Input 48V output 50V5.6A Isolated DC / DC converter module

UR129A

November,28 2018

Summary

UR129A is an insulated DC/DC converter module for 48V intermediate buses.

Feature

- Outputs 50V 5.6A 280W
- Outline 58.4mm×22.76mm×15.7mm (W×D×H)
- Weight 30g
- All-in-one
- Design free
- High Efficiency 93% typ. (Vin=48V, Io=5.6A)
- Smaller size achieved by high-frequency switching technology
- Security measure
  Over Current Protection
  Over Voltage Protection
  Thermal Shut Down

Appearance

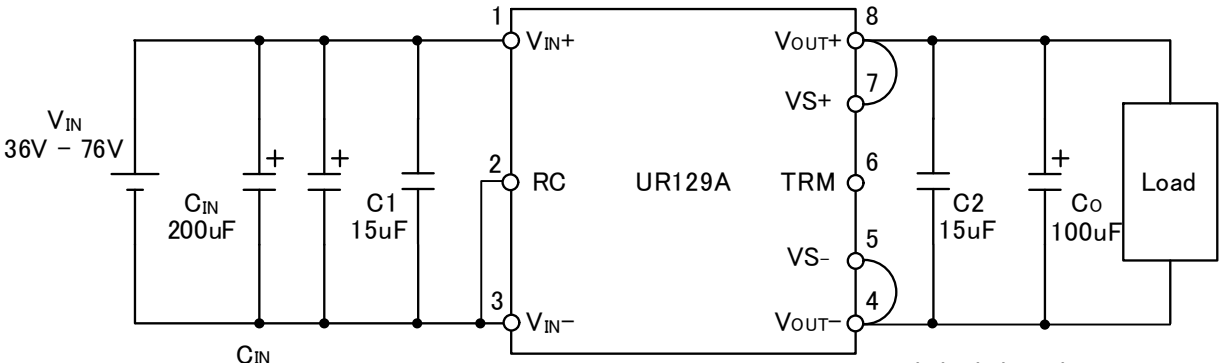
Main specifications

Input voltage range DC36 to 76V
Conversion frequency 200kHz

RoHS directive compliance

Judgment based on EU Directive 2002/95 / EC, and excluding non-regulated items, lead, cadmium, mercury, hexavalent chromium, and PBB and PBDE of specified brominated flame retardants meet the prescribed standards Indicates a thing.

Standard application



CIN
Electrolysis capacitor: 100V 100uF×2
C1
Ceramic capacitor: 15uF

CO hybrid electrolytic capacitor
63V100uF
C2
Ceramic capacitor: 15uF

Standard connection diagram

- Be sure to ground yourself when handling the module. Use a wrist strap to ground the human body, and insert a 1MΩ resistor near the human body to prevent electric shock.
- At the input side, attach an electrolytic capacitor of about CIN = 100uF x 2 and a ceramic capacitor of about C1 = 15uF.
- Attach a conductive polymer hybrid electrolytic capacitor with CO = 100uF or more and a ceramic capacitor with C2 = 15uF on the output side. (Hybrid electrolytic capacitor: 800uFmax)
  * Cin is equivalent to 100ZLJ100M10X20 made by Rubycon (100V100uF),
  We recommend using Nippon Chemi-Con's HHSC630E101MJC5S or equivalent (63V100uF) for the capacitor.
- Output ripple may be greatly amplified due to wiring and so on, so it is recommended to check the operation on the set.

Specifications (Ta = 25 ° C unless otherwise specified)

Item		Acceptance criteria			Unit	Remarks
		MIN.	TYP.	MAX.		
Input voltage range		36	48	76	V	
Input current		-	6.3	-	A	at V_{IN}= 48V I_O= 5.6A
Efficiency	(1)	-	93	-	%	at V_{IN}= 48V I_O= 5.6A
Rated output voltage		-	50	-	V	
Output current		0	-	5.6	A	
Maximum output power		-	-	280	W	
Output Voltage Initial Setting		49.5	-	50.5	V	at V_{IN}=48V Io=5.6A
Voltage fluctuation	(2)	-	-	1.9	V	
Static input fluctuation		-	-	450	mV	V_{IN}= 40V to 76V
Static load fluctuation		-	-	650	mV	V_{IN}= 40V to 76V
Output Ripple Noise Voltage	(3)	-	-	450	mV_{P-P}	
Voltage variable range	(4)	45	-	55	V	
Output overcurrent protection		7.2	-	-	A	Over-current value can be lowered by changing software. （Optional function）
Output overvoltage protection		56	-	67	V	
Operating temperature range		−40	-	100	℃	Aluminum base plates
		−40		85	℃	Ambient temperature
Storage humidity range		10	-	90	%	No condensation
Storage temperature range		−55	-	125	℃	
Storage humidity range		5	-	95	%	No condensation
Vibration resistance		Frequency: 10-55Hz Acceleration: 49.0 m/s2 Period: 3 minutes Vibration direction: X, Y, Z Vibration time: 1 hour each				Non-operating
Shock resistance		Falling from the 50mm height to the concrete surface, The number of drops is 5 on each side.				No non-operating No failure
Withstanding voltage	Input-output	DC1500V 1 minute or AC500V 1 minute Cut-off Current 10mA, DC500V 50MΩ min				
	Inputs-Baseplate	DC1500V 1 Minute or AC500V 1 Minute Cut-Off Current 10mA, DC500V 50MΩ min				
	Outputs-Baseplate	AC500V 1 Minute Cut-Off Current 10mA, DC500V 50MΩ min				
Safety standard		UL62368-1, C-UL(CSA62368-1), DEMKO EN62368-1 acquisition				
Operating life		10 Year				According to JEITA RCR-9102B
Product mass		-	30	-	g	
Product externals	W × D × H	58.4×22.76×15.7			mm	See External Dimensions for details

(1) Aluminum base plate temperature 25°C

(2) Values are for all input voltage, resistive load condition and temperature range.
Excludes instantaneous voltage drops at the time of sudden load changes.

(3) For Ripple measurement, see Ripple Measurement Circuit.

(4)When the input voltage range is 36V to 40V, there is an upper limit value of the output variable range.
Refer to output-voltage variable term.

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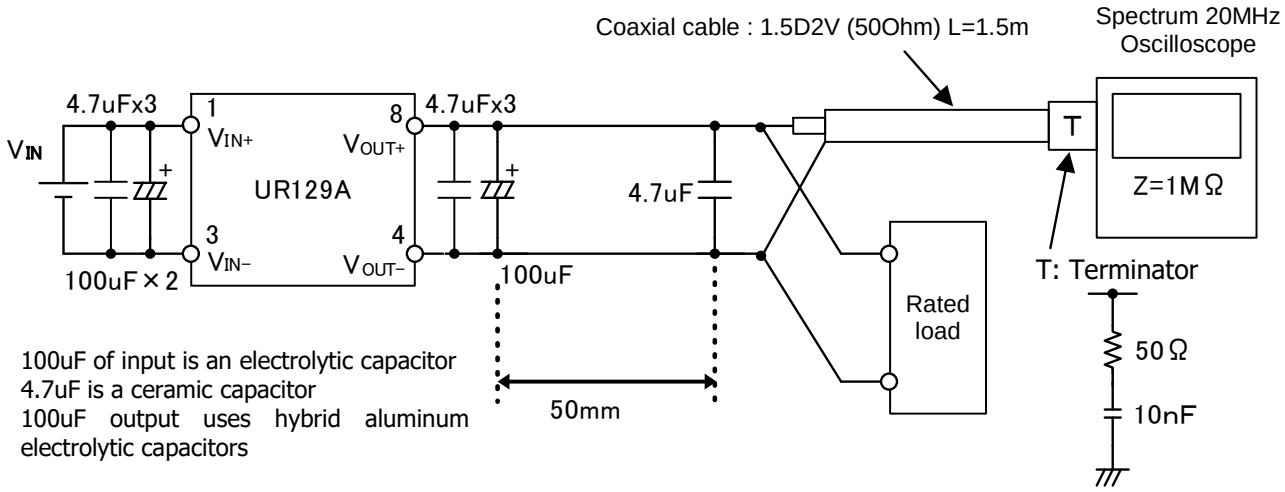
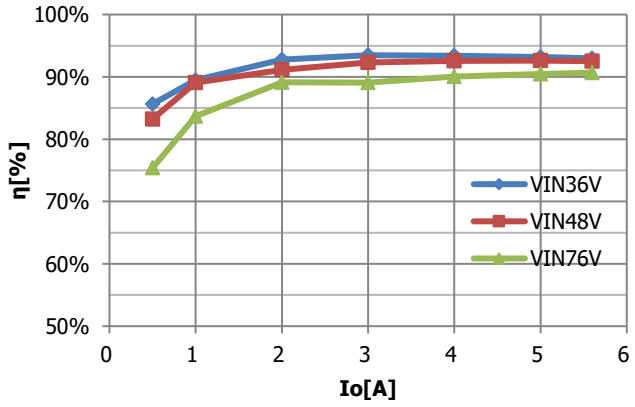


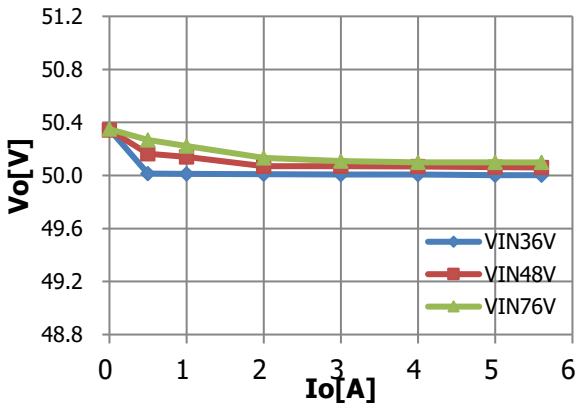
Ripple Measurement Circuit

Typical characteristics

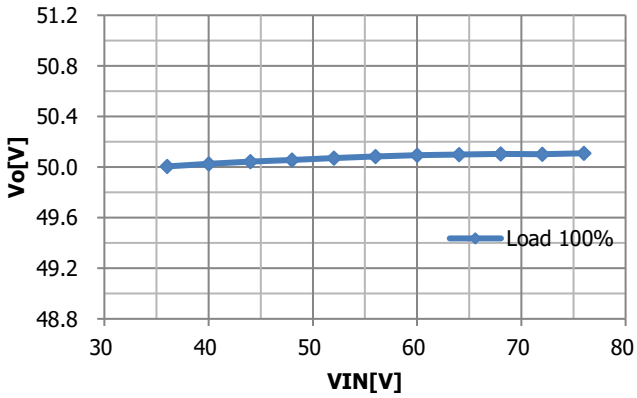
Efficiency



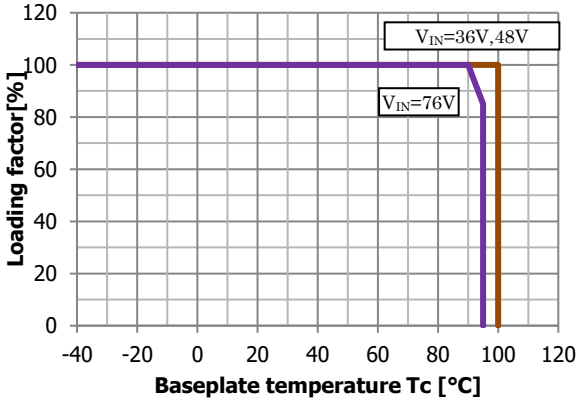
Load regulation



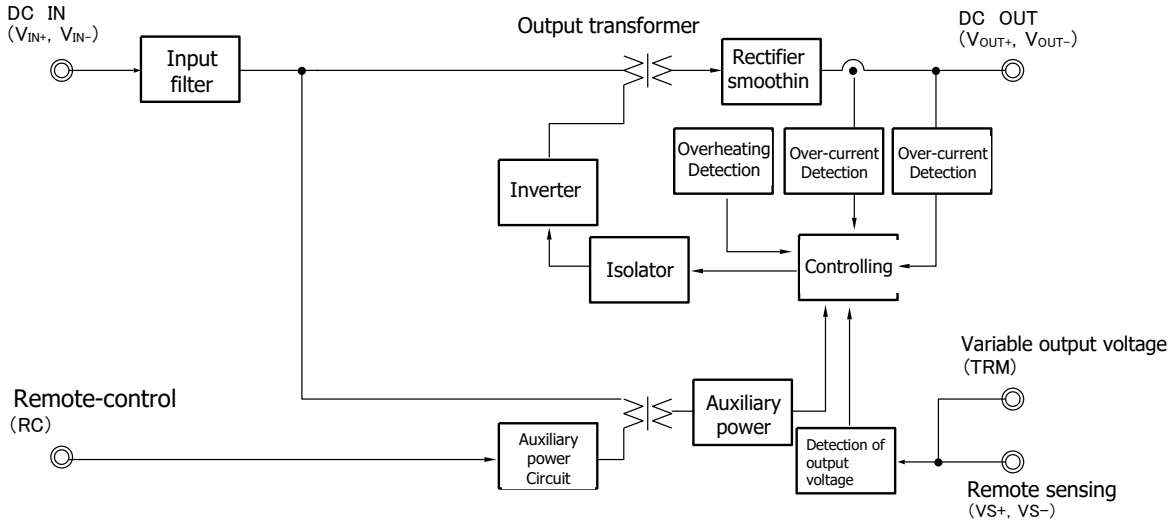
Line regulation



Temperature rating



Block diagram



Terminal layout

Terminal number	Symbol	Functioning
1	V_{IN+}	＋Input-terminal
2	RC	Remote-control
3	V_{IN-}	－Input-terminal
4	V_{OUT-}	－Output-terminal
5	VS－	－Remote sensing
6	TRM	Output Voltage Variable Terminal
7	VS＋	＋Remote sensing
8	V_{OUT+}	＋Output-terminal

Terminal function

1. V_{IN+}
   DC / DC converter positive input terminal. Supply 36 to 76 VDC between this terminal and the VIN- terminal.
2. RC
   This DC/DC converter is operated by connecting this terminal to the VIN-.
   The DC / DC converter stops when 5V is supplied to this terminal or when it is opened.
3. V_{IN-}
   This is the negative input terminal of the DC/DC converter.
   Supply 36 to 76 VDC between this terminal and the VIN + terminal.
4. V_{OUT-}
   This is the negative terminal of the DC/DC converter.
   Outputs are taken from this terminal and the Vout+ terminal.
5. VS－
   Remote sensing terminal on the negative pole.
   Voltage between VS+ and VS-terminals is converted to a constant voltage.
6. TRM
   Output Voltage Adjustment Terminal.
   Voltage between VS+ and VS-terminals is converted to a constant voltage.
7. VS＋
   Positive remote sensing terminal. Voltage between VS+ and VS-terminals is converted to a constant voltage.
8. V_{OUT+}
   Positive terminal of DC/DC converter. Take the outputs from this terminal and Vout-terminal.

Input fuse

UR129A has no built-in fuse. To improve the safety of the equipment, mount a normal blow type fuse. Attach the fuse to the Vin (+) side when the Vin (-) side is grounded, and to the Vin (-) side when the Vin (+) side is grounded.

Input Fuse Recommended Current Rating: 15A

Input capacitor

Connect the following capacitor between VIN + and VIN- pins to prevent the input line inductance from affecting the DC-DC converter.

TC =-40 to +100°C 100μ F×2 or more

If the input ends of the DC-DC converter are directly turned on or off using switches or other means, surge voltages may be generated due to the effect of the input line's Inductance, etc., and DC-DC converters may fail. In such cases, increase the capacity value above to absorb surge.

Output capacitor

For stable operation of the DC-DC converter and reduction of output ripple noise, connect the following hybrid electrolytic capacitor between VOUT + and VOUT− terminals within 50mm from the output end. (Nippon Chemi-Con's HHSC630E101MJC5S or equivalent)

TC = -40 ～ + 100 ℃ 100μ F or more
Maximum capacity: 800μ F

If the load current fluctuates rapidly, the output voltage may undershoot significantly. Load response characteristics can be improved by increasing the number of output hybrid electrolytic capacitors.

A ripple current flows through the hybrid electrolytic capacitor. When selecting a hybrid electrolytic capacitor, check the allowable ripple current value before selecting components. Check the actual ripple current value with the actual device.

Over Current Protection (OCP)

Although a built-in over current protection circuit is used, avoid using a short circuit or overcurrent. When the overcurrent protection circuit operates, the output is cut off. After that, it will return automatically after about 5 seconds. The overcurrent value can be reduced by changing the software (optional). Please contact us for details.

Over Voltage Protection (OVP)

Built-in over voltage protection function (OVP). When OVP operates, the output is shut off. UR129 is a latch stop type OVP. When this function is activated, the output can be returned by re-inputting or resetting the ON / OFF terminal (RC terminal).

Thermal Shut Down (TSD)

Built-in thermal shut down function (TSD). When the base plate temperature exceeds 110 ° C, the TSD function operates and shuts off the output. The output shut-off state by TSD is released by lowering the base plate temperature.

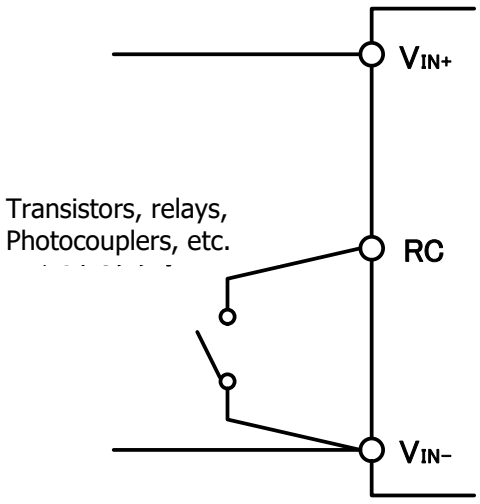
For details of each protection circuit operation and its conditions, see page 8, Table of each protection function and its conditions.

Remote-control

By controlling between the RC terminal and the VIN- terminal, output ON / OFF control can be performed.

Between RC and VIN-	Output voltage
L Levels (0 to 1.5V) or short	ON
H Levels (4 to 7V) or open	OFF

When the RC terminal is at L level, the outflow current is up to 6mA.
When the RC terminal is opened, a 5V occurs at the RC terminal.



When not using the remote control function, short the RC and VIN-terminals.

Remote sensing

There is a remote sensing function that compensates for the voltage drop caused by wiring from the output terminal of the DC-DC converter to the load terminal. If the remote sensing function is not required, short the VS + and VOUT + terminals and the VS- and VOUT- terminals with the shortest distance. Use shielded wires, twisted pair wires, parallel patterns, etc. for the remote sensing wires to reduce the effects of noise. Use the voltage at the power output terminal within the output voltage variable range.

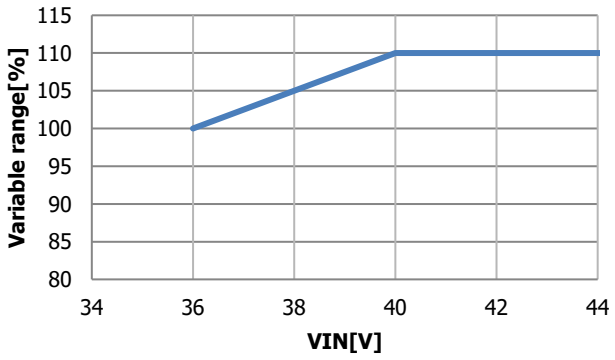
Variable output voltage

The output voltage can be changed within the following range by externally connecting a resistor and a variable resistor using the TRM pin. Note, however, that raising the output voltage beyond the following range may activate the overvoltage protection function. When not adjusting the output voltage, leave the TRM terminal open.

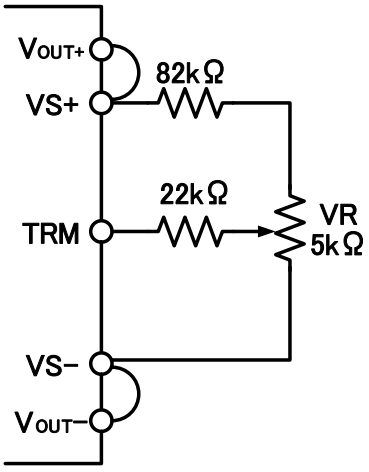
Output variable range:-10% to +10% of the rated output voltage

When using it simultaneously with the remote sensing function, make sure that the sum of the voltage drop due to the wiring from the output terminal to the load terminal and the variable output voltage does not exceed the variable output range.
Also, when the output voltage is variable, use the output power and output current of the DC-DC converter within the maximum output value.

* When the input voltage range is 36V to 40V, the upper limit of the output variable range is as shown in the figure.

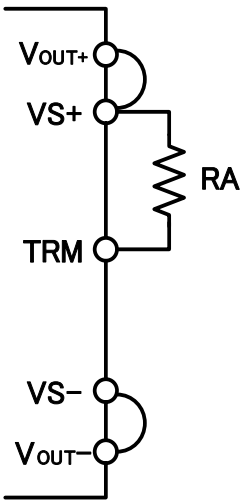


When adjusting output voltage



Connections diagram

When setting the output voltage high



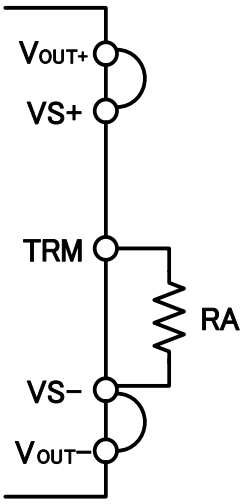
Connections diagram

$$RA = \frac{5.4 \times Vo \times (1+\Delta)}{1.65 \times \Delta} - \frac{5.4}{\Delta} - 11 \quad [k\Omega]$$

$$\Delta = \frac{Vset - Vo}{Vo}$$

Vo : Rated output voltage
Vset : Set Voltage

When setting the output voltage to a low level



Connections diagram

$$RA = \frac{5.4}{\Delta} - 11 \quad [k\Omega]$$

$$\Delta = \frac{Vo - Vset}{Vo}$$

Vo : Rated output voltage
Vset : Set Voltage

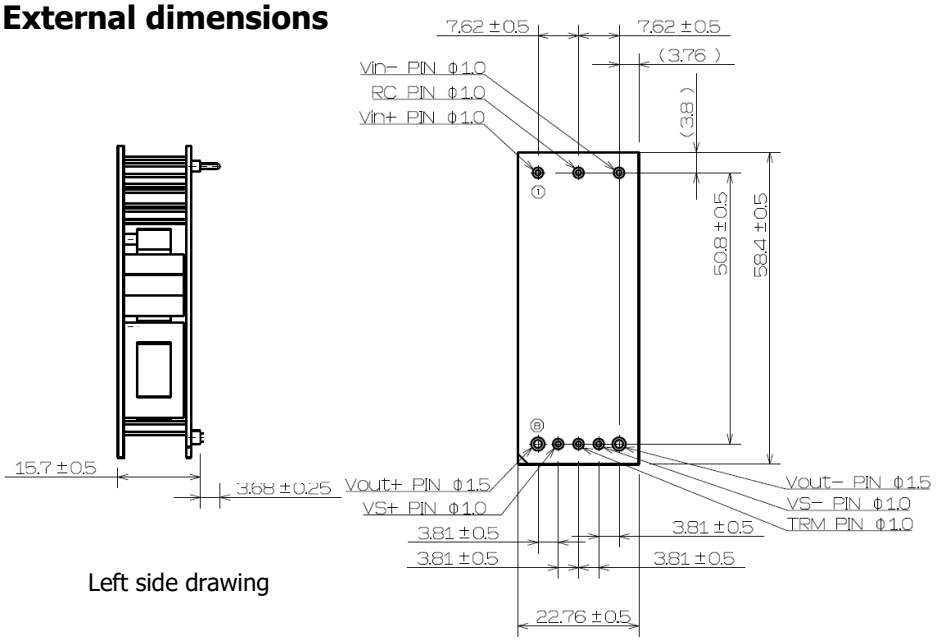
Withstanding voltage

When conducting pressure resistance tests for acceptance inspections, etc., increase the voltage gradually, without putting the test voltage into the test from the beginning. Also, lower the voltage gradually when cutting off. In particular, for pressure-resistant testing equipment with timers, a number of times the applied voltage may be generated as soon as the switches are terminated.

Safety standard

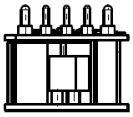
There is no basic insulation, double insulation or reinforced insulation in any combination between the input, output and base plate of this device. When the input voltage exceeds 60V DC, if the above insulation is required, please satisfy with the structure of the final product.
Use an external fuse (15A) certified to safety standards for input.

External dimensions



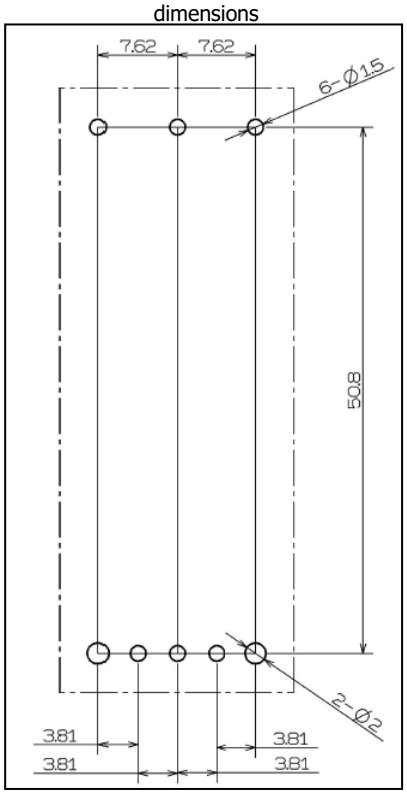
Left side drawing

Front view (1:1)



Bottom view

Recommended PCB processing dimensions

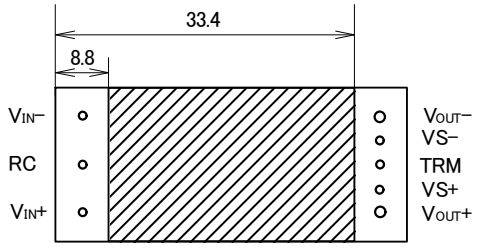


NOTES:
1) Unit：mm
2) Without instructions, the tolerance is ±0.5mm .
3) The dimension indicated by () is a reference dimension.
4) Consider the tolerance fully when designing the terminal holes of the parts.

Board mounting method

- Pattern Wiring Prohibited Area

Avoidance of the diagonal part of the diagram should be avoided when implementing power modules. If it is wired to the diagonal line, it may cause an insufficient insulation.



- Board mount holes

Please determine the size of the holes of the printed circuit board by referring to the recommended printed circuit board processing dimension diagram and the size below.

Terminals names	Board Mounting Holes
V_{IN}+、RC、V_{IN}-、VS-、TRM、VS+	φ1．5
V_{OUT}+、V_{OUT}-	φ2．0

- Conductive Heat Release by Aluminum Base Plate

When using the aluminum base plate for conduction and heat dissipation from the aluminum base plate to the equipment housing, etc., be careful not to apply unbalanced load or stress to the aluminum base plate.

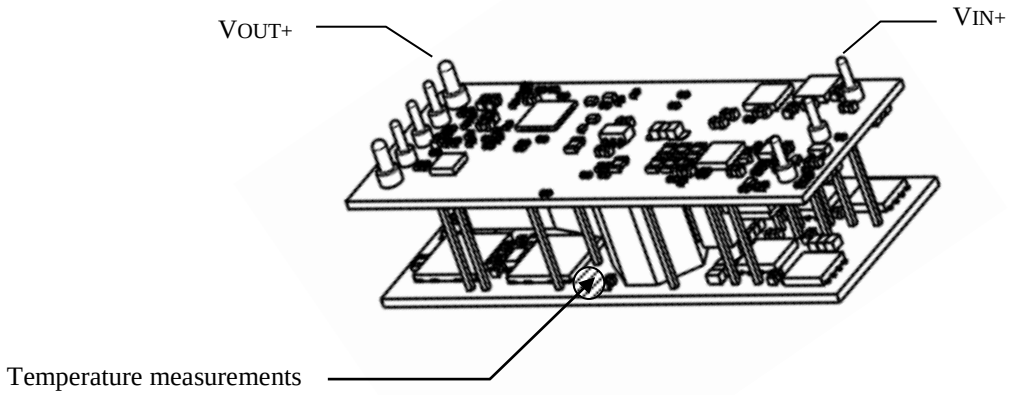
Each protection function and its conditions

Protection function	Stop condition	Stop state	Reversion method
OVP	Output Voltage: 56V or more	Latch Stop	RC ON/OFF and power re-supply
OCP	Output current:7.2A or higher	5s Stopped	Automatic return
High-speed OCP (When an excessive current flows instantaneously due to a load short circuit, etc.)	Base plate temperature: 110°C or less	5s Stopped	Automatic return
	Base plate temperature: 110°C or more	Latch Stop	RC ON / OFF Power on again (Please re-enter at 100 ℃ or less)
TSD (heat release fins are required (1))	Base plate temperature: 110°C or more	Stop	Automatic recovery at 100°C or below

(1) In the absence of heat dissipation fins, there is a risk that the power supply may fail due to insufficient temperature protection.

Base Plate Thermal Measurement Point

The temperature should not exceed 100°C at the point of temperature measurement.

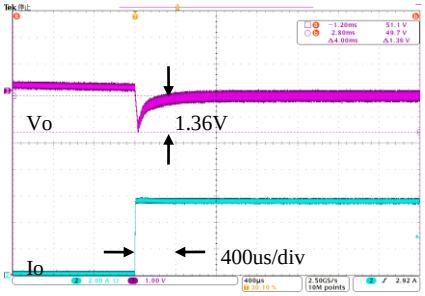


Capacitor Capacity and Load Response Characteristics

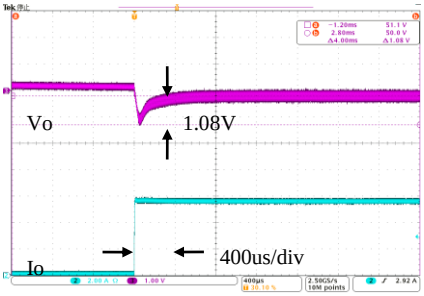
The load response characteristics can be improved by increasing the hybrid electrolytic capacitor of the output.

Typical Load Response Characteristics

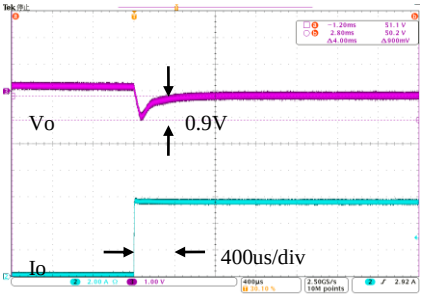
Input Voltage 60V　　Load conditions 0%⇒100%



Co：100uF



Co：200uF



Co：300uF

Precautions for use

Pay attention to the precautions as it may cause a loss of reliability depending on the storage environment and the handling method for characteristic inspection.

Precautions for storage

- The storage environment is preferably room temperature (5 to 35 ° C) and room humidity (40 to 75%), and avoid locations with high temperature, high humidity, and large changes in temperature and humidity.
- Avoiding direct sunlight in a place that does not generate harmful gases such as corrosive gases and is free of any dust.
- For products that have been stored for a long period of time, check the soldering property and lead rust before using them.

Characteristics Analysis and Precautions for Handling

- When conducting characterization inspections such as incoming inspections, pay careful attention to the application of surge voltage from the measuring instrument, short between terminals, and incorrect connection. Also, do not measure it above the rating.
- Do not use the product in an overloaded condition, as this may cause a breakdown.

Attaching method

- Ensure that the temperature of the power supply does not exceed the temperature range indicated by the Derating Characteristics so that sufficient cooling effects can be obtained.
- When using heat-dissipating silicone grease to conduct and radiate heat from the aluminum base plate, apply an appropriate amount evenly. If applied more than necessary, excessive stress will be applied.
- Silicone grease for heat radiation that has been left for a long time will cause the heat radiation effect to deteriorate due to cracks and cause cracks when screws are fixed.
- Be careful not to allow any foreign matter to enter the silicone lease for heat dissipation. Foreign matter may damage heat dissipation, or if an insulating sheet is used, it may damage the insulating sheet and cause an insufficient insulation.
- We recommend the following silicone leases for heat dissipation and their equivalents.

Product name Type	Manufacturer's name
G747	Shin-Etsu Chemical Co., Ltd.
YG6260	Momentive Performance Materials Japan LLC
SC102	Toray Dow Corning Silicone Co., Ltd.

Soldering method

- When soldering, be sure to work in as short a time as possible within the following conditions.
  ・260±5°C 15sec.
  ・450±5°C 5sec. （Soldering iron）

Handling Precautions for Prevention of Static Damage

- When handling modules, take care of human body earth. Use a wrist strap or the like for the human body grounding, and place a 1MΩ resistor close to the human body to prevent electric shock.
- Place a conducting table mat, floor mat, etc. on the platform handling the module, and take the earth.
- When using a measuring instrument such as a curve tracer, also take a ground.
- When soldering, ground the tip of the soldering iron or dip tank to prevent leakage voltage of the soldering iron or dip tank from being applied to the module.
- Use our shipped containers for the modules, or use electrostatic containers, aluminum foil, and other materials to take anti-static measures.

Forward-Looking Statements

- The content specified herein is subject to change without notice due to improvements and other reasons. Before using the product, confirm that the information is up to date.
- The operation examples and circuit examples described in this document are shown for reference in use, and our company or a third party may infringe on industrial property, intellectual property, or other infringement rights caused by these. Does not take any responsibility.
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