ZWS10C - 50C Series
Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT (Common)

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

⚠ DANGER

- Never use this product in locations where flammable gas or ignitable substances are present.

⚠ INSTALLATION WARNING

- When installing, ensure that work is done in accordance with the instruction manual.
  When installation is improper, there is risk of electric shock and fire.
- Installation shall be done by Service personnel with necessary and appropriate technical training and experience.
  There is a risk of electric shock and fire.
- Do not cover the product with cloth or paper etc.
  Do not place anything flammable around.
  This might cause damage, electric shock or fire.

⚠ WARNING on USE

- Do not touch this product or its internal components while circuit in operation, or shortly after shutdown.
  You may receive a burn.
- While this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- For product without cover, do not touch this product or its internal components while product is in operation, or shortly after shutdown. There are high voltage potential and high temperature parts in the product.
  This might cause injury such as electric shock or burn.
- There are cases where high voltage charge remains inside the product. Therefore, do not touch even if they are not in operation as you might get injured due to high voltage and high temperature.
  You might also get electric shock or burn.
- Do not make unauthorized changes to this product nor remove the cover as you might get an electric shock or might damage the product. We will not be held responsible after the product has been modified, changed or dis-assembled.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc.
  Please stop using it immediately and shut off the product.
  It might lead to fire and electric shock. In such cases, please contact us.
  Do not attempt repair by yourself, as it is dangerous for the user.
- Do not operate and store these products in environments where condensation occurs due to moisture and humidity.
  It might lead fire and electric shock.
- Do not drop or apply shock to this product. It might cause failure.
  Do not operate these products mechanical stress is applied.
- When necessary, this products is to be repaired only by us or our authorized agents.
  It is important that this product cannot be used in hazardous environments (facilities such as nuclear power control system or life support equipment) without our written consent.

⚠ CAUTION on MOUNTING

- Confirm connections to input/output terminals are correct as indicated in the instruction manual before switching on.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged.
- Input/output line, please use the wires as short and thick as possible.
- Do not use this product in special environment with strong electromagnetic field, corrosive gas or conductive substances and direct sunlight, or places where product is exposed to water or rain.
- Mount this product properly in accordance with the instruction manual, mounting direction and shall be properly be ventilated.
- Please shut down the input when connecting input and output of the product.
- When installing in environment where conductive foreign, dust and liquid may be present, please consider penetration of above foreign material in the power supply by installing filter, to prevent trouble or malfunction.

⚠ CAUTION on USE

- Product individual notes are shown in the instruction manual.
  If there is any difference with common notes individual notes shall have priority.
- Before using this product, be sure to read the catalog and instruction manual.
  There is risk of electric shock or damage to the product or fire due to improper use.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged, or cause electric shock or fire.
- If the built-in fuse is blown, do not use the product even after replacing the fuse, as there is risk of abnormality inside.
  Be sure to request repair to our company.
- For products without built-in protection circuit (element, fuse, etc.), insert fuse at the input to prevent smoke, fire during abnormal operation. As for products with built-in protection circuit, depending on usage conditions, built-in protection circuit might not work. It is recommended to provide separate proper protection circuit.
- For externally mounted fuse do not use other fuses aside from our specified and recommended fuse.
- This product was made for general purpose electronic equipment use and is not designed for applications requiring high safety (such as extremely high reliability and safety requirements.
  Even though high reliability and safety are not required, this product should not be used directly for applications that have serious risk for life and physical safety.
  Take sufficient consideration in fail-safe design (such as providing protective circuit or protective device inside the system, providing redundant circuit to ensure no instability when single device failure occurs).
- When used in environments with strong electromagnetic field, there is possibility of product damage due to malfunction.
- When used in environment with corrosive gas (hydrogen sulfide, sulfur dioxide, etc.) , there is possibility that they might penetrate the product and lead to failure.
- When used in environments where there is conductive foreign matter or dust, there is possibility of product failure or malfunction.
- Provide countermeasure for prevention of lightning surge voltage as there is risk of damage due to abnormal voltage.
- Connect together the frame ground terminal of the product and the ground terminal of the equipment for safety and noise reduction. If these ground is not connected together, there is risk of electric shock.
- Parts with lifetime specifications (built-in fan, electrolytic capacitor) are required to be replaced periodically.
  Set the overhaul period depending on the environment of usage and perform maintenance.
  Also, note that there are cases when EOL products cannot be overhauled.
- Take care not to apply external abnormal voltage to the output. Especially, applying reverse voltage or overvoltage more than the rated voltage to the output might cause failure, electric shock or fire.
- This product is designed under condition Material group IIIb, Pollution Degree (PD): PD2, Over Voltage category (OVC): OVCII and Class of equipment: Class I and Class II.
  This product is designed to be accessible only to service technicians as part of indoor use device.
- This product contains a printed circuit board utilizing surface mounted devices.
  PCB stress such as bending, twisting etc. could cause damage. Therefore, please handle with care.
- When handling this product, hold the board edge and take care not to touch the component side.
  When installing this product in apparatus or equipment, mount it on spacers.
- The outputs of this product may, under fault conditions, exceed ES1 voltage limits.
  Therefore the outputs must be protected in the end equipment to maintain ES1.
- This product has used Power Thermistor to protect the circuit from Inrush Current.
  Frequent repetition of input might cause damage to internal components because of generating surge current.

Note

- Take note that traces of sheet metal processing be left in our power supplies.
- When disposing product, follow disposal laws of each municipality.
- Published EMI (CE, RE) or immunity is the result when measured in our standard measurement conditions and might not satisfy specification when mounted and wired inside end-user equipment.
  Use the product after sufficiently evaluating at actual end-user equipment.
- When exporting our products, apply for necessary permissions as required by rules and regulations of Foreign Exchange and Foreign Trade Control Act.
- Catalogue, contents of the instruction manual may be changed without a prior notice. Refer to latest catalogue or instruction manual.
- Reproduction or reprinting the instruction manual or its portion is forbidden without our permission.

LONG-TERM STORAGE METHOD AND LONG-TERM STORAGE PERIOD

- Please keep the product in carton box.
- Please do not apply excessive vibration, shock or mechanical stress applied directly to the product.
- Please keep away from direct sunlight.
- For long-term storage temperature and humidity, the following conditions shall be used as a guideline :
  Temperature range : 5℃～30℃
  Humidity range : 40%～60%RH
  Please keep away from the places where temperature and humidity can change drastically.
  It can cause condensation on the product or deterioration.
- For long-term storage period, we recommend to use within 2 years after receiving the product.
  < Soldering and PCB mounted products : On Board, Power Module and etc >
  For products that have been received for more than 1 year, please check lead oxidation and solderability.
  In addition, SMD type products may have MSL (Moisture Sensitivity Level) provision.
  Please be sure to read the instruction manual and delivery specifications.
  < Unit type or PCB type of products : the product is used an aluminium electrolytic capacitor >
  There is tendency that the leakage current of an aluminium electrolytic capacitor may increase when stored without using for a long time. This phenomenon can be improved by applying voltage to the aluminum electrolytic capacitor to reduce the increased leakage current through the self-recovery effect of the electrolyte.
  For reference, before using products that have been stored for a very long time, please warm-up first for 30 minutes or more without taking load.
  < Criterion of warm up voltage condition >
  (1)Implementation period : 1 year or above after the delivery
  (2)Electrical continuity condition
  Input voltage : Rating
  Load : 0A
  Ambient temperature : Normal temperature
  Time : 30 minutes or more

1. Model name identification method

ZWS 10C - 5 /□

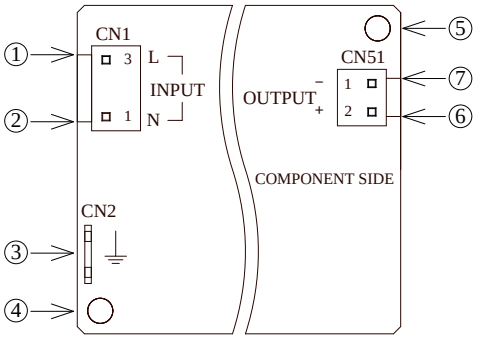
- Option (*1)
- Rated Output Voltage
- Series Name
- Output Power type
- Series Name

(*1) Blank : Standard type.
/L : With chassis model.
/A : With chassis and cover model.
/CO2 : With coating on both sides of PCB model.
/P : PCB mount model.

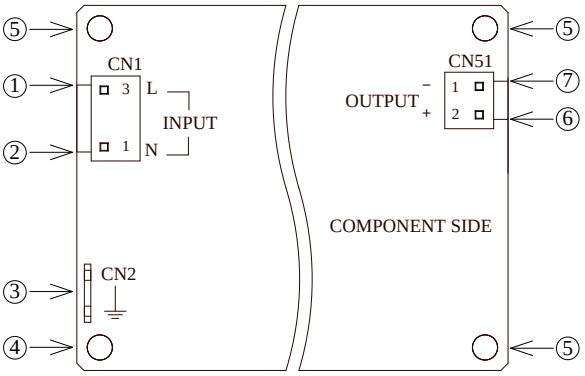
Note : For "/CO2" model, both sides of PCB are coated. However, some areas on PCB are not coated.

2. Terminal Explanation

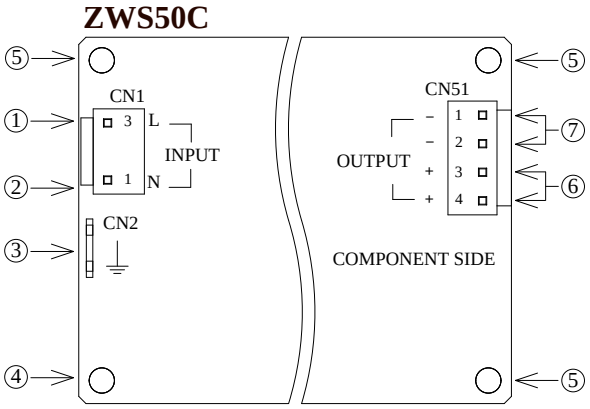
ZWS10C/ZWS15C



ZWS30C



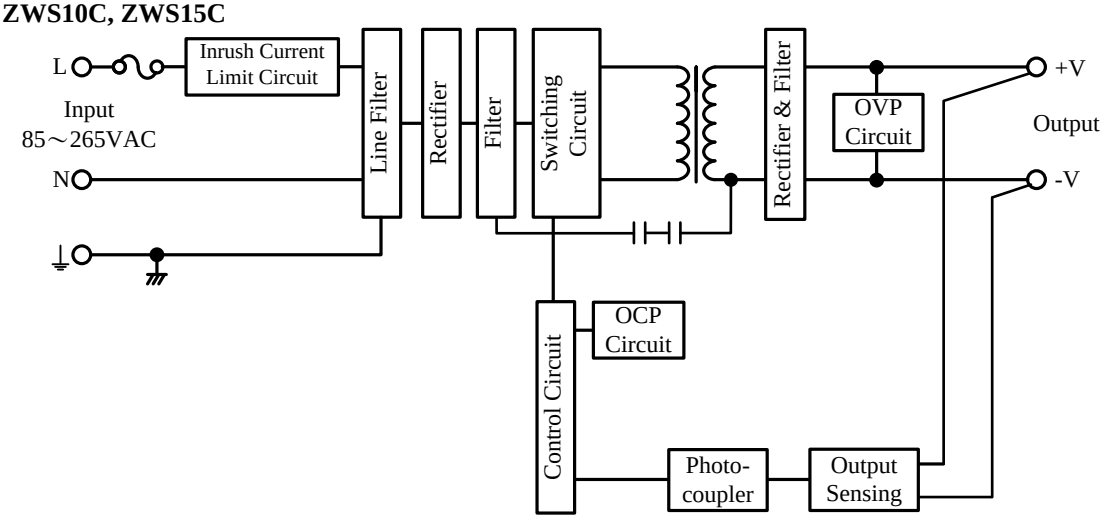
ZWS50C



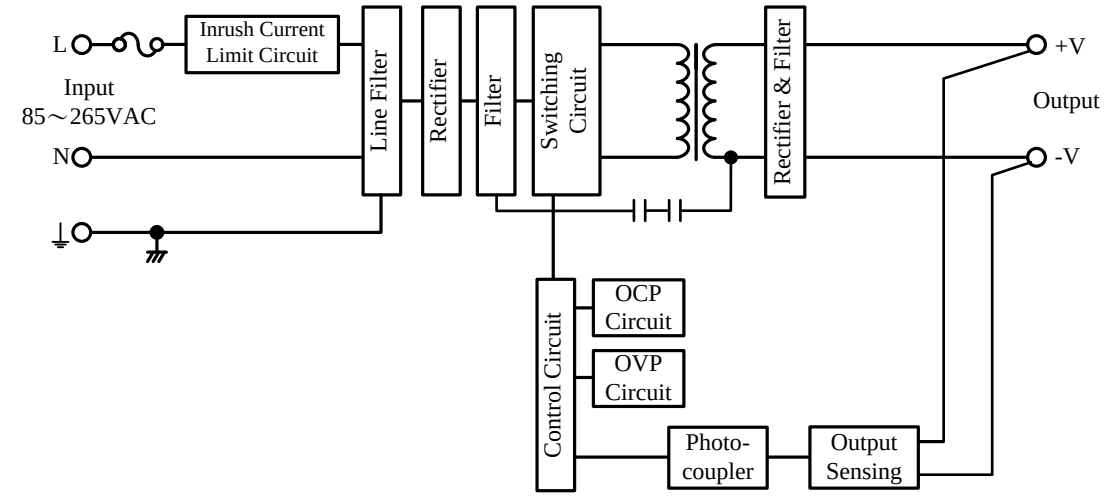
① L : Input terminal Live line (Fuse in line) (CN1)
② N : Input terminal Neutral line (CN1)
③ ⏚ : Earth (⏚) Terminal (CN2)
④ Mounting hole (hole diameter : ϕ 3.5mm)
This hole is electrically connected to terminal of CN2.
The mounting surface of the spacer should be within Max ϕ 6.2mm.
⑤ Mounting hole (hole diameter : ϕ 3.5mm)
These holes are used for support the unit.
⑥ + : + Output Terminal (CN51)
⑦ – : – Output Terminal (CN51)

3. Block Diagram

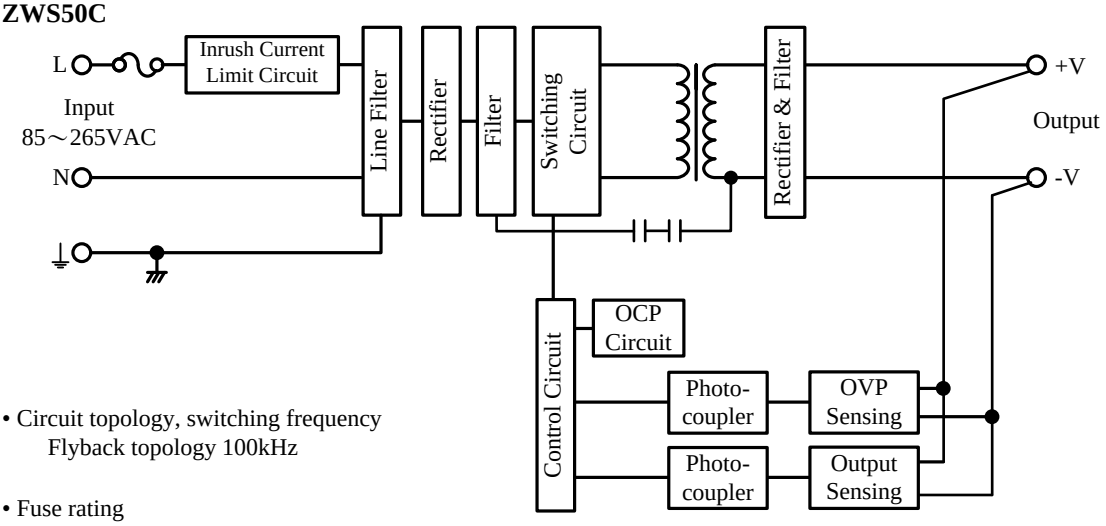
ZWS10C, ZWS15C



ZWS30C



ZWS50C

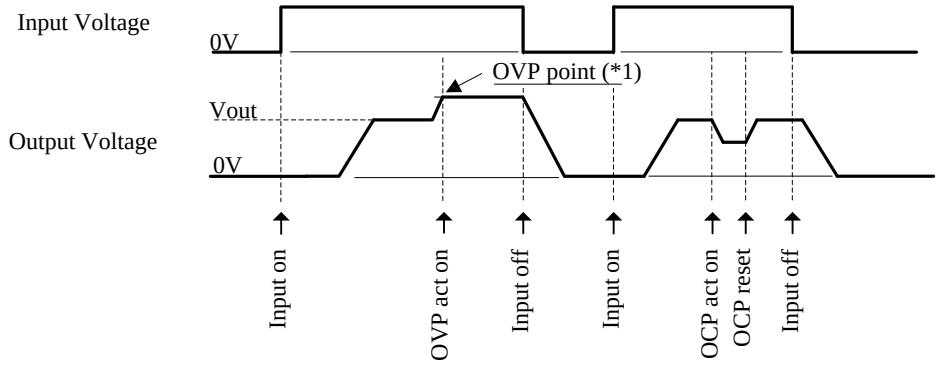


• Circuit topology, switching frequency
  Flyback topology 100kHz

• Fuse rating
  ZWS10C : 1.0A
  ZWS15C : 1.0A
  ZWS30C : 2.5A
  ZWS50C : 2.5A

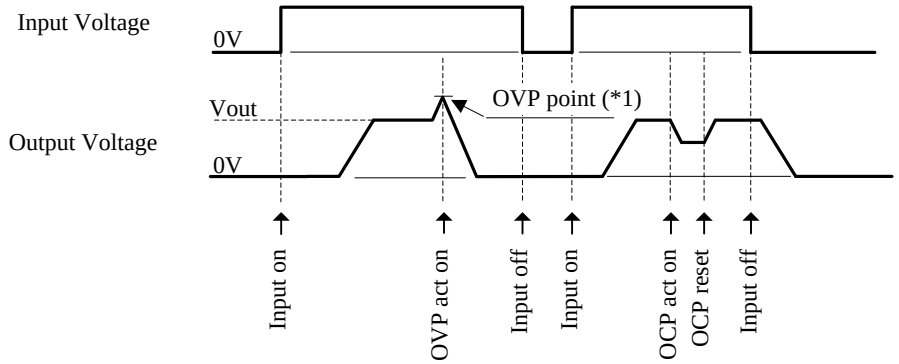
4. Sequence time chart

ZWS10C, ZWS15C



(*1) OVP point
5V-15V : >115%.
24V : >112%.

ZWS30C, ZWS50C

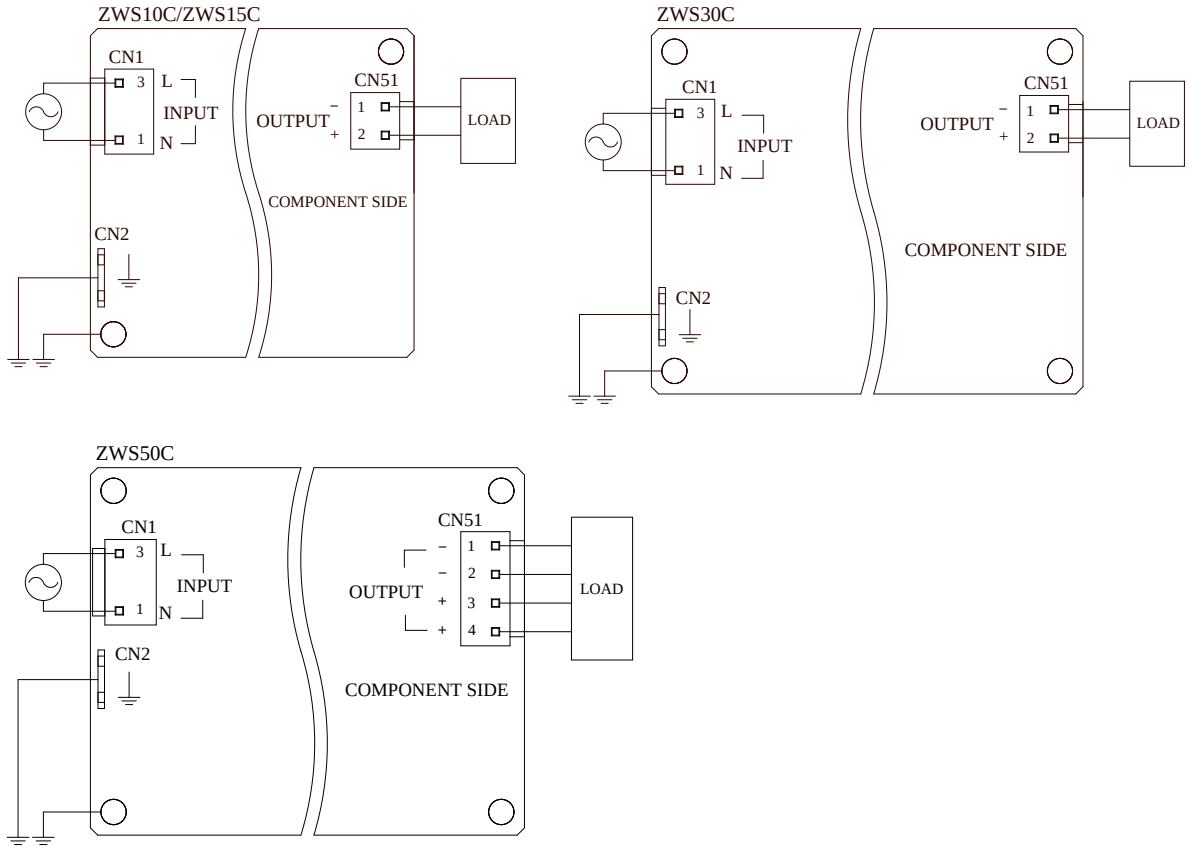


(*1) OVP point
ZWS30C, ZWS50C : >115%.

5. Terminal connecting method

Pay attention to the input wiring. If it is connected to wrong terminal, the power supply will be damaged.

- Input must be off when making connections.
- Connect ⏚ terminal and mounting hole to protective earth (frame ground of the equipment etc.) of the equipment in Class I insulation.
  When connecting the ⏚ terminal to a protective earth, use a thick wire for safety and improvement of noise sensitivity.
- The output load line and input line shall be separated to improve noise sensitivity.
- Do not apply stress to PCB, when connecting or removing connector.
- Use input/output connector (housing) specified by the table below.
- Use recommended crimping tool. Connector is not included with this product. (Refer to the following)



Connector / Housing and terminal Pin

Terminal	Symbol	Connector	Housing	Terminal Pin	Maker
Input connector	CN1	B2P3-VH(LF)(SN)	VHR-3N (AWG#22 ~ AWG#16)	SVH-21T-P1.1 or BVH-21T-P1.1 SVH-41T-P1.1 or BVH-41T-P1.1	J.S.T.
Output connector	CN51 (ZWS10C - 30C)	B2P-VH(LF)(SN)	VHR-2N (AWG#20 ~ AWG#16)		
	CN51 (ZWS50C)	B4P-VH(LF)(SN)	VHR-4N (AWG#20 ~ AWG#16)		
FG TAB	CN2	-	STO-21T-250N (AWG#22 ~ AWG#18) STO-61T-250N (AWG#18 ~ AWG#14)	-	

Matching housing and terminal --- Not included with the product

Hand Crimping Tool

Hand Crimping Tool	Terminal Pin	Maker
YC-160R	SVH-21T-P1.1 or BVH-21T-P1.1	J.S.T.
YC-930R YC-931R	SVH-41T-P1.1 or BVH-41T-P1.1	

6. Explanation of Functions and Precautions

6-1. Input Voltage Range

Input voltage range is single phase 85-265VAC (47-63Hz).
Input voltage, which is out of specification, might lead unit damage.
For cases where conformance to various safeties required, described as 100-240VAC (50-60Hz).

6-2. Inrush Current

This series equipped power thermistor to limit the inrush current. Higher inrush current will flow at higher ambient temperature or re-input condition. Please select input switch and fuse carefully with the high temperature and re-input the power condition. The Inrush Current value is under cold start at 25°C in the specification.

6-3. Over Voltage Protection (OVP)

ZWS10C/ZWS15C : The over voltage protection (OVP) circuit with zener diode clamp system is built in. Over 115% of nominal voltage will clamp the output. If the output voltage is lowered due to the over voltage application, the output will not resume. Replacement of the power supply unit is necessary.

ZWS30C/ZWS50C : The OVP function is output shut down method and manual reset type. Over 115% of nominal voltage will shut down the output. If the output voltage is lowered due to the over voltage application, the output will not resume. To reset OVP, remove the input of power supply for a few minutes, and then re-input.

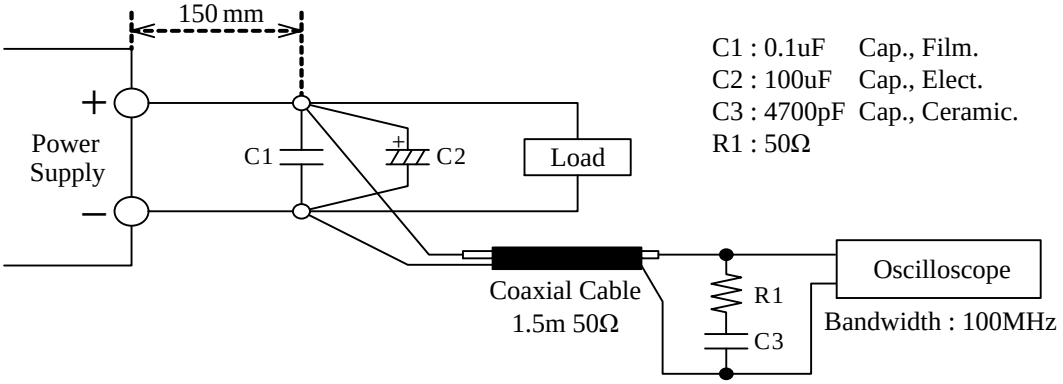
In addition, the setting value of OVP is fixed and not adjustable. Pay attention not to apply higher voltage externally to the output terminal to avoid unit failure. In case of inductive load, put protective diode in series to the output power line. In heavy load condition, OCP may triggered before output reach OVP threshold.

6-4. Over Current Protection (OCP)

Current limiting (Hiccup) with automatic recovery.
OCP function operates when the output current exceeds 105% of maximum DC output current of specification.
The outputs will be automatically recovered when the overload condition is removed. Never operate the unit under over current or shorted conditions, which may lead unit damage. OCP setting is fixed and cannot be adjusted externally.

6-5. Output Ripple & Noise

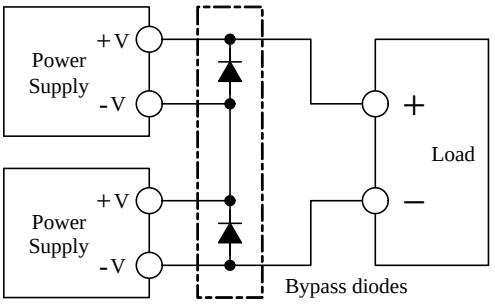
The standard specification for maximum ripple value is measured according to below measurement circuit .
When load lines are longer, ripple will becomes larger. In this case, electrolytic capacitor, film capacitor, etc. might be necessary to use across the load terminal. The output ripple cannot be measured accurately if the probe ground lead of oscilloscope is too long.



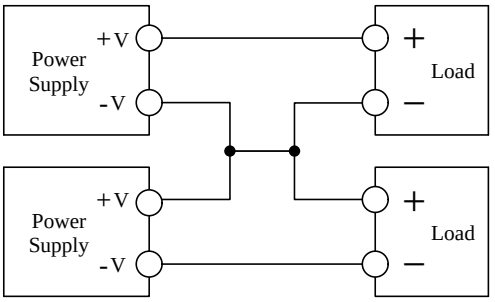
6-6. Series Operation

For series operation, either method (A) or (B) is possible.

Method (A)



Method (B)

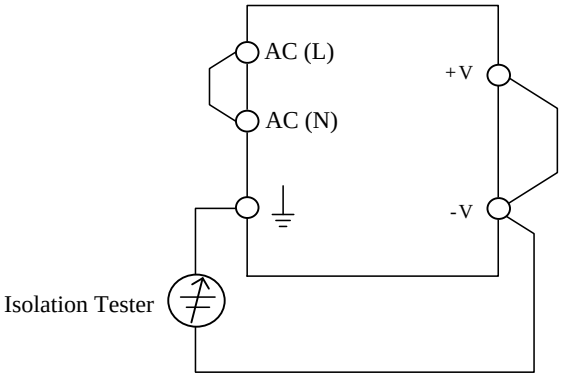


Note : Ensure that all units must be in operation. (Never use in condition that one of the units is not operated.)
Please select a bypass diode with maximum forward current rating more than output load current.
And maximum reveres voltage must withstand each power supply output voltage.

6-7. Isolation Test

Isolation resistance between Output - ⏚ terminal is more than 100MΩ at 500VDC.
For safety operation, voltage setting of DC isolation tester must be done before the test.
Ensure that the unit is fully discharged after the test.

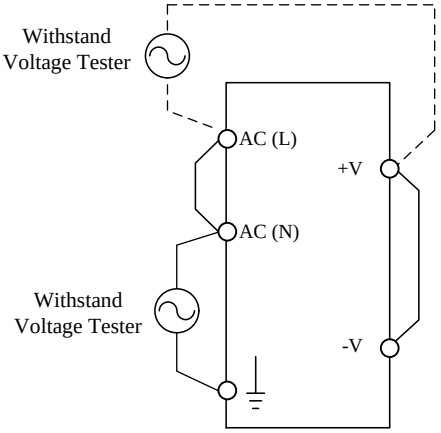
Output - ⏚ terminal : 500VDC More than 100MΩ

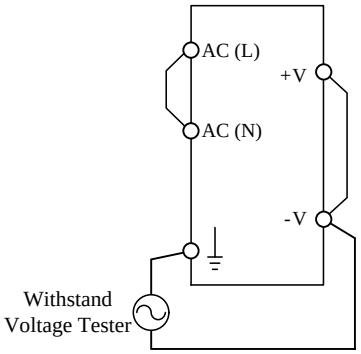


6-8. Withstand Voltage

This series is designed to withstand 3.0kVAC between input and output, 2.0kVAC between input and ⏚ and 750VAC between output and ⏚ each for 1 minute. When testing withstand voltage, set current limit of the withstand voltage test equipment to 10mA (output - ⏚: 20mA). The applied voltage must be gradually increased from zero to the testing value and then gradually decreased for shut down. When timer is used, the power supply may be damaged by high impulse voltage at timer switch on and off. Connect input and output as follows.

Input - Output (Dotted line) : 3.0kVAC 1min(10mA) Output - ⏚ terminal : 750VAC 1min(20mA)
Input - ⏚ terminal (Solid line) : 2.0kVAC 1min(10mA)





7. Mounting Method

7-1. Mounting Directions

Recommended standard mounting method is (A). Method (B)-(F) are also possible.

(MOUNTING A)	(MOUNTING B)	(MOUNTING C)	(MOUNTING D)	(MOUNTING E)	(MOUNTING F)
(STANDARD MOUNTING) CN1(INPUT)	CN1(INPUT)	CN1(INPUT)	CN1(INPUT)	CN1(INPUT)	CN1(INPUT)

7-2. Output Derating

Use within the following output derating range based on the mounting direction and power supply ambient temperature.

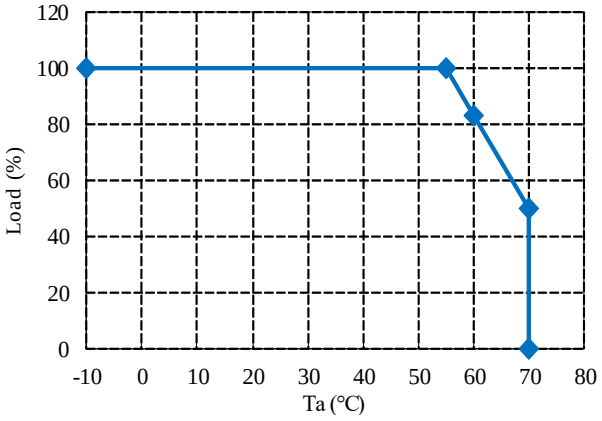
If the power supply is operated beyond the output derating, the IC's built-in over temperature shut down function operates and output will be shut down.

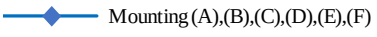
After shut down, remove the input and cool down to reset over temperature shut down, and then re-input.

Load(%) of derating curve indicates output derating values below are based on the maximum output current value at the rated output voltage value as 100%.

■ CONVECTION COOLING

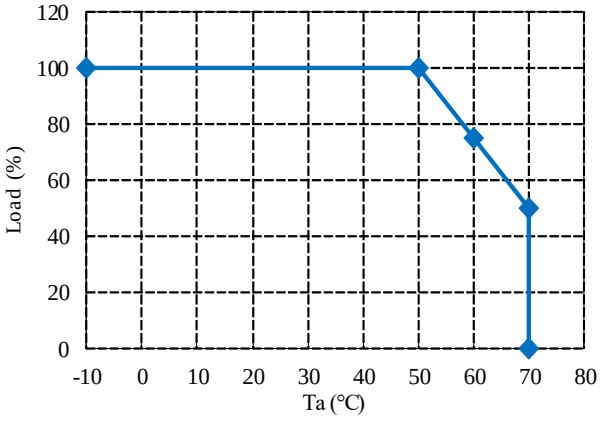
ZWS10C

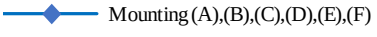




Ta (℃)	Load (%)
	Mounting (A),(B),(C),(D),(E),(F)
-10 ~ +55	100
60	83
70	50

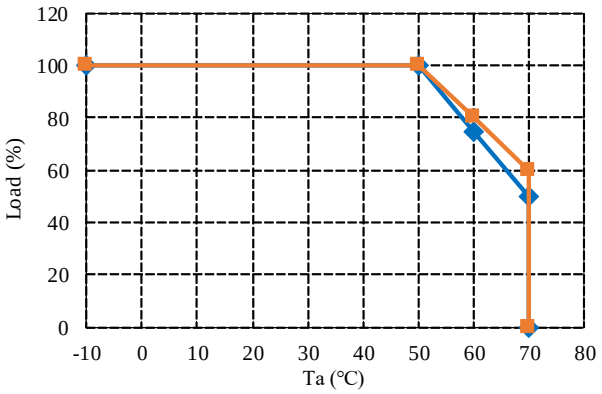
ZWS15C

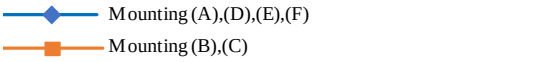




Ta (℃)	Load (%)
	Mounting (A),(B),(C),(D),(E),(F)
-10 ~ +50	100
60	75
70	50

ZWS30C

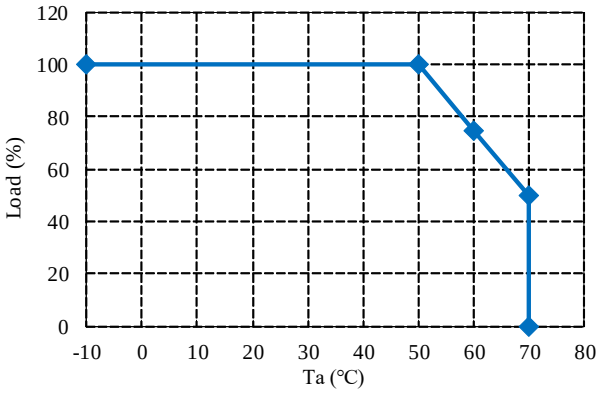


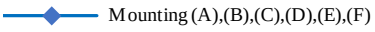


Ta (℃)	Load (%)	
	Mounting (A),(D),(E),(F)	Mounting (B),(C)
-10 ~ +50	100	100
60	75	80
70	50	60

ZWS50C

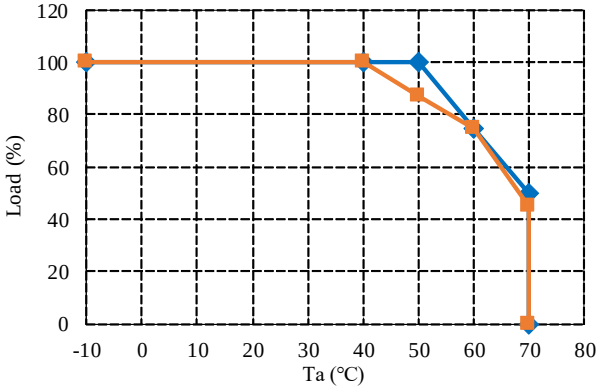
5V/15V

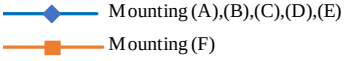




Ta (℃)	Load (%)
	Mounting (A),(B),(C),(D),(E),(F)
-10 ~ +50	100
60	75
70	50

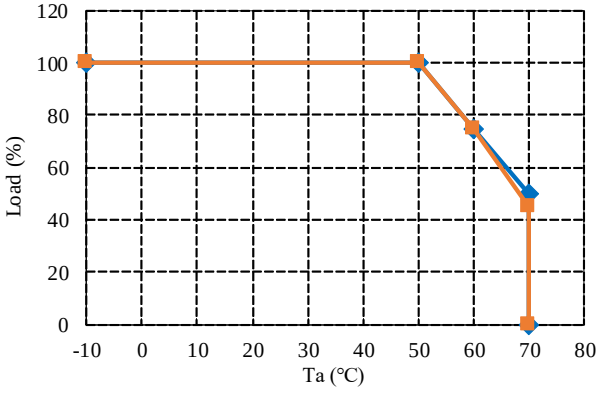
12V

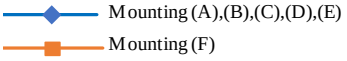




Ta (℃)	Load (%)	
	Mounting (A),(B),(C),(D),(E)	Mounting (F)
-10 ~ +40	100	100
50	100	87
60	75	75
70	50	45

24V/48V

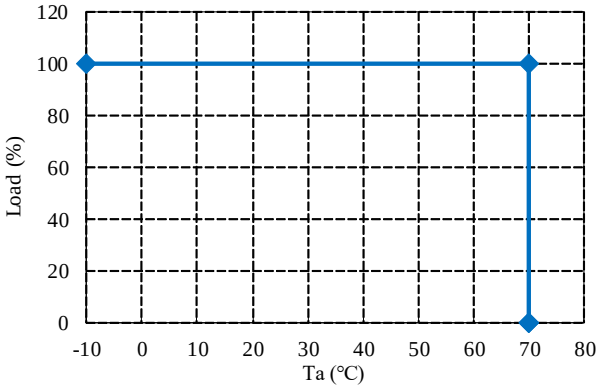




Ta (℃)	Load (%)	
	Mounting (A),(B),(C),(D),(E)	Mounting (F)
-10 ~ +50	100	100
60	75	75
70	50	45

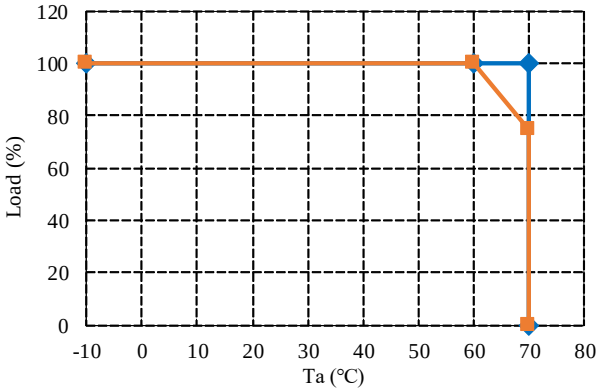
■ FORCED AIR COOLING

ZWS10C・ZWS15C・ZWS30C



Ta (℃)	Load (%)
	Mounting (A),(B),(C),(D),(E),(F)
-10 ~ +70	100

ZWS50C



Ta (℃)	Load (%)	
	Mounting (A),(D),(E),(F)	Mounting (B),(C)
-10 ~ +60	100	100
70	100	75

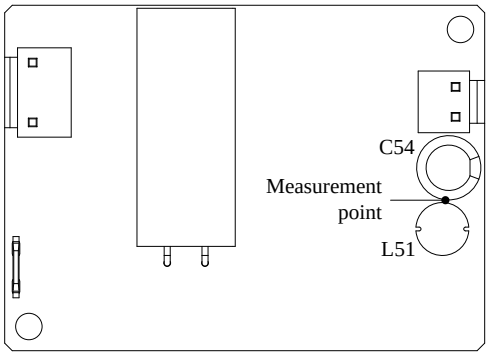
In the case of using at forced air cooling, entire component must be cool down.
As a guide, an air velocity of more than 0.8m/s is required to flow through the component side of power supply.
The power supply is considered as a component installed to an equipment, the equipment must be re-evaluated and make sure to meet allowable component temperature.

Electrolytic capacitor allowable Max temperature

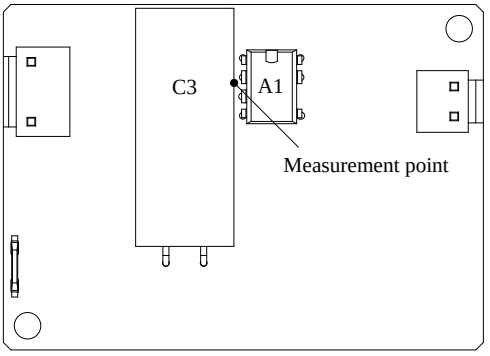
Model	Allowable Max temperature		
	C3	C4	C54
ZWS10C	-	-	71℃
ZWS15C	77℃	-	-
ZWS30C	-	73℃	-
ZWS50C	-	77℃	-

Measurement point

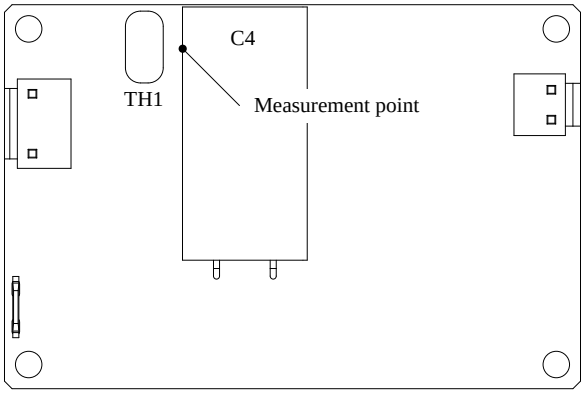
ZWS10C



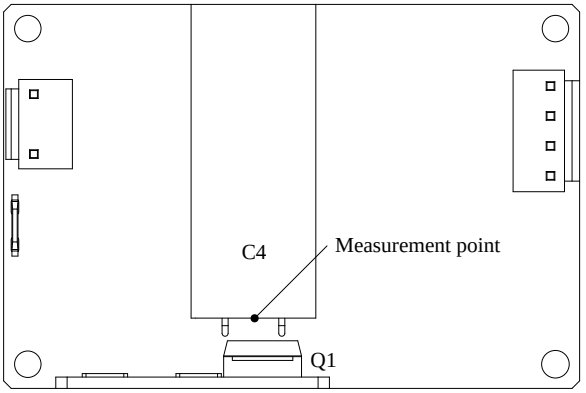
ZWS15C



ZWS30C



ZWS50C

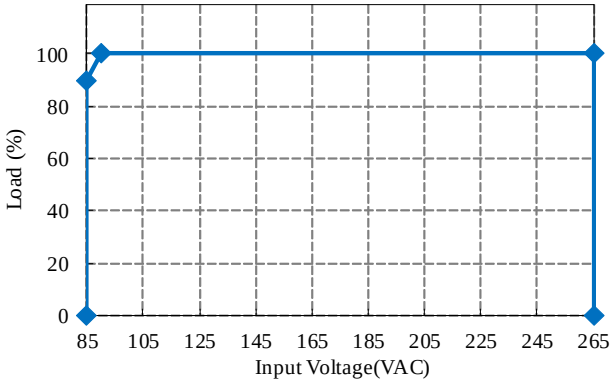


7-3. Output Derating according to the Input Voltage

Load (%) is percent of maximum output current value in a rated output voltage.
In addition, the input derating curve must be considered, refer to section 7-2. Output Derating curve according to the Mounting Direction.

ZWS50C

12V/15V/24V/48V



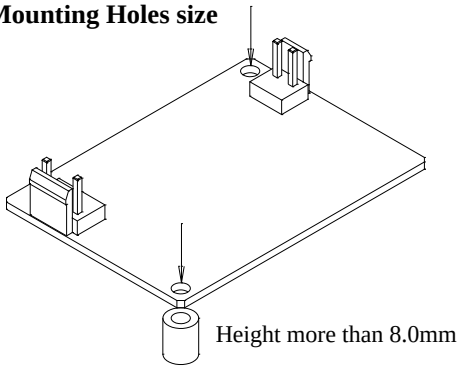
Input Voltage(VAC)	Load (%)
85	90
90 to 265	100

7-4. Mounting Method

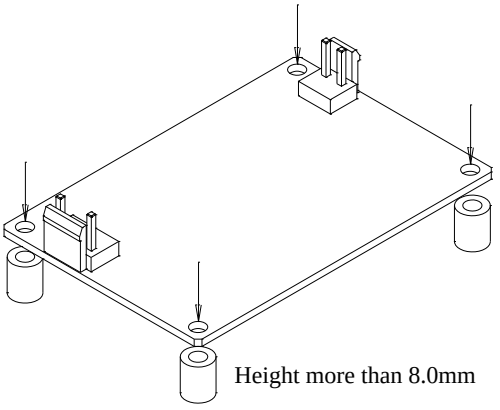
7-4-1. Mounting method for standard model

Insert the spacer (Max ϕ 6.2mm) of height more than 8mm to lift the unit. And use all mounting holes for the unit installation. The vibration spec is specified under this mounting condition.
Recommended torque for mounting screw: M3 screw, 0.59N·m (6.0 kgf · cm).

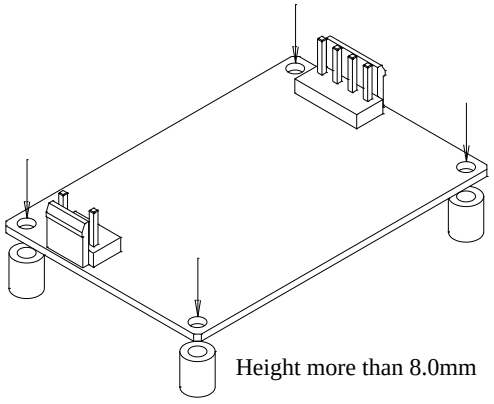
■ **Mounting Holes size**



ZWS10C, ZWS15C : 2 HOLES ϕ 3.5mm

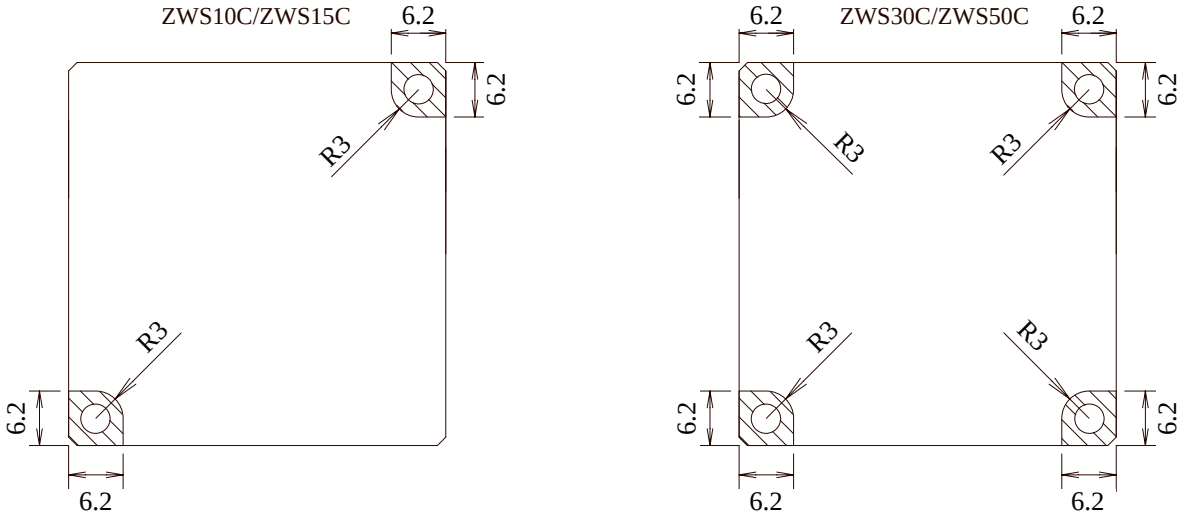


ZWS30C : 4 HOLES ϕ 3.5mm



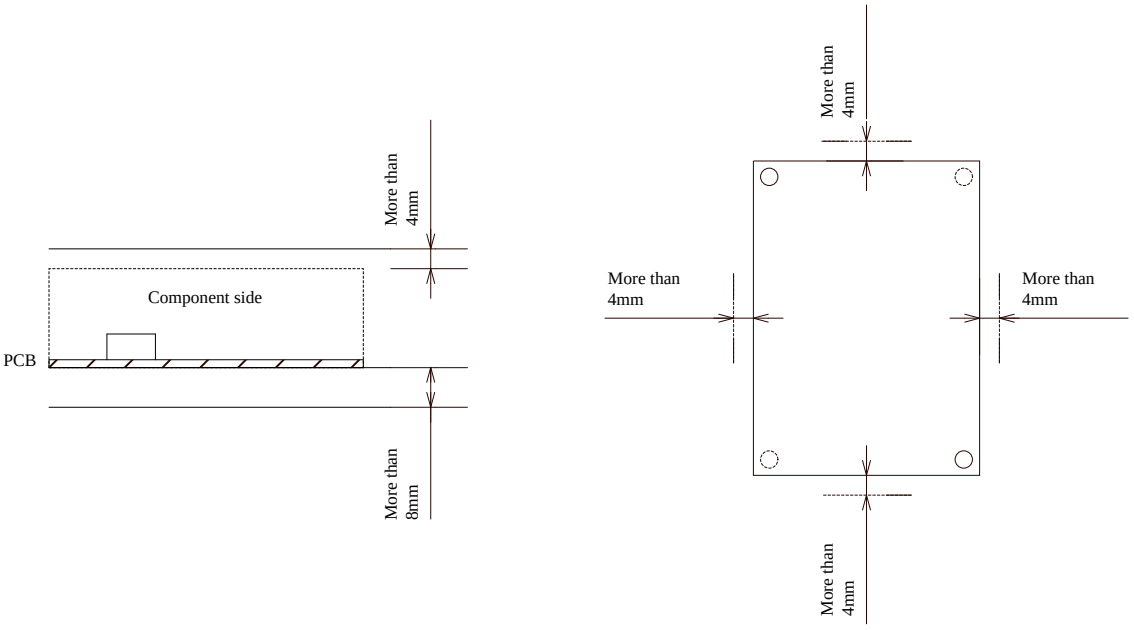
ZWS50C : 4 HOLES ϕ 3.5mm

Allowable area by metal pieces is 6.2mm from each PCB corners. Refer to figure below.



■ Condition to meet EMC, Isolation & Withstand Voltage and Cooling requirement.

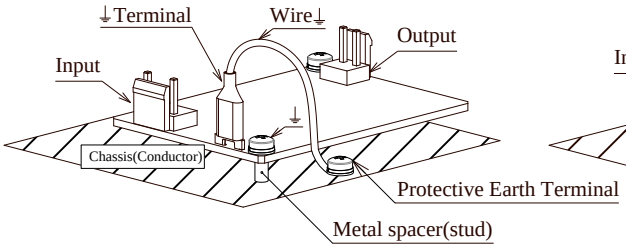
(1) Keep 4mm space minimum from the surface and sides of power supply, 8mm space minimum from the bottom side of PCB to meet safety requirement, or more space depend on safety requirement. If the space is not enough, the specification of isolation and withstand voltage will not be satisfied.



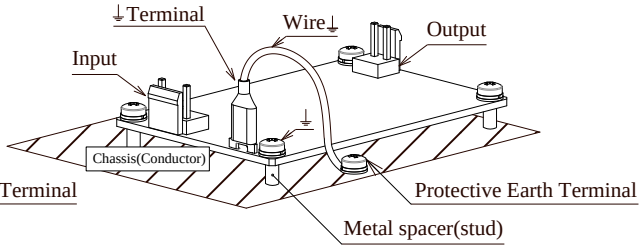
(2) More space may be required in the surrounding of power supply and the upper area of components for effective cooling depends on the application conditions.

(3) For installation in Class I end equipment, ⏚ terminal (Earth) must be connected to the Protective earth terminal of the equipment.
If not connected, the conducted noise, radiation noise and output noise may increase.

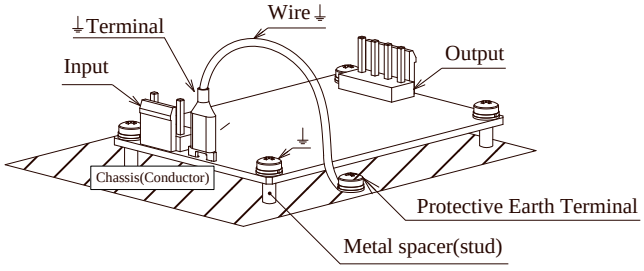
ZWS10C/ZWS15C



ZWS30C

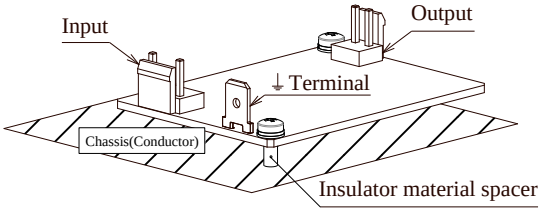


ZWS50C

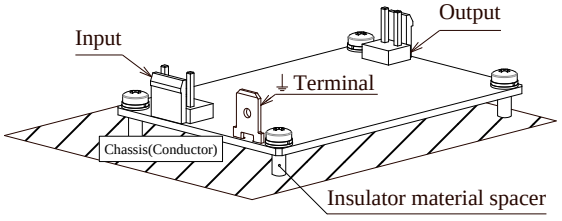


(4) For Installation in Class II end equipment, ⏚ terminal (Earth) is unnecessary to be connected to Protective earth terminal of the equipment. The unit need to be fixed and it is insulated from any accessible conductive part by reinforced insulation, so use a resin (insulating) spacer for fixing.

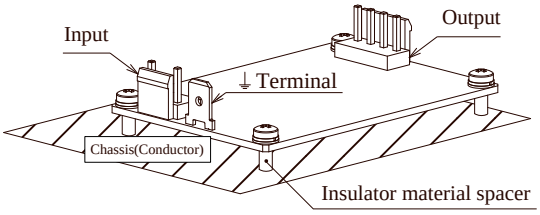
ZWS10C/ZWS15C



ZWS30C



ZWS50C



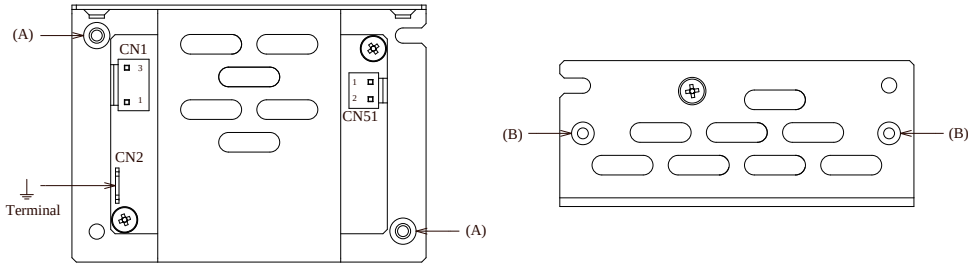
7-4-2. Mounting method for /A type, /L type

/A type is optional model with metal chassis and cover.
/L type is optional model with metal chassis.
The mounting holes on the bottom(A) or on the side(B) of the chassis are for power supply fixing.
The maximum allowable penetration for screw into chassis is 4mm. Consider the incomplete threads when installing.
Recommended torque for mounting screw : M3 screw, 0.59N·m (6.0 kgf · cm).
Refer to the /A type and /L type outline drawings for the detailed dimensions.

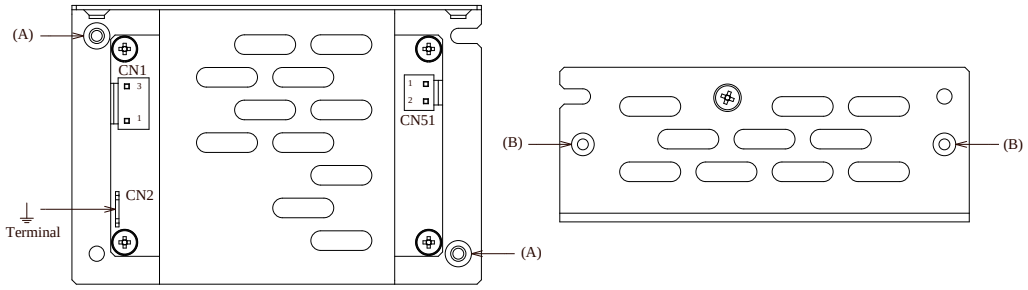
More space may be required in the surrounding of power supply and the upper area of components for effective cooling depends on the application conditions.

■ /A type

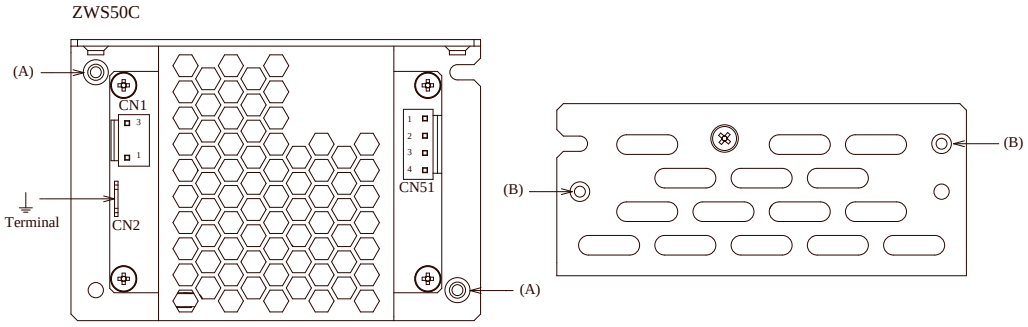
ZWS10C/ZWS15C



ZWS30C

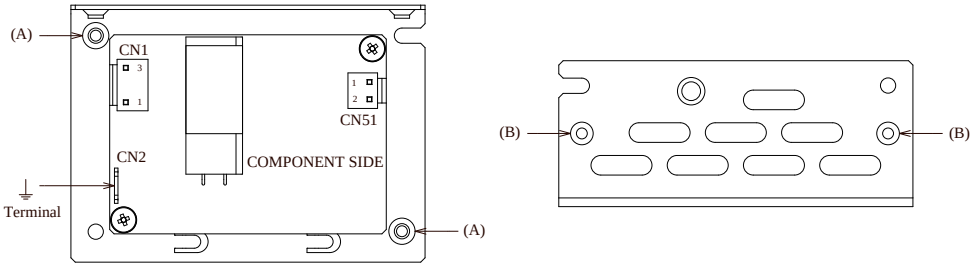


ZWS50C

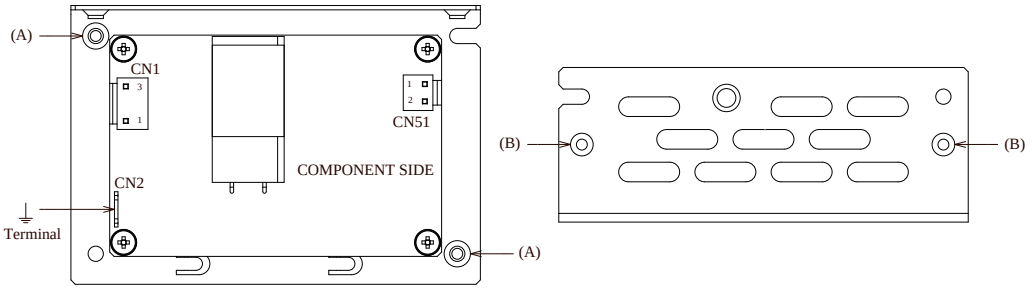


■ /L type

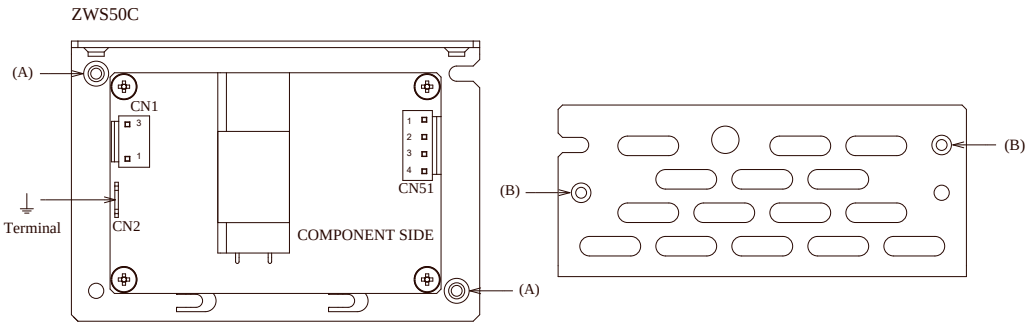
ZWS10C/ZWS15C



ZWS30C



ZWS50C



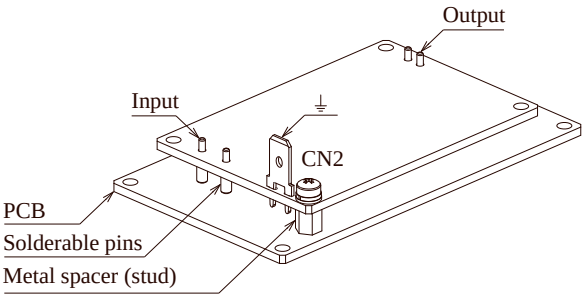
■ Mounting Holes size

A: 2-M3 tapped, embossed and countersink holes for mounting screws to fix the power supply from bottom.
B: 2-M3 tapped, embossed and countersink holes for mounting screws to fix the power supply from side.

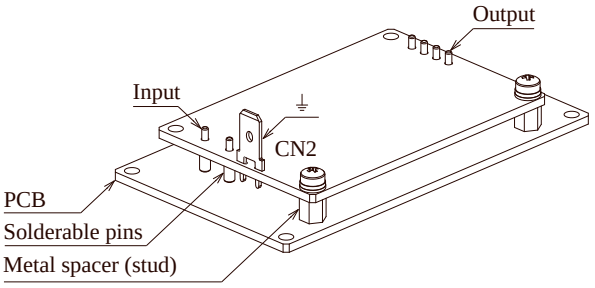
7-4-3. Mounting method, Solder and Cleaning Condition for /P type

(1) /P type is optional model with solderable-pin type Input, Output and ⏚ terminals, which should be fixed on PCB of the end products by soldering. PCB holes without metal spacers no need fixed.

ZWS10C/ZWS15C/ZWS30C



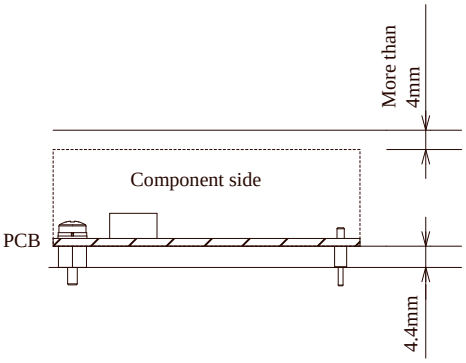
ZWS50C

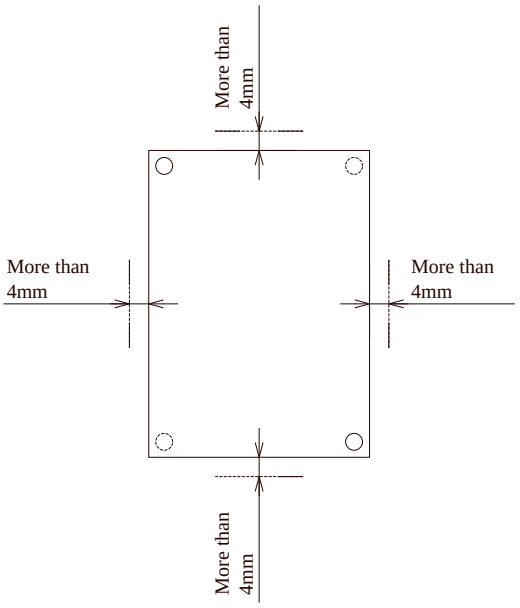


(2) Keep 4mm space minimum from the surface and sides of power supply.
If the space is not enough, the specification of isolation and withstand voltage will not be satisfied.

The height of the PCB bottom side of the /P type is determined to be 4.4 mm by the pins, if wiring patterns under the power supply (power supply mounting surface), please refer to allowable area of pattern wiring.

More space may be required in the surrounding of power supply and the upper area of components for effective cooling depends on the application conditions.





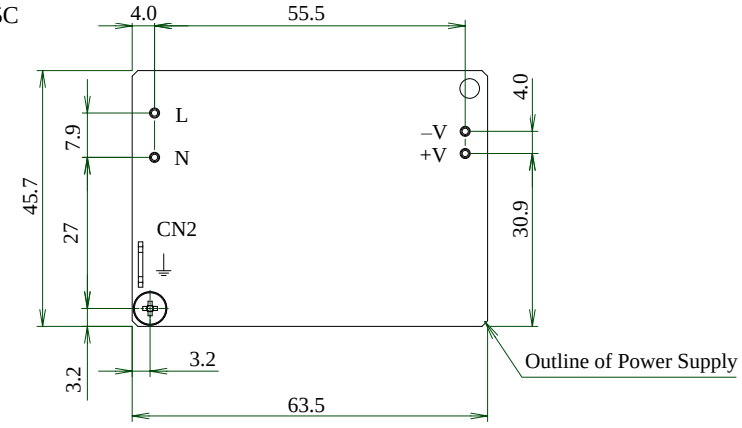
■ Mounting method

(1) Mounting Holes on PCB

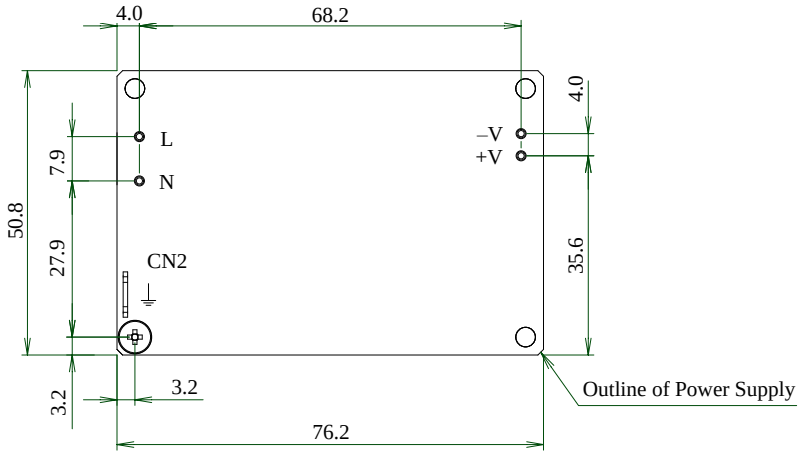
There is the recommended diameter of hole and land in below table.
The mounting hole position is in below figure.
Also, see outline drawing for outline of the power supply.

	Input/Output terminals	Metal spacer terminal
Pin diameter	ϕ 1.0mm	ϕ 2.0mm
Hole diameter	ϕ 1.6mm	ϕ 3.5mm
Land diameter	ϕ 3.0mm	ϕ 6.4mm

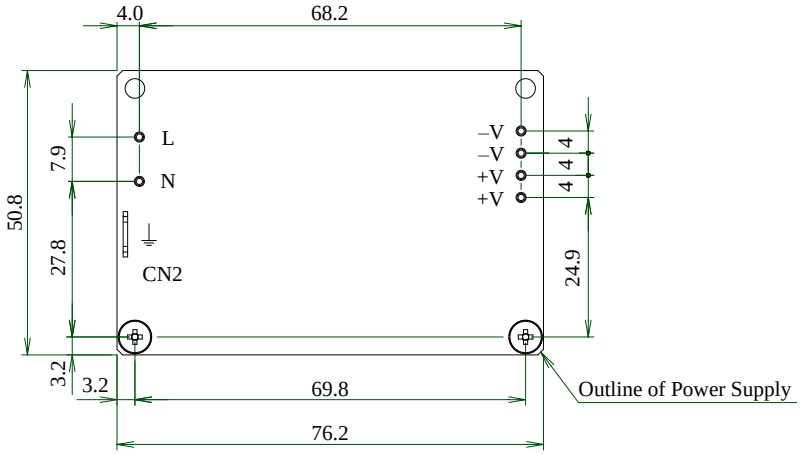
ZWS10C/ZWS15C



ZWS30C



ZWS50C



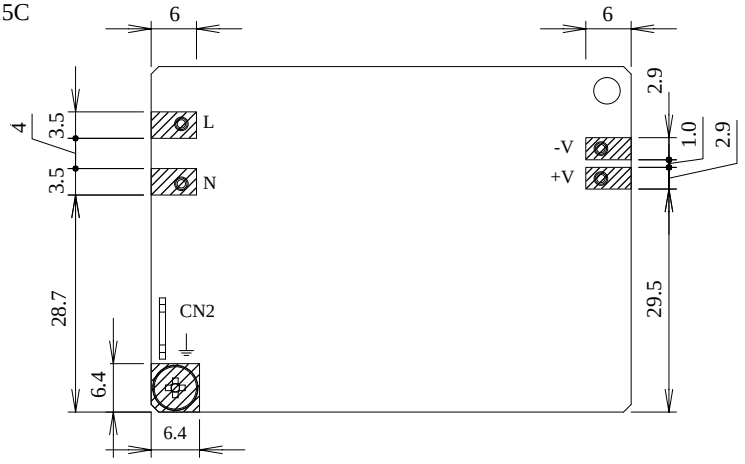
(2) Allowable Area of Pattern Wiring

When power supply mount on PCB, suggest wiring pattern to allowable area as shown below figure.
Avoid wiring patterns other than allowable pattern area, if wiring pattern to other area, there is a possibility to occur insulation failure.
If wiring pattern other than allowable pattern area, please use insulation sheet to keep the necessary distance.
Also wiring signal pattern under the power supply, evaluate enough on actual system because it is susceptible to noise.

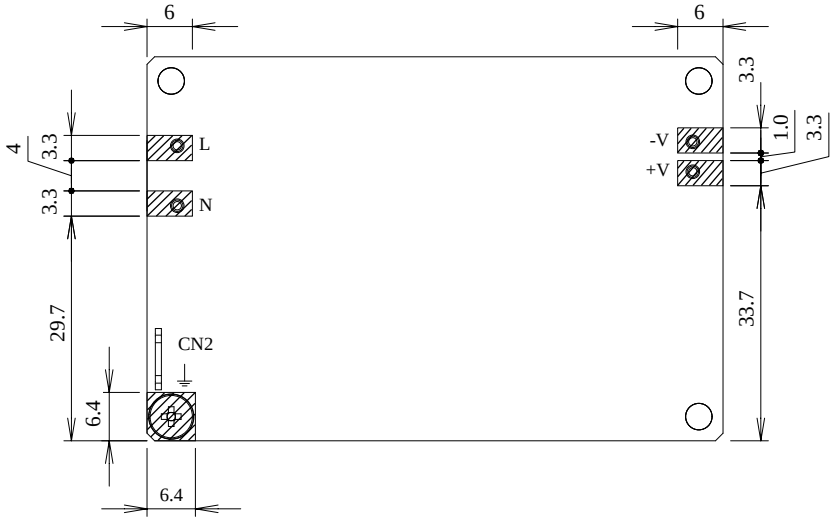
The allowable pattern area

: Allowable pattern area

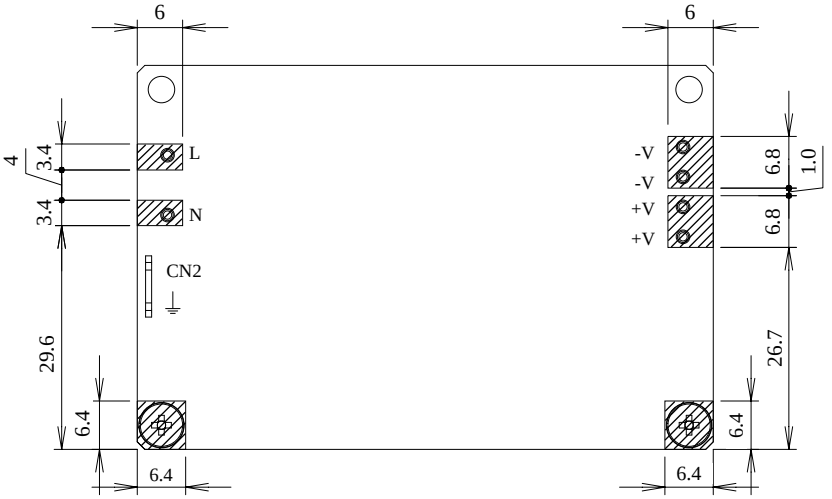
ZWS10C/ZWS15C



ZWS30C



ZWS50C



(3) Input / Output Pattern Width
Large current flows through input and output pattern. If pattern width is too narrow, heat on pattern will increase because of voltage drop of pattern. Relationship between allowable current and pattern width varies depending on materials or printed circuit board, thickness of conductor and allowable temperature rise of pattern, etc. It is definitely necessary to confirm on manufactures of printed circuit board for designing pattern.

(4) Stress to the Pin
Do not apple excessive stress to the power supply input/output pin and FG standoff, it will easily cause internal connections broken.
Do not pull or bend pins strongly in order to avoid risk or solder crack.

■ Recommended Soldering Condition

Recommended soldering conditions are as follows.
(1) Solder Dip :
Dip condition : 260°C within 10 seconds up to 1 time.
Pre-heat condition : 110°C for 30 - 40 seconds.
(2) Soldering Iron :
350°C within 3 seconds up to 1 time/PIN.

Note) Soldering time changes according to heat capacity of soldering iron, pattern on printed circuit board etc.
Please confirm the actual performance.

■ Recommended Cleaning Condition

Cleaning is not recommended.

8. EMC and Wiring Method

This power supply is primarily designed and manufactured to be used and enclosed in other equipment.
The installation, wiring, grounding and end application of the switching power supply in the equipment system may influence its EMC characteristics. Therefore, the EMC performance has to be tested on end system level. Additional filtering may be required depends on application and installation methods.

Please refer to following application notes which may help to improve EMC performance.
(1) The output load line and input line shall be separated each other and twisted individually to improve noise.
(2) Use all lines as thick and short as possible to made lower impedance.
(3) Noise can be reduced by attaching a capacitor to the load terminals.
(4) For safety and EMI considerations, connect between ⏚ terminal and Frame Ground terminal of equipment firmly.
(5) The recommended wire size :
Input : AWG#22 ~ AWG#16
Output : AWG#20 ~ AWG#16

9. External Fuse Rating

Refer to the following fuse rating when selecting the external input fuse.
Surge current flows when input turn on. Use slow-blow fuse or time-lag fuse. Fast-blow fuse can not be used.
Fuse rating is specified by inrush current value at input turn on.
Do not select the fuse according to actual input current (rms.) values.

ZWS10C : 1.0A
ZWS15C : 1.0A
ZWS30C : 2.5A
ZWS50C : 2.5A

10. Before concluding that the unit is at fault

(1) Check if the rated input voltage is connected.
(2) Check if the wiring of input and output is correct.
(3) Check if the wire size is not too thin.
(4) Check if the output current and output power dose not over specification.
(5) Audible noise can be heard when input voltage waveform is not sinusoidal wave.
(6) Audible noise can be heard during Dynamic-Load operation.
(7) Ensure that a large capacitor is not connected on the output side. Please use within maximum capacitance shown below.

	Maximum external capacitance				
MODEL	5V	12V	15V	24V	48V
ZWS10C	10000uF	2000uF	1400uF	300uF	-
ZWS15C	10000uF	2500uF	1000uF	500uF	-
ZWS30C	10000uF	2700uF	1500uF	600uF	-
ZWS50C	6000uF	5000uF	4000uF	2500uF	560uF

11. The life expectancy

The life of the power supply depends on the life of the built-in aluminum electrolytic capacitor.
The life is described in reliability data.
The life of the aluminum electrolytic capacitor varies depending on the method of mounting the power supply, the load current, and the ambient temperature.
Please refer to "Electrolytic Capacitor Lifetime".
Please do not use the product which passed over the life expectancy.
There is a risk of unexpected output shutdown and specifications may not be satisfied.
Please contact us for maintenance or exchange the product which passed over the life expectancy.

12. Warranty Period

This product is warranted for a period of 5 years from the date of shipment.
For damages occurring at normal operation within this warranty period, repair is free of charge.

13. EN61558-1 , EN61558-2-16 Compliance Model ZWS-C series

Ta	Rated maximum ambient temperature : Ta max=70℃
	**SMPS** incorporating a short-circuit-proof safety isolating transformer (inherently or non-inherently)
	**SMPS** (Switch mode power supply unit)
 ≤3000m	ZWS10C series model certified altitude of 3,000m.
 ≤3000m	ZWS30C series model certified altitude of 3,000m.
Power factor (Reference)	cosφ 0.3~0.6 ZWS30C/ ZWS50C series model at 100V~240VAC and 50~60Hz. (except ZWS30C-5)

14. CE Marking / UKCA Marking

- **CE Marking**
  CE Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Low Voltage Directive, EMC Directive and RoHS Directive.

- **UKCA Marking**
  UKCA Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Electrical Equipment (Safety) Regulations, Electromagnetic Compatibility Regulations and Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment Regulations.