

100-220VAC Input/5VDC (500mA) Output

# Isolated AC/DC Converter

**BP5720-5**

## ● Absolute Maximum Ratings

Parameter	Symbol	Limits	Unit	Conditions
1-pin input voltage	V <sub>D</sub>	500	V	
4-pin input voltage	V <sub>Nd</sub>	+30 / -5	V	
1-pin input current	I <sub>D</sub>	250	mA	
Maximum power	P <sub>o</sub>	2.5	W	Refer to the derating curve
Withstanding voltage	V <sub>I</sub>	2.5	kVrms	1 sec (primary - secondary : 1 - 6Pin, 9 - 12Pin short)
Allowable maximum surface temperature	T <sub>cmax</sub>	105	°C	Ambient temperature + The module self-heating ≤ T <sub>cmax</sub>
Operating temperature range	T <sub>opr</sub>	-25 to +80	°C	
Storage temperature range	T <sub>stg</sub>	-25 to +105	°C	

## ● Electrical Characteristics

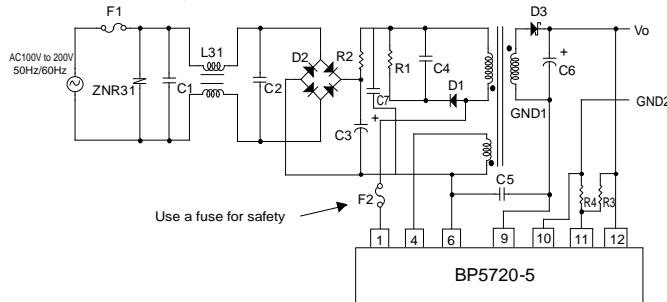
(Unless otherwise noted, V<sub>i</sub>=141V, I<sub>o</sub>=500mA, T<sub>a</sub>=25°C) (V<sub>o</sub>=5V, R<sub>3</sub>/R<sub>4</sub>=open)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	V <sub>i</sub>	113	141	374	V	I <sub>o</sub> =500mA
Output voltage	V <sub>o</sub>	4.75	5.0	5.25	V	
Output current	I <sub>o</sub>	0	-	500	mA	
Line regulation	ΔV <sub>r</sub>	-	10	100	mV	V <sub>i</sub> =113V to 374V
Load regulation	ΔV <sub>L</sub>	-	15	100	mV	I <sub>o</sub> =0mA to 500mA
Output ripple voltage	Δγ	-	100	250	mVp-p	V <sub>i</sub> =141V *1
Power conversion efficiency	η	70	78	-	%	

\*1: Measured peak-to-peak, ripple current bandwidth (spike noise not included).

## ● Application Circuit

External Component Layout



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

Pin No.	Name	Function
1	Np-	Connect the negative side of the primary coil of the external transformer.
2	NC	NC pin
3	Skip	Skip
4	Nd+	This is connected to the plus side of the base coil wire of the external transformer.
5	NC	NC pin
6	V <sub>i</sub> (-)	This is the primary side input minus terminal.
7	Skip	Skip
8	Skip	Skip
9	GND1	End of secondary output smoothing capacitor terminal.
10	GND2	Secondary 5V output GND terminal.
11	VADJ	Secondary output voltage fine-tuning terminal. Resistor has to be inserted between GND2 or V <sub>o</sub> terminals.
12	V <sub>o</sub>	This is the secondary side 5V output voltage control terminal. Insert the output smoothing capacitor 470 μF between GND.

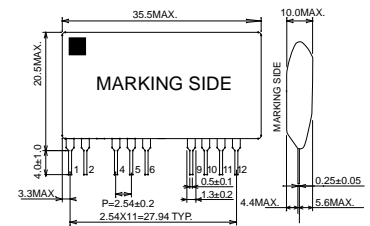
## External Component Specifications

C1: Output smoothing capacitor	0.1μF/275VAC Safety regulation	R1: Resistor	100kΩ±5% 2W 300V or higher
C2: Noise reduction capacitor	0.1μF/275VAC Safety regulation	R2: Noise reduction resistor	1W or higher 10 to 22Ω
C3: Output smoothing capacitor	22μF/450V		Use if necessary
	Limits ripple current 100mA or higher	R3,4: Output voltage adjustment resistor	By changing R3, R4, it is possible to adjust output voltage.
C4: Input smoothing capacitor	2200pF/400V or higher		Refer to the output voltage adjustment notes at right
C5: Noise reduction capacitor	2200pF Safety regulation		10mH 0.2A or higher Safety regulation
C6: Output smoothing capacitor	470μF/10V Low impedance part	L31: Line filter	Ensure that it complies with safety regulations
C7: Noise reduction capacitor	630V or higher 0.1 to 0.22μF	T1: Switching transformer	Be sure to use this for safety.
	Use if necessary	F1: Fuse	Be sure to use this for safety.
D1: Noise reduction diode	800V/0.5A	F2: Fuse	A varistor is required to protect against lightning surges and static electricity.
D2: Diode bridge	800V/1A	ZNR31: Varistor	390V Safety regulation
D3: Rectifier diode	60V/2A		

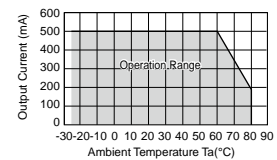
## ● Operation Notes

- An excessively large capacitance at C4 may cause the output to become inactive. Therefore, a capacitance between 470μF to 2200μF is recommended, with a risetime of 10ms or less.
- DC voltage after sourcing
- Overcurrent (reset type) protection circuit is built in, preventing damage from occurring due to unexpected conditions

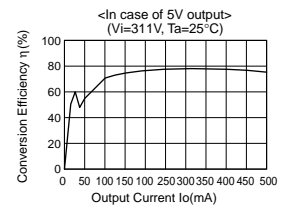
## ● Dimensions (Unit : mm)



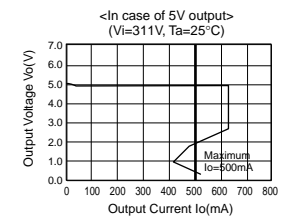
## ● Derating Curve



## ● Conversion Efficiency



## ● Load Regulation



## <<Output voltage adjustment>>

Adjust the output voltage by varying R3 and R4.

- (1) Output voltage range: 4.0 to 6.0V
- (2) Output voltage equations  
 $V_o < 5V, R3 = (30.33V_o - 37.2) / (5 - V_o)k\Omega$   
 $R4 = \text{open}$   
 $V_o = 5V, R3, R4 = \text{open}$   
 $V_o > 5V, R3 = \text{open}$   
 $R4 = 37.6092 / (V_o - 5)k\Omega$

Example) In case of V<sub>o</sub>=5.3V  
 $V_o > 5V, R4 = 37.6092 / (5.3 - 5)k\Omega = 125.364k\Omega$   
 Thus, R3=open  
 $R4 = 120k\Omega (V_o = 5.313V)$

# 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.

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  - [b] Problems arising from the use of the products listed herein
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