

Power Supplies

DC Input

Single Output, General-Purpose

SPB Series

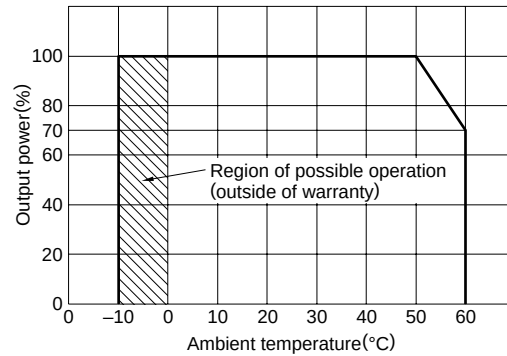
FEATURES

- Wide input voltage range. Can be used for 24V, 48V without switching.
- Floating inputs and outputs.
- Plastic package, on board and extremely light weight(5W model: 30g max.).

PART NUMBERS AND RATINGS

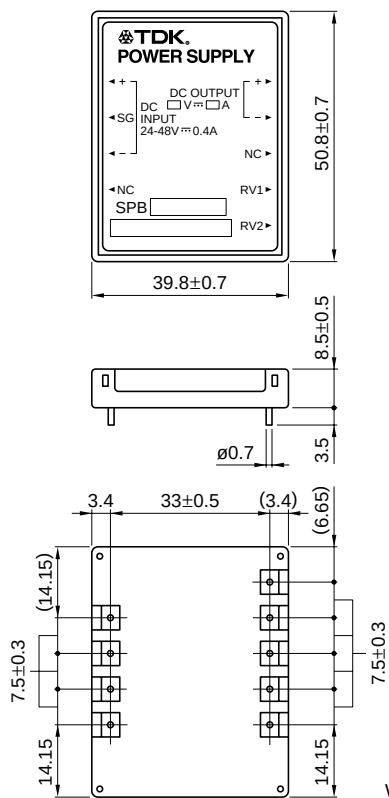
Output voltage(V)	5W type		10W type	
	Current(A)	Part No.	Current(A)	Part No.
5	1	SPB05-1R0	2	SPB05-2R0
12	0.4	SPB12-R40	0.8	SPB12-R80
15	0.35	SPB15-R35	0.65	SPB15-R65
24	0.2	SPB24-R20	0.4	SPB24-R40

DERATINGS

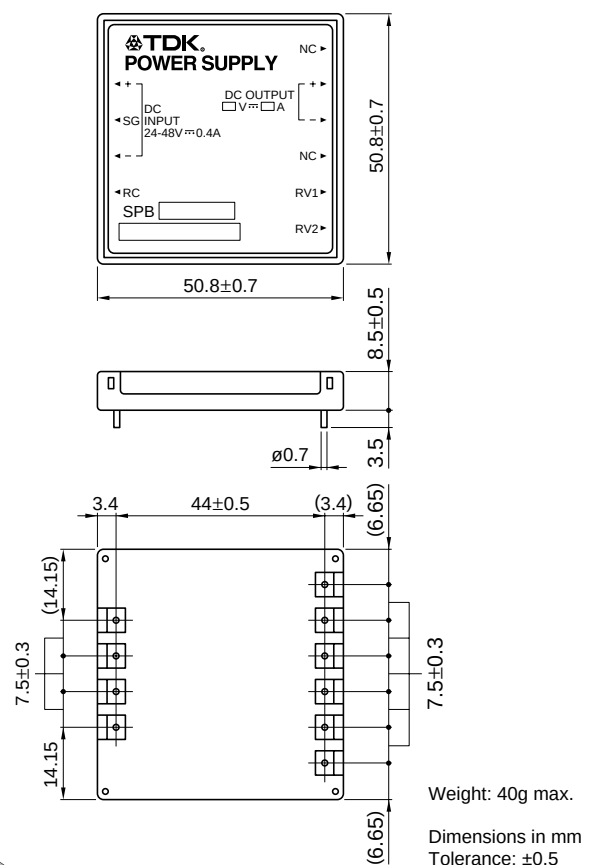


SHAPES AND DIMENSIONS

5W TYPE



10W TYPE



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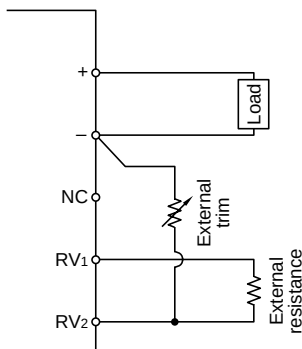
SPECIFICATIONS

5W TYPE

Part No.		SPB05-1R0		SPB12-R40		SPB15-R35		SPB24-R20		
Output voltage, current *1		5V • 1A		12V • 0.4A		15V • 0.35A		24V • 0.2A		
Maximum output power		W	5	4.8		5.25		4.8		
Input requirements										
Input voltage E _{dc}		V	20 to 56[Rating: 24-48]							
Input current		A	0.4max./0.2max.[24/48V input, at maximum output power](Without internal fuse)							
Efficiency		%	[24V]	75typ.	77typ.	77typ.	77typ.	77typ.	77typ.	
			[48V]	73typ.	72typ.	72typ.	71typ.	71typ.		
Output characteristics										
Output voltage		V	5	12		15		24		
Output voltage setting deviation		%	±5max.[Without external resistance and external trim]							
Voltage variable range *2		%	±10typ.[Without external resistance and external trim]							
Maximum output current*1		A	1	0.4		0.35		0.2		
Overvoltage threshold		V	5 to 6.9		13.2 to 15.7		16.5 to 19		26.4 to 31.5	
Overcurrent threshold		A	1.2 to 2		0.48 to 0.8		0.42 to 0.7		0.24 to 0.4	
Voltage stability	Input variation	%	2max.(1typ.)[20 to 30V, 40 to 56V input]				Total variation 5max.(2.5typ.)			
	Load variation	%	2max.(1typ.)[10 to 100% load]							
	Temperature variation	%	2max.(1typ.)[0 to +50°C]							
	Drift	%	0.5max.(0.1typ.)[25°C, input and output ratings, after input voltage ON for 30min to 8h]							
	Dynamic load	%/ms	±4max./1max.[50 to 100% sudden load change]							
Ripple E _{p-p}		mV	100max.		200max.		200max.		300max.	
Noise E _{p-p}		mV	200max.		300max.		300max.		400max.	
Accessory equipment										
Overvoltage protection			Voltage shielding type, recovers upon reset.							
Overcurrent protection			Fixed current threshold type, automatic recovery.							
Remote ON-OFF			None							
Remote sensing			None							
Construction										
External dimensions H×W×L		mm	8.5×50.8×39.8							
Weight		g	30max.							
Mounting method			On board type							
Case material			Nonflammable resin(UL Grade 94V-0)							

*1 Current rating(maximum output current) is determined for 0 to +50°C. Derating is required when used outside this temperature range.

*2 Determination of output voltage



Recommended external resistance values(1/4W)

Output voltage rating	5V	12V	15V	24V
External trim	10kΩ	10kΩ	10kΩ	10kΩ
External resistance	390Ω	8.2kΩ	12kΩ	27kΩ

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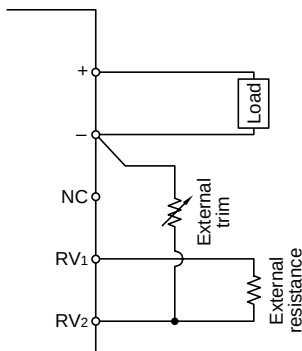
SPECIFICATIONS

10W TYPE

Part No.			SPB05-2R0	SPB12-R80	SPB15-R65	SPB24-R40
Output voltage, current *1			5V • 2A	12V • 0.8A	15V • 0.65A	24V • 0.4A
Maximum output power	W		10	9.6	9.75	9.6
Input requirements						
Input voltage E _{dc}	V		20 to 56[Rating: 24-48]			
Input current	A		0.7max./0.4max.[24/48V input, at maximum output power](Without internal fuse)			
Efficiency	%	[24V]	81typ.	82typ.	80typ.	80typ.
		[48V]	80typ.	80typ.	76typ.	76typ.
Output characteristics						
Output voltage	V		5	12	15	24
Output voltage setting deviation	%		±5max.[Without external resistance and external trim]			
Voltage variable range *2	%		±10typ.[Without external resistance and external trim]			
Maximum output current*1	A		2	0.8	0.65	0.4
Overvoltage threshold	V		5 to 6.9	13.2 to 15.7	16.5 to 19	26.4 to 31.5
Overcurrent threshold	A		2.4 to 4	1 to 1.6	0.8 to 1.3	0.5 to 0.8
Voltage stability	Input variation	%	2max.(1typ.)[20 to 30V, 40 to 56V input]			
	Load variation	%	2max.(1typ.)[10 to 100% load]			
	Temperature variation	%	2max.(1typ.)[0 to +50°C]			
	Drift	%	0.5max.(0.1typ.)[25°C, input and output ratings, after input voltage ON for 30min to 8h]			
	Dynamic load	%/ms	±4max./1max.[50 to 100% sudden load change]			
Ripple E _{p-p}	mV		200max.	200max.	200max.	300max.
Noise E _{p-p}	mV		250max.	300max.	300max.	400max.
Accessory equipment						
Overvoltage protection			Voltage shielding type, recovers upon reset.			
Overcurrent protection			Fixed current threshold type, automatic recovery.			
Remote ON-OFF			Yes			
Remote sensing			None			
Construction						
External dimensions H×W×L	mm		8.5×50.8×50.8			
Weight	g		40max.			
Mounting method			On board type			
Case material			Nonflammable resin(UL Grade 94V-0)			

*1 Current rating(maximum output current) is determined for 0 to +50°C. Derating is required when used outside this temperature range.

*2 Determination of output voltage.



Recommended external resistance values(1/4W)

Output voltage rating	5V	12V	15V	24V
External trim	5kΩ	10kΩ	10kΩ	10kΩ
External resistance	270Ω	8.2kΩ	12kΩ	33kΩ

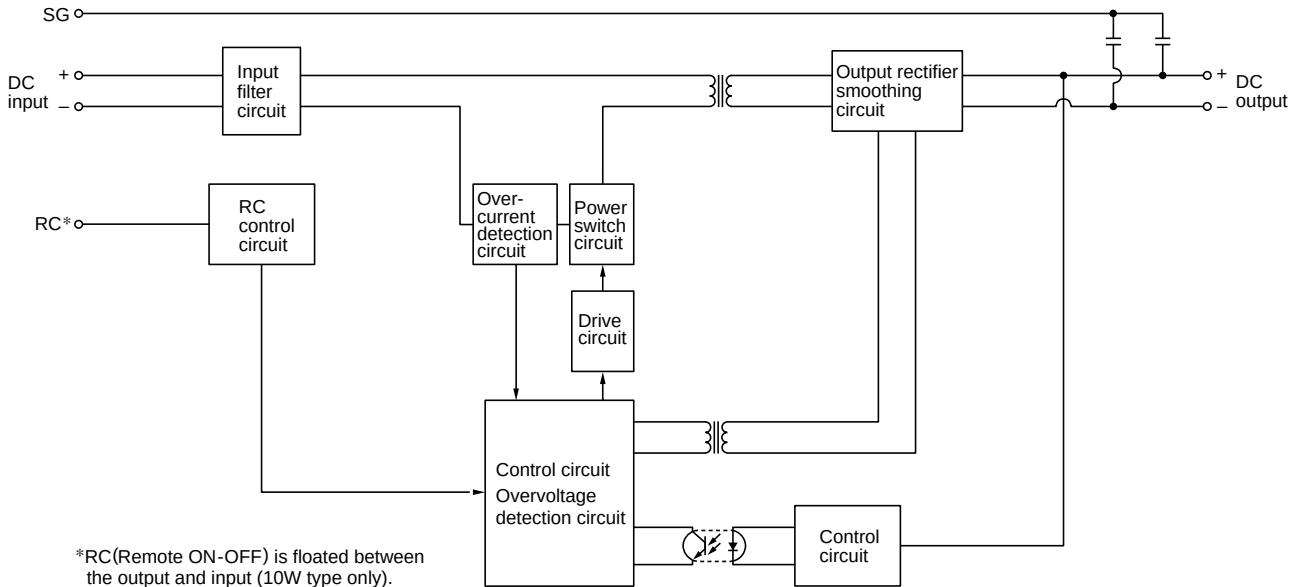
Power Supplies

SPB Series

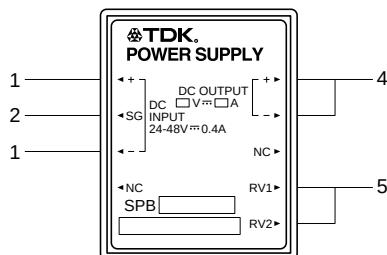
DC Input

Single Output, General-Purpose

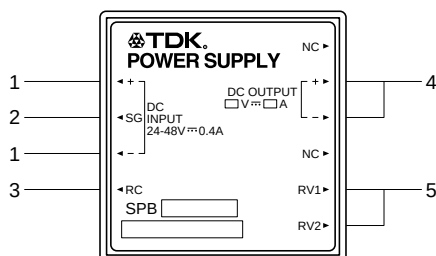
BLOCK DIAGRAM



5W TYPE



10W TYPE



Terminal No.1: DC input terminals (INPUT DC)

Connect to DC input lines.

Terminal No.2: Signal ground (SG)

This should be connected to either the DC input (+) terminal or the DC input (-) terminal. This terminal is connected to the metallic portion of the top surface of the case.

Terminal No.3: Remote ON-OFF terminal (RC)(Only 10W type)

The output voltage is turned ON-OFF by the TTL level control voltage applied between the RC terminal and the (-) input terminal. Output is ON when this control voltage level (H) is within the 2.4V to V_{in} range, or control is open.

Output is OFF when this control voltage level (L) is within the 0 to 0.4V range, or control is shorted.

Since the RC terminal is pulled up internally, the RC terminal should be left open when not used.

Terminal No.4:DC output terminals (+, -)

Connect to load.

Terminal No.5: Output voltage external adjustment terminals (+S, -S)

The output voltage can be adjusted $\pm 10\%$ of the rated voltage by placing a resistance between the RV1 and RV2 terminals or between the RV2 and output (-) terminals.

Power Supplies

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DC Input

Single Output, General-Purpose

COMMON SPECIFICATIONS

Temperature range	Operating	0 to +60°C[With derating over 50°C]
	Storage	-25 to +75°C
Humidity range	Operating	20 to 95(%)RH[Maximum wet-bulb temperature:35°C, without dewing]
	Storage	
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 Edc	Input terminal to output terminal	500V, 1min[Normal temperature, normal humidity, cutout current 5mA]
Insulation resistance	Input terminal to output terminal	100MΩ min. DC.500V[Normal temperature, normal humidity]
	Output terminal to frame ground	

• OUTPUT VOLTAGE CONTROL

Although these DC to DC converters can be used without an external resistance, the output voltage can be adjusted $\pm 10\%$ of the rated voltage by placing a resistance between the RV₁ and RV₂ terminals or between the RV₂ and output (-) terminals.

• REMOTE ON-OFF (10W TYPE)

The output voltage is turned ON-OFF by the TTL level control voltage applied between the RC terminal and the (-) input terminal. Output is ON when this control voltage level (H) is within the 2.4V to Vin range, or control is open.

Output is OFF when this control voltage level (L) is within the 0 to 0.4V range, or control is shorted.

Since the RC terminal is internally pulled up, the RC terminal should be left open when not used.

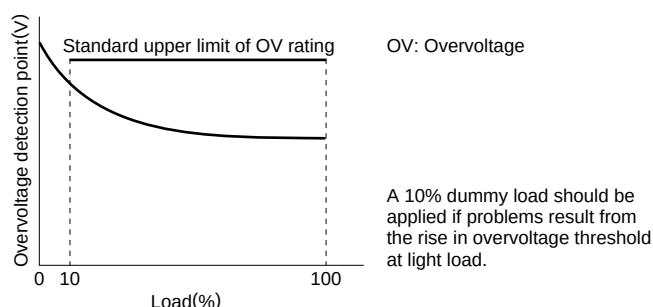
• OVERCURRENT PROTECTION CIRCUIT

An overcurrent protection circuit is provided to protect the power supply circuitry from problems resulting from load short circuiting, etc. This operates by lowering output voltage when the load current rises due to a short circuit. Output voltage returns to the original voltage after the cause of the load current rise is removed.

• OVERVOLTAGE PROTECTION CIRCUIT

This stops the power supply output when the power supply voltage increases above the overvoltage detection point for any reason. This circuit can confirm whether normal voltage results from the power supply being turned ON again. In other words, operation will not begin due to an externally applied voltage.

• OVERVOLTAGE DETECTION THRESHOLD TO LOAD



• OUTPUT CAPACITOR

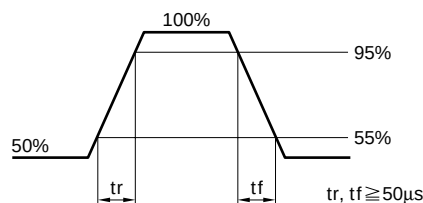
There is no particular need for connection of an external capacitor to the output. A filter or ceramic capacitor is recommended for countering noise. A capacitance value listed below should be used for an external aluminum electrolytic or tantalum capacitor. Please contact TDK before using higher capacitances than those listed in the table below.

Output voltage	5V	12V	15V	24V
SPB5W	2200μF	390μF	330μF	100μF
SPB10W	3900μF	470μF	390μF	120μF

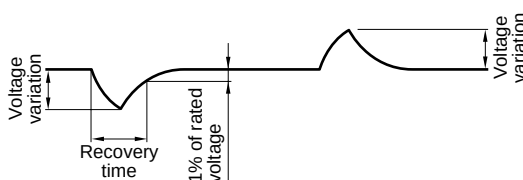
• DYNAMIC LOAD VARIATION

Rapid load variation conditions

Load current



Output voltage



• INPUT POLARITY AND SG TERMINAL

If the (-) input terminal is connected to GND, the SG terminal should be connected to the (-) input terminal. If the (+) input terminal is connected to GND, the SG terminal should be connected to the (+) input terminal. Connection between terminals should be wide, short, and low-impedance.

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• PARALLEL OPERATION

Parallel operation (connecting power supply output terminals in parallel) to increase output current is not possible. However, it is possible to operate outputs in parallel within a given converter (back amp).

• SERIES OPERATION

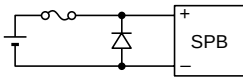
When output voltage is insufficient, series connection of power supplies is possible to obtain a certain voltage. The maximum current is the lowest output current from among the power supplies. A reverse voltage prevention diode is required. Please refer to the TDK publication "Switching Power Supply Technical Manual."

• SHORT CIRCUIT CAUSED BY LOAD

When a load short circuit takes place for several minutes, the power source is protected by operation of the protective circuit. Short circuits for long time periods can damage components. Such prolonged short circuits can markedly shorten the operating life of the power source.

• ABNORMAL OPERATION AND POLARITY REVERSAL OF INPUT VOLTAGE

No built-in circuit protects against abnormal operation of the input power supply. As shown in the diagram below, an external diode and fuse should be added when abnormal operation or reverse voltage are of concern.



A diode should be selected that has a forward current that is 2 to 3 times the fuse current rating.

Fuse current rating

5W type: 1A rating current (normal type fuse)

10W type: 1.5A rating current (normal type fuse)

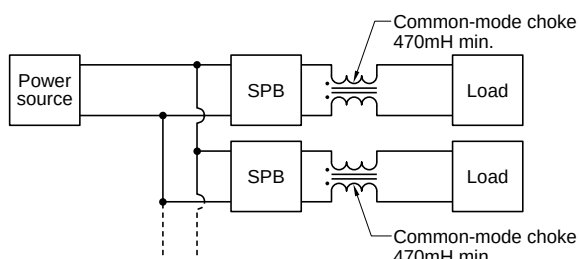
• LONG INPUT WIRING

Incorrect operation can occur due to noise when the input wiring is long (20cm min.). A 100μF capacitor should be connected between the input terminals as close to the terminals as possible.

• OPERATION OF MULTIPLE CONVERTERS

When multiple SPB series converters are connected to the same power supply, and when the load wiring is long, incorrect operation can occur due to mutual interference. Use common-mode noise countermeasures in such cases.

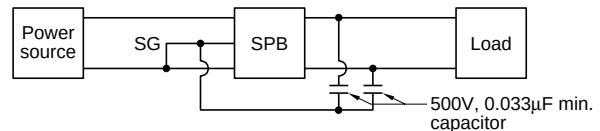
EXAMPLE NOISE COUNTERMEASURE CIRCUIT



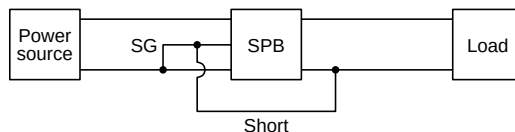
• EXTERNAL NOISE

Use countermeasures such as those shown below to counter incorrect operation resulting from external noise.

(1) Use with isolated input-output

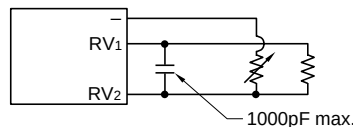


(2) Use with non-isolated input-output



• LONG WIRING TO RV TERMINAL

When an external resistance is used to vary the output voltage, incorrect operation can occur when the RV wiring is long (20cm min.). Therefore a 1000pF max. capacitor should be connected between RV₁ and RV₂ as close to the terminals as possible.

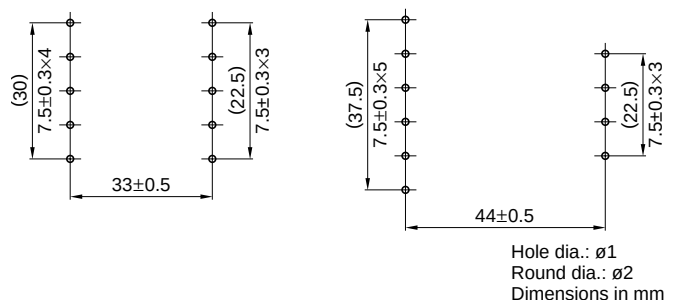


• MOUNTING

Recommended pin patterns

5W type

10W type



• RECOMMENDED SOLDERING CONDITIONS

Solder dip temperature : 230 ± 5°C, 5s

• RECOMMENDED CLEANING CONDITIONS

Solvent: IPA

Method: brush cleaning

• ADDITIONAL COMMENTS

- Specifications and standards were determined at 25°C and nominal input, unless otherwise noted.
- Ripple and noise (50MHz max.) are determined for 0 to +50 °C temperature range and 10 to 100% load.

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