

High efficiency, ultra small size output adjustable high voltage power supply
 High efficiency/I type resonance PWM method 5W high voltage DC-DC converter

Bellnix®

0V-500V, 1000V, 2000V PHV Series

The PHV series was built using Bellnix's original new technology, the I type resonance circuit and PWM method. As a result, high efficiency was attained with the compact size of 1/6 to 1/7 of the normal 5W project. Furthermore, the PHV series has; a low ripple noise (60mVp-p), stabilization of 0.01%, and high accuracy characteristics.

This is a high voltage DC-DC converter of output adjustable type adopting the 5 side metallic shield case.

■ Features

- High efficiency of 72%
- High reliability
- Max output capacity 5W
- Low cost/long life
- 5 sided metallic shield case
- ON/OFF control (optional)
- Adjustable voltage with external voltage
- Low ripple noise
- PCB mounting type
- MTBF anticipated value 380, 00
- Over current protection
- Ultra small size device



■ Model name/Rating

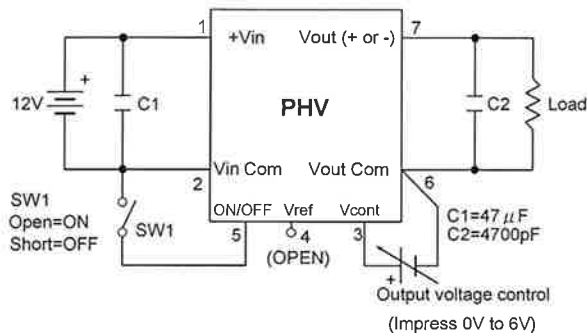
Model name PHV Series	Input voltage (Vdc)	Output voltage (Vdc)	Output voltage range (Vdc)(Note1)	Output current (mA)	Output cap. (W)	Input current (mA) typ	Ripple noise(mVp-p) typ	Case
PHV12-0.5K10000P	10.8 to 16.5	+500	0 to +500	0 to 10	5.0	580	100	PH-20
PHV12-0.5K10000N	10.8 to 16.5	-500	0 to -500	0 to 10	5.0	580	100	PH-20
PHV12-1.0K5000P	10.8 to 16.5	+1000	0 to +1000	0 to 5	5.0	580	100	PH-20
PHV12-1.0K5000N	10.8 to 16.5	-1000	0 to -1000	0 to 5	5.0	580	100	PH-20
PHV12-2.0K2500P	10.8 to 16.5	+2000	0 to +2000	0 to 2.5	5.0	580	160	PH-20
PHV12-2.0K2500N	10.8 to 16.5	-2000	0 to -2000	0 to 2.5	5.0	580	160	PH-20

■ Specifications

Input regulation	0.01% typ.(Input voltage regulation +12V ± 1V)
Load regulation	0.01% typ.(Load current regulation 0% to 100%)
Temp regulation	±0.01%/°C typ.(Temp regulation -10°C to +50°C)
Over current protection	Drooping type characteristic, built-in auto restart circuit operates at 105% or more
Output voltage setting accuracy	Below ±5%(Rated output, Rated load, Vcont=6V)
Output voltage control	External voltage 0V to +6V or an external adjustable resistor 5KΩ
ON/OFF control (Note2)	Available (Between 2pin-5pin, when open=ON, when short=OFF)
Usage temperature range	-10°C to +50°C(Dearting required for temp. 40°C or higher)
Storage temperature range	-20°C to +85°C
Usage humidity range	20% to 95%RH(Non condensing)
Isolation between input/output	Non isolated type (The 2pin-6pin and case are internally connected)

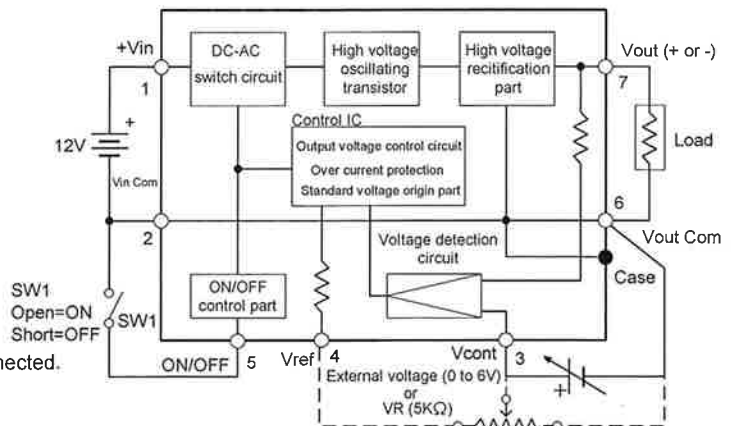
Note1: The output voltage will be controlled by impressing the Vcont voltage. Using an adjustable resistor or an external voltage, voltage should be impressed on the Vcont pin in order to control the output voltage. When Vcont voltage=0V the output voltage (residual output voltage) should be less than 2.0% of the max output voltage.
 Note2: The ON/OFF control is optional. When ordering, add a suffix "R" to the end of the product. Ex) PHV12-0.5K10000PR. (R=Remote control)

■ Test circuit



Warning 1: The input-output ground line and case are internally connected.
 Warning 2: The ON/OFF can be controlled with a transistor.
 (Refer to the ON/OFF control section)

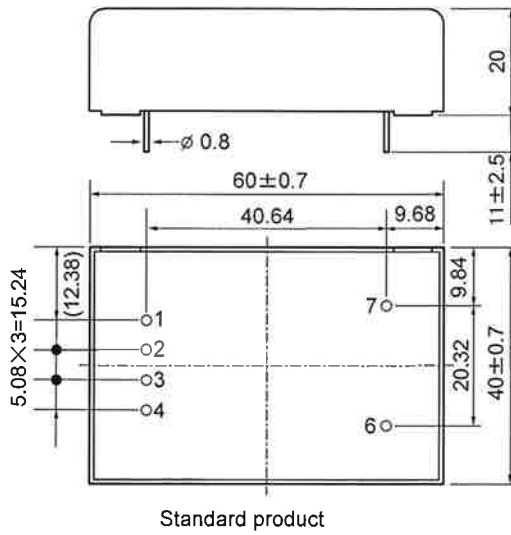
■ Block diagram



■ Model/Dimensions/Pin configuration (PH-20 case)

(Unit : mm) Tolerance unless otherwise specified : ± 0.5

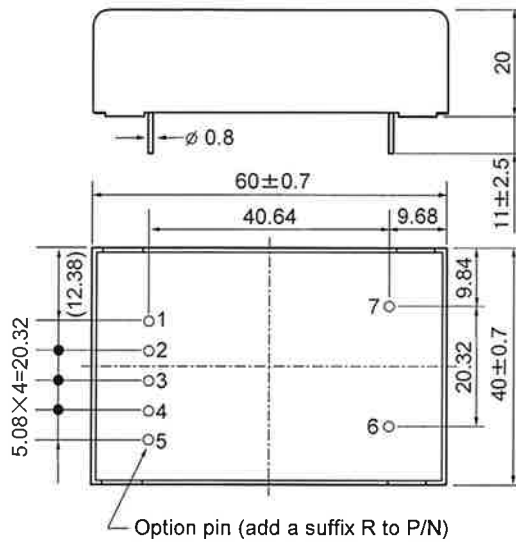
Dimensions for a standard product



Pin	Function
1	+Vin
2	Vin Com
3	Vcont
4	Vref
5	Vout Com
6	Vout (+ or -)

ON/OFF is optional.

Dimensions with the optional ON/OFF feature

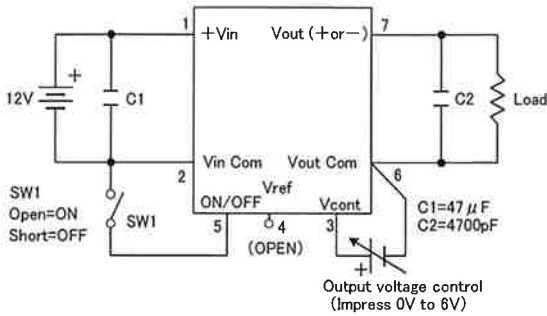


Pin	Function
1	+Vin
2	Vin Com
3	Vcont
4	Vref
5	ON/OFF
6	Vout Com
7	Vout (+ or -)

ON/OFF is optional.

Standard usage information

PHV series (500V, 1KV, 2KV)



The PHV series does not require any external parts, however when the input impedance is high, for example: the distance between the power supply and converter is long, the input line is thin, or the input side has a filter then connecting a capacitor C1 to the input side is recommended. Place the capacitor as close as possible near to the converter pin side, to lower the lead inductance.

ON/OFF control (optional)

By opening and closing between the ON/OFF pin and -Vin Com pin the output voltage can be externally turned on and off.

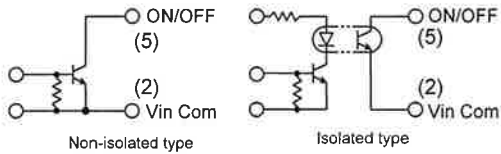
Between the ON/OFF pin (5) and -Vin pin (2)

①Open will turn the output ON

②Short(0 to 1.0V, 1mA max) will turn the output OFF

The ON/OFF pin is internally pulled up to the 5V, so be careful of the voltage from the switching element of the ON/OFF pin (photo couplers, transistors, etc)

Keep open when not using the ON/OFF control.

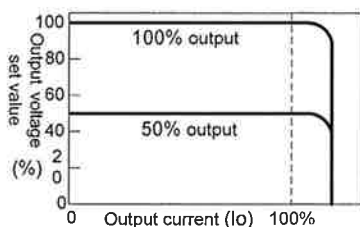


The chattering to the ON/OFF pin will affect the output voltage, so choose one without any chattering. When the output is turned off by ON/OFF control, the residual output voltage should be within 0.5%. (at Input/Output rating)

Over current protection

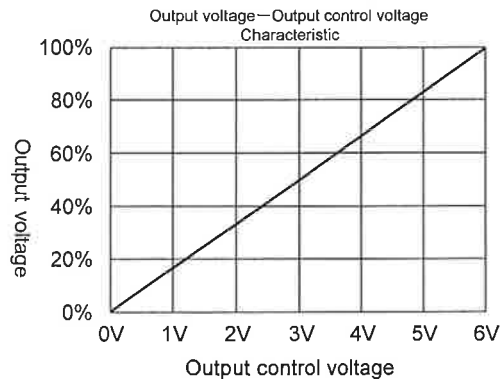
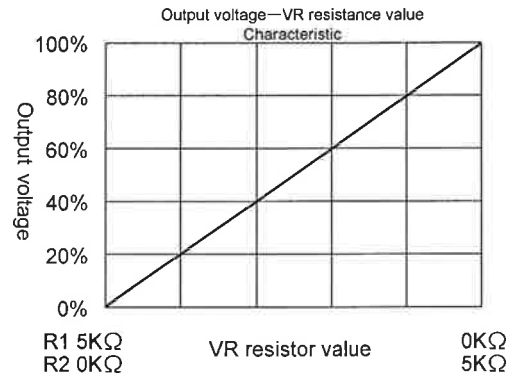
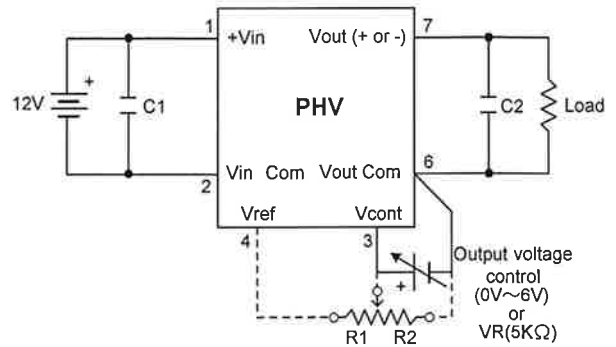
The PHV series installed the over current protection to protect from the over load and load short. When the product status is in over load or load short mode, the output voltage will be decreased, and once the problem has been removed, the voltage will automatically recover.

The PHV series Over current protection characteristic



Setting/Adjusting the output voltage

The PHV series output voltage can be set or adjusted using an external voltage or external adjustable resistor.



- The above characteristics (Output voltage -VR resistor value characteristic) graph is an indication of the resistance value R1 and R2. Please check the output voltage by the adjustable resistor etc. and adjust at the actual using
- Do not impress voltage higher than 6V+5% on the Vcont.
- Use an adjustable resistor appliance with good temperature characteristics.
- When the resistance value is 5.0KΩ(R1=0Ω, R2=5KΩ), the max.voltage 6.0V will impress to Vcont pin. Therefore, the margin of error for the resistance value will largely affect the max output voltage, so use the resistance value as 5.0KΩ±5%.

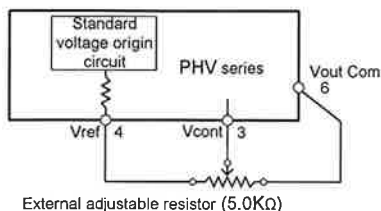
■ Recommended pattern

- 1) The PHV series uses a metallic case. When mounting to a double-sided PCB, the wiring for the converter should be on the soldering side. Also, this converter will generate high voltages so the creepage distance should also be taken in when designing.
- 2) When mounting to a double-sided PCB, the land of the parts side of the high voltage output pin should be as small as possible.
- 3) The metallic case does not need to be connect to ground. However, when using and ground with the metallic case, make the impedance lower as possible between the ground.

■ Vref pin (Standard voltage output)

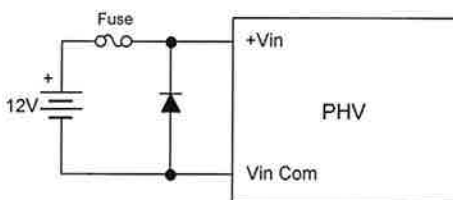
When adjusting the output voltage with an adjustable resistor, this pin is used. Vref has a standard output voltage of 6V. In this case, use an external resistor with a resistance of 5KΩ.

The resistance(the margin of error) of external adjustable resistor will affect the setting value of Vref pin voltage, so use a resistor with high accuracy of 5KΩ±5%. The type of adjustable resistor (5KΩ) will not matter, however one with a well temperature coefficient is recommended.



■ Prevention of inverse input connection

The converter may break if the polarities are reversed. If there is a possibility in which the connections maybe reversed, connect a diode and fuse to the input pin like below.



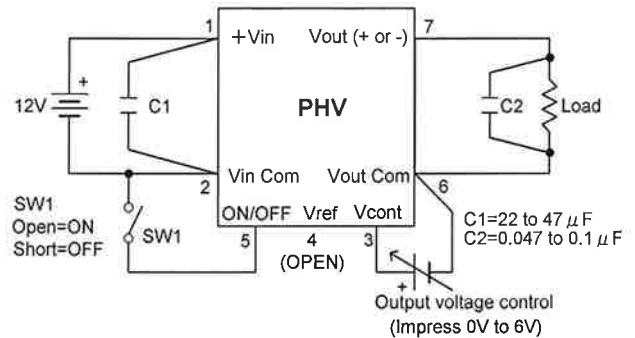
■ Recommended soldering conditions

Soldering conditions for each part is as follows:

- | | | |
|---------------------------|--------------|---------|
| 1) Using a soldering iron | 340 to 360°C | 5 sec. |
| 2) Using a soldering tub | 230 to 260°C | 10 sec. |

■ Lowering the output noise even farther

The PHV series does need any external parts, however to lower the output noise even farther, connect a capacitor C2 like the figure below.



When lowering the output noise even more, keep in mind the input/output wiring, creepage and area distance, while keeping the wiring as thin as possible and layout the C2 near the Load.

Point!

- 1) When choosing a capacitor that connect to the input, choose one which is a high frequency characteristic capacitor.
- 2) Common pattern should be designed thick and short to make same impedance small.
- 3) The capacitor which is connected to the output side should be able to withstand the pressure, and connect to the load side. At this time, the capacitor lead should be shortened. Also, when the load response time is a problem, please be aware of the time constant.

■ Guarantee

This product shall be guaranteed for year. During this period, if there should be any failure definitely due to our designing or manufacturing, we will repair or replace it with a new one at our expense. However, in any case that the product is modified and/or has made any internal remodeling by the buyer, the product can no longer be guaranteed. This guarantee shall cover only the PHV series.

- If you have any further technical questions for this product, please contact to us.

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