

Description

The ZXTR2012P5 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 PowerDI5 package, minimizing PCB area and reducing number of components when compared with a multi-chip discrete solution.

Applications


Supply voltage regulation in:

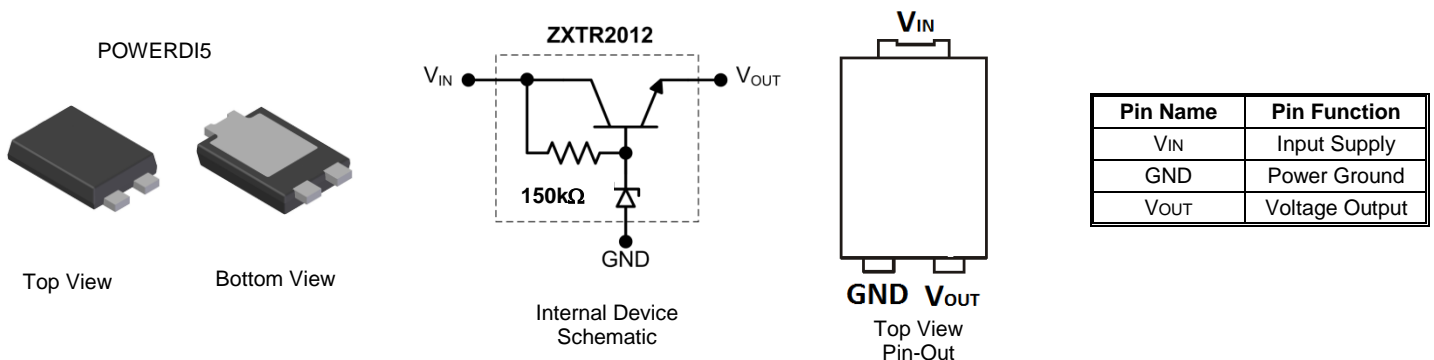
- Startup switch in DC-DC converters
- Networking
- Telecommunications
- Power over Ethernet (PoE)

Features

- Series Linear Regulator Using Emitter-Follower Stage
- Input Voltage = 15V to 100V (For regulated output voltage)
- Output Voltage = 12V \pm 10%
- 150k Ω 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 
- Weight: 0.100 grams (Approximate)




Ordering Information (Note 4)

Product	Package	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTR2012P5-13	PowerDI-5	ZXTR2012	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 <https://www.diodes.com/quality/lead-free/> 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



ZXTR2012 = Product Type Marking Code
 = 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°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)}	Smaller of V _{IN} +12V or 18V	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}	50	mA
Pulsed Output Current (Note 8)	I _{OM}	880	mA
(Note 9)		180	

Thermal Characteristics

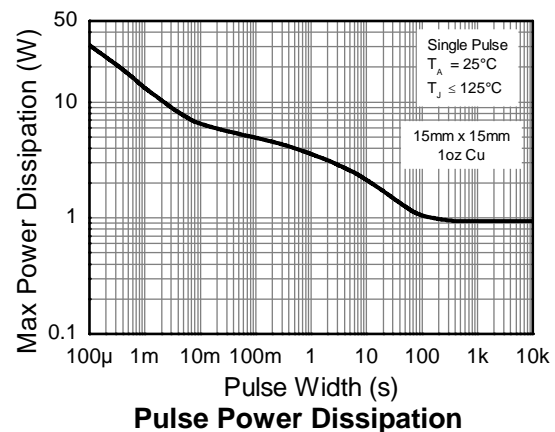
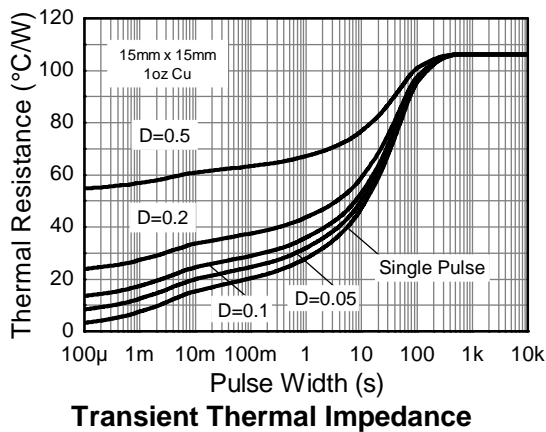
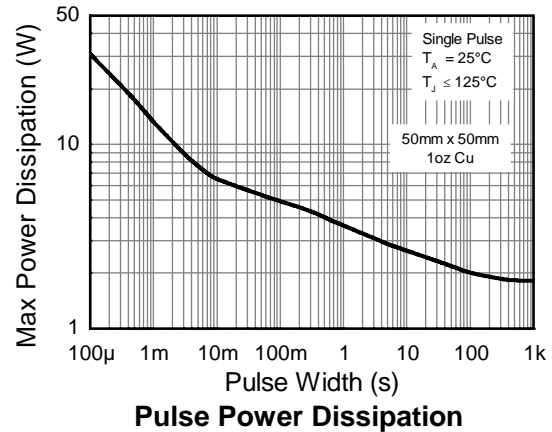
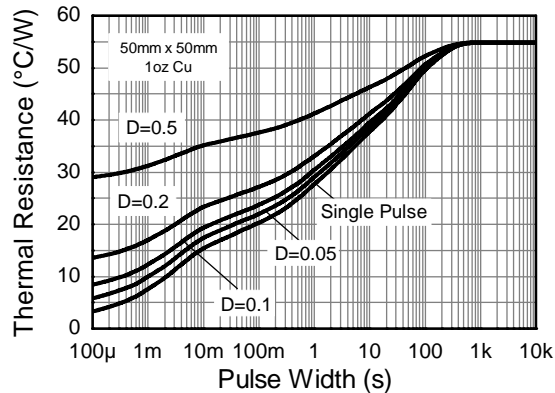
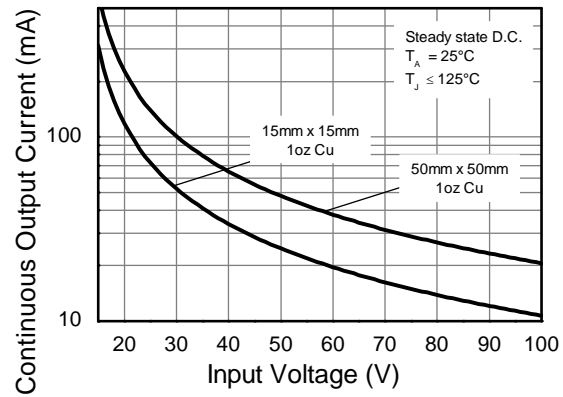
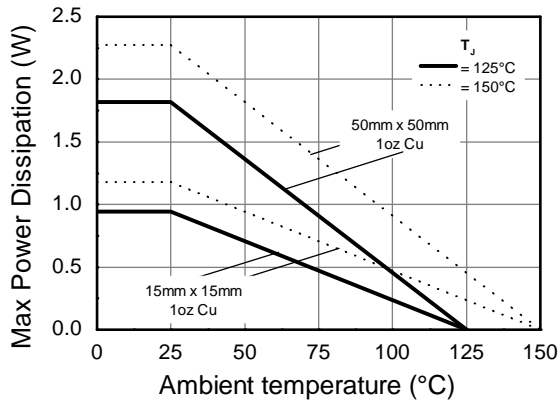
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	1.82	W
(Note 6)		0.94	
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	55	°C/W
(Note 6)		107	
Thermal Resistance, Junction to Lead (Note 10)	R _{θJL}	20	
Thermal Resistance, Junction to Case (Note 10)	R _{θJC}	17.8	
Recommended 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

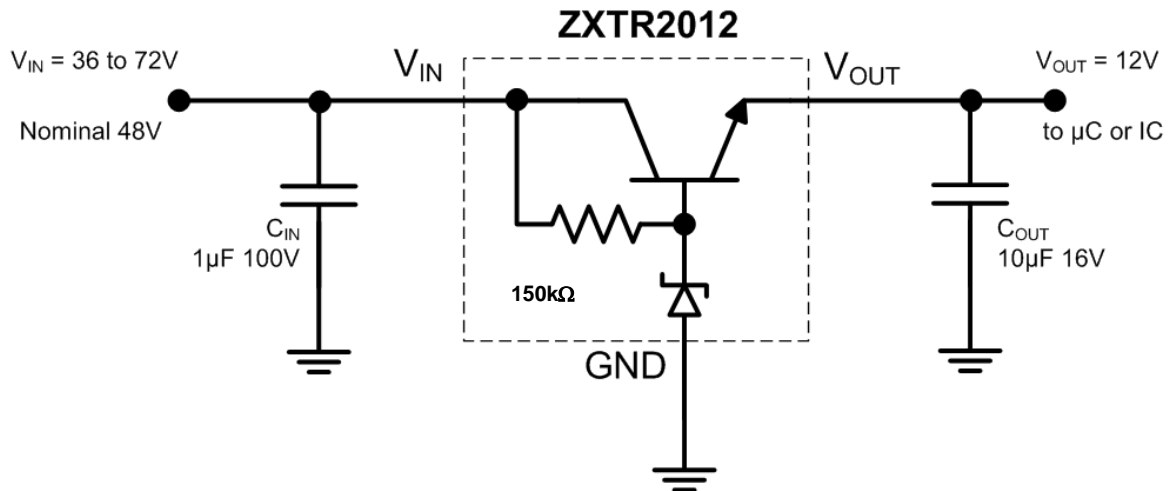


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

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

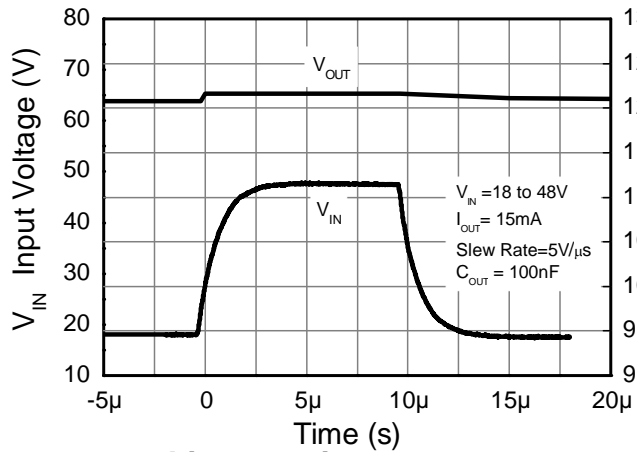


Example of an 12V regulated supply from a nominal 48V for powering a Controller IC.

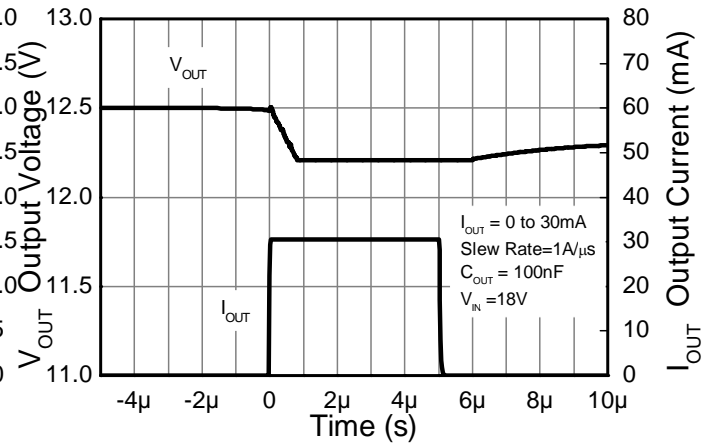
Pin Functions

Pin Name	Pin Function	Notes
V _{IN}	Input Supply	Input voltage can vary from -0.3V to 100V with respect to GND; for V _{OUT} regulated then 15V ≤ V _{IN} ≤ 100V. 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 when 15V ≤ V _{IN} ≤ 100V. When V _{IN} < 15V, then V _{OUT} maximum = V _{IN} - 1.5V. The pin can be pulled high to a maximum of +18V with respect to GND, or +12V with respect to V _{IN} , whichever is lower. It is recommended to connect a 10μF capacitor to GND and a minimum of 10μA to be drawn from V _{OUT} to maintain regulation.

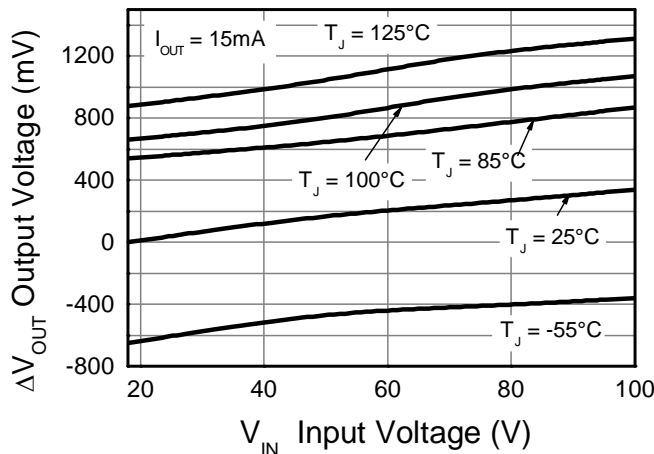
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



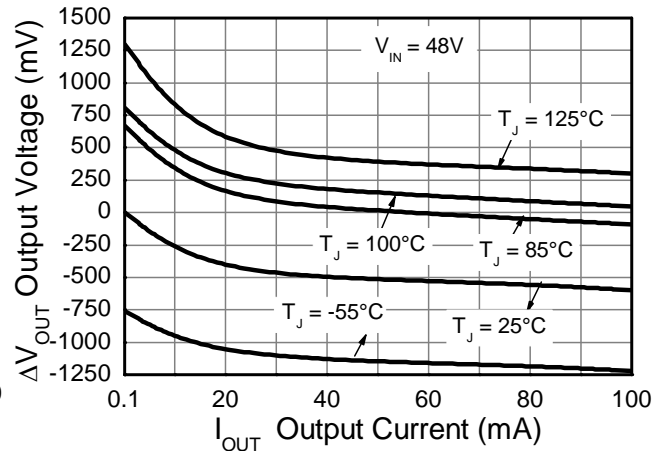
Line transient response



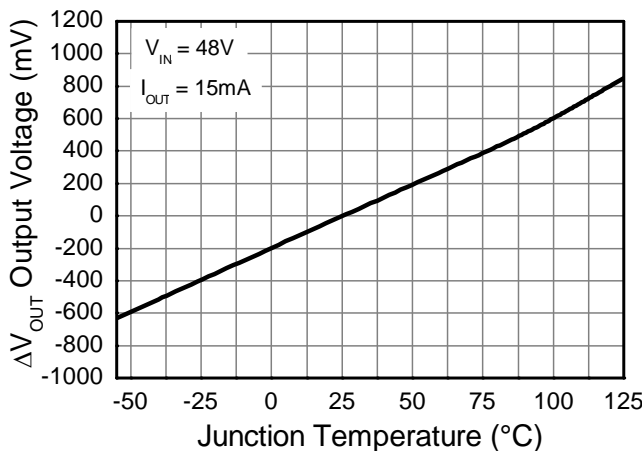
Load transient response



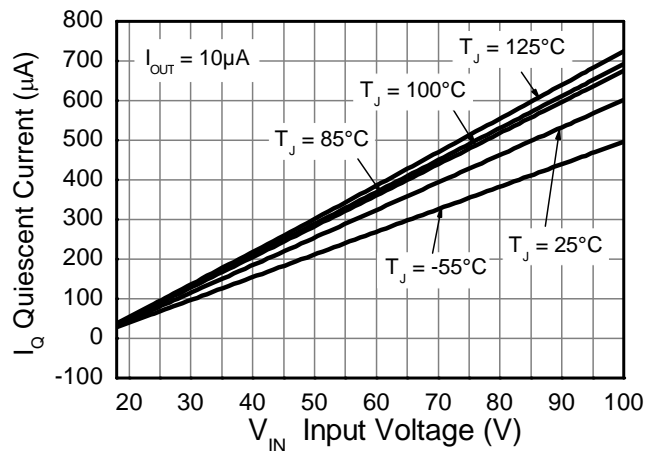
Line Regulation (Note 15)



Load Regulation (Note 16)



Temperature Coefficient (Note 17)



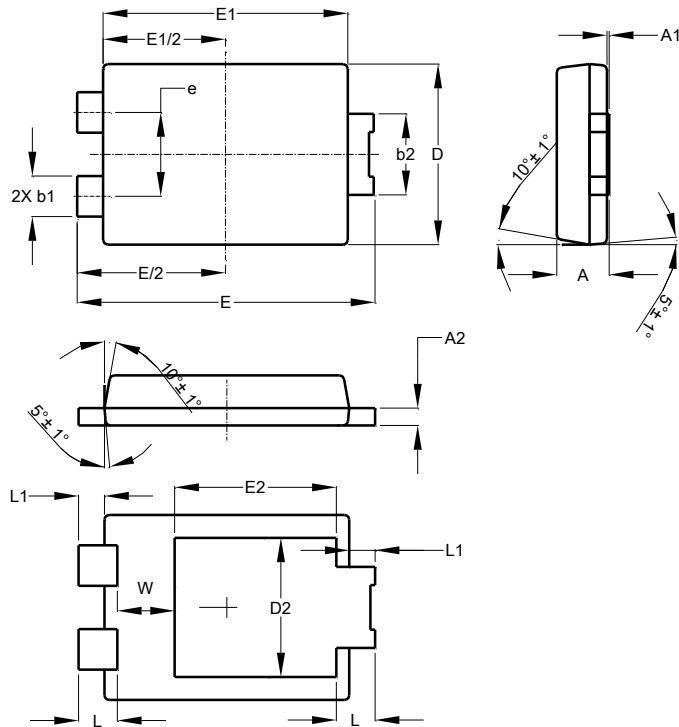
Quiescent Current

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

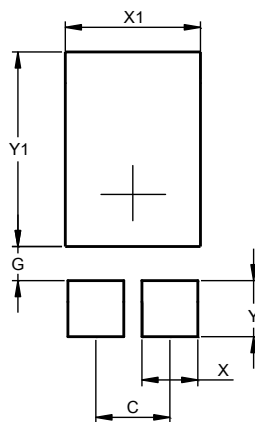
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



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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