60V NPN LOW SATURATION TRANSISTOR IN SOT89

Description

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

Features

- BV_{CEX} > 150V
- BV_{CEO} > 60V
- BV_{ECO} > 6V
- I_C = 5A Continuous Collector Current
- $V_{CE(sat)}$ < 70mV @ 1A
- $R_{CE(sat)}$ = 48mΩ for a Low Equivalent On-Resistance
- Very Low Saturation Voltages
- Excellent hFE Characteristics
- 6V Reverse Blocking Capability
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The ZXTN25060BZQ 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

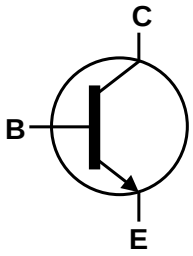
- Package: SOT89
- Package Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.055 grams (Approximate)

Applications

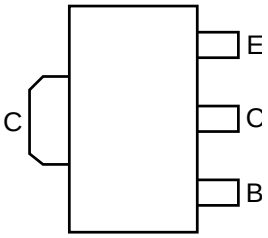
- Motor driving (including DC fans)
- Solenoid, relays and actuator drivers
- DC-DC modules
- Power switches
- MOSFET gate drivers

SOT89

Top View



Equivalent Circuit



Top View
Pin-Out

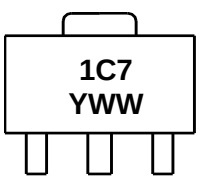
Ordering Information (Note 4)

Part Number	Package	Marking Code	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
ZXTN25060BZQTA	SOT89	1C7	7	12	1,000	Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
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

SOT89



1C7 = Product Type Marking Code
YWW = Date Code Marking
Y = Last Digit of Year (ex: 3 = 2023)
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}	150	V
Collector-Emitter Voltage (Forward Blocking)	V_{CEX}	150	V
Collector-Emitter Voltage	V_{CEO}	60	V
Emitter-Collector Voltage (Reverse Blocking)	V_{ECO}	6	V
Emitter-Base Voltage	V_{EBO}	7	V
Continuous Collector Current	I_C	5	A
Base Current	I_B	1	A
Peak Pulse Current	I_{CM}	10	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	1.1	W
	(Note 6)		1.8	
	(Note 7)		2.4	
	(Note 8)		4.46	
Thermal Resistance, Junction to Ambient Air	(Note 5)	$R_{\theta JA}$	117	°C/W
	(Note 6)		68	
	(Note 7)		51	
	(Note 8)		28	
Thermal Resistance, Junction to Case	(Note 9)	$R_{\theta JC}$	11.5	
Thermal Resistance, Junction to Lead	(Note 10)	$R_{\theta JL}$	8	
Operating and Storage Temperature Range		T_J, T_{STG}	-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:
5. For a device mounted with the exposed collector pad on 15mm x 15mm 1oz 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 4, except the device is mounted on 25mm x 25mm 2oz copper.
7. Same as Note 4, except the device is mounted on 50mm x 50mm 2oz copper.
8. Same as Note 6 measured at t < 5 seconds.
9. Device mounted on FR-4 PCB with minimum recommended pad layout.
10. Thermal resistance from junction to solder-point (on the exposed collector pad).
11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

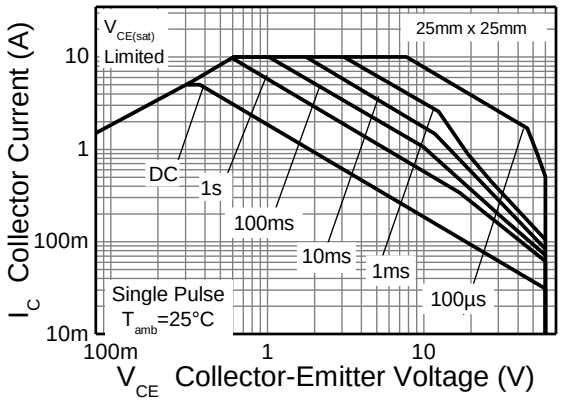


Figure 1. Safe Operating Area

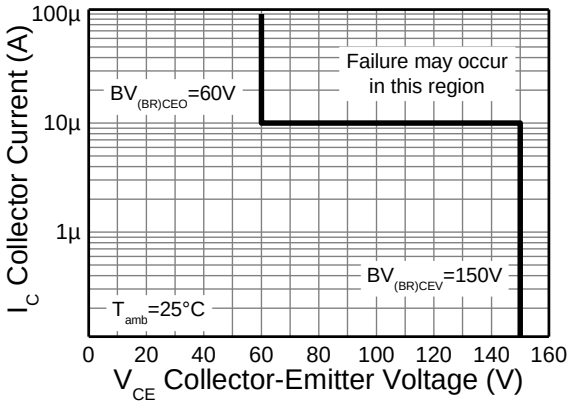


Figure 2. Safe Operating Area

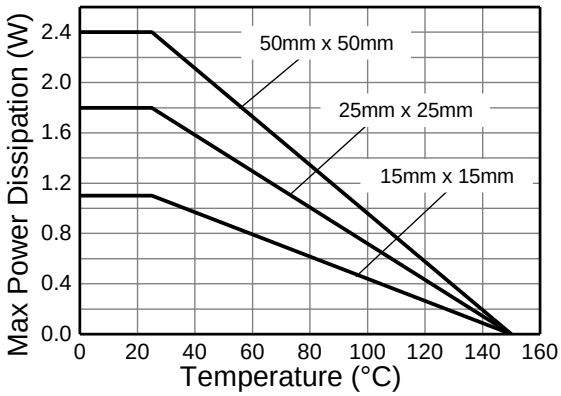


Figure 3. Derating Curve

Thermal Characteristics and Derating Information (continued)

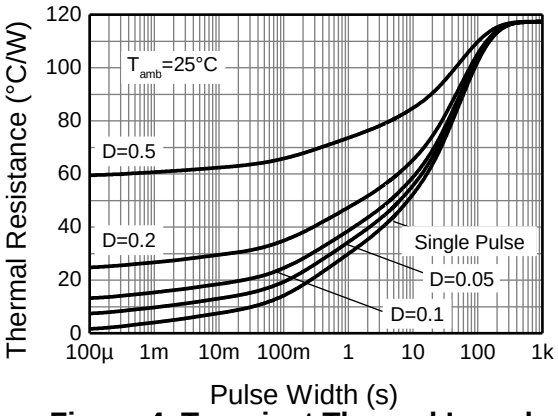


Figure 4. Transient Thermal Impedance

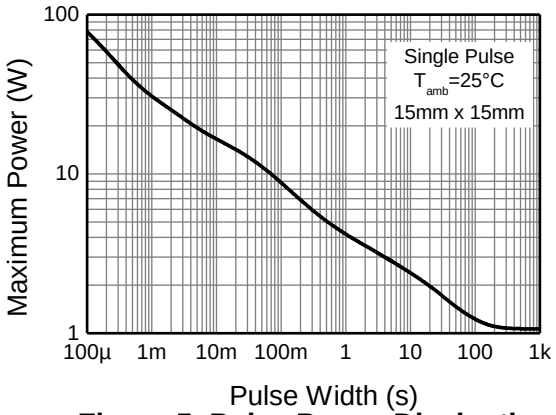


Figure 5. Pulse Power Dissipation

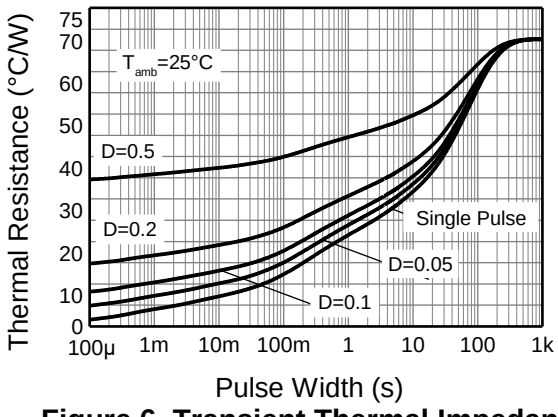


Figure 6. Transient Thermal Impedance

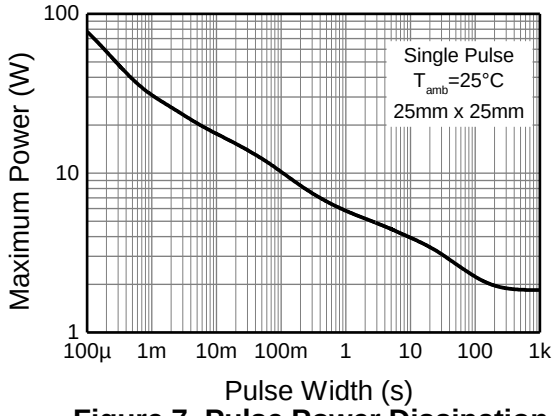


Figure 7. Pulse Power Dissipation

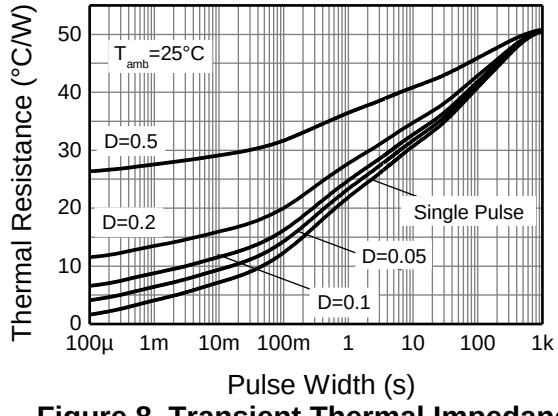


Figure 8. Transient Thermal Impedance

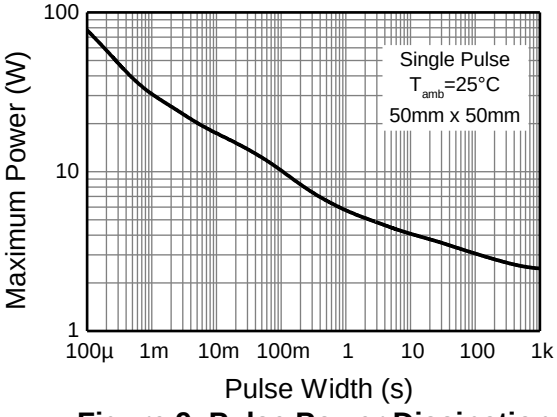


Figure 9. Pulse Power Dissipation

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	150	190	—	V	I_C = 100µA
Collector-Emitter Breakdown Voltage (Forward Blocking)	BV_{CEX}	150	190	—	V	I_C = 100µA, R_{BE} ≤ 1kΩ or -1V < V_{BE} < 0.25V
Collector-Emitter Breakdown Voltage (Note 12)	BV_{CEO}	60	80	—	V	I_C = 10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	7	8.0	—	V	I_E = 100µA
Emitter-Collector Breakdown Voltage (Reverse Blocking)	BV_{ECX}	6	8	—	V	I_E = 100µA, R_{BC} ≤ 1kΩ or -0.25V < V_{BC} < 0.25V
Emitter-Collector Breakdown Voltage (Base Open)	BV_{ECO}	6	7	—	V	I_E = 100µA
Collector-Base Cutoff Current	I_{CBO}	—	1	50 20	nA µA	V_{CB} = 120V V_{CB} = 120V, T_A = +100°C
Collector-Emitter Cutoff Current	I_{CEX}	—	—	100	nA	V_{CE} = 120V, R_{BE} ≤ 1kΩ or -1V < V_{BE} < 0.25V
Emitter-Base Cutoff Current	I_{EBO}	—	1	50	nA	V_{EB} = 5.6V
Collector-Emitter Saturation Voltage (Note 12)	$V_{CE(sat)}$	—	55 70 185 240	70 90 230 305	mV	I_C = 1A, I_B = 100mA I_C = 1A, I_B = 50mA I_C = 4A, I_B = 400mA I_C = 5A, I_B = 500mA
Base-Emitter Saturation Voltage (Note 12)	$V_{BE(sat)}$	—	1.2	1.1	V	I_C = 5A, I_B = 500mA
Base-Emitter Turn-On Voltage (Note 12)	$V_{BE(on)}$	—	0.96	1.05	V	I_C = 5A, V_{CE} = 2V
DC Current Gain (Note 12)	h_{FE}	100 90 45 —	200 180 90 20	300 — — —	—	I_C = 10mA, V_{CE} = 2V I_C = 1A, V_{CE} = 2V I_C = 2A, V_{CE} = 50V I_C = 5A, V_{CE} = 5V
Transitional Frequency	f_T	—	185	—	MHz	I_C = 100mA, V_{CE} = 5V f = 100MHz
Output Capacitance	C_{obo}	—	11.5	20	pF	V_{CB} = 10V, f = 1MHz
Delay Time	t_d	—	16	—	ns	V_{CC} = 10V, I_{CC} = 500mA I_{B1} = - I_{B2} = 50mA
Rise Time	t_r	—	15	—	ns	
Storage Time	t_s	—	509	—	ns	
Fall Time	t_f	—	57	—	ns	

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

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

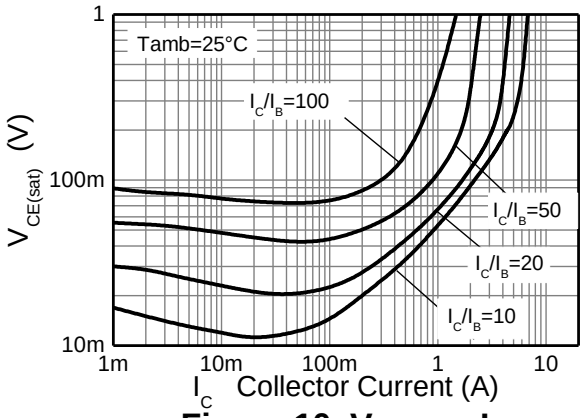


Figure 10. $V_{CE(sat)}$ v I_C

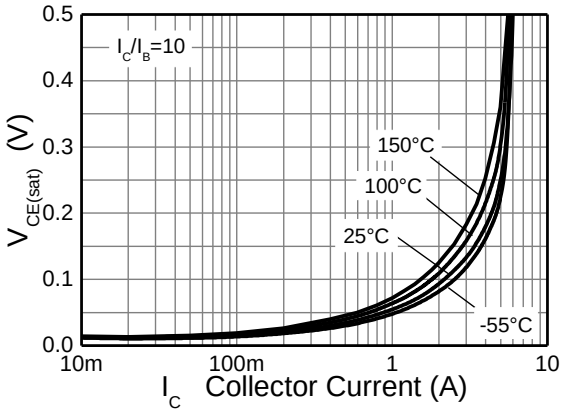


Figure 11. $V_{CE(sat)}$ v I_C

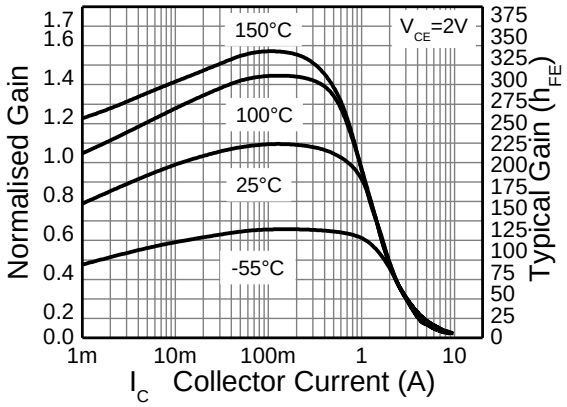


Figure 12. h_{FE} v I_C

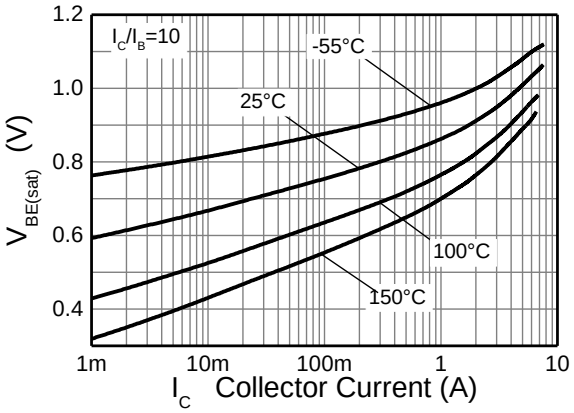


Figure 13. $V_{BE(sat)}$ v I_C

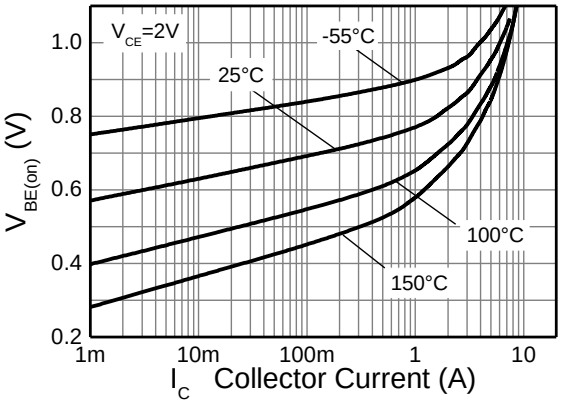


Figure 14. $V_{BE(on)}$ v I_C

Package Outline Dimensions

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

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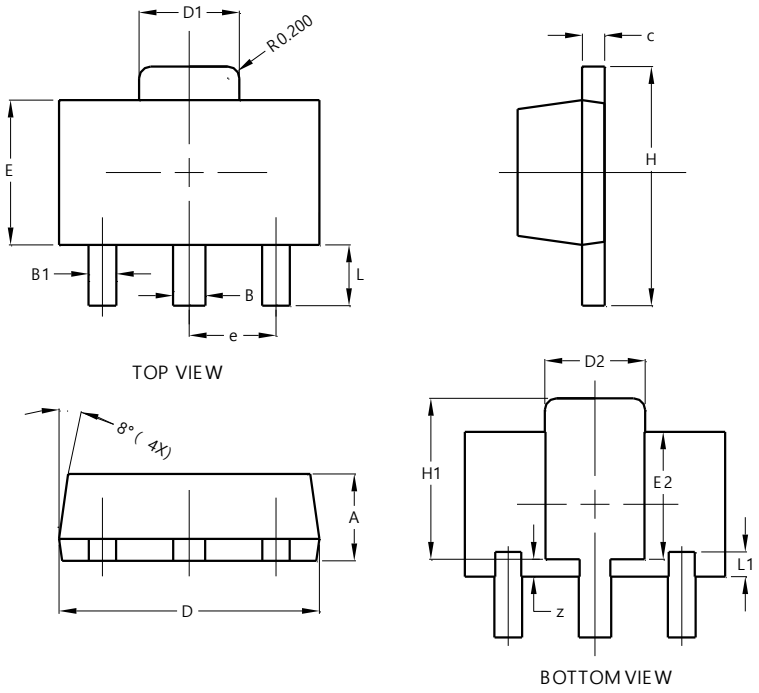

SOT89			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in mm			

Suggested Pad Layout

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

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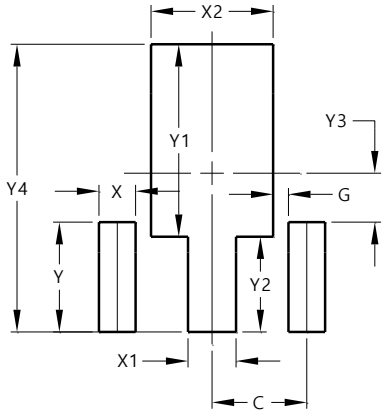

Dimensions	Value (in mm)
C	1.500
G	0.244
X	0.580
X1	0.760
X2	1.933
Y	1.730
Y1	3.030
Y2	1.500
Y3	0.770
Y4	4.530

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