

S SERIES SPU

[FEATURES]

- Wide input (DC.88 to 185V) ultra-thin type single output power supply.
- Plastic package, onboard type.
- Lightweight.
- Input-output floating.

[SUMMARY]

The S series SPU has a wide and high input voltage range (rated DC.110 to 165V) and has a thickness of 13.2mm of an ultra-thin type in spite of a relatively large capacity (50W, 100W).



PART NUMBERS AND RATINGS

Output voltage(V)	50W Type		100W Type	
	Current(A)	Part No.	Current(A)	Part No.
5	10	SPU05-10R	20	SPU05-20R
12	4.2	SPU12-4R2	8.3	SPU12-8R3
24	2.1	SPU24-2R1	4.2	SPU24-4R2

- The rated output current depends upon a structure of a heat sink to be attached and its air flow supplied to the heat sink.
- The above products are only produced upon receipt of order. Please check a delivery date.

S SERIES SPU50W TYPE

SPECIFICATIONS AND STANDARDS

PART NO.		SPU05-10R	SPU12-4R2	SPU24-2R1
Rated output voltage and current		5V • 10A	12V • 4.2A	24V • 2.1A
Maximum output power ^{*1}	W	50	50.4	50.4
INPUT CONDITIONS				
Input voltage E _{dc}	V	88 to 185[Rating: 110 to 165]		
Input current	A	0.6typ./0.4typ.[DC.110/165V](Without built-in fuse)		
Efficiency	%	80typ.	83typ.	83typ.
OUTPUT CHARACTERISTICS				
Output voltage ^{*2} E _{dc}	V	5	12	24
Voltage variable range ^{*2} E _{dc}	V	4 to 5.5	10.8 to 13.2	21.6 to 26.4
Maximum output current	A	10	4.2	2.1
Overvoltage threshold E _{dc}	V	5.5 to 6.9	13.7 to 15.7	27 to 30.5
Overcurrent threshold	A	10.3 to 13.5	4.3 to 5.7	2.2 to 2.9
Voltage stability	Input variation	%	2max.(0.5typ.)(Within the input voltage range)	
	Load variation	%	2max.(1typ.)(10 to 100% load)	
	Temperature variation	%	2max.(0.5typ.)(Case temperature: 0 to +70°C)	
	Drift	%	0.5max.(0.1typ.)(25°C, input and output ratings, after input voltage ON for 30min to 8h)	
	Dynamic load	%/ms	±4max./1ms[50 to 100% sudden load change]	
Ripple E _{p-p}		mV	150max.	200max.
Ripple noise E _{p-p}		mV	250max.	300max.
Ripple noise E _{p-p}		mV	300max.	400max.
AUXILIARY FUNCTIONS				
Overvoltage protection		Voltage shut-down type, recovers upon reset.		
Overcurrent protection		Fixed current and voltage threshold type, automatic recovery.		
Remote ON-OFF		Yes		
Remote sensing		Yes		

STANDARDS

Safety standards ^{*3}	—
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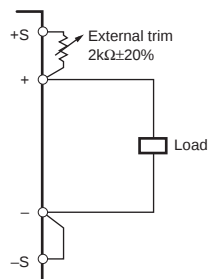
CONSTRUCTIONS

External dimensions	mm	12.7×58×115[H×W×L]
Weight	g	120max.
Mounting method	Can be attached to terminal side (soldered and screwed).	
Case material	Nonflammable resin[UL94V-0]	
Heat sink	Sold separately(Part No.: 3JR0AB179)	

^{*1} The maximum output power depends upon a structure of a heat sink to be attached to the power supply body and its air flow of the fan supplied to the heat sink. The values on the above table are determined on the 50W standard heat sink (3JR0AB179) to which an air is supplied at 1.7m/s air speed.

^{*2} Determination of output voltage

External trim voltage adjustment must be used to set output voltage.



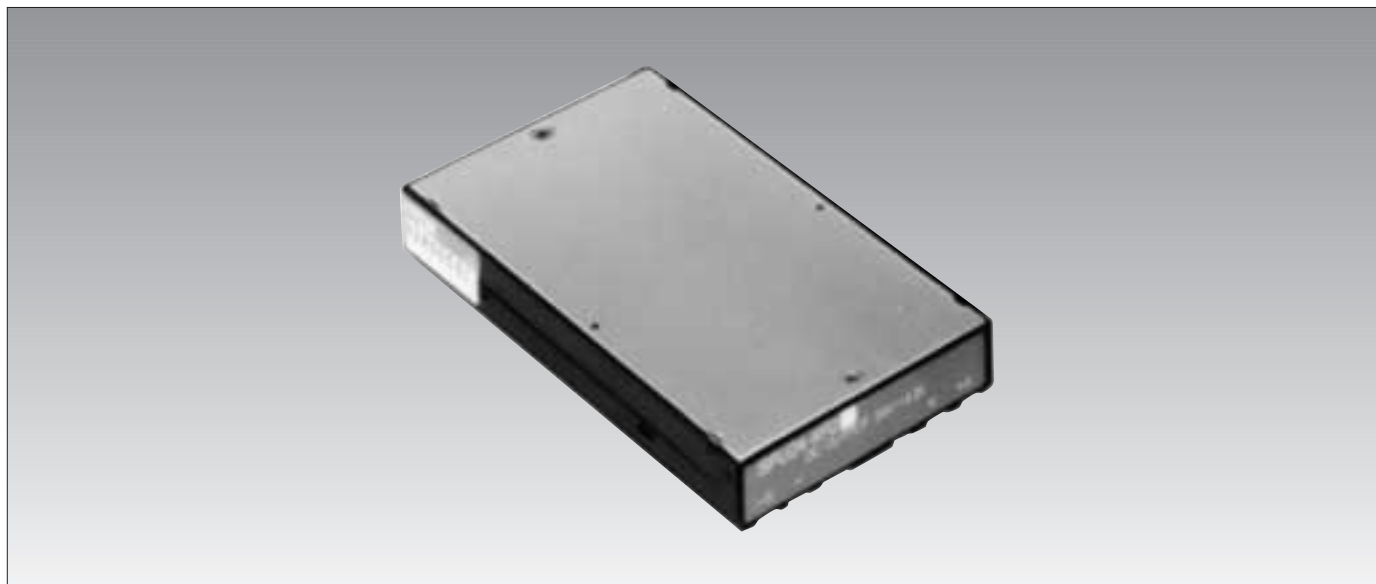
^{*3} Conditions

Size of heat sink: 12(H)×56(W)×115(L)mm or larger

Air speed of fan: 1.7m/s

Input protection fuse: 1.5 to 2A (normal melting type), external

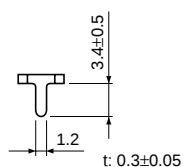
S SERIES SPU50W TYPE



SHAPES AND DIMENSIONS SPU50W TYPE

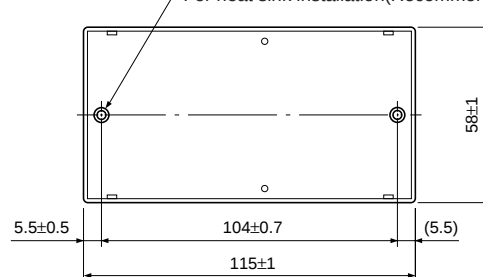
Dimensions in mm
±0.3mm : without specified dimensions

[Detail drawing of terminal block]

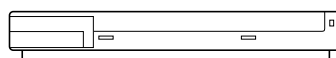


2-M3 Tap

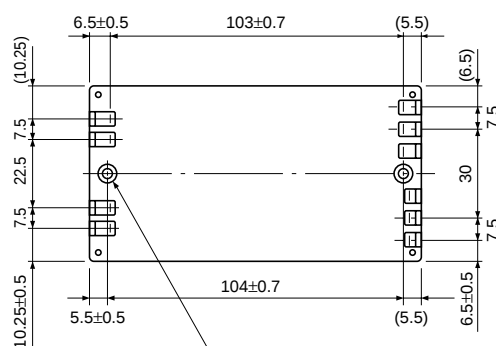
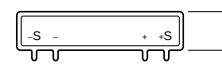
For heat sink installation(Recommend torque: 0.69N·m)



[Input side]



[Output side]



2-M4 Tap(For customer use)

Ground connection only(Ground terminal)(Recommend torque: 1.08N·m)

S SERIES SPU100W TYPE

SPECIFICATIONS AND STANDARDS

PART NO.		SPU05-20R	SPU12-8R3	SPU24-4R2
Rated output voltage and current		5V • 20A	12V • 8.3A	24V • 4.2A
Maximum output power ^{*1}	W	100	99.6	100.8
INPUT CONDITIONS				
Input voltage E _{dc}	V	88 to 185[Rating: 110 to 165]		
Input current	A	1.2typ./0.8typ.[DC.110/165V](Without built-in fuse)		
Efficiency	%	80typ.	83typ.	83typ.
OUTPUT CHARACTERISTICS				
Output voltage ^{*2} E _{dc}	V	5	12	24
Voltage variable range ^{*2} E _{dc}	V	4 to 5.5	10.8 to 13.2	21.6 to 26.4
Maximum output current	A	20	8.3	4.2
Overvoltage threshold E _{dc}	V	5.5 to 6.9	13.7 to 15.7	27 to 30.5
Overcurrent threshold	A	20.6 to 27	8.5 to 11.2	4.3 to 5.7
Voltage stability	Input variation	%	2max.(0.5typ.)(Within the input voltage range)	
	Load variation	%	2max.(1typ.)(10 to 100% load)	
	Temperature variation	%	2max.(0.5typ.)(Case temperature: 0 to +70°C)	
	Drift	%	0.5max.(0.1typ.)(25°C, input and output ratings, after input voltage ON for 30min to 8h)	
	Dynamic load	%/ms	±4max./1ms[50 to 100% sudden load change]	
Ripple E _{p-p}		mV	150max.	200max.
Ripple noise E _{p-p}		mV	250max.	300max.
Ripple noise E _{p-p}		mV	300max.	400max.
AUXILIARY FUNCTIONS				
Overvoltage protection		Voltage shut-down type, recovers upon reset.		
Overcurrent protection		Fixed current and voltage threshold type, automatic recovery.		
Remote ON-OFF		Yes		
Remote sensing		Yes		

STANDARDS

Safety standards ^{*3}	—
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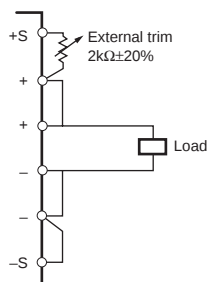
CONSTRUCTIONS

External dimensions	mm	12.7×58×130[H×W×L]
Weight	g	160max.
Mounting method	Can be attached to terminal side (soldered and screwed).	
Case material	Nonflammable resin[UL94V-0]	
Heat sink	Sold separately(Part No.: 3JR0AB163)	

^{*1} The maximum output power depends upon a structure of a heat sink to be attached to the power supply body and its air flow of the fan supplied to the heat sink. The values on the above table are determined on the 50W standard heat sink (3JR0AB179) to which an air is supplied at 1.7m/s air speed.

^{*2} Determination of output voltage

External trim voltage adjustment must be used to set output voltage.



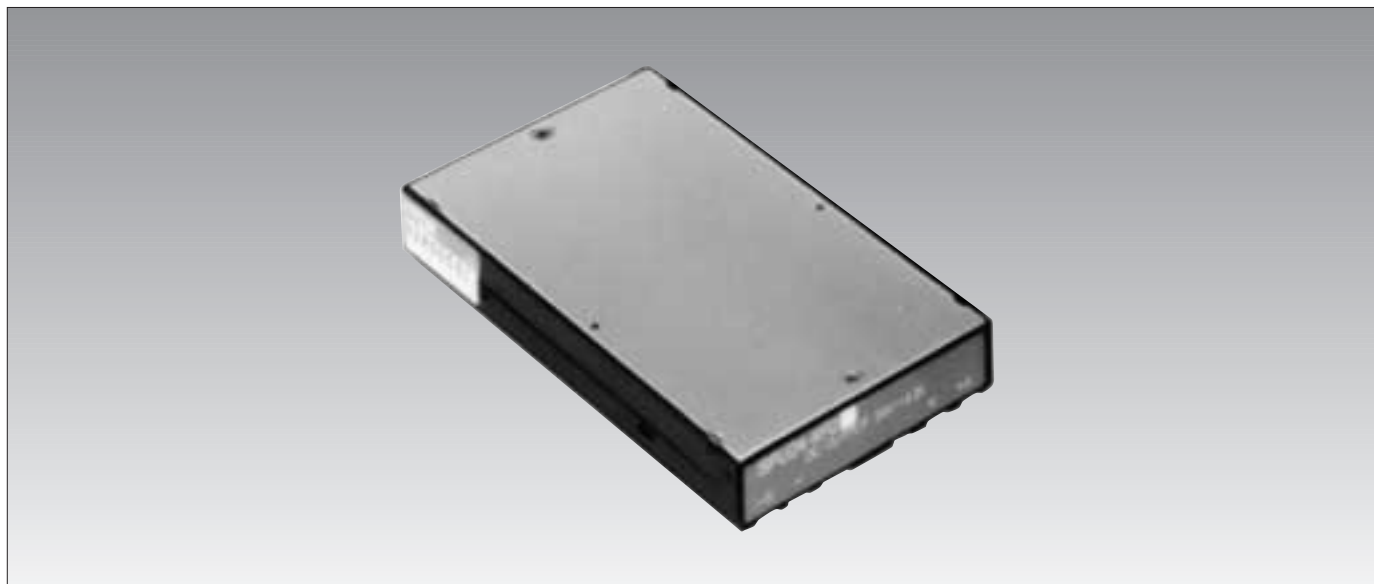
^{*3} Conditions

Size of heat sink: 20(H)×57(W)×128(L)mm or larger

Air speed of fan: 1.7m/s

Input protection fuse: 2.5 to 3A (normal melting type), external

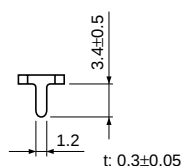
S SERIES SPU100W TYPE



SHAPES AND DIMENSIONS SPU100W TYPE

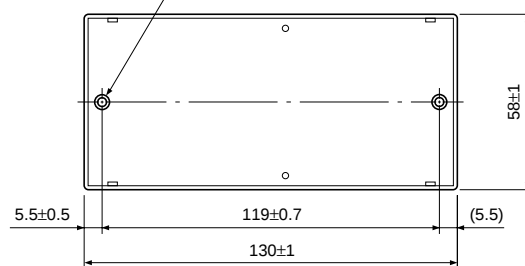
Dimensions in mm
±0.3mm : without specified dimensions

[Detail drawing of terminal block]

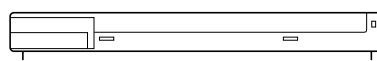


2-M3 Tap

For heat sink installation(Recommend torque: 0.69N•m)



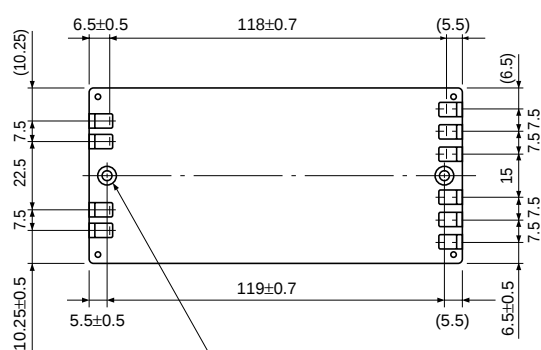
[Input side]



[Output side]



13.7max.

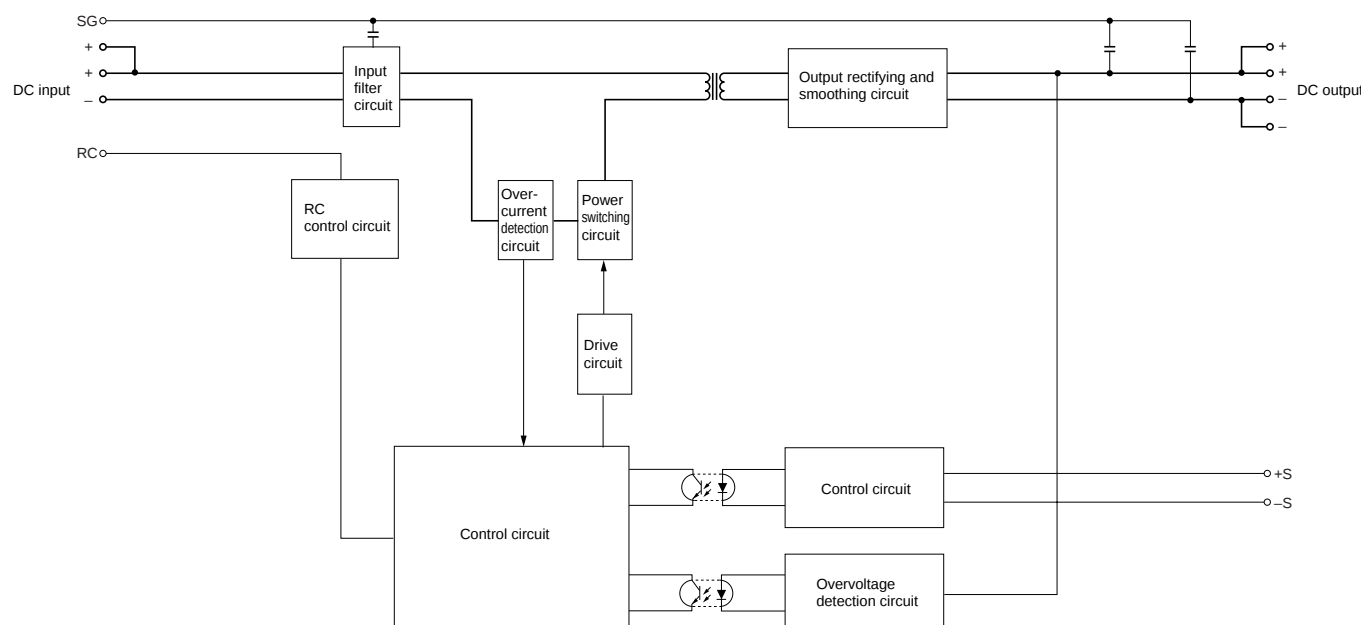


2-M4 Tap(For customer use)

Ground connection only(Ground terminal)(Recommend torque: 1.08N•m)

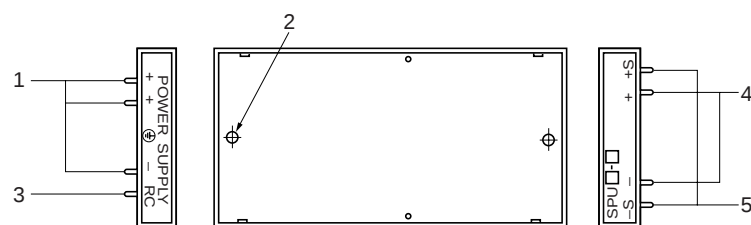
Characteristics, Functions, and Applications

BLOCK DIAGRAM



TERMINAL DESIGNATIONS AND FUNCTIONS

50W TYPE



1 DC input terminals(DC INPUT)

Connected to the DC input line.

2 Frame ground connection tap

Connected to a ground by using an M4 tap provided in the side of the lower surface of the case (terminal side).

3 Remote ON-OFF terminal(RC)

The output voltage can be turned on or off by applying a voltage of a TTL level to a portion between these RC terminals and the input terminal.

Between RC and input (-): Turned on at high level (2.4 to 5V) or in open condition.

Between RC and input (-): Turned off at low level (0 to 0.4V) or in short circuit.

The RC terminal is pulled up inside the power supply and therefore it should be opened when not in use.

4 DC output terminals(+, -)

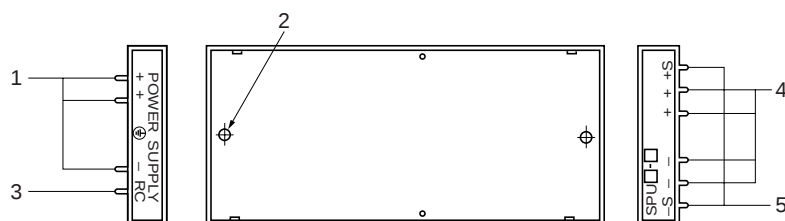
Connected to a load line.

5 Output voltage setting terminal and remote sensing terminals(+S, -S)

Used for setting the rated output voltage or for compensate voltage loss up to a load.

- Unless the remote sensing is used, connect these terminals to DC output terminals (+, -) in 4, respectively.

100W TYPE



Characteristics, Functions, and Applications

COMMON SPECIFICATIONS

Temperature and humidity

Temperature range	Operating(°C)	0 to +50
	Storage(°C)	–25 to +80

Humidity range	Operating(%)RH	20 to 95[Maximum wet-bulb temperature: 35°C, without dewing]
	Storage(%)RH	

Amplitude and vibration

Amplitude	5 to 10Hz	All amplitude 10mm[3 directions, each 1h]
	10 to 55Hz	Acceleration 19.6m/s ² [2G, 3 directions, each 1h]
Vibration	Acceleration	196m/s ² [20G, 3 directions, each 3 times]
	Vibration time	11±5ms

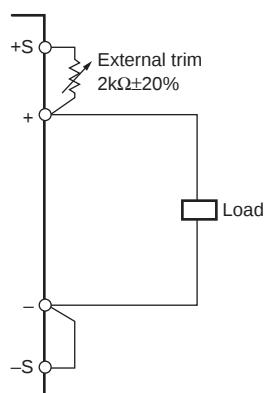
Withstand voltage and insulation resistance

Withstand voltage	Input terminal to frame ground terminal	Eac(kV)2, 1min(25°C, 45 to 75(%)RH, cutout current 5mA)
	Input terminal to output terminal	
Insulation resistance	Input terminal to frame ground terminal	Edc(V)500, 100MΩ min.(25°C, 45 to 75(%)RH)
	Input terminal to output terminal	
	Output terminal to frame ground terminal	

OUTPUT VOLTAGE SETTING

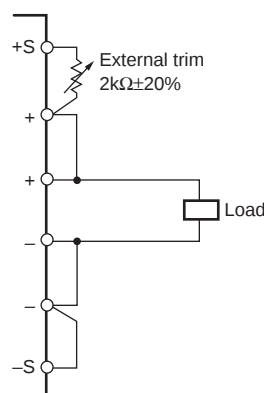
Voltage adjustment with an external trimmer is always required for setting the rated output voltage.

SPU(50W TYPE)

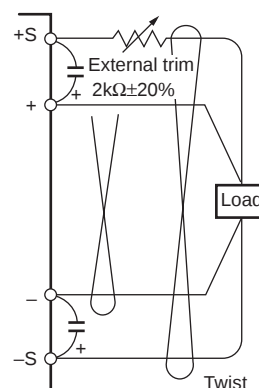


≒ 12.3V output at 1kΩ with external trimmer

SPU(100W TYPE)

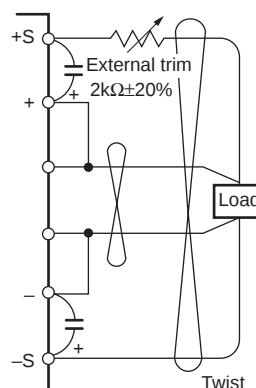


SPU(50W TYPE)



Use stranded wires between the +S and –S terminals and between the + and – terminals.

SPU(100W TYPE)



If the overvoltage protection circuit is easily operated or oscillation easily occurs, add electrolytic capacitors of 470μF or greater between the +S and + terminals and between the –S and – terminals (It should be noted that, however, the output rise time is extended due to a capacity of the capacitor). Unless the remote sensing is used, apply the connection described in the above, OUTPUT VOLTAGE SETTING.

REMOTE ON-OFF

The output voltage can be turned on or off by applying a voltage of a TTL level to a portion between these RC terminals and the input terminal.

- Between RC and input (–): Turned on at high level (2.4 to 5V) or in open condition.
- Between RC and input (–): Turned off at low level (0 to 0.4V) or in short circuit.

The RC terminal is pulled up inside the power supply and therefore it should be opened when not in use.

REMOTE SENSING

In case of a problem of large voltage loss on a load line caused by a long distance from the power supply to the load, the loss is compensated by the remote sensing. The output voltage can be corrected up to 0.25V for the 5V rated output or up to 0.4V for the 12 to 24V rated output (Be careful, however, with the output power).

OVERCURRENT PROTECTION CIRCUIT

The overcurrent protection circuit is provided to protect a power supply circuit from a short-circuit of a load or other troubles. If the load current exceeds the rated value, it operates to decrease the output voltage. The voltage recovers after removing the cause.

OVERVOLTAGE PROTECTION CIRCUIT

If the output voltage of the power supply exceeds the overvoltage detected value for some reason, the overvoltage protection circuit halts the output of the power supply. A normal voltage is secured by resetting the power supply after removing the cause (Note that, however, this circuit does not operate when an overvoltage is applied externally).

Characteristics, Functions, and Applications

HEAT PROTECTION CIRCUIT

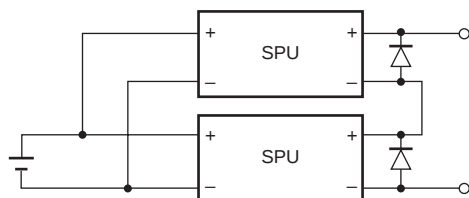
Unless required cooling conditions are fulfilled, an abnormal heat generation in the components is detected and the protection circuit is activated. If this protection circuit operates, no output may be generated from the power supply until the detector temperature drops even if the power supply is turned on again.

PARALLEL OPERATION

It is impossible to use a parallel operation (parallel connection of power supply output terminals) for increasing output current. It is possible, however, to perform a parallel operation (backup) within the range of each output power.

SERIAL OPERATION

In case of an insufficient output voltage, a serial connection of power supplies secures the predetermined voltage. The maximum current corresponds to the lowest output current value among those of the power supplies in series.



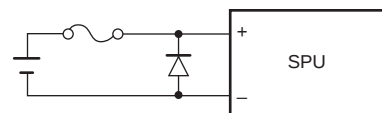
Note) As for a selection of diodes, select ones having forward current twice or more the rated output current.

IN CASE OF A LOAD SHORT-CIRCUITED BY MISTAKE

In case of an occurrence of a short circuit of a load for several minutes, the power supply is protected by an operation of a protection circuit. It should be noted, however, if it continues for a long period of time, the life of the power supply may be significantly reduced due to a deterioration of components.

INPUT REVERSE CONNECTION COUNTERMEASURES

This product contains no protection circuit against a reverse connection of an input power supply. If there is a possibility of a reverse connection or for an abnormality countermeasures, add diode and a fuse to the input terminal as shown below.



Select a diode having twice or three times forward current of the fuse rated current as the above diode.

Rated current of fuse

50W type: Rated current 1.5 to 2A (Normal melting type)

100W type: Rated current 2.5 to 3A (Normal melting type)

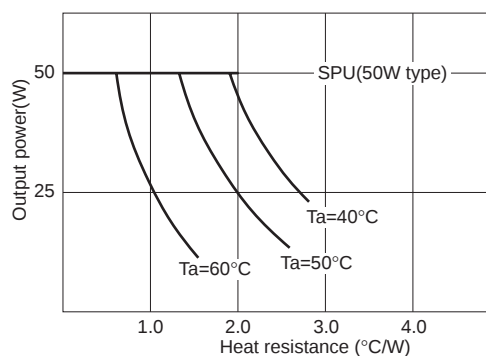
COOLING

It is required to perform forcible air cooling by attaching a heat sink and using a fan in order to use the output power up to the maximum. The selection method of the heat sink and fan cooling conditions are described below.

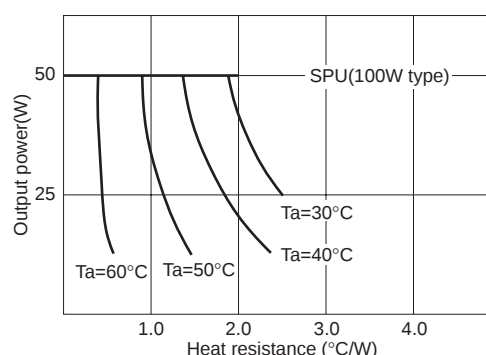
1) Evaluate a heat resistance of the heat sink to an operating temperature on the basis of the required output power.

Relationship between output power and heat sink to be attached

SPU(50W TYPE)



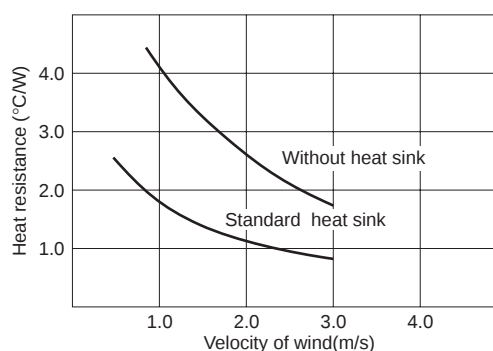
SPU(100W TYPE)



2) After the forcible air cooling of the heat sink with a fan, the size of the heat sink is decreased.

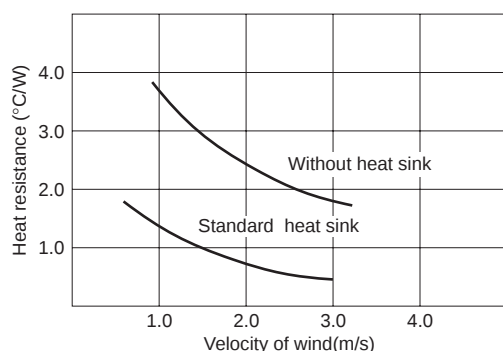
Relationship between heat resistance of heat sink and air speed of fan

SPU(50W TYPE)



Characteristics, Functions, and Applications

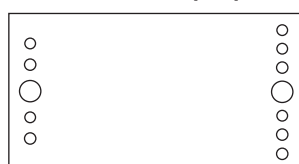
SPU(100W TYPE)



- 3) Select a usable heat sink out of the TDK standard products or products on catalogs of manufacturers which put them on the market.

MOUNTING METHOD

• Recommended pin pattern



Terminal portion(O)
Hole dia.: $\phi 1.5$ Round dia.: $\phi 3.0$
FG connection tap portion(O)
Hole dia.: $\phi 4.5$ Round dia.: $\phi 9.5$
Unit: mm

Refer to SHAPES AND DIMENSIONS for information about dimensions between the terminals.

• Fixing method

In fixing to the PC board, use mounting taps at two places in the side of the lower surface (terminal side). Use M4 screws for fixing and pay attention not to insert the screws 6mm or deeper from the surface of the body (Recommended clamping torque: $1.08\text{N} \cdot \text{m}$).

In fixing a radiator, use mounting taps at two places in the upper surface of the case (aluminum plate side). Use M3 screws for fixing and pay attention not to insert the screws 6mm or deeper from the surface of the body (Recommended clamping torque: $0.69\text{N} \cdot \text{m}$).

In addition, it is recommended to use thermal conducting grease to enhance a radiating effect between the radiator and the power supply body (aluminum surface) when mounting.

• Recommended soldering conditions

Dip: $230 \pm 5^\circ\text{C}$, 5s

• Recommended cleaning conditions

Solvent: IPA

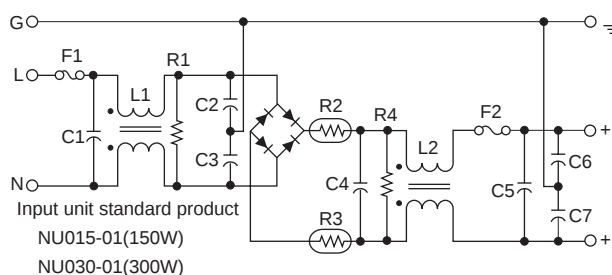
Method: Brush cleaning

Note) An electrolytic capacitor is used. Avoid cleaning such as would compel the entire power supply to be in a solvent.

POWER SUPPLY COMBINATION

• About input circuit

If AC input power supply is constituted by using the SPU product, an input circuit is required for converting an AC input to a DC input. While the input circuit may be discretely composed of a noise filter, rectifying diodes, and a smoothing capacitor commercially available, TDK has prepared a standard product, the AC input unit NU series.



• Construction precautions

The following precautions should be taken when an input circuit is added to utilize AC power input, or when multiple power supplies are used to construct a high capacity power supply.

- 1) Ground line pattern between the input circuit and the SPU power supply should be as thick and short as possible and the ground of the cabinet should be used if possible.
- 2) When multiple SPU power supplies are combined to construct a power supply, a 1000 to 4700pF capacitor (this capacitor should be able to withstand the input to ground voltage) should be placed between the + line and the ground and between the - line and the ground.
- 3) When multiple SPU power supplies are combined to form a large power supply, as much as possible, identical heat sinks should be used for each SPU power supply unit.
- 4) When the wiring pattern between the input circuit and the SPU power supply is long, a $0.1\mu\text{F}$ min. capacitor should be installed between the + and - lines. This capacitor should be located as close as possible to the SPU power supply.
- 5) Noise emission from the SPU power supply to the input power lines is insufficiently reduced. If such noise is a problem, noise should be reduced at the AC input circuit, or a filter should be added before the DC input terminals.

• Heat sink

The heat sink is sold separately. An order should be placed for the following products.

Type	Part No.
50W	3JR0AB179
100W	3JR0AB163

OTHERS

1. Unless conditions are otherwise specified in the specifications or standards, 25°C and rated input-output should be applied.
2. Ripple and noise (50MHz max.) are determined for 0 to $+50^\circ\text{C}$ temperature range and 10 to 100% load.

Separately-sold Option List

Product name	Part No.	Applicable device	Shapes and dimensions (mm)
Heat sink	3JR0AB179	SPU50W	Material: Aluminum * Use cooling grease at mounting.
	3JR0AB163	SPU100W	Material: Aluminum * Use cooling grease at mounting.

Please specify the part No. for ordering.