

**100V NPN HIGH PERFORMANCE TRANSISTOR IN SOT223**

**Features**

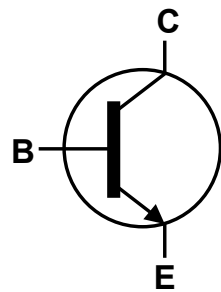
- $BV_{CEO} > 100V$
- $I_C = 3A$  High Continuous Current
- $I_{CM} = 6A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < 300mV @ 1A$
- Complementary PNP Type: FZT753
- **Lead-Free Finish; RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**

**Mechanical Data**

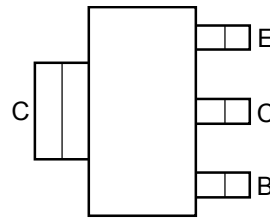
- Case: SOT223
- Case material: molded plastic. "Green" molding compound.
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 **Ⓔ**
- Weight: 0.112 grams (approximate)



Top View



Device Symbol



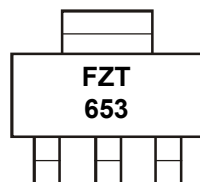
Top View  
Pin-Out

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

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
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/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

**Marking Information**



FZT653 = Product Type Marking Code

**Absolute Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	120	V
Collector-Emitter Voltage	$V_{CEO}$	100	V
Emitter-Base Voltage	$V_{EBO}$	7	V
Continuous Collector Current	$I_C$	2	A
Peak Pulse Current	$I_{CM}$	6	A

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

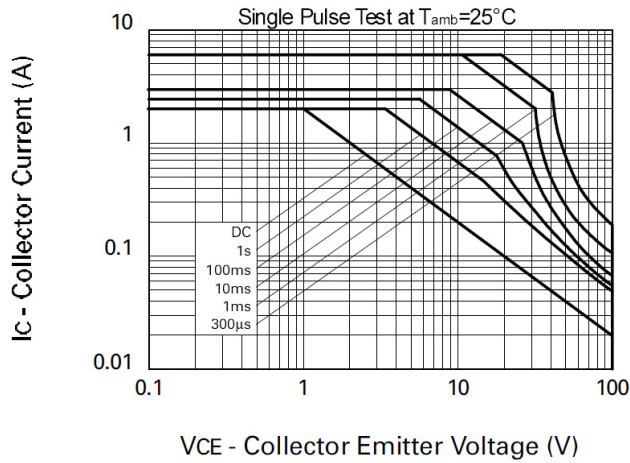
Characteristic	Symbol	Value	Unit
Power Dissipation	$P_D$	2	W
		3	W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
		41.7	$^\circ\text{C/W}$
Thermal Resistance, Junction to Leads	$R_{\theta JL}$	12.9	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 9)

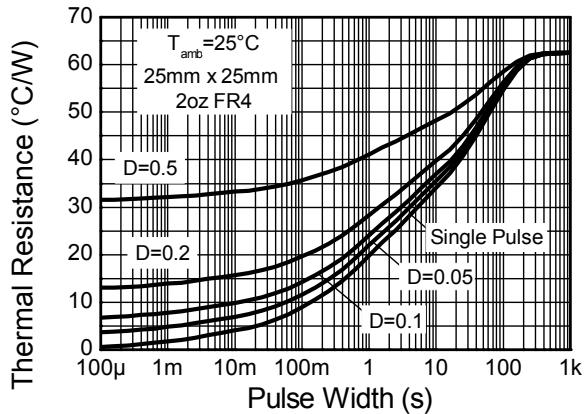
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted with the collector lead on 25mm x 25mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
  7. Same as note (6), except the device is mounted on 50mm x 50mm 2oz 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.

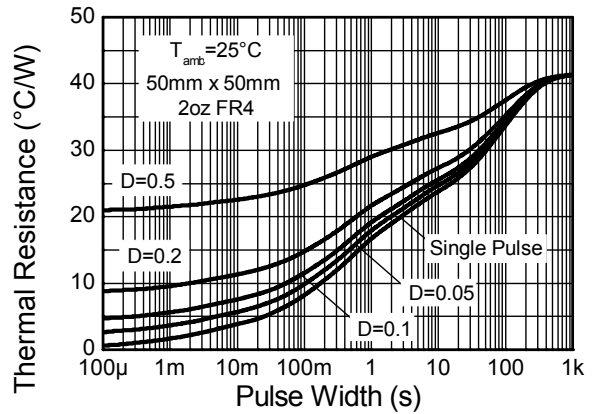
**Thermal Characteristics and Derating Information**



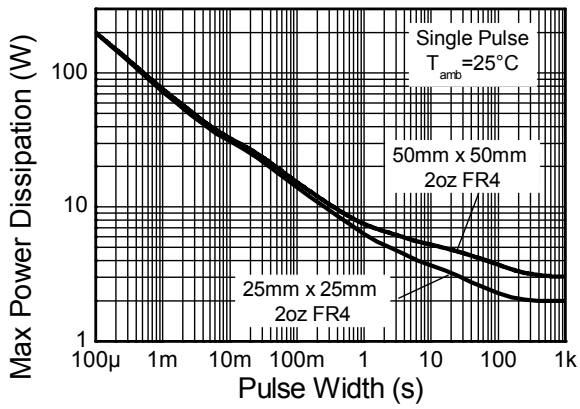
**Safe Operating Area**



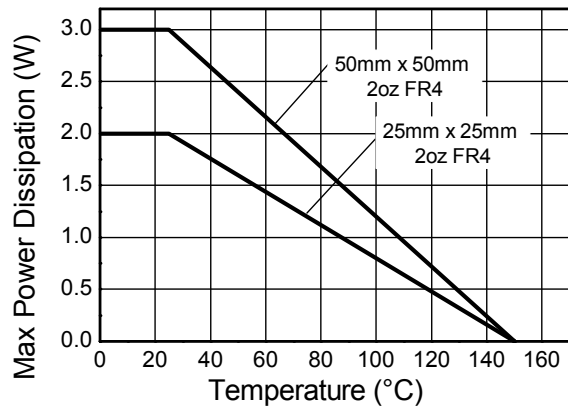
**Transient Thermal Impedance**



**Transient Thermal Impedance**



**Pulse Power Dissipation**



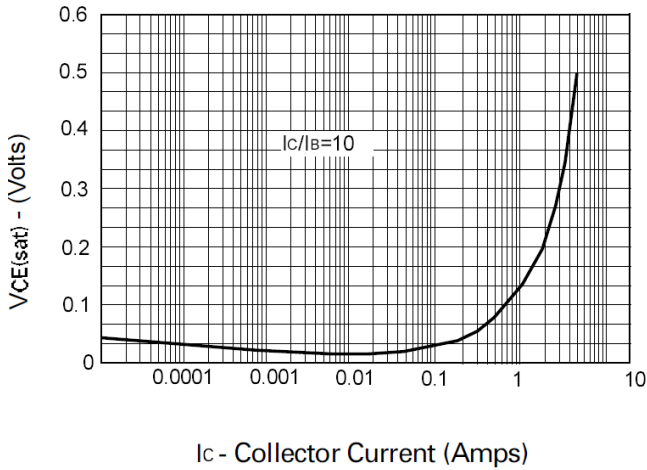
**Derating Curve**

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	120	–	–	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	100	–	–	V	$I_C = 1\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	–	–	V	$I_E = 100\mu\text{A}$
Collector Cut-off Current	$I_{CBO}$	–	< 1	100	nA	$V_{CB} = 100\text{V}$
		–	–	10	$\mu\text{A}$	$V_{CB} = 100\text{V}, T_A = +125^\circ\text{C}$
Emitter Cut-off Current	$I_{EBO}$	–	< 1	100	nA	$V_{EB} = 5.6\text{V}$
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	–	0.13	0.3	V	$I_C = 1\text{A}, I_B = 100\text{mA}$
		–	0.23	0.5		$I_C = 2\text{A}, I_B = 200\text{mA}$
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	–	0.9	1.25	V	$I_C = 1\text{A}, I_B = 100\text{mA}$
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	–	0.8	1.0	V	$I_C = 1\text{A}, V_{CE} = 2\text{V}$
DC Current Gain (Note 10)	$h_{FE}$	70	200	–	–	$I_C = 50\text{mA}, V_{CE} = 2\text{V}$
		100	200	300		$I_C = 500\text{mA}, V_{CE} = 2\text{V}$
		55	110	–		$I_C = 1\text{A}, V_{CE} = 2\text{V}$
		25	55	–		$I_C = 2\text{A}, V_{CE} = 2\text{V}$
Current Gain-Bandwidth Product (Note 10)	$f_T$	140	175	–	MHz	$V_{CE} = 5\text{V}, I_C = 100\text{mA}, f = 100\text{MHz}$
Switching Times	$t_{on}$	–	80	–	ns	$I_C = 500\text{mA}, V_{CC} = 10\text{V}, I_{B1} = -I_{B2} = 50\text{mA}$
	$t_{off}$	–	1200	–		
Output Capacitance (Note 10)	$C_{obo}$	–	–	30	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$

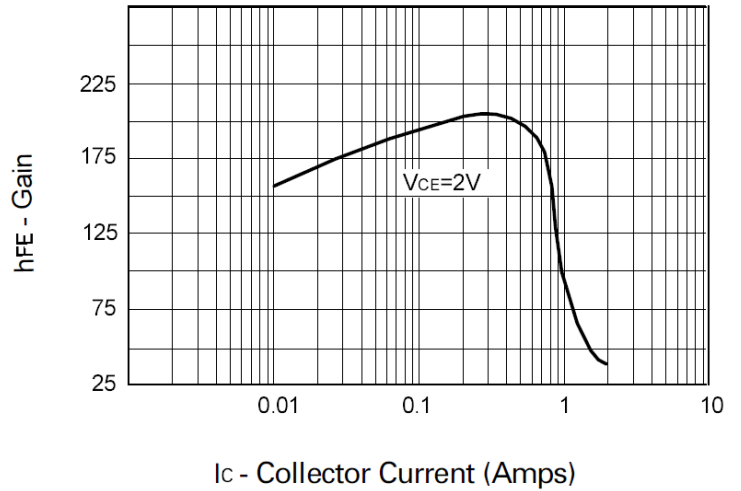
Note: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$

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



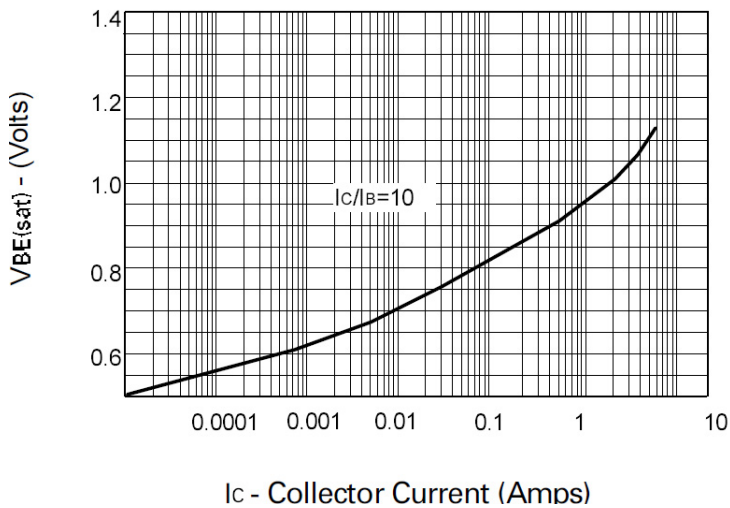
$I_C$  - Collector Current (Amps)

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

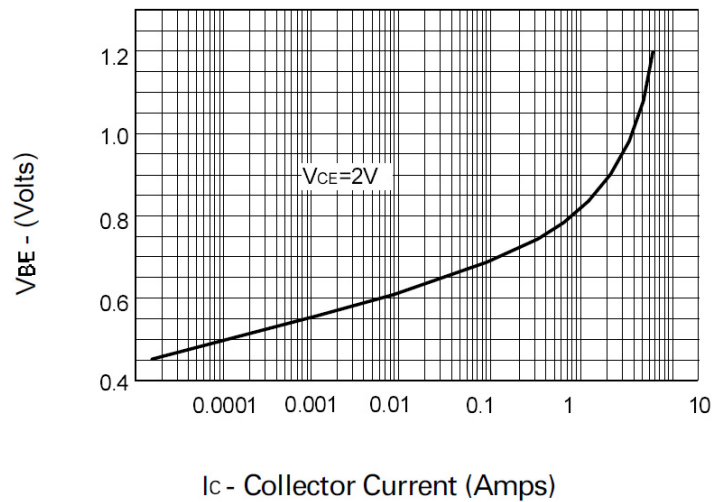


$I_C$  - Collector Current (Amps)

**hFE v  $I_C$**

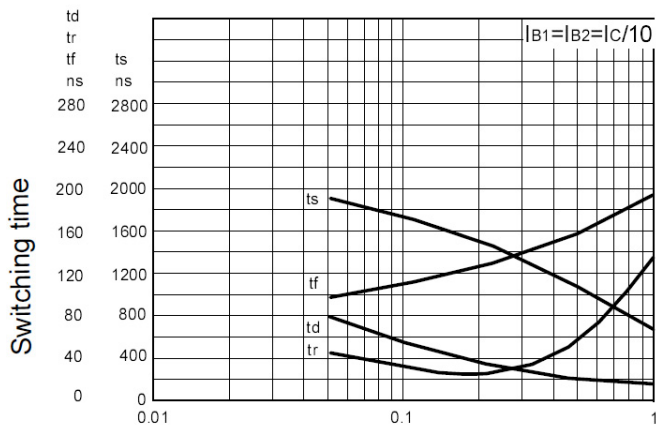


$I_C$  - Collector Current (Amps)



$I_C$  - Collector Current (Amps)

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

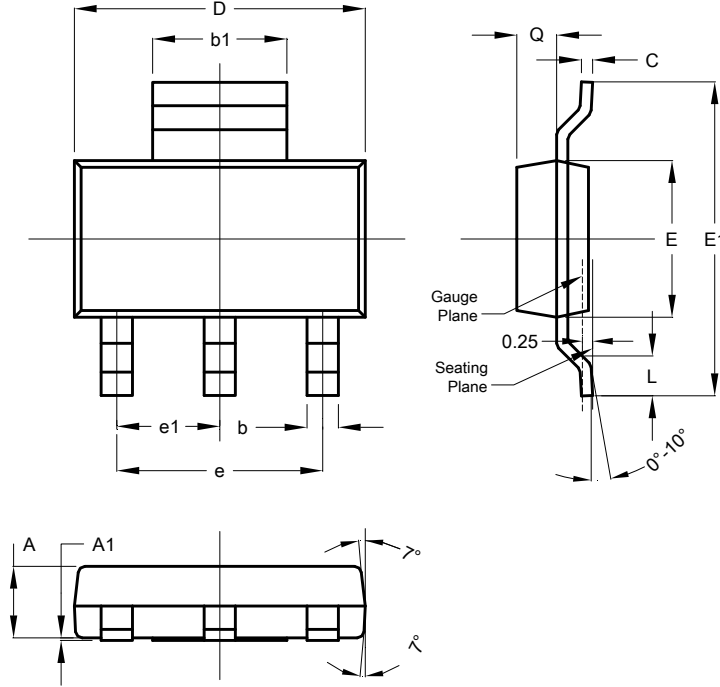


$I_C$  - Collector Current (Amps)

**Switching Speeds**

**Package Outline Dimensions**

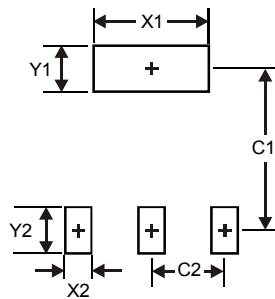
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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