

Description

This bipolar junction transistor (BJT) is 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: DIODES™ FZT751Q
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DIODES™ FZT651Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified. PPAP capable, and manufactured in IATF 16949 certified facilities.**

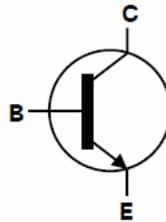
<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

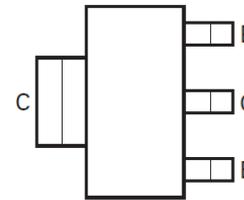
- Package: SOT223 (Type DN)
- Package Material: Molded Plastic. "Green" Molding Compound;
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads; Solderable per MIL-STD-202, Method 208③
- Weight: 0.112 grams (Approximate)



Top View



Device Symbol



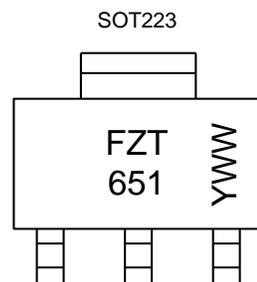
Top View
Pin-Out

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
FZT651QTA	SOT223 (Type DN)	FZT651	7	12	1,000	Reel
FZT651QTC	SOT223 (Type DN)	FZT651	13	12	4,000	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



FZT 651 = Product Type Marking Code
 YWW = Date Code Marking
 Y or \bar{Y} = Last Digit of Year (ex: 2 = 2022)
 WW or \bar{WW} = Week Code (01~53)

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	80	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Base Voltage	V_{EBO}	7	V
Continuous Collector Current	I_C	3	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	(Note 5)	2	W
		(Note 6)	3	W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Note 5)	62.5	$^\circ\text{C/W}$
		(Note 6)	41.7	$^\circ\text{C/W}$
Thermal Resistance, Junction to Leads (Note 7)	$R_{\theta JL}$	12.9	$^\circ\text{C/W}$	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$	

ESD Ratings (Note 8)

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:
5. 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.
 6. Same as Note 5, except the device is mounted on 50mm x 50mm 2oz copper.
 7. Thermal resistance from junction to solder-point (at the end of the collector lead).
 8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

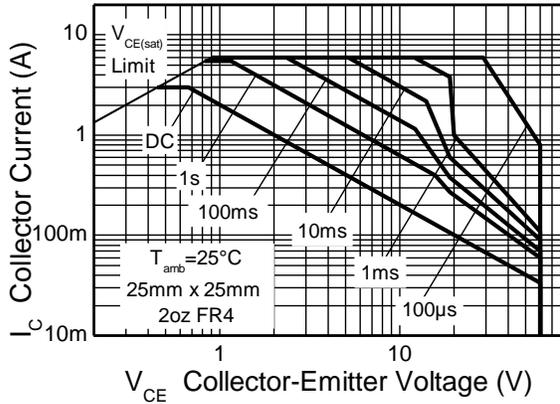


Figure 1. Safe Operating Area

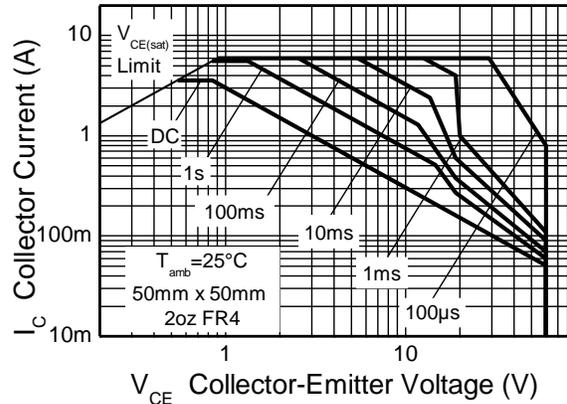


Figure 2. Safe Operating Area

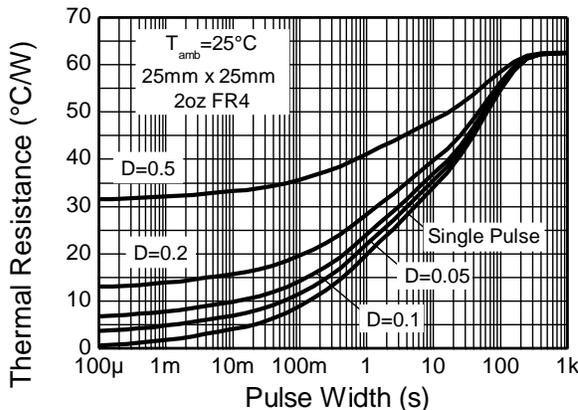


Figure 3. Transient Thermal Impedance

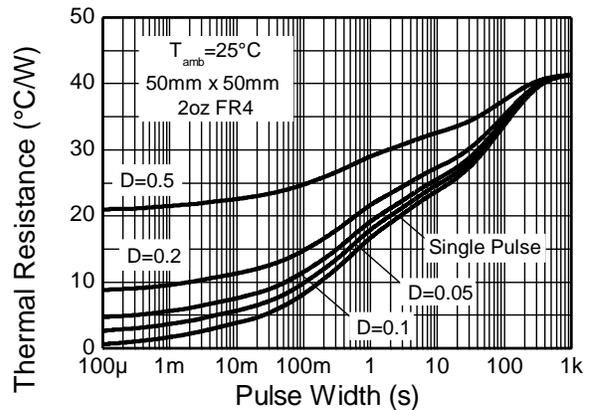


Figure 4. Transient Thermal Impedance

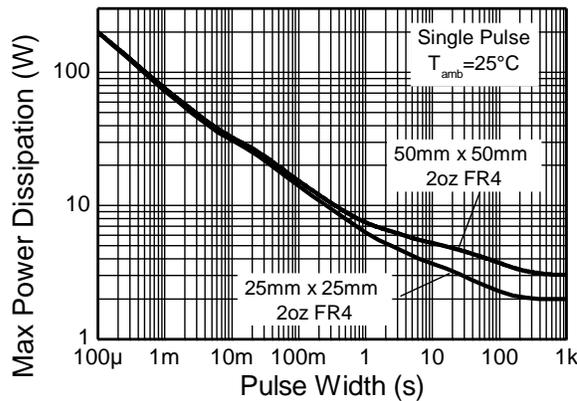


Figure 5. Power Pulse Dissipation

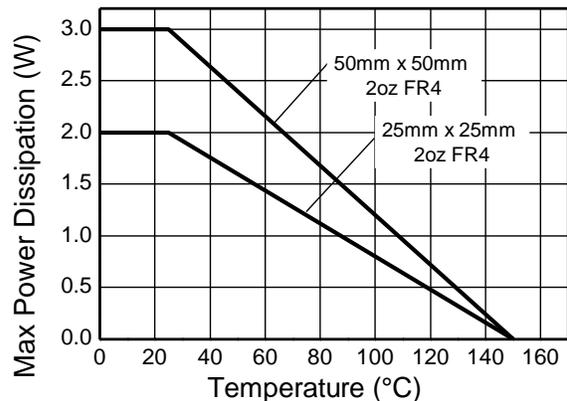


Figure 6. Power Pulse Dissipation

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV _{CBO}	80	—	—	V	I _C = 100μA
Collector-Emitter Breakdown Voltage (Note 9)	BV _{CEO}	60	—	—	V	I _C = 10mA
Emitter-Base Breakdown Voltage	BV _{EBO}	7	—	—	V	I _E = 100μA
Collector Cut-off Current	I _{CBO}	—	—	0.1	μA	V _{CB} = 60V
		—	—	10		V _{CB} = 60V, T _A = +125°C
Emitter Cut-off Current	I _{EBO}	—	—	100	nA	V _{EB} = 4V
Collector-Emitter Saturation Voltage (Note 9)	V _{CE(sat)}	—	0.12	0.3	V	I _C = 1A, I _B = 100mA
		—	0.35	0.6		I _C = 3A, I _B = 300mA
Base-Emitter Saturation Voltage (Note 9)	V _{BE(sat)}	—	0.9	1.25	V	I _C = 1A, I _B = 100mA
Base-Emitter Turn-On Voltage (Note 9)	V _{BE(on)}	—	0.8	1.0	V	I _C = 1A, V _{CE} = 2V
DC Current Gain (Note 9)	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 9)	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 9)	C _{obo}	—	—	30	pF	V _{CB} = 10V, f = 1MHz

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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

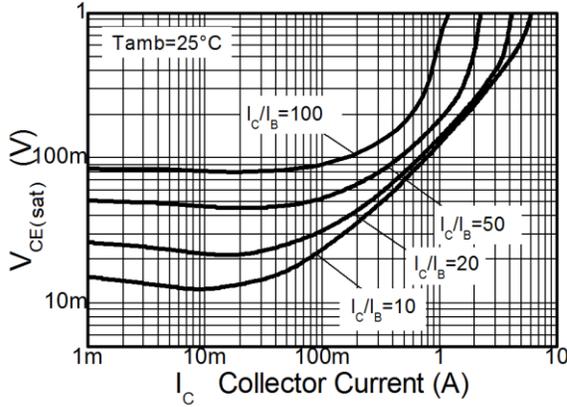


Figure 7. $V_{CE(sat)} \ v \ I_C$

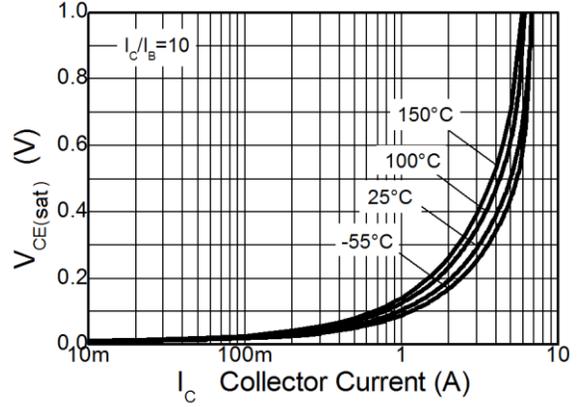


Figure 8. $V_{CE(sat)} \ v \ I_C$

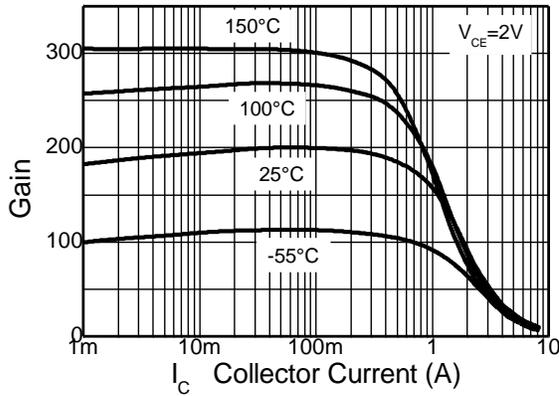


Figure 9. $h_{FE} \ v \ I_C$

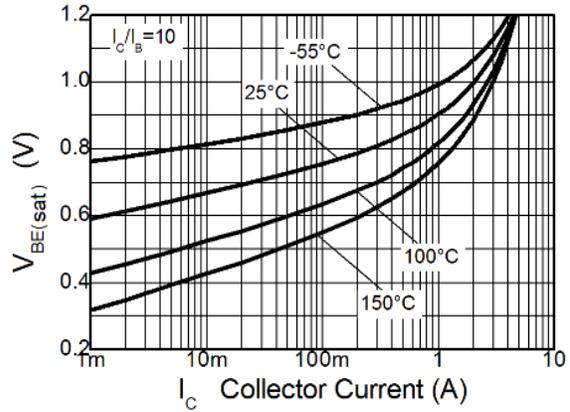


Figure 10. $V_{BE(sat)} \ v \ I_C$

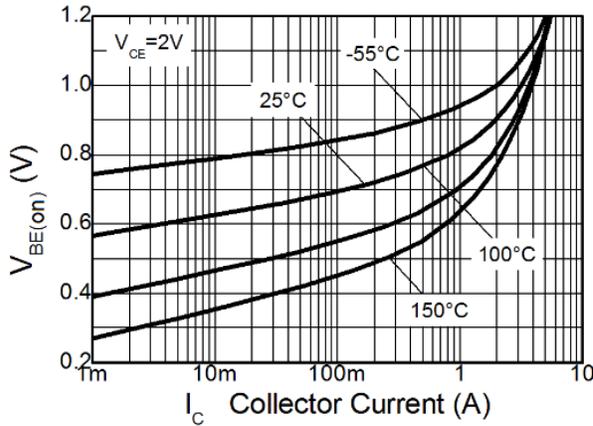
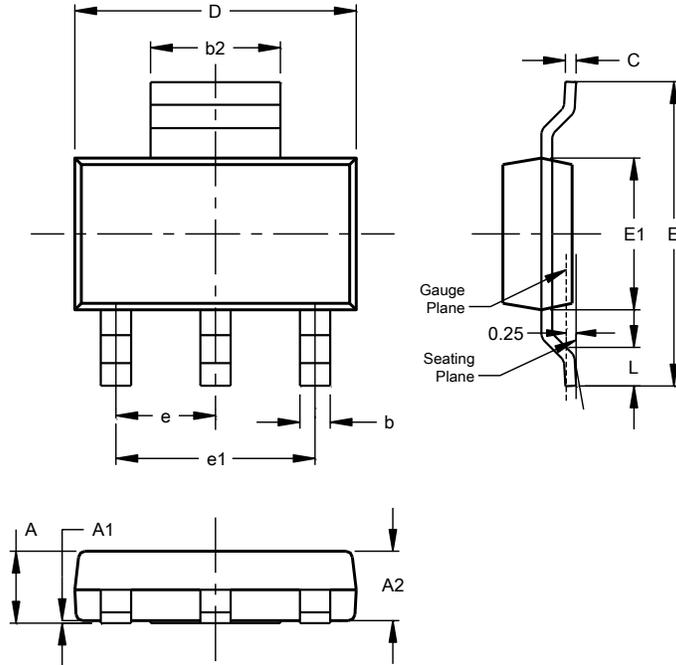


Figure 11. $V_{BE(on)} \ v \ I_C$

Package Outline Dimensions

Please see <https://www.diodes.com/design/support/packaging/> for the latest version.

SOT223 (Type DN)

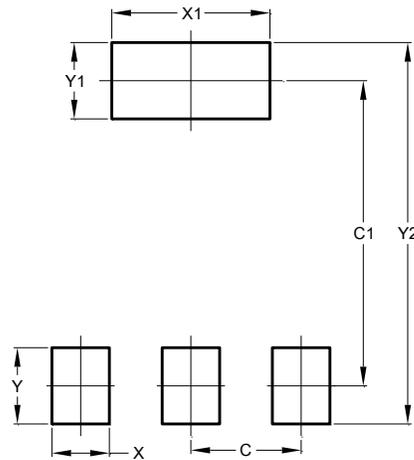


SOT223 (Type DN)			
Dim	Min	Max	Typ
A	--	1.70	--
A1	0.01	0.15	--
A2	1.50	1.68	1.60
b	0.60	0.80	0.70
b2	2.90	3.10	--
c	0.20	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	--	--	2.30
e1	--	--	4.60
L	0.85	--	--
All Dimensions in mm			

Suggested Pad Layout

Please see <https://www.diodes.com/design/support/packaging/> 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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