

## 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)

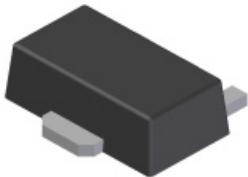
## Application

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

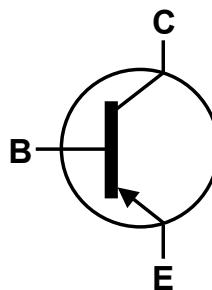
## Mechanical Data

- 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 (e3)
- Weight: 0.052 grams (Approximate)

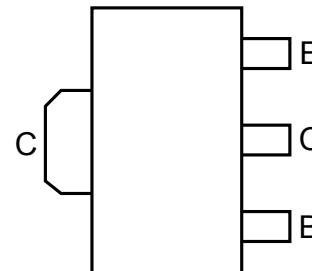
SOT89



Top View



Device Symbol


Top View  
Pin-Out

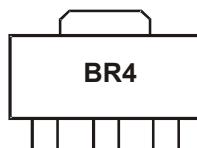
## Ordering Information (Notes 4 &amp; 5)

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-90	V
Collector-Emitter Voltage	$V_{CEO}$	-80	V
Emitter-Base Voltage	$V_{EBO}$	-5	V
Continuous Collector Current	$I_C$	-1	A
Peak Pulse Current	$I_{CM}$	-2	A
Peak Base Current	$I_{BM}$	-200	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation	$P_D$	1	W
		1.5	
		2.1	
Thermal Resistance, Junction to Ambient Air	$R_{\theta JA}$	125	°C/W
		83	
		60	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	13	°C/W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-65 to +150	°C

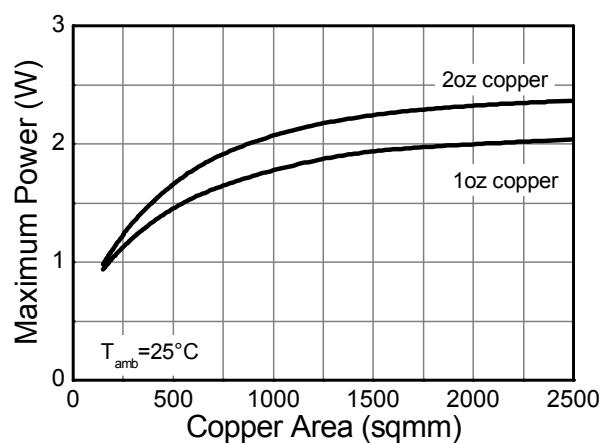
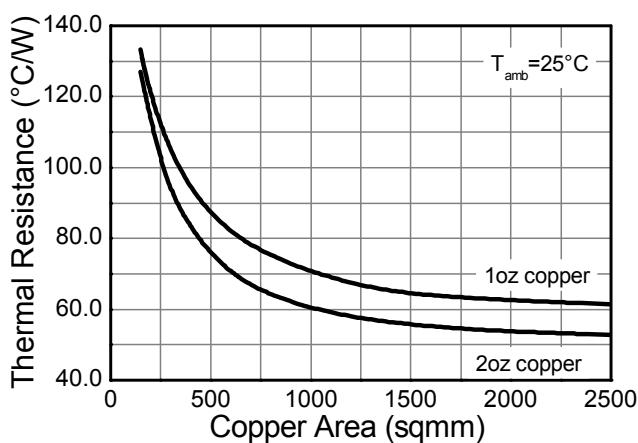
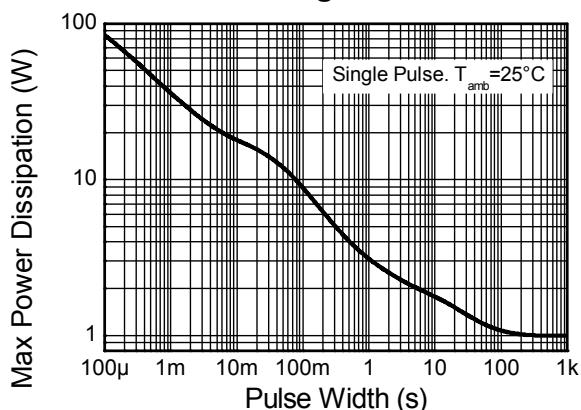
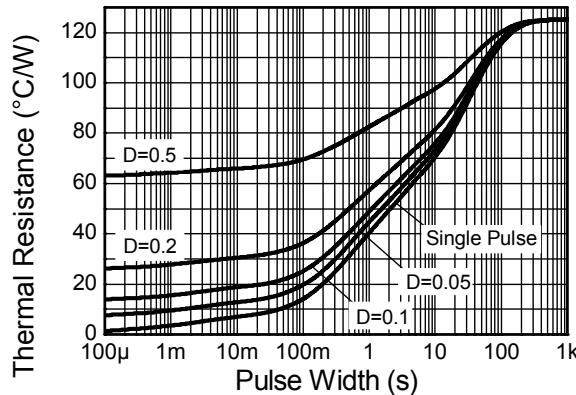
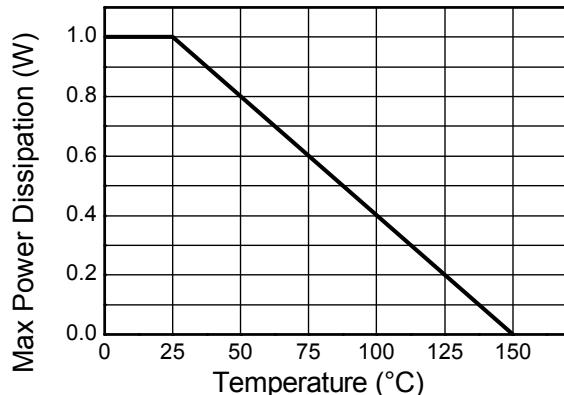
**ESD Ratings** (Note 10)

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

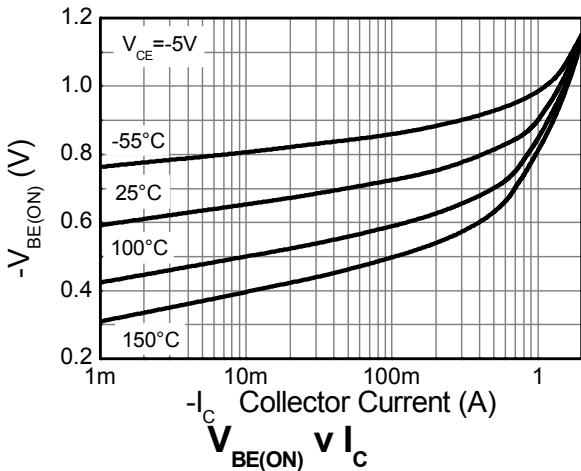
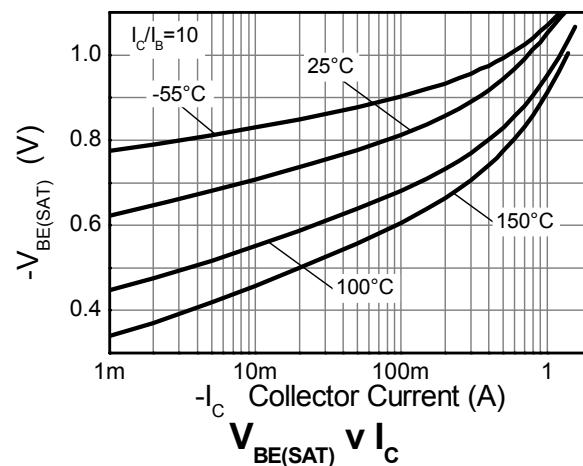
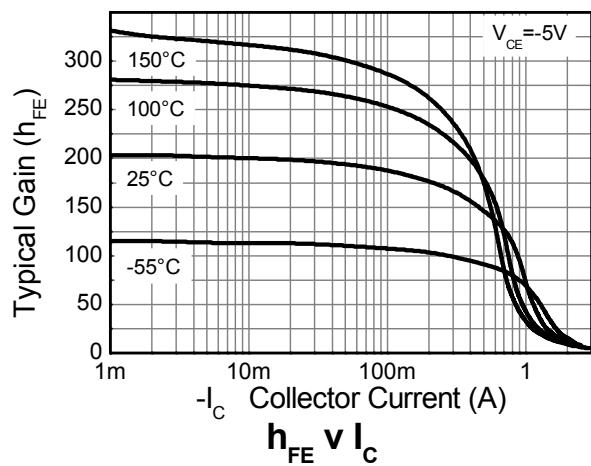
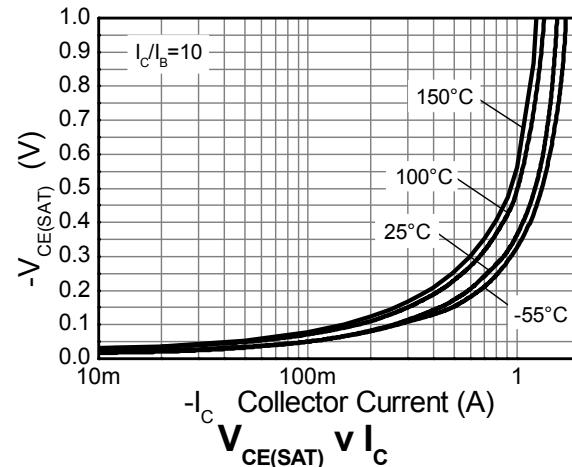
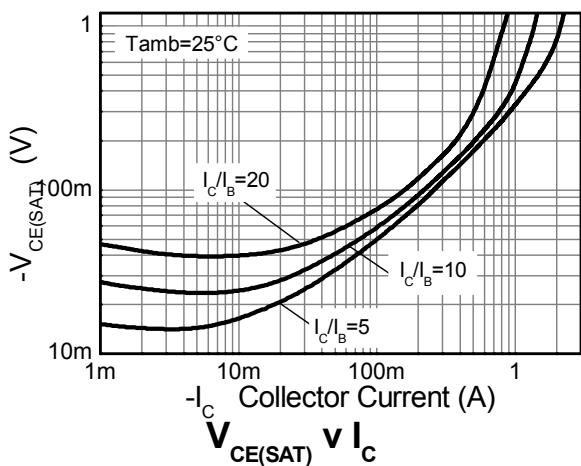


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

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

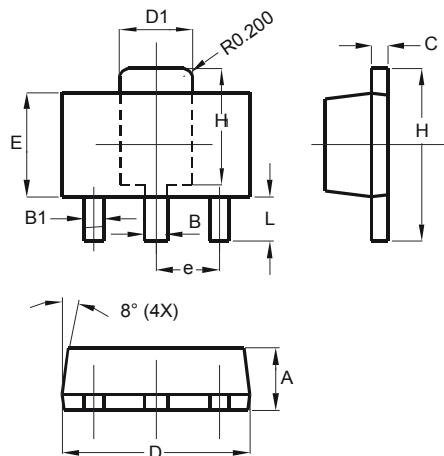
Note: 11. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

**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.

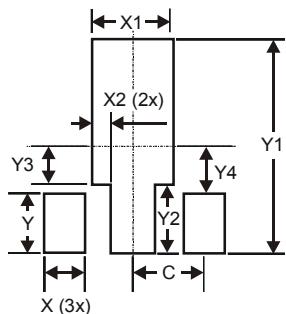


SOT89		
Dim	Min	Max
<b>A</b>	1.40	1.60
<b>B</b>	0.44	0.62
<b>B1</b>	0.35	0.54
<b>C</b>	0.35	0.44
<b>D</b>	4.40	4.60
<b>D1</b>	1.62	1.83
<b>E</b>	2.29	2.60
<b>e</b>	1.50 Typ	
<b>H</b>	3.94	4.25
<b>H1</b>	2.63	2.93
<b>L</b>	0.89	1.20

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)
<b>X</b>	0.900
<b>X1</b>	1.733
<b>X2</b>	0.416
<b>Y</b>	1.300
<b>Y1</b>	4.600
<b>Y2</b>	1.475
<b>Y3</b>	0.950
<b>Y4</b>	1.125
<b>C</b>	1.500

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