

# CHVM2 Series

## Instruction Manual

### BEFORE USING THE POWER SUPPLY UNIT

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

#### DANGER

Never use this product in locations where flammable gas or ignitable substances are present.

#### INSTALLATION WARNING

- When installing, ensure that work is done in accordance with the instruction manual. When installation is improper, there is risk of electric shock and fire.
- Installation shall be done by Service personnel with necessary and appropriate technical training and experience. There is a risk of electric shock and fire.
- Do not cover the product with cloth or paper etc. Do not place anything flammable around. This might cause damage, electric shock or fire.

#### WARNING ON USE

- Do not touch this product or its internal components while circuit in operation, or shortly after shutdown. You may receive a burn.
- While this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- There are cases where high voltage charge remains inside the product. Therefore, do not touch even if they are not in operation as you might get injured due to high voltage and high temperature. You might also get electric shock or burn.
- Do not make unauthorized changes to this product nor remove the cover as you might get an electric shock or might damage the product. We will not be held responsible after the product has been modified, changed or dis-assembled.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc. Please stop using it immediately and shut off the product.  
It might lead to fire and electric shock. In such cases, please contact us. Do not attempt repair by yourself, as it is dangerous for the user.
- Do not operate and store these products in environments where condensation occurs due to moisture and humidity. It might lead fire and electric shock.
- Do not drop or apply shock to this product. It might cause failure. Do not operate these products mechanical stress is applied.

#### CAUTION ON MOUNTING

- Confirm connections to input/output terminals are correct as indicated in the instruction manual before switching on.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged.
- Input line, please use the wires as short and thick as possible.
- Do not use this product in special environment with strong electromagnetic field, corrosive gas or conductive substances and direct sunlight, or places where product is exposed to water or rain.
- Please shut down the input when connecting input and output of the product.
- When installing in environment where conductive foreign, dust and liquid may be present, please consider penetration of above foreign material in the power supply by installing filter, to prevent trouble or malfunction.

 **CAUTION ON USE**

- Product individual notes are shown in the instruction manual. If there is any difference with common notes individual notes shall have priority.
- Before using this product, be sure to read the catalog and instruction manual. There is risk of electric shock or damage to the product or fire due to improper use.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged, or cause electric shock or fire.
- Insert fuse at the input to prevent smoke, fire during abnormal operation.
- For externally mounted fuse do not use other fuses aside from our specified and recommended fuse.
- This product was made for general purpose electronic equipment use and is not designed for applications requiring high safety (such as extremely high reliability and safety requirements. Even though high reliability and safety are not required, this product should not be used directly for applications that have serious risk for life and physical safety. Take sufficient consideration in fail-safe design (such as providing protective circuit or protective device inside the system, providing redundant circuit to ensure no instability when single device failure occurs).
- When used in environments with strong electromagnetic field, there is possibility of product damage due to malfunction.
- When used in environment with corrosive gas (hydrogen sulfide, sulfur dioxide, etc.) , there is possibility that they might penetrate the product and lead to failure.
- When used in environments where there is conductive foreign matter or dust, there is possibility of product failure or malfunction.
- Provide countermeasure for prevention of lightning surge voltage as there is risk of damage due to abnormal voltage.
- Take care not to apply external abnormal voltage to the output. Especially, applying reverse voltage or overvoltage more than the rated voltage to the output might cause failure, electric shock or fire.

 **NOTE**

- Take note that traces of sheet metal processing be left in our power supplies.
- When disposing product, follow disposal laws of each municipality.
- When exporting our products, apply for necessary permissions as required by rules and regulations of Foreign Exchange and Foreign Trade Control Act.
- Catalogue, contents of the instruction manual may be changed without a prior notice. Refer to latest catalogue or instruction manual.
- Reproduction or reprinting the instruction manual or its portion is forbidden without our permission.

**⚠ LONG-TERM STORAGE METHOD AND LONG-TERM STORAGE PERIOD**

- Please keep the product in carton box.
- Please do not apply excessive vibration, shock or mechanical stress applied directly to the product.
- Please keep away from direct sunlight.
- For long-term storage temperature and humidity, the following conditions shall be used as a guideline :
  - Temperature range : 5°C~30°C
  - Humidity range : 40%~60%RH
  - Please keep away from the places where temperature and humidity can change drastically.
  - It can cause condensation on the product or deterioration.
- For long-term storage period, we recommend to use within 1 years after receiving the product.
  - < Soldering and PCB mounted products : On Board, Power Module and etc >
  - For products that have been received for more than 1 year, please check lead oxidation and solderability.

The CHVM series is an adjustable output voltage type mid-high voltage DC-DC converter. Output voltage can be controlled using an external voltage or external adjustable resistor. The CHVM series has adopted a 5 side metallic shield, with farther low ripple and low noise.

## ■ Features

- PCB mounting type
- Output capacity 2W to 2.6W
- Over current protection
- Smallest size device
- Low price
- UL / cUL 60950-1 certified product
- Adopted a 5 sided metallic shield case
- Remote ON/OFF control
- High reliability, long life
- Low ripple noise of 30mVp-p
- Adjustable voltage using an external voltage
- CE marking

## ■ Model name/Rating

Models CHVM series	Input Voltage (Vdc)	Output Voltage (Vdc)	Output Current (mA)	Load Resistance (K $\Omega$ ) min	Output capacity (W)	Input Current (mA) typ	Ripple Noise (mVp-p) typ
CHVM2R6-12-0470PW	10.8 ~ 13.2	0 ~ +470	0 ~ 5.6	83.3	2.6	390	40
CHVM2R6-12-0470NW	10.8 ~ 13.2	0 ~ -470	0 ~ 5.6	83.3	2.6	390	40
CHVM2-12-1000PW	10.8 ~ 16.5	0 ~ +1000	0 ~ 2	500	2.0	280	30
CHVM2-12-1000NW	10.8 ~ 16.5	0 ~ -1000	0 ~ 2	500	2.0	280	30
CHVM2-12-1500PW	10.8 ~ 16.5	0 ~ +1500	0 ~ 1.3	1150	2.0	290	30
CHVM2-12-1500NW	10.8 ~ 16.5	0 ~ -1500	0 ~ 1.3	1150	2.0	290	30
CHVM2-12-2000PW	10.8 ~ 16.5	0 ~ +2000	0 ~ 1	2000	2.0	340	50
CHVM2-12-2000NW	10.8 ~ 16.5	0 ~ -2000	0 ~ 1	2000	2.0	340	50

## ■ Specifications

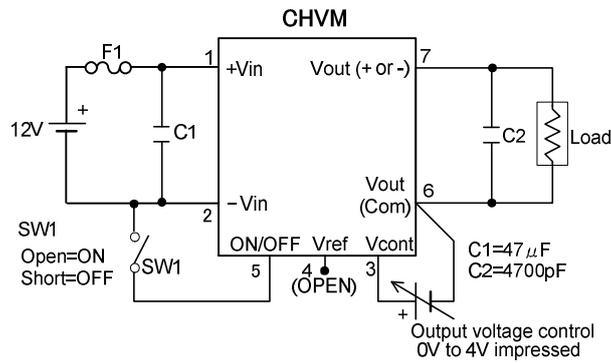
Line regulation	0.03% typ.(Regulation of input voltage range)
Load regulation	470V type : 0.08%typ, 1KV, 1.5KV, 2KV type : 0.03% typ(Load current 0 to 100%)
Temp regulation	$\pm 0.01\%/^{\circ}\text{C}$ typ.(Temp. regulation -10 $^{\circ}\text{C}$ to +50 $^{\circ}\text{C}$ )
Over current protection	Hold back characteristic, auto restart circuit operates at 105% or more.
Output voltage accuracy	Below $\pm 5\%$ (Rated output, rated load, 470V type is $V_{\text{cont}}=3.76\text{V}$ , 1KV, 1.5KV, 2KV type is $V_{\text{cont}}=4\text{V}$ )
Output voltage control	External voltage is 0V to +4V, or an adjustable resistor with 5K $\Omega$ .
ON/OFF control	Available (Between 2pin-5pin :when open=ON, when short=OFF)
Usage temperature range	-10 $^{\circ}\text{C}$ to +60 $^{\circ}\text{C}$ (Derating required for temp.50 $^{\circ}\text{C}$ or higher )
Storage temperature range	-25 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$
Usage humidity range	20% to 95%RH(Non condensing)
Input/output isolation	Non isolated type (2pin-6pin and case are internally connected .)
MTBF expected value	390,000Hours(min).

Note1: The output voltage can be controlled by impressing the  $V_{\text{cont}}$  voltage. Using an adjustable resistor or an external voltage, voltage should be impressed on the  $V_{\text{cont}}$  pin in order to control the output voltage.

When  $V_{\text{cont}}$  voltage=0V the output voltage(residual output voltage) should be less than 0.5% of the max output voltage (at Input/Output rating).

Note2: Details are subject to change for improvement, etc., without prior notice.

■ Test circuit

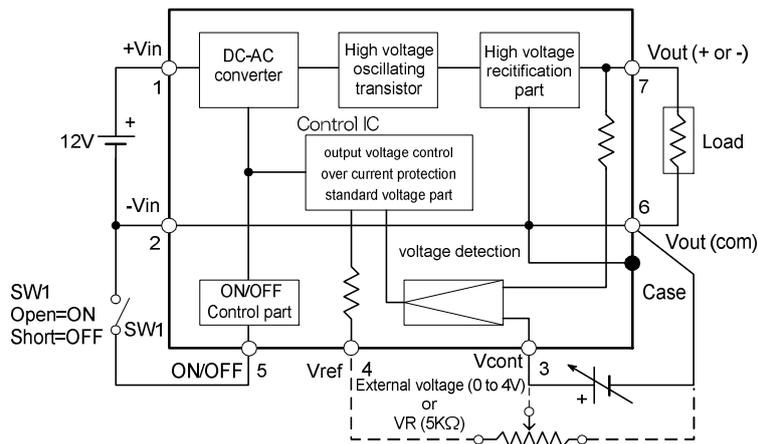


Warning 1: The input-output ground line and case are internally connected.

Warning 2: Vref is 4V (When external VR=5KΩ)

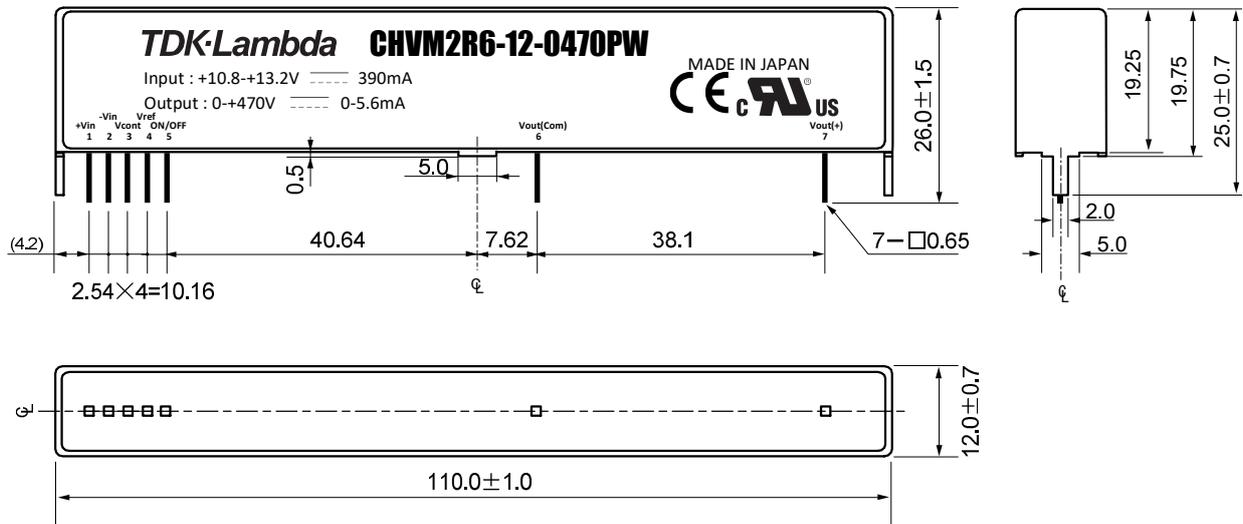
Warning 3: The ON/OFF can be controlled with a transistor.

■ Block diagram



- Switching frequency (fixed) : 200kHz

■ Shape, dimensions and terminal composition



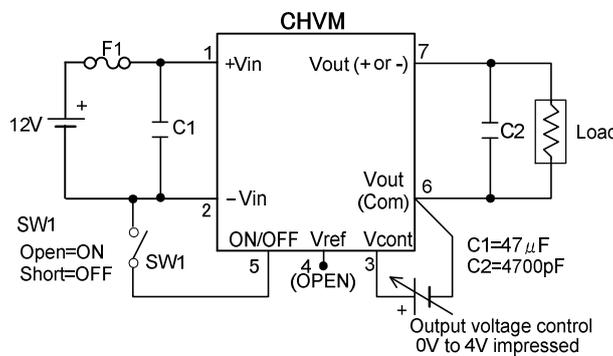
( Bottom view )

Pin-No.	Pin name
1	+Vin
2	-Vin
3	Vcont
4	Vref
5	ON/OFF
6	Vout (com)
7	Vout (+ or -)

- 1) Pins  
Material : Phosphorous bronze  
Treatment : Ni base Au coating
- 2) Case  
Material : Brass  
Treatment : Nickel coating

Weight : 65g typ. Units : mm Tolerance unless otherwise specified ±0.5

■ Standard usage instructions



The CHVM series does not require any external parts, however when the impedance is high, for example: The distance between the power supply and converter 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

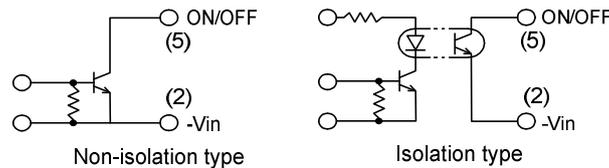
By opening and closing the ON/OFF pin and -Vin pin the external voltage can be turned on and off.

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

- 1) Open will turn the output ON
- 2) Short(0 to 1.0V, 1mAmax) will turn the output OFF

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

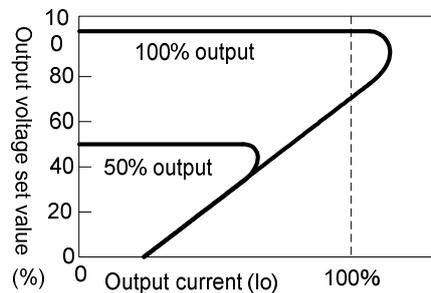
Keep the (5) open when not using the ON/OFF control.



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%.

## ■ Over current protection

The CHVM series is 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.

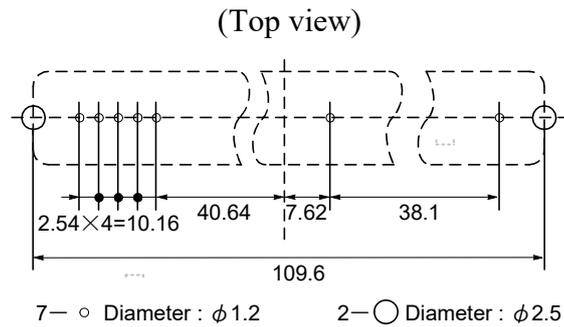


CHVM Series  
 Over current protection  
 characteristic

The over current protection has a hold back characteristic.

The load should be set more than minimum resistor value which according to each series.

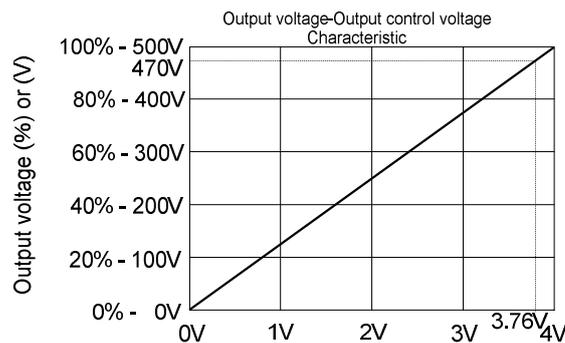
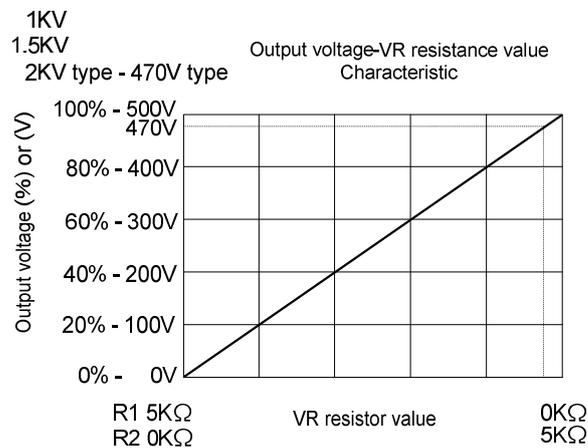
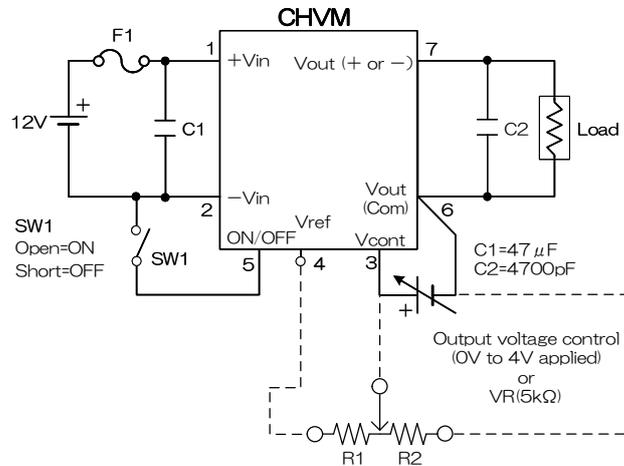
■ Recommended pattern



- (1) The CHVM 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 of pattern should 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 case of CHVM series should be connected to the -Vin and Vout (Com).
- (4) The metallic case does not need to be connecting to ground.  
However, when using and ground with the metallic case, make the impedance lower as possible between the ground.

## ■ Setting and adjustment of output voltage

The output voltage of the CHVM series can be set and adjusted by external voltage and external variable resistor.



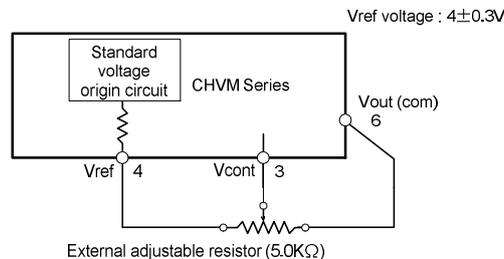
- The above characteristics (Output voltage -VR resistor value characteristic) graph is an indication of the resistance value R1 and R2. Please check the output voltage by the adjustable resistor etc. and adjust at the actual using.
- Do not impress voltage higher than 4V+5% on the Vcont.
- Choose an adjustable resistor appliance with good temperature characteristics.
- When the resistance value is 5.0KΩ (R1=0Ω, R2=5KΩ), the max.voltage 4.0V will impress to Vcon 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%.

### ■ 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 4V. 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 an accuracy of 5KΩ±5%.

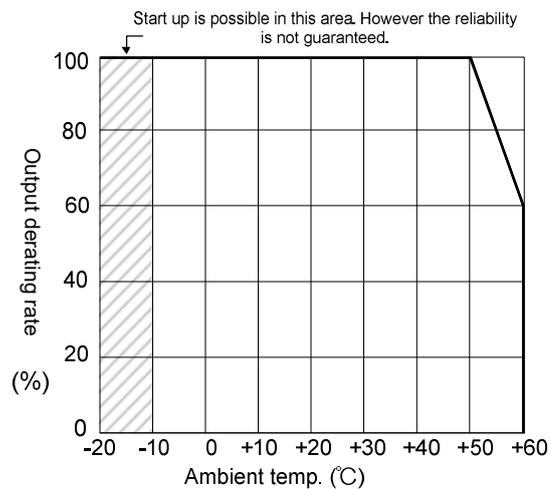
The type of adjustable resistor will not matter, however one with a well temperature coefficient is recommended.



### ■ Temperature derating

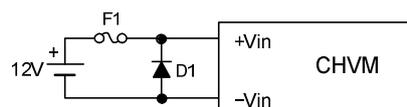
When using the product where the ambient temp. is higher than 50°C, follow the derating graph below.

The minimum load resistance is set for each series. When using higher than 50°C, set the load resistance high by following the below graph.



### ■ Protection against reverse 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.



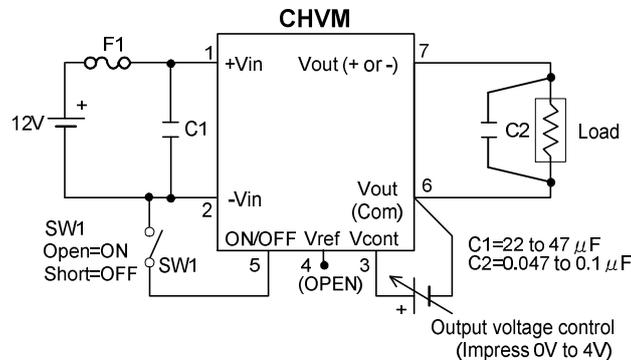
### ■ Recommended soldering conditions

Soldering conditions for each part is as follows:

- |                     |             |            |
|---------------------|-------------|------------|
| (1) Soldering iron  | 340 - 360°C | 5 seconds  |
| (2) Dip solder bath | 230 - 260°C | 10 seconds |

■ **To reduce output noise further**

The CHVM 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.

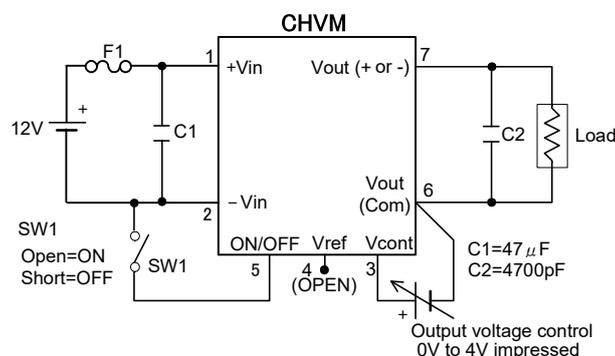
**Point!**

- (1) When choosing a capacitor that connect to the input, choose one which is a high frequency characteristic capacitor.
- (2) Common line 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.

■ **Safety standard**

The CHVM series has attained the UL62368-1, CSA62368-1, UL60950-1, CSA60950-1 certification and CE marked.

When using the CHVM series as a Recognized certified product please mount an input fuse as shown below.



Choose a fuse(F1) from below:

- UL Listed products
- DC250V, Rated current 2A type