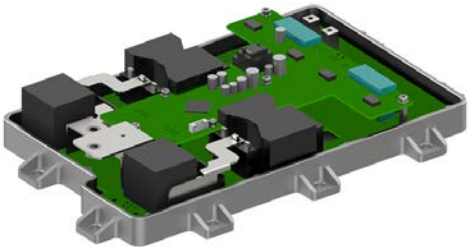
This specification describes the performance characteristic of a 4500W isolated DC/DC converter capable of power conversion between a 300 ~ 450 Vdc high bus and a 28 ~ 58.4 Vdc low voltage (LV) bus. The converter will support curre CAN for step-up and step-down conversions.



Contents

Features

- Isolated bidirectional DC/DC conversion in current mode / voltage mode
- 300 ~ 450 Vdc HV range, 28 ~ 58.4 Vdc LV range
- HV → LV Power: 4300 W (Step-Down conversion)
- HV ← LV Power: 4500 W (Step-Up conversion)
- Efficiency: 97% max; full range 90% min.
- -40 ~ 85 ℃ operation temperature range
- Comprehensive monitoring and protection based on CAN bus communication

☐ SMPS Adaptor (Wall-Mount)
■ Open Frame
☐ SMPS Unit (With Plastic Case)
☐ SMPS Adaptor (Desktop)
☐ SMPS Unit (With Metal Case)
☐ Others

Applications

- Energy storage systems
- Industrial applications with batteries

Model List

PLD4500-BDGA400-48

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Input / Output Characteristics of Step-Down Conversion Mode

* All data tested at 25 ℃ ambient temperature, unless otherwise specified.

Input Characteristics (HV side input characteristics)

Input	Description / Condition / Note	Min.	Typ.	Max.
Voltage	HV side can tolerate voltages up to 500 Vdc	300 Vdc	410 Vdc	450 Vdc
Current**	Continuous operation	10A	11A	10A
Inrush Current			15 A	30 A
OVP*		460±10 Vdc		
OVP Recovery	Hysteresis band：20.0 Vdc (typ.)	440±10 Vdc		
UVP*		290±10 Vdc		
UVP Recovery	Hysteresis band: 10.0 Vdc (typ.)	310±10 Vdc		
OCP*	1.15*full load, ±10%	13 A		
SCP*		Yes		

* Latch with fault reporting via CAN. Last 5 faults can be recorded on the MCU flash. Faults can be cleared via CAN.

** When Vin = 300V, the Vo range is limited to 28~45V, and the max Po is 2500W.

Output Characteristics (LV side output characteristics)

Output	Description / Condition / Note	Min.	Typ.	Max.
Voltage	Resting: 48 Vdc, Operating: 51.2 Vdc	28 Vdc	51.2 Vdc	58.4 Vdc
Current		92A	84A	74 A
Power	Refer to Fig. HV Output I – V Characteristic	4300 W		
On-off Control	Controlled by CAN	Yes		
Turn-on Delay	After CAN enable signal is applied ， max	1 s		
Dynamic Response time**	max	1 s		
Efficiency	@ 410 Vdc, 51.2 Vdc, ≥ 50% Load;	97%		
OVP***		62.2±0.8 Vdc		
OVP Recovery	Hysteresis band：5 Vdc (typ.)	57.2±0.8Vdc		
UVP***		25.2±0.8 Vdc		
UVP Recovery	Hysteresis band: 5 Vdc (typ.)	30.2±0.8 Vdc		
OCP***	1.15 full load, ±10%	106 A	97 A	85 A
SCP*		Yes		
OTP***	Baseplate temperature, ≥ 2 s	85±5℃		
OTP Recovery	Hysteresis: 10 ℃ (typ.)	75±5℃		

* Measured at the output edge of power supply, measuring setup described below. Measurements will be made with an oscilloscope set to 20 MHz-bandwidth limit. The outputs will be bypassed with one 0.1 μF ceramic cap (type X7R) and one 10 μF (low ESR) electrolytic capacitor.

** Controlled via CAN, the converter can be operated either in current mode or voltage mode (in both directions) of the output, and the power can be transferred in either direction. The converter is able to respond to changes in current set-point, voltage set-point, or power transfer direction within 1 sec.

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*** Latch with fault reporting via CAN. Fault can be cleared via CAN.

Input / Output Characteristics of Step-Up Conversion Mode

Input Characteristics (LV side input characteristics)

Input	Description / Condition / Note	Min.	Typ.	Max.
Voltage	Resting: 48 Vdc, Operating: 51.2 Vdc	28 Vdc	51.2 Vdc	58.4 Vdc
Current**	Continuous operation	87A	92 A	82 A
Inrush Current	@ 51.2 Vdc input, Highly depend on cable impedance		150A	
OVP*		62.2±0.8 Vdc		
OVP Recovery	Hysteresis band：5.0 Vdc (typ.)	57.2±0.8Vdc		
UVP*			25.2±0.8 Vdc	
UVP Recovery	Hysteresis band: 5.0 Vdc (typ.)		30.2±0.8 Vdc	
OCP*	1.15*full load, ±10%	106A		
SCP*		Yes		

* Latch with fault reporting via CAN. Last 5 faults can be recorded on the MCU flash. Fault can be cleared via CAN.

** When Vin = 28V, the Vo range is limited to 300~410V, and the max Po is 2200W

Output Characteristics (HV side output characteristics)

Output	Description / Condition / Note	Min.	Typ.	Max.
Voltage	Resting: 48 Vdc, Operating: 51.2 Vdc	300 Vdc	410 Vdc	450 Vdc
Current	Refer to Fig.4	12 A	11 A	10 A
Power	Refer to Fig.5, De-rating		4500 W	
On-off Control	Controlled by CAN		Yes	
Turn-on Delay	After CAN enable signal is applied	1 s		
Turn-on Overshoot	max	5%		
Dynamic Response time**	max	1 s		
Efficiency	@ 51.2 Vdc, 410 Vdc, ≥ 50% Load;		97%	
OVP***		460±10 Vdc		
OVP Recovery***	Hysteresis band：10.0 Vdc (typ.)	440±10 Vdc		
UVP***		290±10 Vdc		
UVP Recovery***	Hysteresis band: 10.0 Vdc (typ.)	310±10 Vdc		
OCP***		13.8 A	12.7A	11.5 A
SCP		Yes		
OTP***	Baseplate temperature, ≥ 2 s	85±5℃		
OTP Recovery	Hysteresis band: 10 ℃ (typ.)	75±5℃		

* Measured at the output edge of power supply, measuring setup described below. Measurements will be made with an oscilloscope set to 20 MHz-bandwidth limit. The outputs will be bypassed with one 0.1 μF ceramic cap (type X7R) and one 10 μF (low ESR) electrolytic capacitor.

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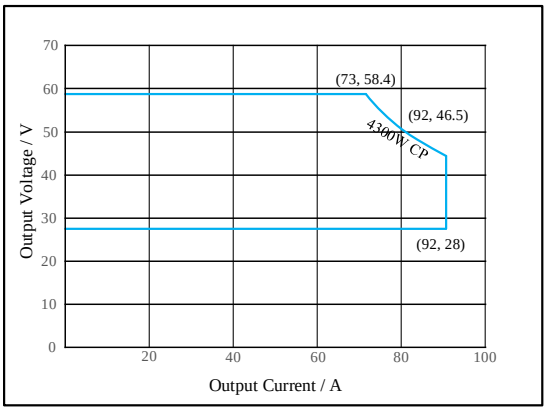
** Controlled via CAN, the converter can be operated either in current mode or voltage mode (in both directions) of the output, and the power can be transferred in either direction. The converter is able to respond to changes in current set-point, voltage set-point, or power transfer direction within 1 sec.

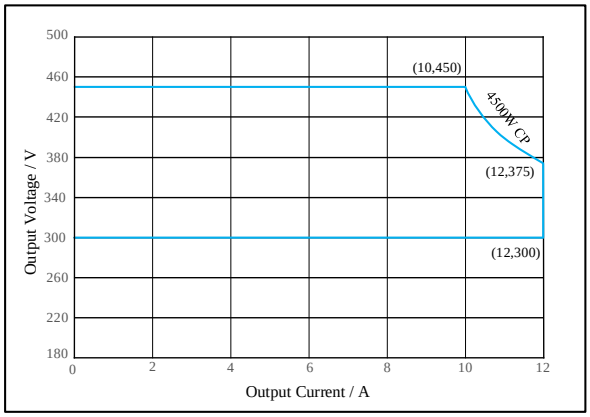
*** Latch with fault reporting via CAN. Fault can be cleared via CAN.

Performance Curve

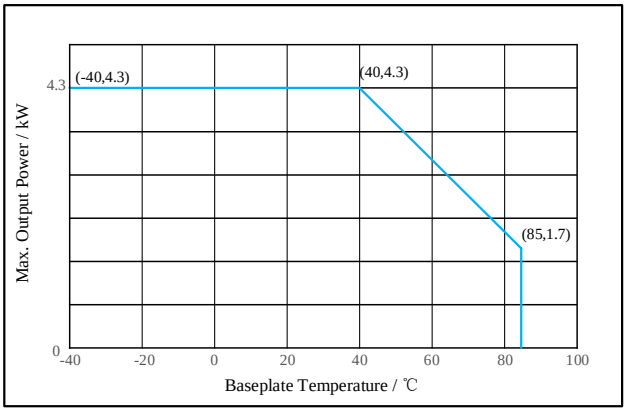
LV output I – V Characteristic



HV Output I – V Characteristic

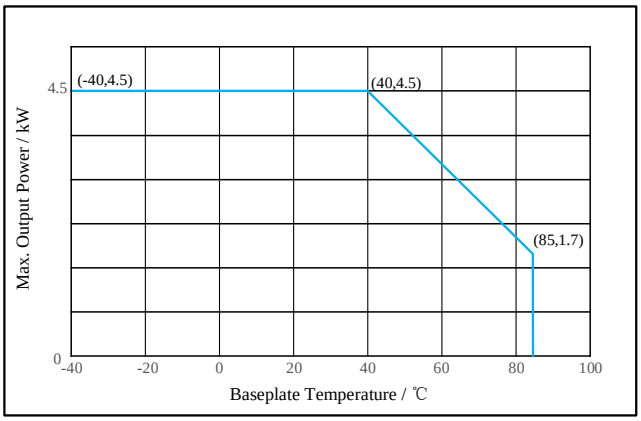


LV Output Power De-rating vs. Baseplate Temperature



The converter can maintain 4300 W full power operation when the baseplate temperature is below 40℃. The output power will be de-rated automatically when the baseplate temperature is higher than 40℃, and shut down when the baseplate temperature is higher than 85℃.

HV Output Power De-rating vs. Baseplate Temperature



The converter can maintain 4500 W full power operation when the baseplate temperature is below 40℃. The output power will be de-rated automatically when the baseplate temperature is higher than 40℃,and shut down when the baseplate temperature is higher than 85℃.

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CAN Communication

CAN Parameters

- CAN 2.0 A/B – 11bit Mode (Tolerant of 29 – bit messages)
- Baud Rate: Selectable, 125/250/500 kbps (default is 500 kbps)

CAN Details

Refer to the document file：DC/DC CAN Packets

ID	Packet Name	Message Direction	Periodicity	DLC	Bit 0 1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	16 17 18 19 20 21 22 23	24 25 26 27 28 29 30 31	32 33 34 35 36 37 38 39	40 41 42 43 44 45 46 47	48 49 50 51 52 53 54 55	56 57 58 59 60 61 62 63
0x300	DCDC CTRL	System ↔ DCDC	As needed but no more than once per 200ms	8	Mode	debug mode		Hi-side Voltage Command 10mV / bit		Lo-side Current Command 5 mA / bit		Hi-Side Current Limit 70 mA / bit
0x301	DCCD STAT	DCDC ↔ System	200ms when active	8	Stat	0	Lo-Side Voltage 0.1V / bit	Hi-side Voltage 10mV / bit		Lo-side Current 5mA / bit		Hi-Side Current 70 mA / bit
0x302	TEMPERATURE & FAULTS	DCDC ↔ System	1000ms when active	8	Controller Temp 1 °C / bit offset:128	Base Plate Temp 1 °C / bit offset:128	Faults		Latched Faults (same fields as Faults but latched. Cleared same as "Active Faults")		Actual Output Power 0.1W / bit	
0x303	EXECUTE	System ↔ DCDC	As needed but no more than once per 200ms	2	CMD	~CMD						
0x304	VERSION	DCDC ↔ System	sent when required	8	DC/DC HW Version Major	DC/DC HW Version Minor	DC/DC HW Version Patch	DC/DC HW Version Internal	DC/DC FW Version Major	DC/DC FW Version Minor	DC/DC FW Version Patch	DC/DC FW Version Internal
0x305	CONFIG	System ↔ DCDC	As needed but no more than once per 1000ms	2	KeyValue	New config						
0x306	CONFIG ACK	DCDC ↔ System	sent after 0x305	1	New config ACK							
0x307	DEBUG INFO	DCDC ↔ System	200ms	8	ADC_I_LV_M_A 5mA/bit		ADC_I_LV_M_B 5mA/bit		dutyA/phaseA	dutyB/phaseB	ENA/ENB	Trip Zone Flag

NOTE

- When writing the field CMD you must also write the field ~CMD with the bit-wise inversion of the value in CMD
- Operation to set (or update) Voltage and Current set points:

1) Write DCDC CTRL (0x300) with fields set as desired
2) Write EXECUTE (0x303) with the fields CMD = UPDATE

- To clear a fault condition:

1) Read DCDC STAT (0x301). Note whether the bit "Active Fault" in the field "Stat" is asserted. If this bit is set, then it will latch asserted.
2) Read TEMPERATURE & FAULTS (0x302) until all bits in the field "Faults" are clear. The field "Latched Faults" will latch faults that may assert and clear quickly.
3) [Optional] Update the parameters in DCDC CTRL (0x300) if they are different than what was last sent
4) Write EXECUTE (0x303) with the field CMD = UPDATE AND CLR FAULTS to clear the "Active Fault" bit in the field "Stat" of DCDC STAT (0x301) and will also clear latched faults in the field "Latched Faults" of TEMPERATURE & FAULTS (0x302)

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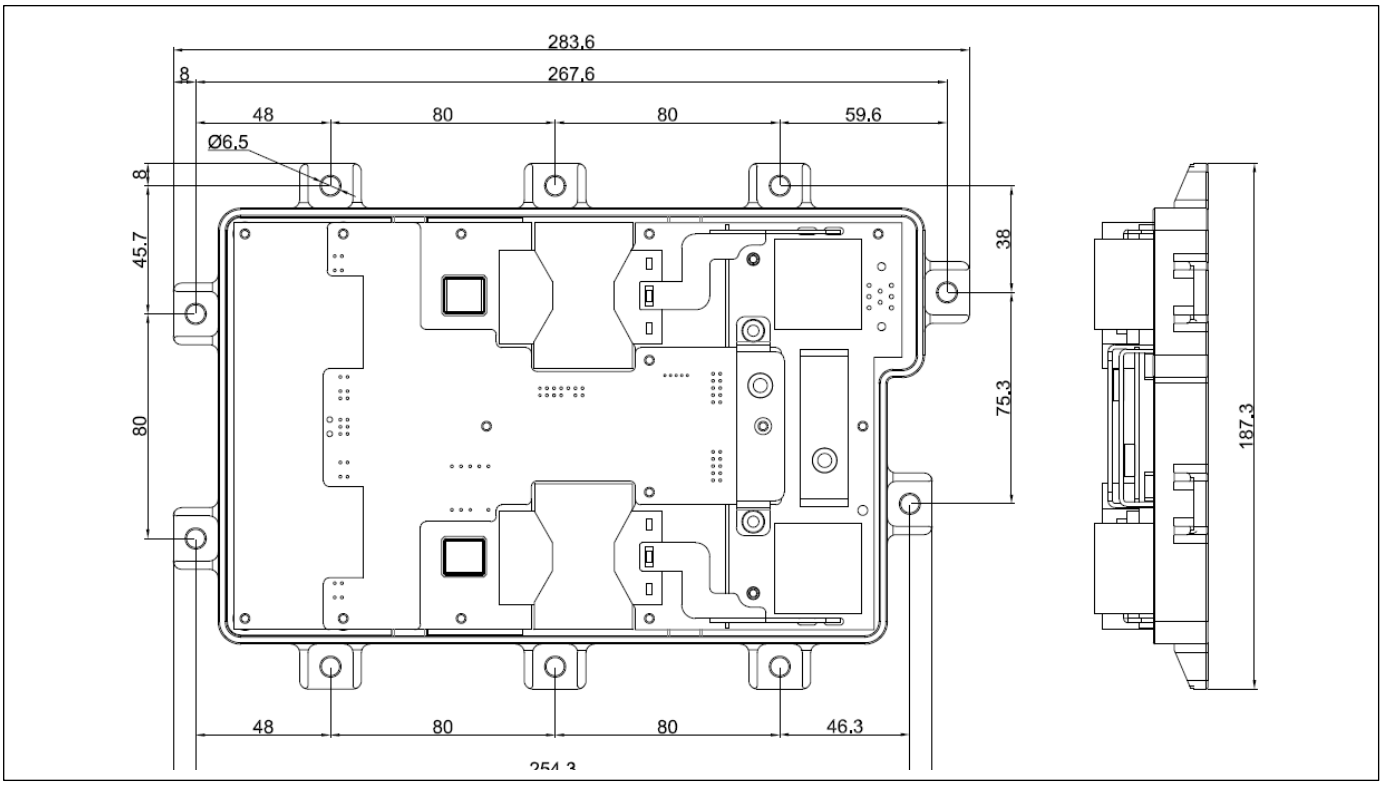
Mechanical Specification

Dimension and Outline Drawing

(unit: mm)



Power & Signal Ports

Name	Pin	Definition
Signal Ports	1	CAN _L
	2	CAN_H
	3	WAKEUP
	4	N/C
	5	N/C
	6	CAN_Term_L
	7	CAN_Term_H
	8	N/C

*Communication signals can be customized as required.

*The instructions will be shipped with the goods.

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Environmental Requirements

The power supply shall operate normally, and sustain no damage as a result of the environmental conditions listed in this section.

Item	Description / Condition / Note	Min.	Typ.	Max.
Ambient temperature	Ambient operation temperature	-40℃		+85℃
Baseplate temperature	operation temperature refer to Fig.2 and Fig.5, Derating	-40℃		+85℃
Storage temperature		-40℃		+85℃
Humidity	Non-condensing			95%
Altitude		0 m		2000 m
Vibration*	Physical abuse per EN 60068-2-6*			
Odor	No odor or health-harming gas release			

Safety &EMC Compliance

1. Primary to Secondary insulation: 2500Vac 5mA max/60second.
2. Primary to Earth insulation: 1000Vac 5mA max/60second.
3. Insulation Resistance: 2MΩ minimum from primary to secondary by adding 500Vdc 60s test voltage.

Isolation

Isolation	Input Wires	Output Wires	0-10V Wires (Class 1 & 2)	Enclosure
Input Wires	Not applicable	3750Vac	3750Vac	1800Vac
Output Wires	3750Vac	Not applicable	500Vac	1800Vac
0-10V Wires (Class 1 & 2)	3750Vac	500Vac	Not applicable	1800Vac
Enclosure	1800Vac	1800Vac	1800Vac	Not applicable

The instructions will be shipped with the goods.

Revision History

Change Date	Rev.	Description of Change		
		Item	From	To
2023.07.15	V0.1	New release		

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