

**80V PNP MEDIUM POWER TRANSISTOR IN SOT89**

**Features**

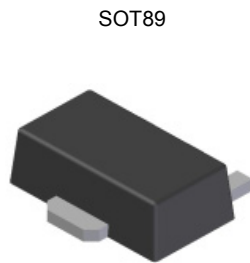
- $BV_{CEO} > -80V$
- $I_C = -1A$  High Continuous Current
- Low saturation voltage  $V_{CE(sat)} < -250mV @ -150mA$
- Complementary type BSR43
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**

**Application**

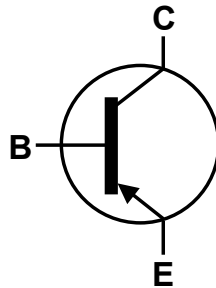
- Load management functions
- Solenoid, relay and actuator drivers
- DC – DC modules

**Mechanical Data**

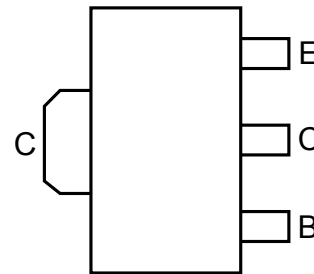
- Case: SOT89
- Case Material: Molded Plastic, "Green" Molding Compound  
UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish, Solderable per MIL-STD-202,  
Method 208  $\text{e3}$
- Weight: 0.052 grams (Approximate)



Top View



Device Symbol



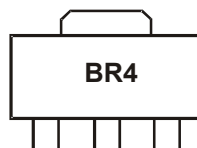
Top View  
Pin-Out

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

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
BSR33TA	AEC-Q101	BR4	7	12	1,000
BSR33QTA	Automotive	BR4	7	12	1,000

- 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. Automotive products are AEC-Q10x qualified and are PPAP capable. Automotive, AEC-Q10x and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**



BR4 = Product Type Marking Code

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-90	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-80	V
Emitter-Base Voltage	V <sub>EBO</sub>	-5	V
Continuous Collector Current	I <sub>C</sub>	-1	A
Peak Pulse Current	I <sub>CM</sub>	-2	A
Peak Base Current	I <sub>BM</sub>	-200	mA

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

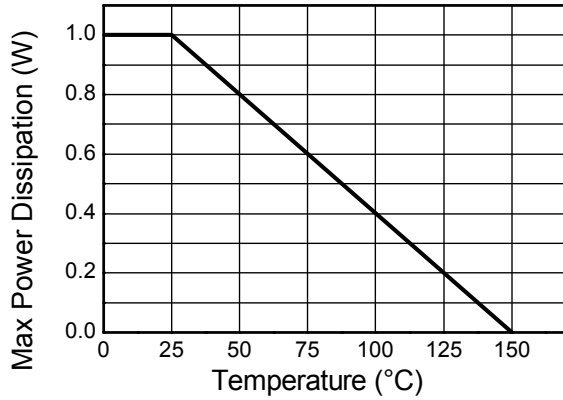
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 6)	1
		(Note 7)	1.5
		(Note 8)	2.1
Thermal Resistance, Junction to Ambient Air	R <sub>θJA</sub>	(Note 6)	125
		(Note 7)	83
		(Note 8)	60
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	13	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

**ESD Ratings** (Note 10)

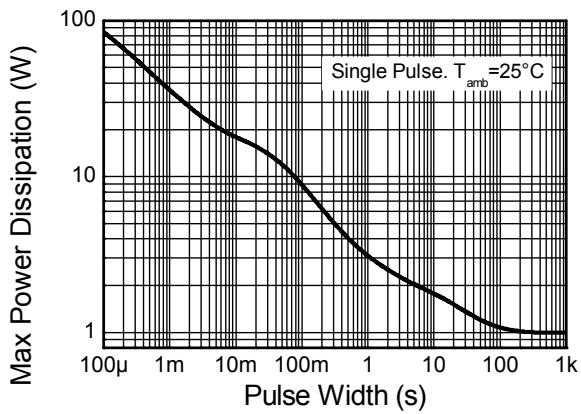
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted with the exposed collector pad on 15mm x 15mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as note (6), except the device is mounted on 25mm x 25mm 1oz copper.
  8. Same as note (6), except the device is mounted on 50mm x 50mm 1oz copper.
  9. Thermal resistance from junction to solder-point (on the exposed collector pad).
  10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

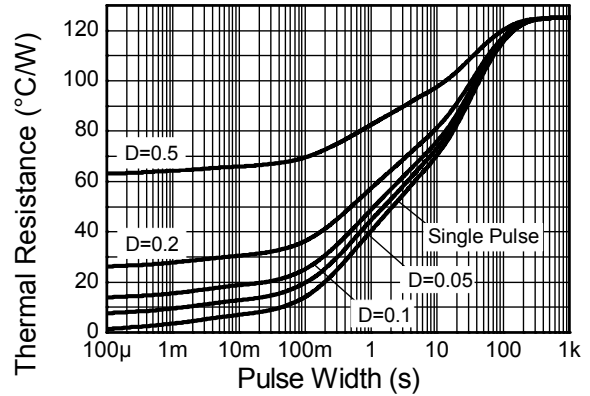
**Thermal Characteristics and Derating Information**



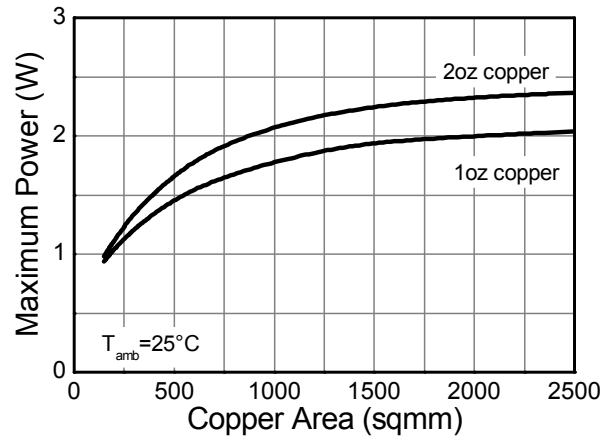
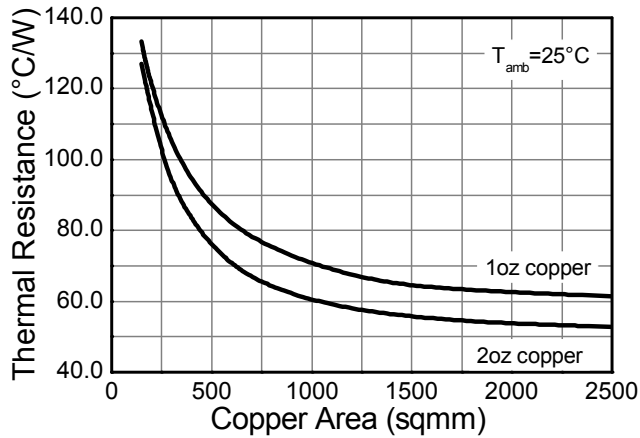
**Derating Curve**



**Pulse Power Dissipation**



**Transient Thermal Impedance**

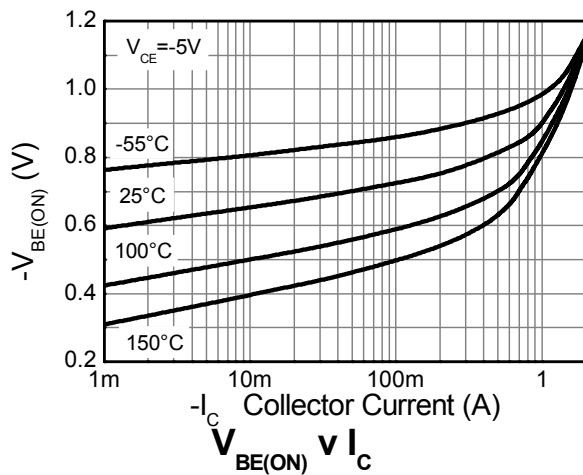
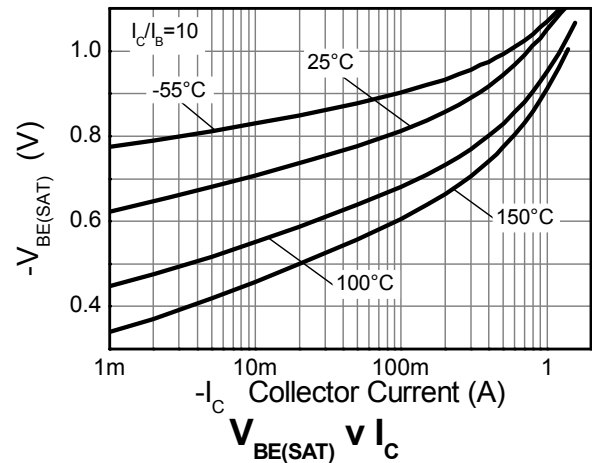
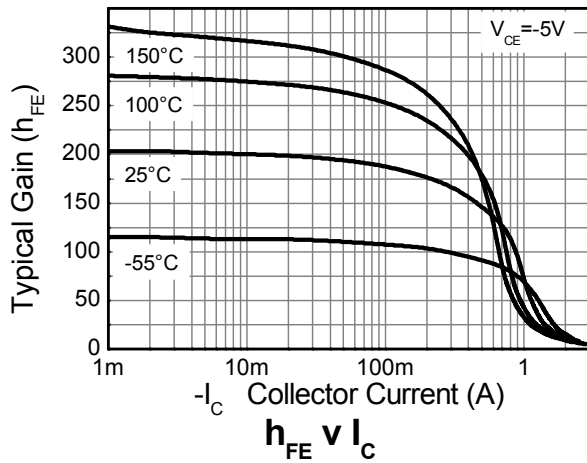
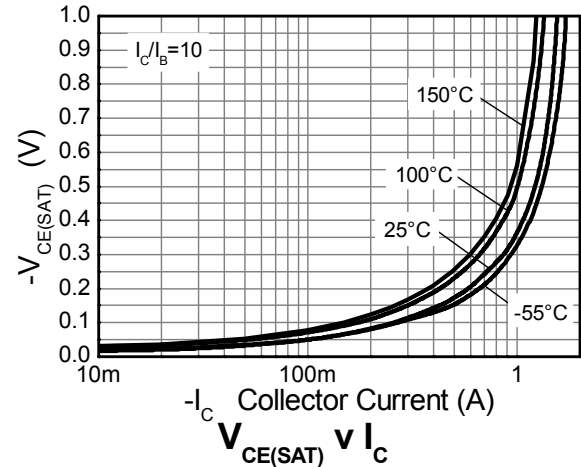
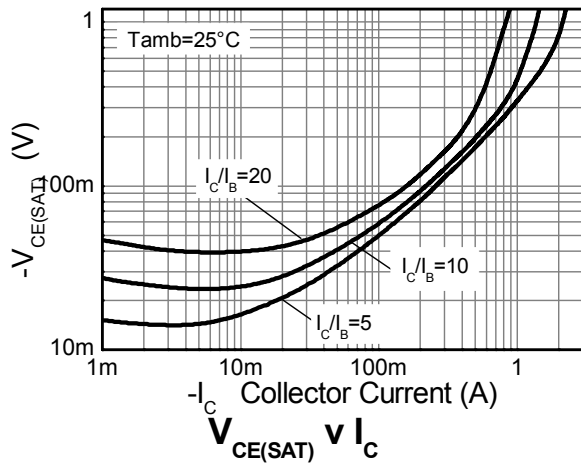


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ.	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	-90	–	–	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 11)	$BV_{CEO}$	-80	–	–	V	$I_C = -10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-5	–	–	V	$I_E = -100\mu\text{A}$
Collector Cutoff Current	$I_{CBO}$	–	–	-100 -50	nA $\mu\text{A}$	$V_{CB} = -60\text{V}$ $V_{CB} = -60\text{V}, T_J = +150^\circ\text{C}$
DC current transfer Static ratio (Note 11)	$h_{FE}$	30 100 50	– – –	– 300 –	–	$I_C = -100\mu\text{A}, V_{CE} = -5\text{V}$ $I_C = -100\text{mA}, V_{CE} = -5\text{V}$ $I_C = -500\text{mA}, V_{CE} = -5\text{V}$
Collector-Emitter Saturation Voltage (Note 11)	$V_{CE(sat)}$	– –	– –	-0.25 -0.5	V	$I_C = -150\text{mA}, I_B = -15\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$
Base-Emitter Saturation Voltage (Note 11)	$V_{BE(sat)}$	–	–	-1.0 -1.2	V	$I_C = -150\text{mA}, I_B = -15\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$
Transitional Frequency	$f_T$	100	–	–	MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 35\text{MHz}$
Output capacitance	$C_{obo}$	–	–	20	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Input Capacitance	$C_{ibo}$	–	–	120	pF	$V_{CB} = -0.5\text{V}, f = 1\text{MHz}$
Turn-On Time	$T_{on}$	–	–	500	ns	$V_{CC} = -20\text{V}, I_C = -100\text{mA}$
Turn-Off Time	$T_{off}$	–	–	650	ns	$I_{B1} = I_{B2} = -5\text{mA}$

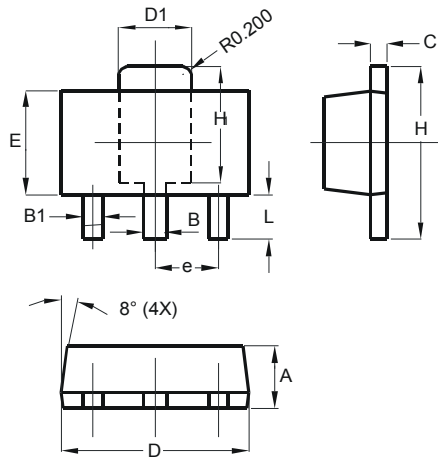
Note: 11. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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



## Package Outline Dimensions

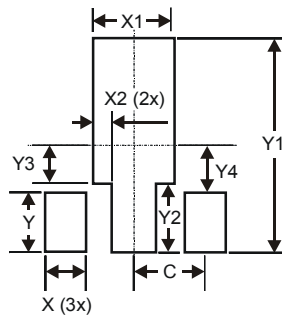
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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

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