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[Diodes Incorporated](#)  
[2DA1971-7](#)

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**2DA1971**

**400V PNP HIGH VOLTAGE SWITCHING TRANSISTOR IN SOT89**

**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**

**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 (E3)
- Weight: 0.05 grams (Approximate)

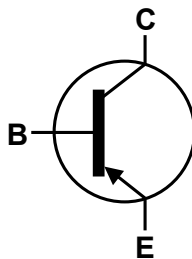
**Applications**

- High Voltage Switching

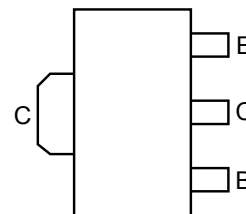
SOT89



Top View



Device symbol



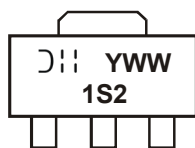
Top View  
Pin Out

**Ordering Information** (Note 4)

| Product    | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------|---------|--------------------|-----------------|-------------------|
| 2DA1971-7  | 1S2     | 7                  | 12              | 1,000             |
| 2DA1971-13 | 1S2     | 13                 | 12              | 2,500             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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 <http://www.diodes.com/products/packages.html>.

**Marking Information**



Top View

1S2 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y = Last digit of year (ex: 1 = 2011)  
 WW = Week code (01 – 53)



**2DA1971**

**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.)

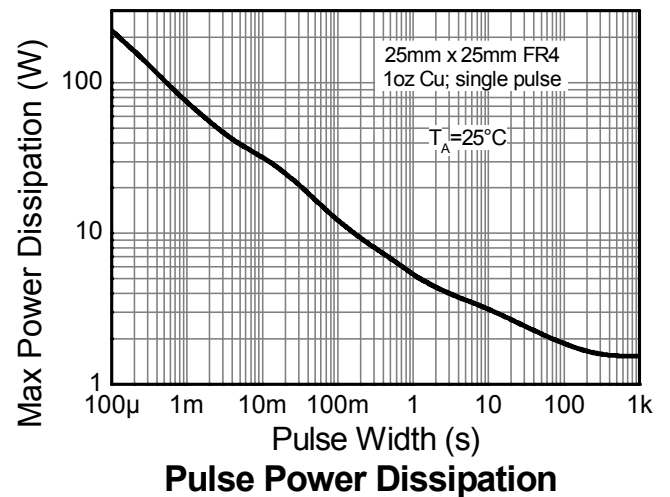
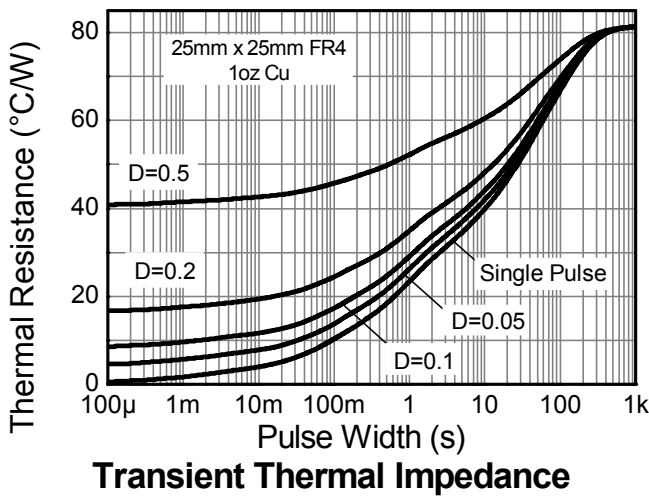
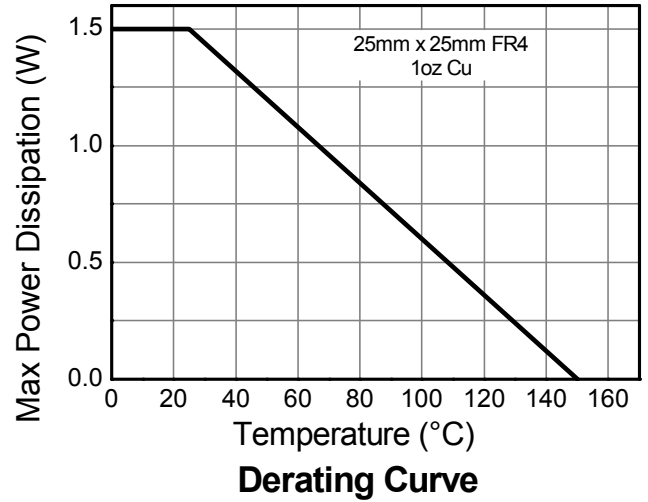
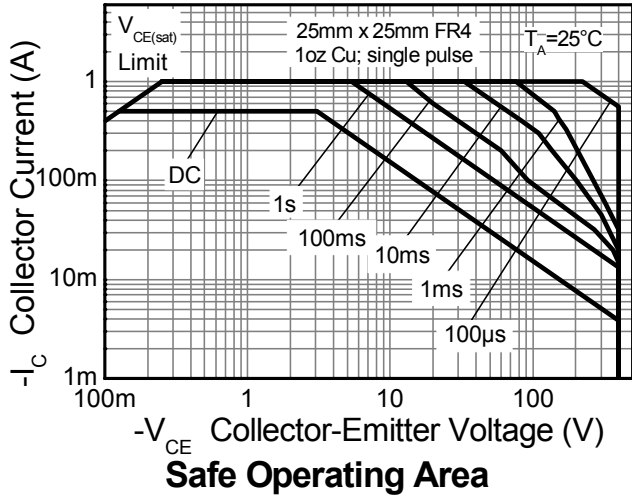
| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Power Dissipation (Note 5)                       | P <sub>D</sub>                    | 1.5         | W    |
| Thermal Resistance, Junction to Ambient (Note 5) | R <sub>θJA</sub>                  | 83          | °C/W |
| Thermal Resistance, Junction to Leads (Note 6)   | 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 7)

| 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:
5. For a device mounted with the exposed collector pad on 25mm x 25mm 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  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**

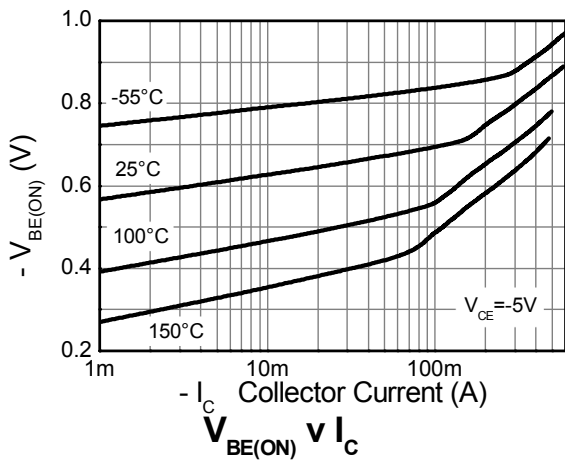
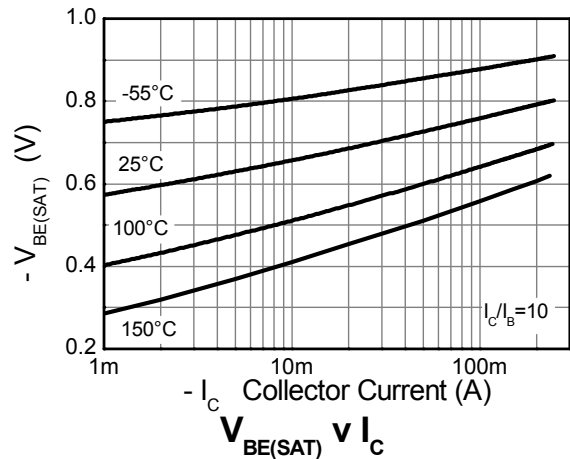
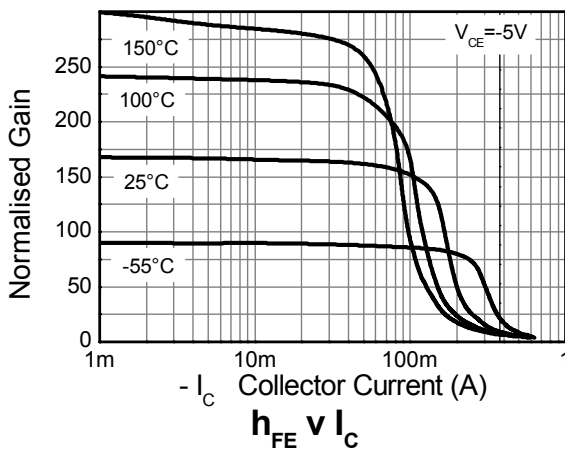
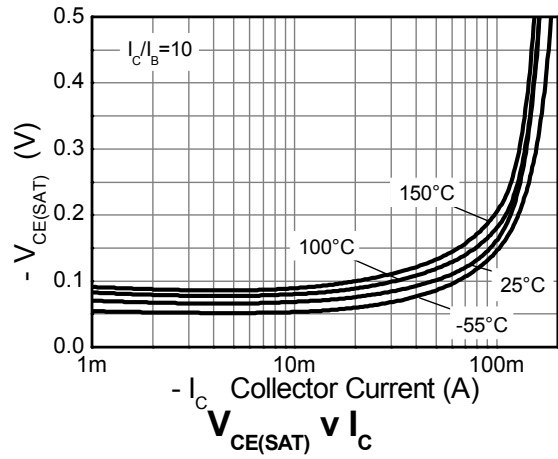
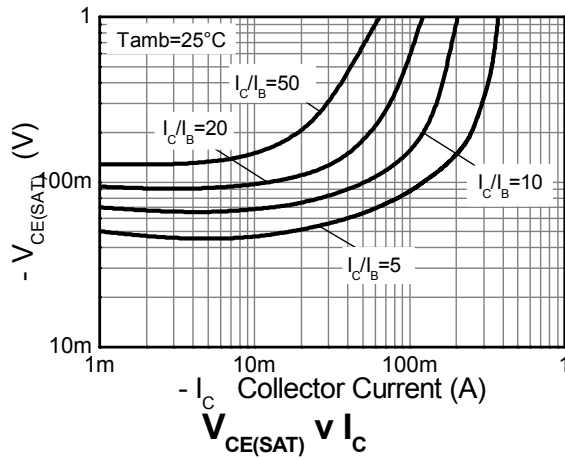


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| 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 8)   | 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 8) | h <sub>FE</sub>      | 140<br>140 | -     | 450<br>400   | -    | I <sub>C</sub> = -20mA, V <sub>CE</sub> = -5V<br>I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V      |
| Collector-Emitter saturation Voltage (Note 8)  | V <sub>CE(sat)</sub> | -          | -     | -250<br>-400 | mV   | I <sub>C</sub> = -100mA, I <sub>B</sub> = -10mA<br>I <sub>C</sub> = -200mA, I <sub>B</sub> = -40mA   |
| Base-Emitter saturation Voltage (Note 8)       | V <sub>BE(sat)</sub> | -          | -0.75 | -0.9         | V    | I <sub>C</sub> = -100mA, I <sub>B</sub> = -10mA  |
| Base-Emitter Turn-On Current (Note 8)          | 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,<br>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,<br>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   |  |

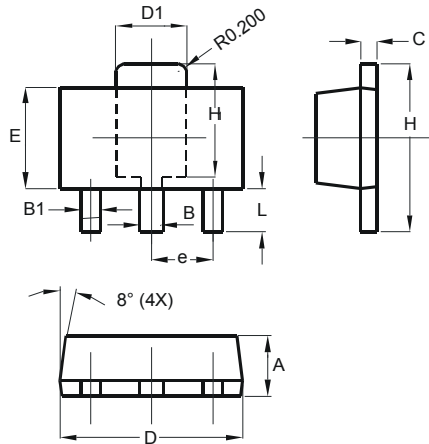
Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

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



### Package Outline Dimensions

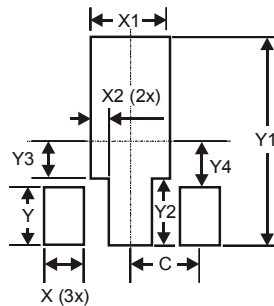
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT89                |          |      |
|----------------------|----------|------|
| Dim                  | Min      | Max  |
| A                    | 1.40     | 1.60 |
| B                    | 0.44     | 0.62 |
| B1                   | 0.35     | 0.54 |
| C                    | 0.35     | 0.44 |
| D                    | 4.40     | 4.60 |
| D1                   | 1.62     | 1.83 |
| E                    | 2.29     | 2.60 |
| e                    | 1.50 Typ |      |
| H                    | 3.94     | 4.25 |
| H1                   | 2.63     | 2.93 |
| L                    | 0.89     | 1.20 |
| All Dimensions in mm |          |      |

### Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| X          | 0.900         |
| X1         | 1.733         |
| X2         | 0.416         |
| Y          | 1.300         |
| Y1         | 4.600         |
| Y2         | 1.475         |
| Y3         | 0.950         |
| Y4         | 1.125         |
| C          | 1.500         |

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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