220VAC Input/–12VDC (250mA) Output

Non-Isolated AC/DC Converter

BP5053-12

● Absolute Maximum Ratings

Parameter	Symbol	Limits	Unit	Conditions
Input voltage	Vi	–420	V	DC
Operating temperature range	Topr	–20 to +80	℃	Refer to derating curve
Storage temperature range	Tstg	–25 to +105	℃	
Allowable maximum surface temperature	Tcmax	105	℃	Ambient temperature + the module self-heating ≦Tcmax
Maximum Output current	Io	250	mA	PEAK value of current

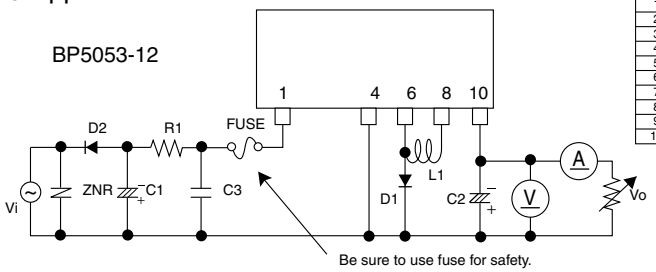
● Electrical Characteristics

Unless otherwise specified Ta=25°C, Vi=311V, Io=250mA

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage range	Vi	–240	–311	–390	V	DC
Output voltage	Vo	–12.0	–12.7	–13.4	V	
Output current	Io	–	–	250	mA	∗1
Line regulation	Vr	–	0.01	0.20	V	Vi= –240 to –390V
Load regulation	Vl	–	0.10	0.20	V	Io=0 to 250mA
Output ripple voltage	Vp	–	0.04	0.20	Vp-p	∗2
Power conversion efficiency	η	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



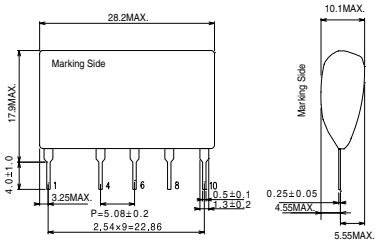
Pin No.	Function
1	Input terminal : Vi(-311VDC)
2	Skip
3	Skip
4	COMMON
5	Skip
6	Power inductor terminal
7	Skip
8	Power inductor terminal
9	Skip
10	Output terminal : Vo(-12.7VDC)

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

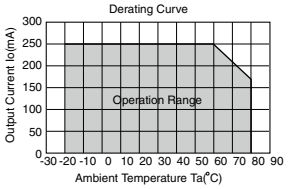
External Component Specifications

FUSE: fuse	Use a quick-acting fuse (1.0A)
C1: Input capacitor	Above 450V, 22 to 100μF Ripple current is 0.7Arms or greater
C2: Output capacitor	Above 30V, 220 to 1000μF ,Low impedance ESR 0.18Ω max. Ripple current is 0.65Arms or higher. Capacitor impedance affects the output ripple voltage.
C3: Noise removal capacitor	Above 450V, 0.1to 0.22μF 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 22Ω 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.

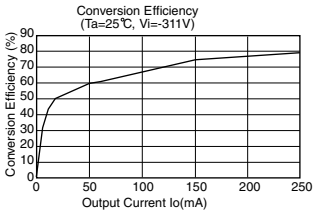
●Dimensions (Unit : mm)



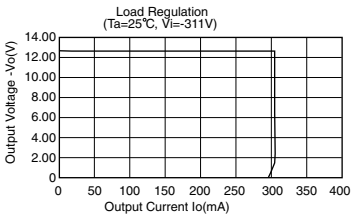
●Derating Curve



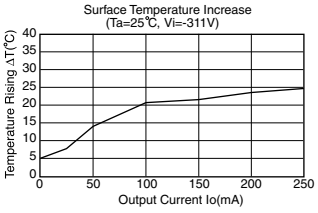
● Conversion Efficiency



●Load Regulation



●Surface Temperature Increase



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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_2, H_2S, NH_3, SO_2, NO_2) 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.

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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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