

**400V PNP HIGH VOLTAGE SWITCHING TRANSISTOR**


**Description**

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

**Features**

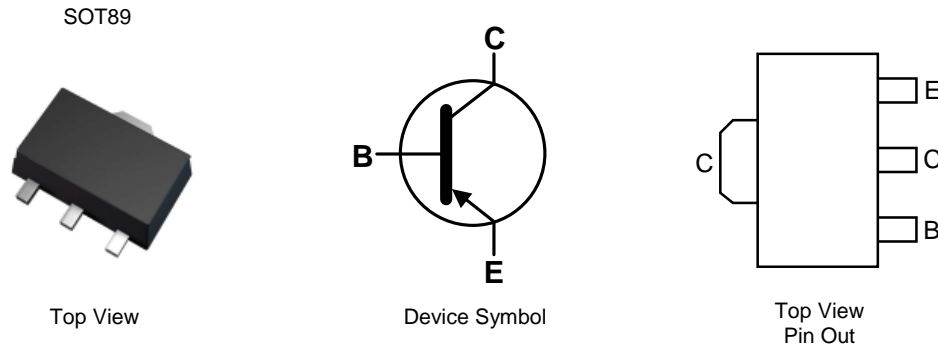
- $BV_{CEO} > -400V$
- $I_C = -0.5A$  Continuous Collector Current
- $I_{CM} = -1A$  Peak Pulse Current
- High Gain Holds up  $h_{FE} \geq 140$  @  $I_C = -100mA$
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101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

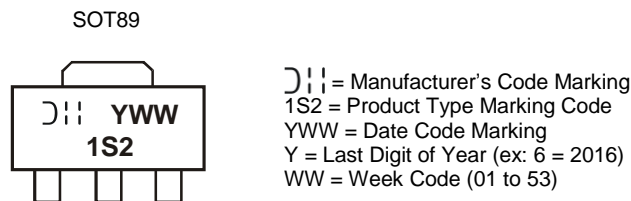


**Ordering Information** (Notes 4 and 5)

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.)

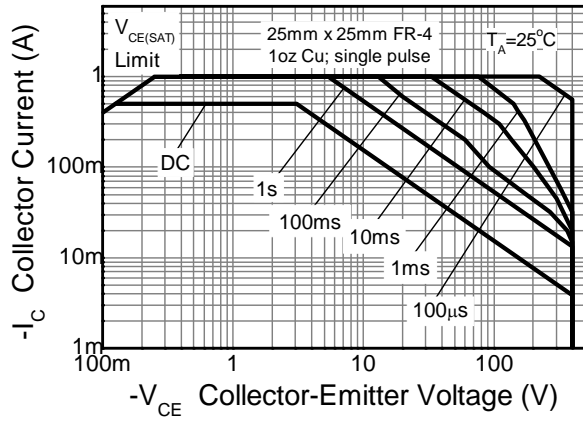
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	1.5	W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	83	°C/W
Thermal Resistance, Junction to Leads (Note 7)	R <sub>θJL</sub>	10.4	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>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

**ESD Ratings** (Note 8)

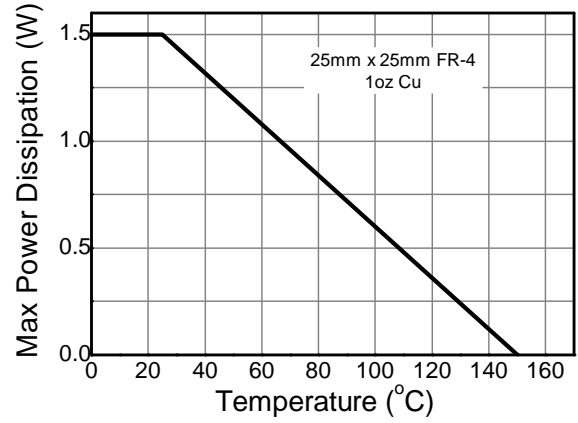
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- 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.

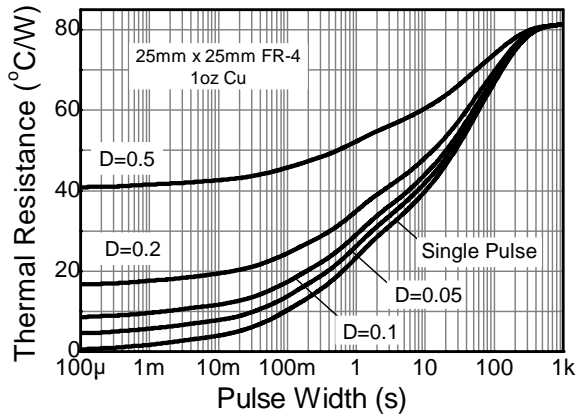
**Thermal Characteristics and Derating information**



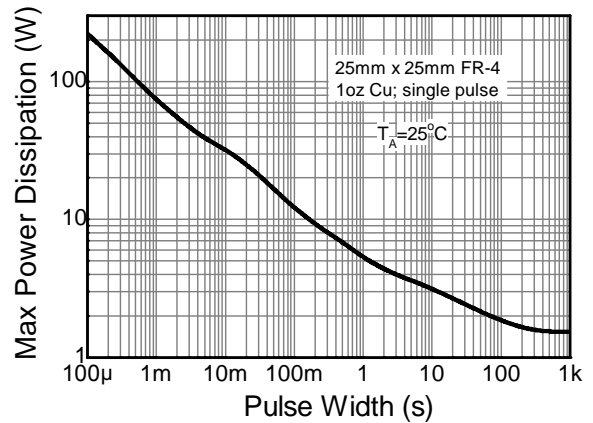
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



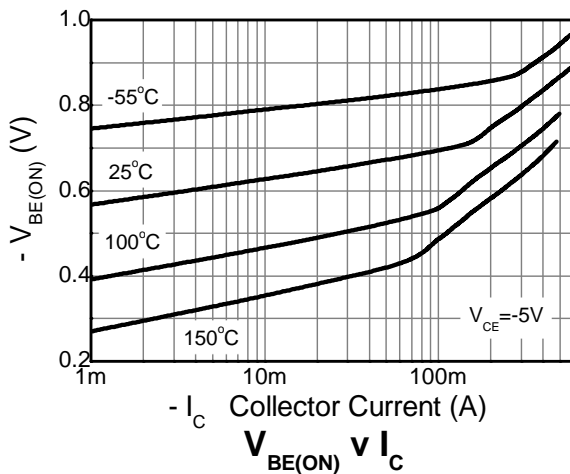
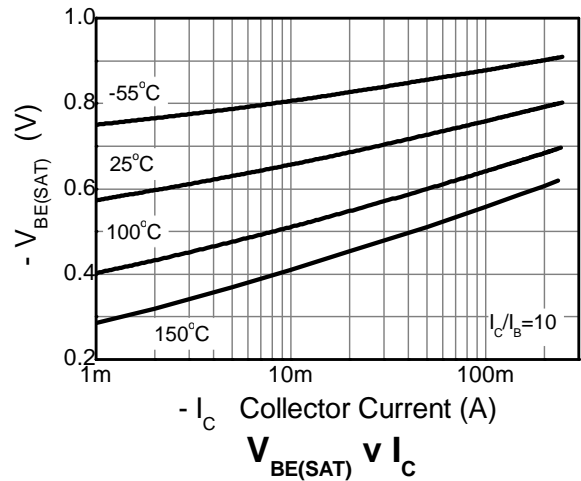
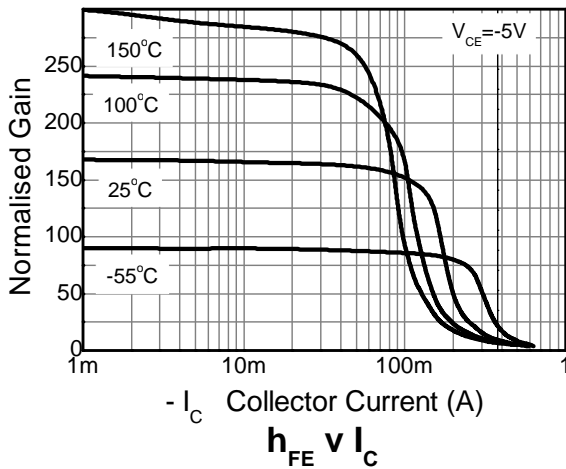
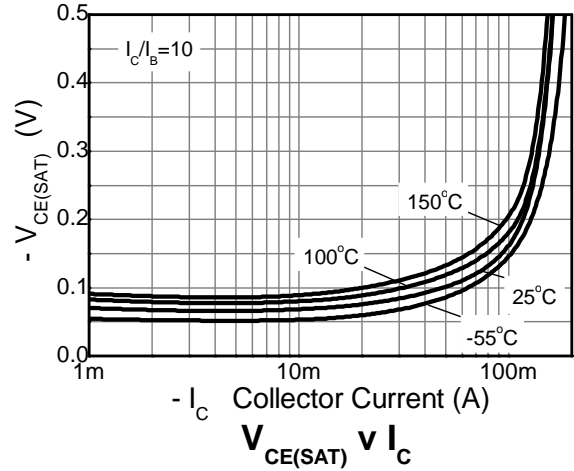
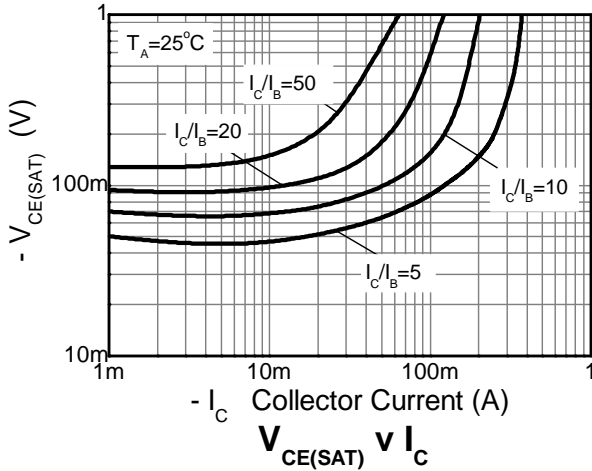
**Pulse Power Dissipation**

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	-400	—	—	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 9)	$BV_{CEO}$	-400	—	—	V	$I_C = -1\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-7	—	—	V	$I_E = -100\mu\text{A}$
Collector-Emitter Cut-off Current	$I_{CES}$	—	—	-100	nA	$V_{CE} = -320\text{V}$
Collector Cut-off Current	$I_{CBO}$	—	—	-100	nA	$V_{CB} = -320\text{V}$
Emitter Cut-off Current	$I_{EBO}$	—	—	-100	nA	$V_{EB} = -6\text{V}$
Static Forward Current Transfer Ratio (Note 9)	$h_{FE}$	140 140	—	450 400	—	$I_C = -20\text{mA}, V_{CE} = -5\text{V}$ $I_C = -100\text{mA}, V_{CE} = -5\text{V}$
Collector-Emitter Saturation Voltage (Note 9)	$V_{CE(SAT)}$	—	—	-250 -400	mV	$I_C = -100\text{mA}, I_B = -10\text{mA}$ $I_C = -200\text{mA}, I_B = -40\text{mA}$
Base-Emitter Saturation Voltage (Note 9)	$V_{BE(SAT)}$	—	-0.75	-0.9	V	$I_C = -100\text{mA}, I_B = -10\text{mA}$
Base-Emitter Turn-On Voltage (Note 9)	$V_{BE(ON)}$	—	—	-0.8	V	$I_C = -200\text{mA}, V_{CE} = -10\text{V}$
Transition Frequency	$f_T$	—	75	—	MHz	$I_C = -50\text{mA}, V_{CE} = -5\text{V},$ $f = 50\text{MHz}$
Collector Output Capacitance	$C_{OBO}$	—	19	—	pF	$V_{CB} = -10\text{V}, I_E = 0, f = 1\text{MHz}$
Delay Time	$t_{(D)}$	—	89	—	ns	$V_{CC} = -200\text{V}, I_C = -100\text{mA},$ $I_{B1} = -10\text{mA}, I_{B2} = 20\text{mA}$
Rise Time	$t_{(R)}$	—	111	—	ns	
Storage Time	$t_{(S)}$	—	2165	—	ns	
Fall Time	$t_{(F)}$	—	185	—	ns	

Note: 9. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

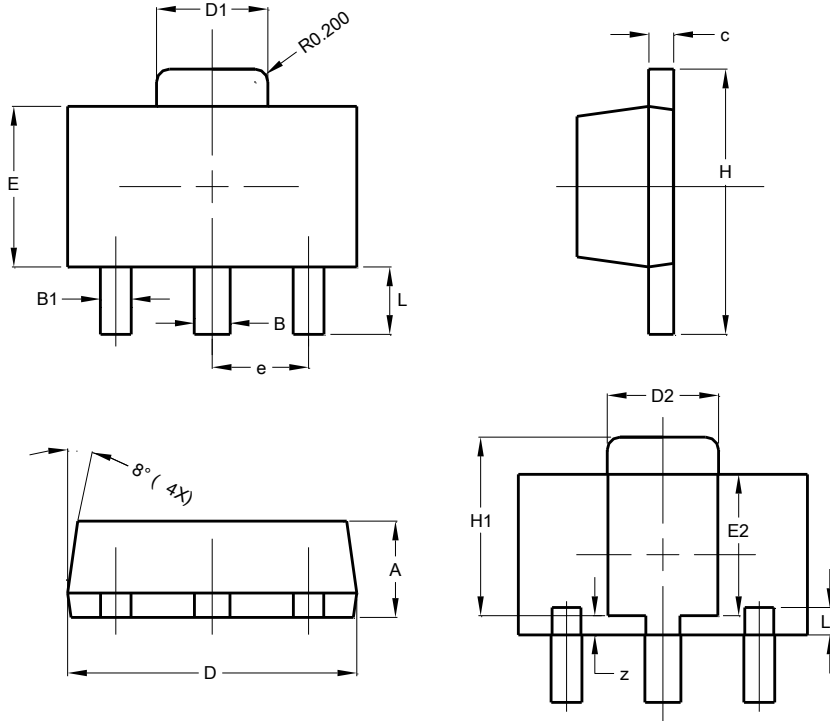
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Package Outline Dimensions**

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

**SOT89**

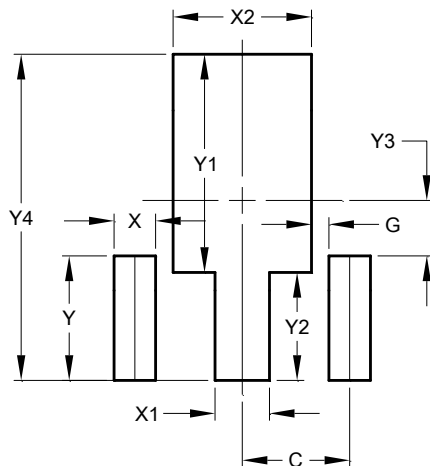


SOT89			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in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