1. Pin Connection

No.	Pin connection	Function
1	+DC (+V) INPUT	+Side of input voltage
2	−DC (−V) INPUT	−Side of input voltage
3	+DC (+V) OUTPUT	+Side of output voltage
4	COMMON	GND of output voltage (Only applicable for Dual output)
5	−DC (−V) OUTPUT	−Side of output voltage
6	Case connecting pin	If connected to −side of input, the case potential can be fixed and the value of radiation noise can be reduced.

●Single output

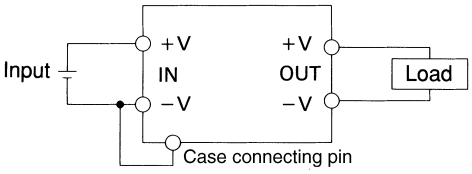


Fig. 1.1 Single output of pin connection

●Dual output

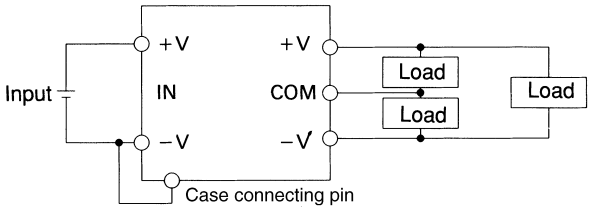


Fig. 1.2 Dual output of pin connection

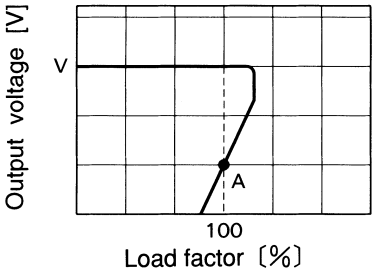
●Case connecting pin
Case connecting pin is available. By connecting this pin to −side of input, the radiation noise from main body can be reduced.

2. Function

2.1 Overcurrent protection

■Overcurrent protection circuit is built-in to be operated over 105% of the rated current.
This function works to protect against short circuit and overcurrent condition of less than 20 seconds.
When cause of activation of overcurrent protection is removed, the output will be automatically recovered.

■The power supply which has a current foldback characteristics may not start up when connected to nonlinear load such as lamp, motor or constant current load.
See the characteristics below.



——: Load characteristics of power supply
- - - - -: Characteristics of load (lamp, motor, constant current load, etc.)
Note: In case of nonlinear load, the output is locked out at A point.

Fig. 2.1 Current foldback characteristics

2.2 Isolation

■When conducting tests such as the Hi-Pot test at an incoming test, gradually increase the voltage. Also, gradually reduce the voltage for shut down. Avoid using the Hi-Pot tester with timer because it may generate the voltage a few times higher than the applied voltage when the timer starts and ends.

3. Wiring to Input/Output Pin

■Input filter is built-in. By external capacitor Ci closer to the input terminal, input connected noise from converter can be reduced by forming the π type filter. Since operating frequency is high, select the capacitor with high frequency type.

■Install Ci at input terminal when the line from source to converter is long. When Ci is not installed, it may unstabilize the output, it makes input feedback noise big and several times voltage of input voltage is applied. Moreover, install Ci at input terminal if abnormal voltage from input power supply like surge is drawn.

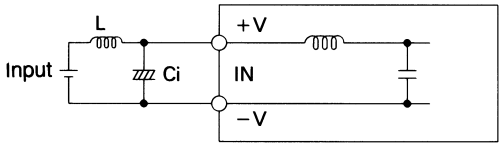


Fig. 3.1 Connecting method of external capacitor at input terminal

Table 3.1 Capacity of external capacitor at input terminal: Ci [μF]

Model / Input voltage (V)	ZS1R5 ZW1R5	ZS3 ZW3	ZS6 ZW6	ZS10 ZW10
5	100	220	470	470
12	47	100	220	220
24	33	47	100	100
48	10	22	47	47

■To decrease more ripple, install external capacitor Co at output terminal as below chart.

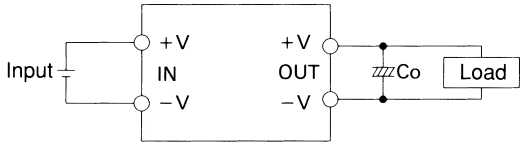


Fig. 3.2 Connecting method of external capacitor at input terminal

Table 3.2 Capacity of external capacitor at output terminal: Co [μF]

Model / Output voltage (V)	ZS1R5 ZW1R5	ZS3 ZW3	ZS6 ZW6	ZS10 ZW10
5	100	220	220	220
12	100	100	100	100
15	100	100	100	100

■When the distance between load and DC output is long, please install capacitor at load as below.

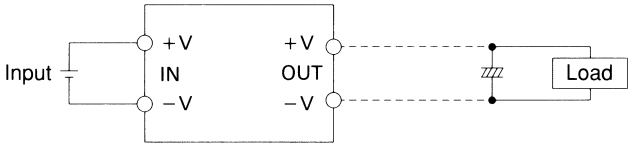


Fig. 3.3 Connection method of capacitor at load

■Since operating frequency is high, common mode noise occurs slightly. To reduce the noise more, install capacitor between −V input and −V output as below.

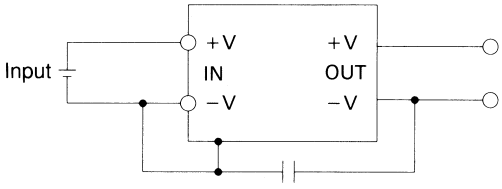


Fig. 3.4 Circuit to reduce common mode noise

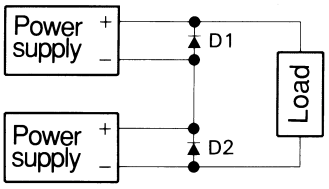
4. Series Operation and Parallel Operation

4.1 Series operation

●ZS1R5/ZW1R5 • ZS3/ZW3 • ZS6/ZW6

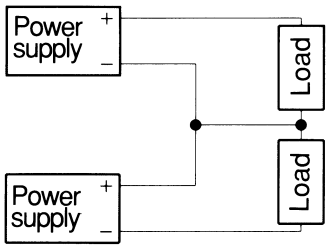
■Series operation is available by connecting below. However, output current in series connection should be lower than the lowest rated current in each unit.
But at series operation with same output voltage, diode is not required to attach even if at (a).

(a)



D1, D2: Please use Schottky Barrer Diode which has lower forward voltage.

(b)



●ZS10/ZW10

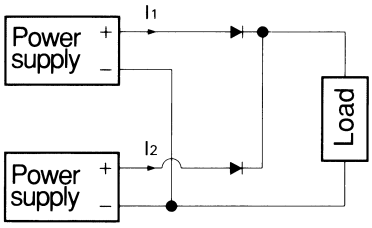
■Series operation is available. However, output current in series connection should be lower than the lowest rated current in each unit.

4.2 Parallel redundancy operation

■Parallel redundancy operation is available by connecting below.

■Values of I_1 and I_2 might be slightly different because of fine differences of output voltage. Keep balance of output current, as output current from each power supply should not exceed the rated current value.

I_1, I_2 ≦ the rated current value



Z

5. Assembring and Installation Method

5.1 Installation method

■The unit can be mounted in any direction. Position them with proper intervals to allow enough air ventilation. Ambient temperature around each power supply should not exceed the temperature range shown in delating curve.

■Avoid placing the DC input line pattern layout underneath the unit because it will increase the line conducted noise. Make sure to leave an ample distance between the line pattern layout and the unit. Also, avoid placing the DC output line pattern underneath the unit because it may increase the output noise. Lay out the pattern away from the unit.

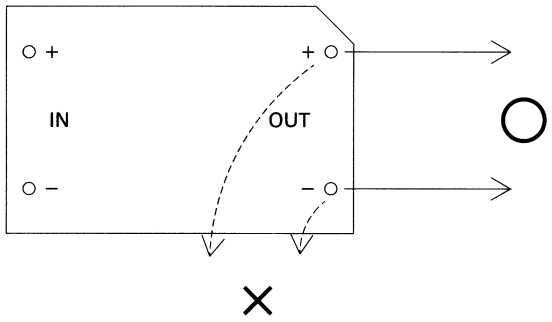


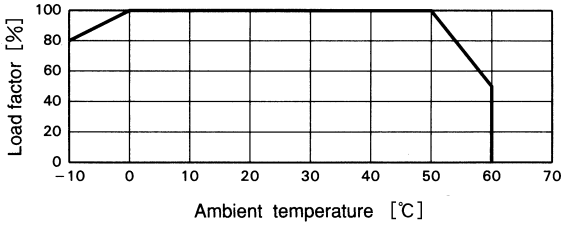
Fig. 5.1 Pattern wiring

5.2 Derating

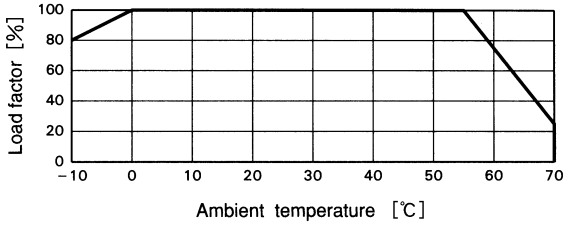
■By derating the output current, it is possible to operate the unit from −10℃~+60℃ for ZS (W) 1R5~ZS6 and from −10℃~+70℃ for ZS (W) 10.

■When unit mounted any way other than in drawings below, it is required to consider ventilated environments by forced air cooling or temperature/load derating. For details, please consult our sales or engineering department.

Except ZS(W)10



ZS(W)10



■The temperature increase of case surface at full load is shown by below table as referenced data.

Table 5.1 The surface temperature of case increase data (Z series) (Unit: deg)

Input voltage	Output voltage	1.5W	3W	6W	10W
5V	5V	20	25	28	37
	12V	21	27	30	43
	15V	22	28	28	40
	±12V	20	27	34	39
	±15V	20	29	32	44
12V	5V	14	18	24	34
	12V	13	22	23	34
	15V	14	21	22	28
	±12V	13	18	21	36
	±15V	12	20	24	34

Input voltage	Output voltage	1.5W	3W	6W	10W
24V	5V	18	14	25	33
	12V	17	17	21	29
	15V	16	19	22	29
	±12V	17	17	25	32
	±15V	18	19	24	29
48V	5V	15	25	30	32
	12V	12	29	25	27
	15V	12	22	28	26
	±12V	16	21	24	33
	±15V	16	20	25	33

6. Input Voltage/Current Range

■When a non-regulated source id used as a front end, make sure that the voltage fluctuation together with the ripple voltage will not exceed the input voltage range.

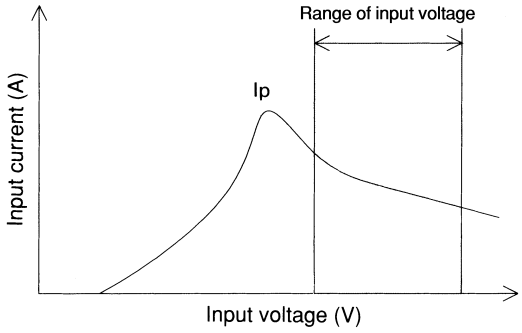


Fig. 6.1 Input current characteristics (Except ZS10, ZW10)

■Use an input power supply unit with enough power cosidering the start-up current (Ip) for the DC−DC.

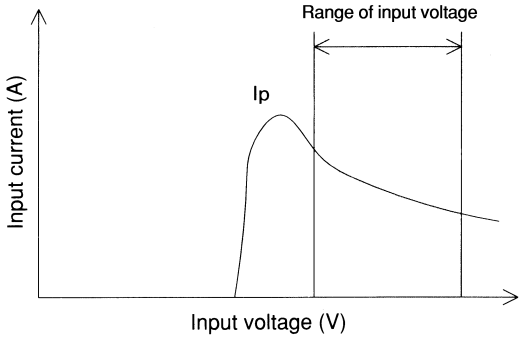


Fig. 6.2 Input current characteristics (ZS10, ZW10)

7. Cleaning

■Cleaning agents:

No.	Classification	Cleanig agents
1	Water type	Pine Alpha ST-100S (ARAKAWA CHEMICAL CO.)
2		Clean Through 750H (KAO Corporation)
3	Solvent type	IPA
4		Asahiklin AK−225AES (ASAHI GLASS CO.)

Z

■Cleaning period

The total time of varnishing, ultrasonic wave and vapor should be within 2 minutes. In case of ultrasonic wave cleaning, the ultrasonic should be less than 15W/ℓ. During cleaning to drying (the condition that cleaning liquid is soaked into the ink of name plate), do not touch on the surface of name plate.

■After cleaning, dry them enough.

8. Soldering

■Flow soldering : 260℃ less than 15 seconds.
■Soldering iron : 450℃ less than 5 seconds.

9. Input/Output Pin

■When too much stress is applied on the input/output pins of the unit, the internal connection may be weakened. As below Fig. 8.1, avoid applying stress of more than 1kgf on the pins horizontally and more than 2kgf vertically.

■The input/output pins are soldered on PCB internally, therefore, do not pull or bend them with abnormal forces.

■When additional stress is expected to be put on the input/output pins because of vibration or impacts, fix the unit on PCB (using silicone rubber or fixing fittings) to reduce the stress onto the input/output pins.

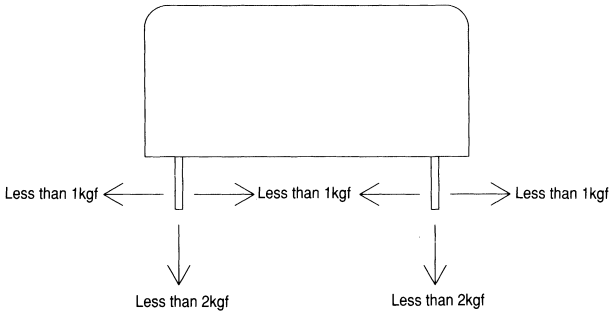
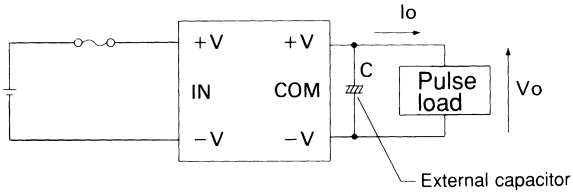
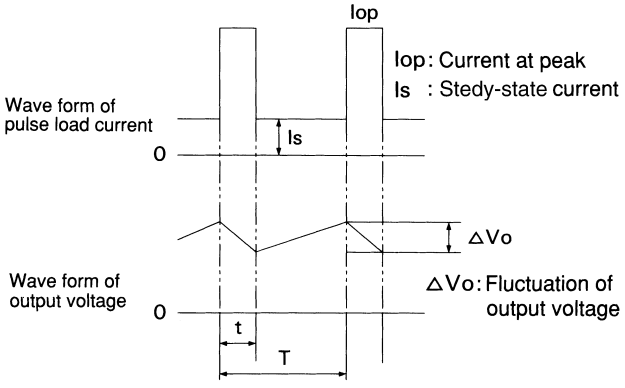


Fig. 8.1 Stress onto the pins

10. Peak Current (Pulse Load)

■When converter is used for pulse load, there is a way to supply pulse current by connecting the capacitor externally at output.





■The average current Iav of output is shown in below formula.

$$Iav = Is + \frac{(Iop - Is)\,t}{T}$$

■The required electrolytic capacitor C is found by below formula.

$$C = \frac{(Iop - Iav)\,t}{\Delta Vo}$$

Z