

**400V PNP HIGH VOLTAGE SWITCHING TRANSISTOR**


## Description

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirement of Automotive Applications.

## Features

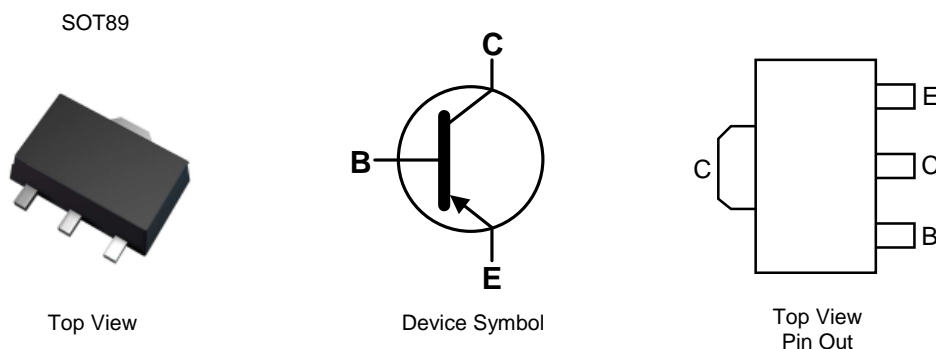
- $BV_{CEO} > -400V$
- $I_C = -0.5A$  Continuous Collector Current
- $I_{CM} = -1A$  Peak Pulse Current
- High Gain Holds up  $h_{FE} \geq 140$  @  $I_C = -100mA$
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

- Case: SOT89
- Case 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

- High Voltage Switching

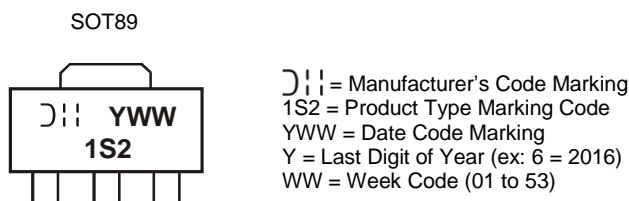


## Ordering Information (Notes 4 and 5)

Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
2DA1971Q-7	Automotive	1S2	7	12	1,000

- 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-400	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-400	V
Emitter-Base Voltage	V <sub>EBO</sub>	-7	V
Continuous Collector Current	I <sub>C</sub>	-0.5	A
Peak Pulse Current	I <sub>CM</sub>	-1	A
Base Current	I <sub>B</sub>	-250	mA

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

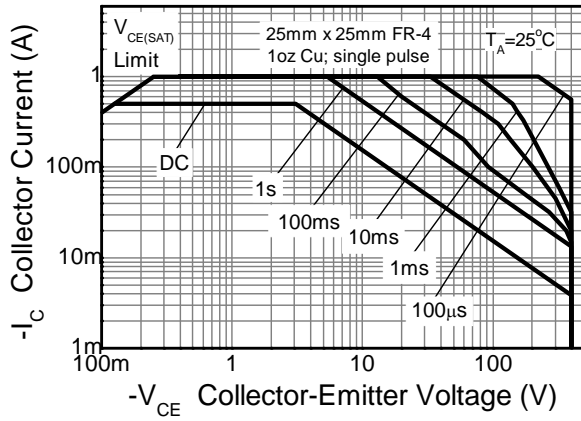
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	1.5	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	83	°C/W
Thermal Resistance, Junction to Leads (Note 7)	R <sub>θJL</sub>	10.4	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 8)

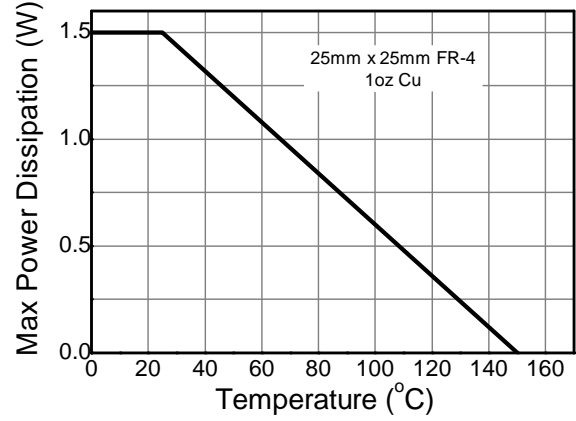
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted with the exposed collector pad on 25mm x 25mm 1oz copper that is on a single-sided FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Thermal resistance from junction to solder-point (on the exposed collector pad).
  8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

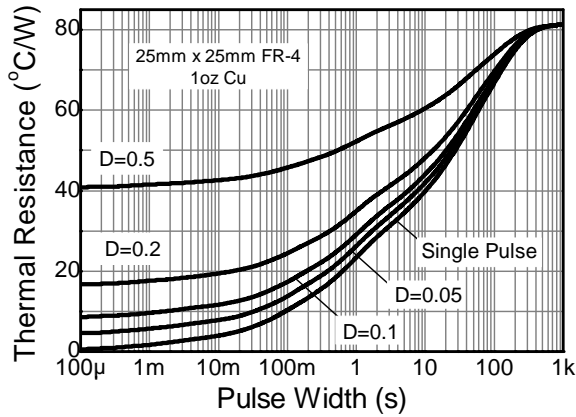
## Thermal Characteristics and Derating information



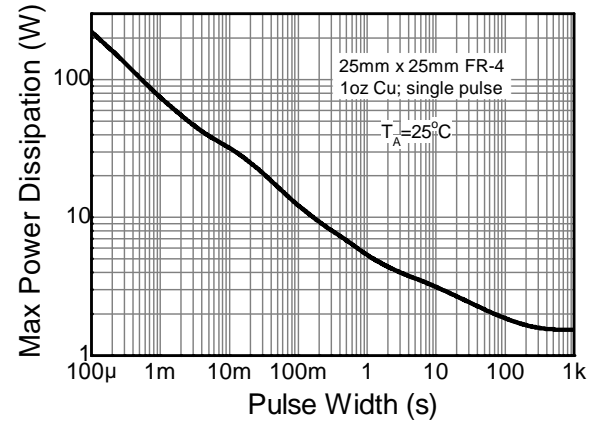
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



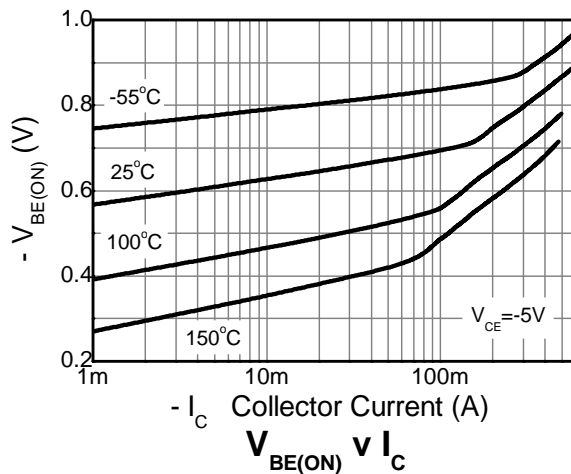
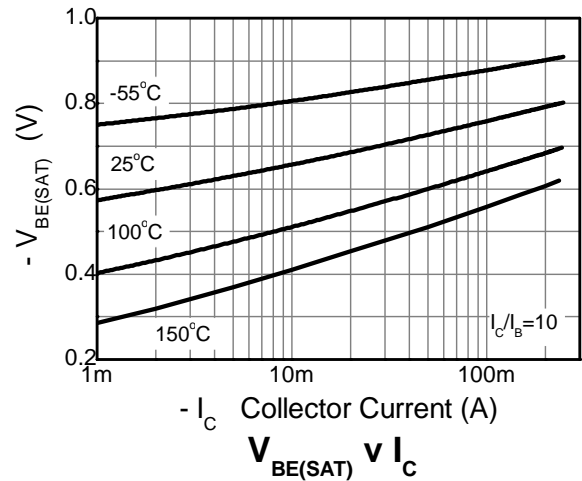
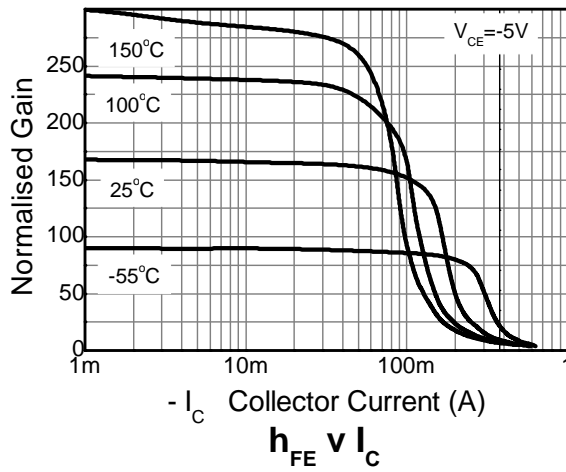
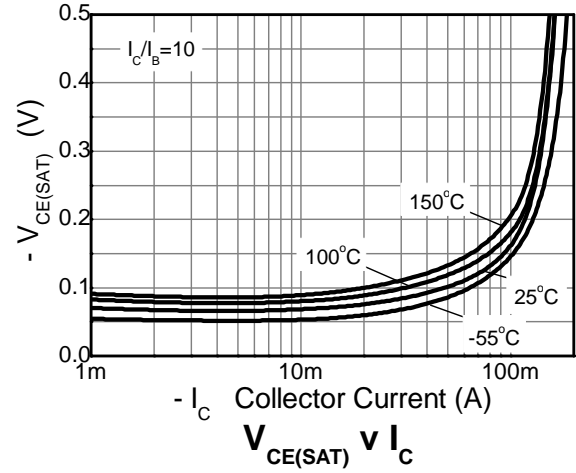
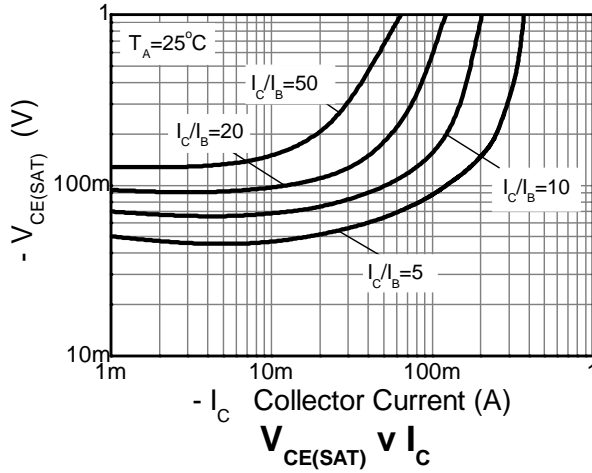
**Pulse Power Dissipation**

**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>	-400	—	—	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 9)	BV <sub>CEO</sub>	-400	—	—	V	I <sub>C</sub> = -1mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	—	—	V	I <sub>E</sub> = -100μA
Collector-Emitter Cut-off Current	I <sub>CES</sub>	—	—	-100	nA	V <sub>CE</sub> = -320V
Collector Cut-off Current	I <sub>CBO</sub>	—	—	-100	nA	V <sub>CB</sub> = -320V
Emitter Cut-off Current	I <sub>EBO</sub>	—	—	-100	nA	V <sub>EB</sub> = -6V
Static Forward Current Transfer Ratio (Note 9)	h <sub>FE</sub>	140 140	—	450 400	—	I <sub>C</sub> = -20mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V
Collector-Emitter Saturation Voltage (Note 9)	V <sub>CE(SAT)</sub>	—	—	-250 -400	mV	I <sub>C</sub> = -100mA, I <sub>B</sub> = -10mA I <sub>C</sub> = -200mA, I <sub>B</sub> = -40mA
Base-Emitter Saturation Voltage (Note 9)	V <sub>BE(SAT)</sub>	—	-0.75	-0.9	V	I <sub>C</sub> = -100mA, I <sub>B</sub> = -10mA
Base-Emitter Turn-On Voltage (Note 9)	V <sub>BE(ON)</sub>	—	—	-0.8	V	I <sub>C</sub> = -200mA, V <sub>CE</sub> = -10V
Transition Frequency	f <sub>T</sub>	—	75	—	MHz	I <sub>C</sub> = -50mA, V <sub>CE</sub> = -5V, f = 50MHz
Collector Output Capacitance	C <sub>OBO</sub>	—	19	—	pF	V <sub>CB</sub> = -10V, I <sub>E</sub> = 0, f = 1MHz
Delay Time	t <sub>(D)</sub>	—	89	—	ns	V <sub>CC</sub> = -200V, I <sub>C</sub> = -100mA, I <sub>B1</sub> = -10mA, I <sub>B2</sub> = 20mA
Rise Time	t <sub>(R)</sub>	—	111	—	ns	
Storage Time	t <sub>(S)</sub>	—	2165	—	ns	
Fall Time	t <sub>(F)</sub>	—	185	—	ns	

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

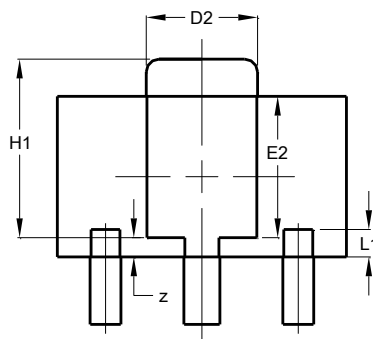
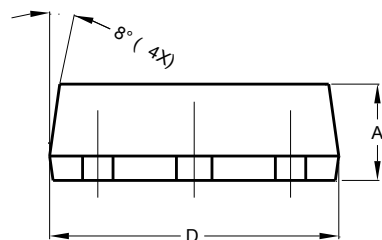
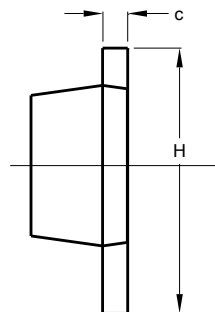
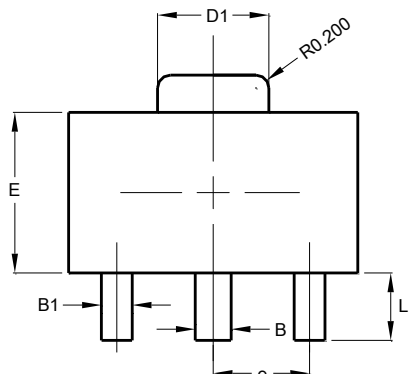
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

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

**SOT89**

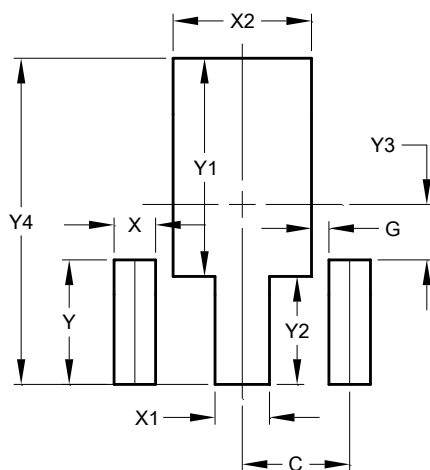


SOT89			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in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

## Suggested Pad Layout

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

**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

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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