

40V PNP LOW SATURATION TRANSISTOR IN SOT89
Description

This bipolar junction transistor (BJT) is designed to meet the stringent requirement of automotive applications.

Features

- $BV_{CEO} > -40V$
- $I_C = -5.5A$ Continuous Collector Current
- $I_{CM} = -15A$ Peak Pulse Current
- Very Low Saturation Voltage $V_{CE(SAT)} < -60mV$ max @ -1A
- $R_{SAT} = 29m\Omega$ @ -5.5A for Low Equivalent On-Resistance
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The ZXTP2009ZQ 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

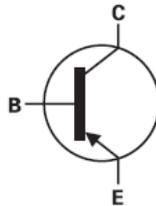
- Package: SOT89
- Package Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Plated Leads. Solderable per MIL-STD-202, Method 208
- Weight: 0.05 grams (Approximate)

Applications

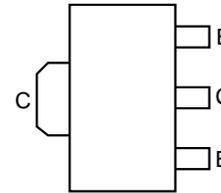
- DC-DC converters
- MOSFET gate drivers
- Charging circuits
- Power switches
- Motor controls

SOT89


Top View



Device Schematic

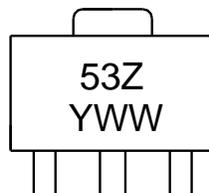


Pin-Out Top View

Ordering Information (Note 4)

Part Number	Package	Marking Code	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
ZXTP2009ZQTA	SOT89	53Z	7	12	1000	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


53Z = 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 _{CB0}	-50	V
Collector-Base Voltage	V _{CBS}	-50	V
Collector-Emitter Voltage	V _{CEO}	-40	V
Emitter-Base Voltage	V _{EBO}	-7	V
Continuous Collector Current	I _C	-5.5	A
Peak Pulse Current	I _{CM}	-15	A

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

Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P _D	0.9	W mW/°C
		7.2	
		1.5	
		12	
		2.1	
Thermal Resistance, Junction to Ambient	R _{θJA}	16.8	°C/W
		3	
		24	
		139	
Thermal Resistance, Junction to Case	R _{θJC}	83	°C/W
		60	
		42	
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	4000	V	3A
Electrostatic Discharge—Machine Model	ESD MM	400	V	C

- Notes:
5. For a device mounted with the collector lead on 15mm × 15mm 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in steady-state.
 6. Same as Note 6, except the device is mounted on 25mm × 25mm 1oz copper.
 7. Same as Note 6, except the device is mounted on 50mm × 50mm 1oz copper.
 8. Same as Note 6, except the device is mounted on 25mm × 25mm measured at t < 5 secs.
 9. Device mounted on FR-4 PCB with minimum recommended pad layout.
 10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

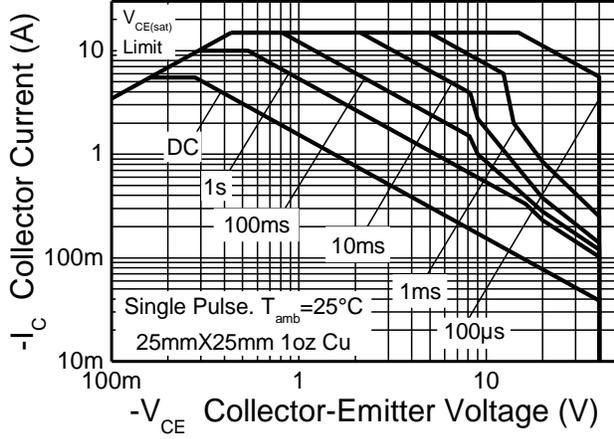


Figure 1. Safe Operating Area

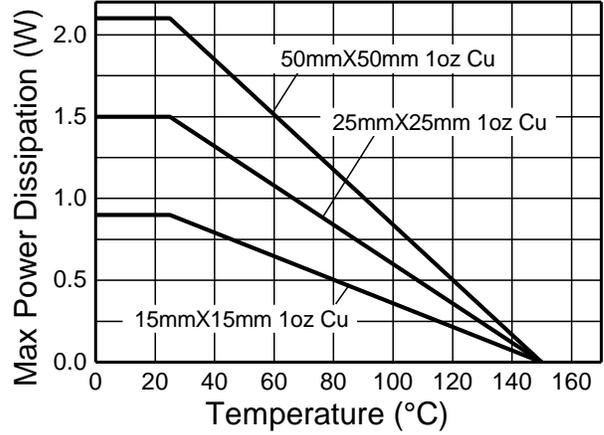


Figure 2. Derating Curve

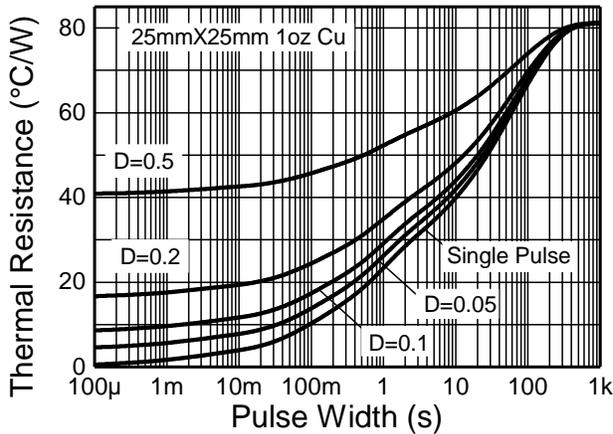


Figure 3. Transient Thermal Impedance

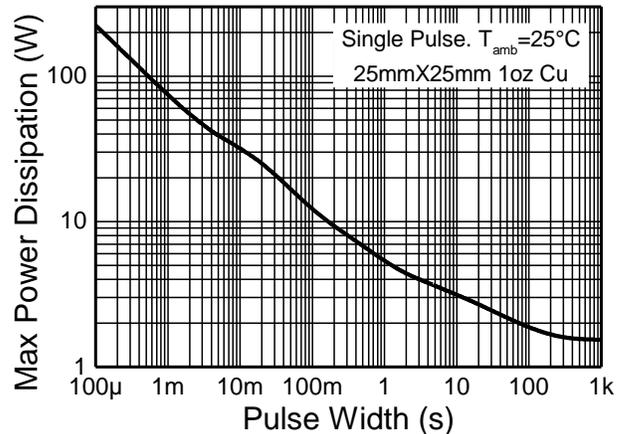


Figure 4. Pulse Power Dissipation

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV _{CB0}	-50	-90	—	V	I _C = -100μA
Collector-Emitter Breakdown Voltage	BV _{CER}	-50	-90	—	V	I _C = -1μA, R _B ≤ 1kΩ
Collector-Emitter Breakdown Voltage (Note 11)	BV _{CEO}	-40	-58	—	V	I _C = -10mA
Emitter-Base Breakdown Voltage	BV _{EBO}	-7.5	-8.3	—	V	I _E = -100μA
Collector Cutoff Current	I _{CB0}	—	-1	-20	nA	V _{CB} = -40V
Collector Cutoff Current	I _{CES}	—	-1	-20	nA	V _{CB} = -32V
Emitter Cutoff Current	I _{EBO}	—	-1	-20	nA	V _{EB} = -6V
Collector-Emitter Saturation Voltage (Note 11)	V _{CE(sat)}	—	-15 -44 -50 -120 -70 -125 -130 -162	-30 -60 -70 -165 -80 -175 -175 -185	mV	I _C = -0.1A, I _B = -10mA I _C = -1A, I _B = -100mA I _C = -1A, I _B = -50mA I _C = -1A, I _B = -10mA I _C = -2A, I _B = -200mA I _C = -2A, I _B = -40mA I _C = -3.5A, I _B = -175mA I _C = -5.5A, I _B = -550mA
Base-Emitter Saturation Voltage (Note 11)	V _{BE(sat)}	—	-820 -1000	-900 -1075	mV	I _C = -2A, I _B = -40mA I _C = -5.5A, I _B = -550mA
Base-Emitter Turn-On Voltage (Note 11)	V _{BE(on)}	—	-778 -869	-850 -950	mV	I _C = -2A, V _{CE} = -2V I _C = -5.5A, V _{CE} = -2V
DC Current Gain (Note 11)	h _{FE}	200 200 170 110	390 350 290 175	550	—	I _C = -10mA, V _{CE} = -2V I _C = -0.5A, V _{CE} = -2V I _C = -2A, V _{CE} = -2V I _C = -5.5A, V _{CE} = -2V
Transition Frequency	f _T	—	152	—	MHz	V _{CE} = -10V, I _C = -50mA, f = 100MHz
Output Capacitance (Note 11)	C _{OBO}	—	53	—	pF	V _{CB} = -10V, f = 1MHz
Switching Times	t _d	—	18	—	ns	V _{CC} = -10V, I _C = -1A, I _{B1} = -I _{B2} = -100mA
	t _r	—	17	—		
	t _s	—	325	—		
	t _r	—	60	—		
Switching Times	t _d	—	55	—	ns	V _{CC} = -30V, I _C = -2A, I _{B1} = -I _{B2} = -20mA
	t _r	—	107	—		
	t _s	—	264	—		
	t _r	—	103	—		

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

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

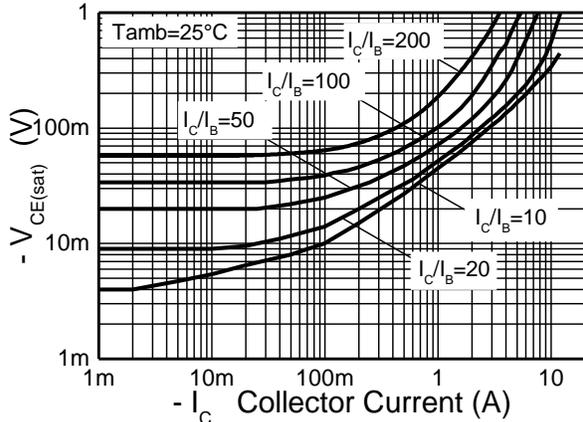


Figure 5. $V_{CE(sat)}$ v I_C

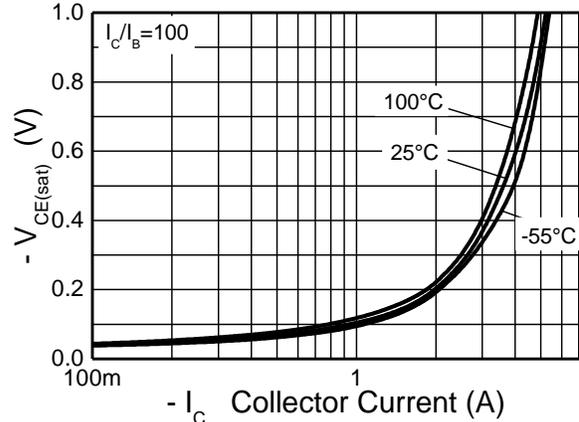


Figure 6. $V_{CE(sat)}$ v I_C

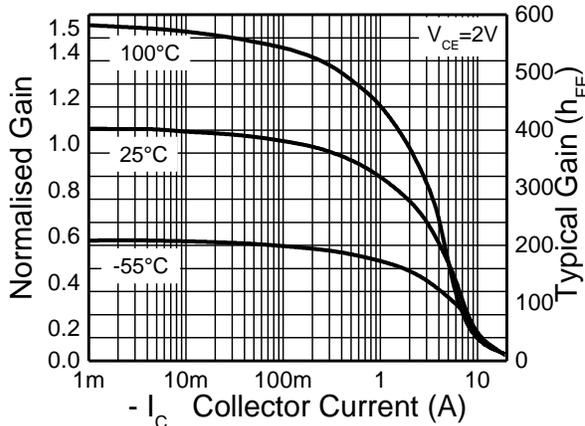


Figure 7. h_{FE} v I_C

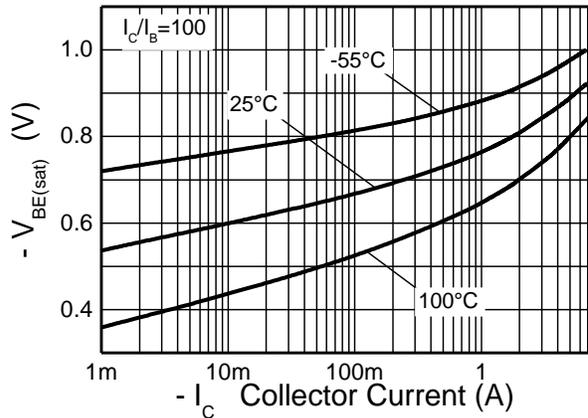


Figure 8. $V_{BE(sat)}$ v I_C

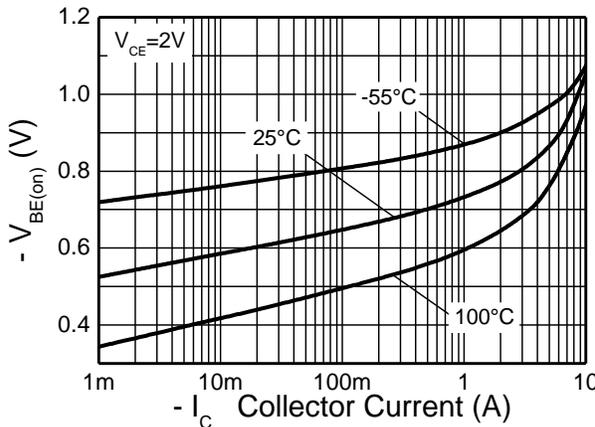
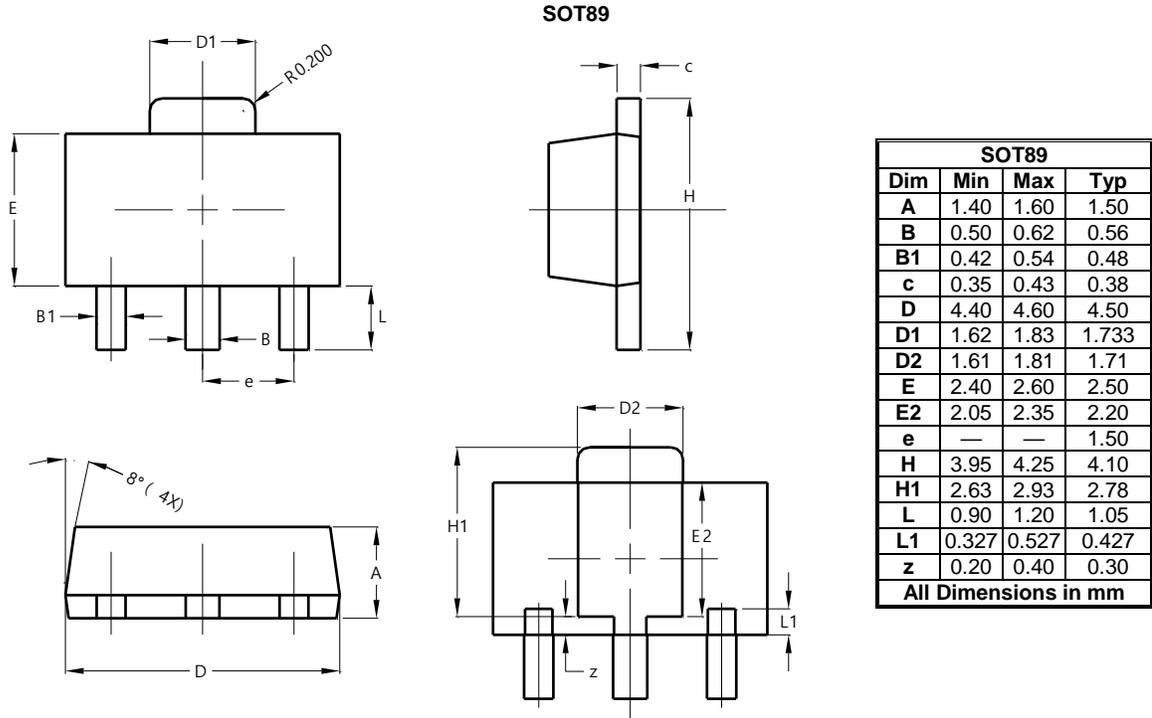


Figure 9. $V_{BE(on)}$ v I_C

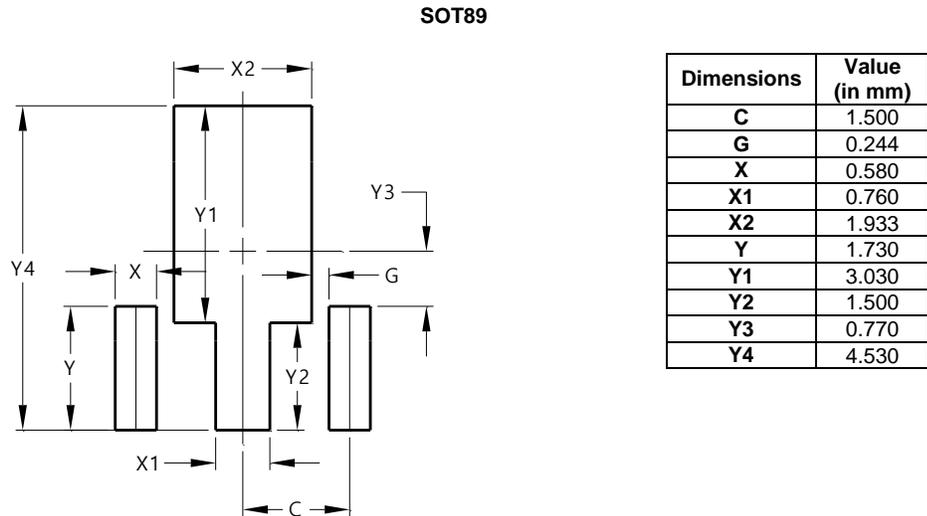
Package Outline Dimensions

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



Suggested Pad Layout

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