



YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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Description

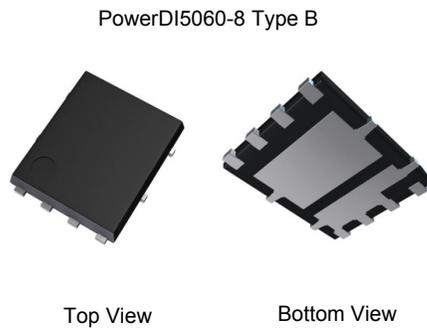
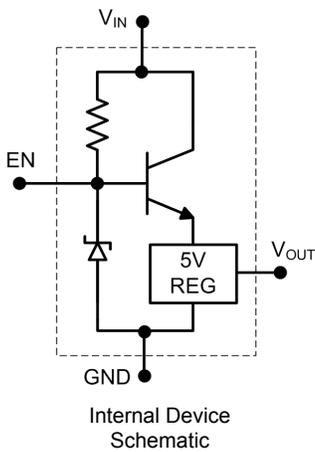
The NK-ZXTR1005PD8 is a high voltage regulator with fixed output voltage of $5V \pm 2\%$ and a 50mA drive capability. It is designed for use in high voltage applications where standard linear regulators cannot be used. This function is fully integrated into a PowerDI5060 package, minimizing PCB area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

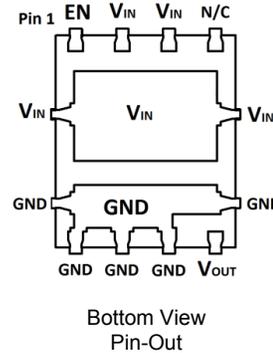


Features

- 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

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

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	I_{OUT}	42	mA
Pulsed Output Current	I_{OM}	100	mA
		100	

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

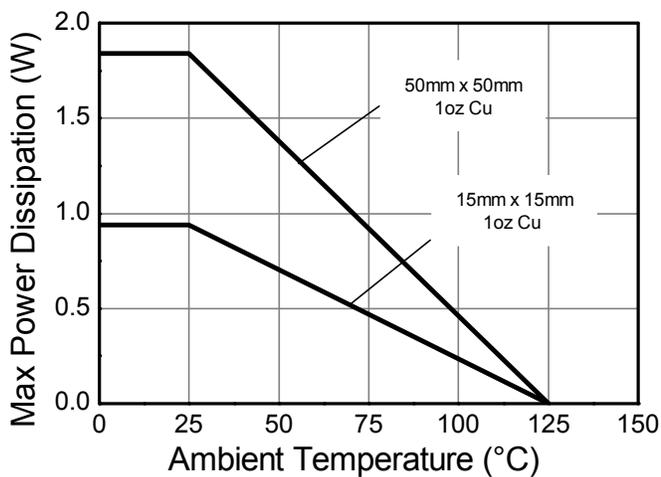
Characteristic	Symbol	Value	Unit
Power Dissipation	P_D	1.84	W
		0.94	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	54.3	$^\circ\text{C/W}$
		106.4	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	13	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	13.9	
Maximum Operating Junction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

ESD Ratings (Note 11)

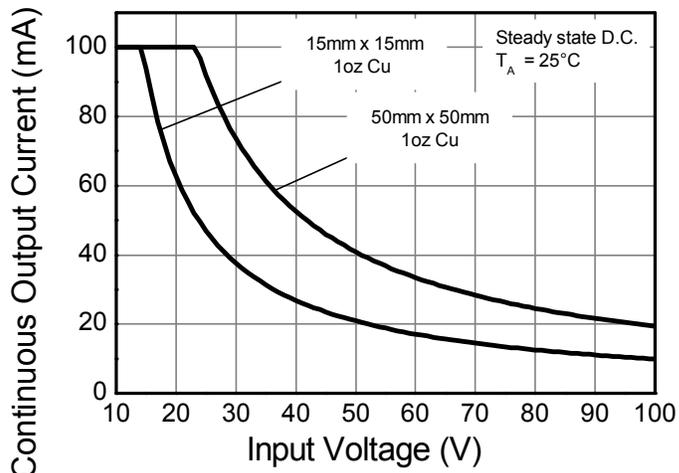
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- 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 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.

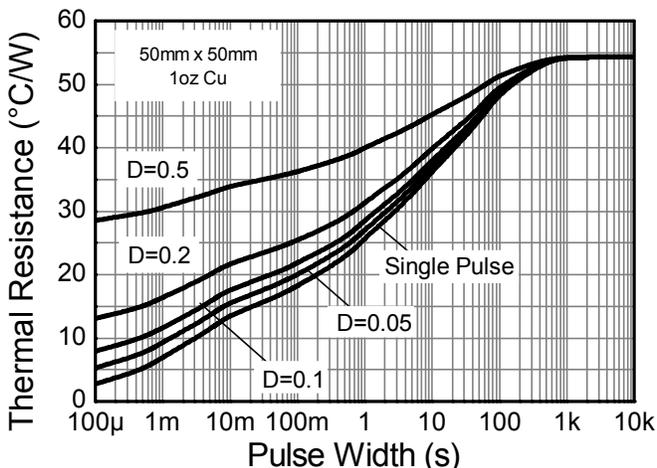
Thermal Characteristics and Derating Information



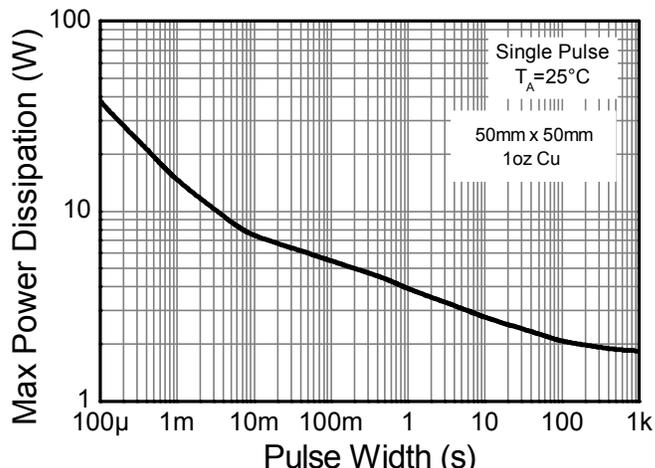
Derating Curve



Safe Operating Area



Transient Thermal Impedance



Pulse Power Dissipation

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

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

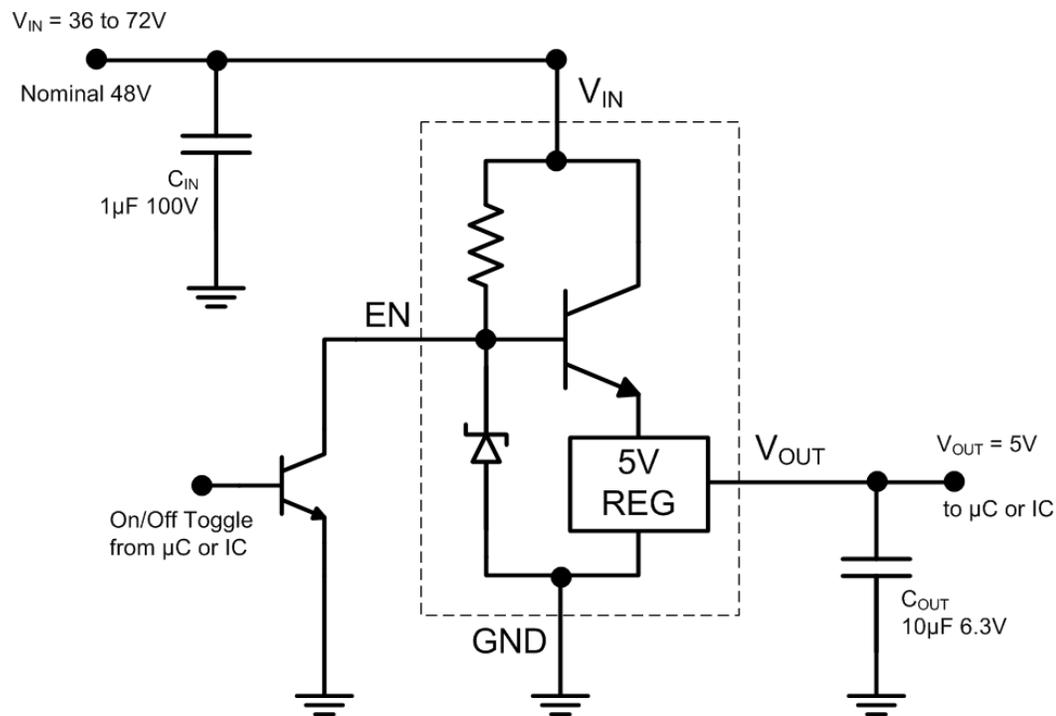
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage (Note 12)	V_{OUT}	4.9	5.0	5.1	V	$V_{IN} = 48\text{V}, I_{OUT} = 15\text{mA}$
Line Regulation (Note 12 & 13)	ΔV_{OUT}	-10	2	10	mV	$V_{IN} = 10 \text{ to } 100\text{V}, I_{OUT} = 15\text{mA}$
Average Temperature Coefficient	$\Delta V_{OUT}/\Delta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

- Notes:
12. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.
 13. Line regulation $\Delta V_{OUT} = V_{OUT}(@ V_{IN} = 100\text{V}) - V_{OUT}(@ V_{IN} = 10\text{V})$
 14. Load regulation $\Delta V_{OUT} = V_{OUT}(@ I_{OUT} = 50\text{mA}) - V_{OUT}(@ I_{OUT} = 0\text{mA})$

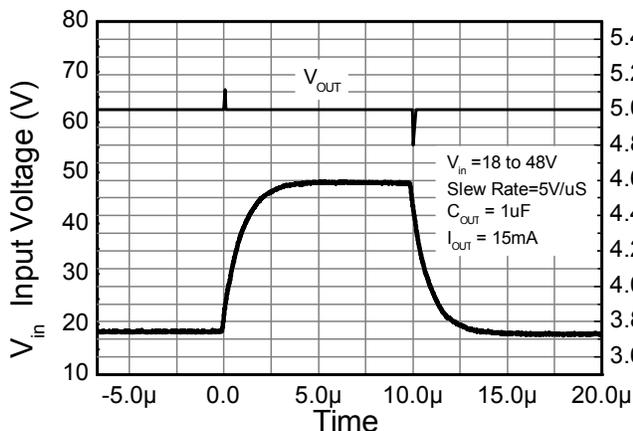
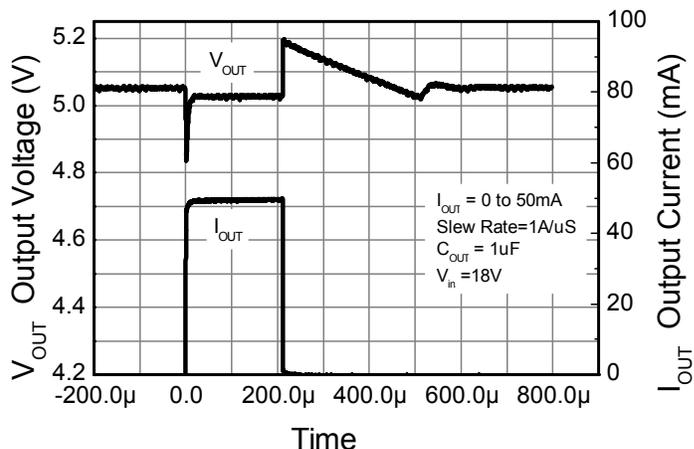
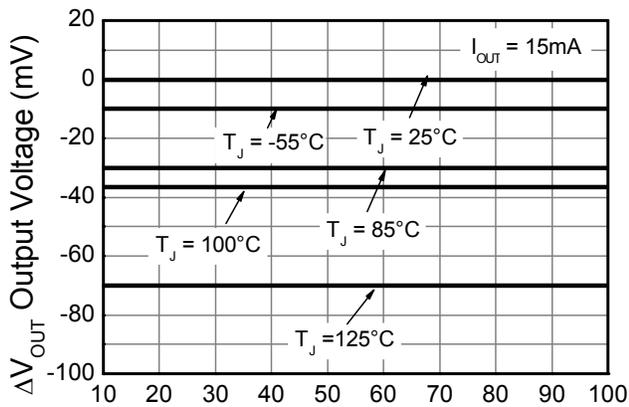
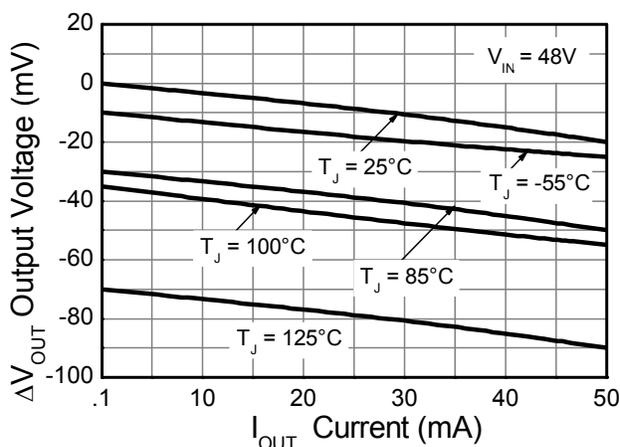
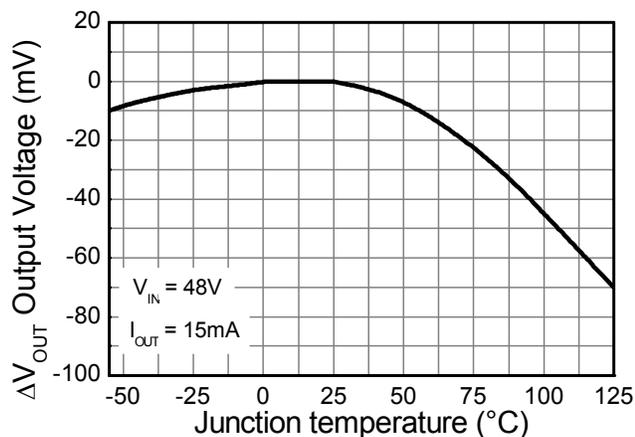
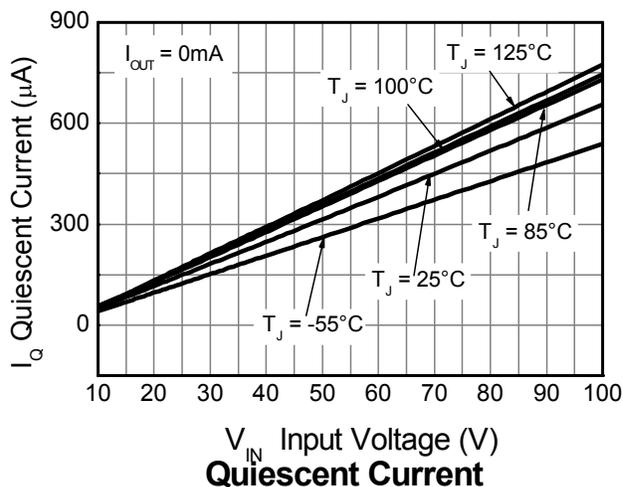
Pin Functions

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 $1\mu\text{F}$ 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 $\geq 100\text{nF}$ 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 = $-100\text{nA} < I_{EN} < 100\text{nA}$ Disable Output EN pin = $-0.3\text{V} < V_{EN} < 1\text{V}$

Typical Application Circuit

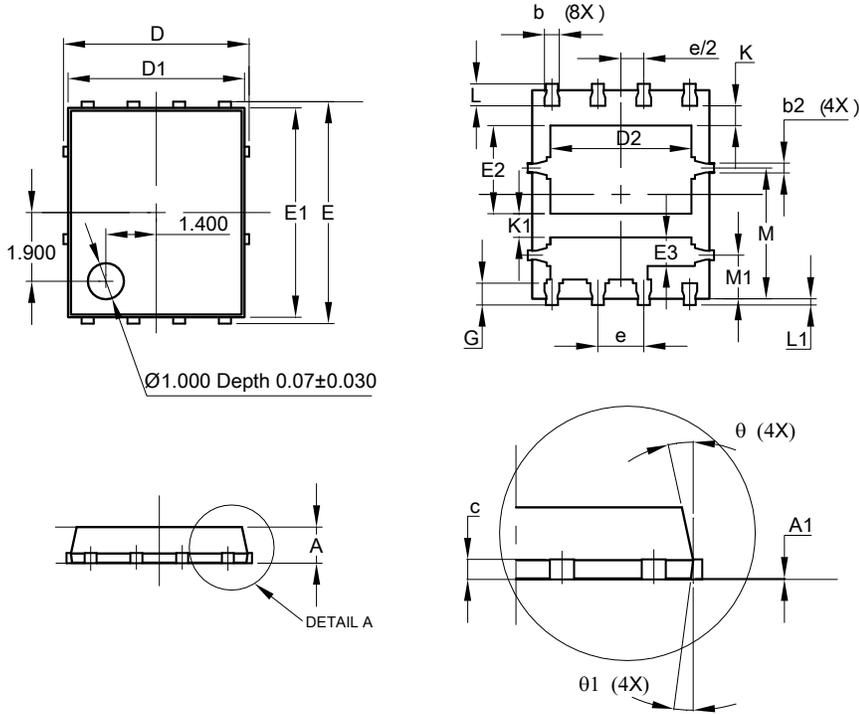


Example of a 5V regulated supply from a nominal 48V for powering a Controller IC.

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)


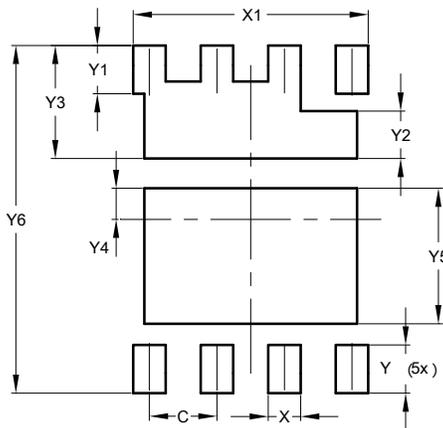
- Notes:
- Line regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 10\text{V}, I_{OUT} = 15\text{mA}, T_J = +25^\circ\text{C})$
 - Load regulation $\Delta V_{OUT} = V_{OUT} - V_{OUT}(@ V_{IN} = 48\text{V}, I_{OUT} = 0\text{A}, T_J = +25^\circ\text{C})$
 - Temperature Coefficient $\Delta V_{OUT}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

Package Outline Dimensions



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



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