

Description

The ZXTR2005P5 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 PowerDI[®]5 package, minimizing PCB area and reducing the number of components when compared with a multi-chip discrete solution.

Applications

Supply voltage regulation in:

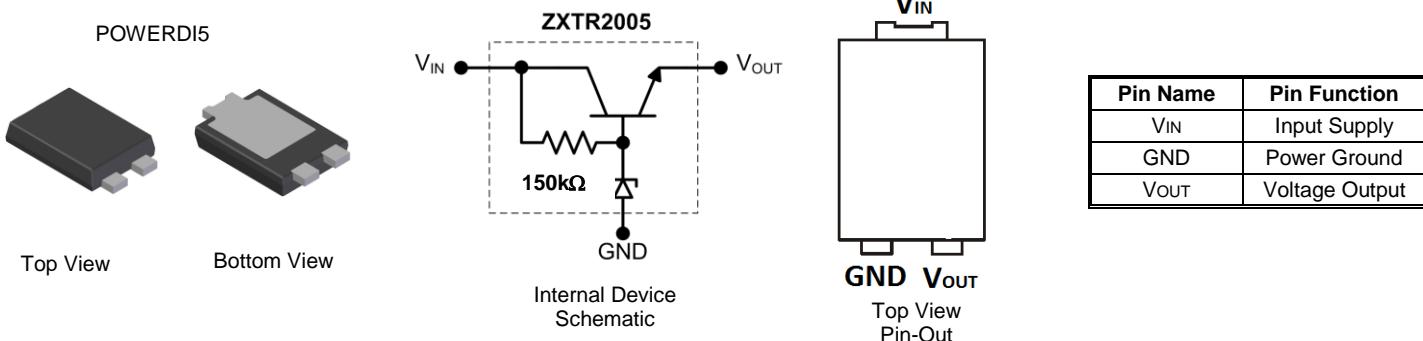
- Startup switch in DC-DC converters
- Networking
- Telecommunications
- Power over Ethernet (PoE)

Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 10V to 100V (For regulated output voltage)
- Output Voltage = 5V ± 10%
- 150kΩ resistor to limit quiescent current
- Fully integrated into a PowerDI5 package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 for High Reliability

Mechanical Data

- Case: PowerDI5
- 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 (e3)
- Weight: 0.100 grams (Approximate)



Ordering Information (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTR2005P5-13	PowerDI5	ZXTR2005	13	16	5,000

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 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



ZXTR2005 = Product Type Marking Code
 DII = Manufacturers' Code Marking
 K = Factory Designator
 YYWW = Date Code Marking
 YY = Last Two Digits of Year (ex: 17 for 2017)
 WW = Week code (01 to 53)

Absolute Maximum Ratings (Voltage relative to GND, @ $T_A = +25^\circ\text{C}$, 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}	360	mA
Peak Pulsed Input & Output Current	I_{IM}, I_{OM}	2	A
Maximum Voltage applied to V_{OUT}	$V_{OUT(max)}$	Smaller of $V_{IN}+5\text{V}$ or 11V	V

Maximum Current at $V_{IN} = 48\text{V}$ (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Continuous Output Current	I_{OUT}	42	mA
Pulsed Output Current	I_{OM}	740	mA
		150	

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation	P_D	1.82	W
		0.94	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	55	°C/W
		107	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	20	°C
Thermal Resistance, Junction to Case	$R_{\theta JC}$	17.8	
Recommended Operating Junction Temperature Range	T_J	-40 to +125	
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

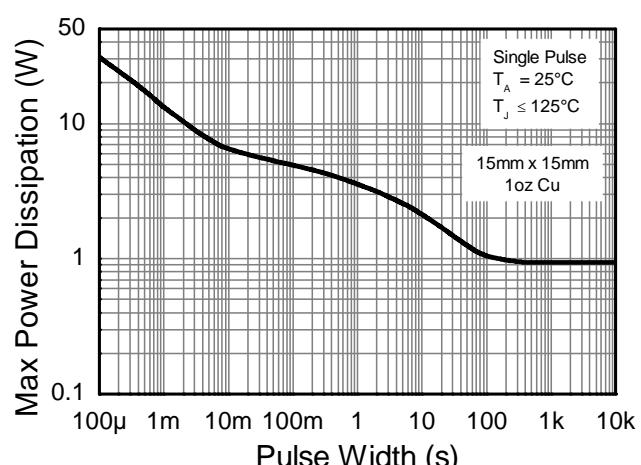
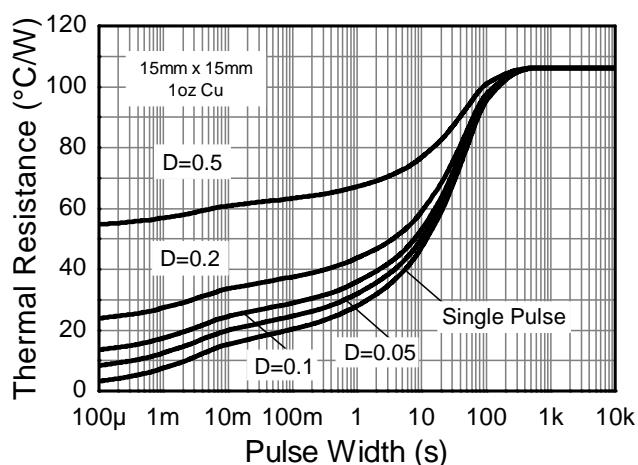
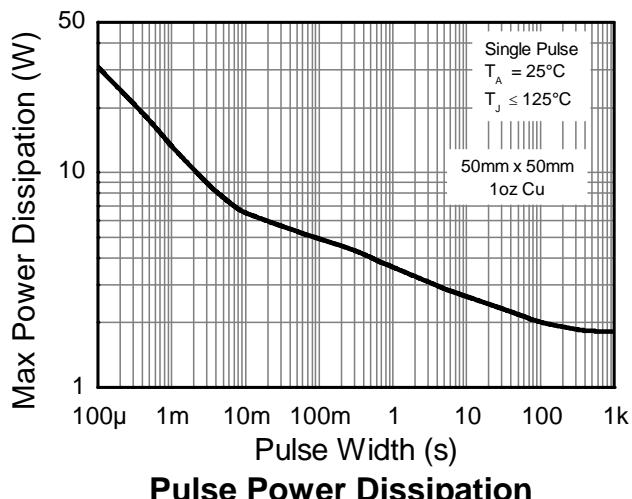
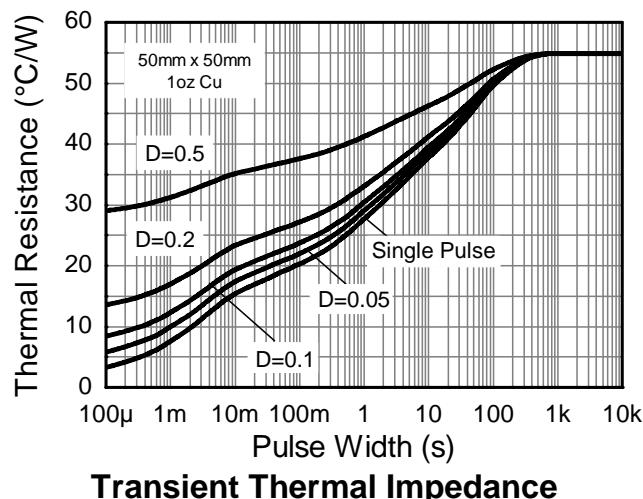
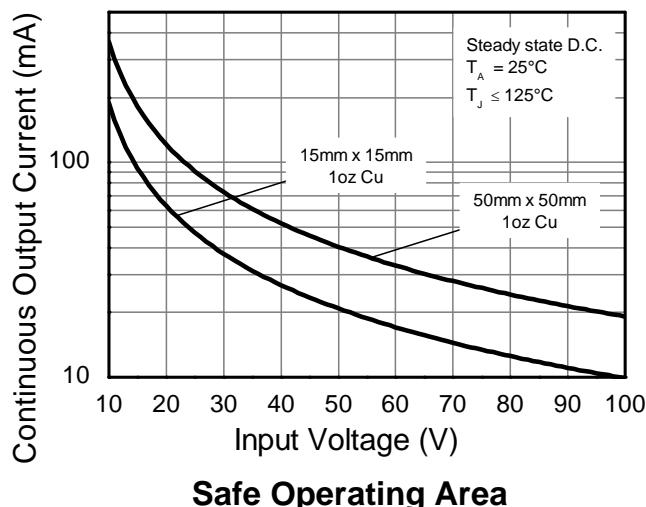
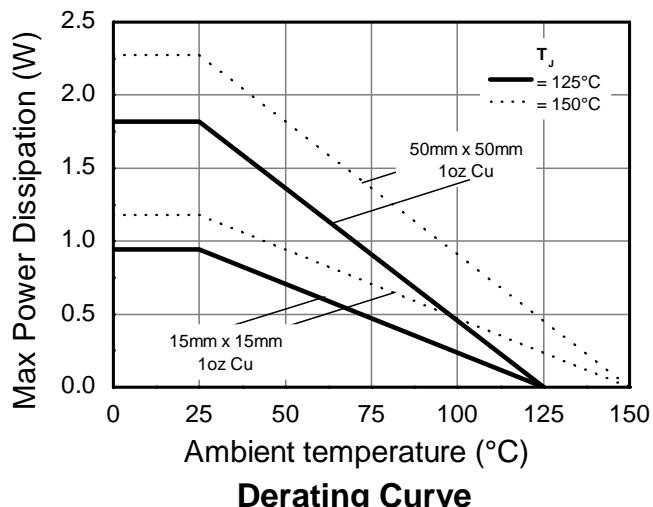
Notes:

5. 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 while operating in steady-state.
6. Same as Note 5, except mounted on 15mm x 15mm 1oz copper.
7. Same as Note 5, while operating at $V_{IN} = 48\text{V}$. Refer to Safe Operating Area for other input voltages.
8. Same as Note 5, except measured with a single pulse width = $100\mu\text{s}$ and $V_{IN} = 48\text{V}$.
9. Same as Note 5, except measured with a single pulse width = 10ms and $V_{IN} = 48\text{V}$.
10. $R_{\theta JL}$ = Thermal resistance from junction to solder-point (on the exposed V_{IN} pad).

$R_{\theta JC}$ = Thermal resistance from junction to the top of case.

11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Information

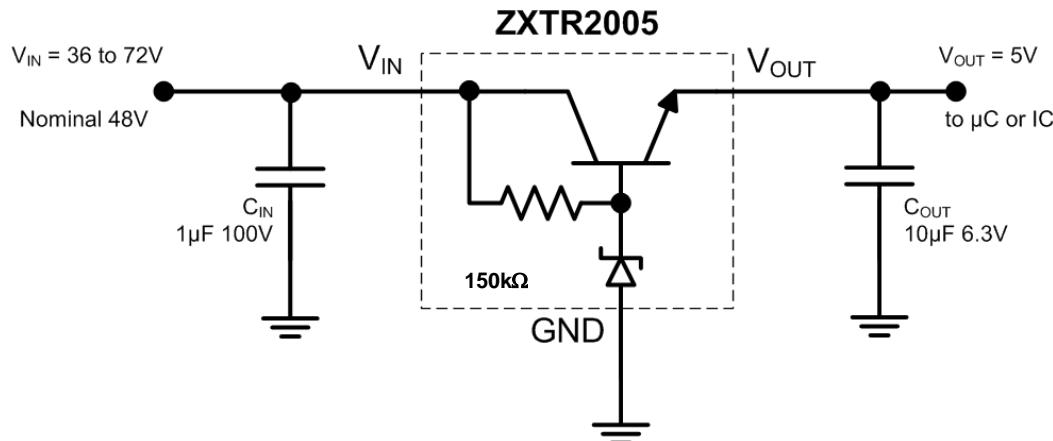


Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V_{OUT}	4.5	5.0	5.5	V	$V_{\text{IN}} = 48\text{V}$, $I_{\text{OUT}} = 15\text{mA}$
Line Regulation (Notes 12 & 13)	ΔV_{OUT}	—	195	300	mV	$V_{\text{IN}} = 10$ to 72V , $I_{\text{OUT}} = 15\text{mA}$
Temperature Coefficient	$\Delta V_{\text{OUT}}/\Delta T$	—	7.0	—	$\text{mV}/^\circ\text{C}$	$T_J = -40^\circ\text{C}$ to $+125^\circ\text{C}$ $V_{\text{IN}} = 48\text{V}$, $I_{\text{OUT}} = 15\text{mA}$
Load Regulation (Notes 12 & 14)	ΔV_{OUT}	—	-185 -205	-350 -400	mV	$I_{\text{OUT}} = 0.1$ to 30mA , $V_{\text{IN}} = 48\text{V}$ $I_{\text{OUT}} = 0.1$ to 100mA , $V_{\text{IN}} = 48\text{V}$
Minimum Value of Input Voltage Required to Maintain Line Regulation	$V_{\text{IN(MIN)}}$	10	—	—	V	—
Quiescent Current	I_Q	—	260 550	500 900	μA	$V_{\text{IN}} = 48\text{V}$, $I_{\text{OUT}} = 10\mu\text{A}$ $V_{\text{IN}} = 100\text{V}$, $I_{\text{OUT}} = 10\mu\text{A}$
Power Supply Rejection Ratio	$\Delta V_{\text{IN}}/\Delta V_{\text{OUT}}$	—	45	—	dB	$C_{\text{OUT}} = 100\text{nF}$, $I_{\text{OUT}} = 15\text{mA}$, $V_{\text{OUT}} = 5\text{V}$, $V_{\text{IN}} = 10$ to 100V , $f = 100\text{Hz}$

Notes:

12. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$
13. Line regulation $\Delta V_{\text{OUT}} = V_{\text{OUT}}(@ V_{\text{IN}} = 72\text{V}) - V_{\text{OUT}}(@ V_{\text{IN}} = 15\text{V})$
14. Load regulation $\Delta V_{\text{OUT}} = V_{\text{OUT}}(@ I_{\text{OUT}} = 30\text{mA}) - V_{\text{OUT}}(@ I_{\text{OUT}} = 0.1\text{mA})$
 $\Delta V_{\text{OUT}} = V_{\text{OUT}}(@ I_{\text{OUT}} = 100\text{mA}) - V_{\text{OUT}}(@ I_{\text{OUT}} = 0.1\text{mA})$

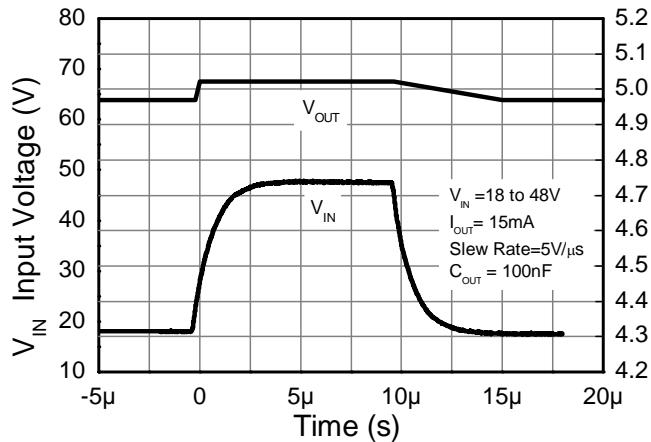
Typical Application Circuit


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

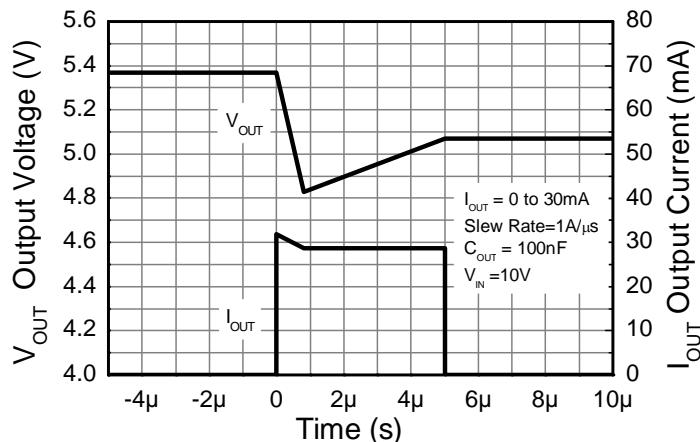
Pin Functions

Pin Name	Pin Function	Notes
V_{IN}	Input Supply	Input voltage can vary from -0.3V to 100V with respect to GND; for V _{OUT} regulated then $10\text{V} \leq V_{\text{IN}} \leq 100\text{V}$. It is recommended to connect a 1 μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V_{OUT}	Voltage Output	Outputs a regulated 5V when $10\text{V} \leq V_{\text{IN}} \leq 100\text{V}$. When $V_{\text{IN}} < 10\text{V}$, then V _{OUT} maximum = $V_{\text{IN}} - 1.5\text{V}$. The pin can be pulled high to a maximum of +11V with respect to GND, or +5V with respect to V _{IN} , whichever is lower. It is recommended to connect a 10 μF capacitor to GND and a minimum of 10 μA to be drawn from V _{OUT} to maintain regulation.

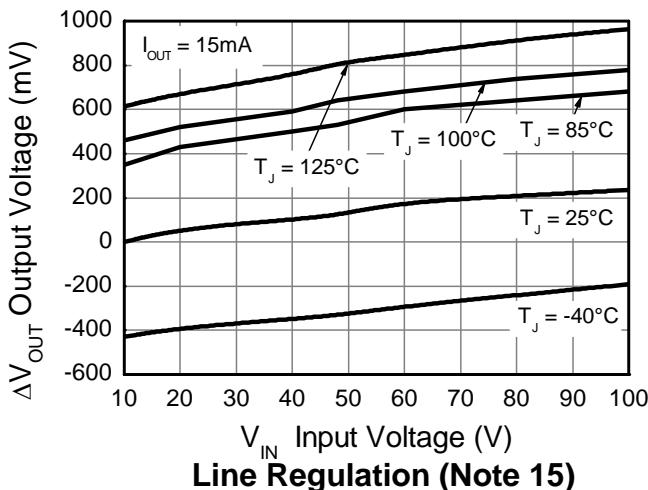
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



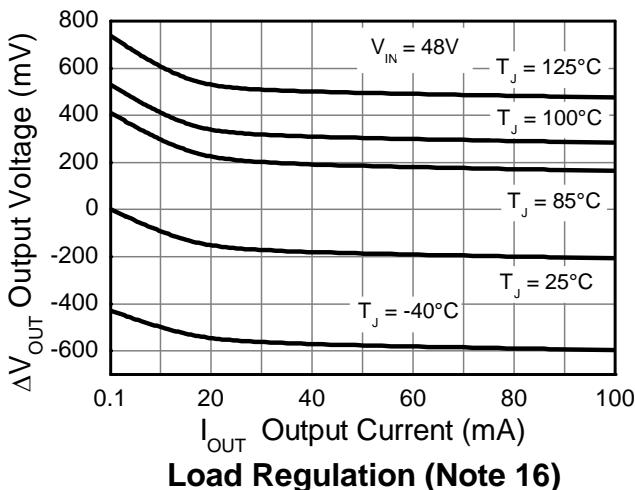
Line transient response



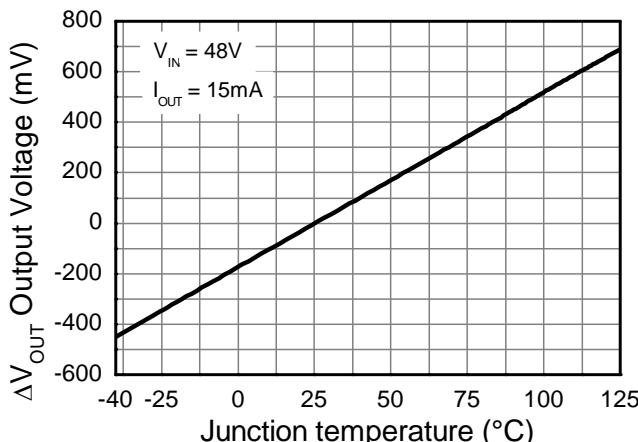
Load transient response



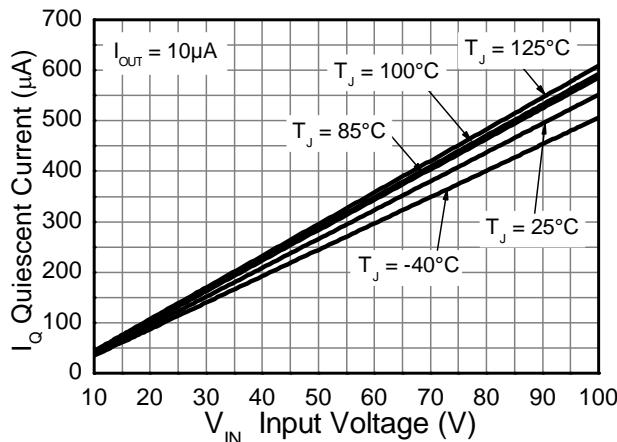
Line Regulation (Note 15)



Load Regulation (Note 16)



Temperature Coefficient (Note 17)



Quiescent Current

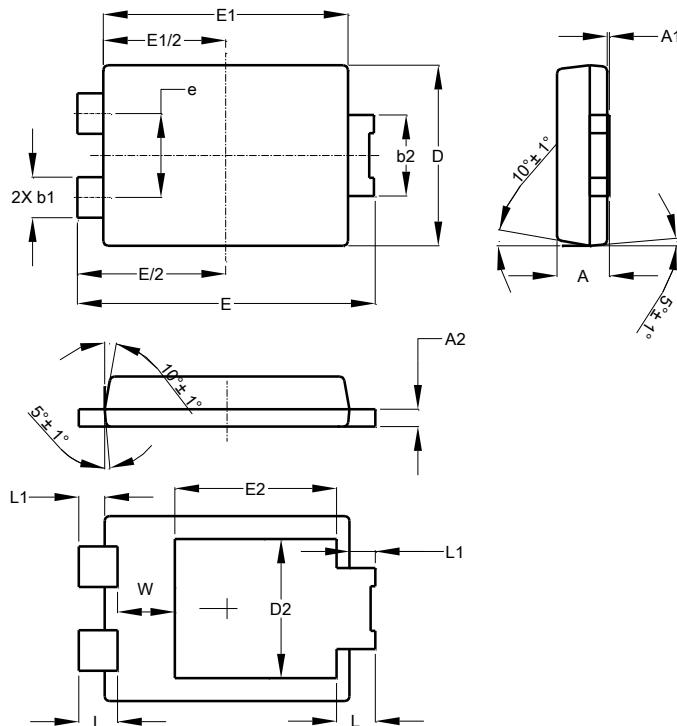
Notes: 15. Line regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 15\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$

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 <http://www.diodes.com/package-outlines.html> for the latest version.

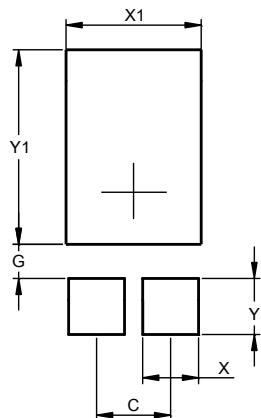


PowerDI5			
Dim	Min	Max	Typ
A	1.05	1.15	1.10
A1	0.00	0.05	--
A2	0.33	0.43	0.381
b1	0.80	0.99	0.89
b2	1.70	1.88	1.78
D	3.90	4.05	3.966
D2	--	--	3.054
E	6.40	6.60	6.504
e	--	--	1.84
E1	5.30	5.45	5.37
E2	--	--	3.549
L	0.75	0.95	0.85
L1	0.50	0.65	0.57
W	1.10	1.41	1.255

All Dimensions in mm

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



Dimensions	Value (in mm)
C	1.840
G	0.852
X	1.390
X1	3.360
Y	1.400
Y1	4.860

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