

# AC / DC converter unit

## BP5035

The BP5035 is an AC / DC converter which can be used to supply  $-12\text{V}$  (+ COMMON), 200mA DC output from a commercial power supply (100V AC). Using this unit enables simple, easy drive of microcomputers, DC motors, heaters, LEDs, and many other electronic components without using a transformer. It also allows set PCBs to be kept compact and lightweight, with extremely few attachments.

### ●Applications

Power supply circuits for vacuum cleaners, washing machines, refrigerators, electric carpets, electric rice cookers and hot water pots, irons, cordless telephones, air purifiers, humidifiers, dehumidifiers, illumination devices and other small household appliances, as well as power supply circuits for gas, fire and smoke alarms, DC motors, sensors, and other similar devices

### ●Features

- 1) Elimination of a transformer enables compact, light-weight power supply boards.
- 2) Wide input voltage range. (80 to 120Vrms for AC voltage conversion)
- 3) DC power supplies can be easily configured, with few attachments.
- 4) The output current is large, at 200mA.
- 5) A + COMMON of  $-12\text{V}$  output is provided. This is ideal for TRIAC drive for AC control.
- 6) Since no transformer is used, the power supply board is less vulnerable to splitting or cracking from impact or shock.
- 7) Hybridization of the IC reduces the number of labor hours in the assembly process.

### ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Limits	Unit
Power supply voltage	$V_{cc}$	$-170$	V
Output current	$I_o$	200	mA
Operating temperature	$T_{opr}$	$-25 \sim +80$	$^\circ\text{C}$
Storage temperature	$T_{stg}$	$-25 \sim +105$	$^\circ\text{C}$

### ●Recommended operating conditions ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	$V_{cc}$	$-170$	$-141$	$-113$	V (DC)

● Pin descriptions

Pin No.	Pin name
1	V <sub>OUT</sub>
3	COIL
5	COIL
7	COMMON
10	V <sub>IN</sub>

Pins 2, 4, 6, 8, and 9 are not used.

● Electrical characteristics (Unless otherwise noted, T<sub>a</sub> = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	V <sub>I</sub>	-170	-141	-113	V	DC
Output voltage	V <sub>O</sub>	-11	-12	-13	V	V <sub>I</sub> = -141V, I <sub>O</sub> = -200mA
Output current	I <sub>O</sub>	0	—	200	mA	V <sub>I</sub> = -141V *1
Line regulation	V <sub>r</sub>	—	0.04	0.15	V	V <sub>I</sub> = -113 ~ -170V, I <sub>O</sub> = -200mA
Load regulation	V <sub>l</sub>	—	0.05	0.15	V	I <sub>O</sub> = 0 ~ -200mA, V <sub>I</sub> = -141V
Output ripple voltage	V <sub>p</sub>	—	0.05	0.15	mV <sub>P-P</sub>	V <sub>I</sub> = -141V, I <sub>O</sub> = -200mA *2
Power conversion efficiency	η	60	74	—	%	V <sub>I</sub> = -141V, I <sub>O</sub> = -200mA

\*1 Based on derating curve.

\*2 Output ripple voltage does not include spike noise.

● Measurement circuit

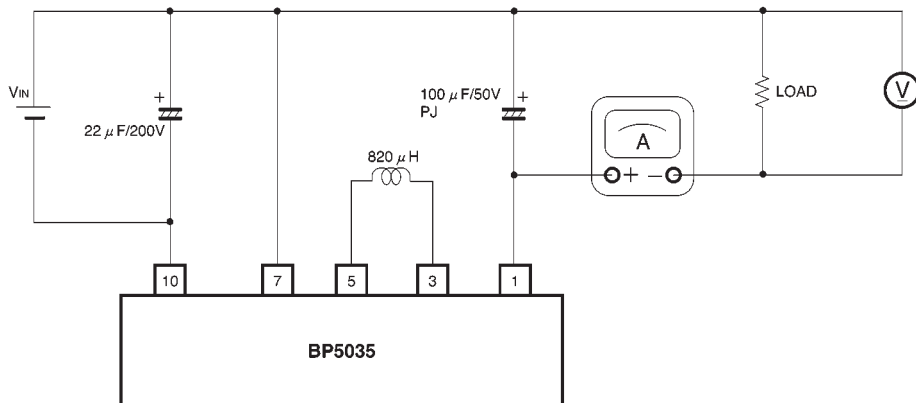


Fig.1

●Application example

Example showing BP5035 used in washing machine

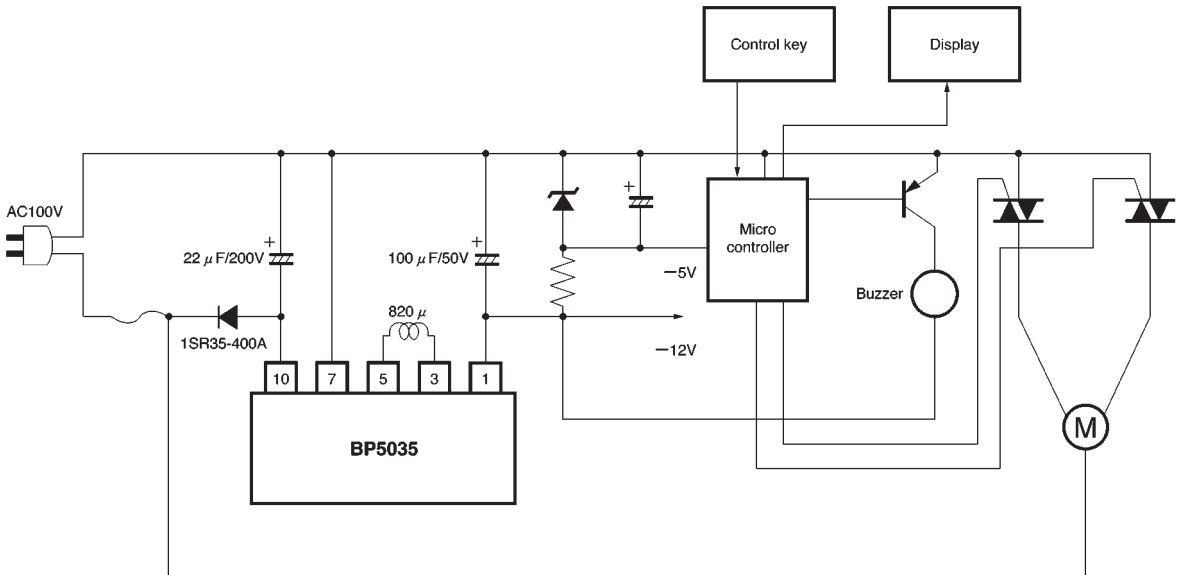


Fig.2

Basic power supply circuit

Half wave rectification circuit

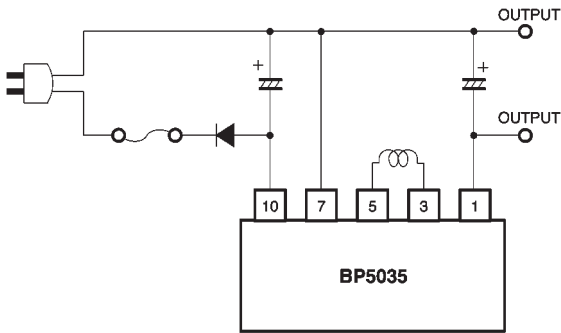


Fig.3

Full wave rectification circuit

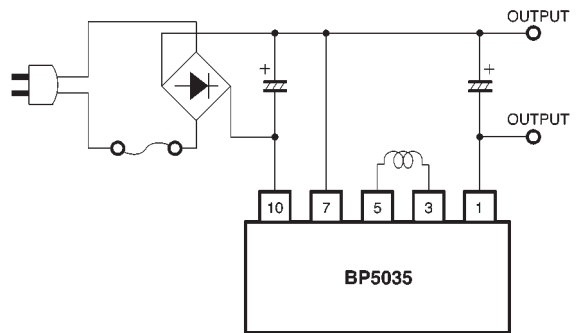


Fig.4

### ● Selecting attached components

#### (1) Diodes

The rectifying diodes used should fulfill the following conditions.

In the absolute maximum ratings, the reverse surge current should be 400V or higher, the average rectifying current should be 0.5A or higher, and the forward surge voltage should be 20A or higher.

#### (2) Capacitor for input voltage smoothing

A capacitor with a larger capacitance produces a more stable output voltage, but increases the surge current when the power supply is turned on. The capacitor should have a withstand resistance of at least 200V. Make sure a capacitor of 22 $\mu$ F or higher is used for half wave rectification, and 6.8 $\mu$ F or higher for full wave rectification.

#### (3) Capacitor for output voltage smoothing

This capacitor should have a low ESR. Capacitors designed for low-impedance switching power supplies are especially suitable. The ESR of the capacitor affects the output ripple voltage. Please refer to the table below for the names of products made by various manufacturers.

Maker	Product
Nichicon	PJ series
Matsushita electric	Model A FA series

### ● Operation notes

(1) The output current needs to be reduced as the ambient temperature rises.

(2) Lead pins should be securely soldered. If COMMON pins are not securely connected, or pins which are connected internally but which are not used are connected to other pins, irregular voltages could be produced, causing breakdowns and damage.

#### (3) Excessive current and shorted loads

The excessive current limit is a drooping model. At 25°C, if excessive current which exceeds the absolute maximum ratings is produced intermittently, or is produced continuously for a total of one minute or longer, the product is vulnerable to damage. If there is any danger of the load being shorted or excessive current being produced, always use a protective device such as a fuse.

(4) Avoid subjecting this product to strong impact.

#### (5) Regulations governing electrical products

As a stand-alone product, this product is not subject to regulations governing electrical appliances. Please be aware, therefore, that applications must be submitted for sets and not for individual products.

#### (6) Insulation

This product is not insulated on the primary and secondary sides, and there is a danger of electrical shock if it is touched.

#### (7) Connections with other devices

Devices using this product should not be connected to other devices. If connected, insulation should be provided.

●Electrical characteristic curves

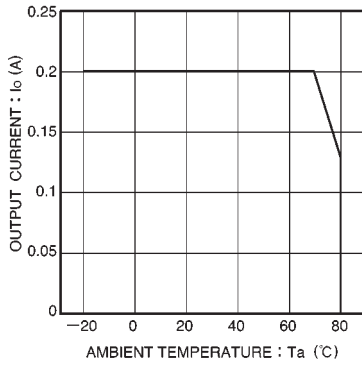


Fig.5 Derating curve

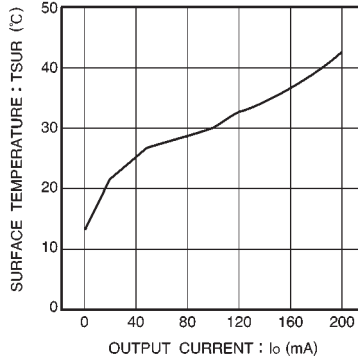


Fig.6 Surface temperature rise

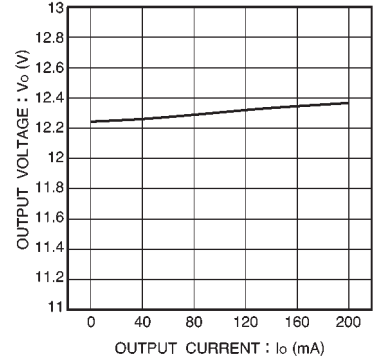


Fig.7 Output characteristic

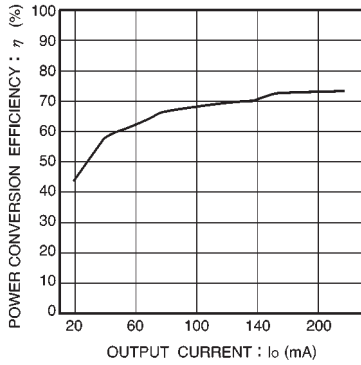


Fig.8 Power conversion efficiency

●External dimensions (Units: mm)

