

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

**Description**

This Bipolar Junction Transistor (BJT) has been designed to meet the stringent requirements of automotive applications.

**Features**

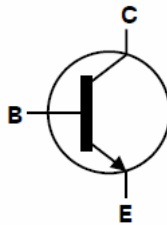
- $BV_{CEO} > 60V$
- $I_C = 3A$  High Continuous Current
- $I_{CM} = 6A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < 300mV @ 1A$
- Complementary PNP Type: FZT751Q
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

**Mechanical Data**

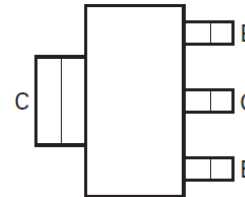
- Case: SOT223
- Case Material: Molded Plastic. "Green" Molding Compound;
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads; Solderable per MIL-STD-202, Method 208 (3)
- Weight: 0.112 grams (Approximate)



Top View



Device Symbol



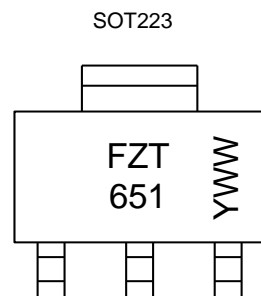
Top View  
Pin-Out

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

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
FZT651QTA	Automotive	FZT651	7	12	1,000
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/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**



FZT 651 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 5= 2015)  
 WW or  $\bar{W}W$  = Week Code (01~53)

**Absolute 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.)

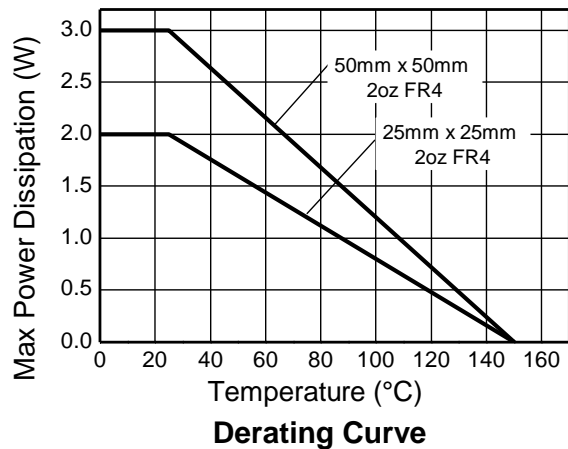
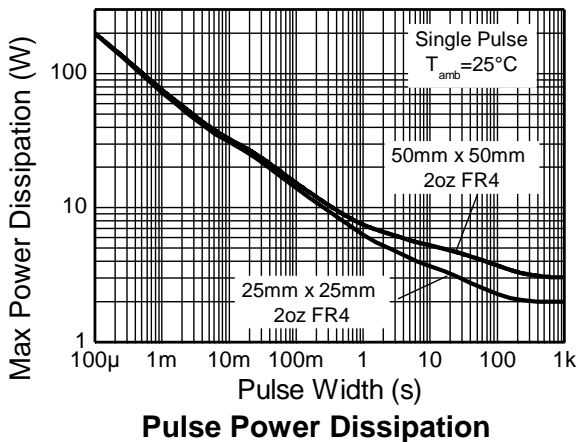
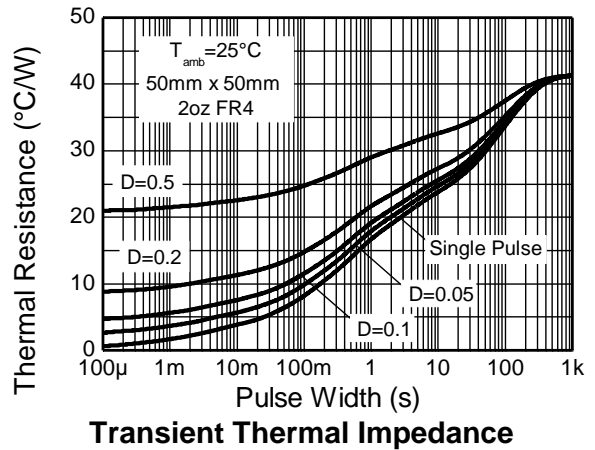
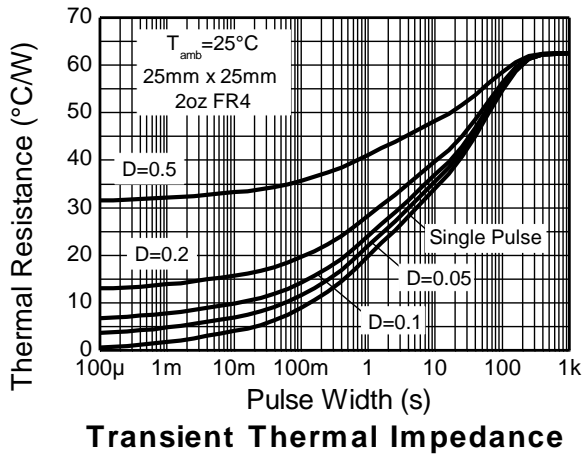
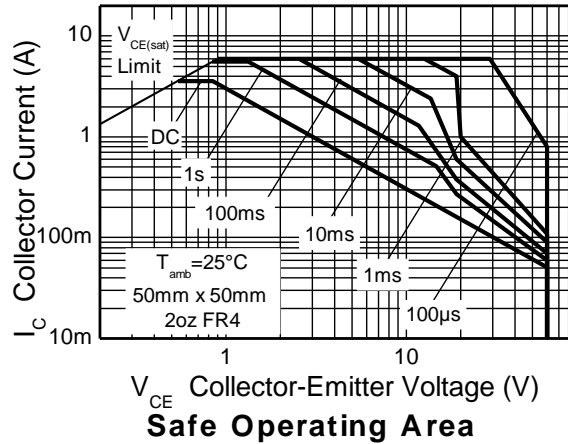
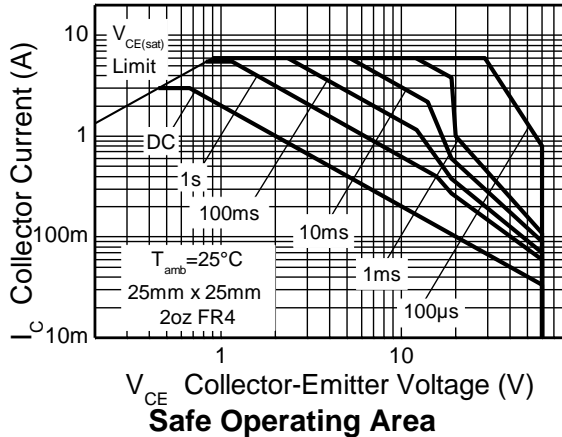
Characteristic	Symbol	Value	Unit	
Power Dissipation	P <sub>D</sub>	(Note 6)	2	W
		(Note 7)	3	W
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 6)	62.5	°C/W
		(Note 7)	41.7	°C/W
Thermal Resistance, Junction to Leads (Note 8)	R <sub>θJL</sub>	12.9	°C/W	
Operating and Storage Temperature 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	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 2oz 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**

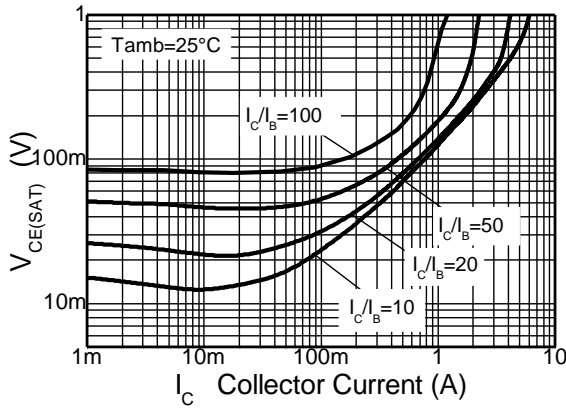


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

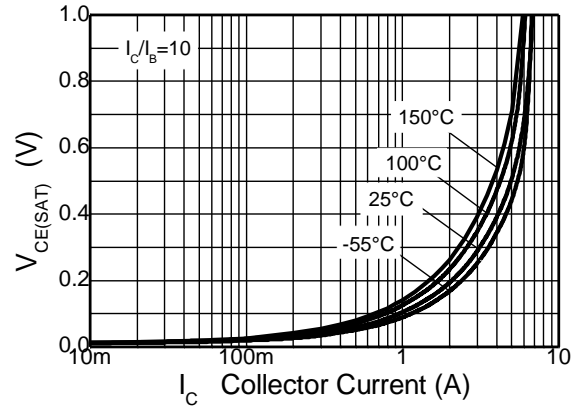
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	80	—	—	V	$I_C = 100\mu A$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	60	—	—	V	$I_C = 10mA$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	—	—	V	$I_E = 100\mu A$
Collector Cut-off Current	$I_{CBO}$	—	—	0.1	$\mu A$	$V_{CB} = 60V$
		—	—	10		$V_{CB} = 60V, T_A = +125^\circ C$
Emitter Cut-off Current	$I_{EBO}$	—	—	100	nA	$V_{EB} = 4V$
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	—	0.12	0.3	V	$I_C = 1A, I_B = 100mA$
		—	0.43	0.6		$I_C = 3A, I_B = 300mA$
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	—	0.9	1.25	V	$I_C = 1A, I_B = 100mA$
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	—	0.8	1.0	V	$I_C = 1A, V_{CE} = 2V$
DC Current Gain (Note 10)	$h_{FE}$	70	200	—	—	$I_C = 50mA, V_{CE} = 2V$
		100	200	300		$I_C = 500mA, V_{CE} = 2V$
		80	170	—		$I_C = 1A, V_{CE} = 2V$
		40	80	—		$I_C = 2A, V_{CE} = 2V$
Current Gain-Bandwidth Product (Note 10)	$f_T$	140	175	—	MHz	$V_{CE} = 5V, I_C = 100mA, f = 100MHz$
Switching Times	$t_{on}$	—	45	—	ns	$I_C = 500mA, V_{CC} = 10V, I_{B1} = I_{B2} = 50mA$
	$t_{off}$	—	800	—		
Output Capacitance (Note 10)	$C_{obo}$	—	—	30	pF	$V_{CB} = 10V, f = 1MHz$

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

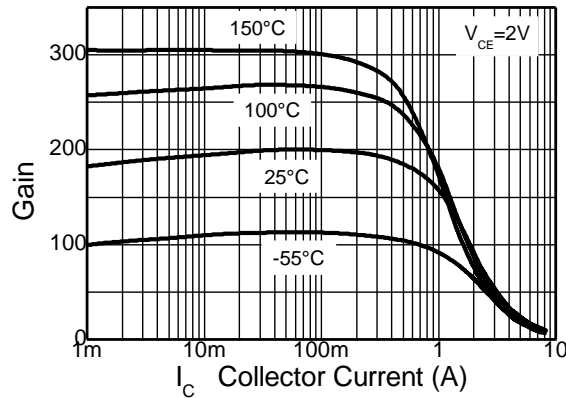
**Typical Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)



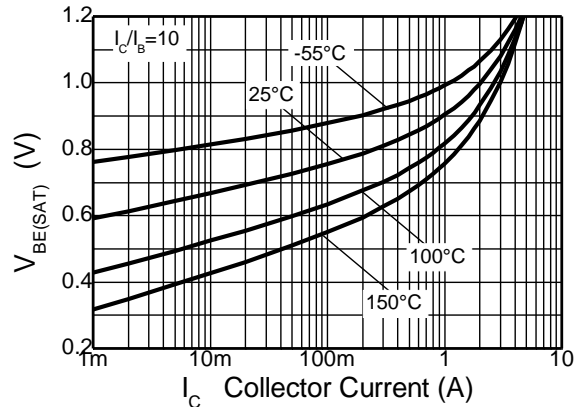
**V<sub>CE(SAT)</sub> v I<sub>C</sub>**



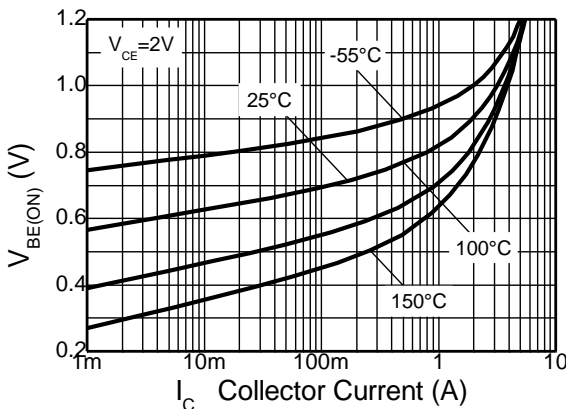
**V<sub>CE(SAT)</sub> v I<sub>C</sub>**



**h<sub>FE</sub> v I<sub>C</sub>**



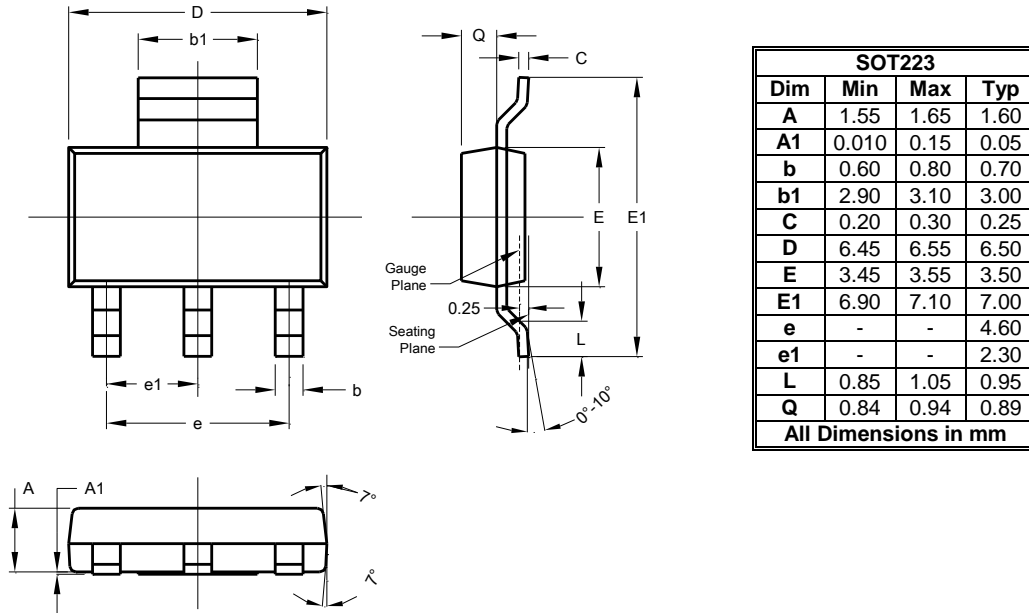
**V<sub>BE(SAT)</sub> v I<sub>C</sub>**



**V<sub>BE(ON)</sub> v I<sub>C</sub>**

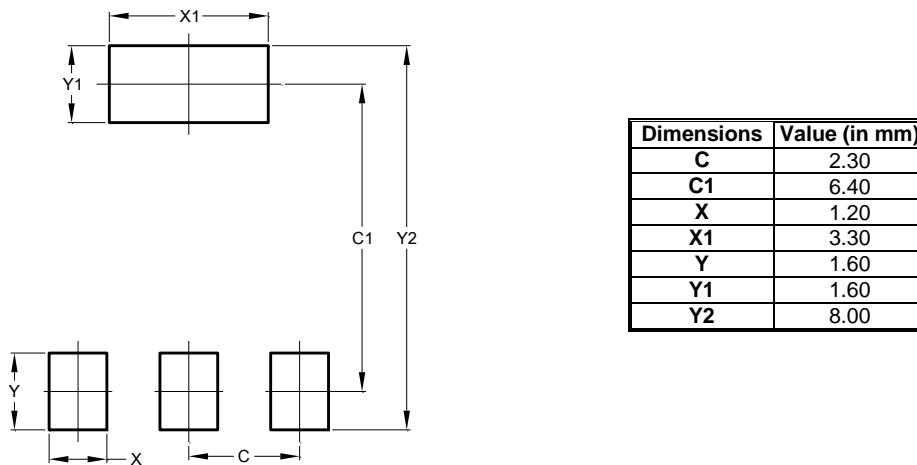
## Package Outline Dimensions

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



## Suggested Pad Layout

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



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