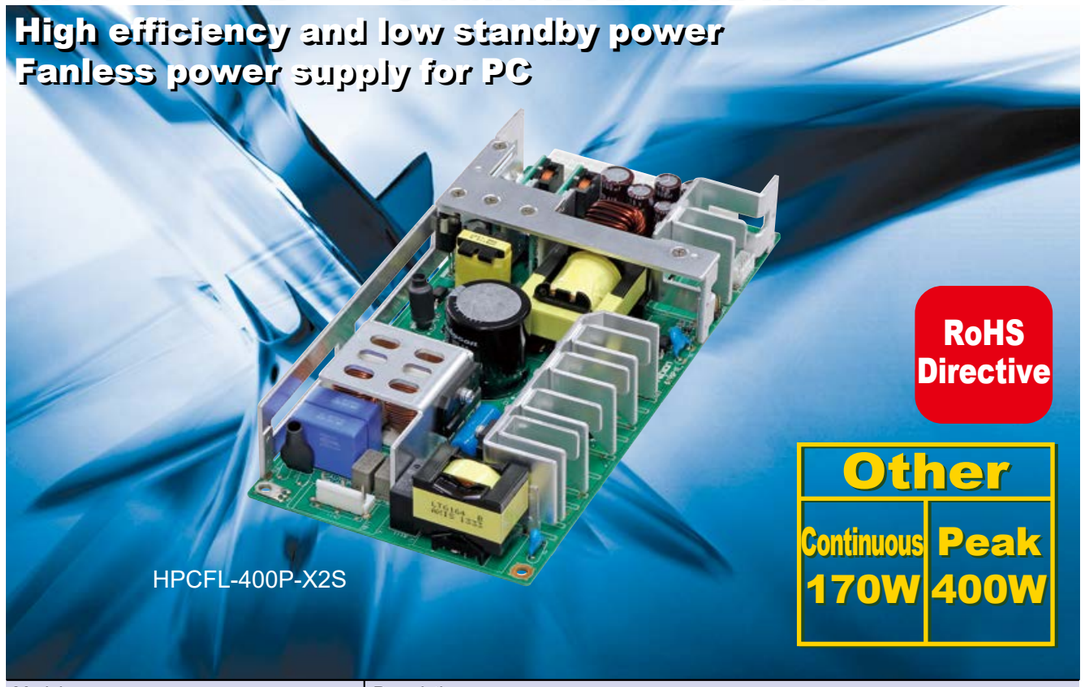
System Rack Power Supply HPCFL-400P-X2S



Model	Description
HPCFL-400P-X2S	–

■Model Name Coding

HPCFL-400P-X2S

① ② ③ ④⑤⑥

① Series name
② Output power
③ Peak power available
④ ATX output
⑤ +3.3V output equipped
⑥ Standard

Features

- Long life design with fanless power supply and expected life of more than 10 years (30°C, 170W, 24 hours continuous operation)
- High efficiency and low heat generation
- Min. load current is 0A for all outputs, supporting any kinds of loads.
- 1U rack size
- Backup functions by connecting battery pack.
- Capacitor pack supports momentary power failure. (optional)
- Coutinuous max. output power 305W with forced air cooling (power connector for fan contained)
- Detachable harness

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

●Function

DC start | RS 232C | USB | TTL | PFC | Silence | 5VSB FAN | TSFC FAN | Connection | RoHS

●Input

AC input	85-264V AC (Worldwide range, with PFC)

●Output

Output voltage		+3.3V	+5V	+12V	-12V	+5VSB
max power (coutinuous) Max. current/	Convection cooling	10A	10A	14A	0.2A	1A
		Total 83W		168W	2.4W	5W
		Total 168W				
		Total 170W				
	Forced air cooling	16A	16A	25A	0.5A	1.5A
		Total 90W		300W	6W	7.5W
		Total 300W			6W	7.5W
		Total 305W				
Peak current/ peak power (within 5s)		20A	20A	30A	0.5A	2A
		Total 120W		360W	6W	10W
		Total 390W				
		Total 400W				
Min. current		0A	0A	0A	0A	0A

●Dimension

W×H×D (mm)	106×37×225

●Output connector (optional component)

Main 20+4pin | Main 24pin | Main 20pin | AT | AUX | 12V 4pin | 12V 8pin | PCI-E 6pin | PCI-E 6+2pin | HDD | S-ATA | FDD

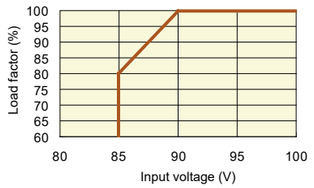
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	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		85% typ (100VAC), 88% typ (240VAC) *Characteristic data: Fig.5					305W at rated input/output
	Power Factor		96% min. (100VAC), 90% min. (240VAC) *Characteristic data: Fig.6					
	Inrush Current		31A peak (100VAC), 75A peak (240VAC) *Characteristic data: Fig.7					Rated input/output, cold start (25°C) Reclosing input interval shall be 10s min.
	Input Current		3.8A typ (100VAC), 1.6A typ (240VAC) *Characteristic data: Fig.5					At rated output
Output	Rated Voltage		+3.3V	+5V	+12V	-12V	+5VSB	
	Convection cooling	Rated Current	8A	8A	8A	0.2A	1A	Reference value at measurement of input/output characteristics.
		Rated Power	26.4W	40W	96W	2.4W	5W	
		Max. Current / Power	10A	10A	14A	0.2A	1A	At convection cooling, coutinuous rated Max. output power: 170W Refer to <Fig.1> <Fig.4> the derating condition
			83W max.		168W	2.4W	5W	
			168W max.					
			170W max.					
	Forced air cooling	Rated Current	8A	8A	19A	0.5A	1A	Reference value at measurement of input/output characteristics.
		Rated Power	26.4W	40W	228W	6W	5W	
		Max. Current / Power	16A	16A	25A	0.5A	1.5A	At forced air cooling, coutinuous rated Max. output power: 305W Refer to <Fig.1> <Fig.4> the derating condition
			90W max.		300W	6W	7.5W	
			300W max.			6W	7.5W	
			305W max.					
	Peak Current / Power		20A	20A	30A	0.5A	2A	Peak output power 400W Time: 5 sec or less Refer to <Fig.2> duty ratio of repetitive load: 10% or less
			120W max.		360W	6W	10W	
			390W max.					
			400W max.					
	Min. Current		0A	0A	0A	0A	0A	Refer to<Fig.3> Min. load condition
	Total Voltage Accuracy (%)		±5 max.	±5 max.	±5 max.	±5 max.	±5 max.	Accuracy against output voltage value including temperature and time lapse drifts as well as input/load regulation.
	Max. Ripple Voltage (mVp-p)		50 max.	50 max.	120 max.	120 max.	50 max.	Two wires are coming out from the output connector and connected into one at the edge. 47μF electrolytic capacitor and 0.1μF ceramic capacitor are placed on it and it is measured.*Characteristic data: Fig. 18
	Max. Spike Voltage (mVp-p)		100 max.	100 max.	170 max.	170 max.	100 max.	
Protection	Over Current Protection	OCP point (A)	21 min.	21 min.	31 min.	Short protection		Measurements done with no load except for the voltage measurement
		Method	All outputs except +5VSB are shut down.			Hold down current limiting	All outputs shut down	All outputs shut down with a +5VSB short-circuit (automatic recovery)
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'			Automatic recovery		AC reclosing period of 120s or longer
	Over Voltage Protection	OVP point (V)	3.76-4.3	5.74-7.0	13.4-15.6	–	7.0	
		Method	All outputs except +5VSB are shut down.			–	Zener Clamp	
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'			–	–	AC reclosing period of 120s or longer
Environment	Operating Temp./ Humidity		0-60°C*/10-90%					Refer to <Fig.4> Temperature derating below. There shall be no condensation
	Storage Temp./Humidity		-20-70°C/10-95%					There shall be no condensation
	Vibration		Acceleration amplitude: 2G (10-55Hz), Sweep cycles: 10 times in the X-, Y-, and Z-axes					Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Lift one bottom edge up to 50mm and let it fall. Number of bumps: 3 each of 4 edges					Follow JIS-C-60068-2-31 chassis fixed state at no operation
Insulation	Dielectric Strength		AC input - FG/DC output: 1500VAC for 1 minute					Cut-off current 10mA
	Insulation Resistance		AC input - FG/DC output: 50MΩ min.					At 500VDC
	Leakage Current		0.2mA max. (100VAC)/0.4mA max. (200VAC)/0.5mA max. (240VAC) *Characteristic data: Fig.8					IEC60950 compliant
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)					Measured by INS-410 There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant					
	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, EN55022-B compliant *Characteristic data: Fig. 9,10					Measured by single unit
	Harmonic Current Regulations		IEC61000-3-2 class D compliant					At rated input/output
Others	Safety Standards		UL60950, CSA60950 (c-UL) certified, PSE (ordinance clause 2) compliant, CE Marking (IEC62368-1)					Class I equipment and build-in type power supply, standard installation A and convection cooling
	Cooling System		Convection cooling (170W) or forced air cooling (305W) by external fan					Refer to Installation, derating condition
	Output Grounding		Connected chassis (FG)					
	Output Hold-up Time		AC cut-off → PWR_OK holds up 16ms min. *Characteristic data: Fig.15					At rated output
	Reliability Grade		FA (Industrial equipment grade to use double-sided PCB with plated through hole)					Following our standard
	MTBF		100,000 H min					Based on EIAJ RCR-9102
	Weight		0.65kg 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.

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

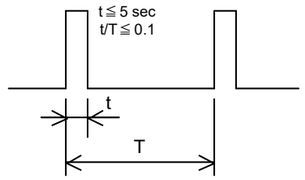
<Fig.1> Low input voltage derating

When the input voltage is 90V AC or less, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.



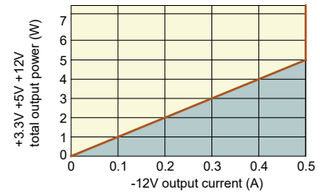
<Fig.2> Duty Ratio

Peak current/power shall be 5 sec or less continuously. For repetitive loads, duty ratio shall be 10% or less.



<Fig.3> Min. load condition

The output voltage accuracy of -12V shall be defined within the range as shown below. Also, as the normal operation range of PWR_OK signal, please use the 1.0% of the peak load to be used as min. load power.

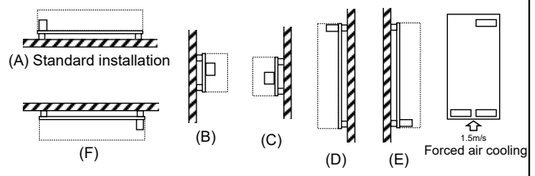


Installation/Derating conditions

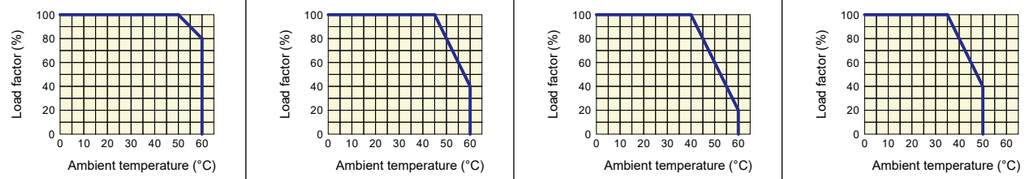
When using the product in a high temperature environment or at a low input voltage conditions, the output current and power shall be reduced according to the following conditions. The load factor of each CH and the total value specified in the output specifications shall be set up 100%.

1. Both continuous and instantaneous ratings shall be followed according to the load factor in accordance with the output reduction curve for each installed condition shown in <Fig. 4>.
2. When using the product with an input voltage of 90V or less, use it in accordance with the load factor shown in <Fig. 1>. If the load reduction conditions of both <Fig.1> and <Fig.4> are applying, use it with the value multiply for the both reduction rate.

Installation



<Fig.4> Temperature derating

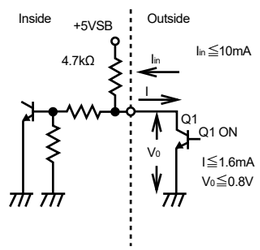


Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification
Input Signal	PS_ON	+3.3V, +5V, +12V and -12V outputs are delivered with 'L' input. +3.3V, +5V, +12V and -12V outputs shutdown with 'H' or 'OPEN' input.
	+3.3V SENSE	The input terminal to detect the voltage of CH1 (+3.3V) output; by connecting to the load terminal, only the line drop of the + side of the output cable is compensated.
Output Signal	PWR_OK	'H' signal is delivered when CH2 (+5V) output is normal.
	FAN_C	PWM signal for external fan control Outputs 0-100% in 10 steps depending on temperature rise

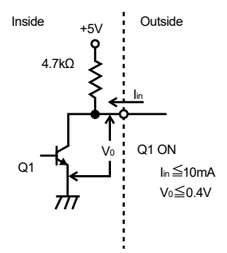
Input Signal Circuit / Output Signal Circuit

PS_ON

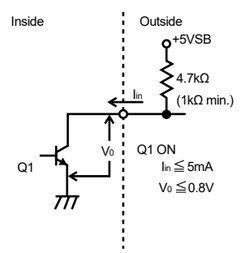


Connect the +3.3 V SENSE signal to +3.3 at the load end because +3.3 V output may not be satisfied the specification.

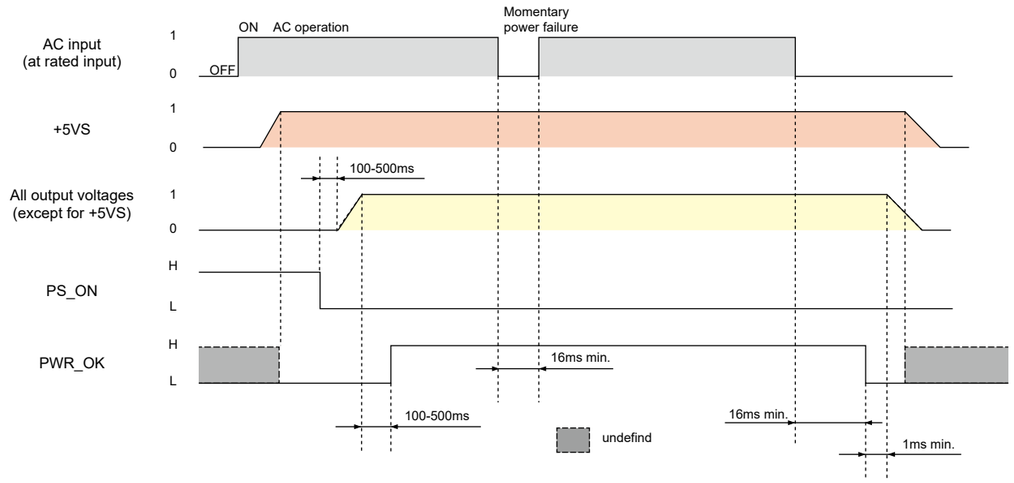
PWR_OK



FAN_C

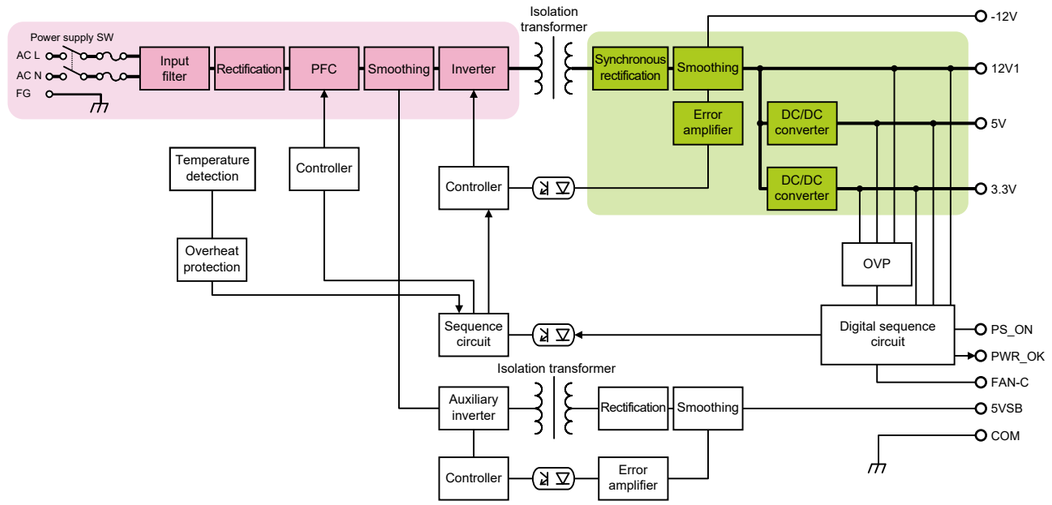


Sequence Timing Chart

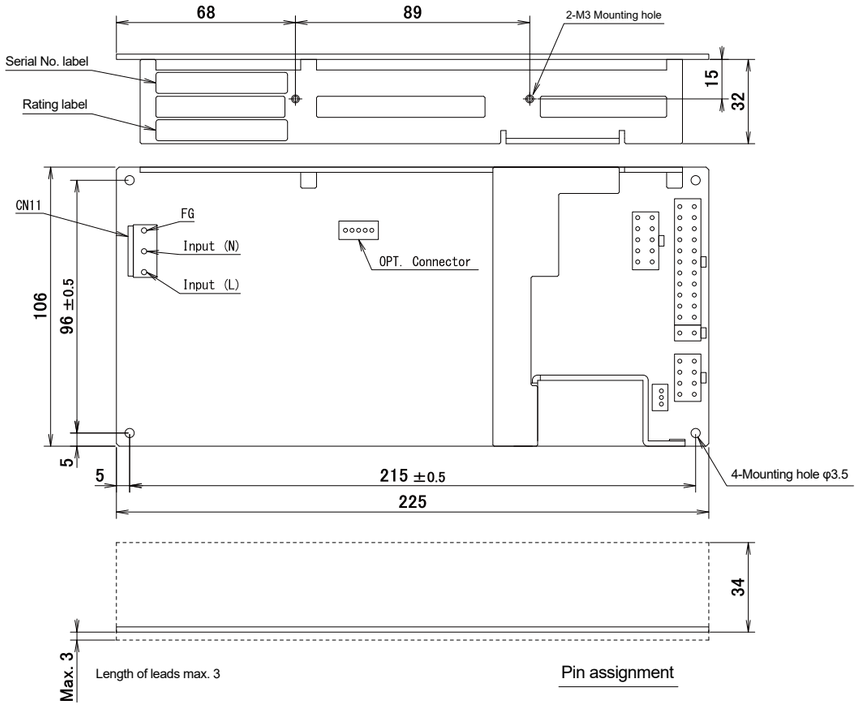


*1 Rise time difference among outputs shall be 50ms max.
The order and difference in level of output voltage for each output voltage at falling shall not be specified.
*2 Rise time of PWR_OK signal shall be 10ms or less.
(provided that capacitive load is not connected to PWR_OK signal output)

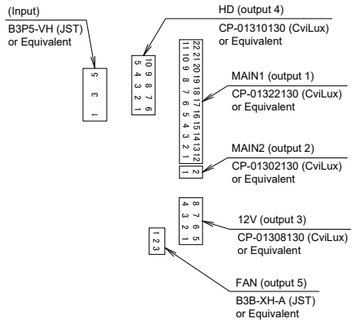
Block Diagram



Outline Drawing



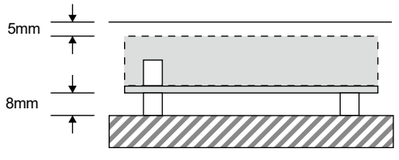
Pin assignment

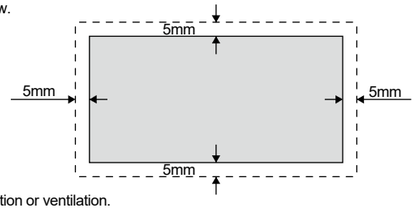


*1 Dimensional tolerance shall be ± 1mm unless otherwise specified.
*2 The screw depth of penetration into PSU is 5mm max.

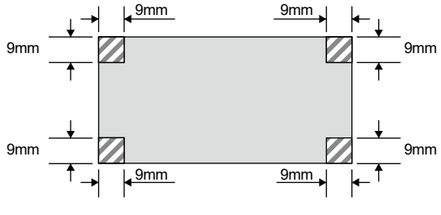
Installation

In order to fulfill the insulation and dielectric strength standard, set up within the dimensions below.





To suppress temperature rise around power supply, pay attention to set up to avoid poor convection or ventilation.
The unit shall be fixed by using 4-mounting holes on PCB within the diagonal range below.

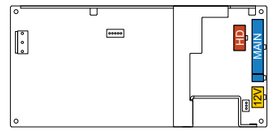


The unit shall be installed with the condition that can have enough conduction on the same metal plate.
In case of not taking the conduction, you may not expect enough performance in noise characteristics.

Options (Sold separately)

Detachable output harness

Model	Length and type of connector	Output port allocation
Main power cable MAIN		
WH-M2022-300	MAIN 300±10 20Pin	
WH-M2022-500	MAIN 500±10 20Pin	
WH-M2422-500	MAIN 500±10 24Pin	
12V power cable 12V		
WH-V0408-500	12V 500±15 12V 4Pin	
WH-V0808-500	12V 500±15 12V 8Pin	
WH-VV208-500-02	12V 500±10 12V 8Pin, 12V 8Pin	
WH-VG208-500-02	12V 500±10 12V 8Pin, 12V 6Pin	
WH-VG208-500	12V 500±15 12V 4Pin, 12V 6Pin	
HD power cable HD		
WH-PP610-850	HD 550±15, 150±15, 150±15	Peripheral (HD)
WH-PS610-850	HD 550±15, 150±15, 150±15	FD
WH-PS710-850	HD 550±15, 150±15, 150±15, 850±15	S-ATA
WH-PS810-1000	HD 550±15, 150±15, 150±15, 150±15	



Acceptable cables

MAIN	HD	12V
1 model	1 model	1 model

Capacitor package and Battery package

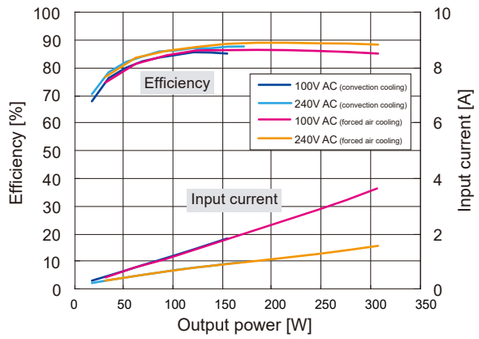
Photos	Model	Category	Description
	BS27A-P350/12V	Charging/discharging board for lead-acid battery	Supported a lead acid battery of up to 12V 5Ah
	BS28A-H350/2.5L	Ni-MH	5 inch bay size

Cable

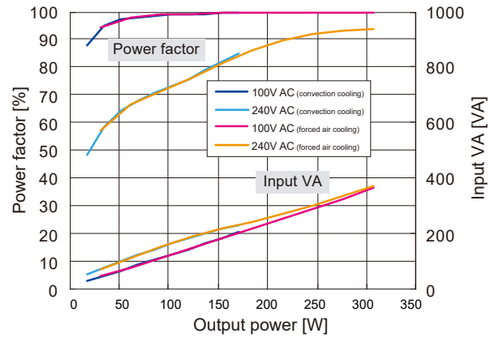
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	
	WH-C05VH-800-01	Input harness (with ferrite core)	
	WH-06XH09ELR-200	Power harness for connecting BS27A battery pack	Connect between HPCFL-400P-X2S and WH-09ELP05XA-200
	WH-09ELP05XA-200	Power harness for connecting BS27A/BS28A battery pack	Connect between HPCFL-400P-X2S and BS28A-H350/2.5L Connect between WH-06XH09ELR-200 and BS27A-P350/12V

Characteristics Data (Examples of actual measurement)

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

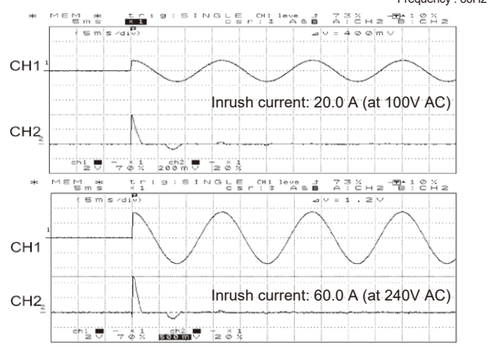


● Fig.6 Power Factor/Input VA vs. Output Power



● Fig.7 Inrush Current [at forced air cooling]

Load : Rated
Frequency : 60Hz



● Fig.8 Leakage Current [at forced air cooling]

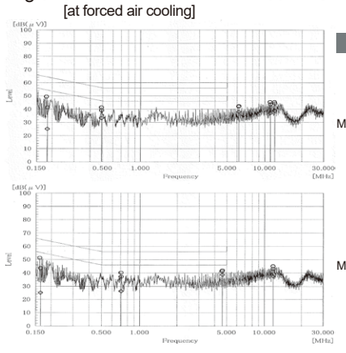
Input : 100, 200, 240V AC
Load : Rated load and Min. load

	Rated load	Min. load
100V AC	0.09mA	0.09mA
200V AC	0.23mA	0.23mA
240V AC	0.28mA	0.28mA

● Fig.9 Conducted Emission at 100V AC
[at forced air cooling]

Input : 100V AC
Load : Rated
Mode : Peak

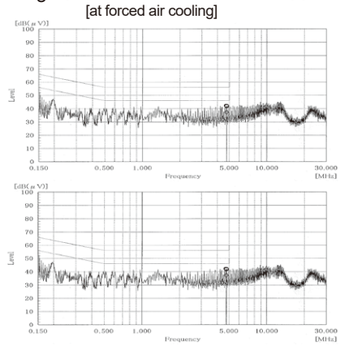
VCCI Class B



● Fig.10 Conducted Emission at 230V AC
[at forced air cooling]

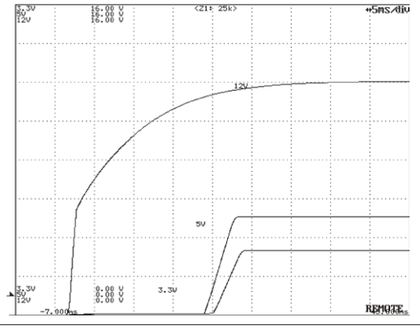
Input : 230V AC
Load : Rated
Mode : Peak

VCCI Class B



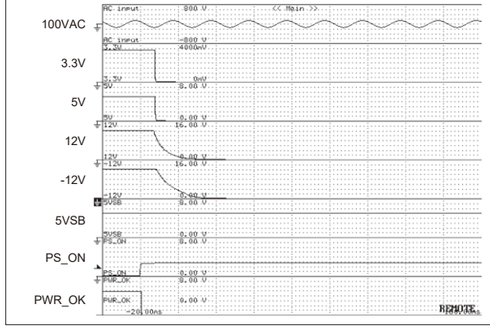
● Fig.11 Rising Characteristics at 100V AC
[at forced air cooling]

Input : 100V AC
Load : Rated
Time axis : 5 ms/DIV



● Fig.12 Falling Characteristics at 100V AC
(at remote OFF) [at forced air cooling]

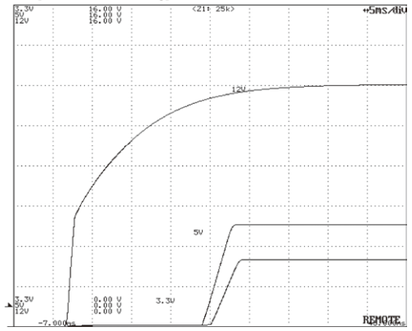
Input : 100V AC
Load : Rated
Time axis : 20 ms/DIV



Characteristics Data (Examples of actual measurement)

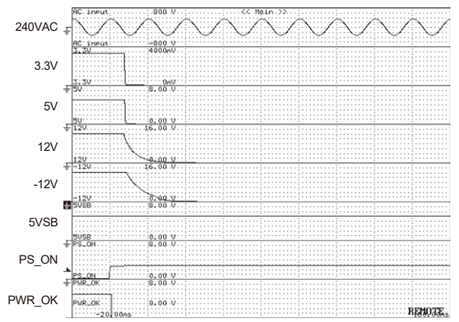
● Fig.13 Rising Characteristics at 240V AC
[at forced air cooling]

Input : 240V AC
Load : Rated
Time axis : 5 ms/DIV



● Fig.14 Falling Characteristics at 240V AC
(at remote OFF) [at forced air cooling]

Input : 240V AC
Load : Rated
Time axis : 20 ms/DIV



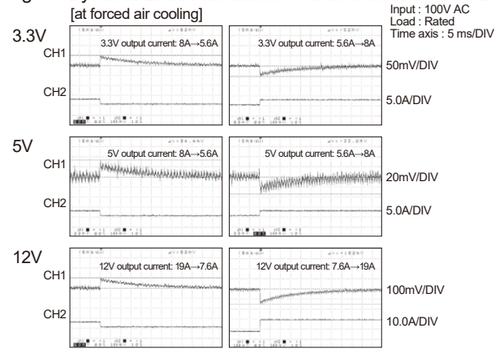
● Fig.15 Output Hold-up Time vs. Output power
[at convection cooling]

PWR_OK: the pont that PWR_OK signal "L" is delivered.
Output voltage: the point that output voltage exept 5VSB fails down to 95%.

Temp.	Input voltage	Hold-up time	
		PWR_OK	Output voltage
-5°C	100 VAC	60.77ms	39.05ms
	240V AC	60.57ms	38.78ms
25°C	100V AC	63.65ms	41.38ms
	240V AC	63.79ms	41.48ms
55°C	100V AC	66.70ms	43.77ms
	240V AC	67.03ms	43.95ms
65°C	100V AC	94.84ms	62.03ms
	240V AC	95.45ms	62.96ms

● Fig.16 Dynamic Load Fluctuation Characteristics at 10 kHz
[at forced air cooling]

Input : 100V AC
Load : Rated
Time axis : 5 ms/DIV



● Fig.17 Output Voltage Regulation
(Load Fluctuation) [at convection cooling]

Output	Min. load	Rated load
3.3V output	0A	8A
5V output	0A	8A
12V output	0A	8A
-12V output	0A	0.2A

AC input	85V	100V	240V	264V
3.3V output (min.)	3.305V	3.318V	3.318V	3.318V
3.3V output (rated)	3.326V	3.326V	3.326V	3.326V
5V output (min.)	5.098V	5.098V	5.098V	5.098V
5V output (rated)	5.070V	5.070V	5.069V	5.069V
12V output (min.)	12.104V	12.104V	12.103V	12.103V
12V output (rated)	12.095V	12.096V	12.096V	12.096V
-12V output (min.)	-12.214V	-12.216V	-12.217V	-12.217V
-12V output (rated)	-12.207V	-12.206V	-12.205V	-12.204V

● Fig.18 Ripple and Spike Voltage

Load: Rated

Temp.	AC Input voltage	+3.3V		+5V		+12V		-12V		+5VSB	
		Ripple (mV)	Noise (mV)	Ripple (mV)	Noise (mV)	Ripple (mV)	Noise (mV)	Ripple (mV)	Noise (mV)	Ripple (mV)	Noise (mV)
-5°C	100V	10.5	25.8	22.5	55.0	49.9	91.8	15.0	47.5	5.9	22.6
	240V	9.8	22.5	21.6	51.4	49.0	80.0	12.8	45.1	5.8	16.6
25°C	100V	10.5	26.8	20.3	52.4	37.6	85.8	15.1	49.4	7.8	27.2
	240V	9.7	22.1	19.1	49.2	36.9	66.1	12.8	43.4	7.6	21.6
55°C	100V	12.1	28.0	19.1	49.8	33.6	84.3	14.6	46.4	8.5	27.3
	240V	11.5	21.9	17.8	45.3	32.8	58.3	11.6	40.9	7.8	21.6
65°C	100V	10.2	22.3	18.2	43.9	24.0	52.8	12.4	40.0	2.4	13.2
	240V	9.8	19.6	16.6	41.3	23.7	41.8	11.0	37.4	2.4	9.3

● Fig.19 Ambient Temperature vs. Lifetime Expectancy

Input : 100V AC
Load : Rated

■Electrolytic capacitors

Power supply intake temperature	25°C
Lifetime expectancy (about)	18 years

*The lifetime shall be 15 years at longest due to deterioration of sealing plates.

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

Input : 100V AC