

ZXTR1005PD8

100V INPUT, 5V 50mA VOLTAGE REGULATOR

Description

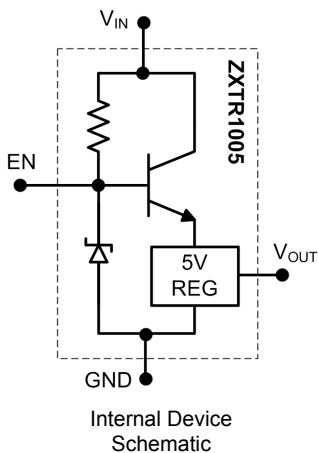
The ZXTR1005PD8 is a high voltage regulator with fixed output voltage of $5V \pm 2\%$ and a 50mA drive capability. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a PowerDI5060 package, minimizing PCB area and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

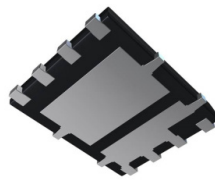
- Networking
- Telecom
- Power Over Ethernet (PoE)



PowerDI5060-8 Type B



Top View



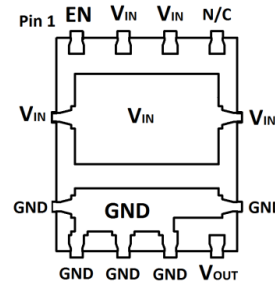
Bottom View

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 
- Weight: 0.104 grams (approximate)



Bottom View
Pin-Out

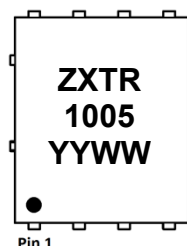
Pin Name	Pin Function
V _{IN}	Input Supply
GND	Power Ground
V _{OUT}	Voltage Output
EN	Enable
N/C	Not Connected

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 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}	± 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 (Note 7)	I_{OUT}	42	mA
Pulsed Output Current (Note 8)	I_{OM}	100	mA
(Note 9)		100	

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

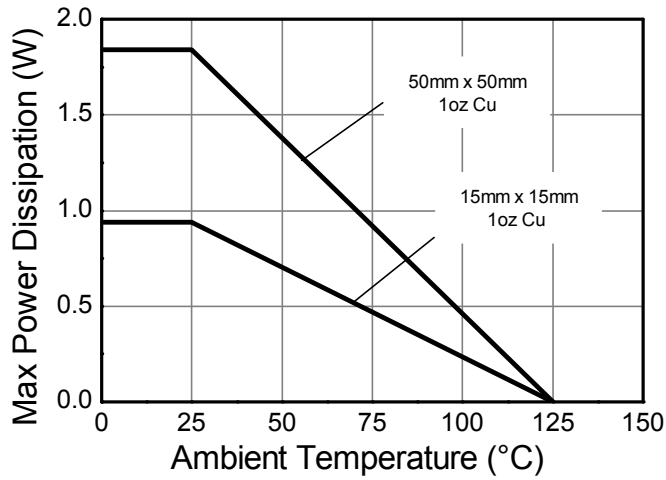
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	1.84	W
(Note 6)		0.94	
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	54.3	$^\circ\text{C/W}$
(Note 6)		106.4	
Thermal Resistance, Junction to Lead (Note 10)	$R_{\theta JL}$	13	
Thermal Resistance, Junction to Case (Note 10)	$R_{\theta JC}$	13.9	
Maximum Operating Junction Temperature Range	T_J	-55 to +125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 to +150	$^\circ\text{C}$

ESD Ratings (Note 11)

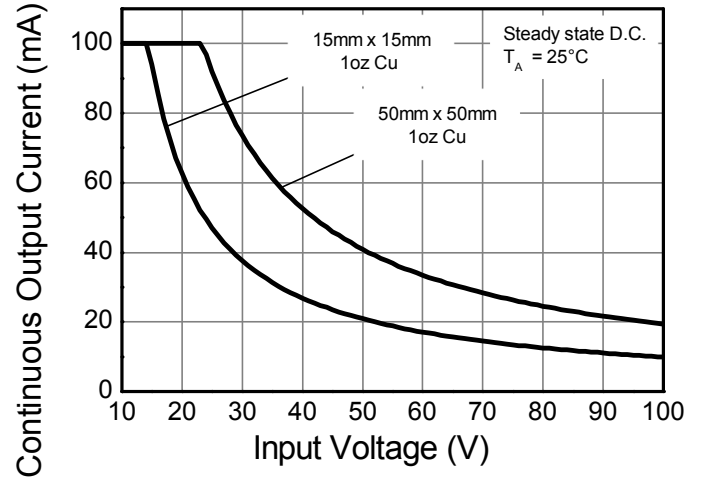
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- 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 μs 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.

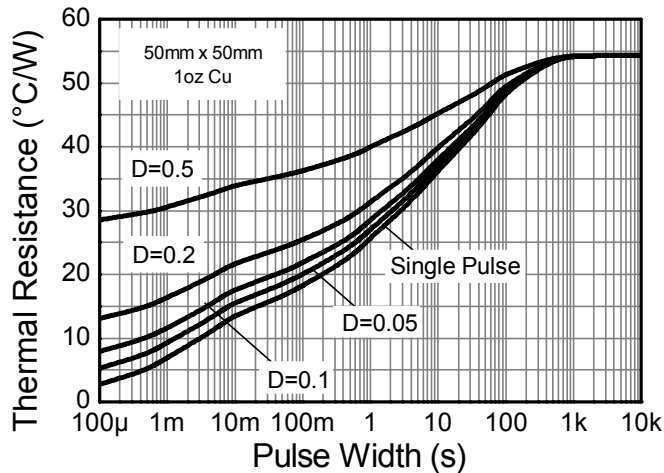
Thermal Characteristics and Derating Information



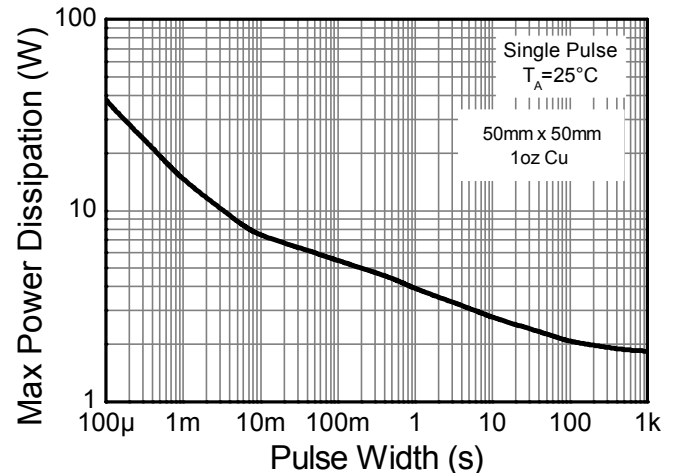
Derating Curve



Safe Operating Area



Transient Thermal Impedance



Pulse Power Dissipation

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

Enable Output with EN = OPEN (i.e. -100nA < I_{EN} < 100nA)

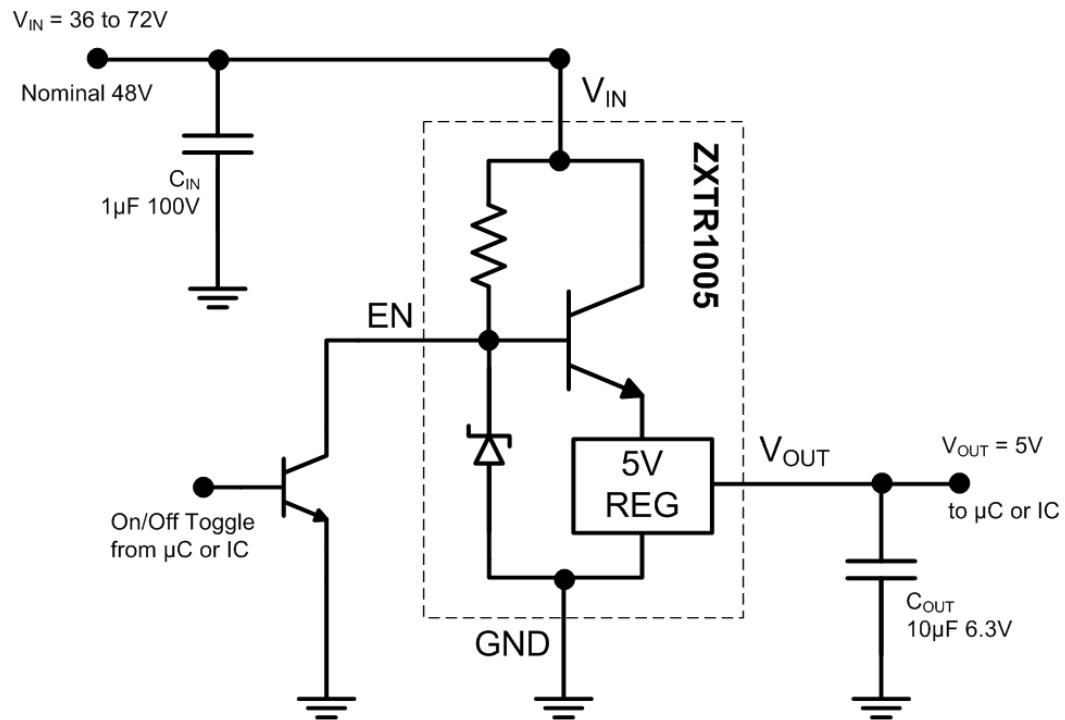
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V _{OUT}	4.9	5.0	5.1	V	V _{IN} = 48V, I _{OUT} = 15mA
Line Regulation (Note 12 & 13)	ΔV _{OUT}	-10	2	10	mV	V _{IN} = 10 to 100V, I _{OUT} = 15mA
Average Temperature Coefficient	ΔV _{OUT} /ΔT	—	0.44	0.7	mV/°C	T _J = -55°C to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

Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.
 13. Line regulation ΔV_{OUT} = V_{OUT}(@ V_{IN} = 100V) – V_{OUT}(@ V_{IN} = 10V)
 14. Load regulation ΔV_{OUT} = V_{OUT}(@ I_{OUT} = 50mA) – V_{OUT}(@ I_{OUT} = 0mA)

Pin Functions

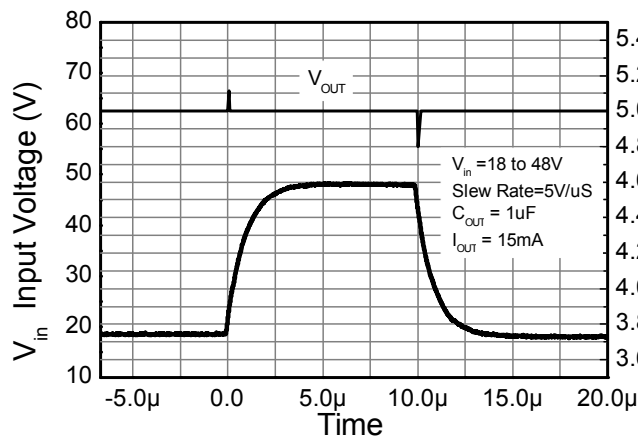
Pin Name	Pin Function	Notes	
V _{IN}	Input Supply	To maintain output regulation the input voltage can vary from 10V to 100V with respect to the GND pin. It is recommended to connect a 1μF capacitor to GND.	
GND	Power Ground	This pin should be tied to the system ground.	
V _{OUT}	Voltage Output	Outputs a regulated 5V 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	Output Always On When the output state is required to be permanently on, then the EN pin should be left floating in an OPEN state.	EN pin = Do not connect
		Toggle Output On/Off Toggle the regulator's output state between on (5V) and off (0V). Enable Output Leave the EN pin floating in an OPEN state. Disable Output Pull the EN pin to GND in a SHORT state. For example, see the Typical Application Circuit showing a transistor toggling the EN pin.	Enable Output EN pin = -100nA < I _{EN} < 100nA Disable Output EN pin = -0.3V < V _{EN} < 1V

Typical Application Circuit

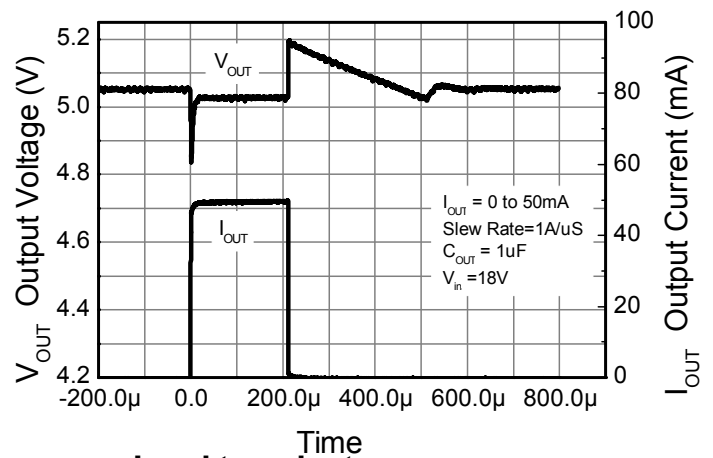


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

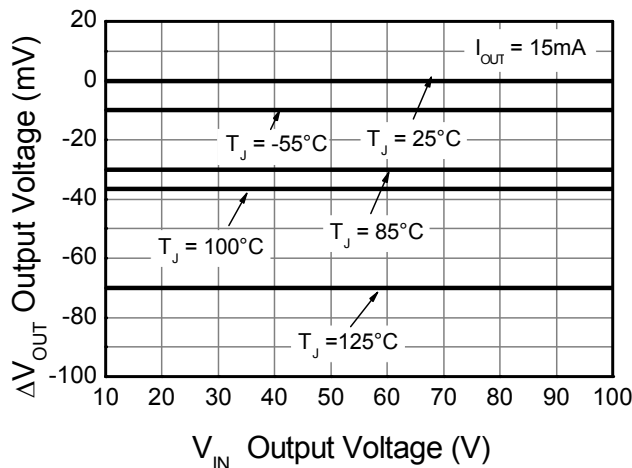
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



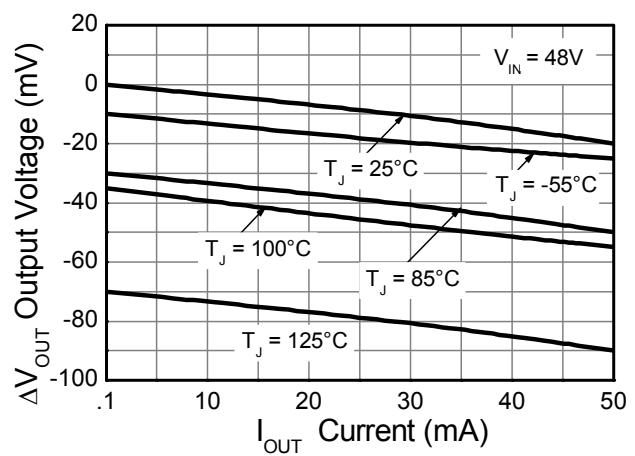
Line transient response



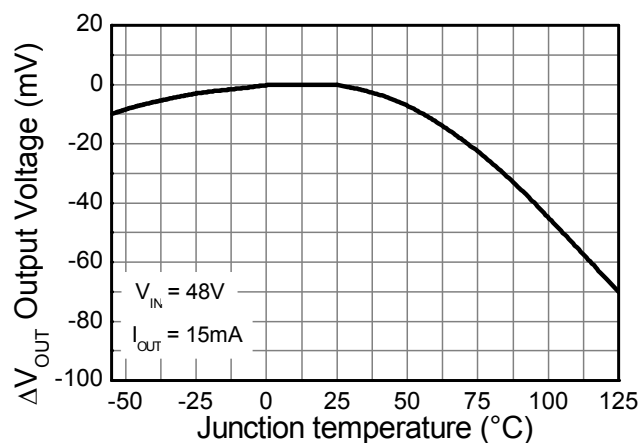
Load transient response



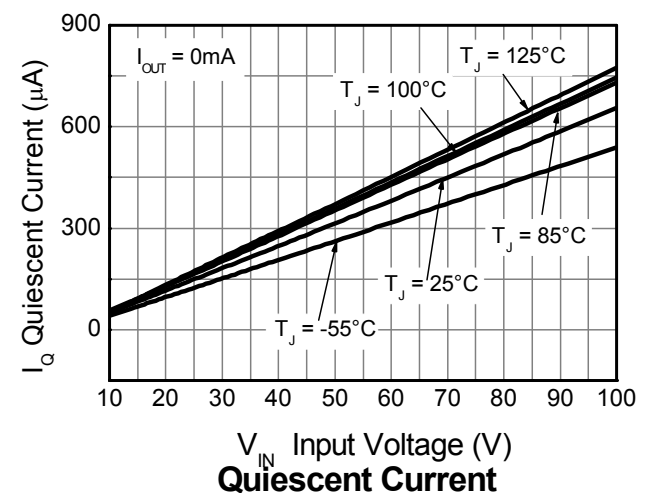
Line Regulation (Note 15)



Load Regulation (Note 16)



Temperature Coefficient (Note 17)

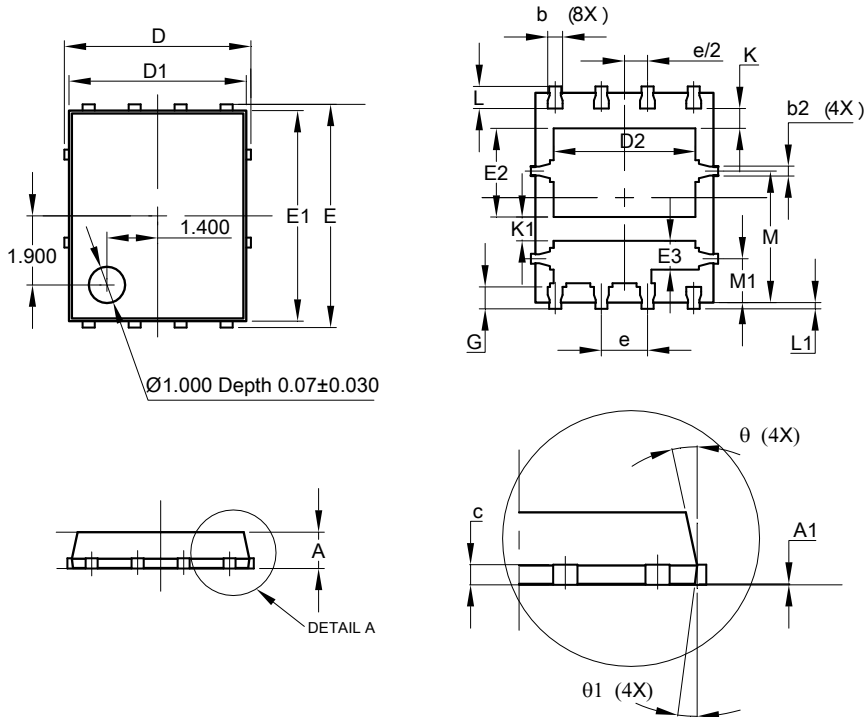


Quiescent Current

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

Package Outline Dimensions

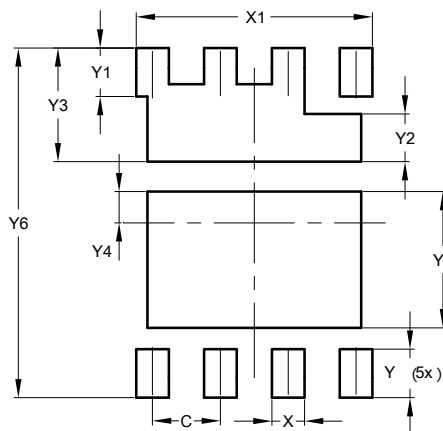
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



POWERDI [®] 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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