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1 Functions

1.1 Input Voltage Range

■ If output voltage value doesn't fall within specifications, a unit may not operate in accordance with specifications and/or fail.

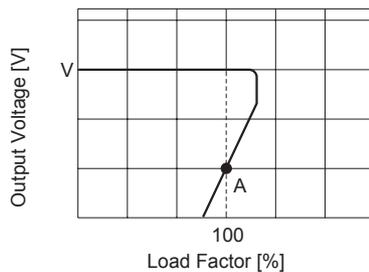
1.2 Overcurrent Protection

■ Overcurrent Operation

An overcurrent protection circuit is built-in and activated over 105% of the rated current or above. It prevents the unit from short circuit and overcurrent for less than 20 seconds. The unit automatically recovers when the fault condition is removed.

■ Current Foldback Characteristic

If a model that has a current foldback characteristic is connected to a non-linear load such as lamp or motor, or to a constant current load, it may not start up. Please see the characteristics below.



————— : Load Characteristic of Power Supply
 - - - - - : Characteristic of Load (Lamp, Motor or Constant Current Load, etc.)

Note : The output may be locked out at Point A when the unit is connected to a lamp, motor or constant current load.

Fig.1.1 Current Foldback Characteristic

1.3 Isolation

■ When you run a Hi-Pot test as receiving inspection, gradually increase the voltage to start. When you shut down, decrease the voltage gradually by using a dial. Please avoid a Hi-Pot tester with a timer because, when the timer is turned ON or OFF, it may generate a voltage a few times higher than the applied voltage.

■ In the case of use in locations exposed to constant voltage between the input and the output of the unit is applied, please contact us.

1.4 Output Voltage Adjustment Range

■ The output voltage is adjustable through an external potentiometer. Adjust only within the range of $\pm 5\%$ of the rated voltage.

■ To increase the output voltage, turn the potentiometer clockwise and connect in such a way that the resistance value between ② and ③ becomes small.

To decrease the output voltage, turn the potentiometer counter-clockwise.

■ Please use a wire as short as possible to connect to the potentiometer and connect it from the pin terminal on the power supply side. Temperature coefficient deteriorates when some types of resistors and potentiometers are used. Please use the following types.

Resistor.....Metal Film Type, Temperature Coefficient of $\pm 100\text{ppm}/^\circ\text{C}$ or below
 Potentiometer...Cermet Type, Temperature Coefficient of $\pm 300\text{ppm}/^\circ\text{C}$ or below

■ If output voltage adjustment is not required, open the pin terminal TRM.

■ In the case of dual output, \pm voltages are adjusted simultaneously.

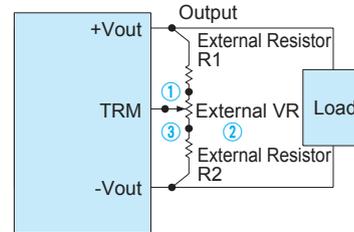


Fig.1.2 Connecting External Devices

Table 1.1 List of External Devices

| Item # | Output Voltage | Constant of External Device [Ω] (Adjustable within $\pm 5\%$) | | |
|--------|------------------|--|-----|------|
| | | VR | R1 | R2 |
| 1 | 3.3V | 1K | 100 | 100 |
| 2 | 5V | 1K | 100 | 270 |
| 3 | 12V | 5K | 10K | 1.2K |
| 4 | 15V | 5K | 10K | 470 |
| 5 | $\pm 12\text{V}$ | 5K | 18K | 470 |
| 6 | $\pm 15\text{V}$ | 5K | 18K | 470 |

1.5 Remote ON/OFF (Excluding 1R5)

■ You can turn the power supply ON or OFF without turning the input power ON or OFF through the pin terminal RC.

(1) SU/SUC3/SUT3 and SU/SUC6/SUT6

■ The output of the power supply turns ON when the pin terminal RC is connected to the pin terminal -Vin. When the voltage of the pin terminal RC is between 2.0 to 9.0V, the output of the power supply goes OFF.

■ When the voltage of the pin terminal RC is between 0.3 to 2.0V, the output voltage value may be an uncertain value which is less than the rated voltage.

■ Please see the following diagram for how to use the pin terminal RC.

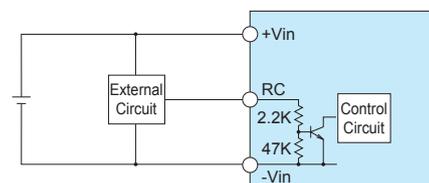


Fig.1.3 Internal Circuits of Remote ON/OFF

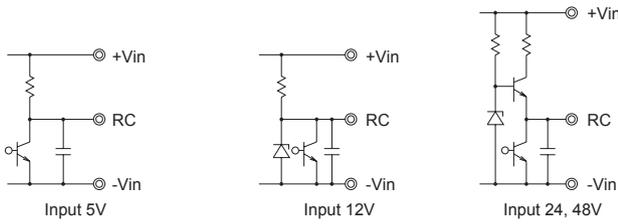


Fig.1.4 Examples of Using an External Remote ON/OFF Circuit

Table 1.2 Specification of Remote ON/OFF

| Voltage Level of the pin terminal RC (V_{RC}) | SU/SUC3/SUT3, SU/SUC6/SUT6 Output |
|---|-----------------------------------|
| Open or Short or $0V \leq V_{RC} \leq 0.3V$ | ON |
| $2.0V \leq V_{RC} \leq 9.0V$ | OFF |

- Please keep the voltage level of the pin terminal RC (V_{RC}) at 9.0V or below.
- If you do not use the Remote ON/OFF function, please short out between the pin terminals RC and -Vin to prevent malfunction.

(2) SU/SUC10/SUT10

- The output of the power supply turns ON when the pin terminal RC is connected to the pin terminal -Vin. When the pin terminal RC is open or the voltage of the pin terminal RC is between 2.4 to 7.0 V, the output of the power supply goes OFF.
- When the voltage of the pin terminal RC is between 1.2 to 2.4V, an output voltage value may be an uncertain value which is less than the rated voltage.
- Please see the following diagram for how to use the pin terminal RC.

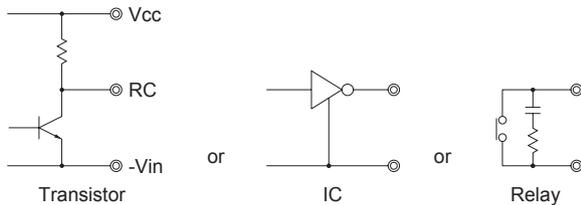


Fig.1.5 Examples of Using an External Remote ON/OFF Circuit

Table 1.3 Specification of Remote ON/OFF

| Voltage Level of the pin terminal RC (V_{RC}) | SU/SUC10/SUT10 Output |
|---|-----------------------|
| Short or $0V \leq V_{RC} \leq 1.2V$ | ON |
| Open or $2.4V \leq V_{RC} \leq 7.0V$ | OFF |

- When the pin terminal RC is at the "Low" level, outflowing current is 0.5mA typ. When Vcc is used, please make sure that the voltage of Vcc is 7.0V or less.
- If you do not use the Remote ON/OFF function, please short out between the pin terminals RC and -Vin.

2 Wiring to Input/Output Pin Terminals

- Basically, SU/SUC/SUT series do not need any external capacitor. However, you can create a π -shaped filter circuit by adding a capacitor C_i near the input pin terminal and reduce reflected input noise from a converter. Please connect the capacitor as needed.
- When you use a capacitor C_i , please use the one with high frequency and good temperature characteristics.
- If the power module is to be turned ON/OFF directly with a switch, inductance from the input line will induce a surge voltage several times that of the input voltage and it may damage the power module. Make sure that the surge is absorbed, for example, by connecting an electrolytic capacitor between the input pins.
- If an external filter containing L (inductance) is added to the input line or a wire from the input source to the DC-DC converter is long, not only the reflected input noise becomes large, but also the output of the converter may become unstable. In such case, connecting C_i to the input pin terminal is recommended.
- If you use an aluminum electrolytic capacitor, please pay attention to its ripple current rating.

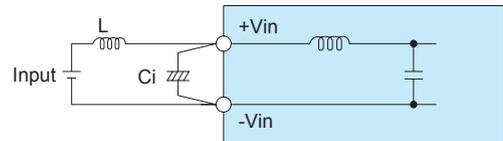


Fig.2.1 Connecting an External Capacitor to the Input Side

Table 2.1 Recommended Capacitance of an External Capacitor on the Input Side [μF]

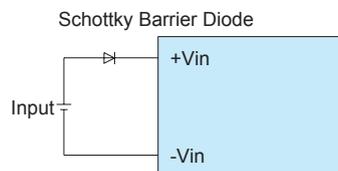
| Model Input Voltage(V) | SU/SUC1R5 | SU/SUC3/SUT3 | SU/SUC6/SUT6 | SU/SUC10/SUT10 |
|---------------------------|-----------|--------------|--------------|----------------|
| 5 | 10 - 100 | 10 - 220 | 10 - 470 | 10 - 470 |
| 12 | 10 - 47 | 10 - 100 | 10 - 220 | 10 - 220 |
| 24 | 10 - 33 | 10 - 47 | 10 - 100 | 10 - 100 |
| 48 | 4.7 - 10 | 10 - 22 | 10 - 47 | 10 - 47 |

* Please adjust the capacitance in accordance with a degree of the effect you want to achieve.

- If a reverse polarity voltage is applied to the input pin terminal, the power supply will fail.

If there is a possibility that a reverse polarity voltage is applied, connect a protection circuit externally as described below.

(a)



Schottky barrier diode generates a power loss of input current multiplied by forward voltage.

(b)

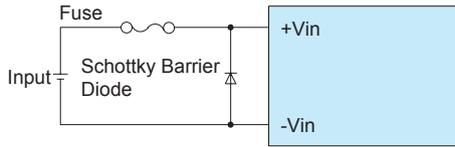


Fig.2.2 Connecting a Reverse Voltage Protection Circuit

■ Basically, SU/SUC/SUT series do not need any external capacitor. However, if you want to further reduce the output ripple noise, connect an electrolytic capacitor or a ceramic capacitor C_o to the output pin terminal as shown below.

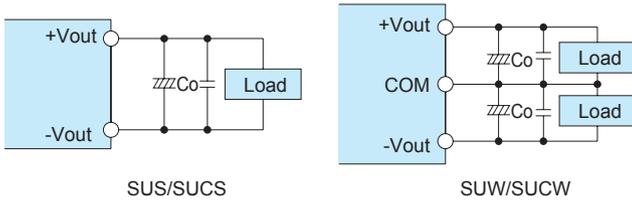


Fig.2.3 Connecting Example of an External Capacitor to the Output Side

 Table 2.2 Recommended Capacitance of External Capacitor on the Output Side [μF]

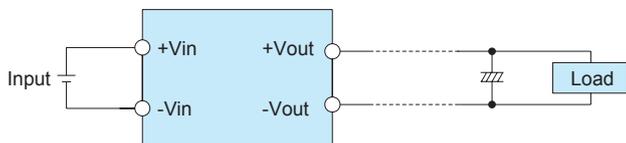
| Model Output Voltage(V) | SU/SUC1R5 | SU/SUC3/SUT3 | SU/SUC6/SUT6 | SU/SUC10/SUT10 |
|----------------------------|-----------|--------------|--------------|----------------|
| 3.3 | 1 - 100 | 1 - 220 | 1 - 220 | 1 - 220 |
| 5 | 1 - 100 | 1 - 220 | 1 - 220 | 1 - 220 |
| 12 | 1 - 100 | 1 - 100 | 1 - 100 | 1 - 100 |
| 15 | 1 - 100 | 1 - 100 | 1 - 100 | 1 - 100 |

* If you use a ceramic capacitor, keep the capacitance within the range between about 0.1 to 10 μF .

* Please adjust the capacitance in light of the effect you want to achieve.

* If you need to use an external capacitor whose capacitance exceeds the range provided in Table 2.2, please contact us.

■ If the distance between the output and the load is long and therefore the noise is created on the load side, connect a capacitor externally to the load as shown below.

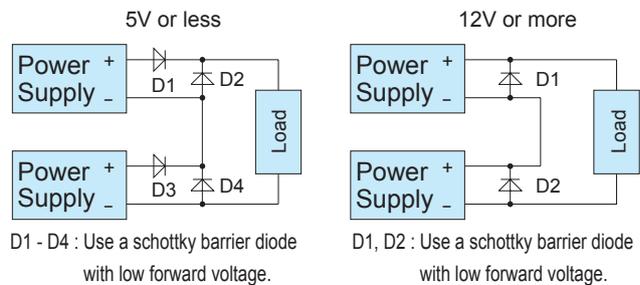


3 Series/Parallel Operation

3.1 Series Operation

■ You can use the power supplies in series operation by wiring as shown below. In the case of (a) below, the output current should be lower than the rated current of a power supply with the lowest rated current among power supplies that are serially connected. Please make sure that no current exceeding the rated current flows into a power supply.

(a)



(b)

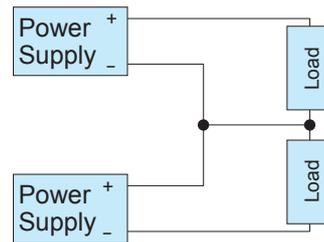


Fig.3.1 Series Operation

3.2 Redundancy Operation

■ You can use the power supplies in redundancy operation by wiring as shown below.

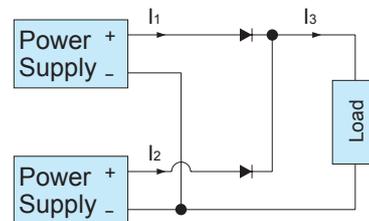


Fig.3.2 Redundancy Operation

■ Even a slight difference in output voltage can affect the balance between the values of I_1 and I_2 .

Please make sure that the value of I_3 does not exceed the rated current of a power supply.

$$I_3 \leq \text{Rated Current Value}$$

4 Input Voltage/ Current Range

- If you use a non-regulated power source for input, please check and make sure that its voltage fluctuation range and ripple voltage do not exceed the input voltage range shown in specifications.
- Please select an input power source with enough capacity, taking into consideration of the start-up current (I_p), which flows when a DC-DC converter starts up. I_p changes depending on the slope of input voltage, load factor and the external capacitor. Please contact us for details.

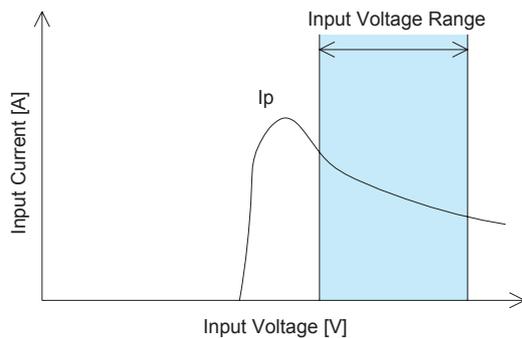


Fig.4.1 Input Current Characteristics

5 Cleaning (except SUC□□C-C)

- If you need to clean the unit, please clean it under the following conditions.
 Cleaning Method: Immersion, Ultrasonic or Vapor Cleaning
 Cleaning agent: IPA (Solvent type)
 Cleaning Time: Within total 2 minutes for immersion, ultrasonic and vapor cleaning
- Please dry the unit sufficiently after cleaning.
- If you do ultrasonic cleaning, please keep the ultrasonic output at 15W/l or below.

6 Safety Standards

- To apply for a safety standard approval using the power supply, please meet the following conditions. Please contact us for details.
- Please use the unit as a component of an end device.
- The area between the input and the output of the unit is isolated functionally. Depending upon the input voltage, basic insulation, dual insulation or enhanced insulation may be needed. In such case, please take care of it within the structure of your end-device. Please contact us for details.
- Please use the following model names when you apply for a safety standard approval.

● SU/SUC1R5

| | | | |
|-------------|-------------|-------------|-------------|
| SUS1R5053R3 | SUS1R5123R3 | SUS1R5243R3 | SUS1R5483R3 |
| SUS1R50505 | SUS1R51205 | SUS1R52405 | SUS1R54805 |
| SUS1R50512 | SUS1R51212 | SUS1R52412 | SUS1R54812 |
| SUS1R50515 | SUS1R51215 | SUS1R52415 | SUS1R54815 |
| SUW1R50512 | SUW1R51212 | SUW1R52412 | SUW1R54812 |
| SUW1R50515 | SUW1R51215 | SUW1R52415 | SUW1R54815 |

| | | | |
|--------------|--------------|--------------|--------------|
| SUCS1R5053R3 | SUCS1R5123R3 | SUCS1R5243R3 | SUCS1R5483R3 |
| SUCS1R50505 | SUCS1R51205 | SUCS1R52405 | SUCS1R54805 |
| SUCS1R50512 | SUCS1R51212 | SUCS1R52412 | SUCS1R54812 |
| SUCS1R50515 | SUCS1R51215 | SUCS1R52415 | SUCS1R54815 |
| SUCW1R50512 | SUCW1R51212 | SUCW1R52412 | SUCW1R54812 |
| SUCW1R50515 | SUCW1R51215 | SUCW1R52415 | SUCW1R54815 |

● SU/SUC3

| | | | |
|-----------|-----------|-----------|-----------|
| SUS3053R3 | SUS3123R3 | SUS3243R3 | SUS3483R3 |
| SUS30505 | SUS31205 | SUS32405 | SUS34805 |
| SUS30512 | SUS31212 | SUS32412 | SUS34812 |
| SUS30515 | SUS31215 | SUS32415 | SUS34815 |
| SUW30512 | SUW31212 | SUW32412 | SUW34812 |
| SUW30515 | SUW31215 | SUW32415 | SUW34815 |

| | | | |
|------------|------------|------------|------------|
| SUCS3053R3 | SUCS3123R3 | SUCS3243R3 | SUCS3483R3 |
| SUCS30505 | SUCS31205 | SUCS32405 | SUCS34805 |
| SUCS30512 | SUCS31212 | SUCS32412 | SUCS34812 |
| SUCS30515 | SUCS31215 | SUCS32415 | SUCS34815 |
| SUCW30512 | SUCW31212 | SUCW32412 | SUCW34812 |
| SUCW30515 | SUCW31215 | SUCW32415 | SUCW34815 |

● SU/SUC6

| | | | |
|-----------|-----------|-----------|-----------|
| SUS6053R3 | SUS6123R3 | SUS6243R3 | SUS6483R3 |
| SUS60505 | SUS61205 | SUS62405 | SUS64805 |
| SUS60512 | SUS61212 | SUS62412 | SUS64812 |
| SUS60515 | SUS61215 | SUS62415 | SUS64815 |
| SUW60512 | SUW61212 | SUW62412 | SUW64812 |
| SUW60515 | SUW61215 | SUW62415 | SUW64815 |

| | | | |
|------------|------------|------------|------------|
| SUCS6053R3 | SUCS6123R3 | SUCS6243R3 | SUCS6483R3 |
| SUCS60505 | SUCS61205 | SUCS62405 | SUCS64805 |
| SUCS60512 | SUCS61212 | SUCS62412 | SUCS64812 |
| SUCS60515 | SUCS61215 | SUCS62415 | SUCS64815 |
| SUCW60512 | SUCW61212 | SUCW62412 | SUCW64812 |
| SUCW60515 | SUCW61215 | SUCW62415 | SUCW64815 |

●SU/SUC10

| | | | |
|------------|------------|------------|------------|
| SUS10053R3 | SUS10123R3 | SUS10243R3 | SUS10483R3 |
| SUS100505 | SUS101205 | SUS102405 | SUS104805 |
| SUS100512 | SUS101212 | SUS102412 | SUS104812 |
| SUS100515 | SUS101215 | SUS102415 | SUS104815 |
| SUW100512 | SUW101212 | SUW102412 | SUW104812 |
| SUW100515 | SUW101215 | SUW102415 | SUW104815 |

| | | | |
|-------------|-------------|-------------|-------------|
| SUCS10053R3 | SUCS10123R3 | SUCS10243R3 | SUCS10483R3 |
| SUCS100505 | SUCS101205 | SUCS102405 | SUCS104805 |
| SUCS100512 | SUCS101212 | SUCS102412 | SUCS104812 |
| SUCS100515 | SUCS101215 | SUCS102415 | SUCS104815 |
| SUCW100512 | SUCW101212 | SUCW102412 | SUCW104812 |
| SUCW100515 | SUCW101215 | SUCW102415 | SUCW104815 |

●SUT3

| | | | |
|------------|------------|------------|------------|
| SUTS3053R3 | SUTS3123R3 | SUTS3243R3 | SUTS3483R3 |
| SUTS30505 | SUTS31205 | SUTS32405 | SUTS34805 |
| SUTS30512 | SUTS31212 | SUTS32412 | SUTS34812 |
| SUTS30515 | SUTS31215 | SUTS32415 | SUTS34815 |
| SUTW30512 | SUTW31212 | SUTW32412 | SUTW34812 |
| SUTW30515 | SUTW31215 | SUTW32415 | SUTW34815 |

●SUT6

| | | | |
|------------|------------|------------|------------|
| SUTS6053R3 | SUTS6123R3 | SUTS6243R3 | SUTS6483R3 |
| SUTS60505 | SUTS61205 | SUTS62405 | SUTS64805 |
| SUTS60512 | SUTS61212 | SUTS62412 | SUTS64812 |
| SUTS60515 | SUTS61215 | SUTS62415 | SUTS64815 |
| SUTW60512 | SUTW61212 | SUTW62412 | SUTW64812 |
| SUTW60515 | SUTW61215 | SUTW62415 | SUTW64815 |

●SUT10

| | | | |
|-------------|-------------|-------------|-------------|
| SUTS10053R3 | SUTS10123R3 | SUTS10243R3 | SUTS10483R3 |
| SUTS100505 | SUTS101205 | SUTS102405 | SUTS104805 |
| SUTS100512 | SUTS101212 | SUTS102412 | SUTS104812 |
| SUTS100515 | SUTS101215 | SUTS102415 | SUTS104815 |
| SUTW100512 | SUTW101212 | SUTW102412 | SUTW104812 |
| SUTW100515 | SUTW101215 | SUTW102415 | SUTW104815 |

7 Temperature Measuring Point

7.1 SU/SUC1R5

① SU1R5

■In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.1 at 105°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

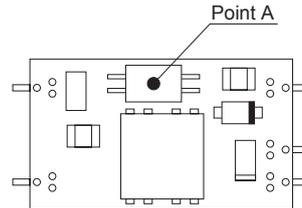


Fig.7.1 Temperature Measuring Point in the case of Forced Air Cooling

② SUC1R5

■In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point B in Fig.7.2 at 95°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

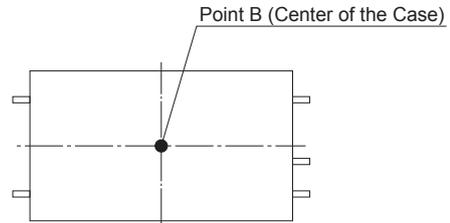


Fig.7.2 Temperature Measuring Point in the case of Forced Air Cooling (Upper Surface of the Case)

7.2 SU/SUC3

① SU3

■In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.3 at 115°C or below and that of Point B at 120°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

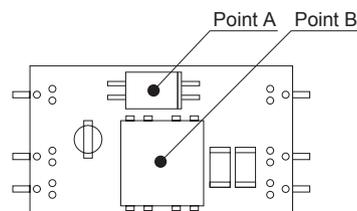


Fig.7.3 Temperature Measuring Points in the case of Forced Air Cooling

② SUC3

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point C in Fig.7.4 at 100°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

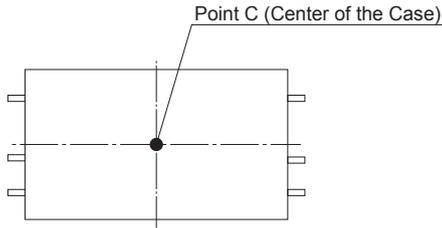


Fig.7.4 Temperature Measuring Point in the case of Forced Air Cooling (Upper Surface of the Case)

7.3 SU/SUC6

① SU6

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.5 at 95°C or below and that of Point B at 115°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

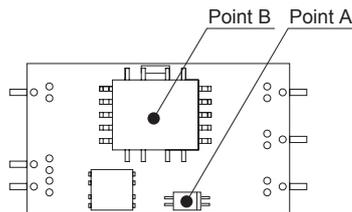


Fig.7.5 Temperature Measuring Points in the case of Forced Air Cooling

② SUC6

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point C in Fig.7.6 at 95°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

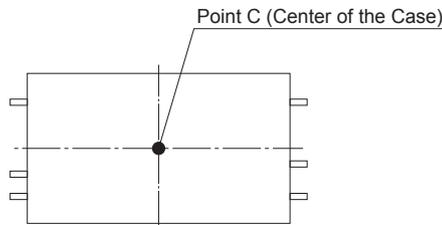


Fig.7.6 Temperature Measuring Point in the case of Forced Air Cooling (Upper Surface of the Case)

7.4 SU/SUC10

① SU10

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.7 at 105°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

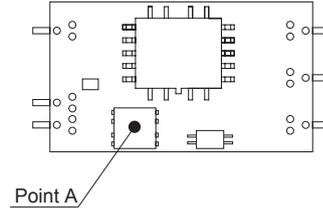


Fig.7.7 Temperature Measuring Point in the case of Forced Air Cooling

② SUC10

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point B in Fig.7.8 at 95°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

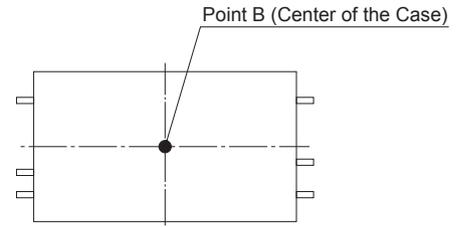


Fig.7.8 Temperature Measuring Point in the case of Forced Air Cooling (Upper Surface of the Case)

7.5 SUT3

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.9 at 100°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

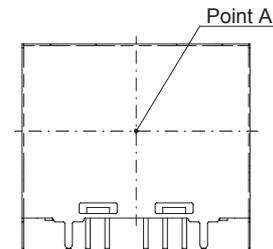


Fig.7.9 Temperature Measuring Point in the case of Forced Air Cooling

7.6 SUT6

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.10 at 95°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

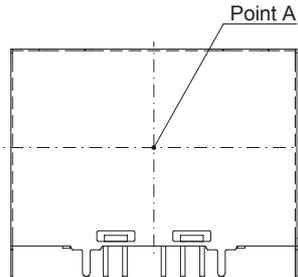


Fig.7.10 Temperature Measuring Point in the case of Forced Air Cooling

7.7 SUT10

■ In the case of forced air cooling (1m/s), please have sufficient ventilation to keep the temperature of point A in Fig.7.11 at 95°C or below.

Please also make sure that the ambient temperature does not exceed 85°C.

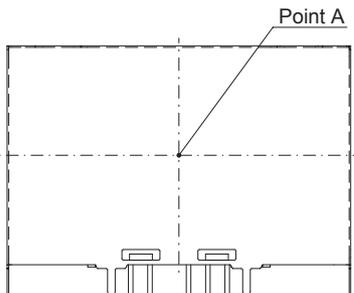
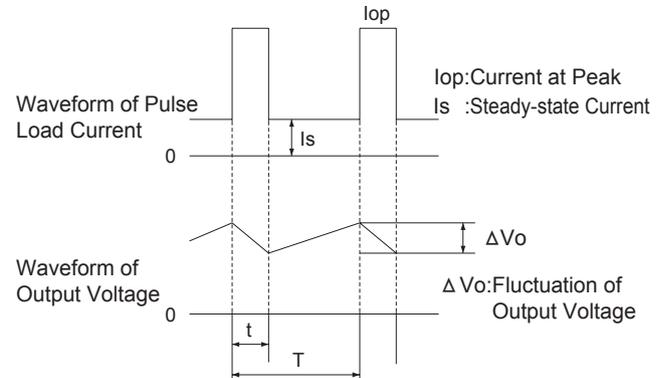
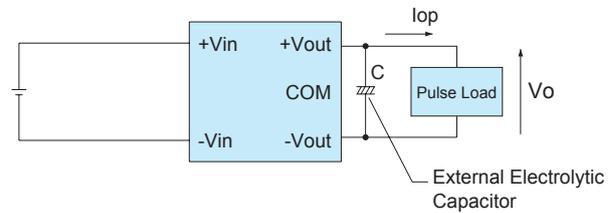


Fig.7.11 Temperature Measuring Point in the case of Forced Air Cooling

8 Peak Current (Pulse Load)

■ If a load connected to a converter is a pulse load, you can provide a pulse current by connecting an electrolytic capacitor externally to the output side.



■ The average output current I_{av} is expressed in the following formula.

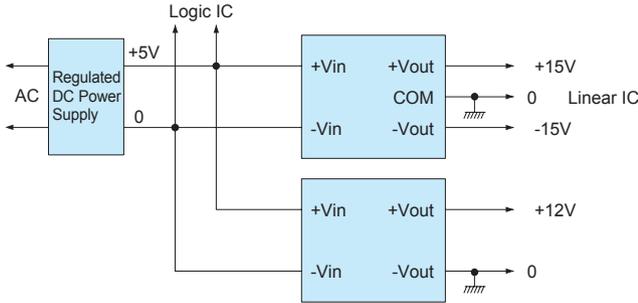
$$I_{av} = I_s + \frac{(I_{op} - I_s) \times t}{T}$$

■ Required electrolytic capacitor C can be obtained from the following formula.

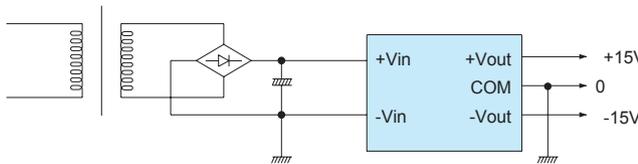
$$C = \frac{(I_{op} - I_{av}) \times t}{\Delta V_o}$$

9 Using DC-DC Converters

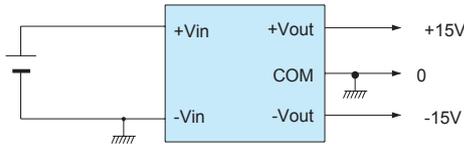
■ To Operate a Linear IC from 5V Output Power Supply



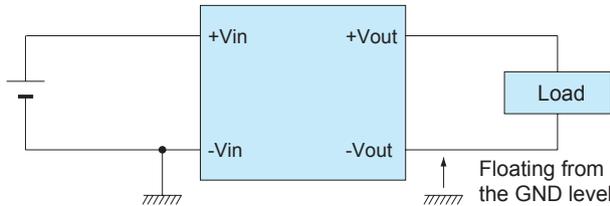
■ When Using a Non-regulated Power Source



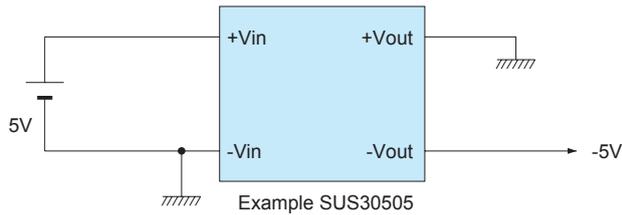
■ When Using a Battery-operated Device



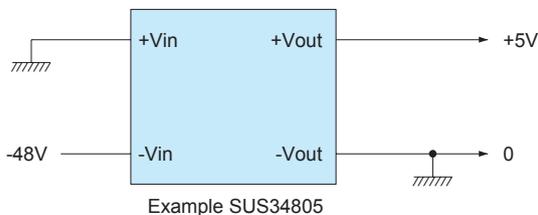
■ When a Floating Mechanism is Required for the Output Circuit



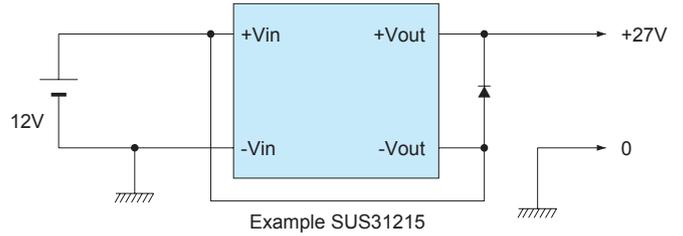
■ To Draw a Reverse Polarity Output



■ To provide a negative voltage to -Vin by using +Vin side of the converter as GND potential (0V)



■ To Draw the Sum of Input Voltage and Plus Output Voltage

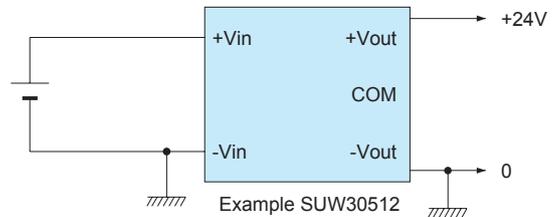


* Output current should be the same as the rated output current of the converter.

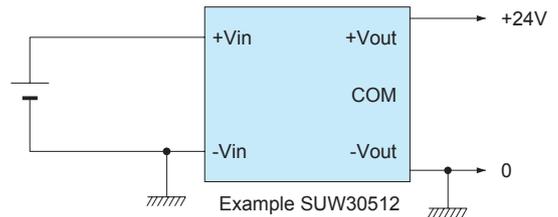
* Output voltage fluctuation is the sum of the input voltage fluctuation and the output voltage fluctuation of the converter.

■ To Use a Dual Output Type

* Dual output type is typically used in the following manner.

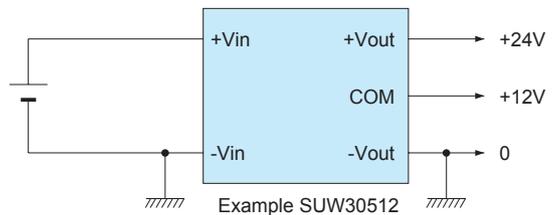


* The unit can be used as a 24V type single output power supply as follows.

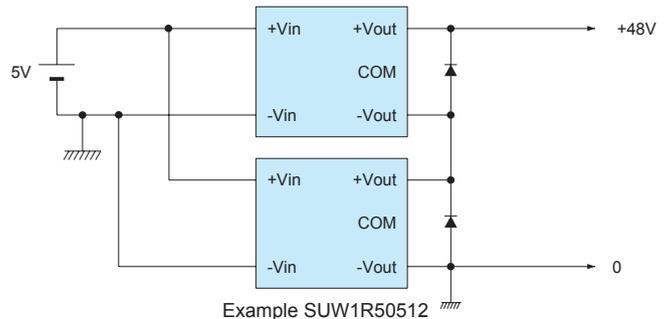


* Another way to use the unit is described below.

* The sum of +12V and +24V flows to the 0V line. Please make sure that this value does not exceed the rated output current of the converter.



■ To Draw 48V Output



10 Options

10.1 Outline of Options

*Please inquire us for details of specifications and delivery timing.

● -C (Only SUC□□C)

- Conformal coating is applied to PCB and parts.
For excessive harsh environment with corrosive gases condition such as H₂S.
- Differences from standard versions are summarized in Table 10.1.

Table 10.1 Coating Type

| | |
|-------------------------|--------------------------------|
| Clearance to user board | 0.05mm min (Refer to Fig.10.1) |
| Safety Standards | no approvals |

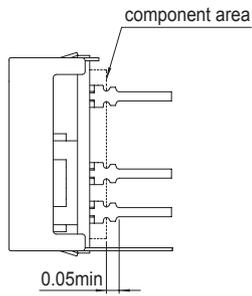


Fig.10.1 Clearance to user board

11 Delivery Package Information

■ These are packed in a tray. (Fig.11.1)

Please order "SU□□□□□BP" for tray type packaging.

Table 12.1 Capacity of the tray (pcs/tray)

| | |
|-------|-------|
| SU1R5 | 30max |
| SU3 | 30max |
| SU6 | 20max |
| SU10 | 20max |

In case of fractions, the units are stored in numerical order.

· The tray shall be transported and carried with keeping it horizontally as less vibration.

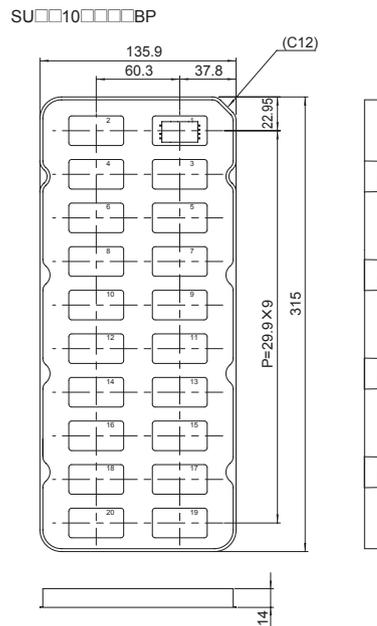
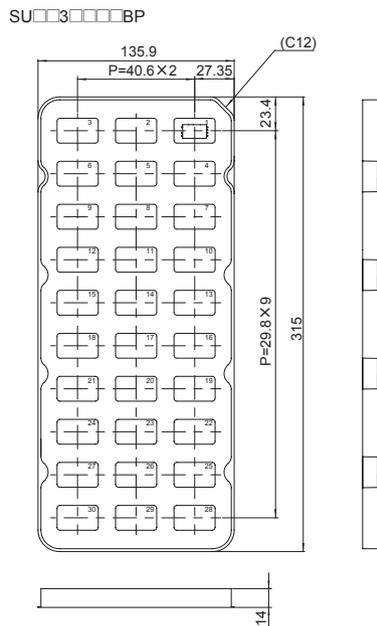
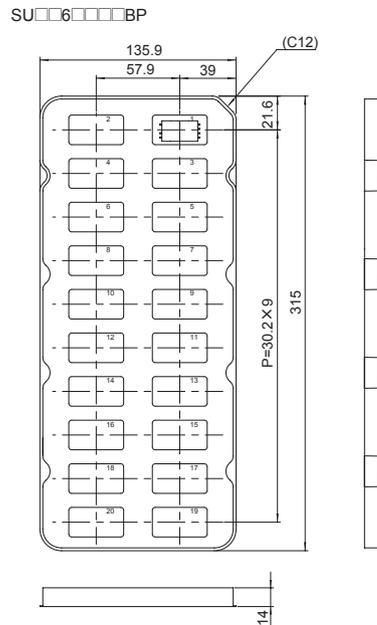
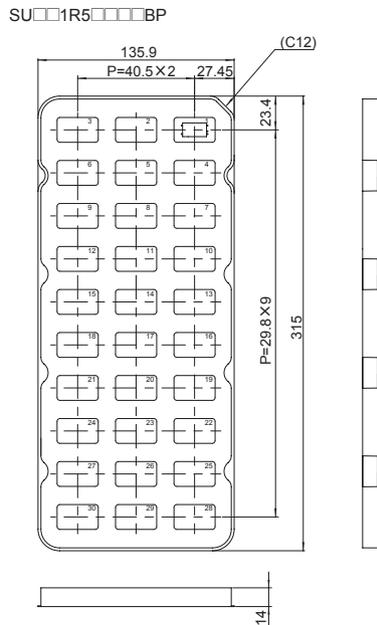
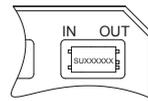


Fig.11.1 Delivery package information

Dimension in mm
Material : Conductive PS