

The BPF Series devices are power factor correction units that achieve unprecedented high efficiency using the latest semiconductor technology. Because of the high efficiency the heating value of the unit is low, allowing operation even with natural air cooling. There are no restrictions on fan air cooling or heat radiator construction, so it can be used in any applications and conditions.

Furthermore, since the unit contains output from internal auxiliary +12V power source, it does not require special power source in equipment for operation in standby mode. High capacity of 100mA allows to use the unit directly as a drive power source for inverters and other devices.



■ Characteristics

- Output voltage accuracy $\pm 3\%$
- High efficiency 94%/96% (100V/200V)
- High power factor 0.98/0.96(100V/200V)
- Non-isolated type converter
- Internal overcurrent protection circuit
- Undervoltage protection
- ON/OFF control
- Output overvoltage protection
- PowerGood output function (open collector)
- Auxiliary power output (+12V, 100mA)
- Operating temperature $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$
Natural air cooling up to $+50^{\circ}\text{C}$ without derating
(temperature derating required if temperature above $+50^{\circ}\text{C}$)
- Noise terminal voltage: VCCI CISPR22 ClassB
- RoHS compliant

■ Models and ratings

Table 1

Models BPF Series	Power W	Input V Vac	Output V Vdc	Output I A	Efficiency %(typ.)	Power factor (typ.)
BPF-360S0R7	250	85~264	360	0.7	94 (100Vin)	0.98 (100Vin)
					96 (200Vin)	0.96 (200Vin)

Note 1: Depending on ambient temperature, temperature derating and forced air cooling may be required.

■ Specifications

Table 2

Input voltage range *1	AC85~264V
Rated input voltage	AC100/200V
Rated output voltage	DC360V
Output voltage accuracy	$\pm 3\%$
Input fluctuation	0.2% typ. (Rated output for input voltage range given in the Table 1)
Load fluctuation	0.1% typ. (Rated input/output voltage, for load varying from 0 to 100%)
Ripple noise	11Vp-p typ. (Rated input/output, measurement frequency bandwidth 20MHz)
Efficiency	94% typ. (input voltage AC100V) 96%typ. (input voltage AC200V), for rated load
Power factor	0.98 typ. (input voltage AC100V) 0.95typ. (input voltage AC200V) for rated load
Inrush current *2	Up to 11A (input voltage AC100V) up to 26.5A (input voltage AC200V)
Leakage current	Up to 0.25mA (input voltage AC100V) up to 0.5mA (input voltage AC200V)
Overcurrent protection	Yes
Under voltage lock out	Yes
Output overvoltage protection	Yes
Remote ON/OFF	Yes
P-Good output	Yes
Auxiliary power source output	12V $\pm 10\%$, 100mA
Noise terminal voltage	VCCI CISPR22 : ClassB
Operating temperature range	-20°C to $+70^{\circ}\text{C}$ (refer to temperature derating on separate sheet)
Storage temperature range	$-40^{\circ}\text{C} \sim +90^{\circ}\text{C}$
Humidity range	20 ~ 95%R.H. (max. wet bulb temperature 69°C without condensation)
Cooling conditions	Natural air cooling
Weight	200g typ.
Outer dimensions	W=100 L=90 H=38.1 (mm) (Refer to outer dimensions on separate dimension/shape specifications)

* 1 The operating range of the power factor correction function is AC85~255V.

* 2 Cold start, no external capacitor. Excluding inrush current to input filter.

* The above specifications are provided for rated values, unless otherwise specified.

* The contents of this datasheet may be changed for improvement or other purposes at any time without prior notice.

1. Scope

This specification applies to the BPF series AC output power factor correction module.

2. Models and ratings

Model	Rated input voltage	Rated output
BPF-360S0R7	AC 100 / 200V	360V, 0.7A (250W)

Unless otherwise mentioned in the specifications, rated input, rated output and ambient temperature 25°C±5°C are used.

3. Environmental conditions

3-1 Temperature range

Operating temperature -20°C ~ +70°C (temperature above 50°C requires derating)

Storage temperature -30°C ~ +90°C

3-2 Humidity range

Operating humidity 20 ~ 95% R.H. (max. wet bulb temperature 35°C without condensation)

Storage humidity 20 ~ 95% R.H. (max. wet bulb temperature 35°C without condensation)

3-3 Air cooling conditions

Natural air cooling

Temperature derating exists. See chapter 5. Temperature derating.

3-4 Vibration and shock testing

Vibration: 5 ~ 10Hz total amplitude 10mm, 10 to 55Hz acceleration 2G (1 hour in each of 3 directions)

Shock: acceleration 20G (3 times in each of 3 directions)

shock time 11±5ms

4. Specifications and standards

This product is RoHS compliant.

4-1 Input characteristics

Parameter	Specifications and standards	Conditions
Input voltage *1	AC 85 ~ 264V (rated 100 / 200V)	Power factor correction operating range AC 85 ~ 255V
Input frequency	AC 45 ~ 65Hz (rated 50 / 60Hz)	
Input current	2.7A typ., 1.3A typ	For input voltage 100V For input voltage 200V
Power factor	0.98 typ.	For input voltage 100V and rated load
	0.95 typ.	For input voltage 200V and rated load
Inrush current *2	11A max.	For input voltage 100V
	26.5A max.	For input voltage 200V
Leakage current	0.25mA max.	For input voltage 100V
	0.5mA max.	For input voltage 200V

*1 Outside the voltage range for power factor correction the module functions as rectifier. The output voltage is obtained from the input voltage by full-wave rectification.

*2 Cold start, no external capacitor. Excluding inrush current to input filter.

Output characteristics and functions

*1, *2

Parameter	Specifications and standards	Conditions
Rated output voltage	360V	
Output voltage setting accuracy	±3%	
Adjustable output voltage range	Fixed	
Output current	0 to 0.7A	
Input fluctuation	±0.2% typ. ±1% max.	For input fluctuation in the range 85~255V
Load fluctuation	±0.1% typ. ±1% max.	For load fluctuation in the range 0~0.7A
Temperature fluctuation	±0.3% typ. ±2% max.	For temperature fluctuation in the range -20~+50°C
Ripple noise	11Vp-p typ., 20Vp-p max.	BW = 20MHz
Efficiency	94% typ.	For input voltage 100V and rated output
	96% typ.	For input voltage 200V and rated output
Overcurrent protection	Operates at 105% or higher	Constant power control, voltage drooping type
Under voltage lock out	Yes Activation voltage: AC75V typ. Deactivation voltage: AC65V typ.	

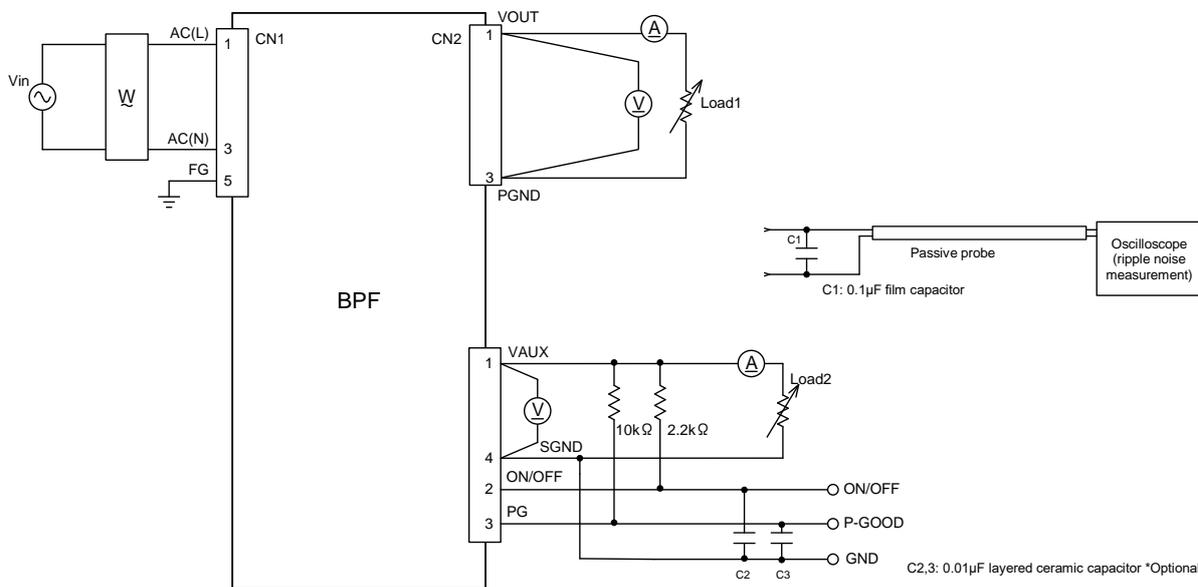
Parameter	Specifications and standards	Conditions
ON/OFF control	Yes CN3 ON/OFF terminal Photo coupler input (20mA max) Current flows: OFF Open: ON	With reference to CN3 SGND terminal
P-Good output	CN3: between PG–SGND terminals Open collector output (30V max, 10mA max) Normal output: closed (0.4V max) Output low: open	Closes 200ms after the output voltage reaches 320V or higher. Open when output voltage lowers to 260V or lower
Output overvoltage protection	Yes Switching stop, automatic restoration	Operating threshold: 410V typ.
Instantaneous power failure time *3	20ms: output voltage 260V min.	For rated input
Start-up time	400 ms typ, 1s max	For input voltage 100V
Auxiliary power source output	12V±10%, 100mA	Ripple noise: 200mVp-p typ, 500mVp-p max
Maximum load capacitance	230 µF	For input voltage 240V

*1 Measured using measurement circuit in the chapter 4-2.

*2 Unless otherwise mentioned, measured at rated input, rated output and ambient temperature 25°C±5°C.

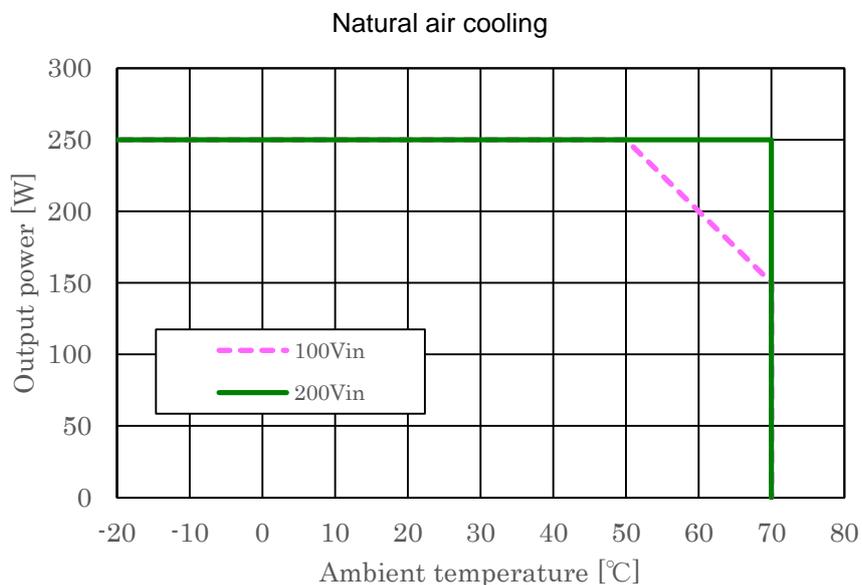
*3 Without external capacitor. For 0.7A (CC mode) load.

4-2 Measurement circuit

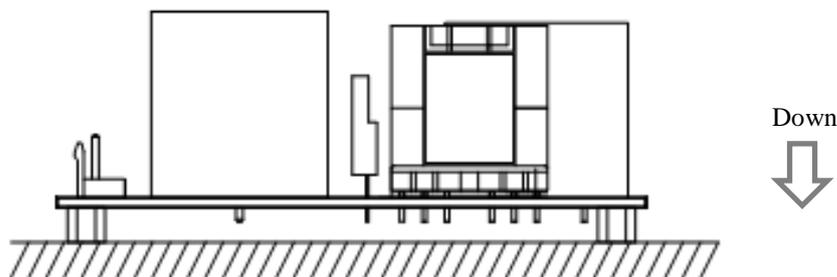


5. Temperature derating

5-1 Derating curve



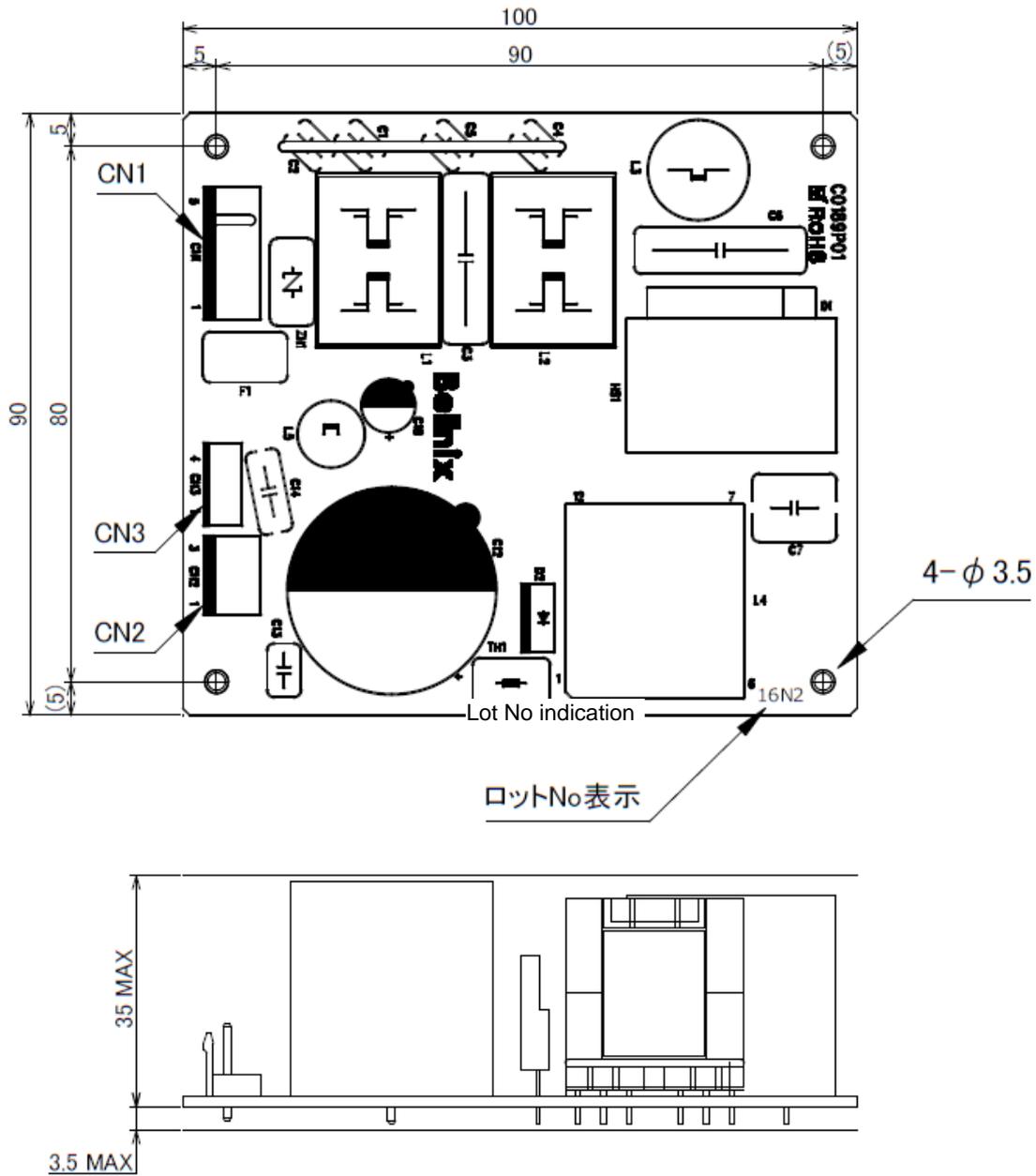
5-2 Grounding direction



*Please consult about other installation directions.

6. Outer dimensions and terminals

6-1 Shape and dimensions



6-2 Description of terminals

1) Power supply input connector CN1 (B3P5-VH: made by J.S.T. Connector)

Pin	Name	Function
1	AC(L)	AC power supply terminal
3	AC(N)	AC power supply terminal
5	FG	Frame ground terminal

2) Output connector CN2 (B3P-VH: made by J.S.T. Connector)

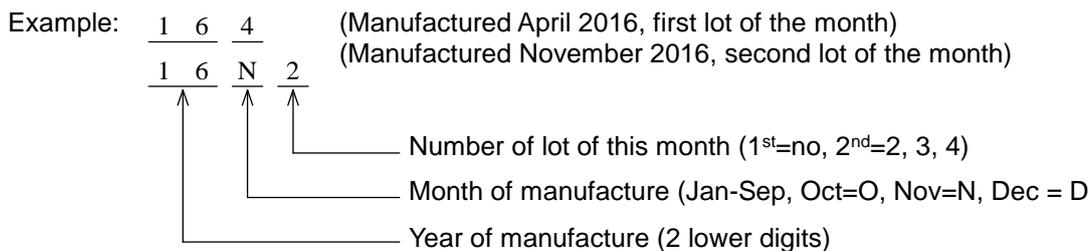
Pin	Name	Function
1	VOUT	Output terminal.
2	NC	Not connected. Do not connect it electrically.
3	PGND	Output reference terminal.

3) Control connector CN3 (B4B-XH-A: made by J.S.T. Connector)

Pin	Name	Function
1	VAUX	+12V auxiliary power supply output terminal
2	ON/OFF	Remote ON/OFF control input terminal
3	PG	P-Good output
4	SGND	GND for VAUX output. Connected to PGND internally.

6-3 Lot No indication

1) 4 digits indication following the example of production lot number (3 digits for the first lot of the month).



7. Various functions

7-1 Capacitance of external output capacitor

Output holding time can be extended by connecting external output capacitor. Capacitance of the capacitor can be calculated using the following expression.

$$t = \frac{1}{2} (C_1 + C_2) \times (V_1^2 - V_2^2) / P_{out}$$

t: Holding time at instantaneous failure (sec.)

V1: Output voltage=360V (V)

V2: Minimal held voltage at instantaneous failure (V)

C1: Capacitance of internal capacitor=270uF (F)

C2: Capacitance of external capacitor (F)

Pout: Actual load power (W)

*Select the capacitance of the external capacitor within the range of the maximum load capacitance.

Note that connecting the external capacitor increases the inrush current.

7-2 ON/OFF control

This function allows turning the power factor correction ON and OFF. ON/OFF control of the standby power is not supported. Setting the ON/OFF terminal (CN3 Pin 2) High or Low (relatively to SGND terminal (CN3 3Pin)) it is possible to turn the power factor correction function ON or OFF. By combining with the auxiliary power supply, it is possible to perform ON/OFF control by opening and closing the circuit.

Although the switching operation is stopped when the output is OFF, voltage of approximately 1.41 x input voltage is generated on output terminal through diode rectification.

Avoid chattering on ON/OFF terminal. The chattering may cause malfunction of internal circuits.

The terminal is connected internally to the light-emitting side (diode) of a photo coupler. (20mA max)

When the ON/OFF control is not used, leave the ON/OFF terminal open or connect it to SGND.

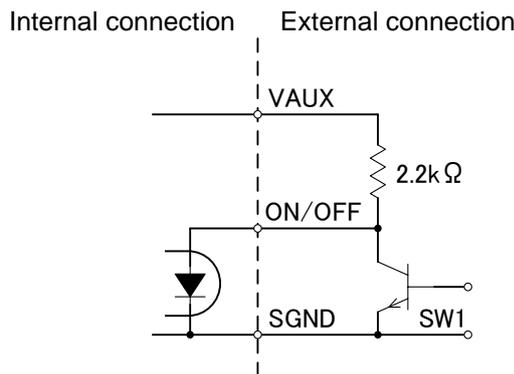


Fig.a Example of connection circuit when the ON/OFF control is used.

SW1 closed: ON, open: OFF

7-3 Under voltage lock out

The unit is equipped with under voltage lock out (UVLO) function preventing malfunction when input voltage is low. When input voltage reaches the operation start voltage (75V typ), the unit starts switching operation. If the input voltage falls to operation stop voltage (65V typ), the switching operation is stopped.

7-4 Output overvoltage protection

When the output voltage exceeds the threshold of the output overvoltage protection function, the unit stops switching operation. However, the function does not activate if overvoltage is caused by damaged unit.

7-5 Overcurrent protection

When output current exceeds the threshold of the overcurrent protection and the overcurrent condition occurs, the output power is limited by lowering the output voltage. When the overcurrent condition is canceled, the output voltage will be restored automatically.

7-6 P-Good output

When the output voltage reaches 320V (typ.), terminals P-Good and SGND close after 200 ms (typ.) (low impedance), and open (high impedance) when the output voltage reaches 260V typ.

Even if the ON/OFF control is turned OFF, the P-Good output functions when the output voltage exceeds the threshold value.

The output is open collector output of internal photo coupler. (Applicable voltage: 30V max.)

When the P-Good output is not used, leave the PG terminal open or connect it to SGND.

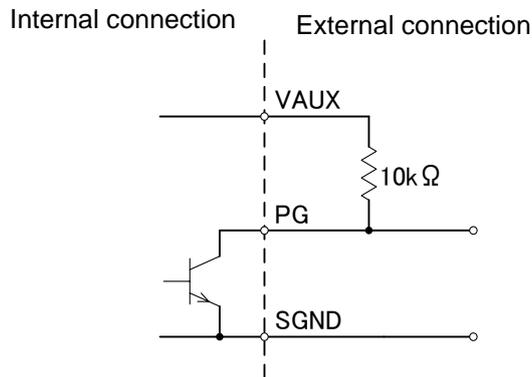


Fig.b P-Good connection circuit example.

8. Expected life

The expected life is given in the following table.

Ambient temperature	Average load factor	Expected life
Below 40°C	80%	7 years

(For input voltage 100V)

9. Precautions for use

To ensure user's safety, check specifications before using the product and always observe the following precautions when using it.

- The product is intended for use in general electronics equipment (office equipment, communication equipment, measurement equipment). Do not use the product in medical equipment, nuclear equipment, trains, and other areas, where human life or property may be directly affected by damaged product, or in the environment with constant vibration. For any use other than in general electronics equipment please consult the manufacturer.
- High voltage is generated on the output of this product. Do not touch the output terminal in energized state or within 60 seconds after disconnecting the input.
- Mount the product by fixing it with screws.
- While the product has a built-in overcurrent protection circuit, a prolonged short circuit condition should be avoided as it can damage the product.
- A power thermistor is used in this product to limit the inrush current. Do not connect and disconnect input repeatedly.
- The product may be damaged if used under nonstandard electrical or environmental conditions including temperature, etc. The product must be always used within specifications.
- Avoid storing or using the product in places where corrosive gas or dust are generated.
- The product may be damaged by static electricity. Take measures against static electricity in the working environment, such as using grounding straps to discharge the static charge on workers, etc.
- The product does not come with a test report.

10. Warranty

The warranty period of this product is one year. Should the product become defective within the warranty period due to defects in design or manufacture, it will be repaired or replaced free of charge. However, this warranty does not cover products which have been subjected to internal modifications, etc.

The scope of the warranty is limited to this product only.