Nipron GAZE into the future

2023 April

Single-Output Power Supply
FZP-040 series

FZP-040 series

Nipron Co., Ltd.

AC-DC
switching power supply

FZP-040 series

Ultra-small size/high-efficiency single-output power supply

FZP-040 Series

Continuous: 30–39.6W Peak: 40–60W

Output voltage: 5/12/15/24V

Efficiency (FZP-040-12)

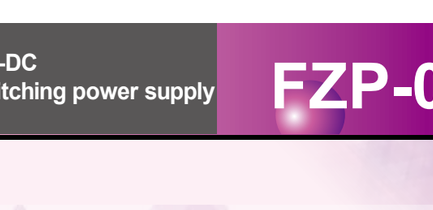
At 100V AC: **90.3%**

At 230V AC: **92.7%**

* an example measurement

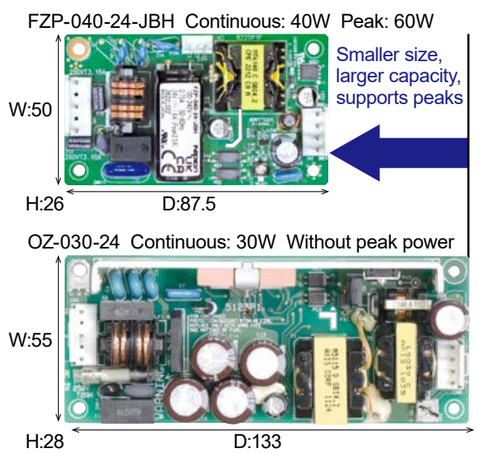
Supports peak output of 150% higher

Supports a 5-second output of peak power, which makes it optimal for devices requiring an inrush current, such as motors.



Smaller size with larger capacity

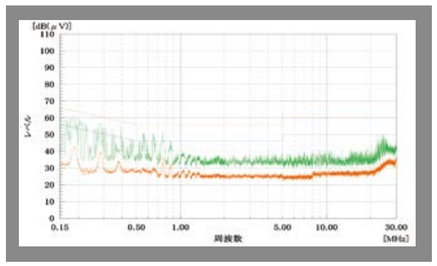
130% larger capacity in continuous level, supports peak output, and 44% smaller size compared with Nipron's conventional OZ-030 series.



Clears VCCI Class B for conducted emissions

The power supply unit clears VCCI Class B for conducted emissions. No need for an external noise filter, helping to save associated work and costs.

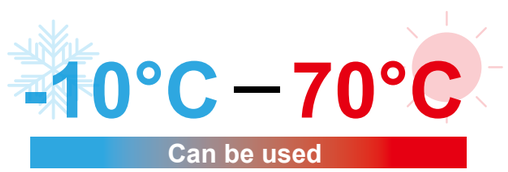
There is no need for an external noise filter!



Measurement condition
Input: 230V AC
Output: rated load
(an example measurement)

Wide operating temperature range

It can be used at ambient temperatures from -10°C to 70°C.



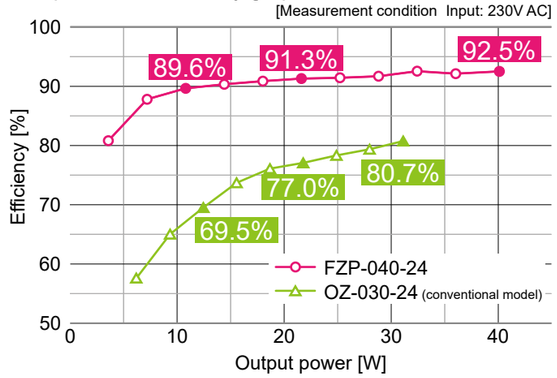
Derating required when ambient temperature exceeds 50°C.

Achieved high efficiency and low-level heat generation

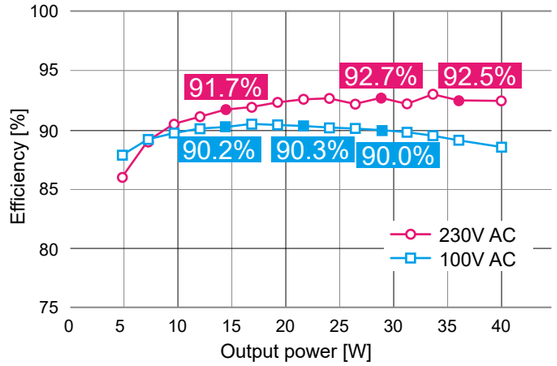
Achieves 92.7% typ efficiency with 12V output type. This high-level efficiency reduces heat generation, while also allowing a smaller size and a longer service life.

Comparison of efficiency graph (an example measurement)

[Measurement condition Input: 230V AC]

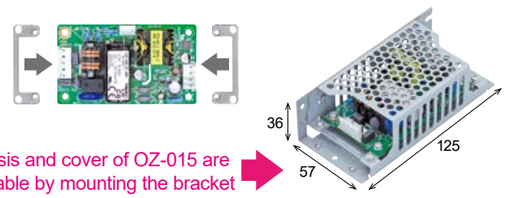


Efficiency graph (FZP-040-12, an example measurement)

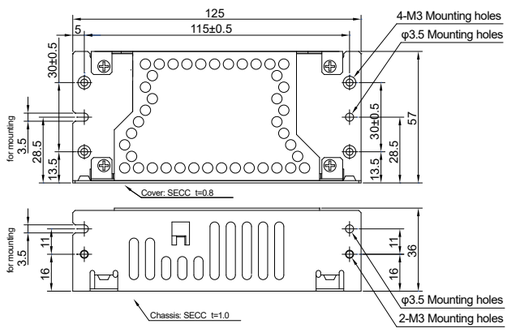


Responding to demand for replacements

We have a lineup with chassis and cover that enables replacement without changing the mounting pitch, making them compatible with the OZ-015 series and other products from different manufacturers.



Chassis and cover of OZ-015 are available by mounting the bracket



* Please contact us for details.

Measures against momentary power failure (only for FZP-040-**-JBH)

Connecting capacitor units creates a backup for momentary power failure by extending the output holding time. Doing so contributes to the improved reliability of embedded devices. The output holding time can be further extended by connecting capacitor units in parallel.

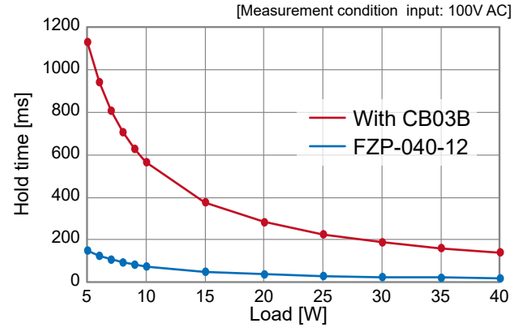
FZP-040-**-JBH

Capacitor unit
CB03B-EC400/801F

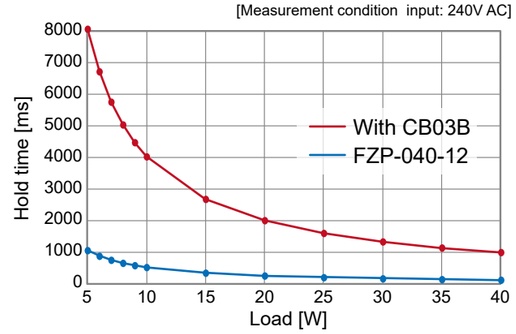
Extend the output holding time

Output hold time graph (FZP-040-12, an example measurement)

[Measurement condition input: 100V AC]



[Measurement condition input: 240V AC]



Adjustable output voltage (only for FZP-040-**-JBH)

The output voltage is adjustable for a particular model with a variable resistor. It allows voltage adjustment within ±10% of the rated output voltage.

Features

Model	Optional connector	Variable resistor to adjust output voltage
FZP-040-**-J0L	–	–
FZP-040-**-JBH	○	○

Other features

- Double-sided PCB with plated through hole adopted
- Coated PCB is available (Please contact us for the detail)
- Medical standards model coming soon
  Medical standards IEC60601-1 Ed.3.1 MOPP, MOOP-certified

Single-Output Power Supply FZP-040 series

Structure and I/O connector	Model	Output voltage	Output current *1	Output power *1
Open frame type/ Nylon connector	FZP-040-5-J0L	+5V	6.0A (8.0A)	30W (40W)
	FZP-040-5-JBH	+5V	6.0A (8.0A)	30W (40W)
	FZP-040-12-J0L	+12V	3.3A (5.0A)	39.6W (60W)
	FZP-040-12-JBH	+12V	3.3A (5.0A)	39.6W (60W)
	FZP-040-15-J0L	+15V	2.6A (4.0A)	39W (60W)
	FZP-040-15-JBH	+15V	2.6A (4.0A)	39W (60W)
	FZP-040-24-J0L	+24V	1.6A (2.5A)	38.4W (60W)
	FZP-040-24-JBH	+24V	1.6A (2.5A)	38.4W (60W)

■ Model name coding

FZP-040-**-J**
① ② ③ ④ ⑤⑥⑦

① Series name
② Supports peak output
③ Output power
④ 5:5V, 12:12V, 15:15V, 24:24V
⑤ Input/Output connector type J: Nylon connector
⑥ Optional joint connector 0: Without connector B: With connector
⑦ Presence or absence of function L: Without a variable resistor to adjust output voltage H: With a variable resistor to adjust output voltage

*1 Values in ( ) above show peak current and power.

Features

- Smaller size with higher capacity
- No output temperature derating up to 50°C ambient temperature
- It is not necessary to provide a noise filter on the outside. Low noise and low leakage current is also realized.
- Backup for momentary power failure is available (only for FZP-040-**-JBH)

High level of efficiency 92%* has been achieved for a 12 V output type.
(*At 230V AC input)
Peak power output, approx. 150% higher than continuous max.

Safety standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HOA	OA	

●Function

TTL PFC RoHS Directive

●Input

AC input	85-264V AC (Worldwide range)

●Dimension

W×H×D (mm)	50×26×87.5

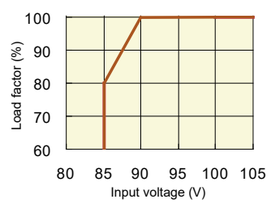
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification				Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)				Worldwide range *See <Fig.1> Low input voltage derating.
	Input Frequency		50-60Hz				Frequency range 47-63Hz
	Efficiency	100VAC	87% typ. (5V output), 90% typ. (12V,15V output), 91% typ. (24V output)				At rated load
		240VAC	89% typ. (5V output), 92% typ. (12V,15V, 24V output)				
	Inrush Current	100VAC	30A typ.				Power thermistor system at cold start (25°C)*1
		240VAC	70A typ.				
	Input Current	100VAC	0.65A typ. (5V output), 0.75A typ. (12V,15V,24V output)				At rated output
		240VAC	0.33A typ. (5V output), 0.40A typ. (12V,15V,24V output)				
Output	Model		FZP-040-5	FZP-040-12	FZP-040-15	FZP-040-24	
	Rated Voltage		+5V	+12V	+15V	+24V	
	Continuous Rated Output		6.0A	3.3A	2.6A	1.6A	At rated input Refer to <Fig.3> output derating on the next page.
			30W	39.6W	39W	38.4W	
	Peak Current/Power		8.0A	5.0A	4.0A	2.5A	*Refer to peak output power condition on the next page.
			40W*	60W*	60W*	60W*	
	Factory Setting		5V±2%	12V±2%	15V±2%	24V±2%	Set at rated input, no load
	Adjustable Voltage Range		±10%	±10%	±10%	±10%	*Set with a variable resistor to adjust output voltage (-JBH)
	Ripple Voltage	0-70°C	50mV max.				Connect 150mm max. lead wire to output connectors, and then connect a 47uF electrolytic capacitor with a 0.1uF ceramic capacitor in parallel to the other ends of the wires to measure by an oscilloscope with 100MHz frequency band.
		-10-0°C	50mV max.				
	Spike Noise Voltage	0-70°C	200mV max.				
		-10-0°C	200mV max.				
Protection	Over Current Protection	OCP point (A)	101% min. of peak rated current				
		Method	Blocking oscillation				
		Recovery	Automatic recovery				
	Over Voltage Protection	OVP point (V)	5.75-7.25V	13.8-16.8V	17.3-22.5V	27.6-33.6V	
		Method	Output shutdown				
		Recovery	Reclosing of AC input				
Environment	Operating Temp./Humidity		-10-70°C*/20-95%RH				*Refer to <Fig.3> output derating on the next page.
	Storage Temp./Humidity		-20-85°C/10-95%RH				There shall be no condensation
	Vibration		To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.				Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Lift one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges, and no malfunction shall be observed.				Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		4kV AC/1minute between input and output				Cut-off current 10mA
			2kV AC/1minnute between input and FG				Cut-off current 10mA
			2kV AC/1minute between each output and FG				Cut-off current 10mA
	Insulation Resistance		50MΩ min. between each input and outputs and FG				At 500VDC
	Leakage Current		0.2mA typ. (100VAC), 0.5mA typ. (264VAC)				
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000ns,cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)				There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant				Apply to FG. There shall be no malfunction, nor failure.
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant				
	Fast Transient Burst		EN61000-4-4 compliant				
	Lightning Surge		EN61000-4-5 compliant				
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant				
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant				
	Voltage dips/Regulation		EN61000-4-11 compliant				
	Conducted Emmision		VCCI-B, FCC-B, CISPR22-B, EN55032-B compliant				At rated input and rated output and fixed to metal housing
	Harmonic Current Regulations		IEC61000-3-2 (edition 2.1) classA, EN61000-3-2 (A14) classA compliant				At rated input and rated output
Others	Safety Standard		UL/CSA62368-1 (3rd) certified, CE Marking, UKCA Marking IEC/EN62368-1 (3rd) compliant				
	Cooling System		Convection cooling or forced air cooling by external fan				
	Output Grounding		Capacitor grounding				
	Output Hold-up Time		Refer to Output Hold-up Time vs. Output Power				
	Reliability Grade		FA (Industrial equipment grade to use double-sided PCB with platted through hole)				Following our standard
	Weight		70g typ.				
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.				Except for errors caused by operation not specified in this specification.

*1 Charging current equal to or less than 200μs into X-capacitor in input filter circuit shall not be defined as inrush current.

<Fig.1> Low input voltage derating

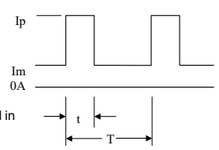
Follow the derating below to derate rated current/power.



Peak output power condition

- Duty ratio of peak current shall be 30% or less.
- Energized period of peak current shall be 5 seconds or less.
- The value resulting from the formula below shall not exceed the continuous rated current, Io, after derating specified in the clause, "Output derating."

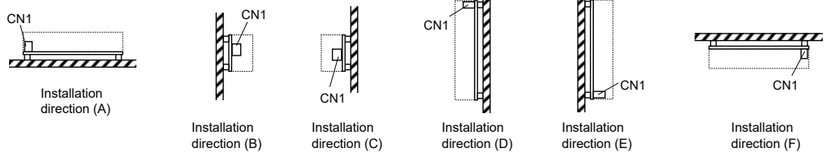
$\sqrt{((Ip^2 \times D)+(Im^2 \times (1-D)))} \leqq Io$
Ip=Peak current value
Im= Min. current value
D= Duty ratio, t/T
t= Pulse width of peak current
T= Cycle
Io= Continuous rated current specified in the clause"Output derating"



(Note) If the temperature of the power thermistor for limiting inrush current does not rise enough (and its resistance value is too large), such as when the normal average load power is small, the output voltage at peak output might drop about 100 ms. If this might cause any problem, please check the output voltage waveform while the power supply is installed on an actual device at operation.

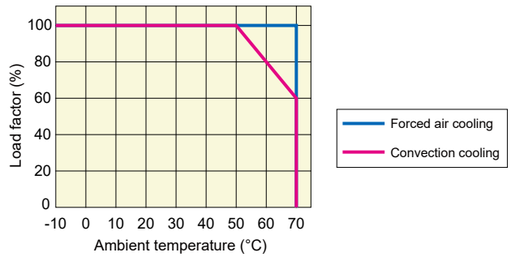
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

<Fig.2> Installation direction

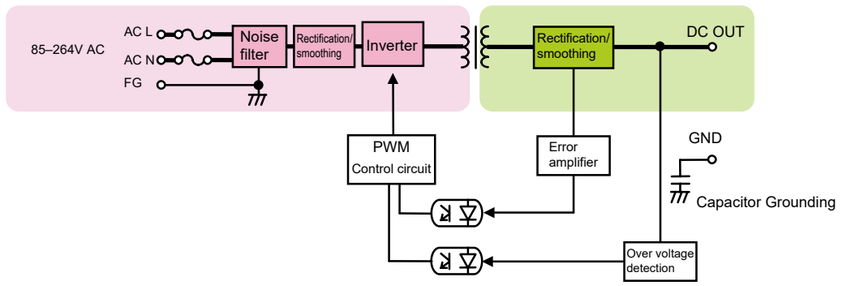


<Fig.3> Output derating

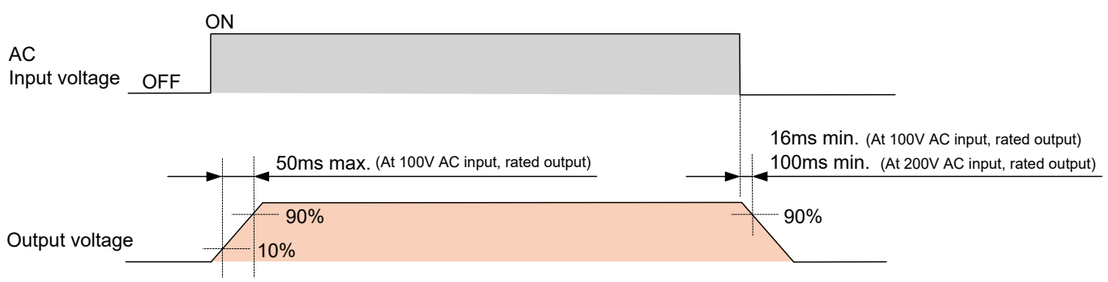
When the ambient temperature of the power supply exceeds 50°C, reduce the output according to the derating table below.
There is no output derating depending on the mounting direction, but please evaluate the output sufficiently on the actual equipment.



Block Diagram

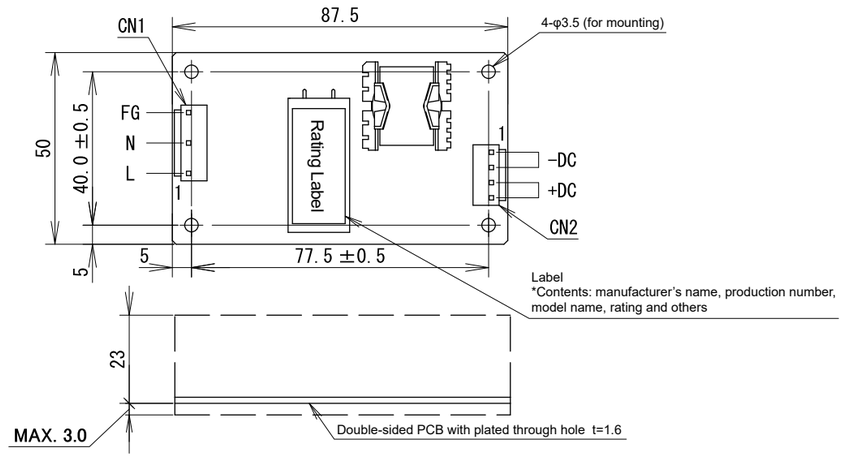


Sequence Timing Chart

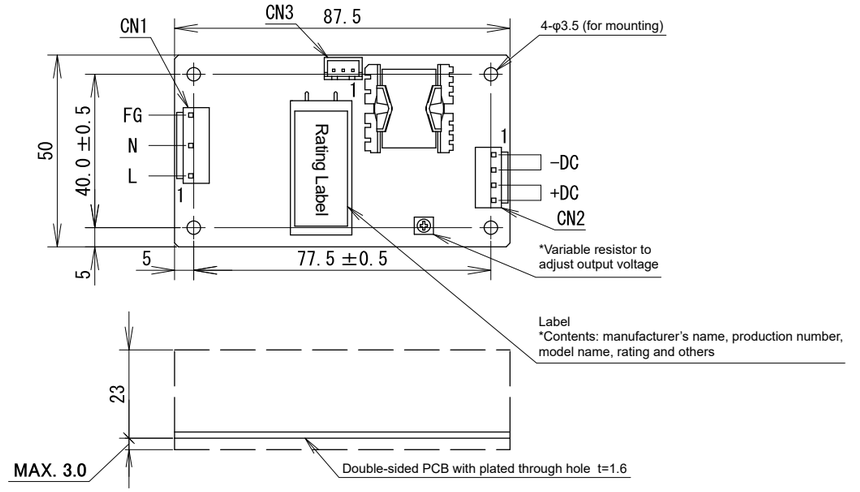


Outline Drawing

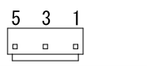
■ PCB type (open frame) model (FZP-040-**-J0L)



■ PCB type (open frame) model (FZP-040-**-JBH)



■ Connector pin allocation



CN1 (Input)		
PIN No.	FUNCTION	CONNECTOR TYPE
1	AC(L)	B3P5-VH(JST)
2		
3	AC(N)	
4		
5	FG	

*CN1 Applicable housing:
VHR-5N (JST)
Applicable terminals:
Reel: SVH-21T-P1.1 (JST)
Bulk: BVH-21T-P1.1 (JST)

CN2 (Output)		
PIN No.	FUNCTION	CONNECTOR TYPE
1、2	−DC	B4P-VH(JST)
3、4	+DC	

*CN2 Applicable housing:
VHR-4N (JST)
Applicable terminals:
Reel: SVH-21T-P1.1 (JST)
Bulk: BVH-21T-P1.1 (JST)

CN3 (Optional connector)

*CN3 Applicable housing:
XHP-3 (JST)
Applicable terminals:
Reel: SXH-001T-P0.6 (JST)
Bulk: BXH-001T-P0.6 (JST)

Options (Sold separately)

Cable			
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	For nylon connector.
	WH-C05VH-800-01	Input harness (with ferrite core)	For nylon connector.
	WH-C04VH-800	Output harness	For nylon connector.
	WH-03XH03XH-115	Harness for connecting capacitor unit	Connection harness for connecting the capacitor unit (CB03B-EC400/801F). (Length: 115mm)
	WH-03XH03XH-350	Harness for connecting capacitor unit	Connection harness for connecting the capacitor unit (CB03B-EC400/801F). (Length: 350mm)

Capacitor board			
Photos	Model	Category	Description
	CB03-EC400/801F CB03B-EC400/801F	Capacitor board	Capacitor board for measures against momentary power failure Connectable for FZP-040-**JBH

Connection in Series and Parallel

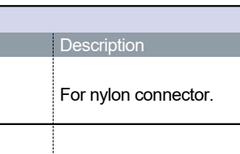
■ Series operation

Series connection is available as in figure (1) and (2) on the right.
Series connection between different output voltages is available, such as 12 V and 24 V.

Note: In the case that different voltages are connected in series as in figure (1) on the right;

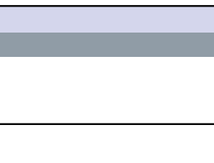
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
2. Connect diodes for protection as show in the figure (1).
   The rated current of the diodes shall be 1.5 times or more of the peak output current of the power supply which has larger peak output current among PSU1 and PSU2.
   Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.

(1)



In the case of series connection of different output voltages, connect diodes shown as above.

(2)



■ Parallel operation

Parallel operation is not possible.

Capacitor Board CB03*-EC400/801F

Model	Description
CB03-EC400/801F	———
CB03B-EC400/801F	with blackout detection signal (AC_FAIL)

■Model name coding

CB03 B - EC 400 / 801F
① ② ③ ④ ⑤

① Series name
② Modification B: with blackout detection signal
③ Electrolytic capacitor
④ Output voltage
⑤ Capacity

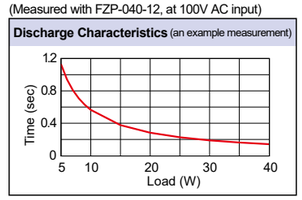
Compatible Power Supply

●FZP-040-**-JBH series

Capacitor Charge/Discharge Characteristics

(Be aware that it is a reference value at initial use of the capacitor board; it is not a guaranteed value.)

(Measured with FZP-040-12, at 100V AC input)



Features

- About 15 years expected life (at 40°C)
  Maintenance free (periodic replacement not required)
- Low and high operating temperature (-10°C to 70°C)

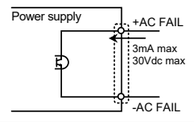
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

Items	Specification	Measurement condition, etc.
Capacitor	420V 800uF typ	2000 hrs. used at 105°C
Operating Temp./Humidity	-10°C–70°C/20–90% RH	There shall be no condensation
Storage Temp./Humidity	-20°C–75°C/10–95% RH	There shall be no condensation
Weight	90g typ	
Capacitor Charging Time	0.5s max. (CB03-EC400/801F) 5s max. (CB03B-EC400/801F)	Time until the capacitor reaches 340V after the power supply is turned on.
Self-discharge Time	About 5 min	Time until the capacitor voltage decreases to 60V in the case that the connection with the power supply goes open at full charge.
Vibration	To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.	Follow JIS-C-60068-2-6 at no operation
Mechanical Shock	Lift one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges.	Follow JIS-C-60068-2-31 at no operation
Insulation Resistance (only for CB03B-EC400/801F)	50MΩ min. between each input and AC_FAIL and FG	At 500V DC
Dielectric Strength (only for CB03B-EC400/801F)	3kV AC/1minnute between input and AC_FAIL *1	Cut-off current 10mA
	2kV AC/1minnute between input and FG *2	Cut-off current 10mA
Reliability Grade	FA (Industrial equipment grade to use double-sided PCB with plated through hole)	Following our standard
Expected Life*	About 15 years	Environmental temperature: 40°C Based on the calculation of the actual life of an electrolytic capacitor.
Warranty	Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.	Except for errors caused by operation not specified in this specification.

* Be aware that expected life is a reference value; it is not a guaranteed value.

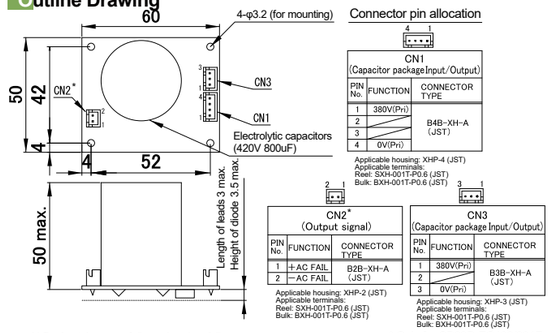
(*1) Input should be primary side and AC_FAIL should be secondary side. (*2) FG shall be the mounting holes on the 4 corners of the board.

Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification	Signal Circuit
Output Signal	Blackout detection signal* (AC_FAIL)	The signal goes "OPEN" at low AC input voltage and power failure detection. However, when the RC signal is OFF, the output is OPEN regardless of the presence or absence of input voltage. (Detects a drop in voltage of the input smoothing capacitor inside the power supply, short and long of the detection time depends on small and big of the output power.)	

* Only for CB03B-EC400/801F

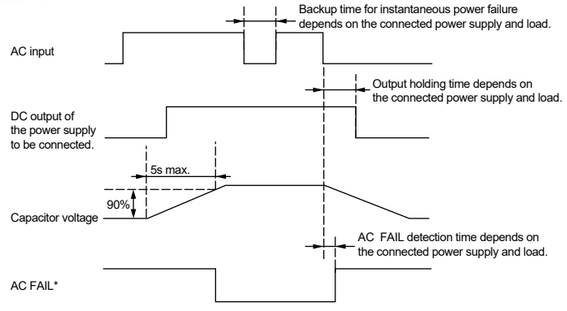
Outline Drawing



*1 Design tolerance of dimensions is ± 0.5.

* Only for CB03B-EC400/801F

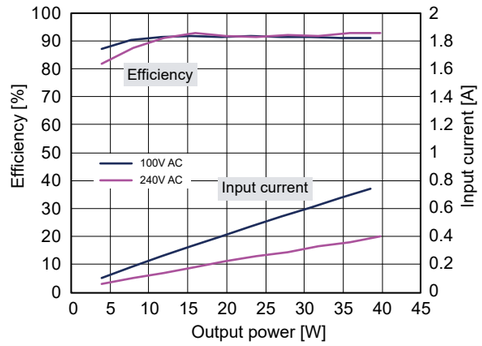
Sequence Timing Chart



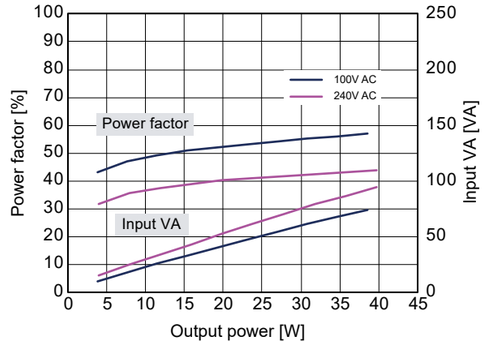
* Only for CB03B-EC400/801F

Characteristics Data (Typical features of the product series) FZP-040-24-JBH (Examples of actual measurements)

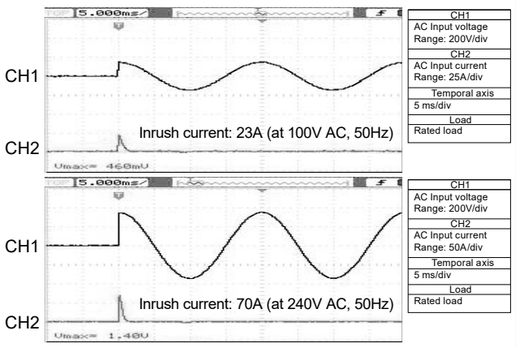
● Fig.5 Efficiency/Input Current vs. Output Power



● Fig.6 Power Factor/Input VA vs. Output Power



● Fig.7 Inrush Current



● Fig.8 Leakage Current

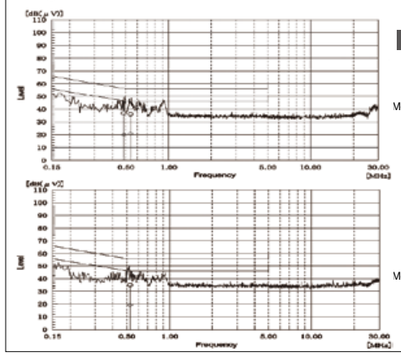
Input : 100, 264V AC
Load : Rated load and Min. load

	Rated load	Min. load
100V AC	0.11mA	0.11mA
264V AC	0.29mA	0.29mA

● Fig.9 Conducted Emission at 100V AC

Input : 100V AC
Load : Rated
Mode : Peak

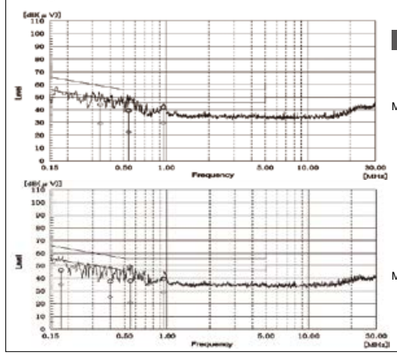
EN55032 Class B



● Fig.10 Conducted Emission at 230V AC

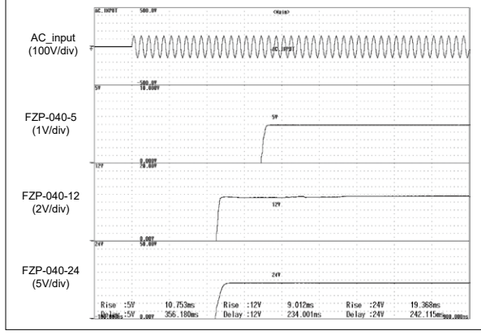
Input : 230V AC
Load : Rated
Mode : Peak

EN55032 Class B



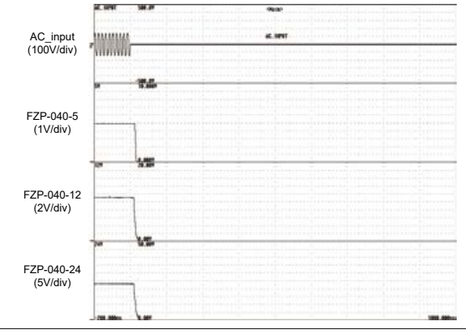
● Fig.11 Rising Characteristics at 100V AC

Input : 100V AC
Load : Rated
Time axis : 100 ms/DIV



● Fig.12 Falling Characteristics at 100V AC

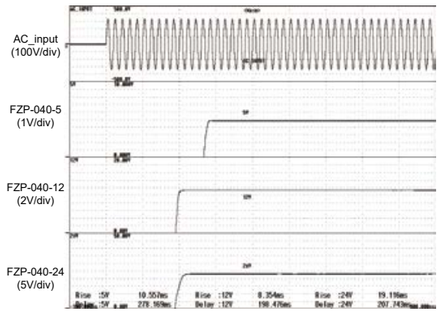
Input : 100V AC
Load : Rated
Time axis : 200 ms/DIV



Characteristics Data (Typical features of the product series) FZP-040-24-JBH (Examples of actual measurements)

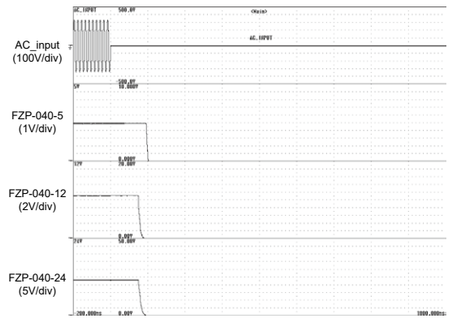
● Fig.13 Rising Characteristics at 240V AC

Input : 240V AC
Load : Rated
Time axis : 100 ms/DIV

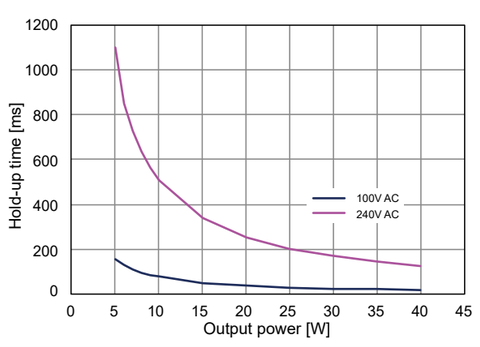


● Fig.14 Falling Characteristics at 240V AC

Input : 240V AC
Load : Rated
Time axis : 200 ms/DIV

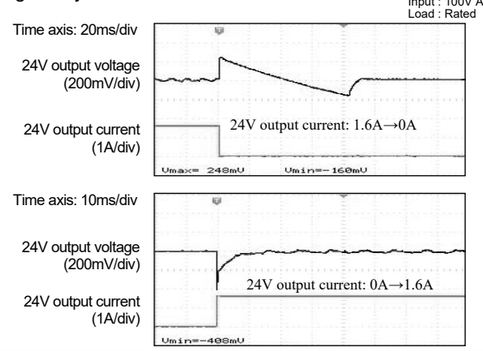


● Fig.15 Output Hold-up Time vs. Output Power

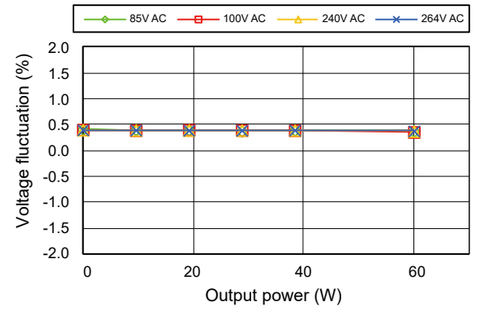


● Fig.16 Dynamic Load Fluctuation Characteristics

Input : 100V AC
Load : Rated



● Fig.17 Output Voltage Regulation (Load Fluctuation)

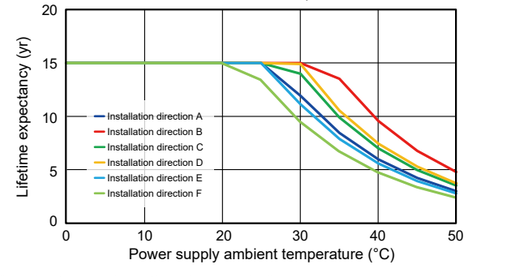


● Fig.18 Ripple and Spike Voltage

Temperature	AC Input voltage	CH1 24V					
		Minimum load		50% load		Rated load	
		Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)
-15°C	85V	6.7	13.3	22.3	39.0	35.8	59.0
	100V	6.0	13.0	23.5	40.0	35.7	59.4
	240V	7.0	14.0	30.1	44.3	37.2	56.3
	264V	7.3	14.1	30.9	47.4	37.8	60.3
25°C	85V	5.7	12.5	9.8	30.0	24.7	58.2
	100V	5.1	11.8	10.6	33.4	24.8	54.4
	240V	5.8	12.8	14.8	30.1	24.9	53.2
	264V	6.6	12.7	15.9	35.2	25.0	53.0
55°C	85V	5.8	12.2	9.2	26.1	30.1	47.2
	100V	5.4	11.3	9.5	28.6	28.8	48.0
	240V	6.4	12.5	11.9	28.0	25.4	48.4
	264V	6.4	12.8	12.2	30.6	25.3	49.4
75°C	85V	5.2	9.5	18.1	28.1	13.1	36.3
	100V	5.7	10.0	18.3	29.2	12.3	33.5
	240V	6.6	13.9	18.2	29.5	12.4	29.8
	264V	7.8	13.5	20.3	29.8	12.1	30.8

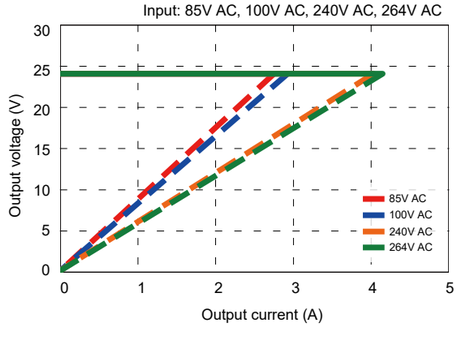
● Fig.19 Ambient Temperature vs. Lifetime Expectancy

Input : 100V AC
Load : Rated, convection cooling
Operation Hours : 24 hours continuous



*Expected life is calculated as if the system is operated 24/7.
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.20 Overcurrent Protection Characteristics (V - I Characteristics)



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