

100V INPUT, 12V 30mA REGULATOR TRANSISTOR

Description

The ZXTR2012Z monolithically integrates a transistor, Zener diode and resistor to function as a high voltage linear regulator. The device regulates with a 12V nominal output at 15mA. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a SOT89 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

Applications

Supply voltage regulation in:

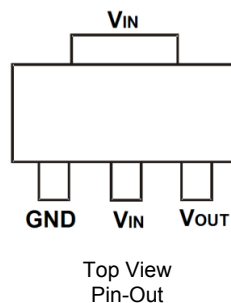
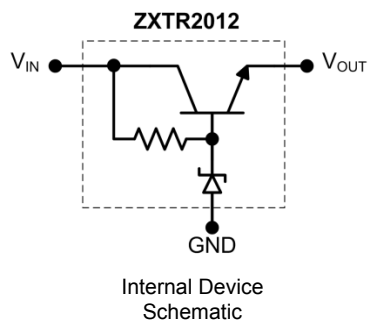
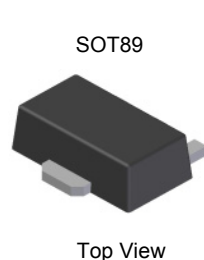
- Networking
- Telecom
- Power Over Ethernet (PoE)

Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 15V to 100V
- Output Voltage = 12V $\pm$ 10%
- Fully integrated into a 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)



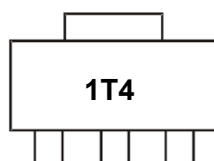
Pin Name	Pin Function
VIN	Input Supply
GND	Power Ground
VOUT	Voltage Output

Ordering Information (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTR2012Z-7	SOT89	1T4	7	12	1,000
ZXTR2012Z-13	SOT89	1T4	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 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



1T4 = Product Type Marking Code

Absolute Maximum Ratings (Voltage relative to GND, @T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Input Supply Voltage	V _{IN}	-0.3 to 100	V
Continuous Input & Output Current	I _{IN} , I _{OUT}	550	mA
Peak Pulsed Input & Output Current	I _{IM} , I _{OM}	2	A
Maximum Voltage applied to V _{OUT}	V _{OUT(max)}	18	V

Maximum Current at V_{IN} = 48V (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current (Note 7)	I _{OUT}	47	mA
Pulsed Output Current (Note 8)	I _{OM}	880	mA
(Note 9)		180	

Thermal Characteristics

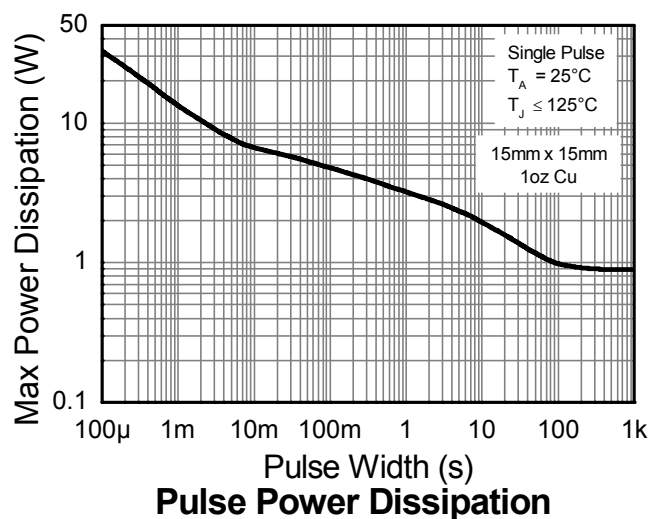
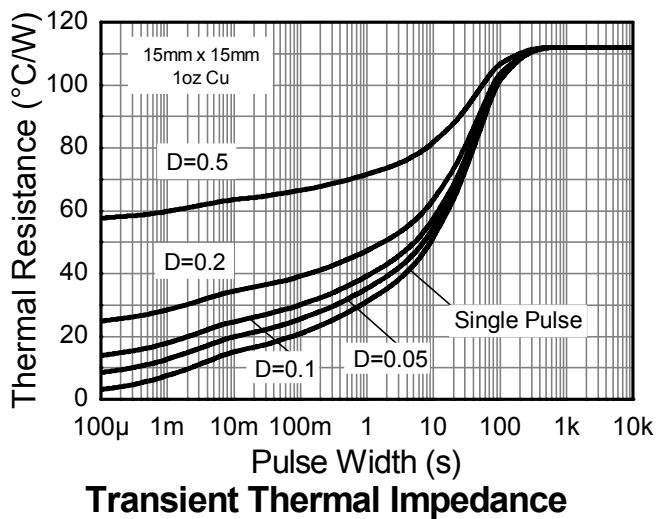
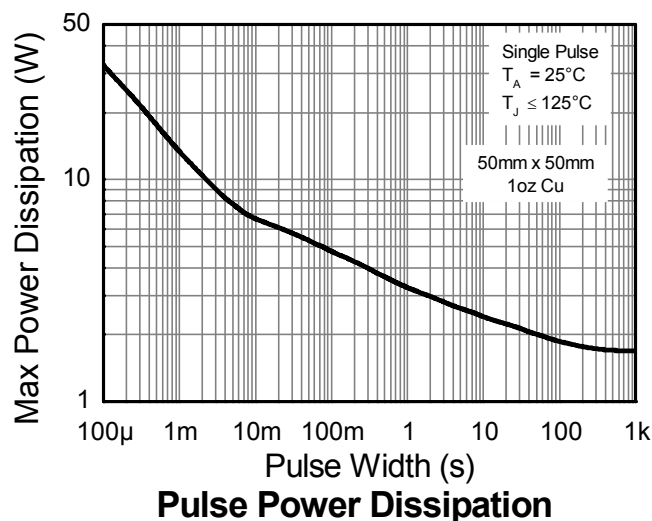
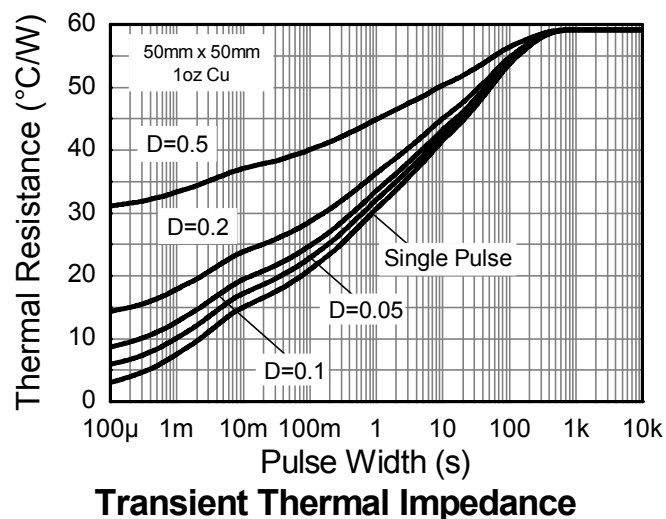
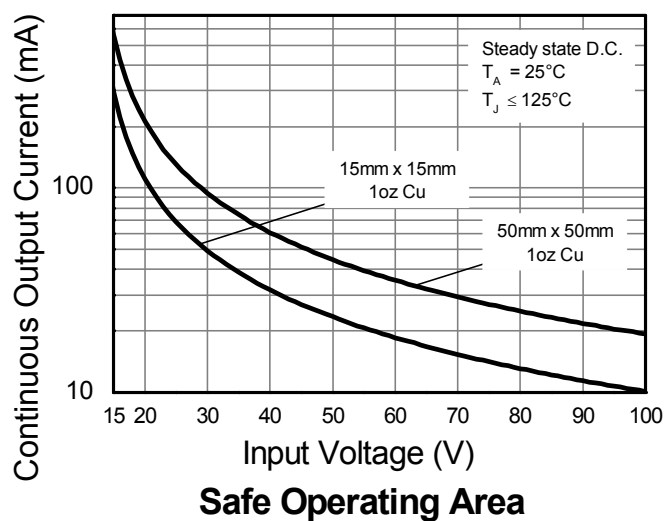
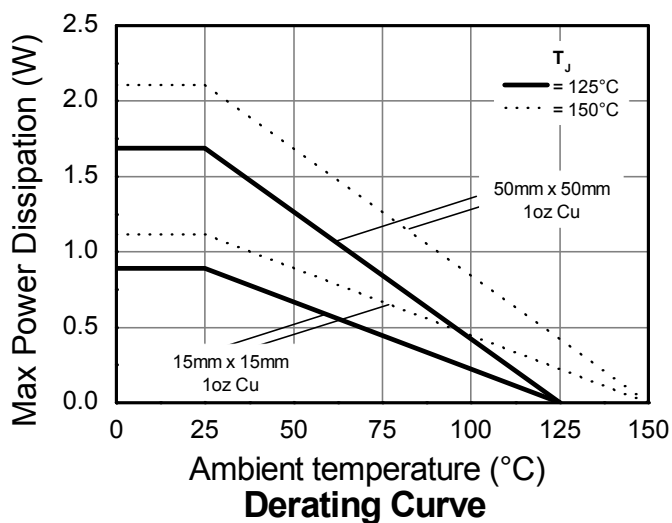
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	1.7	W
(Note 6)		0.89	
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	59	°C/W
(Note 6)		112	
Thermal Resistance, Junction to Lead (Note 10)	R _{θJL}	20	
Thermal Resistance, Junction to Case (Note 10)	R _{θJC}	15.7	
Recommended Operating Junction Temperature Range	T _J	-40 to +125	°C
Maximum Operating Junction and Storage Temperature Range	T _J , T _{STG}	-65 to +150	

ESD Ratings (Note 11)

Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted with the exposed V_{IN} pad on 50mm x 50mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is 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 5, whilst operating at V_{IN} = 48V. Refer to Safe Operating Area for other Input Voltages.
 - Same as note 5, except measured with a single pulse width = 100μs and V_{IN} = 48V.
 - Same as note 5, except measured with a single pulse width = 10ms and V_{IN} = 48V.
 - R_{θJL} = Thermal resistance from junction to solder-point (on the exposed V_{IN} pad).
 - R_{θJC} = Thermal resistance from junction to the top of case.
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information



Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

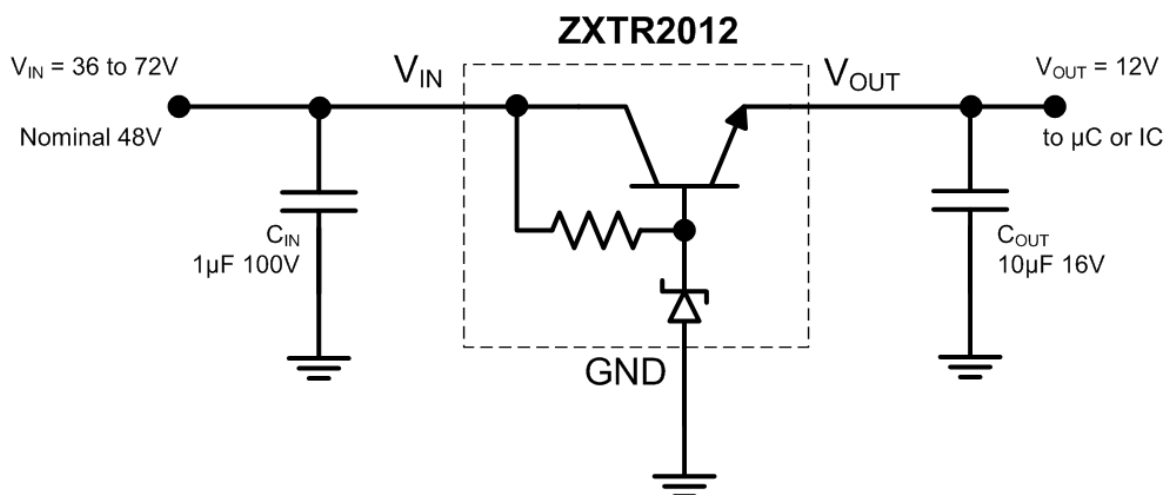
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V _{OUT}	10.8	12	13.2	V	V _{IN} = 48V, I _{OUT} = 15mA
Line Regulation (Notes 12 & 13)	ΔV _{OUT}	—	240	750	mV	V _{IN} = 15 to 72V, I _{OUT} = 15mA
Temperature Coefficient	ΔV _{OUT} /ΔT	—	8.0	—	mV/°C	T _J = -40°C to +125°C V _{IN} = 48V, I _{OUT} = 15mA
Load Regulation (Notes 12 & 14)	ΔV _{OUT}	—	-450 -600	-600 -750	mV	I _{OUT} = 0.1 to 30mA, V _{IN} = 48V I _{OUT} = 0.1 to 100mA, V _{IN} = 48V
Minimum Value of Input Voltage Required to Maintain Line Regulation	V _{IN(MIN)}	15	—	—	V	—
Quiescent Current	I _Q	—	240 590	400 900	μA	V _{IN} = 48V, I _{OUT} = 10μA V _{IN} = 100V, I _{OUT} = 10μA
Power Supply Rejection Ratio	ΔV _{IN} /ΔV _{OUT}	—	45	—	dB	C _{OUT} = 100nF, I _{OUT} = 15mA, V _{OUT} = 12V, V _{IN} = 15 to 100V, f=100Hz

Notes:

12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

13. Line regulation ΔV_{OUT} = V_{OUT}(@ V_{IN} = 72V) – V_{OUT}(@ V_{IN} = 15V)

14. Load regulation ΔV_{OUT} = V_{OUT}(@ I_{OUT} = 30mA) – V_{OUT}(@ I_{OUT} = 0.1mA)
ΔV_{OUT} = V_{OUT}(@ I_{OUT} = 100mA) – V_{OUT}(@ I_{OUT} = 0.1mA)

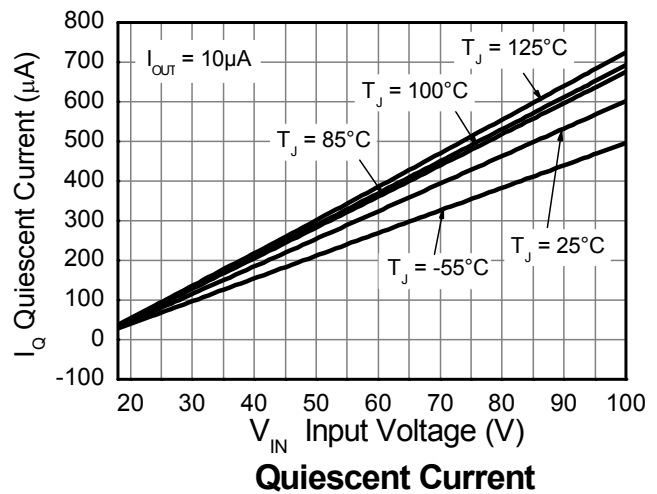
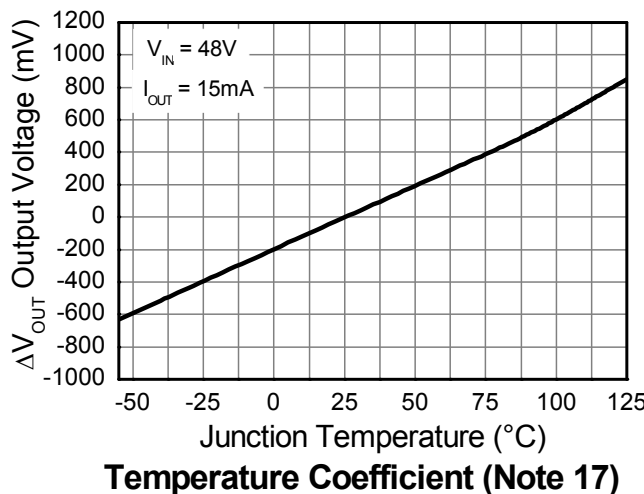
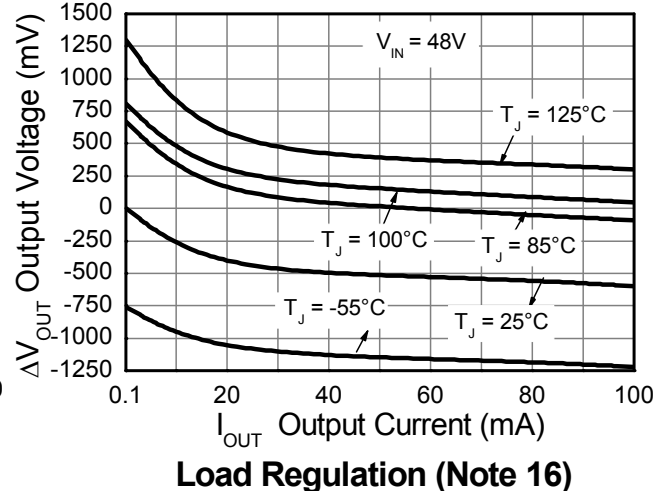
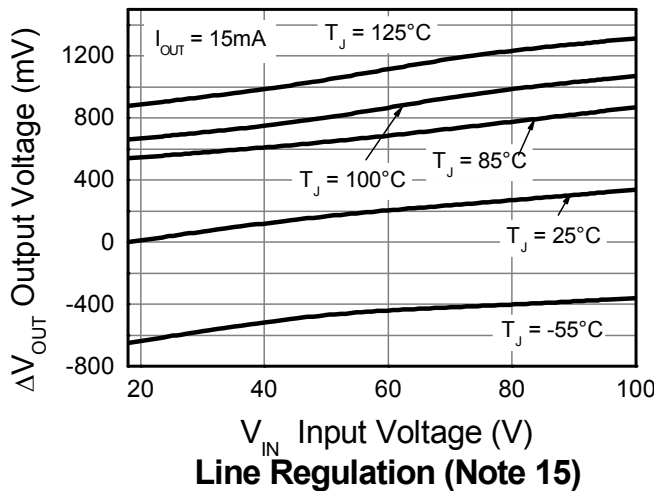
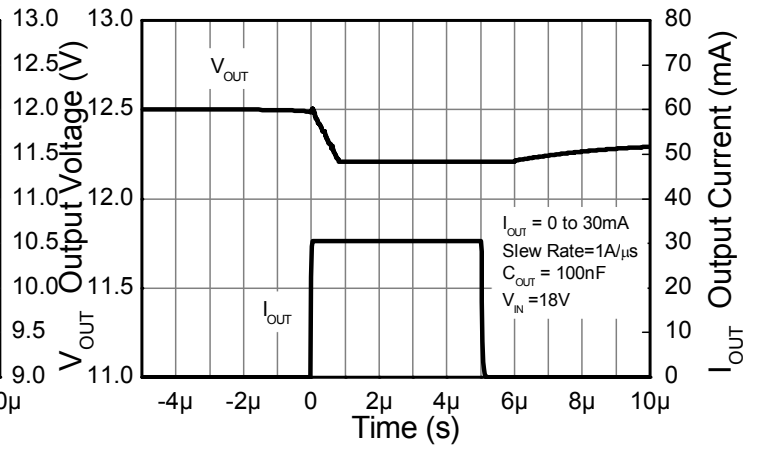
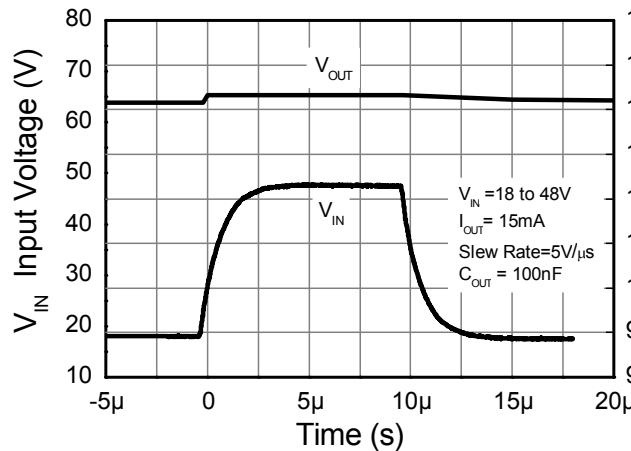
Typical Application Circuit


Example of an 12V regulated supply from a nominal 48V for powering a Controller IC.

Pin Functions

Pin Name	Pin Function	Notes
V _{IN}	Input Supply	To maintain output regulation the input voltage can vary from 15V to 100V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V _{OUT}	Voltage Output	Outputs a regulated 12V. It is recommended to connect a 10μF capacitor to GND. Minimum of 10μA must be drawn from V _{OUT} to maintain regulation. The pin can be pulled high to a maximum of 18V with respect to ground.

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

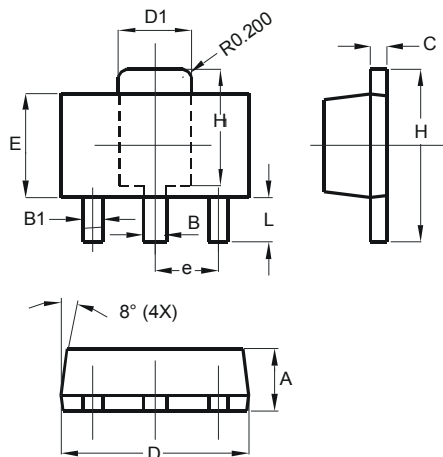


Notes:

15. Line regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 15V, I_{OUT} = 15mA, T_J = +25^\circ\text{C})$
16. Load regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48V, I_{OUT} = 0.1mA, T_J = +25^\circ\text{C})$
17. Temperature Coefficient $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48V, I_{OUT} = 15mA, T_J = +25^\circ\text{C})$

Package Outline Dimensions

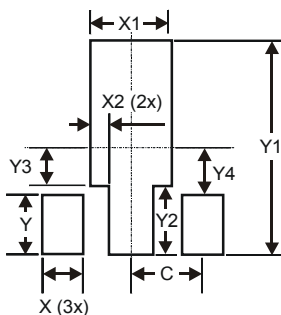
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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