

## Description

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

## Features

- $BV_{CE0} > -40V$
- Maximum Continuous Current  $I_C = -1A$
- Low Saturation Voltage  $V_{CE(sat)} < -500mV @ -1A$
- Complementary NPN type: FCX491AQ
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The FCX591AQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

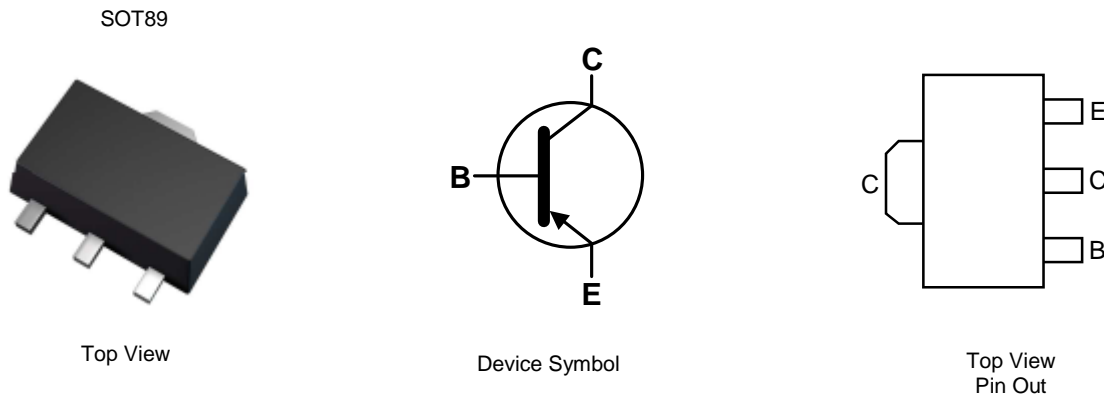
<https://www.diodes.com/quality/product-definitions/>

## 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 @3
- Weight: 0.05 grams (Approximate)

## Application

- Power MOSFET & IGBT gate driving
- Low loss power switching

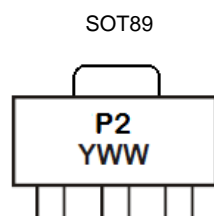


## Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
FCX591AQTA	SOT89	P2	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



P2 = 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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	-40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V
Emitter-Base Voltage	V <sub>EB0</sub>	-7	V
Continuous Collector Current	I <sub>C</sub>	-1	A
Peak Pulse Current	I <sub>CM</sub>	-2	A
Peak Base Current	I <sub>B</sub>	-200	mA

### Thermal Characteristics

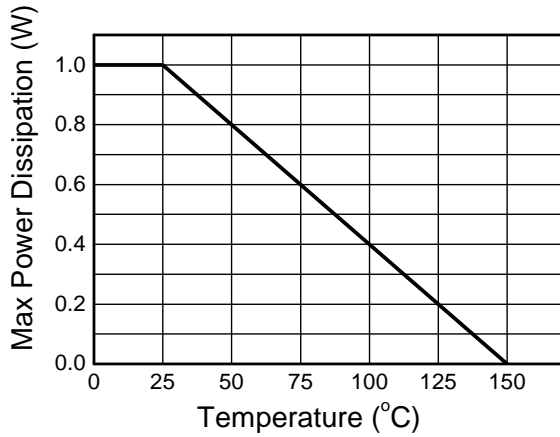
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	1	W
Thermal Resistance, Junction to Ambient Air (Note 5)	R <sub>θJA</sub>	125	°C/W
Thermal Resistance, Junction to Leads (Note 6)	R <sub>θJL</sub>	10.01	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

### ESD Ratings (Note 7)

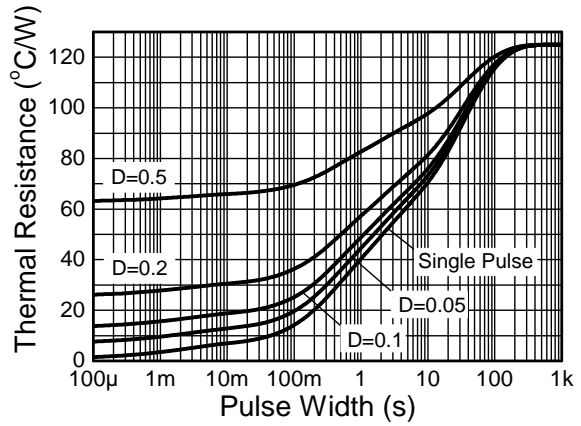
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
5. For a device surface mounted on 15mm X 15mm FR-4 PCB with high coverage of single sided 1 oz copper, in still air conditions; device measured when operating in steady state condition.
  6. Thermal resistance from junction to solder-point (on the exposed collector pad).
  7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

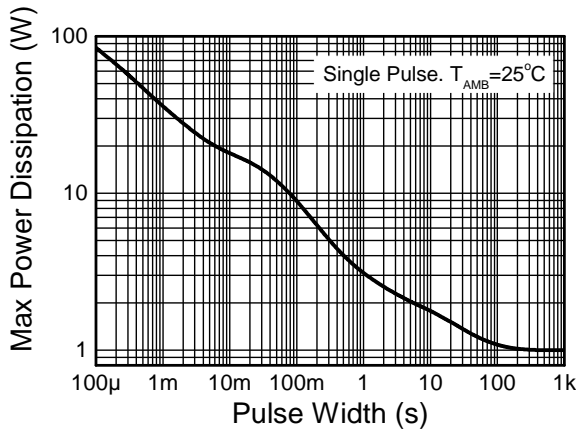
**Thermal Characteristics and Derating Information**



**Fig. 1 Derating Curve**



**Fig. 2 Transient Thermal Impedance**



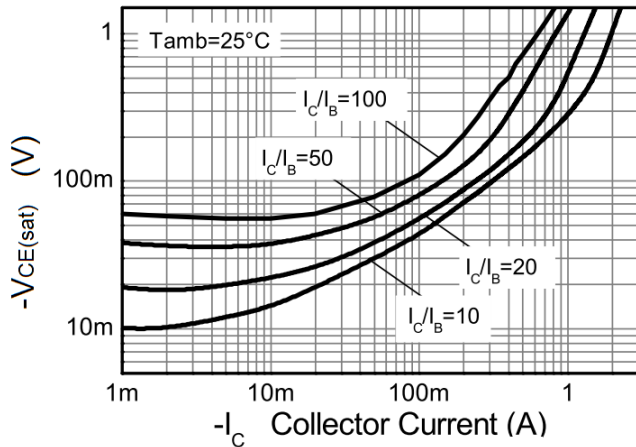
**Fig. 3 Pulse Power Dissipation**

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

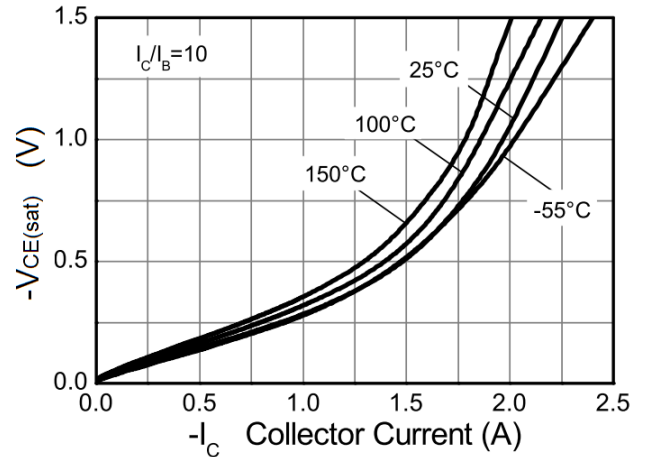
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-40	—	—	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV <sub>CEO</sub>	-40	—	—	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	—	—	V	I <sub>E</sub> = -100μA
Collector Base Cutoff Current	I <sub>CBO</sub>	—	—	-100	nA	V <sub>CB</sub> = -30V
Emitter Base Cutoff Current	I <sub>EBO</sub>	—	—	-100	nA	V <sub>EB</sub> = -4V
Collector Cutoff Current	I <sub>CES</sub>	—	—	-100	nA	V <sub>CES</sub> = -30V
DC Current Transfer Static Ratio (Note 8)	h <sub>FE</sub>	300	—	—	—	I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V
		300	—	800		I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V
		250	—	—		I <sub>C</sub> = -500mA, V <sub>CE</sub> = -5V
		160	—	—		I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V
		30	—	—		I <sub>C</sub> = -2A, V <sub>CE</sub> = -5V
Collector-Emitter Saturation Voltage (Note 8)	V <sub>CE(sat)</sub>	—	—	-0.2	V	I <sub>C</sub> = -100mA, I <sub>B</sub> = -1mA
		—	—	-0.35		I <sub>C</sub> = -500mA, I <sub>B</sub> = -20mA
		—	—	-0.5		I <sub>C</sub> = -1A, I <sub>B</sub> = -100mA
Base-Emitter Saturation Voltage (Note 8)	V <sub>BE(sat)</sub>	—	—	-1.1	V	I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA
Base-Emitter Turn-on Voltage (Note 8)	V <sub>BE(on)</sub>	—	—	-1.0	V	I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V
Transitional Frequency	f <sub>T</sub>	150	—	—	MHz	I <sub>E</sub> = -50mA, V <sub>CE</sub> = -10V f = 100MHz
Output Capacitance	C <sub>obo</sub>	—	—	10	pF	V <sub>CB</sub> = -10V, f = 1MHz

Notes: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

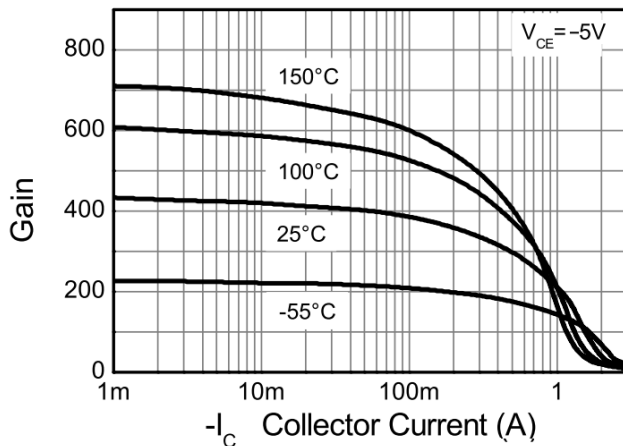
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



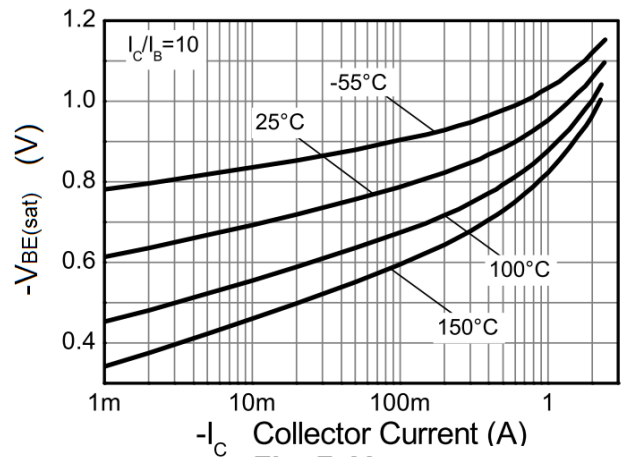
**Fig. 4  $V_{CE(sat)}$  v  $I_C$**



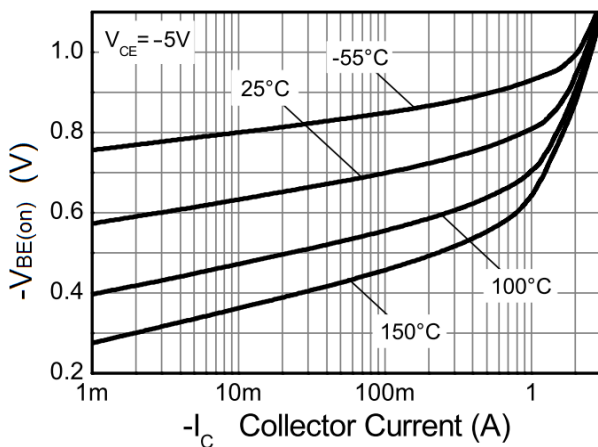
**Fig. 5  $V_{CE(sat)}$  v  $I_C$**



**Fig. 6  $h_{FE}$  v  $I_C$**



**Fig. 7  $V_{BE(sat)}$  v  $I_C$**

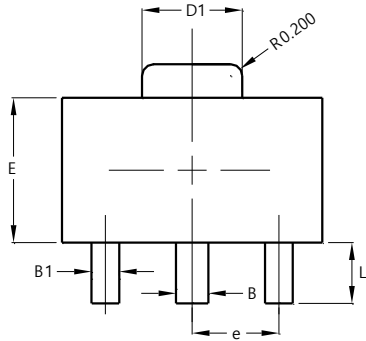


**Fig. 8  $V_{BE(on)}$  v  $I_C$**

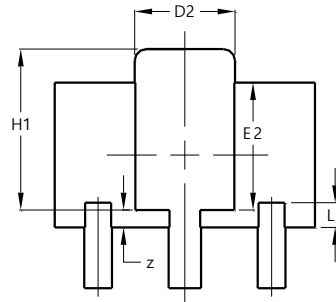
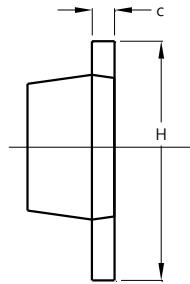
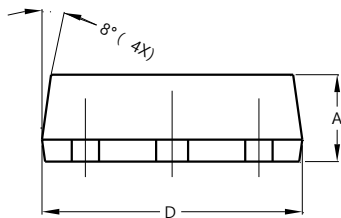
**Package Outline Dimensions**

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

**SOT89**



TOP VIEW



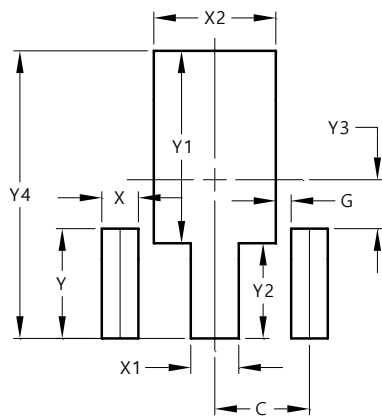
BOTTOM VIEW

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
<b>All Dimensions in mm</b>			

**Suggested Pad Layout**

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

**SOT89**



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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