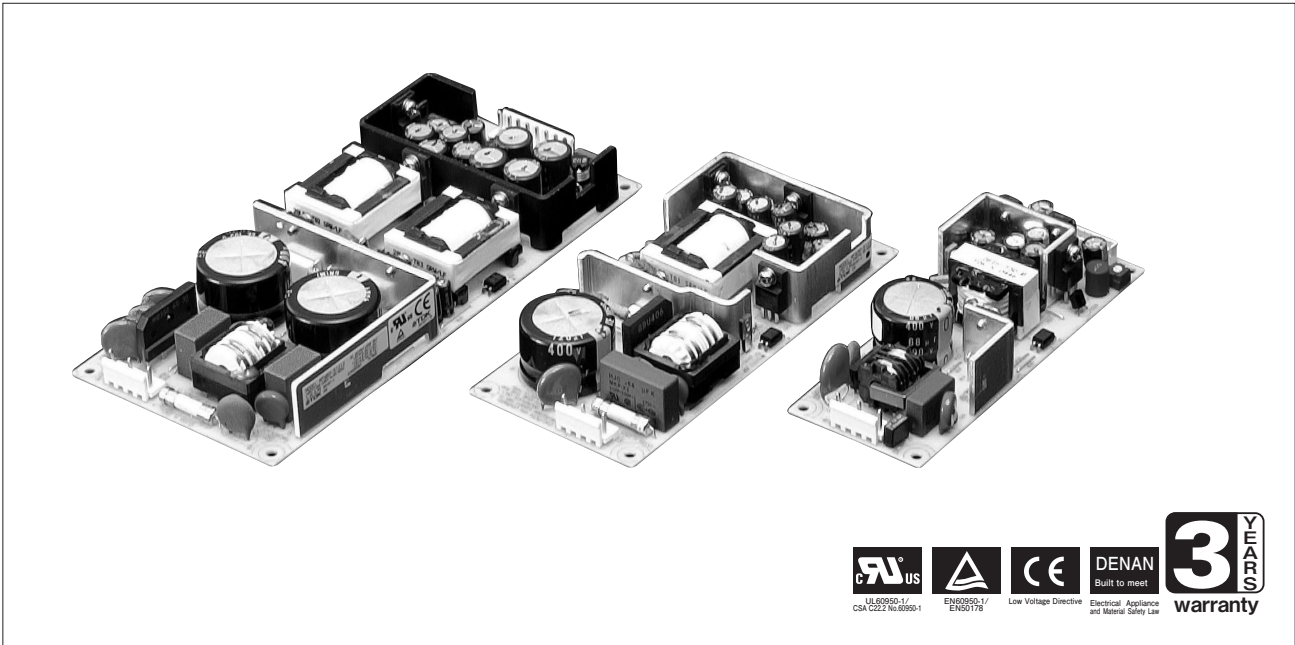


MTW SERIES

Multiple outputs/for general use 15-60W

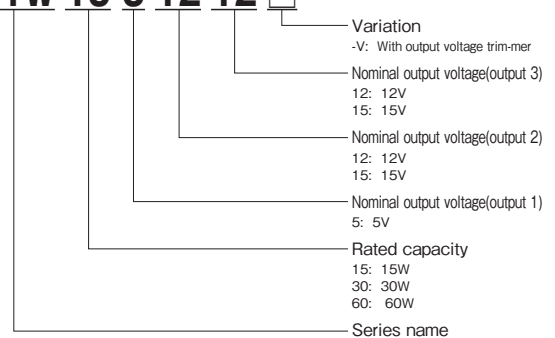


Features

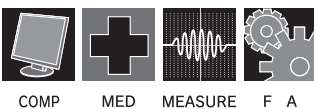
- Worldwide-applicable input, triple-output type
- Compact, slim and lightweight contributing to energy-saving and environmental protection
- Approved by safety standards (UL, C-UL, TÜV), complying with Electrical Appliance and Material Safety Law, CE marking applicable
- EMI: Complying with FCC Class B, VCCI-B, EN55011-B, -B
- Immunity : Complying with EN61000-4-2,-3,-4,-5, -6,-8,-11
- Peak load accommodatable

Model naming logic

MTW 15-5 12 12 □



Applications



Conformity to RoHS Directive

This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

Product line up

Output voltage	15W		30W		60W	
	Output current (Peak current)/Model		Output current (Peak current)/Model		Output current (Peak current)/Model	
+5V	2.0A (3.0A)	MTW15-51212	3.0A (4.5A)	MTW30-51212	5.0A (7.0A)	MTW60-51212
+12V	0.3A (0.6A)		1.2A (2.0A)		2.5A (3.5A)	
-12V	0.2A (0.3A)		0.3A (0.45A)		0.5A (0.7A)	

Output voltage	15W		30W		60W	
	Output current (Peak current)/Model		Output current (Peak current)/Model		Output current (Peak current)/Model	
+5V	2.0A (3.0A)	MTW15-51515	3.0A (4.5A)	MTW30-51515	5.0A (7.0A)	MTW60-51515
+15V	0.3A (0.6A)		0.8A (2.0A)		2.0A (3.5A)	
-15V	0.2A (0.3A)		0.3A (0.45A)		0.5A (0.7A)	

Variation symbol	Function
None	Fixed output voltage type
-V	Output voltage adjustable type

* Output voltage adjustable type: Indicated by "-V" added at the end of model

MTW15W Specifications

ITEMS/UNITS		MODEL	MTW15-51212			MTW15-51515		
		CH	1	2	3	1	2	3
Input	Voltage Range (Nominal: 100-240VAC)	V	AC85-265					
	Frequency (Nominal: 50-60 single phase)	Hz	47-440					
	Power Factor (100/240VAC)(typ)		0.55/0.45					
	Efficiency (100/240VAC)(typ)	%	71/70			68/70		
	Current (100/240VAC)(typ)	A	0.42/0.25					
	Inrush Current (100/240VAC)(typ) (*1)	A	25/50					
	Leakage Current(max)	mA	0.75 (100VAC (Electrical Appliance and Material Safety Law) / 240VAC (UL, IEC))					
Nominal Voltage (*2)	VDC	+5 [V1]	+12 [V2]	-12 [V3]	+5 [V1]	+15 [V2]	-15 [V3]	
Maximum Current (*3)	A	2	0.3	0.2	2	0.3	0.2	
Maximum Peak Current (*4)	A	3	0.6	0.3	3	0.6	0.3	
Maximum Power (P0[V1]+P0[V2]+P0[V3])	W	16			17.5			
Voltage Setting Accuracy (100/240VAC,100% load)	%	+5 ± 0.25	+12 ± 0.6	-12 ± 0.6	+5 ± 0.25	+15 ± 0.6	-15 ± 0.6	
Maximum Line Regulation (Within input voltage range)(max)		0.4%						
Maximum Load Regulation (10-100% load)(max)		2.0%	1.0%		2.0%	1.0%		
Temperature Coefficient (Ambient temperature -10° C to +50° C)(max)	%	1.0						
Warm Up Drift (max) (*5)	%	2.0	1.0		2.0	1.0	2.0	
Max Power Total Regulation (max)(*2)	%	± 2.0						
Maximum Ripple Voltage (max) (*6)	mVp-p	100	120		100	120		
Maximum Ripple & Noise (max) (*6)	mVp-p	120	150		120	150		
Start Up Time (100VAC)(max)	ms	100						
Hold-up Time (100/240VAC)(typ)	ms	20/150						
Voltage Adjustable Range (*7)	VDC	Fixed/Variable (CH1)						
Over Current Protection (min) (*8)	A	3.15	0.63	0.32	3.15	0.63	0.32	
Over Voltage Protection (min) (*9)	VDC	5.7	Not available		5.7	Not available		
Over Temperature Protection		Not available						
Remote Sensing		Not available						
Remote ON/OFF Control		Not available						
Parallel Operation		Not available						
Series Operation		Not available						
Operation Indicator		Not available						
Monitoring Signal		Not available						
Operating Temperature	°C	-10 to +60						
Storage Temperature	°C	-30 to +75						
Operating Humidity	% RH	10-90 (the conditions of maximum 35°C in wet bulb temperature and non-condensation should be ensured.)						
Storage Humidity	% RH	10-90 (the conditions of maximum 35°C in wet bulb temperature and non-condensation should be ensured.)						
Vibration		5-10Hz, 10 minutes sweep, 10mmp-p total amplitude, 3 directions, 1h for each, in non-operation 10-200Hz, 10 minutes sweep, 19.6m/s ² (2G) acceleration, 3 directions, 1h for each, in non-operation						
Shock		588m/s ² (60G), 11 ± 5ms, 3 directions, 3 times for each, in non-operation For 1 minute at ordinary temperature and humidity						
Isolation	Withstand Voltage	Between input terminal and ground terminal: 2.0kVAC, 10mA cutout current Between input terminal and output terminal: 3.0kVAC, 10mA cutout current Between output terminal and ground (G): 500VAC, 20mA cutout current						
	Isolation Resistance	In 500VDC and 100MΩ or over at ordinary temperature and humidity Between input terminal and ground terminal, between input terminal and output terminal, and between output terminal and ground terminal						
Standards	Safety Standards	Approved by UL60950-1, CSA C22.2 No.60950-1 (C-UL), EN60950-1 (TÜV), complying with Electrical Appliance and Material Safety Law (meeting the regulations of creepage surface and spacial distance in item 8 of the appendix table)						
	EMI	Complying with FCC-Class B / VCCI-Class B / EN55011-B / EN55022-B						
	Immunity	Complying with EN61000-4-2 Level 4, -3 Level 3, -4 Level 3, -5 Level 4, -6 Level 3, -8 Level 4, -11						
Mechanical	Weight (max)	g 150						
	Size (W x H x D)	mm 26 x 50 x 127						

With nominal input/output voltage, maximum output current, and Ta=25°C, if not specified separately.

(*1) In primary surge current, 25°C, and cold starting.

(*2) Overshoot in starting input is 4%typ. Floating system is used for V1-V2 and V1-V3.

(*3) The maximum output current value is between -10°C and +50°C. For use in outside this temperature range, derating is needed.

(*4) Flowing time should be within 10 seconds and the effective current/power should be the same as or less than the maximum current/power.

(*5) 30min to 8h after the start of input voltage application.

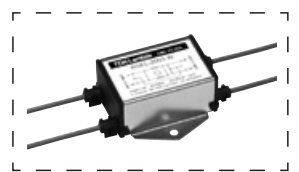
(*6) In 100MHz, -10° C-0° C. Ripple: V1-140mVp-p max, V2, V3-160mVp-p max. Ripple noise : V1-160mVp-p max, V2/V3-180mVp-p max.

(*7) For output voltage adjustable types (variation), output voltage can be varied in the range of +5V through +5.25V for CH1 (+5V) only, by the output voltage trimmer.

(*8) When the other channels are in 0A. Fold-back type drooping system and automatically resumes when the causes are removed.

(*9) For V1 only: Zener clamp system

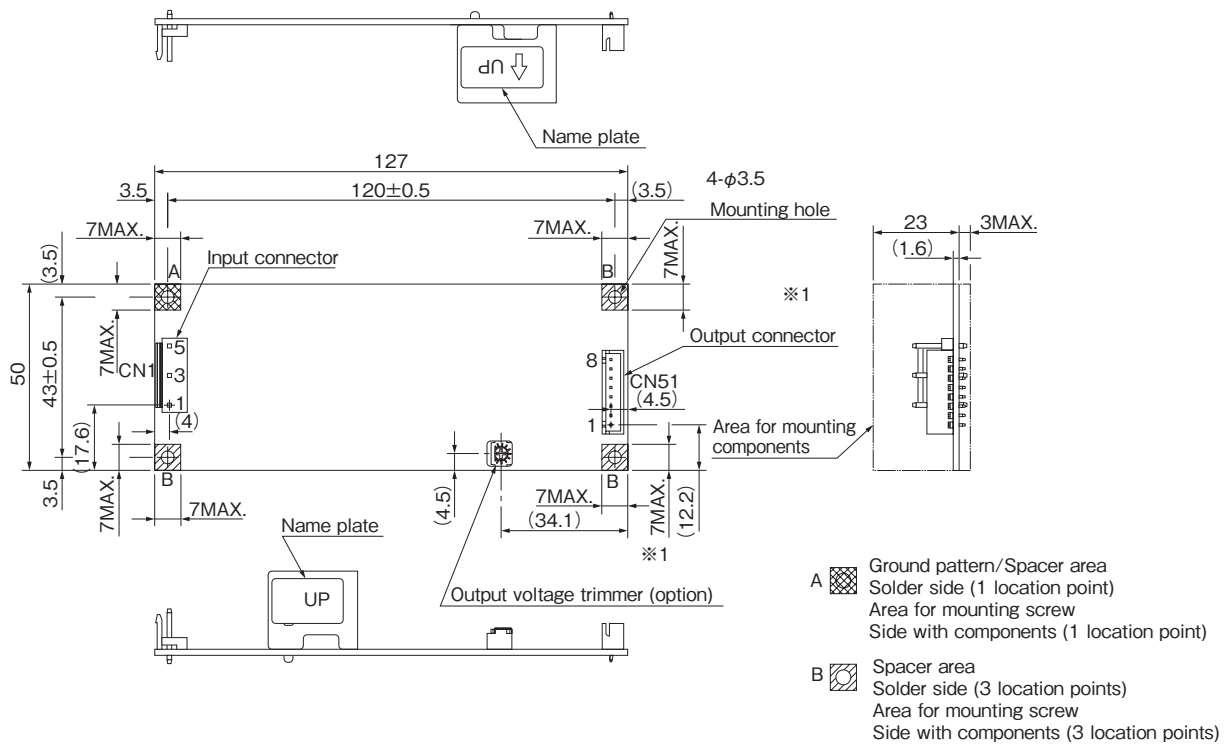
Recommended EMC Filter



RSEL-2001W

Please refer to "TDK-Lambda EMC Filters" catalog.

Outline Drawing



Specifications of terminals

Unit: mm

Allowable difference is ±1mm if not specified separately.



CN1 : Input side

P5	⊥	Ground
P3	N	Neutral
P1	L	Live

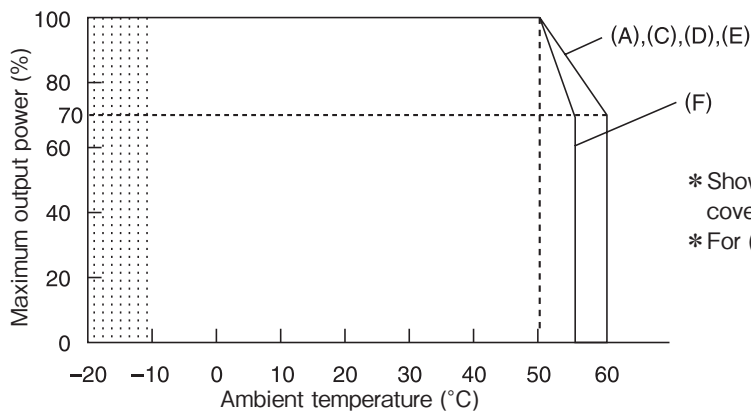
- VH series B3P5-VH-B
by J.S.T. Mfg. Co., Ltd.

CN51 : Output side

P8	V3	Output 3
P7	G2	Ground 2
P6	V2	Output 2
P4	G1	Ground 1
P3	V1	Output 1
P2		
P1		

- XH series B8B-XH-2
by J.S.T. Mfg. Co., Ltd.

Output Power - Ambient Temperature (Derating Curve)



* Shows derating for products without covers.
* For (A)-(F), refer to the item regarding

In the range indicated by [dotted area], operation is possible but the characteristics are not guaranteed.

MTW30W Specifications

		MODEL	MTW30-51212			MTW30-51515		
ITEMS/UNITS	CH		1	2	3	1	2	3
Input	Voltage Range (Nominal: 100-240VAC)	V	AC85-265					
	Frequency (Nominal: 50-60 single phase)	Hz	47-440					
	Power Factor (100/240VAC)(typ)		0.55/0.45					
	Efficiency (100/240VAC)(typ)	%	76/77					
	Current (100/240VAC)(typ)	A	0.8/0.4					
	Inrush Current (100/240VAC)(typ) (*1)	A	20/40					
	Leakage Current (max)	mA	0.55/0.75 (100VAC (Electrical Appliance and Material Safety Law) / 240VAC (UL, IEC))					
Output	Nominal Voltage (*2)	VDC	+5 [V1]	12 [V2]	-12 [V3]	+5 [V1]	+15 [V2]	-15 [V3]
	Maximum Current (*3)	A	3	1.2	0.3	3	0.8	0.3
	Maximum Peak Current (*4)	A	4.5	2	0.45	4.5	2	0.45
	Maximum Power (P0[V1]+P0[V2]+P0[V3])	W	30			33		
	Voltage Setting Accuracy (100/240VAC,100% load)	%	+5+0.3, -0.1	+12 ± 0.6	-12 ± 0.6	+5+0.3, -0.1	+15 ± 0.75	-15 ± 0.75
	Maximum Line Regulation (Within input voltage range)(max)		1.0%	0.4%		1.0%	0.4%	
	Maximum Load Regulation (10-100% load)(max)		2.0%	1.0%		2.0%	1.0%	
	Temperature Coefficient (Ambient temperature -10°C to +50°C) (max)	%	2.0	1.0		2.0	1.0	
	Warm Up Drift (max) (*5)	%	1.0					
	Max Power Total Regulation (max)(*2)	%	± 3.0	± 2.0		± 3.0	± 2.0	
	Maximum Ripple Voltage (max) (*6)	mVp-p	80	100		80	100	
	Maximum Ripple & Noise (max) (*6)	mVp-p	120	150		120	150	
	Start Up Time (100VAC)(max)	ms	300					
	Hold-up Time (100/240VAC)(typ)	ms	20/140					
	Voltage Adjustable Range (*7)	VDC	Fixed/Variable (CH1)					
Function	Over Current Protection (min) (*8)	A	4.7	2.1	0.48	4.7	2.1	0.48
	Over Voltage Protection (min) (*9)	VDC	5.8	Not available		5.8	Not available	
	Over Temperature Protection		Not available					
	Remote Sensing		Not available					
	Remote ON/OFF Control		Not available					
	Parallel Operation		Not available					
	Series Operation		Not available					
	Operation Indicator		Not available					
Environment	Monitoring Signal		Not available					
	Operating Temperature	°C	-10 to +60					
	Storage Temperature	°C	-30 to +75					
	Operating Humidity	% RH	10-90 (the conditions of maximum 35°C in wet bulb temperature and non-condensation should be ensured.)					
	Storage Humidity	% RH	10-90 (the conditions of maximum 35°C in wet bulb temperature and non-condensation should be ensured.)					
	Vibration		5-10Hz, 10 minutes sweep, 10mmp-p total amplitude, 3 directions, 1h for each, in non-operation 10-200Hz, 10 minutes sweep, 19.6m/s ² (2G) acceleration, 3 directions, 1h for each, in non-operation					
Isolation	Shock		588m/s ² (60G), 11 ± 5ms, 3 directions, 3 times for each, in non-operation For 1 minute at ordinary temperature and humidity					
	Withstand Voltage		Between input terminal and ground terminal: 2.0kVAC, 10mA cutout current Between input terminal and output terminal: 3.0kVAC, 10mA cutout current Between output terminal and ground (G): 500VAC, 20mA cutout current					
	Isolation Resistance		In 500VDC and 100MΩ or over at ordinary temperature and humidity Between input terminal and ground terminal, between input terminal and output terminal, and between output terminal and ground terminal					
Standards	Safety Standards		Approved by UL60950-1, CSA C22.2 No.60950-1 (C-UL), EN60950-1 (TÜV), complying with Electrical Appliance and Material Safety Law (meeting the regulations of creepage surface and spacial distance in item 8 of the appendix table)					
	EMI		Complying with FCC-Class B / VCCI-Class B / EN55011-B / EN55022-B					
	Immunity		Complying with EN61000-4-2 Level 4, -3 Level 3, -4 Level 3, -5 Level 4, -6 Level 3, -8 Level 4, -11					
Mechanical	Weight max	g	210					
	Size (WxHxD)	mm	26 x 65 x 140					

With nominal input/output voltage, maximum output current, and Ta=25°C, if not specified separately.

(*1) In primary surge current, 25°C, and cold starting.

(*2) Overshoot in starting input is 4%typ. Floating system is used for V1-V2 and V1-V3.

(*3) The maximum output current value is between -10° C and +50° C. For use in outside this temperature range, Derating is needed.

(*4) Flowing time should be within 10 seconds and the effective current/power should be the same as or less than the maximum current/power.

(*5) 30min to 8h after the start of input voltage application.

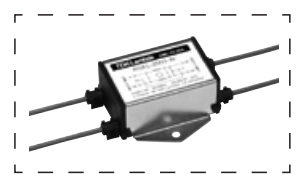
(*6) In 100MHz, -10° C-0° C. Ripple: V1-140mVp-p max, V2, V3-160mVp-p max. Ripple noise: V1-160mVp-p, V2/V3-180mVp-p max.

(*7) For output voltage adjustable types (variation V), output voltage can be varied in the range of +5V through +5.2V for CH1 (+5V) only, by the output voltage trimmer.

(*8) When the other channels are in 0A. Fold-back type drooping system and automatically resumes when the causes are removed.

(*9) For V1 only: Zener clamp system

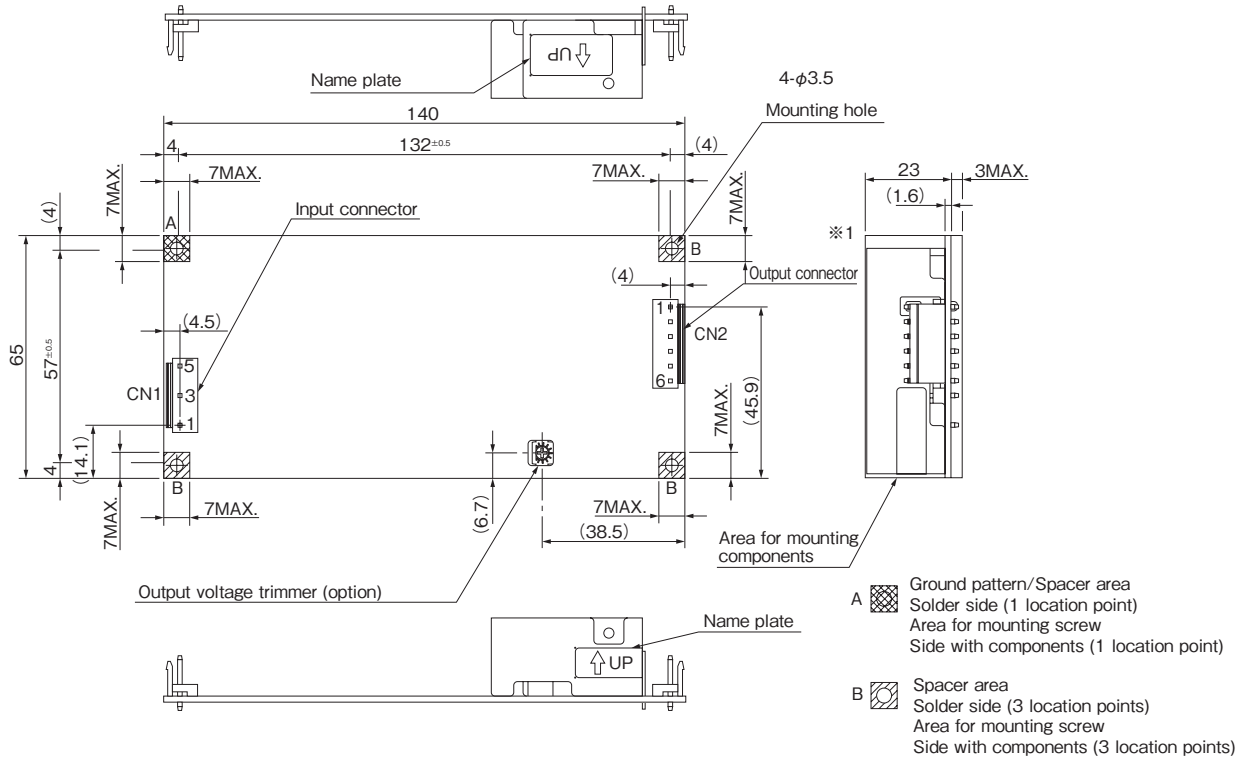
Recommended EMC Filter



RSEL-2001E

Please refer to "TDK-Lambda EMC Filters" catalog.

Outline Drawing



Specifications of terminals

Unit: mm

Allowable difference is ±1mm if not specified separately.



CN1 : Input side

P5	⏏	Ground
P3	N	Neutral
P1	L	Live

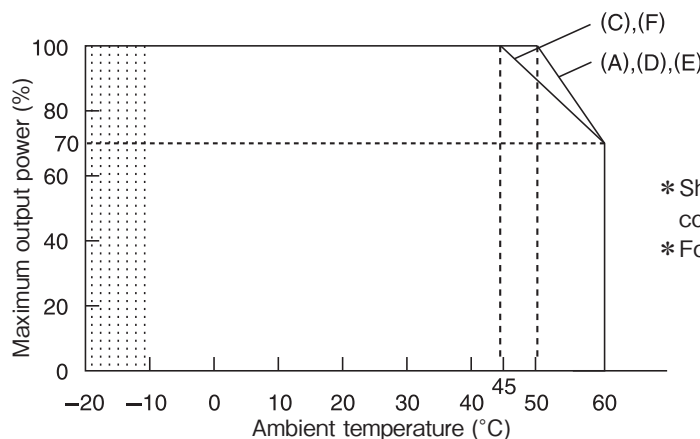
- VH series B3P5-VH-B
 by J.S.T. Mfg. Co., Ltd.

CN2 : Output side

P1	V3	Output 3
P2	G2	Ground 2
P3	G2	Ground 2
P4	V2	Output 2
P5	G1	Ground 1
P6	V1	Output 1

- VH series B6P-VH-B
 by J.S.T. Mfg. Co., Ltd.

Output Power - Ambient Temperature (Derating Curve)



* Shows derating for products without covers.
 * For (A)-(F), refer to the item regarding

MTW60W Specifications

ITEMS/UNITS		MODEL	MTW60-51212			MTW60-51515		
		CH	1	2	3	1	2	3
Input	Voltage Range (Nominal: 100-240VAC)	V	AC85-265					
	Frequency (Nominal: 50-60 single phase)	Hz	47-440					
	Power Factor (100/240VAC)(typ)		0.55/0.45					
	Efficiency (100/240VAC)(typ)	%	76					
	Current (100/240VAC)(typ)	A	1.4/0.8					
	Inrush Current (100/240VAC)(typ) (*1)	A	20/40					
	Leakage Current (max)	mA	0.6/0.75 (100VAC (Electrical Appliance and Material Safety Law) / 240VAC (UL, IEC))					
Nominal Voltage (*2)	VDC	+5 [V1]	12 [V2]	-12 [V3]	+5 [V1]	+15 [V2]	-15 [V3]	
Maximum Current (*3)	A	5	2.5	0.5	5	2	0.5	
Maximum Peak Current (*4)	A	7	3.5	0.7	7	3.5	0.7	
Maximum Power (P0[V1]+P0[V2]+P0[V3])	W	60			62.5			
Voltage Setting Accuracy (100/240VAC,100% load)	%	+5±0.3, -0.1	+12 ± 0.6	-12 ± 0.6	+5±0.3, -0.1	+15 ± 0.6	-15 ± 0.75	
Maximum Line Regulation (Within input voltage range)(max)		1.0%	0.4%		1.0%	0.4%		
Maximum Load Regulation (10-100% load)(max)		2.0%		1.0%	2.0%		1.0%	
Temperature Coefficient (Ambient temperature -10° C to +50° C)(max)	%	2.0		1.0	2.0		1.0	
Warm Up Drift (max) (*5)	%	1.0						
Max Power Total Regulation (max) (*2)	%	± 2.5		± 2.0	± 2.5		± 2.0	
Maximum Ripple Voltage (max) (*6)	mVp-p	80	100		80	100		
Maximum Ripple & Noise (max) (*6)	mVp-p	120	150		120	150		
Start Up Time (100VAC)(max)	ms	350			550			
Hold-up Time (100/240VAC)(typ)	ms	20/180						
Voltage Adjustable Range (*7)	VDC	Fixed/Variable (CH1)						
Over Current Protection (min) (*8)	A	7.4	3.7	0.75	7.4	3.7	0.75	
Over Voltage Protection (min) (*9)	VDC	5.8	13.8	Not available	5.8	16.5	Not available	
Over Temperature Protection		Not available						
Remote Sensing		Not available						
Remote ON/OFF Control		Not available						
Parallel Operation		Not available						
Series Operation		Not available						
Operation Indicator		Not available						
Monitoring Signal		Not available						
Operating Temperature	°C	-10 to +60						
Storage Temperature	°C	-30 to +75						
Operating Humidity	% RH	10-90 (the conditions of maximum 35°C in wet bulb temperature and non-condensation should be ensured.)						
Storage Humidity	% RH	10-90 (the conditions of maximum 35°C in wet bulb temperature and non-condensation should be ensured.)						
Vibration		5-10Hz, 10 minutes sweep, 10mmp-p total amplitude, 3 directions, 1h for each, in non-operation 10-200Hz, 10 minutes sweep, 19.6m/s ² (2G) acceleration, 3 directions, 1h for each, in non-operation						
Shock		588m/s ² (60G), 11 ± 5ms, 3 directions, 3 times for each, in non-operation						
Isolation	Withstand Voltage	For 1 minute at ordinary temperature and humidity Between input terminal and ground terminal: 2.0kVAC, 10mA cutout current Between input terminal and output terminal: 3.0kVAC, 10mA cutout current Between output terminal and ground (G): 500VAC, 20mA cutout current						
	Isolation Resistance	In 500VDC and 100MΩ or over at ordinary temperature and humidity Between input terminal and ground terminal, between input terminal and output terminal, and between output terminal and ground terminal						
Standards	Safety Standards	Approved by UL60950-1, CSA C22.2 No.60950-1 (C-UL), EN60950-1 (TÜV), complying with Electrical Appliance and Material Safety Law (meeting the regulations of creepage surface and spacial distance in item 8 of the appendix table)						
	EMI	Complying with FCC-Class B / VCCI-Class B / EN55011-B / EN55022-B						
	Immunity	Complying with EN61000-4-2 Level 4, -3 Level 3, -4 Level 3, -5 Level 4, -6 Level 3, -8 Level 4, -11						
Mechanical	Weight max	g 330						
	Size (W x H x D)	mm 26 x 83 x 185						

With nominal input/output voltage, maximum output current, and Ta=25°C, if not specified separately.

(*1) In primary surge current, 25°C, and cold starting.

(*2) Overshoot in starting input is 4%typ. Floating system is used for V1-V2 and V1-V3.

(*3) The maximum output current value is between -10°C and +50°C. For use in outside this temperature range, Derating is needed.

(*4) Flowing time should be within 10 seconds and the effective current/power should be the same as or less than the maximum current/power.

(*5) 30min to 8h after the start of input voltage application.

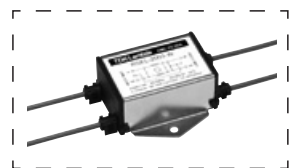
(*6) In 100MHz, -10°C-0°C. Ripple: V1-140mVp-p max, V2/V3-160mVp-p. Ripple noise : V1-160mVp-p max, V2/V3-180mVp-p max.

(*7) For output voltage adjustable types (variation V), output voltage can be varied in the range of 4.5V through 5.5V for CH1 (+5V) only, by the output voltage trimmer.

(*8) When the other channels are in 0A. Fold-back type drooping system and automatically resumes when the causes are removed.

(*9) For V1 only: Zener clamp system

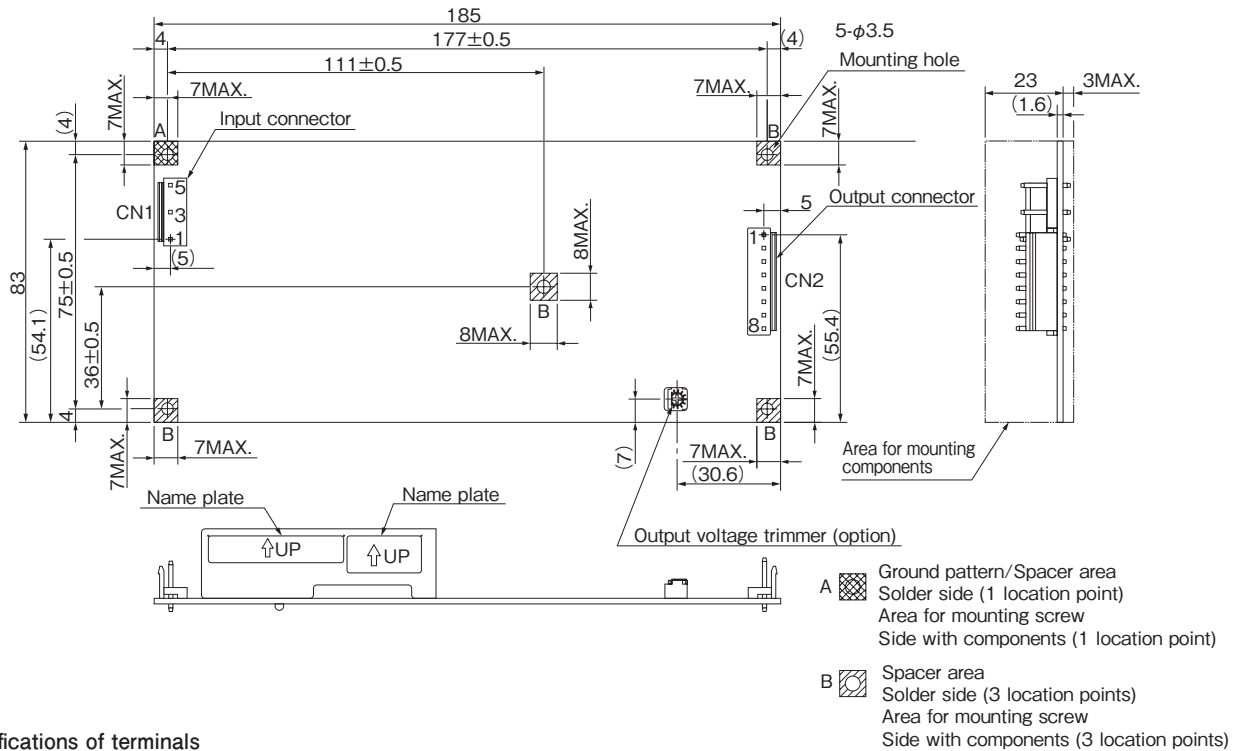
Recommended EMC Filter



RSEL-2003W

Please refer to "TDK-Lambda EMC Filters" catalog.

Outline Drawing



Specifications of terminals



Unit: mm
 Allowable difference is ±1mm if not specified separately.

CN1

P5	±
P3	N
P1	L

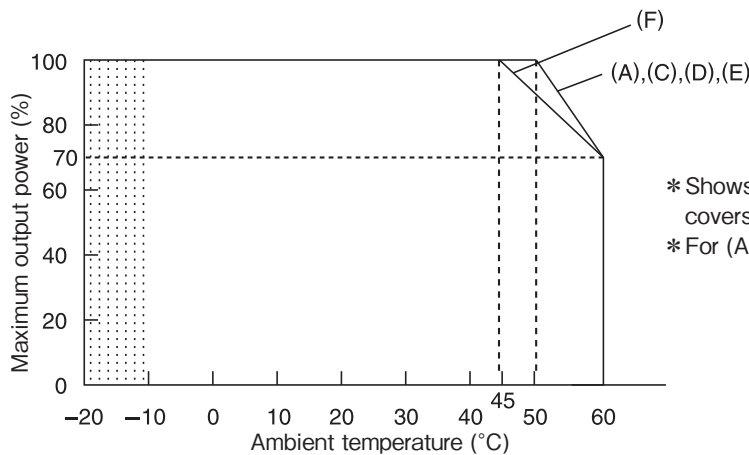
- VH series B3P5-VH-B
 by J.S.T. Mfg. Co., Ltd.

CN2

P1	V3
P2	G2
P3	V2
P4	V2
P5	G1
P6	G1
P7	V1
P8	V1

- VH series B8P-VH-B
 by J.S.T. Mfg. Co., Ltd.

Output Power - Ambient Temperature (Derating Curve)

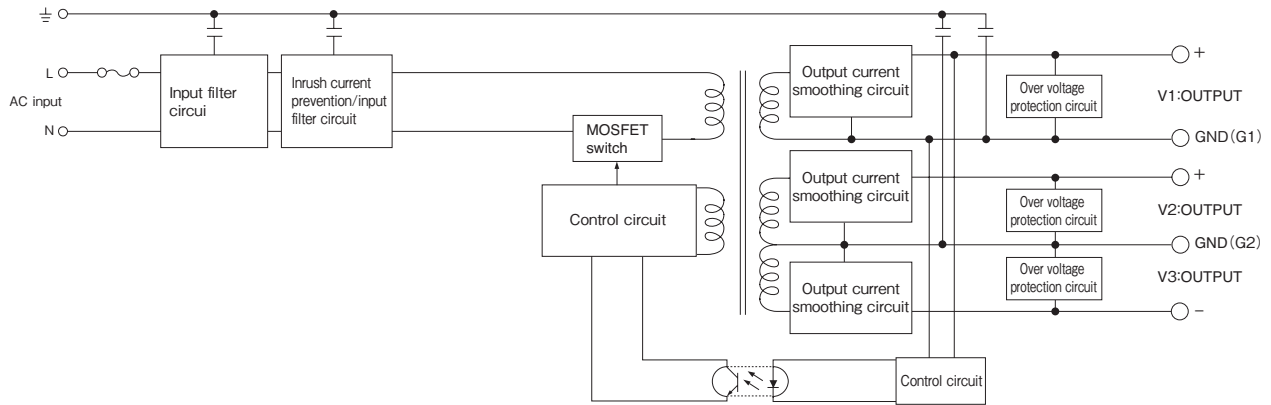


* Shows derating for products without covers.
 * For (A)-(F), refer to the item regarding

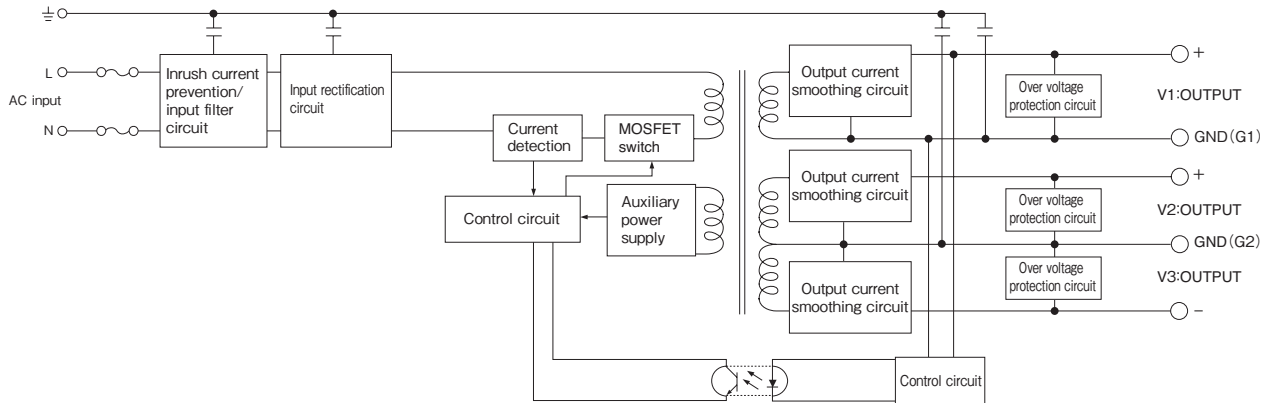
In the range indicated by [shaded area], operation is possible but the characteristics are not guaranteed.

Block Diagram

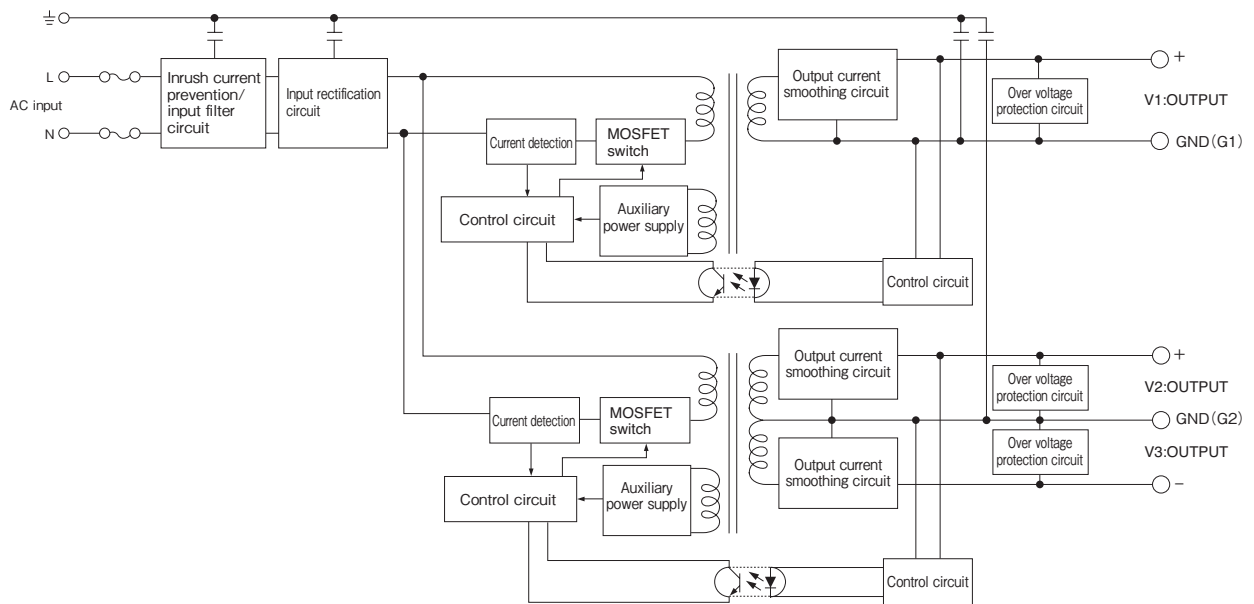
[MTW15W]



[MTW30W]



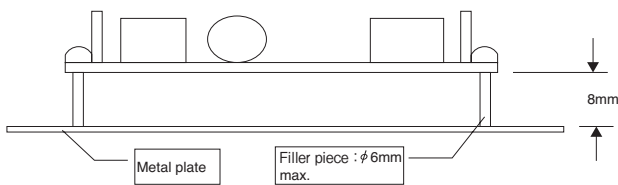
[MTW60W]



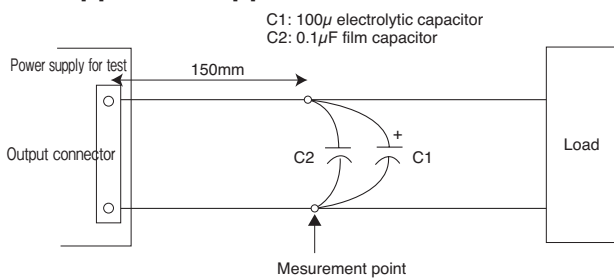
MTW series Instruction Manual

1. Explanation of functions and notes

1 EMI and ESD measurement method

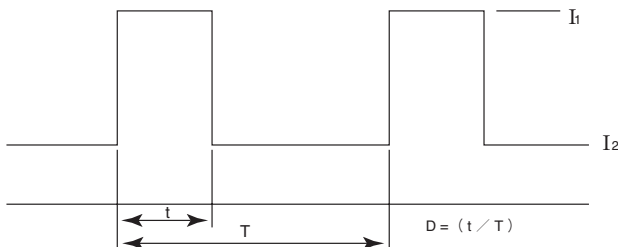


2 Ripple and ripple noise measurement



3 Maximum peak current

Peak current flow can be allowed. However, observe the conditions shown below for a peak current over the nominal value.



- (1) Condition of time $t \leq 10$ seconds
- (2) Condition of peak current $I_1 \leq$ Maximum peak current
- (3) Condition of effective current $\sqrt{D I_1^2 + (1-D) \times I_2^2} \leq$ Maximum current
- (4) Condition of effective power $P \leq$ Maximum power

4 Minimum output current

15W/60W type

There is no restriction in minimum output current value.

30W type

The CH1 (+5V) output current should be 0.5A or over when in use.

If it is 0.5A or lower, the regulations for the other channels cannot be satisfied.

5 CE marking

MTW series meets the EN60950-1 standards and the CE marking is applicable to this series, based on 73/23/EEC and 93/68/EEC. The custom-made power supply units (variation models) modified from this DC power supply device are not basically CE-marking applicable, except when

"CE-marking applicable" is specifically declared in their specification documents.

6 Operation of Over Current Protection

Note that if nonlinear loading such as by lamp or motor, and constant current load is connected, output voltage may not be generated when starting up. Also, there is a restriction in the connectable load capacity. Check it in the specification document.

7 Over Voltage Protection

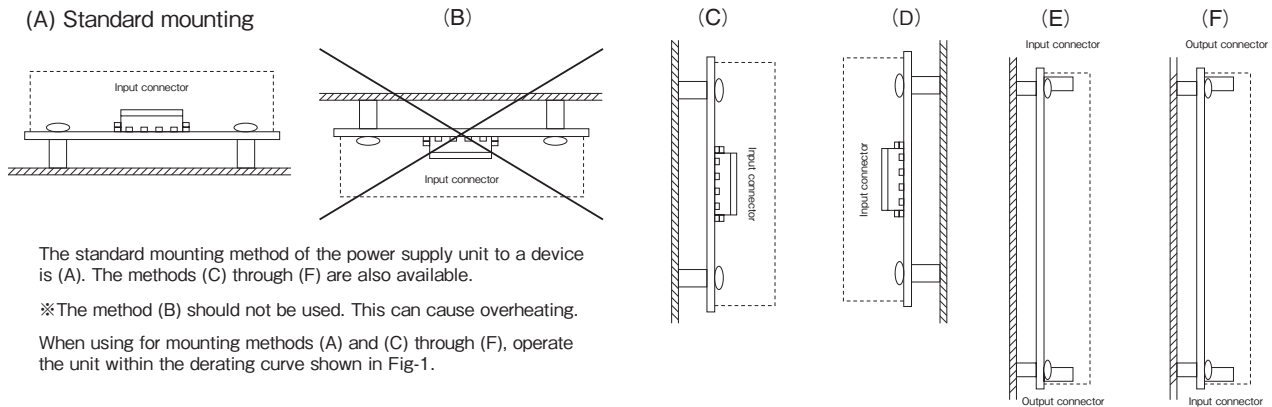
A protection circuit which clamps the output voltage with the zener diode is incorporated, in order to prevent the over voltage output when in an unusual current condition. When this circuit is activated, restart is impossible.

8 Other points to be noted

This product has surface-mount components on the bottom panel (solder side). Vibration, impact, and distortion, etc. in the board can cause failure due to chip crack. Be careful in handling.

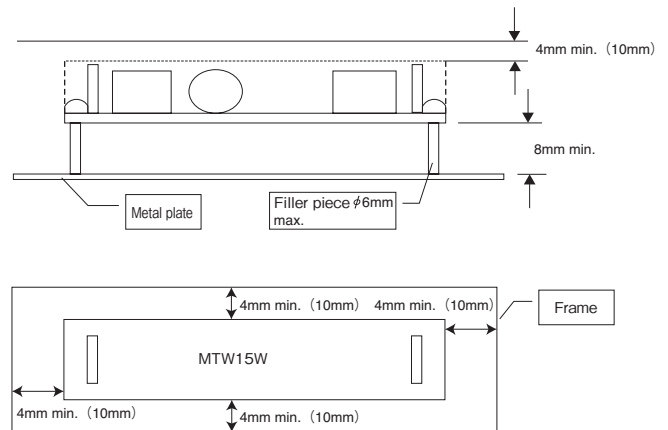
2. Mounting

1 Mounting direction



2 Mounting method

Use spacers (filler pieces: $\phi 6\text{mm}$ max) in the mounting holes on the board. Keep a space of 8mm or over. Also keep a spacial distance (4mm or over) in order to satisfy the insulation regulations/withstand voltage. If a spacial distance (4mm or over) cannot be kept, insert an insulating plate, etc. It is also recommended to keep a distance of 10mm or over from adjacent devices, in order to generate thermal convection.



3. Precautions in use

- When this product is in use, confirm that the power supply's ambient temperature is within the range of operating temperatures. The power supply's ambient temperature means the temperature around the power supply unit, causing a temperature rise inside the device.
- For use with natural air cooling, locate the unit so as to generate thermal convection. Also keep a distance of 10mm or over from adjacent devices, from each side of the unit.
- Select input/output wire materials and noise filters, etc. which have enough allowance in their respective current capacity.
- If the power supply unit is not in use for a long period of time, it is recommended to apply input voltage for approximately 1 hour, every 2 years, to maintain the quality of the electrolytic capacitor.
- When the power supply units are in a series operation, the nominal current is restricted according to the lowest nominal current value of the units in use. In addition, in order to prevent damage to internal elements and other parts due to reverse voltage applied to the unit, connect a diode (reverse withstand voltage: twice or over the value of total output voltage, forward current: twice or over the value of output current, forward voltage drop: possibly minimum) to prevent reverse voltage, to the output terminal of the unit.
- No materials used in this product contain the bromine fire retardant (PBDPEs, PBBs).
- No ODS are used in the production of this product.

4. Troubleshooting

- Is the specified input voltage being applied to the input terminal?
- Are the connections of input/output terminals correct?
- Check that the connecting wires are not too thin.