20V NPN MEDIUM POWER TRANSISTOR IN SOT223

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 or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

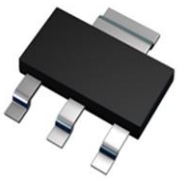
Mechanical Data

- 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 e3
- Weight: 0.112 grams (Approximate)

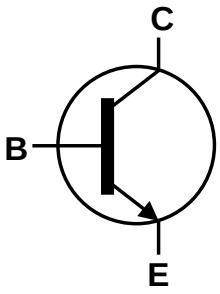
Applications

- Darlington replacements
- Flash gun convertors and battery powered circuits

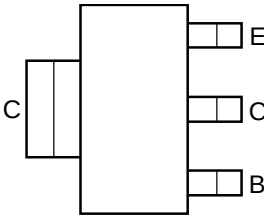
SOT223 (Type DN)



Top View



Device Symbol



Top View
Pin-Out

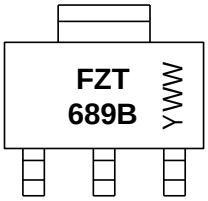
Ordering Information (Note 4)

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 $\overline{Y}$ = Last Digit of Year (ex: 3 = 2023)
WW or $\overline{WW}$ = Week Code (01 to 53)

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	20	V
Collector-Emitter Voltage	V_{CEO}	20	V
Emitter-Base Voltage	V_{EBO}	7	V
Continuous Collector Current	I_C	3	A
Peak Pulse Current	I_{CM}	8	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	3	W
	(Note 6)		2	
	(Note 7)		1.6	
	(Note 8)		1.2	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	41.7	°C/W
	(Note 6)		62.5	
	(Note 7)		78.1	
	(Note 8)		104	
Thermal Resistance Junction to Lead	(Note 9)	$R_{\theta JL}$	12.9	
Operating and Storage Temperature Range		T_J, T_{STG}	-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:
5. 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.
6. Same as Note 5, except the device is mounted on 25mm × 25mm 2oz copper.
7. Same as Note 5, except the device is mounted on 25mm × 25mm 1oz copper.
8. Same as Note 5, except the device is mounted on minimum recommended pad layout.
9. Thermal resistance from junction to solder-point (at the end of the collector lead).
10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

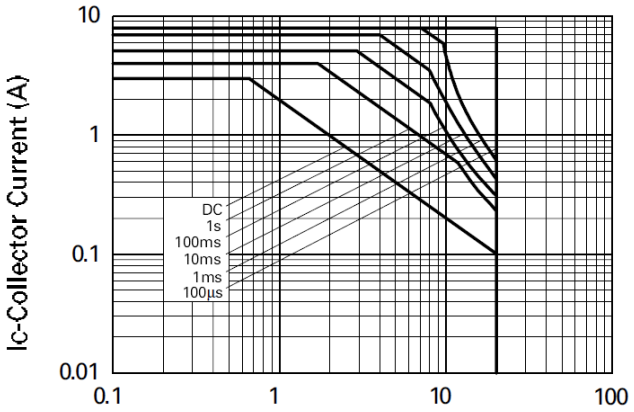


Figure 1. Safe Operating Area

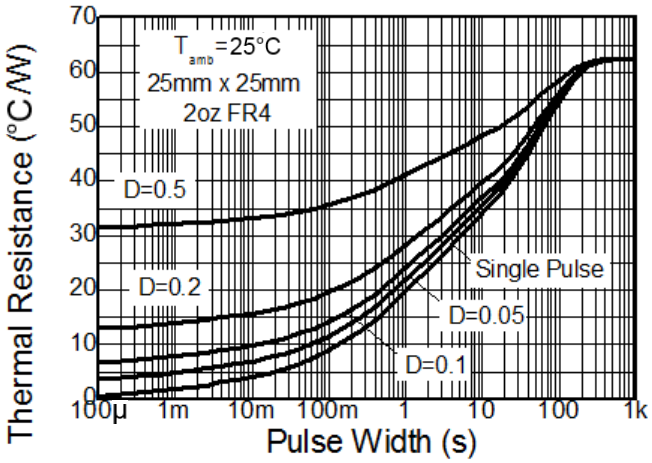


Figure 2. Transient Thermal Impedance

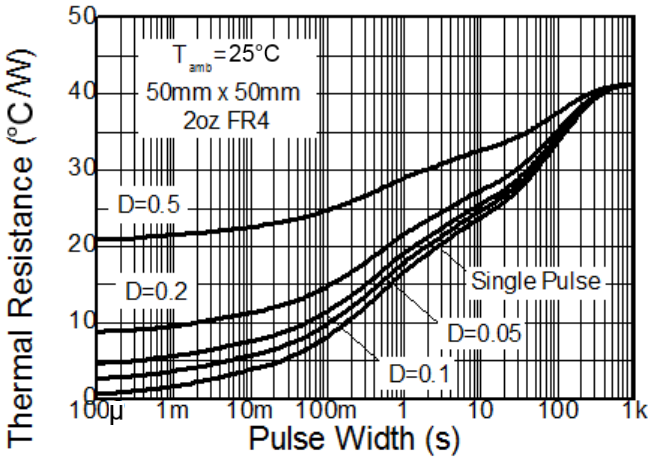


Figure 3. Transient Thermal Impedance

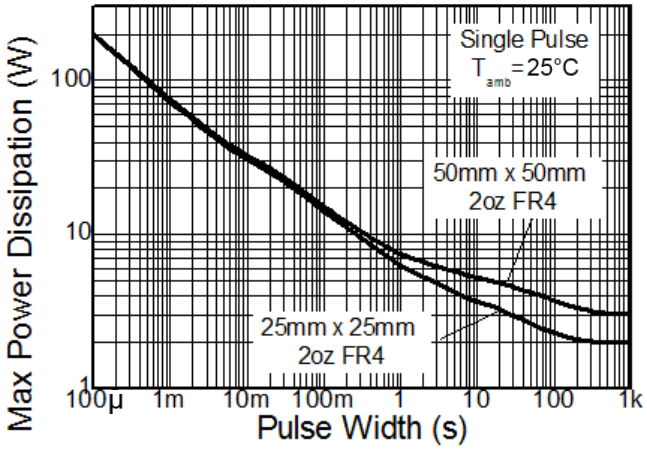


Figure 4. Pulse Power Dissipation

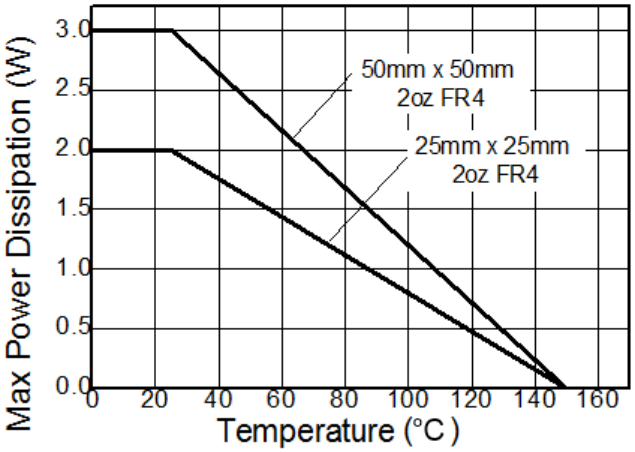


Figure 5. Derating Curve

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	20	—	—	V	I_C = 100µA
Collector-Emitter Breakdown Voltage (Note 11)	BV_{CEO}	20	—	—	V	I_C = 10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	7	—	—	V	I_E = 100µA
Collector-Base Cut-Off Current	I_{CBO}	—	—	50	nA	V_{CB} = 16V
Emitter Cut-Off Current	I_{EBO}	—	—	50	nA	V_{EB} = 6V
DC Current Gain (Note 11)	h_{FE}	500 400 150	— — —	— — —	—	I_C = 0.1A, V_{CE} = 2V I_C = 2A, V_{CE} = 2V I_C = 6A, V_{CE} = 2V
Collector-Emitter Saturation Voltage (Note 11)	$V_{CE(sat)}$	— — —	— — —	100 500 450	mV	I_C = 0.1A, I_B = 0.5mA I_C = 2A, I_B = 10mA I_C = 3A, I_B = 20mA
Base-Emitter Saturation Voltage (Note 11)	$V_{BE(sat)}$	—	—	0.9	V	I_C = 1A, I_B = 10mA
Base-Emitter Turn-On Voltage (Note 11)	$V_{BE(on)}$	—	—	0.9	V	I_C = 1A, V_{CE} = 2V
Input Capacitance	C_{ibo}	—	200	—	pF	V_{EB} = 0.5V, f = 1MHz
Output Capacitance	C_{obo}	—	16	—	pF	V_{CB} = 10V, f = 1MHz
Current Gain-Bandwidth Product	f_T	150	—	—	MHz	V_{CE} = 5V, I_C = 50mA, f = 50MHz
Turn-On Time	t_{on}	—	30	—	ns	V_{CC} = 10V, I_C = 500mA, I_{B1} = -I_{B2} = 50mA
Turn-Off Time	t_{off}	—	800	—	ns	

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

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

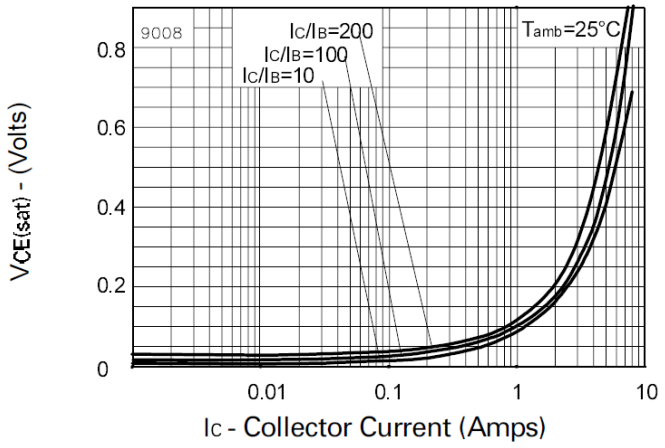


Figure 6. $V_{CE(sat)}$ vs. I_C

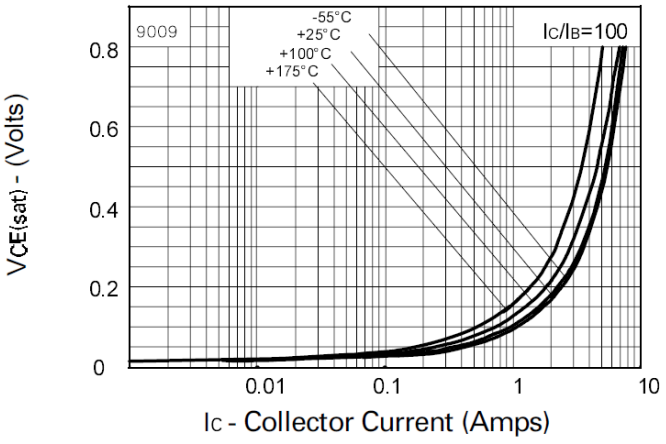


Figure 7. $V_{CE(sat)}$ vs. I_C

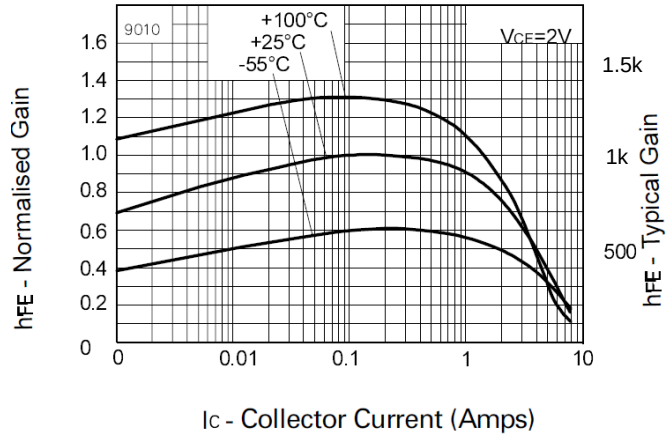


Figure 8. h_{FE} vs. I_C

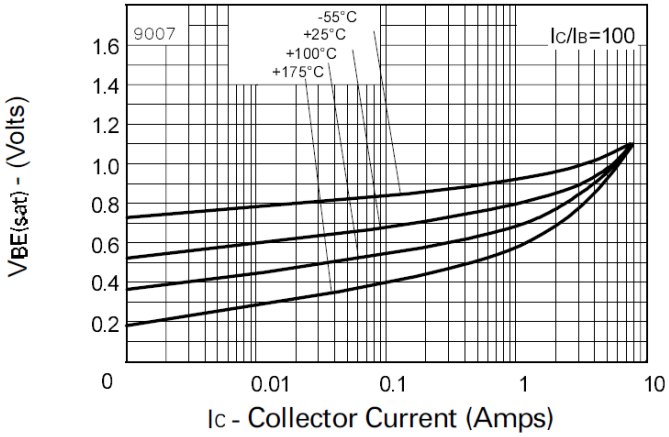


Figure 9. $V_{BE(sat)}$ vs. I_C

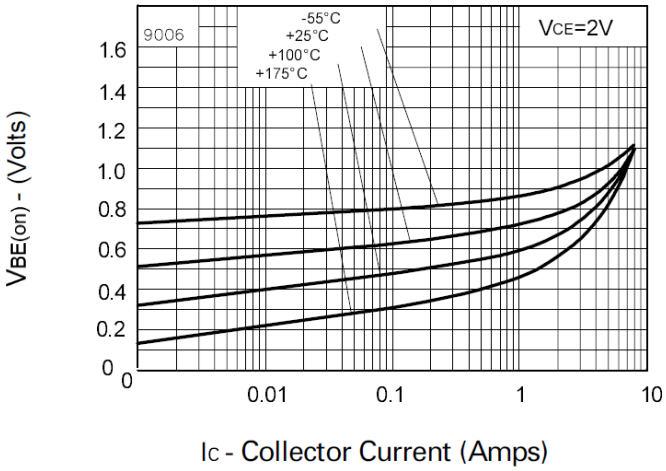
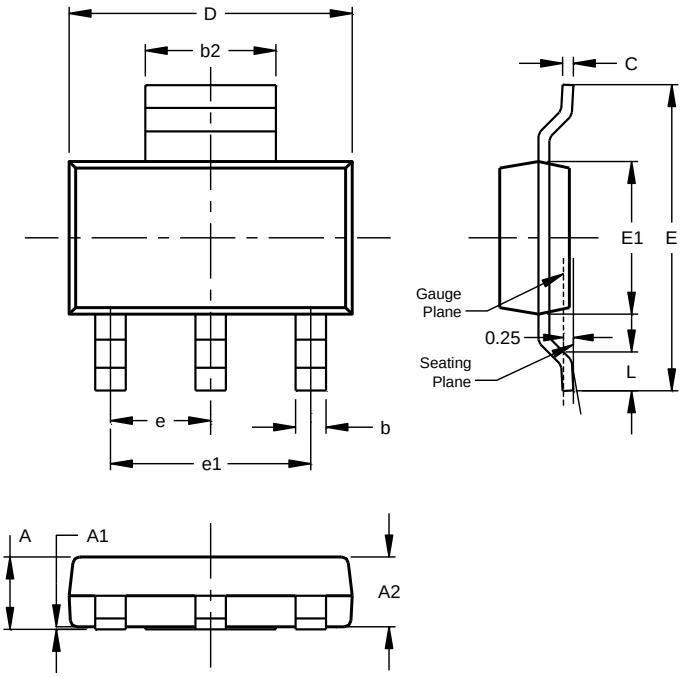


Figure 10. $V_{BE(on)}$ vs. I_C

Package Outline Dimensions

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

SOT223 (Type DN)

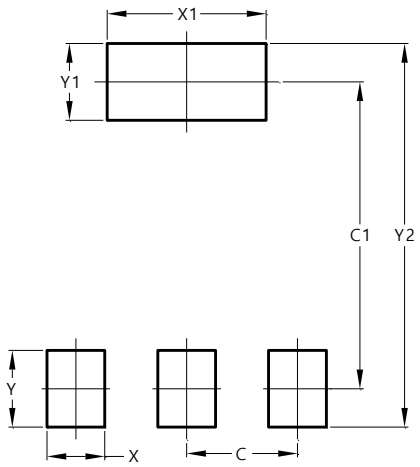


SOT223 (Type DN)			
Dim	**Min**	**Max**	**Typ**
A	--	1.70	--
A1	0.01	0.15	--
A2	1.50	1.68	1.60
b	0.60	0.80	0.70
b2	2.90	3.10	--
c	0.20	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	--	--	2.30
e1	--	--	4.60
L	0.85	--	--
All Dimensions in mm			

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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