

## Description

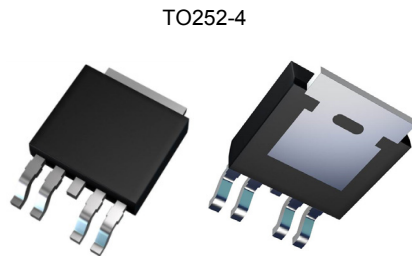
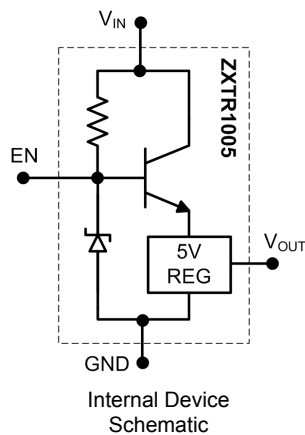
The ZXTR1005K4 is a high voltage regulator with fixed output voltage of  $5V \pm 2\%$  and a 50mA drive capability. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a TO252 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

The device also features an enable pin which disables the regulator when pulled low.

## Applications

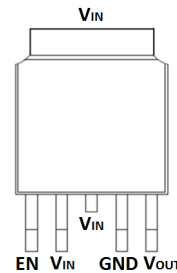
Supply voltage regulation in:

- Networking
- Telecom
- Power Over Ethernet (PoE)



Top View

Bottom View



Top View  
Pin-Out

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

## Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 10 to 100V
- Output Voltage =  $5V \pm 2\%$
- $\pm 4\%$  tolerance over  $-55$  to  $+125^\circ\text{C}$
- Output Current up to 50mA
- Toggle Output On/Off with Enable pin
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

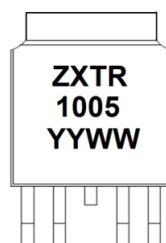
- Case: TO252-4
- Case material: Molded Plastic. "Green" Molding Compound.
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208  $\text{e3}$
- Weight: 0.34 grams (approximate)

## Ordering Information (Note 4)

Product	Package	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXTR1005K4-13	TO252-4	ZXTR 1005	13	16	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



ZXTR 1005 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 13 = 2013)  
 WW = Week (01-52)

**Absolute 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>	-0.3 to 100	V
Enable Current	I <sub>EN</sub>	±1	mA
Continuous Input & Output Current	I <sub>IN</sub> , I <sub>OUT</sub>	100	mA
Peak Pulsed Input & Output Current	I <sub>IM</sub> , I <sub>OM</sub>	100	mA
Maximum Voltage applied to V <sub>OUT</sub>	V <sub>OUT(max)</sub>	10	V

**Maximum Current** (@ V<sub>IN</sub> = 48V, T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current	I <sub>OUT</sub>	50	mA
Pulsed Output Current	I <sub>OM</sub>	100	mA
		100	

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

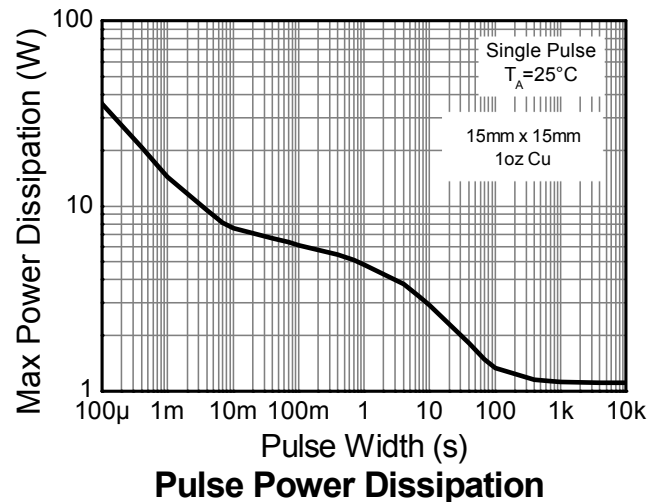
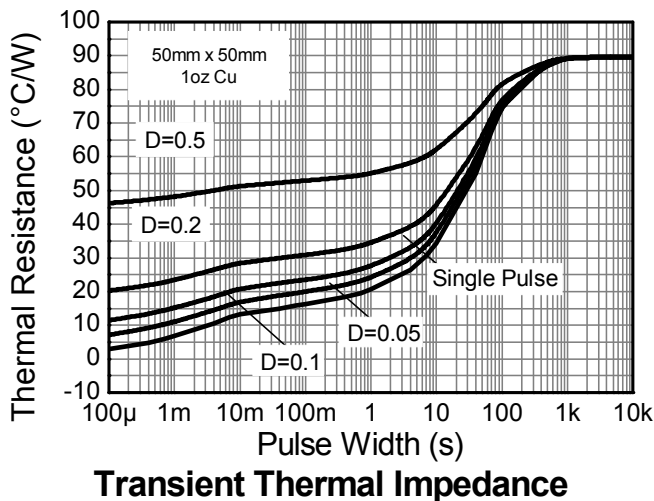
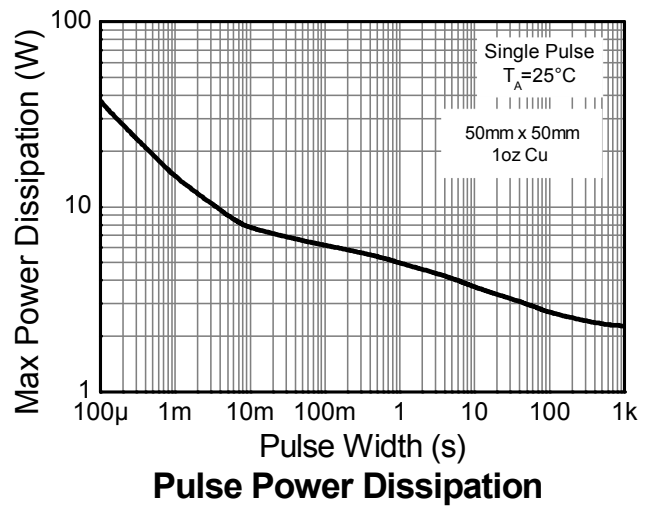
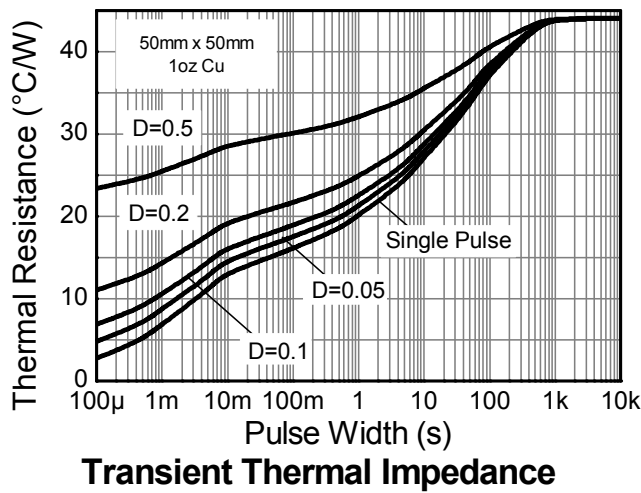
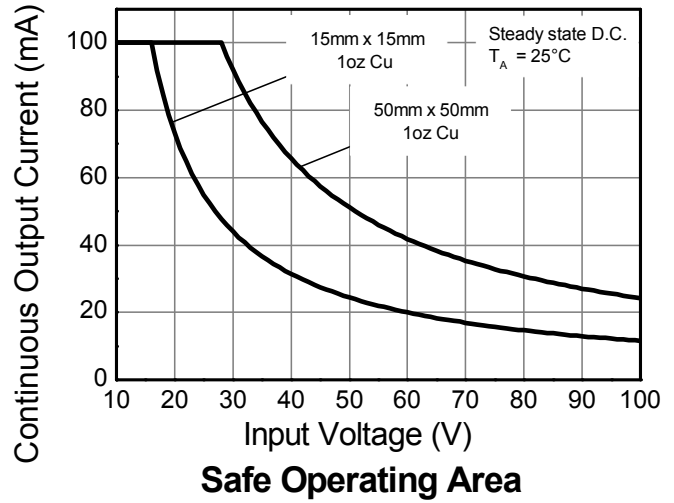
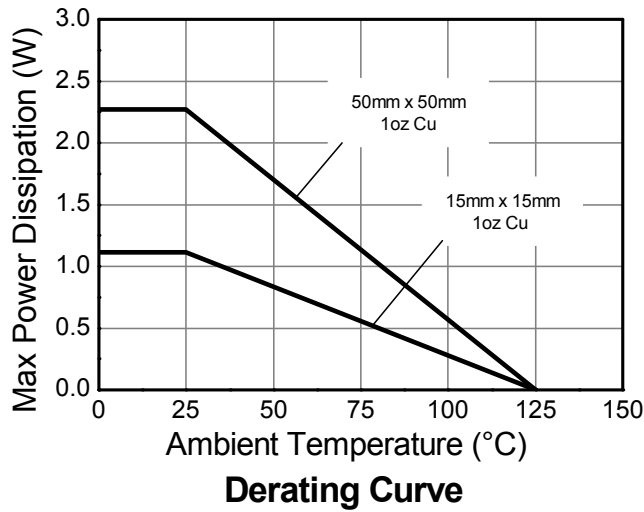
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	2.3	W
		1.1	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	44	°C/W
		90	
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	8.39	
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	8.15	
Maximum Operating Junction Temperature Range	T <sub>J</sub>	-55 to +125	
Storage Temperature Range	T <sub>STG</sub>	-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<sub>IN</sub> 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<sub>IN</sub>=48V this is thermally limited. Refer to Safe Operating Area for other Input Voltages.
  - Same as note 5, except measured with a single pulse width = 100µs and V<sub>IN</sub>=48V. This is limited by the absolute maximum I<sub>OM</sub> rating.
  - Same as note 5, except measured with a single pulse width = 10ms and V<sub>IN</sub>=48V. This is limited by the absolute maximum I<sub>OM</sub> rating.
  - R<sub>θJL</sub> = Thermal resistance from junction to solder-point (on the exposed V<sub>IN</sub> pad).
  - R<sub>θJC</sub> = 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** (Voltage relative to GND, @T<sub>A</sub> = +25°C, unless otherwise specified.)

**Enable Output with EN = OPEN (i.e. -100nA < I<sub>EN</sub> < 100nA)**

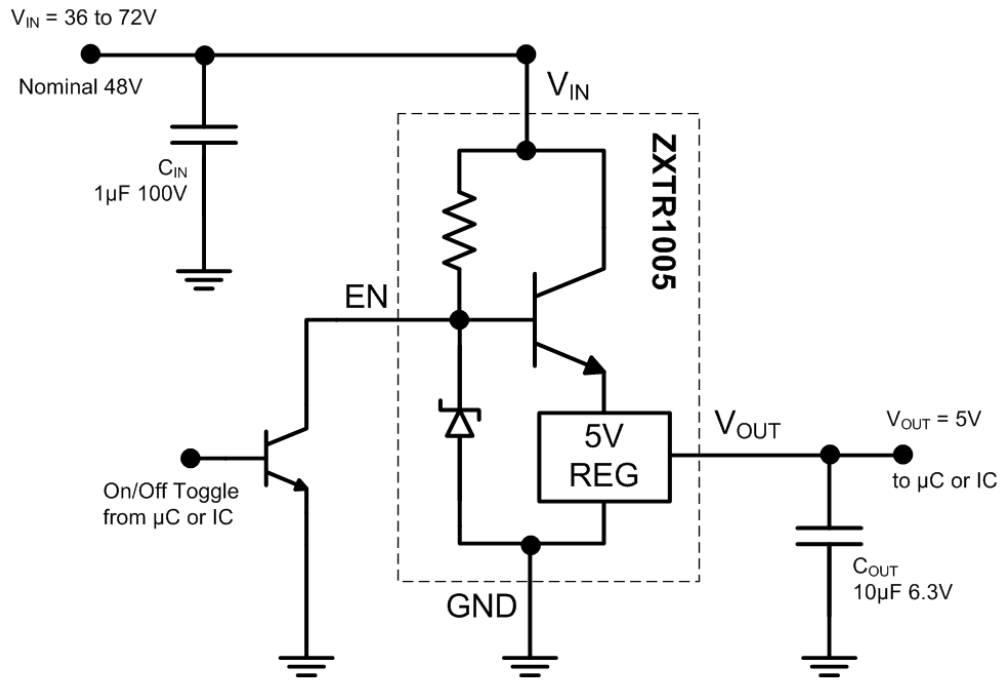
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V <sub>OUT</sub>	4.9	5.0	5.1	V	V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 15mA
Line Regulation (Note 12 & 13)	ΔV <sub>OUT</sub>	-10	2	10	mV	V <sub>IN</sub> = 10 to 100V, I <sub>OUT</sub> = 15mA
Average Temperature Coefficient	ΔV <sub>OUT</sub> /ΔT	—	0.44	0.7	mV/°C	T <sub>J</sub> = -55°C to +125°C V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 15mA
Load Regulation (Note 12 & 14)	ΔV <sub>OUT</sub>	—	20	50	mV	I <sub>OUT</sub> = 0.1 to 50mA, V <sub>IN</sub> = 48V
Minimum Value of Input Voltage Required to Maintain Line Regulation	V <sub>IN(MIN)</sub>	10	—	—	V	—
Power Supply Rejection Ratio	ΔV <sub>IN</sub> /ΔV <sub>OUT</sub>	—	57	—	dB	C <sub>OUT</sub> = 100nF, I <sub>OUT</sub> = 15mA, V <sub>OUT</sub> = 5V, V <sub>IN</sub> = 10 to 100V, f = 100Hz
<b>Toggle Output On/Off</b>						
Enable Output	V <sub>OUT</sub>	4.9	5.0	5.1	V	EN = OPEN, -100nA < I <sub>EN</sub> < 100nA, V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 15mA
Disable Output	V <sub>OUT</sub>	—	0	1	V	EN = GND, -0.3V < V <sub>EN</sub> < 1V, V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 100nA
Quiescent Current (Note 12) with Enable Output	I <sub>Q</sub>	—	300 650	500 900	μA	EN = OPEN, V <sub>IN</sub> = 48V EN = OPEN, V <sub>IN</sub> = 100V
Quiescent Current (Note 12) with Disable Output	I <sub>Q</sub>	—	300 650	500 900	μA	EN = GND, V <sub>IN</sub> = 48V EN = GND, V <sub>IN</sub> = 100V

- Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.  
 13. Line regulation ΔV<sub>OUT</sub> = V<sub>OUT</sub>(@ V<sub>IN</sub> = 100V) – V<sub>OUT</sub>(@ V<sub>IN</sub> = 10V)  
 14. Load regulation ΔV<sub>OUT</sub> = V<sub>OUT</sub>(@ I<sub>OUT</sub> = 50mA) – V<sub>OUT</sub>(@ I<sub>OUT</sub> = 0mA)

**Pin Functions**

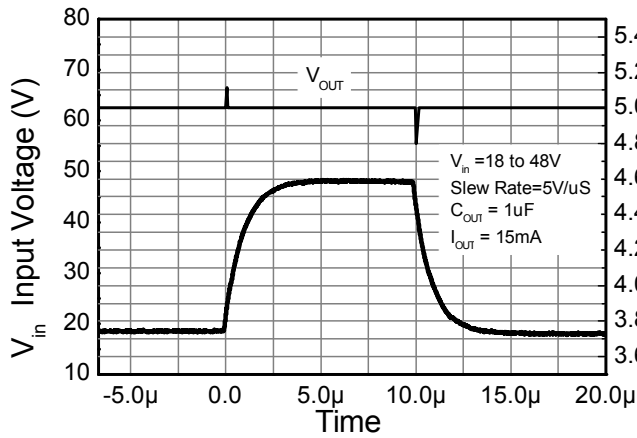
Pin Name	Pin Function	Notes
V <sub>IN</sub>	Input Supply	To maintain output regulation the input voltage can vary from 10 to 100V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V <sub>OUT</sub>	Voltage Output	Outputs a regulated 5V when drawing between 0.1 to 50mA current. It is recommended to connect a ≥100nF capacitor to GND to minimize the noise on the regulated output. The pin can be pulled high to a maximum of 10V with respect to ground.
EN	Enable Output	<p><b>Output Always On</b></p> <p>When the output state is required to be permanently on, then the EN pin should be left floating in an OPEN state.</p> <p><b>Toggle Output On/Off</b></p> <p>Toggle the regulator's output state between on (5V) and off (0V).</p> <p><b>Enable Output</b></p> <p>Leave the EN pin floating in an OPEN state.</p> <p><b>Disable Output</b></p> <p>Pull the EN pin to GND in a SHORT state.</p> <p>For example, see the Typical Application Circuit showing a transistor toggling the EN pin.</p>
		<p>EN pin = Do not connect</p> <p><b>Enable Output</b></p> <p>EN pin = -100nA &lt; I<sub>EN</sub> &lt; 100nA</p> <p><b>Disable Output</b></p> <p>EN pin = -0.3V &lt; V<sub>EN</sub> &lt; 1V</p>

**Typical Application Circuit**

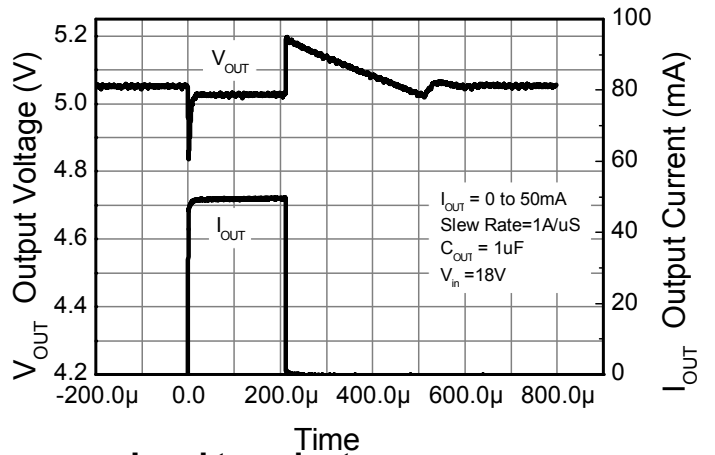


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

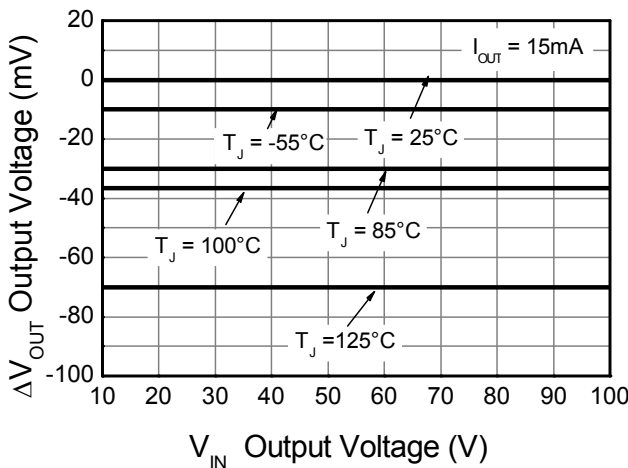
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



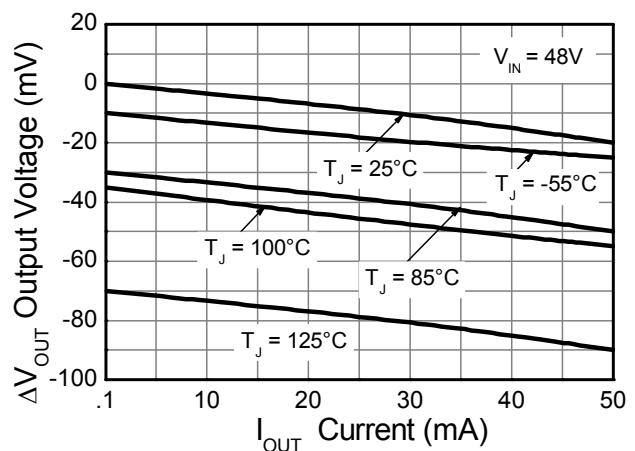
**Line transient response**



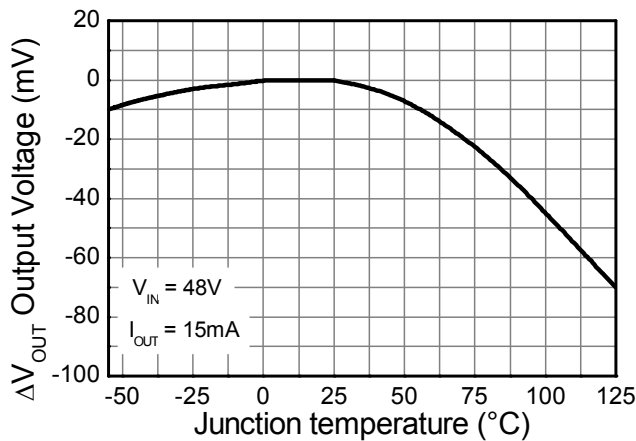
**Load transient response**



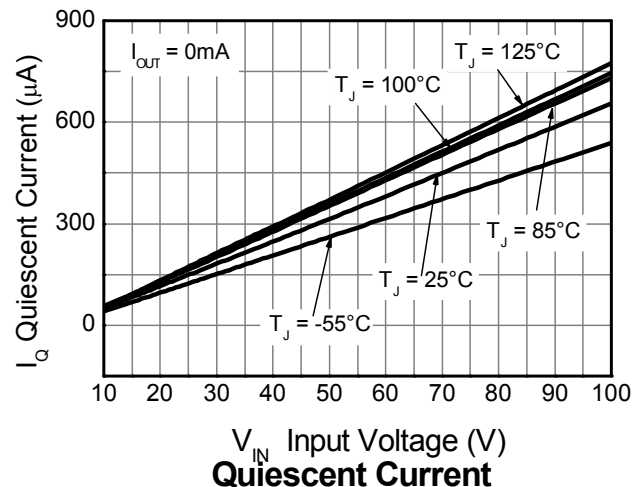
**Line Regulation (Note 15)**



**Load Regulation (Note 16)**



**Temperature Coefficient (Note 17)**

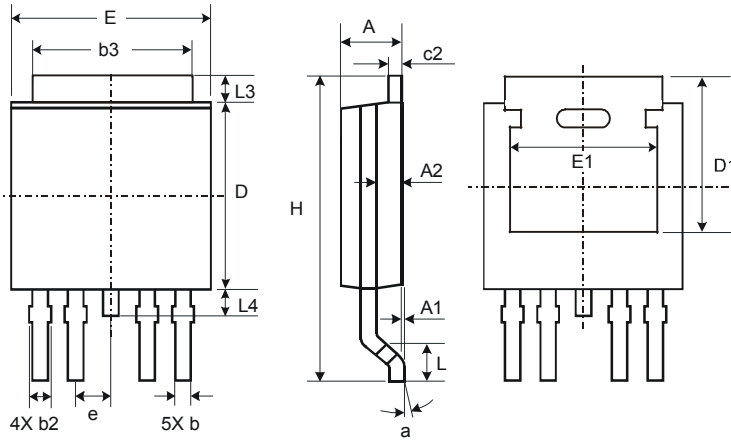


**Quiescent Current**

- Notes:
- 15. Line regulation  $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 10V, I_{OUT} = 15mA, T_J = +25^\circ\text{C})$
  - 16. Load regulation  $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48V, I_{OUT} = 0A, T_J = +25^\circ\text{C})$
  - 17. Temperature Coefficient  $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48V, I_{OUT} = 30mA, T_J = +25^\circ\text{C})$

## Package Outline Dimensions

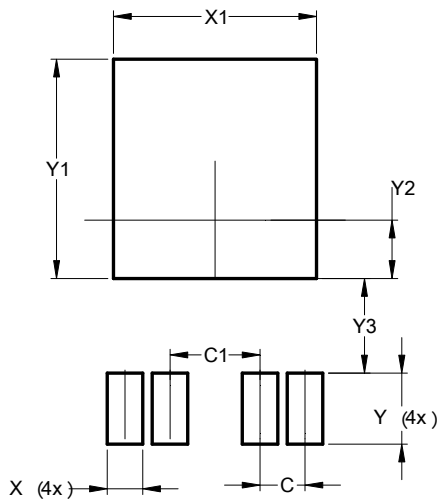
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



TO252-4			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.51	0.71	0.583
b2	0.61	0.79	0.70
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	1.27
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
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)
c	1.27
c1	2.54
X	1.00
X1	5.73
Y	2.00
Y1	6.17
Y2	1.64
Y3	2.66

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