MG1R5, MG3, MG6, MG10

1 Function

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 protection is built-in and comes into effect at over 105% of the rated current.
Overcurrent protection prevents the unit from short circuit and overcurrent condition. The unit automatically recovers when the fault condition is cleared.

1.3 Isolation

■For a receiving inspection, such as Hi-Pot test, increase (decrease) the voltage gradually for a start (shut down). Avoid using Hi-Pot tester with timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.

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

1.4 Remote ON/OFF(MG6, MG10)

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

■Please keep the voltage level of the pin terminal RC(V_{RC}) at 9.0V or below.

Table 1.1 Pin Specification of Remote ON/OFF

Voltage Level of the pin terminal RC (V_{RC})	MG6/MG10 Output
Open or Short or 0V ≦ V_{RC} ≦ 0.3V	ON
2.0V ≦ V_{RC} ≦ 9.0V	OFF

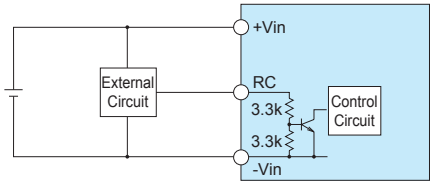


Fig.1.1 Internal Circuits of Remote ON/OFF

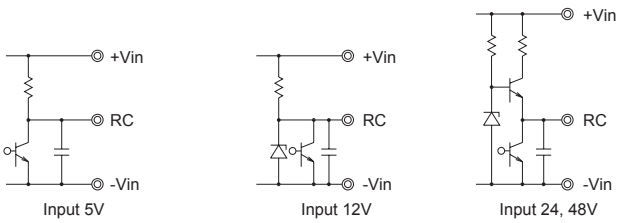


Fig.1.2 Examples of Using an External Remote ON/OFF Circuit

1.5 Output Voltage Adjustment Range

● -Y2 (Excluding MGW1R5/MGW3/ MGFW1R5/MGFW3/MGXW1R5)

■The output voltage is adjustable through an external potentiometer. Adjust only within the range of +10%, -5% of the rated voltage.

■To increase the output voltage, turn the potentiometer so that the resistance value between 2 and 3 becomes small.

■Please use a wire as short as possible to connect to the potentiometer and connect it from the pin 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 ±100ppm/℃ or below

Potentiometer: Cermet Type, Temperature Coefficient of ±300ppm/℃ or below

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

■When the output voltage adjustment is used, note that the output may be stopped when output voltage is set too high.

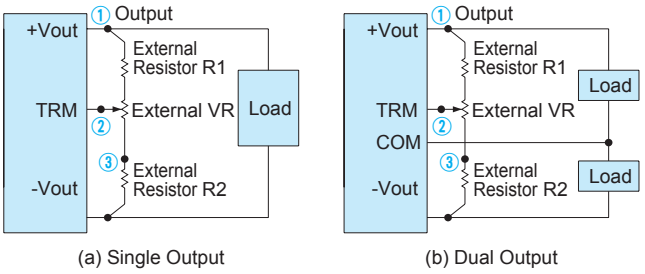


Fig.1.3 Connecting External Devices

Table 1.2 List of External Devices (MG1R5/MG3)

Output Voltage	Constant of External Device [Ω] (Adjustable within +10%, -5%)		
	VR	R1	R2
3.3V	1k	680	150
5V	1k	330	330
12V	5k	15k	2.4k
15V	5k	15k	1.2k
±12V			
±15V			

Table 1.3 List of External Devices (MG6/MG10)

Output Voltage	Constant of External Device [Ω] (Adjustable within +10%, -5%)		
	VR	R1	R2
3.3V	1k	680	150
5V	1k	2.7k	560
12V	5k	15k	2.4k
15V	5k	15k	1.2k
±12V	5k	22k	470
±15V	5k	27k	470

2 Wiring to Input/Output Pin

2.1 Wiring Input Pin

(1) External fuse

■Fuse is not built-in on input side. In order to protect the unit, install the normal-blow type fuse on input side.

■When the input voltage from a front end unit is supplied to multiple units, install the normal-blow type fuse in each unit.

Table 2.1 Recommended fuse (Normal-blow type)

Model / Vin	MG1R5	MG3	MG6	MG10
5	2.0A	3.15A	5.0A	6.3A
12	1.6A	2.0A	2.5A	3.15A
24	1.0A	1.6A	2.0A	2.5A
48	0.8A	1.0A	1.6A	2.0A
12-24 (MGF)	1.6A	2.0A	2.5A	3.15A
24-48 (MGF)	1.0A	1.6A	2.0A	2.5A
12-48 (MGX)	1.6A	—	3.15A	—

(2) External capacitor on the input side

■Basically, MG series does not need any external capacitor.
Adding a capacitor Ci near the input pin terminal and reduce reflected input noise from a converter.
Please connect the capacitor as needed.

■When you use a capacitor Ci, please use the one with high frequency and good temperature characteristics.

■If the power supply 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 supply. 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 Ci to the input pin terminal is recommended.

■If you use an aluminum electrolytic capacitor, please pay attention to its ripple current rating.

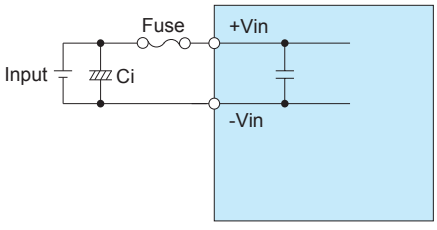


Fig2.1 Connecting Example of an External Capacitor to the Input Side

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

Model / Vin	MG1R5	MG3	MG6	MG10
5	10 - 220	10 - 220	10 - 470	10 - 1000
12	10 - 100	10 - 100	10 - 220	10 - 470
24	10 - 47	10 - 47	10 - 100	10 - 220
48	10 - 22	10 - 22	10 - 47	10 - 100
12-24 (MGF)	10 - 47	10 - 47	10 - 100	10 - 220
24-48 (MGF)	10 - 22	10 - 22	10 - 47	10 - 100
12-48 (MGX)	10 - 100	—	10 - 220	—

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

(3) Reverse input voltage protection

■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.

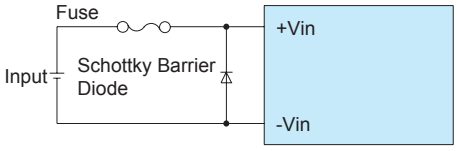
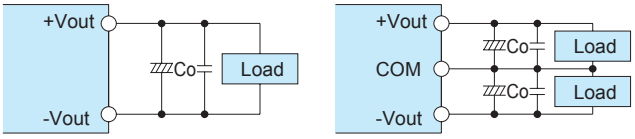


Fig2.2 Reverse Input Voltage Protection

2.2 Wiring Output Pin

■If you want to further reduce the output ripple noise, connect an electrolytic capacitor or a ceramic capacitor Co to the output pin terminal as shown below.



(a) MGS (b) MGW

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

Table 2.3 Recommended Capacitance of External Capacitor on the Output Side [μF]

Model / Vout	MG1R5	MG3	MG6	MG10
3.3	0 - 220	0 - 220	0 - 220	0 - 220
5	0 - 220	0 - 220	0 - 220	0 - 220
12	0 - 100	0 - 100	0 - 100	0 - 100
15	0 - 100	0 - 100	0 - 100	0 - 100
±12	0 - 100	0 - 100	0 - 100	0 - 100
±15	0 - 100	0 - 100	0 - 100	0 - 100

✻If you use a ceramic capacitor, keep the capacitance within the rage between about 0.1 to 22uF.

✻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 noise is created on the load side, connect a capacitor externally to the load as shown below.

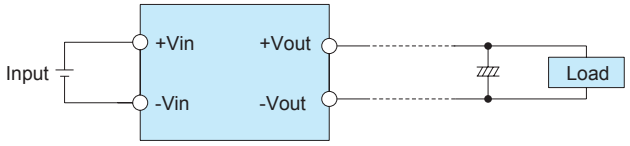


Fig2.4 Connecting Example

3 Series/Redundancy Operation

3.1 Series Operation

■Series operation is available by connecting the outputs of two or more power supplies, as shown below. Output current in series connection should be lower than the lowest rated current in each unit.

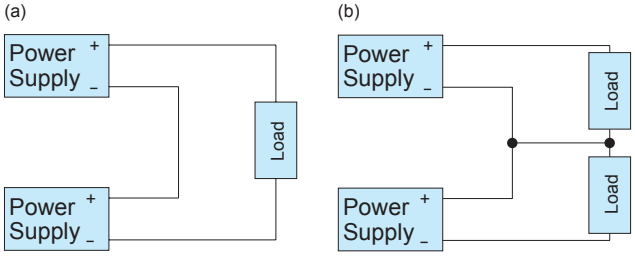


Fig.3.1 Examples of series operation

3.2 Redundancy Operation

■Parallel operation is not possible.

■Redundancy operation is available by wiring as shown below.

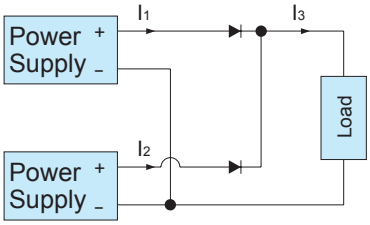


Fig.3.2 Redundancy operation

■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 for each power supply.

$I_3 \leqq$ 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 (Ip), which flows when a DC-DC converter starts up.

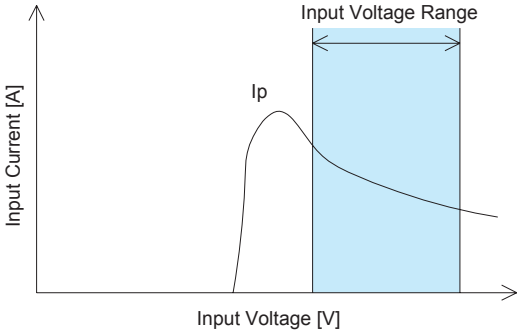


Fig.4.1 Input Current Characteristics

5 Cleaning

■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.

●Safety approved fuse must be externally installed on input side.

7 Temperature Measuring Point

■Please have sufficient ventilation to keep the temperature of point A in Fig.7.1 at Table7.1 or below. Please also make sure that the ambient temperature does not exceed 85℃.

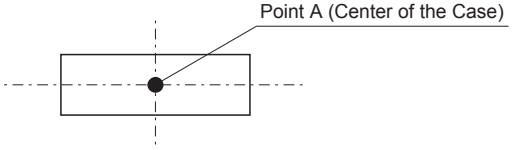


Fig.7.1 Temperature Measuring Point on the case (Top View)

Table 7.1 Point A Temperature

Model	MG1R5	MG3	MG6	MG10
Point A	110℃	110℃	105℃	105℃

8 Lifetime expectancy depends on stress by temperature difference

■Regarding lifetime expectancy design of solder joint, following contents must be considered. Be careful that the soldering joint is not stressed by temperature rise and down which occures by self-heating and ambient temperature change. The stress is accelerated by thermal-cycling, therefore the temperature difference should be minimized as much as possible if temperature rise and down occures frequently.

8.1 MG1R5/MG3 Lifetime expectancy depends on stress by temperature difference

■Product lifetime expectancy depends on case temperature difference (Tc) and number of cycling in a day is shown in Fig.8.1, Fig.8.2 (It is calculated based on our accelerated process test result.) If case temperature changes frequently by changing output load factor etc., the above the lifetime expectancy design should be applied as well. And point A which is shown in Fig.8.3 must keep below 110℃.

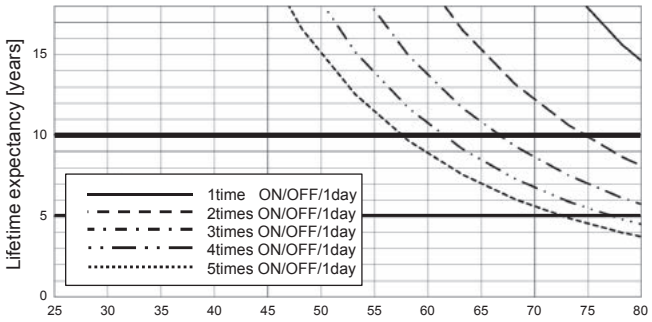


Fig.8.1 Lifetime expectancy against rise/fall temperature difference (MG1R5)

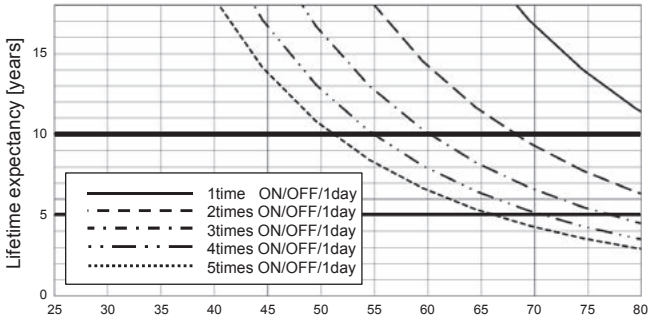


Fig.8.2 Lifetime expectancy against rise/fall temperature difference (MG3)

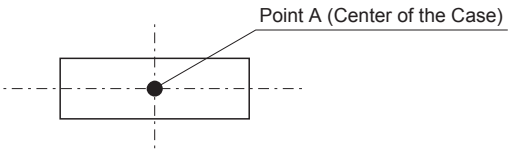


Fig.8.3 Temperature Measuring Point on the case (Top View)

■The warranty period is basically 10 years, however it depends on the lifetime expectancy which is shown in Fig.8.1, Fig.8.2 if it is less than 10 years.

8.2 MG6/MG10 Lifetime expectancy depends on stress by temperature difference

■Product lifetime expectancy depends on case temperature difference (Tc) and number of cycling in a day is shown in Fig.8.4, Fig.8.5 (It is calculated based on our accelerated process test result.) If case temperature changes frequently by changing output load factor etc., the above the lifetime expectancy design should be applied as well. And point A which is shown in Fig.8.6 must keep below 105℃.

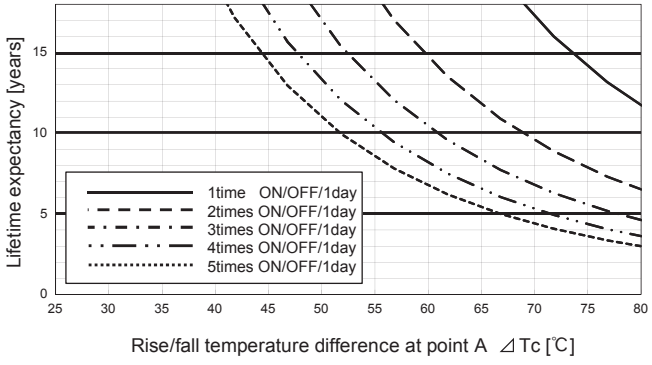


Fig.8.4 Lifetime expectancy against rise/fall temperature difference (MG6)

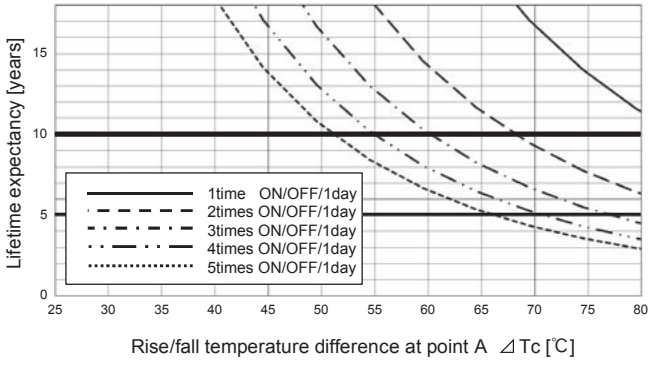


Fig.8.5 Lifetime expectancy against rise/fall temperature difference (MG10)

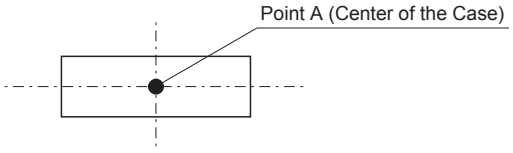


Fig.8.6 Temperature Measuring Point on the case (Top View)

■The warranty period is basically 10 years, however it depends on the lifetime expectancy which is shown in Fig.8.4, Fig.8.5 if it is less than 10 years.