

ZXTR2005Z

100V INPUT, 5V 30mA REGULATOR TRANSISTOR

Description

The ZXTR2005Z monolithically integrates a transistor, Zener diode and resistor to function as a high voltage linear regulator. The device regulates with a 5V 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.

Features


- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 10 to 100V
- Output Voltage = 5V ± 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**

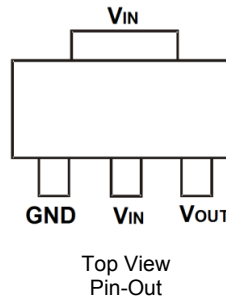
Applications

Supply voltage regulation in:

- Networking
- Telecom
- Power Over Ethernet (PoE)

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 _{IN} | Input Supply |
| GND | Power Ground |
| V _{OUT} | Voltage Output |

Ordering Information (Note 4)

| Product | Package | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|---------|---------|--------------------|-----------------|-------------------|
| ZXTR2005Z-7 | SOT89 | 1T3 | 7 | 12 | 1,000 |
| ZXTR2005Z-13 | SOT89 | 1T3 | 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



1T3 = Product Type Marking Code

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

| Characteristic | Symbol | Value | Unit |
|---|------------------------------------|-------------|------|
| Input Voltage | V _{IN} | -0.3 to 100 | V |
| Continuous Input & Output Current | I _{IN} , I _{OUT} | 350 | mA |
| Peak Pulsed Input & Output Current | I _{IM} , I _{OM} | 2 | A |
| Maximum Voltage applied to V _{OUT} | V _{OUT(max)} | 11 | V |

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

| Characteristic | Symbol | Value | Unit |
|---------------------------|------------------|-------|------|
| Continuous Output Current | I _{OUT} | 38 | mA |
| Pulsed Output Current | I _{OM} | 740 | mA |
| | | 150 | |

Thermal Characteristics

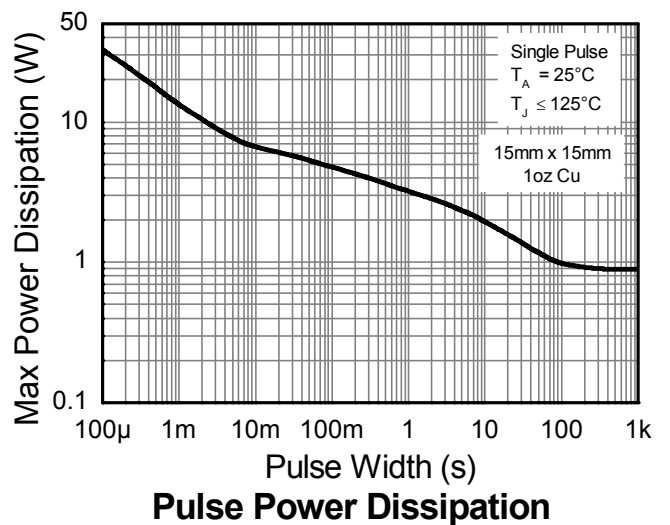
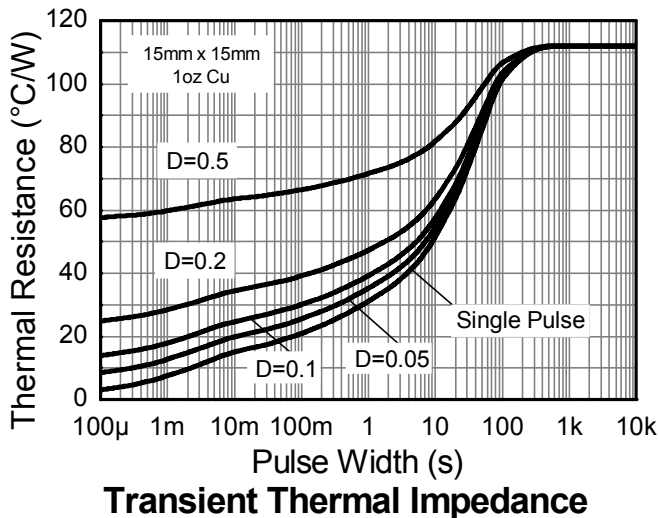
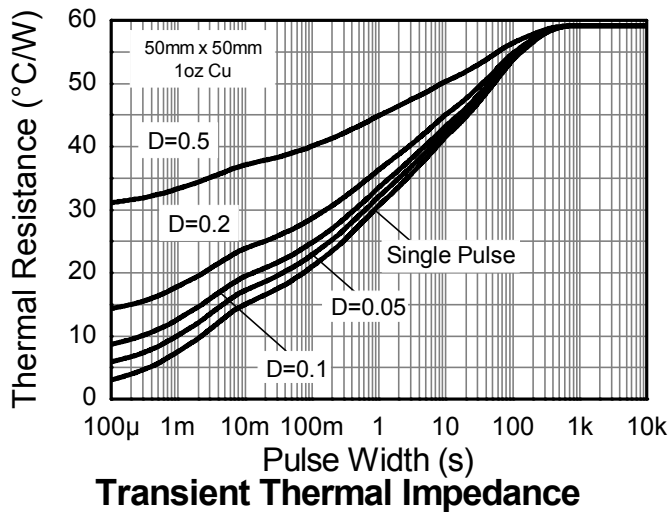
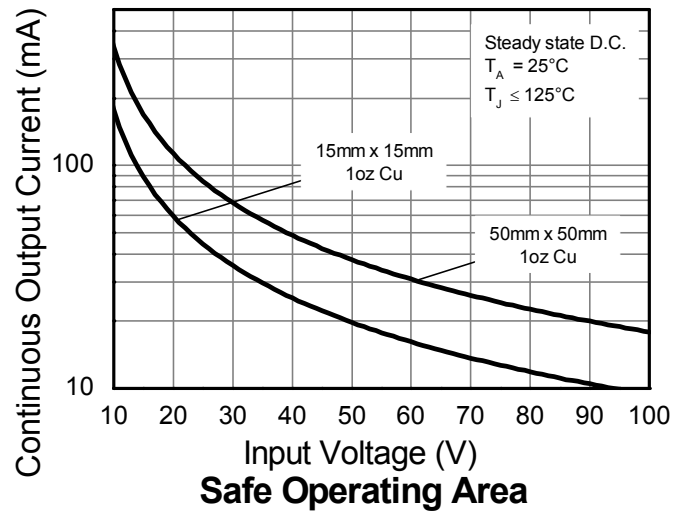
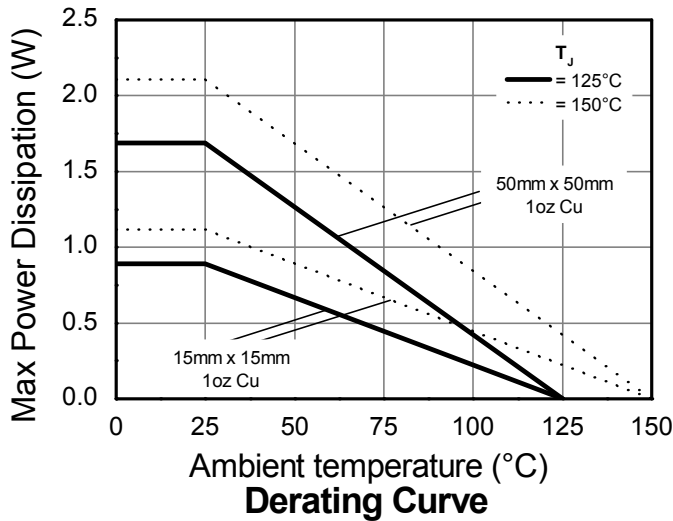
| Characteristic | Symbol | Value | Unit | |
|--|-----------------------------------|-------------|------|----|
| Power Dissipation | P _D | 1.7 | W | |
| | | 0.89 | | |
| Thermal Resistance, Junction to Ambient | R _{θJA} | 59 | °C/W | |
| | | 112 | | |
| Thermal Resistance, Junction to Lead | R _{θJL} | 20 | | |
| Thermal Resistance, Junction to Case | 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 | | °C |

ESD Ratings (Note 11)

| Characteristics | Symbols | 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:
- 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} | 4.5 | 5.0 | 5.5 | V | V _{IN} = 48V, I _{OUT} = 15mA |
| Line Regulation (Notes 12 & 13) | ΔV _{OUT} | — | 195 | 300 | mV | V _{IN} = 10 to 72V, I _{OUT} = 15mA |
| Temperature Coefficient | ΔV _{OUT} /ΔT | — | 7.0 | — | mV/°C | T _J = -40°C to +125°C V _{IN} = 48V, I _{OUT} = 15mA |
| Load Regulation (Notes 12 & 14) | ΔV _{OUT} | — | -185 -205 | -350 -400 | 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)} | 10 | — | — | V | — |
| Quiescent Current | I _Q | — | 260 550 | 500 900 | 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} = 5V, V _{IN} = 10 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} = 10V)
 - 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

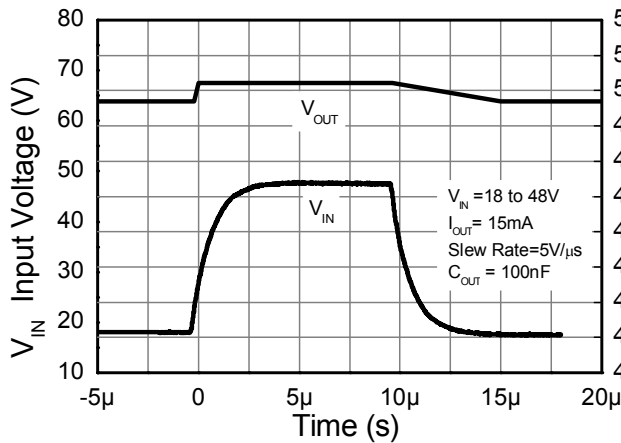


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

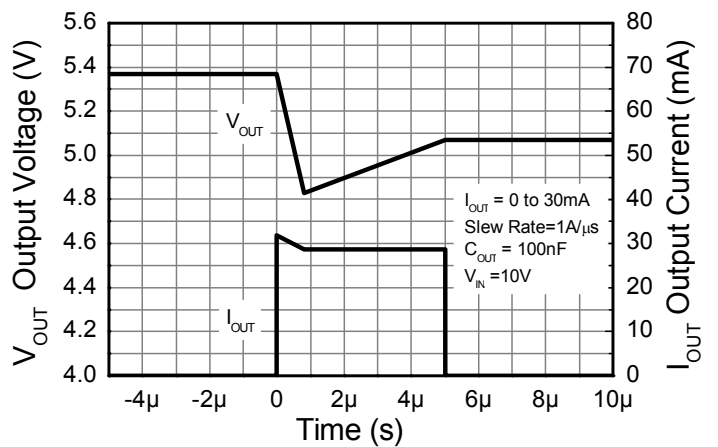
Pin Functions

| Pin Name | Pin Function | Notes |
|------------------|----------------|--|
| V _{IN} | Input Supply | To maintain output regulation the input voltage can vary from 10V 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 5V. 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 11V with respect to ground. |

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



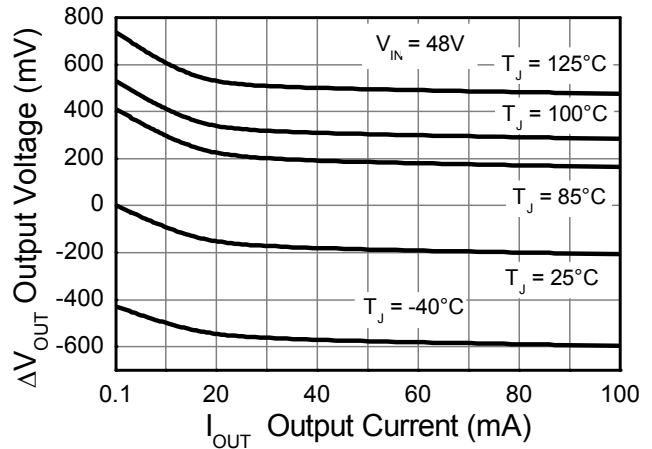
Line transient response



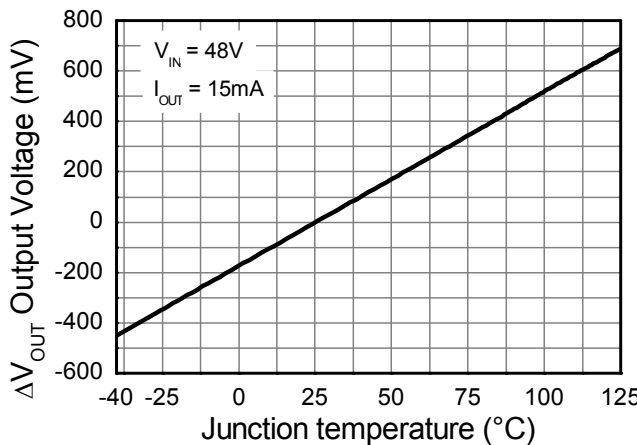
Load transient response



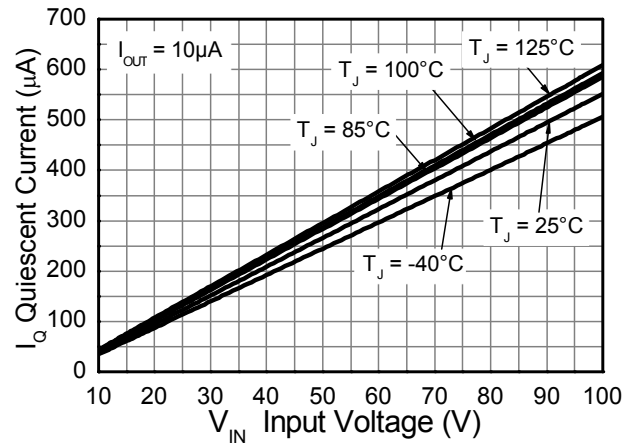
Line Regulation (Note 15)



Load Regulation (Note 16)



Temperature Coefficient (Note 17)

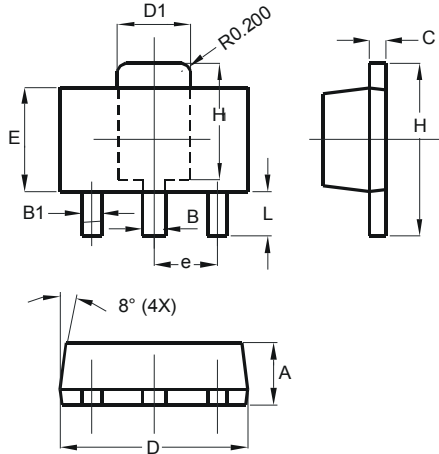


Quiescent Current

Notes: 15. Line regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 10\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$
 16. Load regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48\text{V}, I_{OUT} = 0.1\text{mA}, T_J = +25^\circ\text{C})$
 17. Temperature Coefficient $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$

Package Outline Dimensions

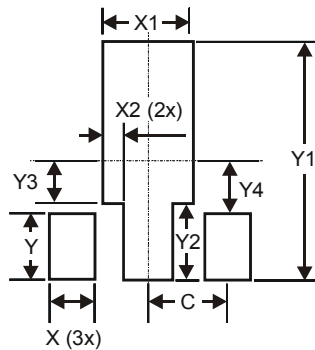
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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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