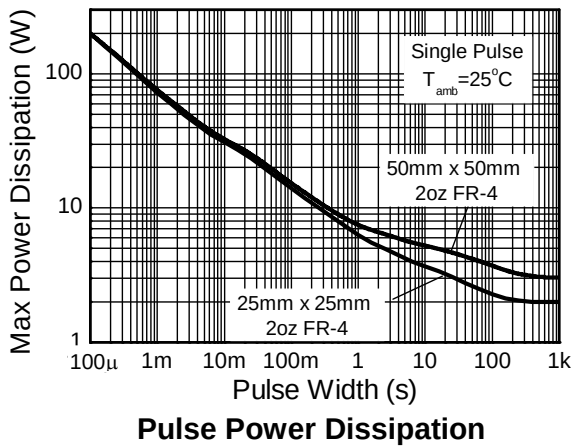
### Safe Operating Area



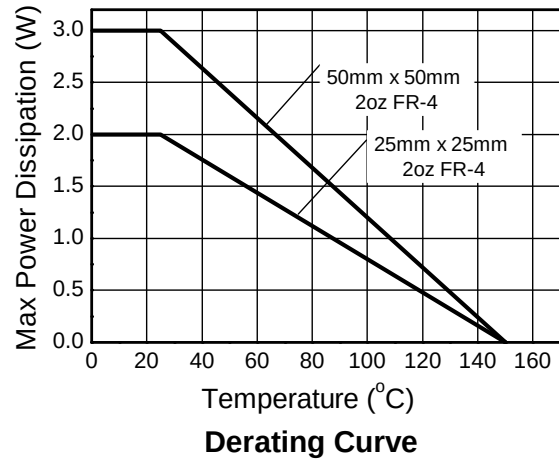
### Transient Thermal Impedance



### Transient Thermal Impedance



### Pulse Power Dissipation



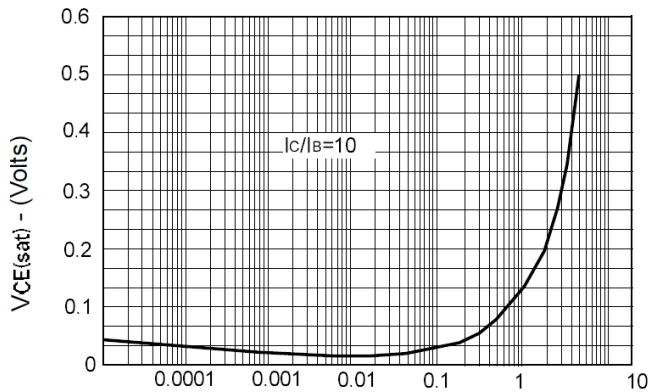
### Derating Curve

**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>    | 120 | –    | –    | V    | I <sub>C</sub> = 100μA                                                                   |
| Collector-Emitter Breakdown Voltage (Note 12)  | BV <sub>CEO</sub>    | 100 | –    | –    | 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>     | –   | < 1  | 100  | nA   | V <sub>CB</sub> = 100V                                                                   |
| Emitter Cut-Off Current                        | I <sub>EBO</sub>     | –   | < 1  | 100  | nA   | V <sub>CB</sub> = 100V, T <sub>A</sub> = +125°C                                          |
| Collector-Emitter Saturation Voltage (Note 12) | V <sub>CE(SAT)</sub> | –   | 0.13 | 0.3  | V    | I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA                                              |
|                                                |                      | –   | 0.23 | 0.5  |      | I <sub>C</sub> = 2A, I <sub>B</sub> = 200mA                                              |
| Base-Emitter Saturation Voltage (Note 12)      | 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 12)         | V <sub>BE(ON)</sub>  | –   | 0.8  | 1.0  | V    | I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V                                                |
| DC Current Gain (Note 12)                      | 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                                             |
|                                                |                      | 55  | 110  | –    |      | I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V                                                |
|                                                |                      | 25  | 55   | –    |      | I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V                                                |
| Current Gain-Bandwidth Product                 | f <sub>T</sub>       | 140 | 175  | –    | MHz  | V <sub>CE</sub> = 5V, I <sub>C</sub> = 100mA, f = 100MHz                                 |
| Switching Times                                | t <sub>ON</sub>      | –   | 80   | –    | ns   | I <sub>C</sub> = 500mA, V <sub>CC</sub> = 10V, I <sub>B1</sub> = -I <sub>B2</sub> = 50mA |
|                                                | t <sub>OFF</sub>     | –   | 1200 | –    |      |                                                                                          |
| Output Capacitance                             | C <sub>OBO</sub>     | –   | –    | 30   | pF   | V <sub>CB</sub> = 10V, f = 1MHz                                                          |

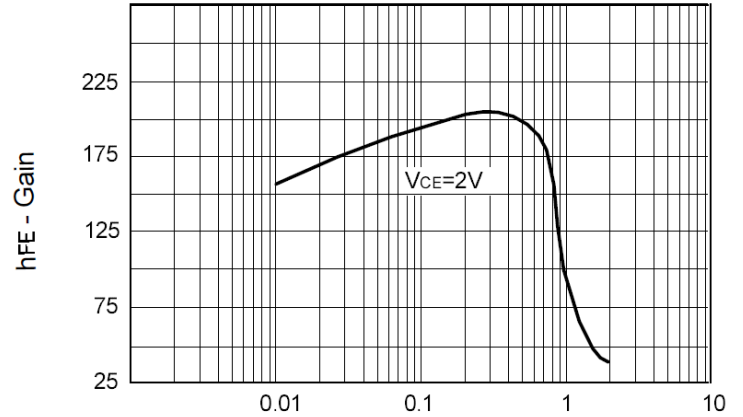
Note: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



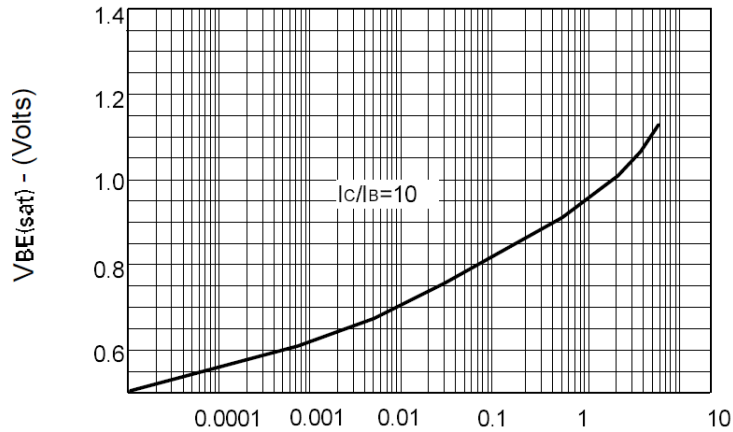
$I_C$  - Collector Current (Amps)

**$V_{CE(sat)}$  v  $I_C$**



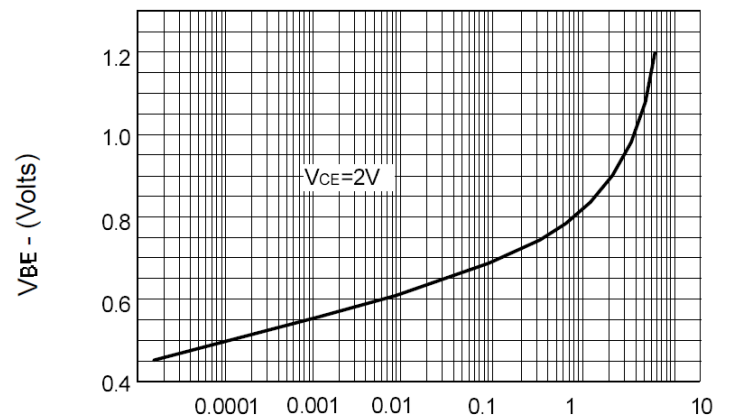
$I_C$  - Collector Current (Amps)

**$h_{FE}$  v  $I_C$**



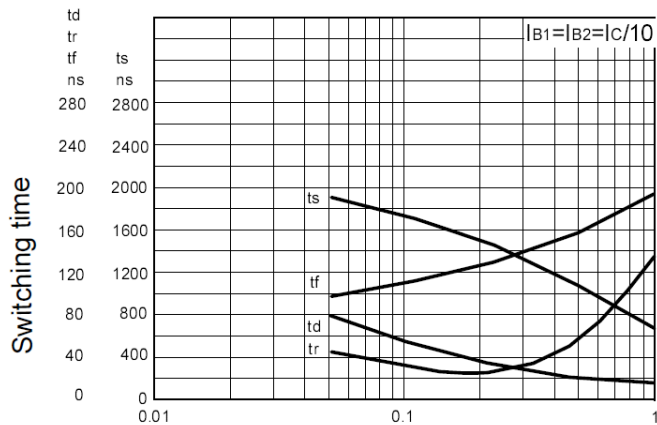
$I_C$  - Collector Current (Amps)

**$V_{BE(sat)}$  v  $I_C$**



$I_C$  - Collector Current (Amps)

**$V_{BE(on)}$  v  $I_C$**

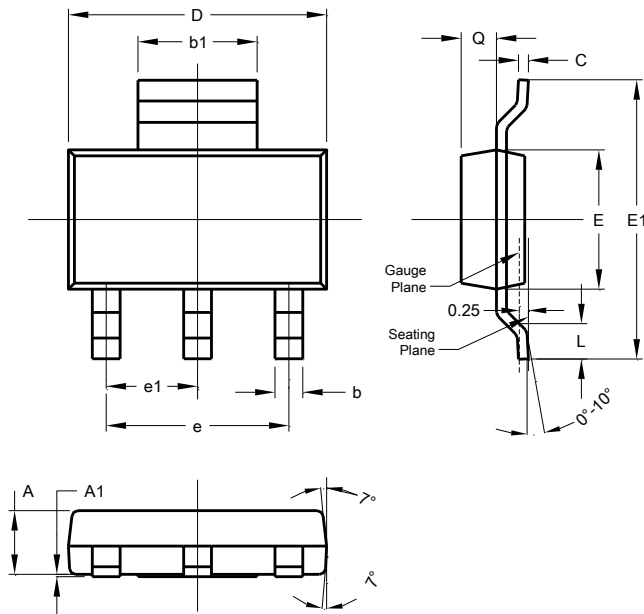


$I_C$  - Collector Current (Amps)

**Switching Speeds**

## Package Outline Dimensions

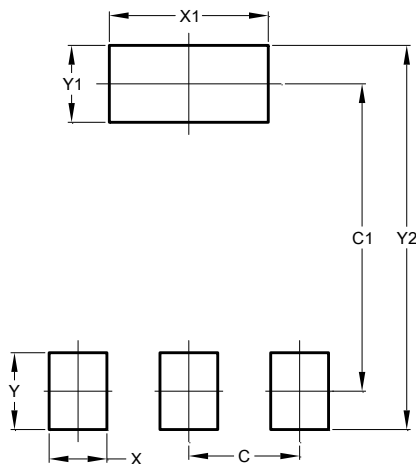
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



| SOT223               |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 1.55  | 1.65 | 1.60 |
| A1                   | 0.010 | 0.15 | 0.05 |
| b                    | 0.60  | 0.80 | 0.70 |
| b1                   | 2.90  | 3.10 | 3.00 |
| 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 <http://www.diodes.com/package-outlines.html> for the latest version.



| 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          |

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to voltage spacing between terminals.

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