General Application Note

DC-DC Converter BDC/BDCD-VC Application Guidelines

BDC-10VC models

BDC-30VC models

1. Introduction

The following guidelines should be carefully read prior to converter use. Improper use may result in the risk of electric shock, damaging the converter, or fire.

2. Risk of Injury

a) To avoid the risk of burns, do not touch the converter's case.
b) Do not touch the input terminals or open the case and touch internal components, which could result in electric shock or burns.
c) When the converter is in operation, keep hands and face at a distance to avoid potential injury during improper operation.

3. Installation Advice

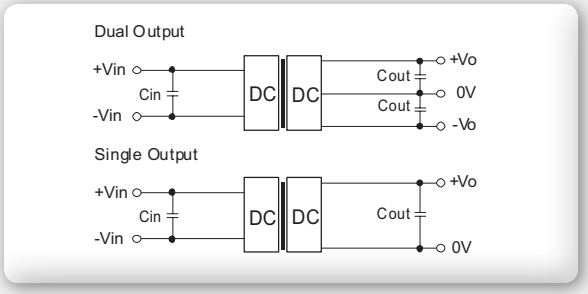
a) Please make sure the input terminals and signal terminals are properly connected in accordance with the stated datasheet requirements.
b) To ensure safe operation and meet safety standard requirements, install a slow blow fuse at input of the converter.
c) Installation and use of DC-DC converters should be handled by a qualified professional.
d) DC-DC converters are used in the primary transmission stage of a design and thus, should be installed in compliance with certain safety standards.
e) Please ensure that the input and output of the converter are incorporated into the design out of the reach of the end user. The end product manufacturer should also ensure that the converter is protected from being shorted by any service engineer or any metal filings.
f) The application circuits and parameters shown are for reference only. All parameters and circuits are to be verified before completing the circuit design.
g) These guidelines are subject to change without notice; please check our website www.bicker.de for updates.

4. Design consideration

1) Typical application

The complete BDC(D)-VC-series have been tested according to the following typical circuit before leaving factory.

If you want to further decrease the input/output ripple, you can increase a capacitance properly or choose capacitors with low ESR, but the greatest capacitance of its filter capacitor must less than the Max. Capacitive Load.



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2) External capacitor tables

BDC-10VC

Input Voltage nom (VDC)	Cout (μF)	Cin (μF)
24V	10	100
48V		10-47

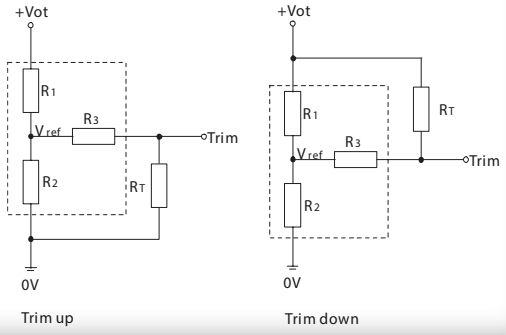
BDC-30VC

Output Voltage (VDC)	Cout (μF)	Cin (μF)
3.3V/5V/9V	220	100
12V/15V	100	

It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot-swappable.

5. Application of Trim and calculation of Trim resistance

Trim only BDC-30VC



Calculation formula of Trim resistance

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vo' - Vref} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - Vref}{Vref} \cdot R_2$$

R_T is Trim resistance
„a" is a self-defined parameter with no real meaning

Applied circuits of Trim (Part in broken line is the interior of models)

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.87	12.4	1.25
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

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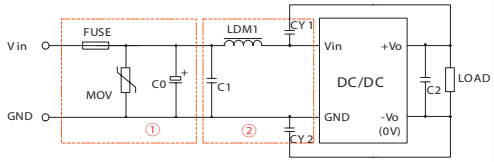
6. EMC recommended circuit

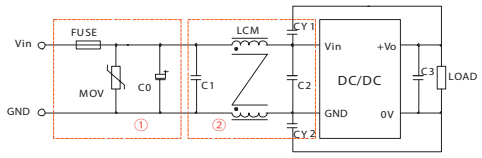
BDC(D)-10VC



Parameter description

Model	Vin:24V	Vin:48V
FUSE	Choose according to actual input current	
MOV	S14K35	S14K60
C0	330μF/50V	330μF/100V
C1	1μF/50V	1μF/100V
C2	Refer to the Cout in Fig.2	
LDM 1	4.7μH	
CY1 /CY2	1nF/2KV	

BDC(D)-30VC



Parameter description

Model	Vin:24V	Vin:48V
FUSE	Choose according to actual input current	
MOV	S14K35	S14K60
C0	330μF/50V	330μF/100V
C , C2	4.7μF/50V	2.2μF/100V
C3	Refer to the Cout in Fig.2	
LCM	1mH	
CY1 , CY2	1nF/2KV	

Note: (1) EMS recommended external circuit
(2) EMI recommended external circuit
Choose according the requirements

7. Remote ON/OFF control

Remote ON/OFF control refers to the turning on or off the converter by external means. Remote ON/OFF control pin is called CTRL.

Positive Logic:
CTRL terminal connected directly to –Vin, output OFF;
CTRL terminal open or connected to up level (TTL High) output ON.

Negative Logic:
CTRL terminal connected directly to –Vin, output ON;
CTRL terminal open, output OFF.

In some special applications, isolated control method is required, see left figure for the reference circuit.

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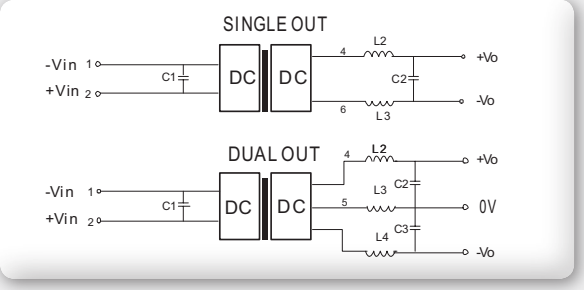
8. Capacitive load

To meet the requirements of capacitive loads, it is recommended for wide input series, the recommended capacitor is 100 µF.

9. Ripple & Noise reduction

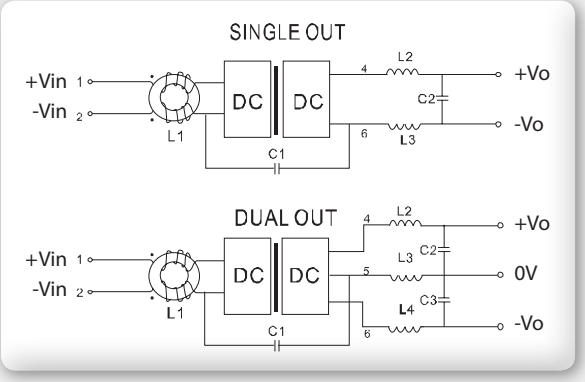
1) Ripple: Considerations here are that the additional output capacitance added, if excessive, may cause the DC/DC converter some difficulty during power up. This value is shown on the datasheet.



C1: EMI Filter and to reduce input ripple: connect aluminum electrolytic capacitor, please refer to datasheet to verify maximum capacitance value.
L2/L3/L4: Form an LC filter network to reduce output noise and ripple. It is recommended to use powered iron magnetic cores and copper magnet wire suitably rated.
C2/C3: Form an LC filter network to reduce output noise and ripple. It is recommended to use aluminum electrolytic capacitors.

2) Noise reduction

A typical example is shown below:



10. Eliminate high-frequency noise

In high-speed circuit, dynamic analog circuit, digital circuit, the distributed resistance and inductance become obvious and sensitive and even scream for quick change of load current. Thus, high frequency is required to be eliminated, meanwhile the resonant which caused by series resistance and distributed parameter is also required to be erased.

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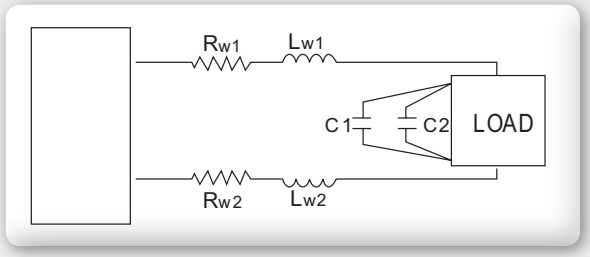

C1 use 1-10uF electrolytic or tantalum capacitor; C2 use 0.1uF ceramic capacitor. (see technical information for details)