

## Description

The ZXTR2008Z monolithically integrates a transistor, Zener diode and resistor to function as a high voltage linear regulator. The device regulates with an 8.2V nominal output and delivers up to 30mA. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a single SOT89 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

## Applications


Supply voltage regulation for the primary side controller in:

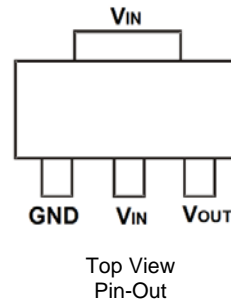
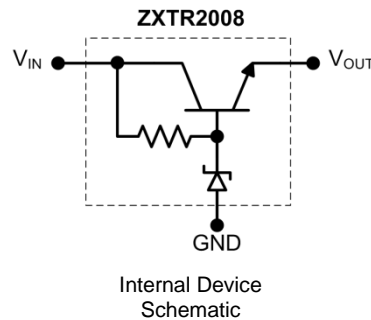
- Networking
- Telecom
- Power Over Ethernet (PoE)

## Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 12V to 100V
- Output Voltage = 8.2V ± 10%
- Continuous Output Current up to 30mA
- Fully integrated into a single SOT89 package
- **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 
- Weight: 0.052 grams (approximate)



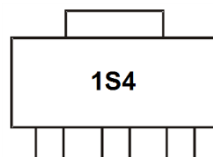
| Pin Name         | Pin Function   |
|------------------|----------------|
| V <sub>IN</sub>  | Input Supply   |
| GND              | Power Ground   |
| V <sub>OUT</sub> | Voltage Output |

## Ordering Information (Note 4)

| Product      | Package | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|---------|---------|--------------------|-----------------|-------------------|
| ZXTR2008Z-7  | SOT89   | 1S4     | 7                  | 12              | 1,000             |
| ZXTR2008Z-13 | SOT89   | 1S4     | 13                 | 12              | 2,500             |

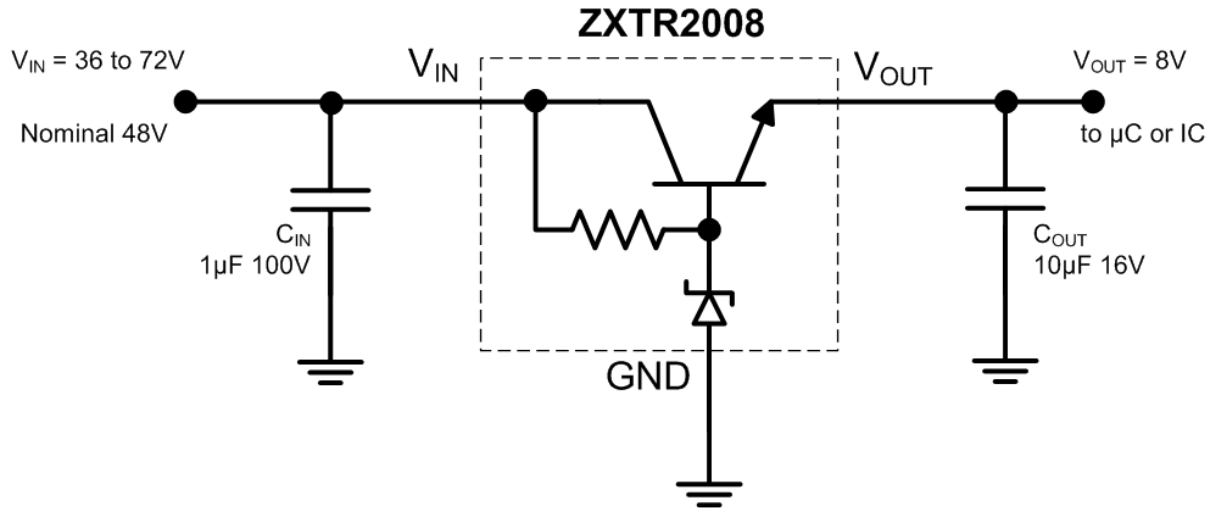
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen and Antimony free, "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



1S4 = Product Type Marking Code

## Typical Application Circuit



Example of an 8V regulated supply from a nominal 48V for powering the primary side controller in a DC-DC converter.

## Maximum Ratings (Voltage relative to GND, @T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic            | Symbol           | Value | Unit |
|---------------------------|------------------|-------|------|
| Input Voltage             | V <sub>IN</sub>  | 100   | V    |
| Input Current             | I <sub>IN</sub>  | 30    | mA   |
| Continuous Output Current | I <sub>OUT</sub> | 30    | mA   |
| Pulsed Output Current     | (Note 7)         | 500   | mA   |
|                           | (Note 8)         | 150   |      |

## Thermal Characteristics

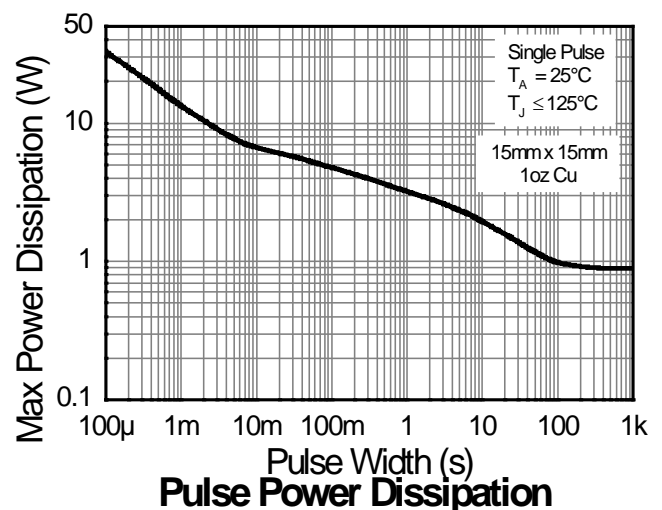
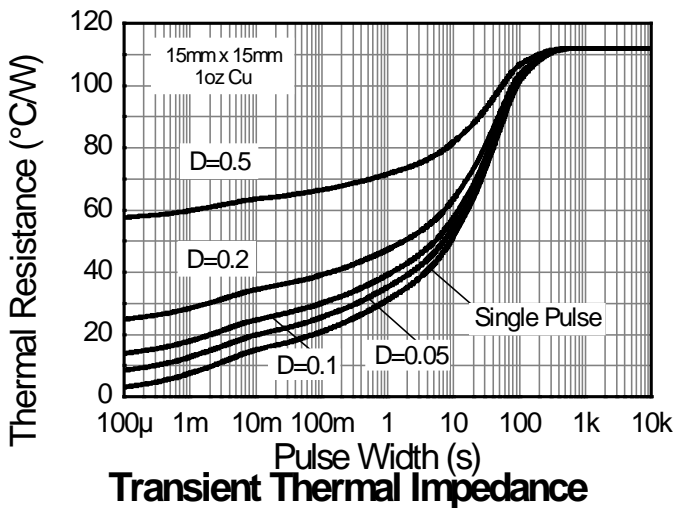
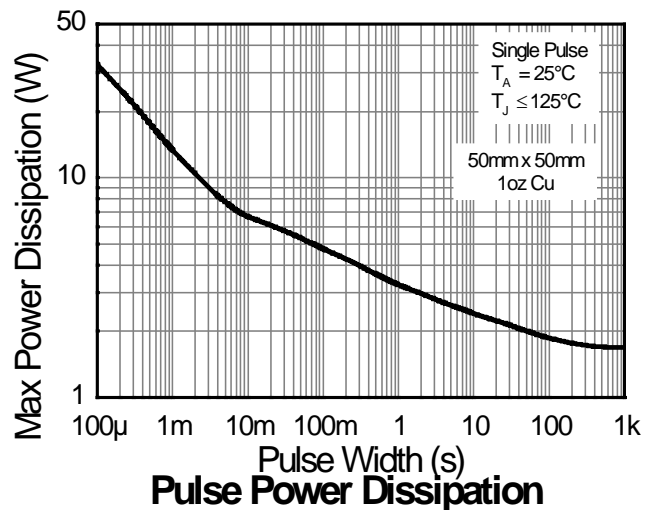
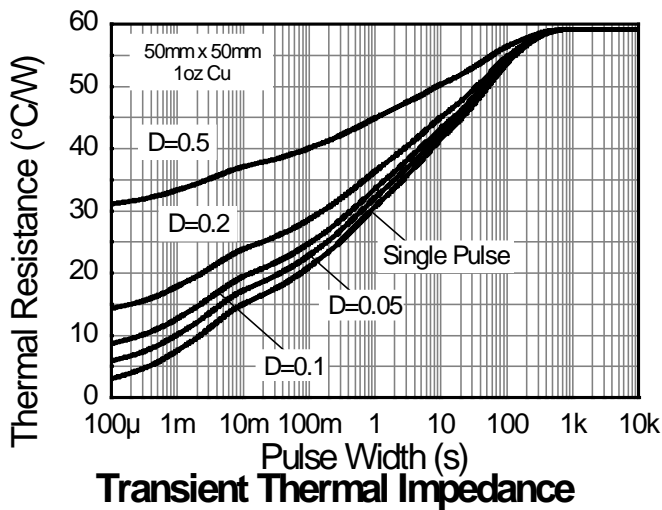
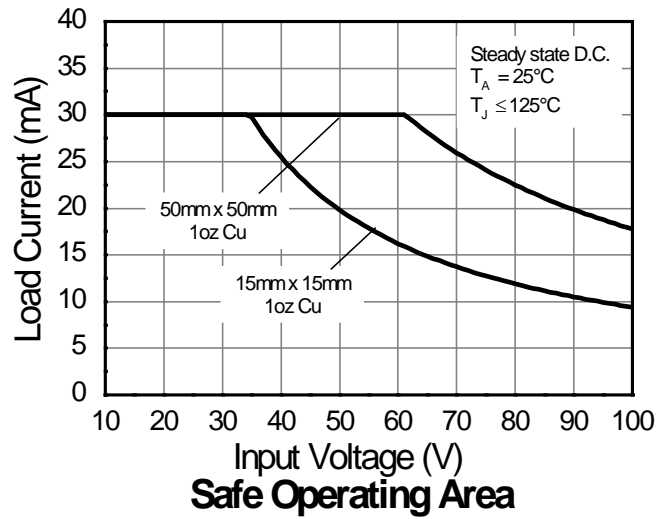
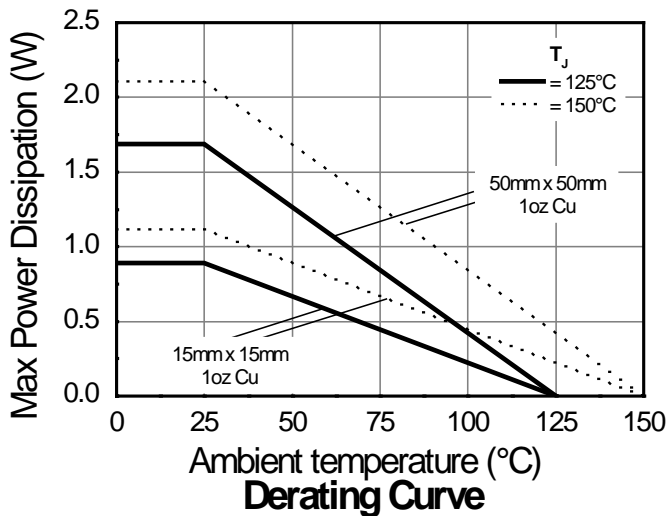
| Characteristic                                           | Symbol                            | Value       | Unit |
|----------------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation                                        | P <sub>D</sub>                    | (Note 5)    | 1.7  |
|                                                          |                                   | (Note 6)    | 0.89 |
| Thermal Resistance, Junction to Ambient                  | R <sub>JA</sub>                   | (Note 5)    | 59   |
|                                                          |                                   | (Note 6)    | 112  |
| Thermal Resistance, Junction to Lead                     | R <sub>JL</sub>                   | 20          | °C/W |
| Recommended Operating Junction Temperature Range         | T <sub>J</sub>                    | -40 to +125 | °C   |
| Maximum Operating Junction and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 | °C   |

## ESD Ratings (Note 10)

| Characteristics                            | Symbols | Value  | Unit | JEDEC Class |
|--------------------------------------------|---------|--------|------|-------------|
| Electrostatic Discharge – Human Body Model | ESD HBM | • 4000 | V    | 3A          |
| Electrostatic Discharge – Machine Model    | ESD MM  | • 300  | V    | B           |

- Notes:
- For a device mounted on 50mm X 50mm 1oz copper that is on a single-sided FR4 PCB; device measured under still air conditions whilst operating in steady-state.
  - Same as note 5, except mounted on 15mm X 15mm 1oz copper.
  - Same as note 6, except measured with a single pulse width = 100µs and V<sub>IN</sub>=48V.
  - Same as note 6, except measured with a single pulse width = 10ms and V<sub>IN</sub>=48V.
  - Thermal resistance from junction to solder-point (on the exposed collector pad).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**

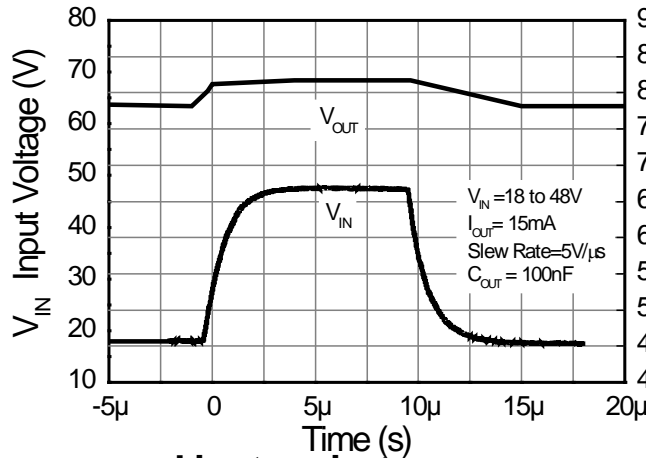


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

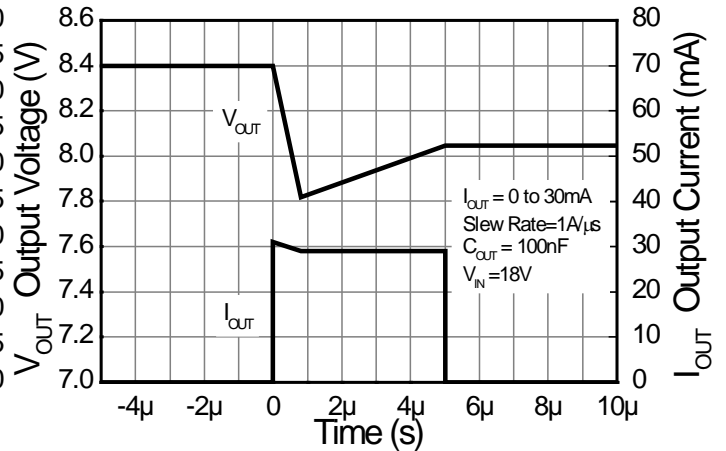
| Characteristic                                                      | Symbol                  | Min  | Typ        | Max        | Unit  | Test Condition                                                                                                                                    |
|---------------------------------------------------------------------|-------------------------|------|------------|------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Voltage                                                      | V <sub>OUT</sub>        | 7.38 | 8.2        | 9.02       | V     | V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 30mA<br>T <sub>J</sub> = +25°C                                                                          |
| Line Regulation (Note 11)                                           | • V <sub>OUT</sub>      | —    | 10         | 300        | mV    | V <sub>IN</sub> = 12 to 72V<br>I <sub>OUT</sub> = 15mA, T <sub>J</sub> = +25°C                                                                    |
| Temperature Coefficient                                             | • V <sub>OUT</sub> /• T | —    | 10         | —          | mV/°C | T <sub>J</sub> = -40°C to +125°C<br>V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 15mA                                                                |
| Load Regulation (Note 12)                                           | • V <sub>OUT</sub>      | —    | -180       | -300       | mV    | I <sub>OUT</sub> = 1 to 30mA<br>V <sub>IN</sub> = 48V, T <sub>J</sub> = +25°C                                                                     |
| Minimum Value of Input Voltage Required to Maintain Line Regulation | V <sub>IN(MIN)</sub>    | 12   | —          | —          | V     | —                                                                                                                                                 |
| Quiescent Current                                                   | I <sub>Q</sub>          | —    | 275<br>650 | 500<br>900 | μA    | V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 10μA, T <sub>J</sub> = +25°C<br>V <sub>IN</sub> = 100V, I <sub>OUT</sub> = 10μA, T <sub>J</sub> = +25°C |
| Power Supply Rejection Ratio                                        | PSRR                    | —    | 8          | —          | dB    | C <sub>OUT</sub> = 100nF, I <sub>OUT</sub> = 30mA,<br>V <sub>OUT</sub> = 8.2V, V <sub>IN</sub> = 10V, f = 100Hz                                   |

Notes: 11. Line regulation • V<sub>OUT</sub> = V<sub>OUT</sub>(@ V<sub>IN</sub> = 72V) - V<sub>OUT(NOMINAL)</sub>(@ V<sub>IN</sub> = 12V)  
 12. Load regulation • V<sub>OUT</sub> = V<sub>OUT</sub>(@ I<sub>OUT</sub> = 30mA) - V<sub>OUT(NOMINAL)</sub>(@ I<sub>OUT</sub> = 1mA)

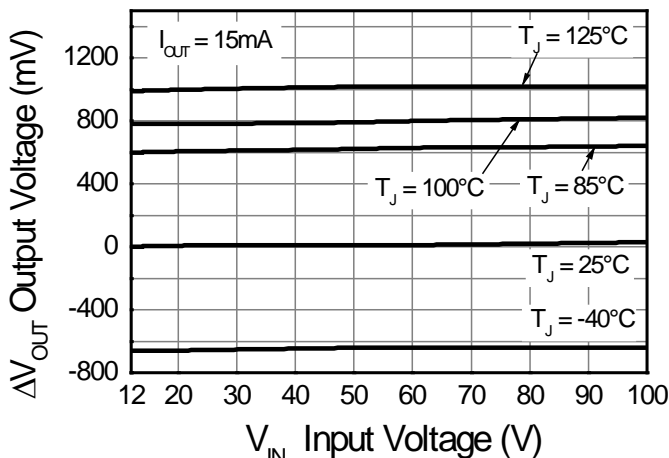
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



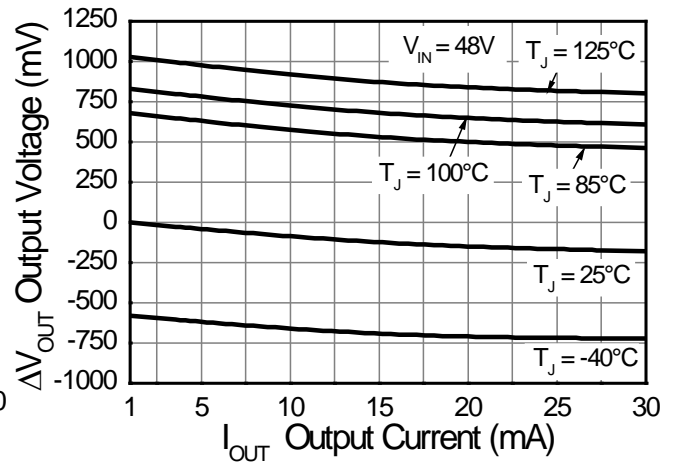
**Line transient response**



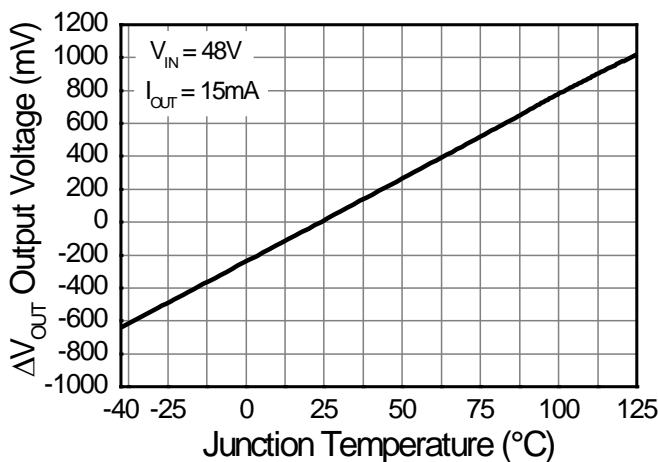
**Load transient response**



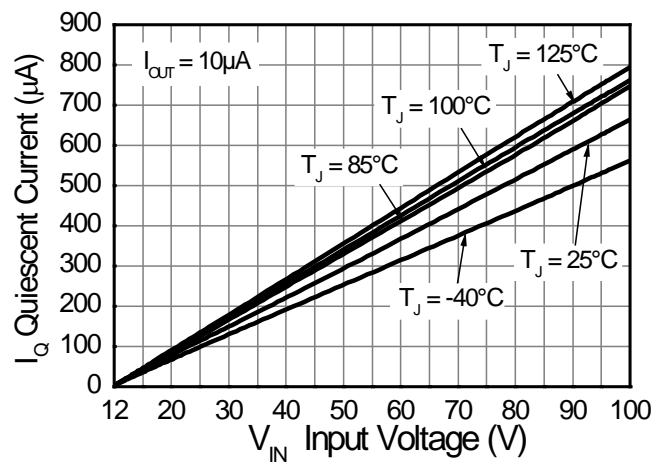
**Line Regulation (Note 13)**



**Load Regulation (Note 14)**



**Temperature Coefficient (Note 15)**

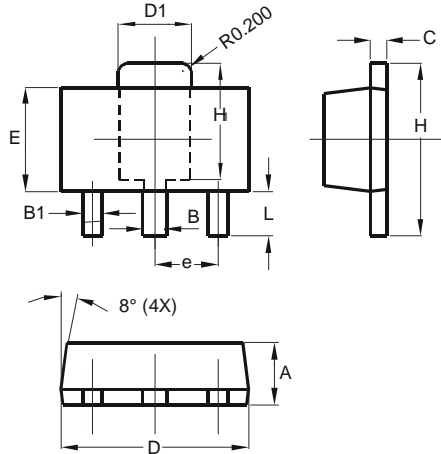


**Quiescent Current**

Notes:  
13. Line regulation •  $V_{OUT} = V_{OUT} - V_{OUT(NOMINAL)}$  (@  $V_{IN} = 12\text{V}$ ,  $I_{OUT} = 15\text{mA}$ ,  $T_J = 25^\circ\text{C}$ )  
14. Load regulation •  $V_{OUT} = V_{OUT} - V_{OUT(NOMINAL)}$  (@  $V_{IN} = 48\text{V}$ ,  $I_{OUT} = 1\text{mA}$ ,  $T_J = 25^\circ\text{C}$ )  
15. Temperature Coefficient •  $V_{OUT} = V_{OUT} - V_{OUT(NOMINAL)}$  (@  $V_{IN} = 48\text{V}$ ,  $I_{OUT} = 15\text{mA}$ ,  $T_J = 25^\circ\text{C}$ )

## Package Outline Dimensions

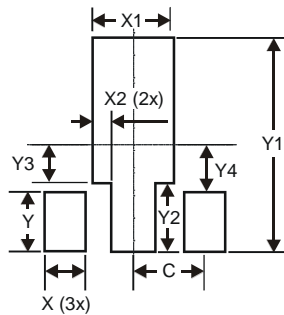
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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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