

## ZXTR1005PD8

### 100V INPUT, 5V 50mA VOLTAGE REGULATOR

#### Description

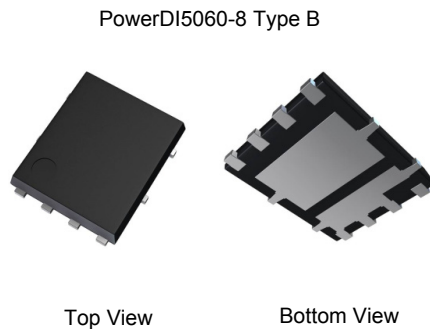
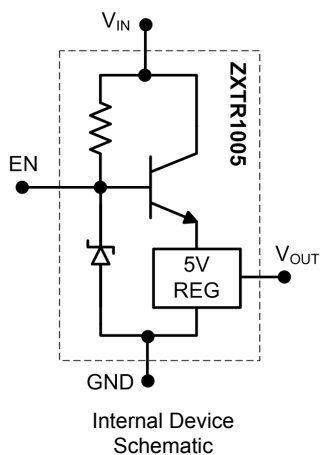
The ZXTR1005PD8 is a high voltage regulator with fixed output voltage of  $5V \pm 2\%$  and a 50mA drive capability. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a PowerDI5060 package, minimizing PCB area and 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)

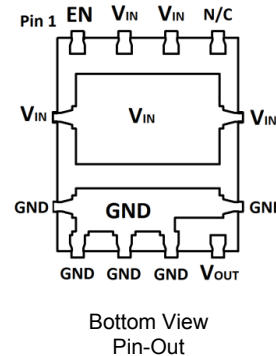


#### Features

- 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: PowerDI5060-8 Type B
- 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  $\text{\textcircled{3}}$
- Weight: 0.104 grams (approximate)



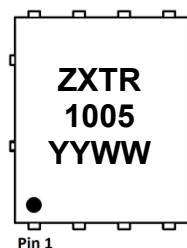
Pin Name	Pin Function
$V_{IN}$	Input Supply
GND	Power Ground
$V_{OUT}$	Voltage Output
EN	Enable
N/C	Not Connected

#### Ordering Information (Note 4)

Product	Package	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXTR1005PD8-13	PowerDI5060-8 Type B	ZXTR 1005	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](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



ZXTR1005 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 13 = 2013)  
 WW = Week (01-52)

**Absolute Maximum Ratings** (Voltage relative to GND, @  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Input voltage	$V_{IN}$	-0.3 to +100	V
Enable current	$I_{EN}$	$\pm 1$	mA
Continuous Input & Output Current	$I_{IN}, I_{OUT}$	100	mA
Peak Pulsed Input & Output Current	$I_{IM}, I_{OM}$	100	mA
Maximum Voltage applied to $V_{OUT}$	$V_{OUT(max)}$	10	V

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

Characteristic	Symbol	Value	Unit
Continuous Output Current	$I_{OUT}$	42	mA
Pulsed Output Current	$I_{OM}$	100	mA
		100	

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

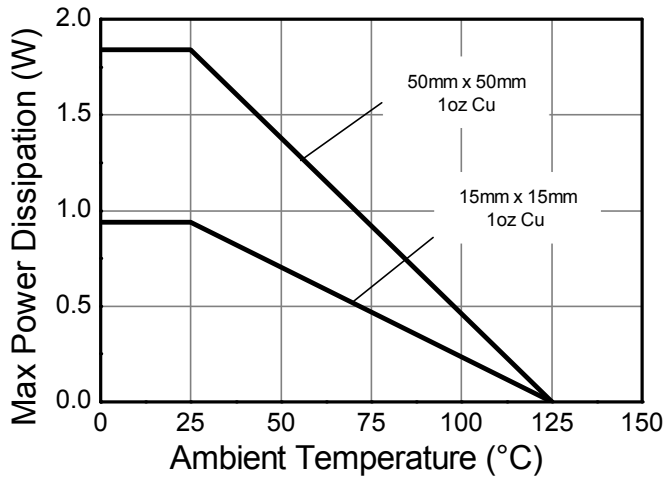
Characteristic	Symbol	Value	Unit
Power Dissipation	$P_D$	1.84	W
		0.94	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	54.3	$^\circ\text{C/W}$
		106.4	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	13	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	13.9	
Maximum Operating Junction Temperature Range	$T_J$	-55 to +125	
Storage Temperature Range	$T_{STG}$	-65 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 11)

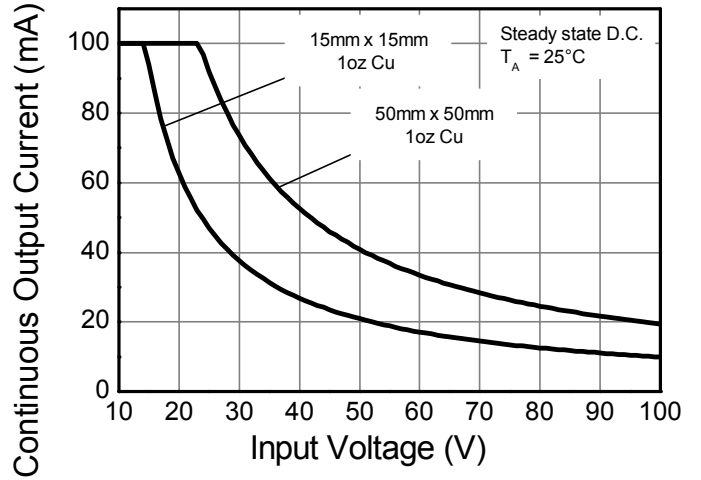
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- 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  $V_{IN} = 48\text{V}$  this is thermally limited. Refer to Safe Operating Area for other Input Voltages.
  - Same as note 5, except measured with a single pulse width = 100 $\mu\text{s}$  and  $V_{IN} = 48\text{V}$ . This is limited by the absolute maximum  $I_{OM}$  rating.
  - Same as note 5, except measured with a single pulse width = 10ms and  $V_{IN} = 48\text{V}$ . This is limited by the absolute maximum  $I_{OM}$  rating.
  - $R_{\theta JL}$  = 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.
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

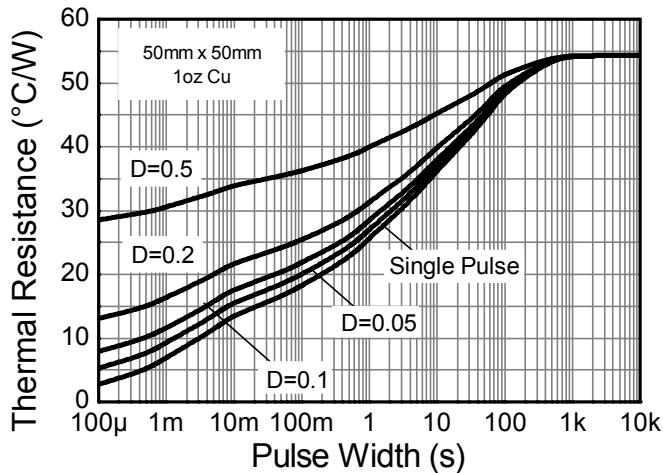
**Thermal Characteristics and Derating Information**



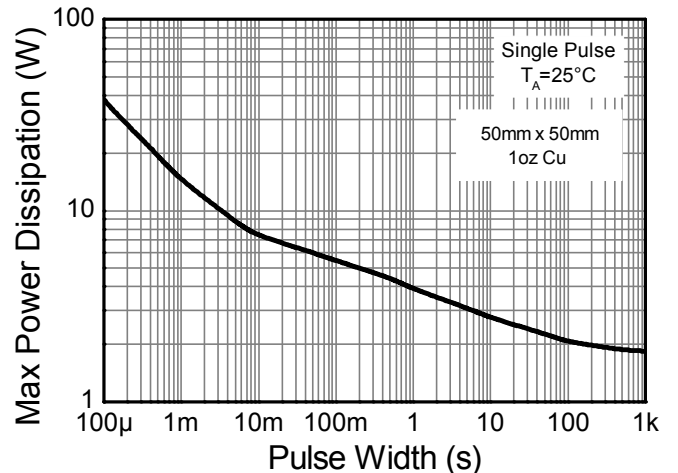
**Derating Curve**



**Safe Operating Area**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

**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)**

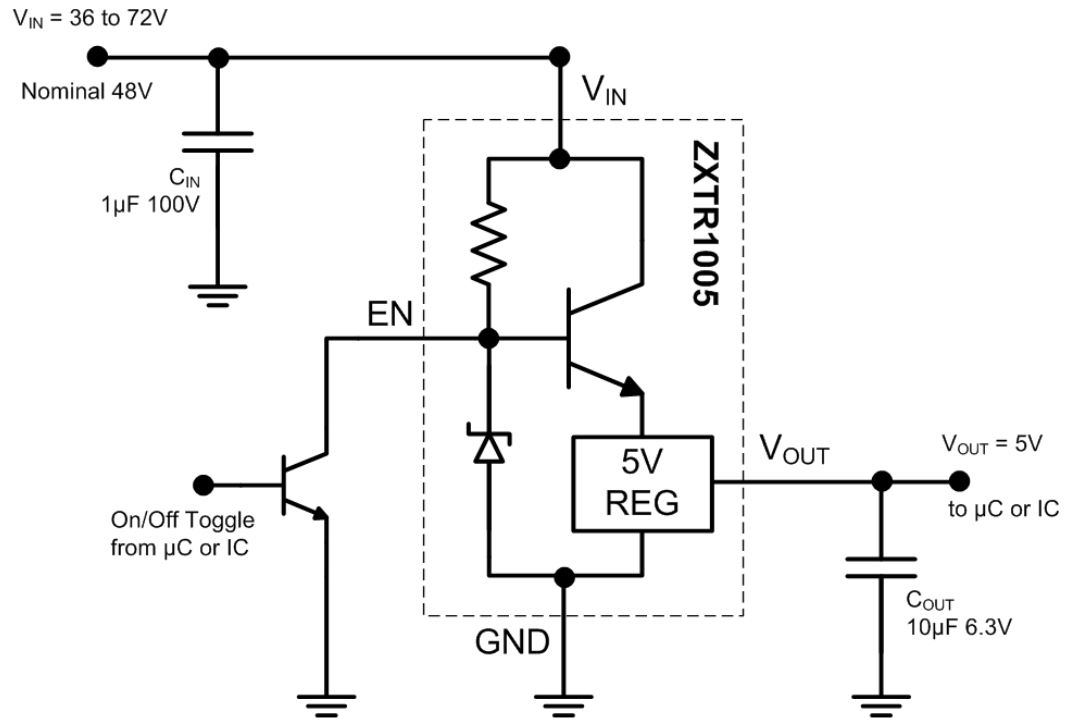
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V <sub>OUT</sub>	4.9	5.0	5.1	V	V <sub>IN</sub> = 48V, I <sub>OUT</sub> = 15mA
Line Regulation (Note 12 & 13)	ΔV <sub>OUT</sub>	-10	2	10	mV	V <sub>IN</sub> = 10 to 100V, I <sub>OUT</sub> = 15mA
Average Temperature Coefficient	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**

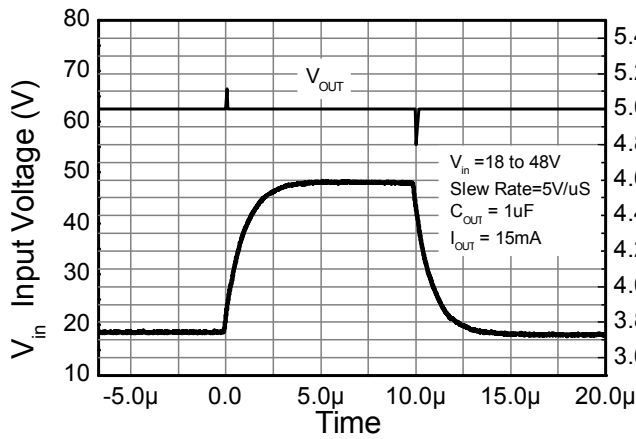
Pin Name	Pin Function	Notes
V <sub>IN</sub>	Input Supply	To maintain output regulation the input voltage can vary from 10V to 100V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.
GND	Power Ground	This pin should be tied to the system ground.
V <sub>OUT</sub>	Voltage 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>

**Typical Application Circuit**

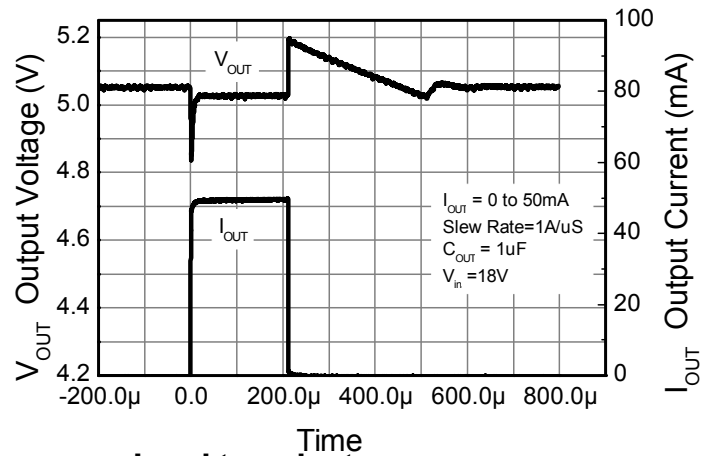


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

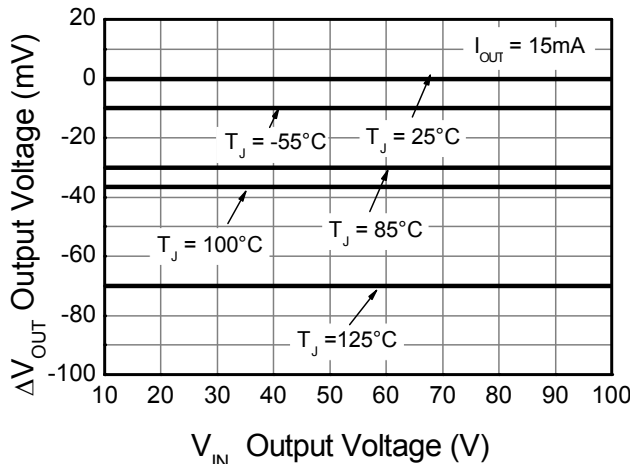
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



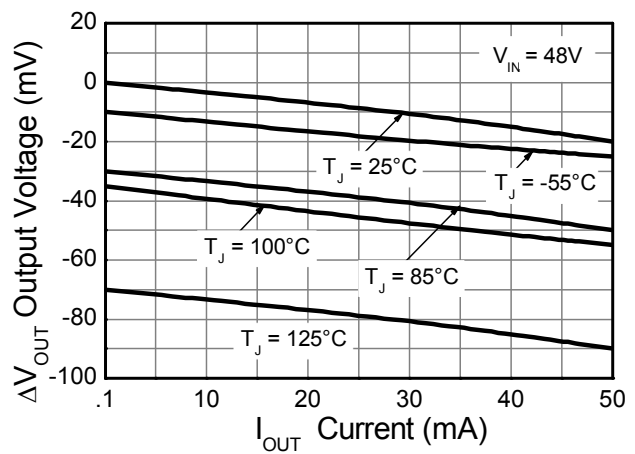
**Line transient response**



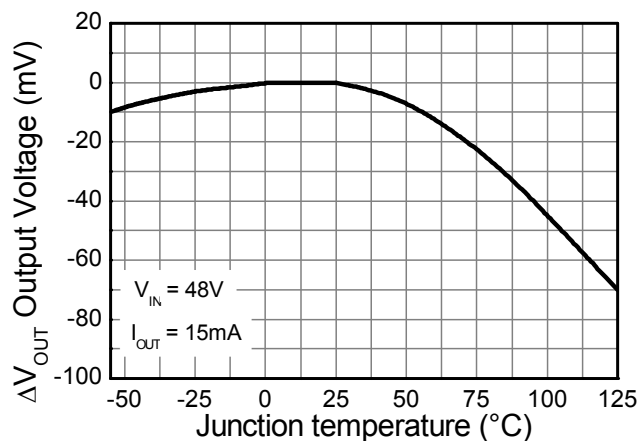
**Load transient response**



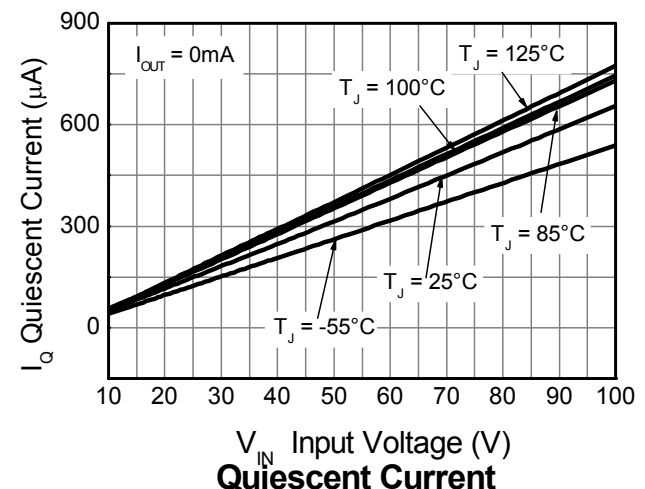
**Line Regulation (Note 15)**



**Load Regulation (Note 16)**



**Temperature Coefficient (Note 17)**

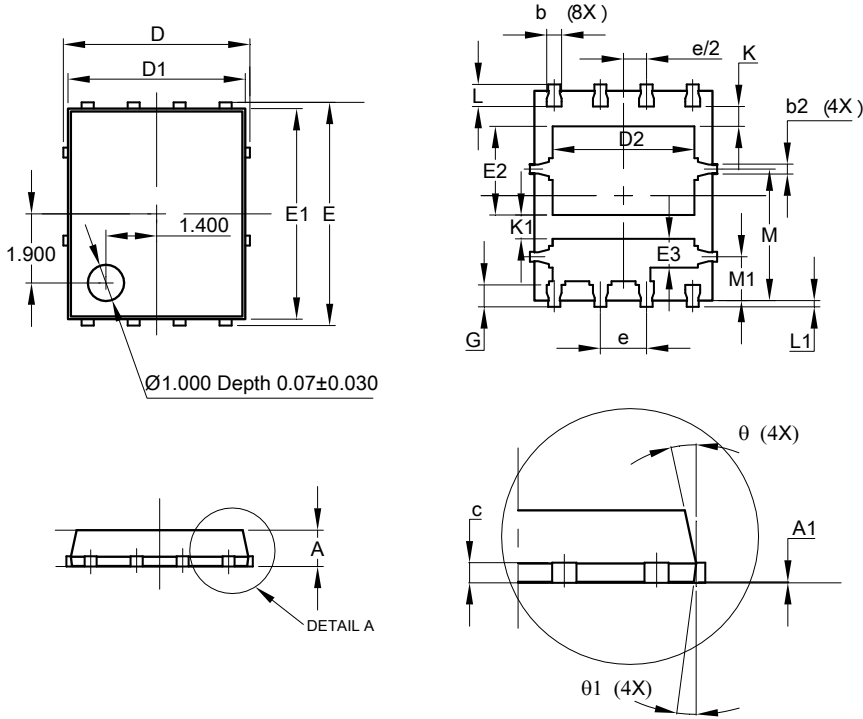


**Quiescent Current**

- 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**

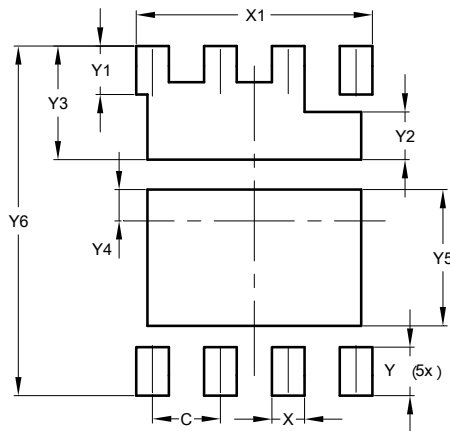
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



POWERDI <sup>®</sup> 5060-8 TYPE B			
Dim	Min	Max	Typ
A	0.90	1.10	1.00
A1	0.00	0.05	—
b	0.33	0.51	0.41
b2	0.20	0.40	0.273
c	0.230	0.330	0.273
D	5.15 BSC		
D1	4.70	5.10	4.90
D2	3.50	4.40	3.90
E	6.15 BSC		
E1	5.60	6.00	5.80
E2	2.25	2.65	2.45
E3	0.595	0.995	0.795
e	1.27 BSC		
G	0.51	0.71	0.61
K	0.51	—	—
K1	0.51	—	—
L	0.51	0.71	0.61
L1	0.05	0.20	0.175
M	3.235	4.035	3.635
M1	1.00	1.40	1.21
θ1	10°	12°	11°
θ2	6°	8°	7°
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	1.270
X	0.610
X1	4.420
Y	0.910
Y1	0.910
Y2	0.895
Y3	2.130
Y4	0.585
Y5	2.550
Y6	6.550

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