

# DC-DC Bidirectional Buck-Boost Power Board

VL10-56V, VH24-75V, 80V 150A

## Typical Performance (YF-BK/ST80V150A)

- Non-isolated synchronous bidirectional buck/boost
- Wide input: VH=22-75V, VL=12-56V
- Peak efficiency >98%
- Over-current protection, short-circuit protection, auto-recovery
- Remote ON/OFF, forward/reverse control
- Thermostatic fan, over-temperature protection, under-voltage & over-voltage protection
- Buck mode: VL voltage & current adjustable
- Boost mode: VH input current adjustable, output voltage adjustable; external voltage & current control
- Optional input/output voltage meters
- Optional fast transient response (for load applications)
- CVIN function for solar panels or fuel cells (VH side)
- Aluminum substrate with high thermal conductivity; natural cooling up to 20W (ambient 25°C); constant working MEI for easy prediction
- Power up to 3600W (VL=24V) / 4500W (VL=36-72V); parallel up to 300A

Unless otherwise specified, all tests are performed at input 48V, output 24V, pure resistive load, and 25° C room temperature. Specifications subject to change without notice.

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## Absolute Maximum Ratings

Item	Min	Typ	Max	Unit	Notes
Input voltage VH	-1	—	80.0	V	Continuous
Output voltage VL	-1	—	60.0	V	—
Power enable EN	-0.7	—	30	V	—
Fan interface current limit	—	0.8	—	A	—
Storage temperature	-45	—	125	° C	—
Aluminum substrate & power pin withstand voltage	—	300	500	V	Non-isolated
Max torque of screw terminal	2	—	3	N • m	—
Potentiometer rotation life	—	200	—	cycles	—

## Recommended Operating Parameters

Item	Min	Typ	Max	Unit
Input voltage VH	—	—	72.0	V
Input current VH	—	60.0	90.0	A
Output voltage VL	12.0	24.0	48.0	V
Output current VL	—	120	150	A

## Technical Specifications

**Buck Mode (VH+ = Input, VL+ = Output)**

Item	Min	Typ	Max	Unit	Notes
VH+ voltage tracking range	26	—	72	V	Buck only
VH input operating voltage	24	36	75	V	—
VH input under-voltage shutdown (adjustable)	19.0	19.2	19.5	V	Shutdown after protection
VH input UV hysteresis	—	$0.96 \times V_u$	$1.04 \times V_u$	V	$V_u$ = set UV value
VH input over-voltage protection (adjustable)	75.0	76.2	76.5	V	Auto-recovery
VH input OV hysteresis	—	$0.96 \times V_u$	$1.04 \times V_u$	V	$V_u$ = set OV value
VH input current range	—	60.0	90.0	A	VH/VL > 2
VH input current limit	—	—	100	A	—

Item	Min	Typ	Max	Unit	Notes
No-load input current (single board)	—	5.0	8.0	mA	Discontinuous mode
Standby current (total power off)	0.1	0.2	0.4	mA	—
VL output voltage adjustment	5.0	—	56	V	—
VL output over-voltage protection	57.0	57.6	57.9	V	—
VL output current range	0	120	150	A	—
VL output current adjustment	10.0	—	180	A	<10A unstable
VL output current limit	—	190	200	A	—
Output voltage regulation (Io=80A)	$0.995 \times V_u$	—	$1.05 \times V_u$	V	$V_u = \text{no-load } V_o$
Output voltage ripple (PK-PK)	—	80	250	mV	48V→24V/120A
Load step (Vo=24V/100A, 0 - 100% Io, CCM)	—	2.0	3.0	V	—
Recovery time	0.5	0.7	—	ms	<2% Vout
Output overshoot (Io=100A)	1.0	1.6	2.2	V	Load 100% - 10%
Recovery time	0.5	0.8	—	ms	<1% Vout

Item	Min	Typ	Max	Unit	Notes
Start-up time	—	110	120	ms	Power-on to Vo stable
Output soft-start time	100	110.0	—	ms	Extendable by request
VL short-circuit current	—	—	180	A	—

**Boost Mode (VL+ = Input, VH+ = Output; VH+ NOT shortable)**

Item	Min	Typ	Max	Unit	Notes
VL input operating voltage	12	—	56	V	—
VL input over-voltage protection (adjustable)	36	57.0	57.9	V	Buck only
VL input OV hysteresis	—	$0.95 \times V_u$	$1.05 \times V_u$	V	Shutdown after protection
VL input current range	—	120	150	A	—
VL input current adjustment	10	—	180.0	A	—
VL input current limit	—	190	200	A	Auto-recovery
No-load input current	3.0	6.0	—	mA	Discontinuous mode
Standby current (total off)	0.08	0.1	0.15	mA	—
VH output voltage adjustment	20.0	—	72.0	V	—

Item	Min	Typ	Max	Unit	Notes
VH output over-voltage protection	75.0	76.2	76.5	V	—
VH output current range	—	60.0	90.0	A	VH/VL>2
VH output current limit	—	—	100.0	A	—
Output voltage regulation	$0.995 \times V_u$	—	$1.05 \times V_u$	V	$V_u = \text{no-load } V_o$
Output voltage ripple (PK-PK)	—	150	250	mV	—
Load step ( $V_o=48V/60A$ )	1.5	2.0	—	V	—
Recovery time	0.8	1	—	ms	<2% $V_{out}$
Output overshoot ( $I_o=60A$ )	1.5	2.0	2.2	V	—
Recovery time	0.8	1.0	—	ms	<1% $V_{out}$
Start-up time	—	110	120	ms	—
Output soft-start time	100	110.0	—	ms	—
VH output short-circuit current	—	—	2.2	A	—

## Conversion Efficiency

Condition	Min	Typ	Max	Unit
65V→24V (2KW)	97.2	97.5	—	%
48V→24V (2KW)	97.4	98.0	—	%
48V→14V (1KW)	96.6	96.7	96.8	%

Condition	Min	Typ	Max	Unit
12V→48V (1KW)	96.0	96.2	96.4	%
24V→48V (2KW)	97.8	98.0	98.2	%
24V→72V (2KW)	96.8	97.1	97.3	%

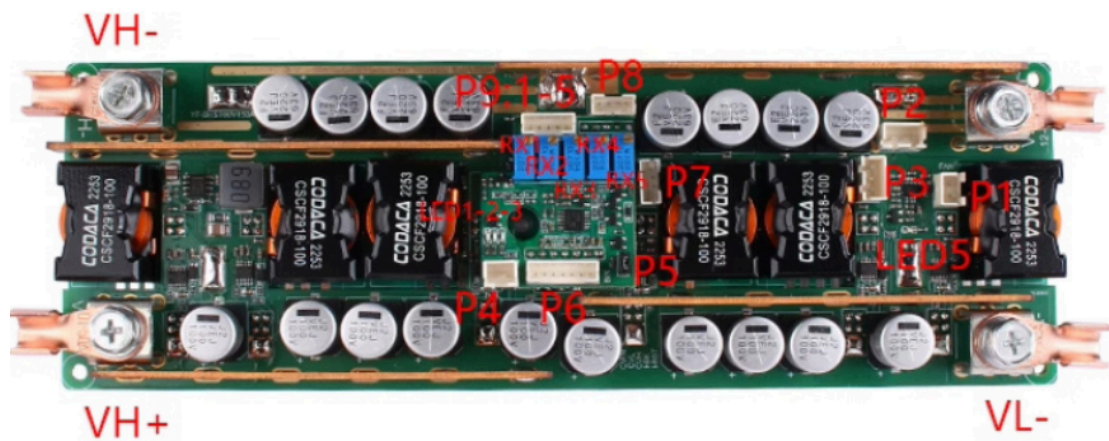
## Other Characteristics

Item	Min	Typ	Max	Unit	Notes
Switching frequency	180	185	190	kHz	—
Buck voltage ratio	2	—	10	×	VH/VL
Boost voltage ratio	2	—	4	×	VL/VH
EN disable valid voltage	0	—	1.0	V	Pull low only
Fan terminal voltage	11.5	11.7	12.2	V	VH+>14V
Fan terminal supply current	—	0.3	0.5	A	—
Over-temperature protection	—	85	95	° C	Aluminum plate
Operating temperature	-45	25	85	° C	Main controller
Main controller temp	-45	—	125	° C	—
Electrolytic capacitor temp	—	—	105	° C	—
Storage temperature	-20	25	85	° C	—
Cooling	—	—	—	—	Natural ≤10W; heatsink/fan >15W

Item	Min	Typ	Max	Unit	Notes
Dimensions	—	230×75×23	—	mm	—
Weight	—	600.0	—	g	—
Optional heatsink	—	230×77×16	—	mm	360g

## Notes

1. This DC-DC is not an ideal constant-current source. Load equivalent resistance shall not be too low. To ensure stability, voltage after current limiting shall exceed 90% of no-load voltage (limited by minimum duty cycle).
2. In boost mode, if adjusting current limit, keep  $V_H - V_L > 5V$  (limited by maximum duty cycle). Boost mode is direct-pass when off; direct-pass cannot limit current and must NOT be shorted.
3. Keep operating voltage away from UV/OV thresholds to avoid tripping from cable voltage drop or voltage fluctuations.
4. Fast transient response may cause oscillation with batteries in charging applications (normal); parameters can be modified to improve.
5. Discontinuous mode has very low standby current (inductor noise  $< 20A$ ); continuous mode has good dynamics for loads but higher no-load loss. Do not connect high-voltage batteries incorrectly in continuous buck charging (risk of reverse boost damage).
6. Current limit cannot be set below 10A. Buck limits VL output current; boost limits VL input current.
7. For charging, add ideal diode to prevent back-feed; add fuse on VH to prevent accidental short.
8. Prolonged over-current on VL may cause overheating (especially poor mounting). Parallel multiple copper lugs for full-load use.
9. Adjust start-up time if input source has slow power-up (e.g., AC adapter). Suggest power-on first then load connection.
10. Dynamic response values measured in continuous mode ( $\approx \times 2$  in discontinuous); not required for charging.
11. Some parameters adjustable for different applications.



Label	Function	Description
VH+	High-voltage positive	Input in buck; output in boost
VH -	High-voltage negative	Common ground with VL -
VL -	Low-voltage negative	Common ground; connect only VL - to reduce loss
VL+	Low-voltage positive	Input in boost; output in buck
RX1	VH voltage tracking	25 turns = 22 - 72V (CW up); buck only
RX2	VL voltage adjust	25 turns = 5 - 56V (CW up); buck only
RX3	VH voltage adjust	25 turns = 20 - 72V (CW up); boost only
RX4	VL output current adjust	10 - 180A (CW up); buck only
RX5	VL input current adjust	10 - 180A (CW up); boost only
P1	Fan power	12V/0.3A thermostatic; NOT shortable
P2	VL voltage meter	Optional; 12V/0.3A output
P3	VH voltage meter	Optional; 12V/0.3A output
P4	EN enable	Pull low to off; float = on
P5	Buck/boost select	Short = buck; float = boost; control >50ms
P6 - P8	Parallel ports	For factory parallel to 300A; user not use
P9-1	VL voltage control	0 - 2.4V = 0 - 56V; RX2 centered/CCW
P9-2	VH voltage control	0 - 2.4V = 22 - 74V; RX3 centered/CCW
P9-3	External current control	0 - 2.5V = 10 - 180A; RX4/RX5 fully CW

Label	Function	Description
P9-4	External mode switch	Pull low = buck; float = boost; remove P5 cap
P9-5	Control GND	Common ground for external signals
LED1	Main power indicator	On = controller powered
LED2/3	Mode indicator	Green = buck; Red = boost
LED4	CVIN indicator	On = solar/fuel cell CVIN valid
LED5	Aux 12V indicator	On = 12V normal; powers controller, fan, meters

### Usage Tips

1. Buck/boost potentiometers controlled independently.
2. Input source must supply >200A to avoid collapse.
3. Input source start-up time < board start-up time.
4. Keep input wires short and low resistance.
5. Avoid series diodes on input (risk of over-voltage).
6. Use electronic load in CR mode (not CC).
7. Adjust voltage with small resistive load for accuracy.
8. Unidirectional use: adjustable UV shutdown; bidirectional use: set VH UV only.

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## UV Shutdown Setting

- Bidirectional: set VH UV only.
- Default VH UV:  $V = ((R1+R3)/10 + 1) \times 1.2 = 11.52V$  ( $R1=R3=43K$ )
- Boost only: VL UV:  $V = ((R2+R3)/10 + 1) \times 1.2V$

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## Custom & Support

Professional manufacturer of power supplies, amplifiers, motor controllers

- DC-DC buck/boost/auto modules
- Brushless/brush motor controllers
- 150W–3000W CC/CV modules (9V–60V, 50W–500W) Customization available; contact service for details.