

220VAC Input/−12VDC (250mA) Output

# Non-Isolated AC/DC Converter

**BP5053-12**

## ● Absolute Maximum Ratings

Parameter	Symbol	Limits	Unit	Conditions
Input voltage	$V_i$	−420	V	DC
Operating temperature range	$T_{opr}$	−20 to +80	°C	Refer to derating curve
Storage temperature range	$T_{stg}$	−25 to +105	°C	
Allowable maximum surface temperature	$T_{cmax}$	105	°C	Ambient temperature + the module self-heating $\leq T_{cmax}$
Maximum Output current	$I_o$	250	mA	PEAK value of current

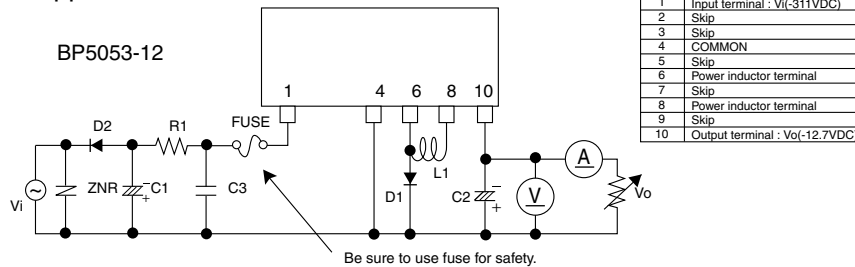
## ● Electrical Characteristics

Unless otherwise specified  $T_a=25^\circ\text{C}$ ,  $V_i=311\text{V}$ ,  $I_o=250\text{mA}$

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage range	$V_i$	−240	−311	−390	V	DC
Output voltage	$V_o$	−12.0	−12.7	−13.4	V	
Output current	$I_o$	−	−	250	mA	*1
Line regulation	$V_r$	−	0.01	0.20	V	$V_i = -240$ to $-390\text{V}$
Load regulation	$V_l$	−	0.10	0.20	V	$I_o=0$ to $250\text{mA}$
Output ripple voltage	$V_p$	−	0.04	0.20	Vp-p	*2
Power conversion efficiency	$\eta$	72	78	−	%	

\*1 Max output current should be reduced according to the surrounding temperature.  
\*2 The output ripple voltage may vary depending on the capacitance, environment, and location of peripheral components.

## ● Application Circuit



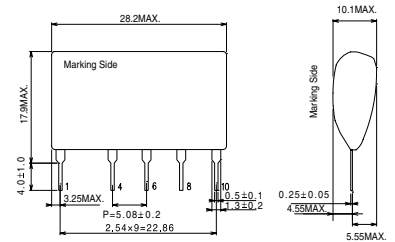
Pin No.	Function
1	Input terminal : $V_i(-311\text{VDC})$
2	Skip
3	Skip
4	COMMON
5	Skip
6	Power inductor terminal
7	Skip
8	Power inductor terminal
9	Skip
10	Output terminal : $V_o(-12.7\text{VDC})$

Please verify operation and characteristics in the customer's circuit before actual usage.  
Ensure that the load current does not exceed the maximum rating.

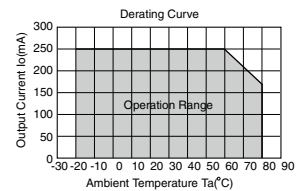
### External Component Specifications

- FUSE: fuse Use a quick-acting fuse (1.0A)
- C1: Input capacitor Above 450V, 22 to 100 $\mu\text{F}$   
Ripple current is 0.7Arms or greater
- C2: Output capacitor Above 30V, 220 to 1000 $\mu\text{F}$ , Low impedance  
ESR 0.18 $\Omega$  max.  
Ripple current is 0.65Arms or higher.  
Capacitor impedance affects the output ripple voltage.
- C3: Noise removal capacitor Above 450V, 0.1 to 0.22 $\mu\text{F}$  film or ceramic capacitor  
Evaluate under actual operating conditions.
- L1: Power inductor Inductance : 1.0mH, Rating current: above 0.74A  
Select components that do not easily get magnetically saturated at high temperature.  
Recommended part : C13FR (MITSUMI)
- R1: Noise reduction resistor 10 to 22 $\Omega$  1/4W  
Determine the ideal value through actual testing.
- D1: Flywheel diode Above 600V, current : above 2.0A, Fast recovery diode  
Please note that both the switching and efficiency characteristics of the module are affected by this diode.  
Recommended part : CMF01 (Toshiba)
- D2: Rectifier diode Use a rectifying diode with a peak reverse voltage of 800V or higher, an average rectification current of 1A or large and a peak surge current of 20A or large. When using a large capacitance input capacitor, select a component that is strong against inrush current at power up. Full-wave rectification can be used.
- ZNR: Varistor A varistor is required to protect against lightning surges and static electricity.

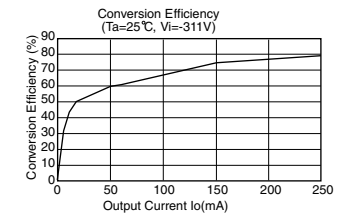
## ● Dimensions (Unit : mm)



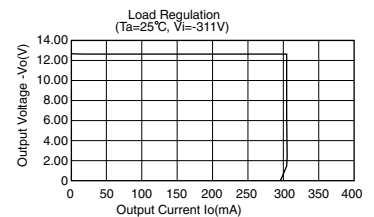
## ● Derating Curve



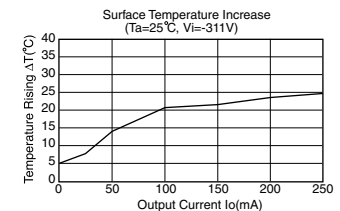
## ● Conversion Efficiency



## ● Load Regulation



## ● Surface Temperature Increase



# Power Module Usage Precautions

## Safety Precautions

- 1) The products are designed and manufactured for use in ordinary electronic equipment (i.e. AV/OA/telecommunication/amusement equipment, home appliances). Please consult with the Company's (ROHM) sales staff if intended for use in devices requiring high reliability (e.g. medical/transport/aircraft/spacecraft equipment, nuclear power/fuel controllers, automotive/safety devices) and whose malfunction may result in injury or death. In this case, failsafe measures must be taken, including the following:
  - [a] Installation of protection circuits in order to improve system safety
  - [b] Incorporation of redundant circuits in the case of single-circuit failure
- 2) The products are designed for use under normal conditions. Application in special environments can cause a deterioration in product performance. Therefore, verification and confirmation of product performance, prior to use, is recommended. The following environments are considered to be 'special':
  - [a] Outdoors, exposed to direct sunlight or dust
  - [b] In contact with liquids, such as water, oils, chemicals, or organic solvents
  - [c] In areas where exposure to the sea air or corrosive gases (i.e. Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>) can occur
  - [d] In places where the products may be in contact with static electricity or electromagnetic waves
  - [e] In proximity to heat-producing items, plastic cords, or flammable materials
  - [f] In contact with sealing or coating products, such as resin
  - [g] In contact with unclean solder or exposed to water or water-soluble cleaning agents used after soldering
  - [h] In areas where dew condensation occurs
- 3) The products are not designed to be radiation resistant
- 4) The Company is not responsible for any problems resulting from use of the products under conditions not recommended herein.
- 5) The Company should be notified of any product safety issues. Moreover, product safety issues should be periodically monitored by the customer.

## Application Notes

- 1) A sufficient margin must be allowed if changes are made to the peripheral circuit due to variations in the inherent tolerances of the external components as well as transient and static characteristics. In addition, please be aware that the Company has not conducted investigations on whether or not particular changes in the example application circuits would result in patent infringement.
- 2) The application examples, their constants, and other types of information contained herein are applicable only when the products are used in accordance with standard methods. Therefore, if mass production is intended, sufficient consideration to external conditions must be made.

## Notes Regarding Industrial Property

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  - [b] Problems arising from the use of the products listed herein
- 3) The Company prohibits the purchaser from exercising or using the intellectual/industrial property rights or any rights belonging to or are controlled by the Company, other than the right to use, sell, or dispose of the products.

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