

PP/PPD Series

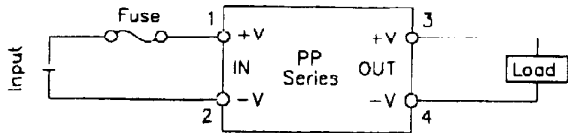
Application Notes

Application Notes	p.2-9
Block Diagram	p.9-11
Mounting Method	p.12

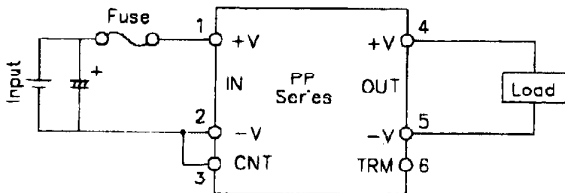
Application Notes

Basic Connection

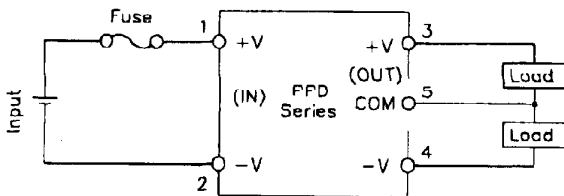
PP Series (PP1R5, PP3, PP6, P10)



PP Series (PP15, PP25)



PPD Series



1. Input Fuse

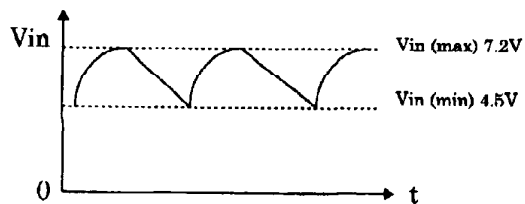
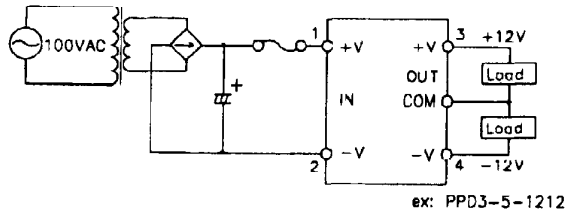
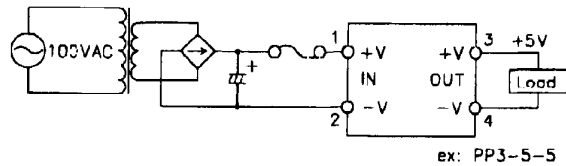
An internal input fuse is not provided in the PP • PPD series. To ensure safe operation, an external fuse (Regular or Slow Blow Type) is recommended.

Recommended Fuse Ratings

	5VDC	12VDC	24VDC	48VDC
PP/PPD1R5	2A	1A	0.5A	0.5A
PP/PPD3	3A	2A	1A	1A
PP/PPD6	-----	3A	2A	1A
PP/PPD10	-----	3A	2A	1A
PP15	-----	5A	3A	1.5A
PP25	-----	7A	4A	2A

2. Unstable Input

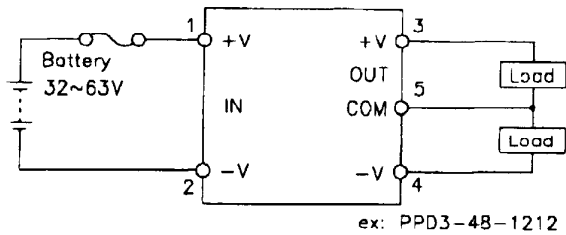
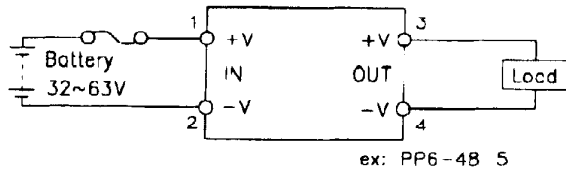
Input voltage is comprised of both the DC voltage (average rectified voltage) and the peak to peak ripple voltage. Peak to peak ripple voltage should be minimized so that the input voltage is within the standard input voltage range as follows.



3. Battery Input

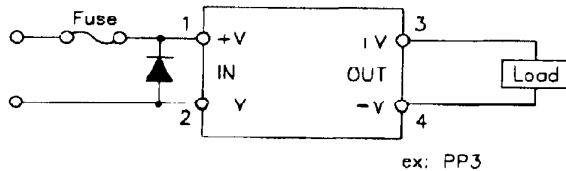
When using a battery as the input power

supply, make sure that the maximum and minimum input voltage do not sway out of the standard input voltage range.

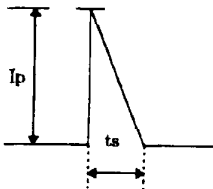


4. Input Reversal

Accidentally reversing the input connections could damage the module. Thus, if the connections may be accidentally reversed, please use a protective diode and an input fuse as shown below.



5. Input Surge Current



5V Input	V _{in}	I _p	t _s
PP/PPD1R5	7.2V	9A	15μS
PP/PPD3	7.2V	10A	20μS

12V Input	V _{in}	I _p	t _s
PP/PPD1R5	16.5V	15A	15μS
PP/PPD3	16.5V	18A	15μS
PP/PPD6	16.5V	18A	70μS
PP/PPD10	16.5V	18A	70μS

24V Input	V _{in}	I _p	t _s
PP/PPD1R5	32V	21A	10μS
PP/PPD3	32V	32A	10μS
PP/PPD6	32V	30A	50μS
PP/PPD10	32V	30A	45μS

48V Input	V _{in}	I _p	t _s
PP/PPD1R5	63V	30A	5μS
PP/PPD3	63V	38A	5μS
PP/PPD6	63V	40A	30μS
PP/PPD10	63V	40A	25μS

PP15/PP25

	V _{in}	I _p	t _s	I _p	t _s
12V	18V	26A	24μS	50A	15μS
24V	36V	70A	8μS	80A	7μS
48V	72V	110A	3μS	125A	8μS

6. Output Voltage and Noise Measurement Method

The measurement method for output voltage and ripple are based upon EIAJ RC-9002A. Upon measurement of the ripple voltage make sure that the oscilloscope probe leads are not too long. If there is influence from other machinery, a precise measurement cannot be made. Further, depending on the frequency area of the oscilloscope, there can be considerable change in the measurement.

7. Over Current Protection (OCP)

When the OCP triggers, the output voltage will fall. Upon cancellation of the overload condition, the module will automatically recover. However, if the short or overload condition continues for over 30 seconds, damage to the module could occur.

The PP/PPD1R5 · 3 have OCP characteristics of the fold back type. Therefore, if a steady or lamp load is used, the output may not rise back up. If this type of load is to be used, please use with a large capacitor connected between the input terminals.

8. Over Voltage Protection (OVP)

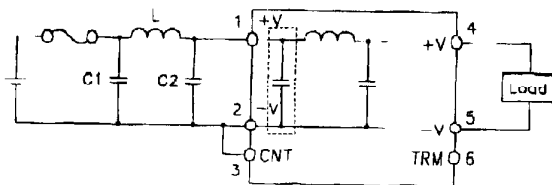
There is a built in OVP circuit in the PP15 and PP25 modules. When the OVP triggers, the output will be shut down. The input must be taken out (for at least five seconds), and then re-inputted manually. Otherwise, the module will not output.

The PP/PPD1R5, PP/PPD3, PP/PPD6, PP/PPD10 series do not have a OVP protection circuit built in.

9. Input Filter

(1). Input Ripple and Noise

When trying to reduce input ripple and noise (long input leads to terminal, etc.), please make use of C1, C2, and L as follows.



*PP15 and PP25 do not have the built in capacitor in the dotted line part above.

A. To Reduce Spike Noise $C2 = 1\sim 10\mu F$

For an LC Filter $C1, C2 = 1\sim 10\mu F$
 $L = \sim 10\mu H$

B. To Reduce Ripple (switching element) and Spike Noise $C2 = 10\sim 330\mu F$

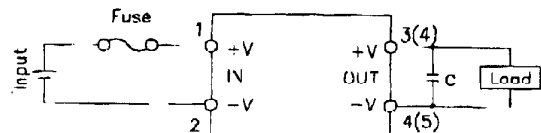
For an LC Filter $C1, C2 = 1\sim 330\mu F$
 $L = \sim 10\mu H$

C. When Input Lines are Long $C1, C2 = 1\sim 330\mu F$
 $L = \sim 10\mu H$

(2) Output Ripple and Noise

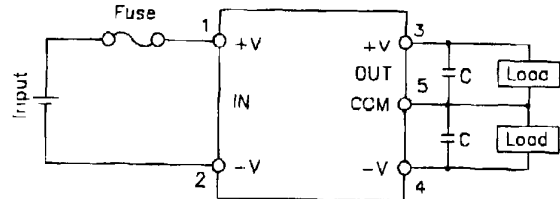
To reduce output ripple and noise, please place a capacitor on the output side as follows.

PP Series



(): PP15, PP25 Series

PPD Series

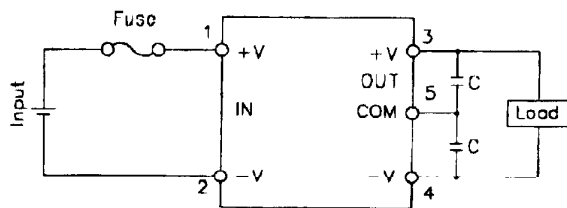


A. To Reduce Spike Noise $C = 1\sim 10\mu F$
 (Film, Ceramic Capacitor)

B. To Reduce Ripple $C = 10\sim 100\mu F$

(switching element)

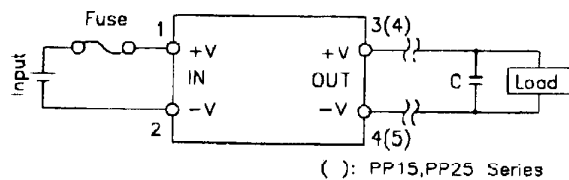
Note: To reduce ripple and spike noise, please use both a 1 μ F and a 100 μ F capacitor. Further, it is recommended that a film or ceramic capacitor with good frequency characteristics be used.



To reduce noise, the output capacitor C should be attached to each output for best results.

(3) Long Output Leads

In the case the output leads are long generating noise, please attach a capacitor to the load terminals.

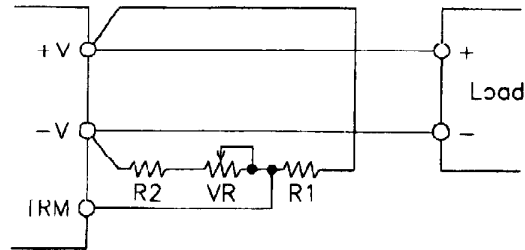


10. Output Voltage Variation (TRM)

This function is only on the PP15 and PP25 series. Using the external potentiometer, the output voltage can be varied within $\pm 5\%$ of the standard output voltage. If the output voltage is raised too far up, the OVP will trigger.

	5V	12V	15V
R1	1K	3.9K	5.6K
R2	680	680	750
VR	1K	1K	1K

External Resistors : Resistance tolerance $\pm 5\%$
 Variable Resistor (VR): Total resistance tolerance $\pm 20\%$
 Remaining Resistance: Value less than 1%



11. ON/OFF Control (CNT)

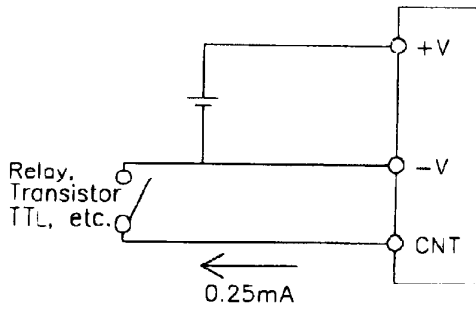
This function is only on the PP15 and PP25 series. Without turning the input on and off, the output can be enabled and disabled using this function. This function is useful for sequence control when building multiple output power supplies. This control circuit is on the input side using the CNT terminal pin. CNT's ground is the input -V terminal. When not using this function, short CNT to input -V terminal.

A. TTL compatible. However, the maximum voltage applied to the CNT terminal is 7V, and the maximum reverse voltage is 0.7V. The sink current at CNT is 0.25mA.

B. ON/OFF control can also be exercised by opening or closing the contacts of a switch or relay, or by operating a transistor as a switch in series with the CNT terminal.

(Shorting -V to CNT will produce an output. Opening that short will cut the output.)

C. Standard remote, ON/OFF control circuit is provided in the primary circuit. For secondary control, isolation can be achieved through use of a optocoupler or relay.

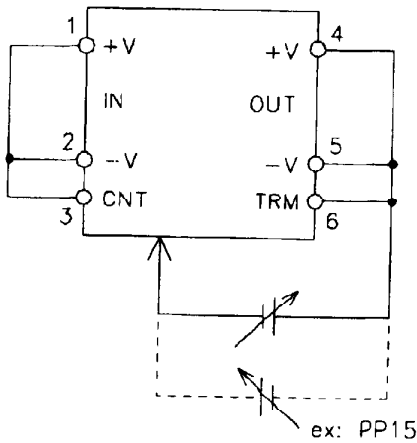


CNT Level for INPUT -V	OUTPUT
H (more than 2.0V) or Open	OFF
L (less than 0.8V) or Short	ON

12. Isolation Resistance/Withstand Voltage

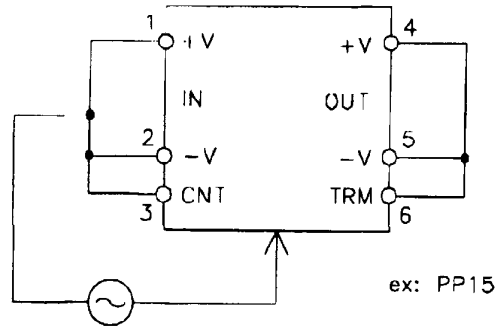
Please do not test with a voltage above the standard voltage for the Isolation Resistance Test. For the Withstand Voltage Test, the applied voltage must be increased gradually from zero to the testing value, and then decreased gradually at shut down. Especially stay away from use of a timer, where a pulse of several times the applied voltage can be generated.

Isolation Resistance Test (output~chassis)



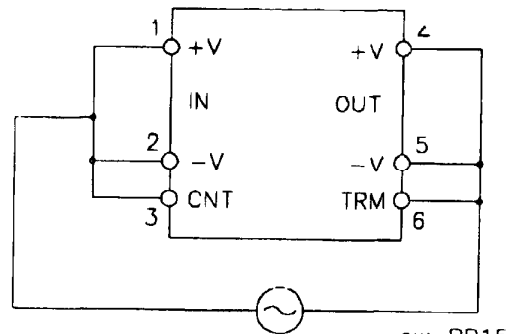
500VDC, more than 100M Ω

Withstand Voltage Test (input~chassis)



500VAC, one minute, 5mA

(input~output)



500VAC, one minute, 5mA

13. Solder and Cleaning

(1) Solder Temperature

Soldering to a PCB should be done with the following conditions.

- A. Solder Dip 260°C 10sec. or less
 Preheat Conditions 110°C 30~40sec.
- B. Soldering Iron 350°C 3sec. or more

(2) Cleaning Method

The recommended cleaning conditions after soldering are as follows.

- A. Cleaning Solution IPA
- B. Cleaning Method

Do not allow the cleaning solution to soak inside the module (Brush Cleaning).
 If cleaning solution does soak inside, the reliability of the module may worsen.
 *When cleaning with condition other than the above, please consult us.

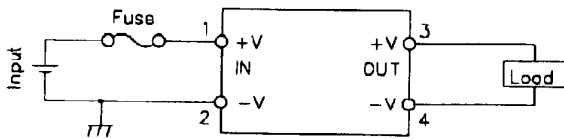
14. External Voltage Applied to Output Terminals

If a voltage of greater than the output voltage is applied externally to the output terminals, the power supply could be damaged.

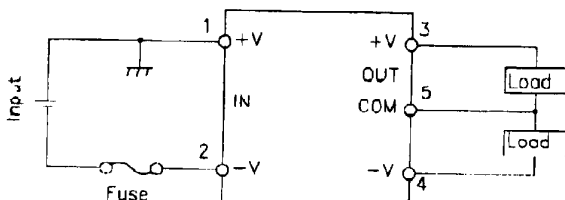
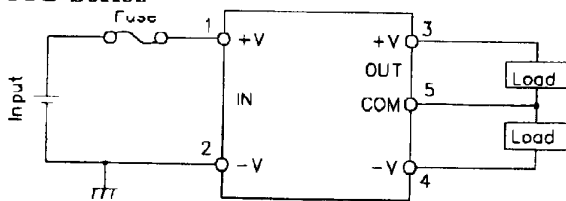
15. Examples of Use

15.1 Floating Output

PP Series

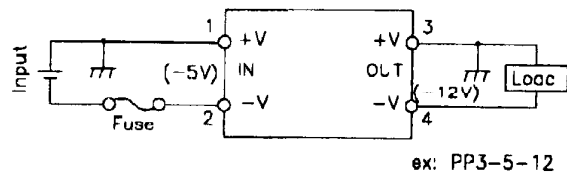
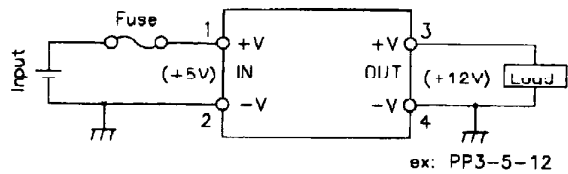


PPD Series

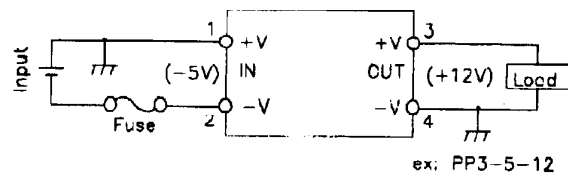
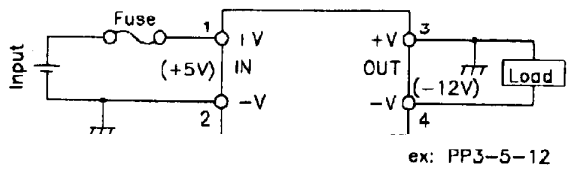


15.2 Common Line Between Input and Output

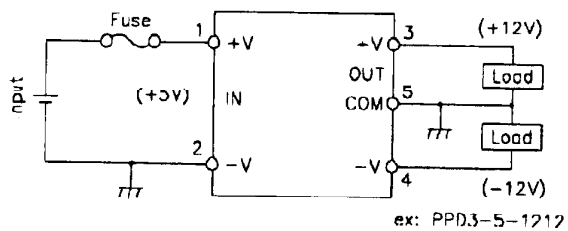
Same Polarity Output

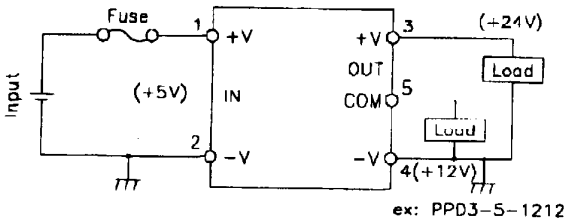
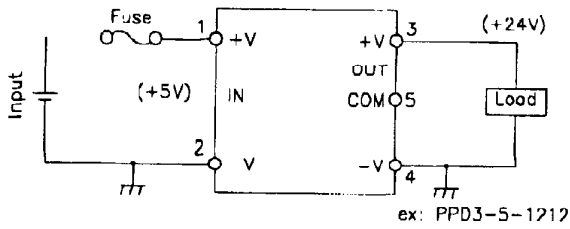


Opposite Polarity Output

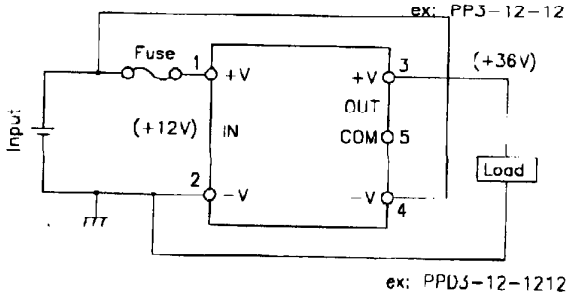
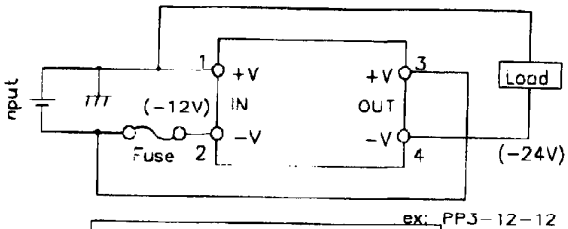
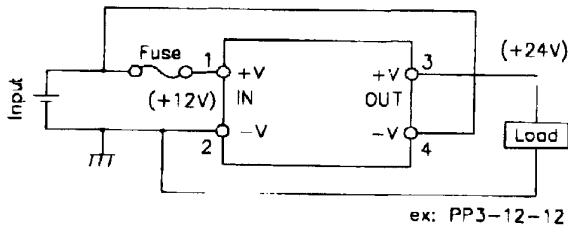


15.3 Combining +V and -V Output



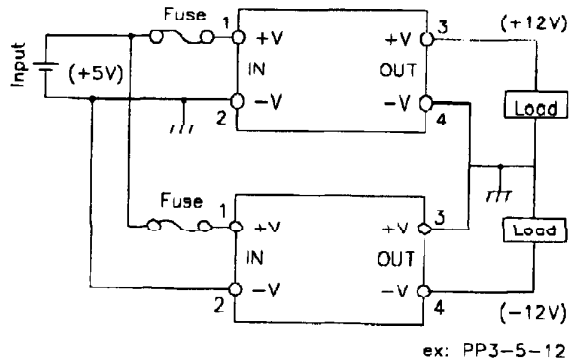
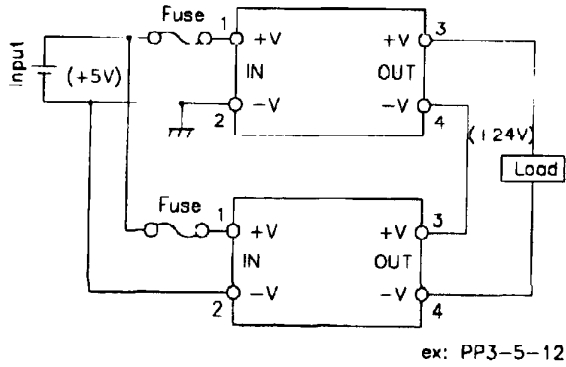


15.4 Output Voltage in Series with Input Voltage

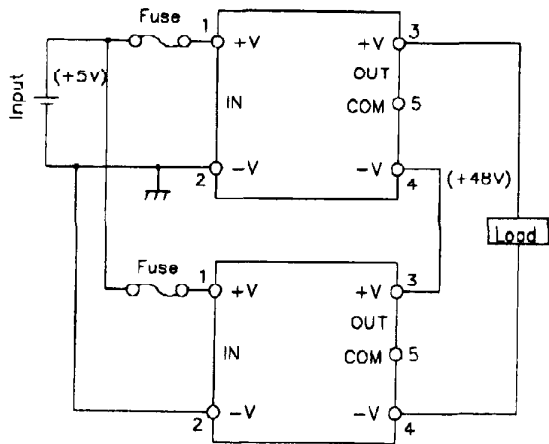


The output voltage regulation is equal to the input voltage regulation plus the converter's output regulation.

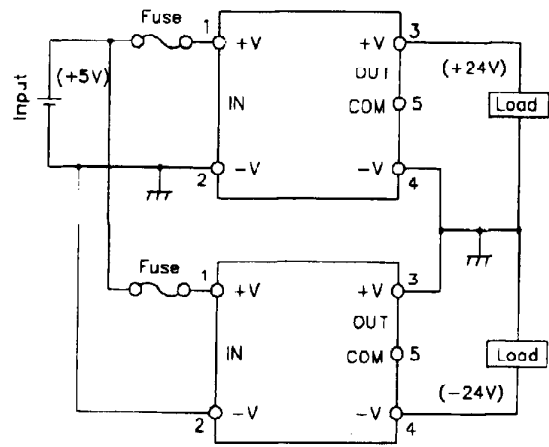
15.5 Construction with Multiple Converters



Note: Make sure that the output current does not exceed the module's maximum output current.



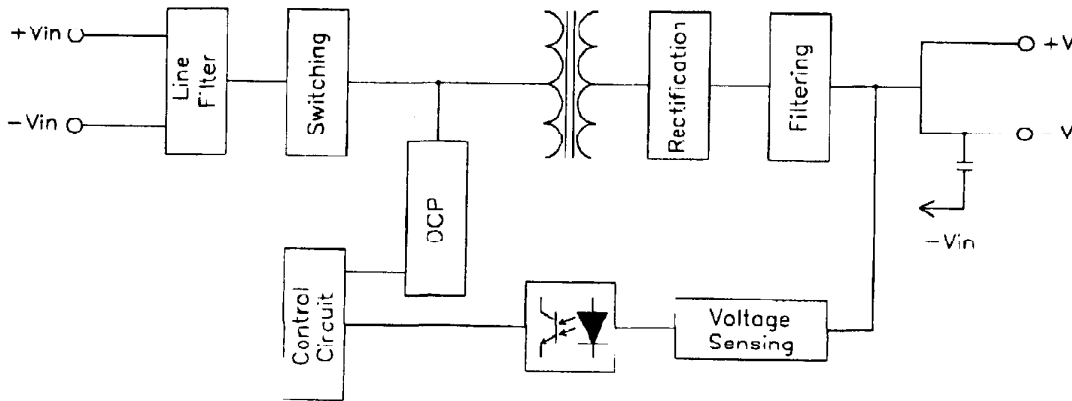
ex: PPD3-5-1212



ex: PPD3-5-1212

Block Diagrams

PP1R5 · PP3 · PP6 · PP10



PP1R5 · PP3

Circuit Topology: Flyback (ON/OFF method)

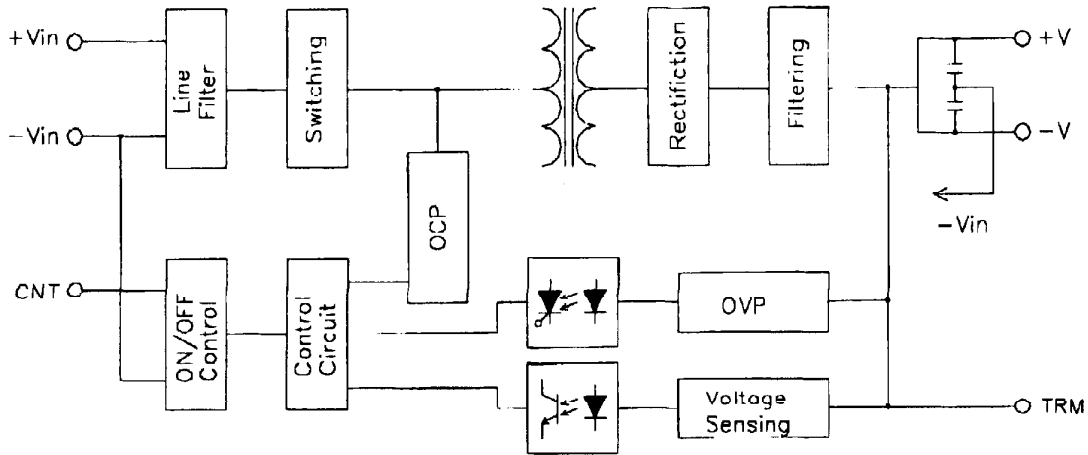
Switching Frequency: 330Khz (fixed)

PP6 · PP10

Circuit Topology: Single Ended Forward (ON/ON method)

Switching Frequency: 300Khz (fixed)

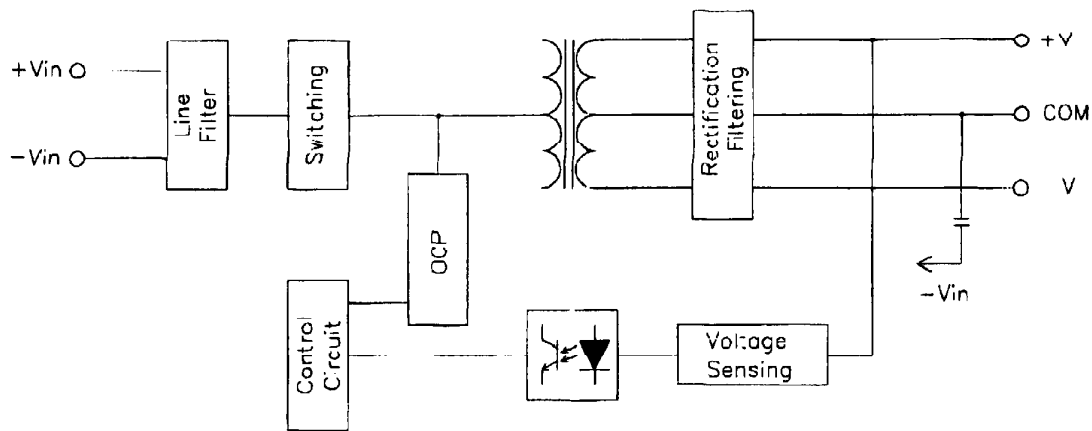
PP15 · PP25



Circuit Topology: Single Ended Forward (ON/ON method)

Switching Frequency: 400Khz (fixed)

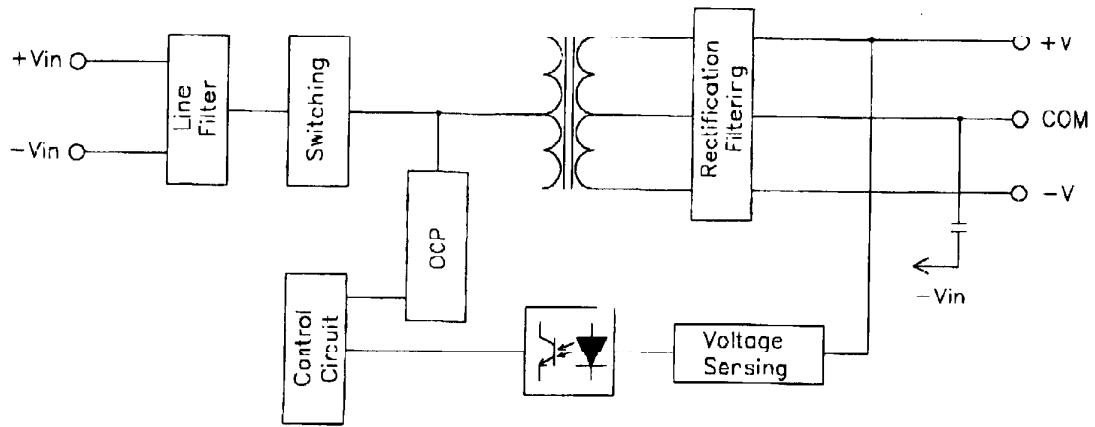
PPD1R5 · PPD3



Circuit Topology: Flyback (ON/OFF method)

Switching Frequency: 330Khz (fixed)

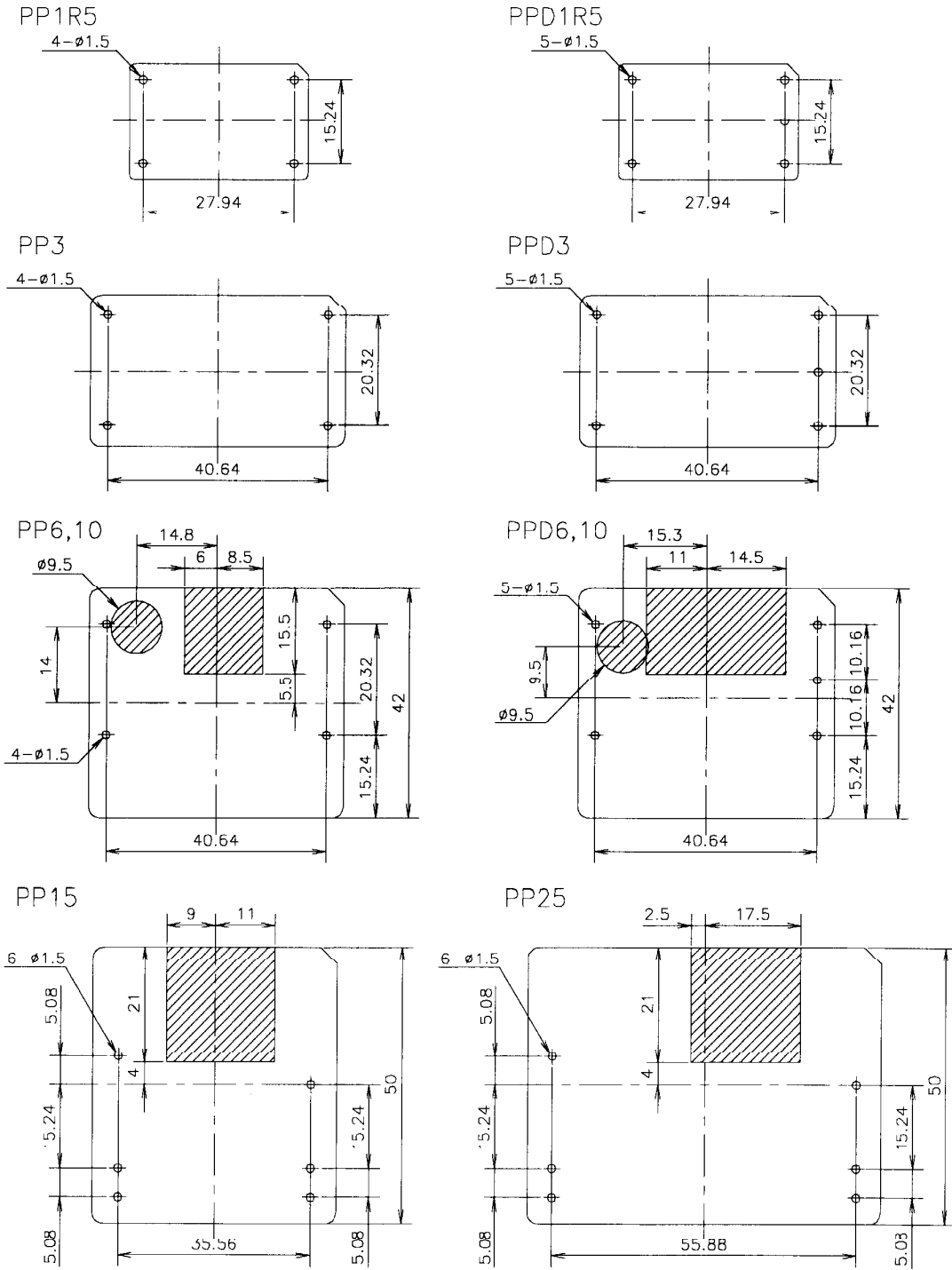
PPD6 • PPD10



Circuit Topology: Single Ended Forward (ON/ON method)
Switching Frequency: 300Khz (fixed)

Mounting Method

Positions for mounting holes on PCB shall be referred to the following dimensions. (TOP VIEW)



 Transformer is mounted, keep the pattern design off the area.