Desktop PC Power Supply ePCSA-650P-E2S

Model	Description	Stock
ePCSA-650P-E2S	———	Standard stock

■Model Name Coding

ePCSA - 650 P - E 2 S
① ② ③ ④ ⑤ ⑥

1. Series name
2. Output power
3. Peak output compliant
4. EPS output
5. +3.3V output equipped
6. Standard

Features

- High efficiency 80% at 240 VAC
- All outputs equipped with voltage regulation circuit individually. 0A (Zero amp) as min. load for all outputs. Driving stably with brand new high performance CPU.
- 650W high peak power EPS power supply
- By building in the thermal-sensing variable speed fan, noise reduction can be realised. Heat related issue for CPU can be settled with fan speed changeover switch.
- Removable cooling FAN
- Output harnesses can be easily customized to meet various requirements.

Refer to “Product Page Guideline” on p.11

Safety standard / Approval	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 (worldwide range)

Output

Output voltage	+3.3V	+5V	+12V1	+12V2	+12V3	-12V	+5VSB
Max. current / max. power (continuous)	24A	24A	18A	12A	12A	0.5A	2.5A
	Total 140W		Total 420W				
	Total 550W						
Peak current / peak power (5 sec max.)	24A	24A	22A	16A	16A	0.5A	3.0A
	Total 150W		Total 480W				
	Total 650W						
Min. current	0A	0A	0A	0A	0A	0A	0A

Dimensions

W×H×D (mm)	150×86×180 (PS/2 ++size)

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

*Refer to p.73 “Detachable output harness” for details

General Specification Condition: at normal temperature and humidity unless otherwise specified

	Items		Specification							Measurement conditions, etc.
AC Input	Rated Voltage		100 - 240 VAC (85* - 264 VAC)							Worldwide range *Refer to Fig.1
	Input Frequency		50 / 60Hz							47-63Hz
	Efficiency		73% min. (100 VAC), 77% min. (240 VAC) *Characteristic data: Fig.4							At rated input/output
	Power Factor		99% min. (100 VAC), 96% min. (240 VAC) *Characteristic data: Fig.5							
	Inrush Current		31A peak (100 VAC), 76A peak (240 VAC) *Characteristic data: Fig.6							At rated input/output at cold start (25°C)
	Input VA		8.3A max. (100 VAC), 3.3VA max. (240 VAC) *Characteristic data: Fig.5							At rated input and max. output (25°C)
			9.5A max. (100 VAC), 3.8A max. (240 VAC)							At rated input and peak output (25°C)
Output	Rated Voltage		+3.3V	+5V	+12V1	+12V2	+12V3	-12V	+5VSB	
	Rated Current		11A	15A	15A	10A	10A	0.5A	2.5A	
	Max. Current / Power		24A	24A	18A	12A	12A	0.5A	2.5A	Max. output power: 550W
			140W max.		420W max.					
			550W max.							
	Peak Current / Power		24A	24A	22A	16A	16A	0.5A	3.0A	Peak output power: 650W Time: 5 sec or less, Duty ratio of repetitive load: 10% or less *Refer to Fig.2
			150W max.		480W max.					
			650W max.							
	Min. Current		0A	0A	0A	0A	0A	0A	0A	
	Total Voltage Accuracy (%)		±4 max.	±4 max.	±5 max.	±5 max.	±5 max.	±5 max.	±5 max.	Total accuracy of temperature, input, and load fluctuations
	Max. Ripple Voltage (mVp-p)		50 max.	50 max.	80 max.	80 max.	80 max.	80 max.	50 max.	Two wires are coming out from the output connector and connected into one at the edge of 50cm max. long. 47µF electrolytic capacitor and 0.1µF ceramic capacitor are placed on it and it is measured by the 100MHz oscilloscope. *Characteristic data: Fig.17
	Max. Spike Voltage (mVp-p)		100 max.	100 max.	200 max.	200 max.	200 max.	200 max.	100 max.	
Protection	Overcurrent Protection	OCP Point (A)	25 min.	25 min.	25 min.	18 min.	18 min.	Short protection		All other outputs are rated loads at rated input voltage. Reclosing period shall be 60 sec., or longer
		Method	All outputs except for +5VSB shutdown PWR_OK goes to 'L'					Hold-down, or all outputsshut down	All outputs shutdown	
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'					Automatic recovery		
	Overvoltage Protection	OVP Point (V)	3.76 - 4.3	5.74 - 7.0	13.4 - 15.6			-	-	Reclosing period shall be 60 sec., or longer
		Method	All outputs except for +5VSB shutdown PWR_OK goes to 'L'					-	-	
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'					-	Zener Clamp	
Environment	Operating Temp. / Humidity		0 to 60°C*/10 to 90%							*Refer to Fig.3 No condensation.
	Storage Temp. / Humidity		-25 to 70°C/10 to 95%							No condensation.
	Vibration		Displacement amplitude: 0.075mm (10-55Hz), Sweep cycles: 10, Test duration: 45 minutes each axis							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							JIS-C-60068-2-31, at no operation
Insulation	Dielectric Strength		AC input - DC output/FG: 1500 VAC for 1 minute							Cut-off current: 15mA, Humidity: 60% max.
	Insulation Resistance		AC input - DC output/FG: 50MΩ min.							With 500 VDC at 60% Humidity max.
	Leakage Current		0.5mA max. (100 VAC) / 1mA max. (200 VAC) *Characteristic data: Fig.7							YEW. TYPE3226 (1kΩ) or equivalent
EMC	Line Noise Immunity		±2000V (pulse width: 100/1000ns, repetitive cycle: 30-100Hz, normal/common mode with pos./neg. polarity for 10 minutes)							Measured by INS-410 No fluctuation of DC output or malfunction
	Electrostatic Discharge		EN61000-4-2 compliant							
	Radiated, Radio-Frequency EM Field		EN61000-4-3 compliant							
	Fast Transient Burst		EN61000-4-4 compliant							
	Lightning Surge		EN61000-4-5 compliant							
	RF Conducted Immunity		EN61000-4-6 compliant							
	Magnetic Field Immunity		EN61000-4-8 compliant							
	Voltage Dip / Regulation		EN61000-4-11 compliant							
	Conducted Emission		VCCI-A, FCC-A, EN55022-A compliant *Characteristic data: Fig.8 and 9							Measured by single unit
	Harmonic Current Regulation		IEC61000-3-2 (Ver.2.1) Class D, EN61000-3-2 (A14) Class D compliant							With rated input/output
Others	Safety Standards		UL60950, CSA C22.2 No.950 (c-UL), CCC							The Electrical Appliance and Material Safety Law Item 2 only to be applied
	Cooling System		Forced air cooling: fan control can be switched between thermal-sensing variable speed and stabilized full rotation modes.							Fan rotates at low speed depending on the internal temperature of power supply even PS_ON# signal 'H'.
	Output Grounding		Connected to chassis (FG)*							*It can be customized to connect to capacitor
	Output Hold-up Time		PWR_OK holds up 16ms min. after AC failure *Characteristic data: Fig.14							At rated output
	Reliability Grade		FA (industrial equipment grade, double-sided PCB with plated through hole)							Follow our standard
	MTBF		70,000 H min.							
	Weight		2.0 kg typ.							
	Warranty		3 years after delivery. If any faults belong to us, the defective unit shall be repaired or replaced at our cost.							Except for errors caused by operation not listed

Fig.1 Derating for Low Input Voltage

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

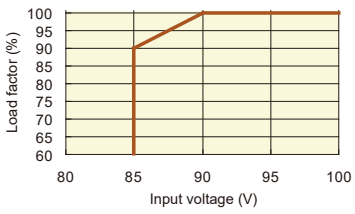


Fig.2 Duty Ratio

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

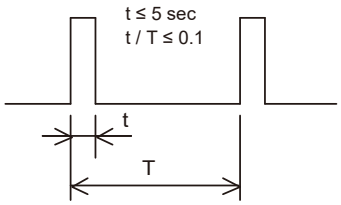
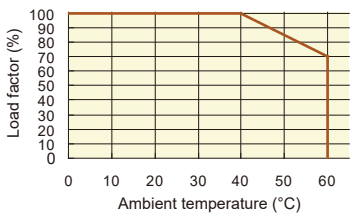
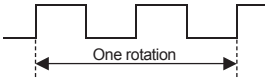


Fig.3 Temperature Derating

When the ambient temperature(near the airflow inlet) exceeds 40°C, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.



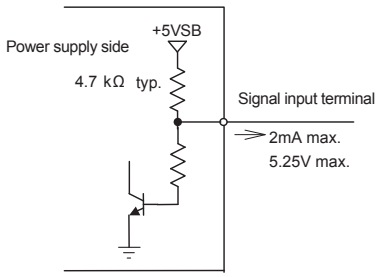
Signal Input / Output Specification Condition: at normal temperature and humidity unless otherwise specified

	Items	Specification	Note
Input Signal	Output ON / OFF Control Signal (PS_ON#)	+3.3V,+5V,+12V1,+12V2,+12V3, and -12V outputs shutdown with 'H' or 'OPEN' input Note: With 'OPEN' input, the voltage of PS_ON# signal becomes 2.0V or less.	The pin 16 of P1MAIN connector
	+3.3V SENSE	The input terminal to detect the voltage of +3.3V output; by connecting to the load terminal, only the line drop of the + side of the output cable is compensated.	The pin 1 of P1MAIN connector
Output Signal	Normal Output Signal (PWR_OK)	'H'signal is delivered at normal output (detection delay time: 100 - 500ms).	The pin 8 of P1MAIN connector
	Fan Monitor Signal (FAN M)	Two cycle pulses per one rotation of the fan motor are delivered (open collector output). Duty ratio of the pulse shall be 0.5 typ. (Interval between the signals becomes longer at low speed and shorter at high speed.) The signal remains 'L' or 'OPEN' when the fan stops caused by any failure or malfunction.	The pin 1 of P5 SIG connector 

Signal Circuit

Input Signal Circuit

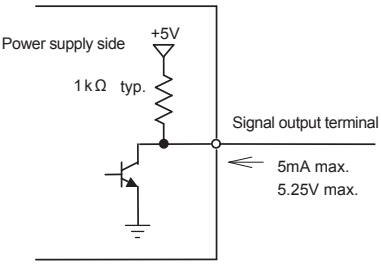
(PS_ON#)



('L'≤0.8V, 2.0V≤'H')

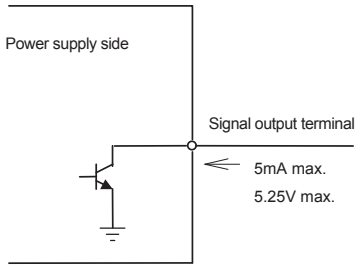
Output Signal Circuit

(PWR_OK)

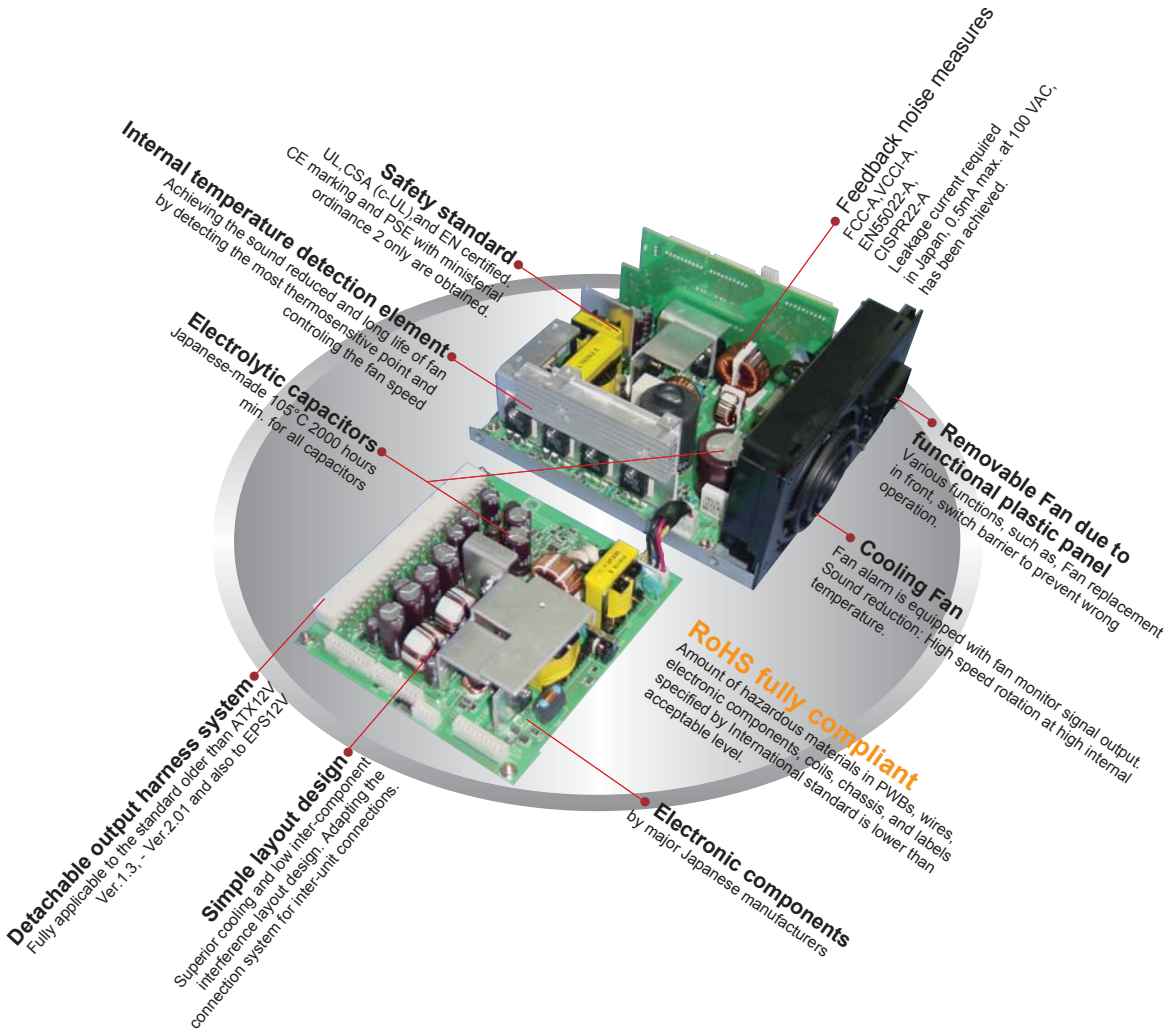


('L'<0.4V)

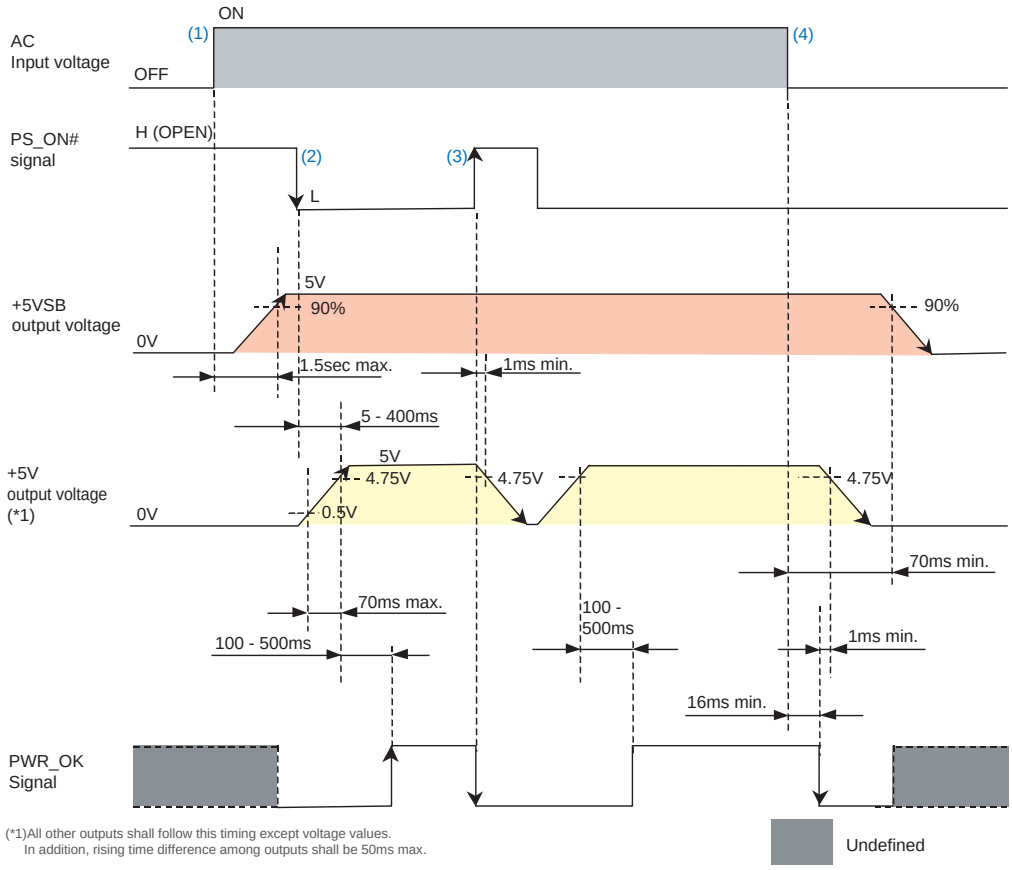
(FAN M)



('L'<0.4V)



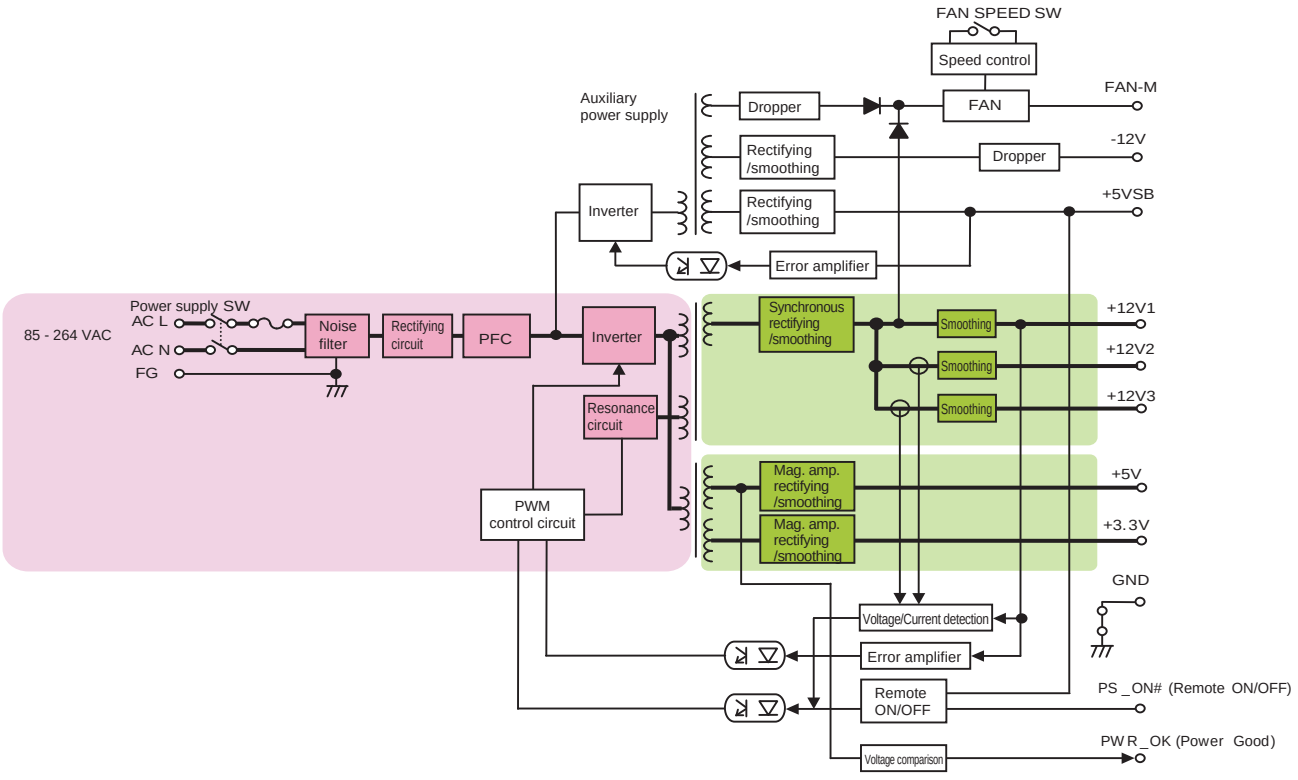
Sequence Diagram



(*1)All other outputs shall follow this timing except voltage values.
In addition, rising time difference among outputs shall be 50ms max.

(1) With PS_ON# 'H (OPEN)', only +5VSB output starts up at AC input.
(2) All outputs start up at PS_ON# 'L' input. Also, PWR_OK goes to 'H' at 100 - 500ms after the +5V output has risen.
(3) At PS_ON# 'H' input, outputs except for +5VSB shut down.
(4) PWR_OK turns to 'L' after 16ms or longer from blackout. 1ms later than this event, the +5V output shuts down and another 1ms later followed by +5VSB shutdown.

Block Diagram



Outline Drawing

P1 MAIN Output

Pin	Signal	Rating
1	+3.3 V Sense	–
2	+3.3 V DC	6 A
3	COM	6 A
4	+5 V DC	6 A
5	COM	6 A
6	+5 V DC	6 A
7	COM	6 A
8	PWR_OK#	10 mA
9	+5 VSB	3 A
10	+12 V2 DC	6 A
11	+12 V2 DC	6 A
12	+3.3 V DC	6 A
13	+3.3 V DC	6 A
14	-12 V DC	0.5 A
15	COM	6 A
16	PS_ON#	10 mA
17	COM	6 A
18	COM	6 A
19	COM	6 A
20	Reserved	–
21	+5 V DC	6 A
22	+5 V DC	6 A
23	+5 V DC	6 A
24	COM	6 A

P2, P3 HD Output

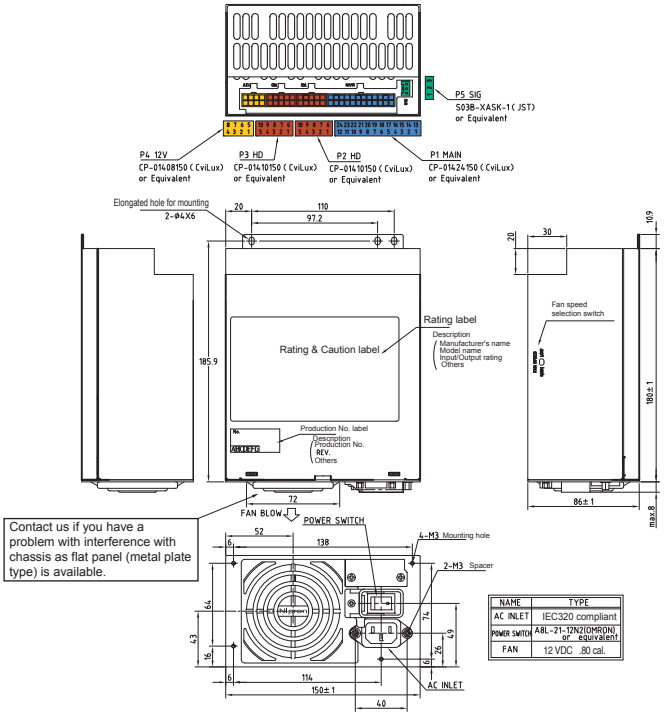
Pin	Signal	Rating
1	+3.3 V DC	6 A
2	+5 V DC	6 A
3	COM	6 A
4	COM	6 A
5	+12 V3 DC	6 A
6	+3.3 V DC	6 A
7	+5 V DC	6 A
8	COM	6 A
9	COM	6 A
10	+12 V3 DC	6 A

P4 12V Output

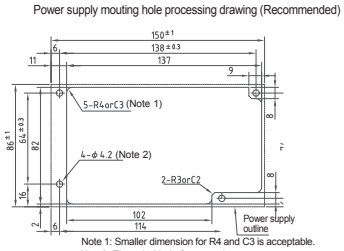
Pin	Signal	Rating
1	COM	6 A
2	COM	6 A
3	COM	6 A
4	COM	6 A
5	+12 V1 DC	6 A
6	+12 V1 DC	6 A
7	+12 V1 DC	6 A
8	+12 V1 DC	6 A

P5 SIG Output

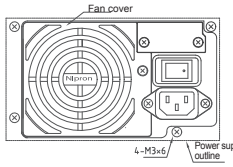
Pin	Signal	Rating
1	FAN-M	5 mA
2	COM	5 mA
3	Reserved	–



Contact us if you have a problem with interference with chassis as flat panel (metal plate type) is available.



Note 1: Smaller dimension for R4 and C3 is acceptable.
Note2: Threaded hole for mounting



When replacing a fan, or adding or replacing interface unit with power supply mounted to the chassis of PC, etc., process holes as specified.

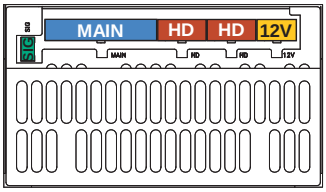
*Dimensional tolerance shall be ±0.5 unless otherwise specified.

■Installation direction
The unit can be installed in any directions.

Optional Components Sold Separately

Detachable Output Harness

Model	Length and Type of Connector	Output Port Allocation
Main power cable MAIN		
WH-M2024-500	MAIN 500±15 → 20-pin	
WH-M2424-500	MAIN 500±15 → 24-pin	
12V power cable 12V		
WH-V0808-500	12V 500±15 → 12V 8-pin	
WH-V0408-500	12V 500±15 → 12V 4-pin	
WH-VG208-500	12V → 12V 4-pin; 500±15 → PCI-E 6-pin	
WH-VV208-500-02	12V → 12V 8-pin; 500±10 → 12V 8-pin	
WH-VG208-500-02	12V → 12V 8-pin; 500±10 → PCI-E 6-pin	
WH-G0808-500	12V 500±10 → PCI-E 6+2-pin	
WH-GG208-500	12V → PCI-E 6-pin; 500±10 → PCI-E 6+2-pin	
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
SIG cable SIG		
WH-S0603-500	SIG 500±15 → SIG-2	
WH-S0303-500	SIG 500±15 → SIG-3	



Acceptable cable(s)

MAIN	12V	HD	SIG
1 model	1 model	2 models	1 model

Harness set MAIN 12V HD	
WHS2828	[contents] / WH-M2024-500 (1) / WH-M2424-500 (1) / WH-V0808-500 (1) / WH-VG208-500 (1) / WH-PP610-850 (1) / WH-PS610-850 (2)

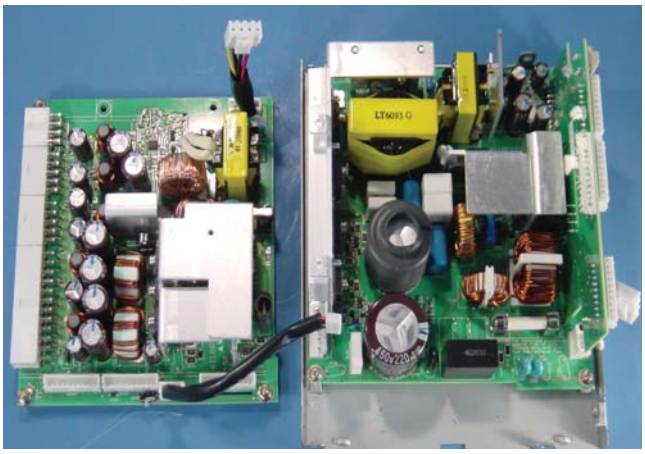
Optional Components Sold Separately

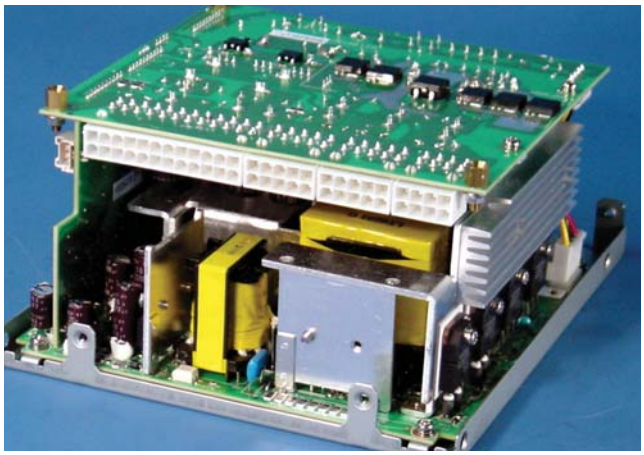
Cable			
Picture	*Model*	*Type*	*Description*
	WH2753	AC power cord	125 VAC 12A [PSE]
	WH2753-02	AC power cord	125 VAC 12A (tracking resistance type) [PSE]

Parts / Unit			
Picture	*Model*	*Type*	*Description*
	ACC2734	AC power cord retention clamp	It prevents the slipping of AC power cord (WH2753, WH2753-02)and operational mistakes of power switch. *In some cases, the clamp (ACC2734) might not be possible mounted to a commercial AC power cord.

Other Optional Components			
Model	*Description*	*Model*	*Description*
ACC2637	Automatic startup unit	WH5105	12V 4-pin connector conversion harness (80mm)
WH2820	20-pin extension harness (600mm)	WH5105-02	12V 4-pin connector conversion harness (320mm)
WH2747	20-pin extension harness (450mm)	WH5055	AT connector conversion harness
WH2892-02	20-pin extension harness (200mm)	ACC5046	Harness with PS_ON switch
WH2812	PCI-E 6-pin connector conversion harness	ACC5077	PS_ON terminal short connector
		WH5073	PS_ON terminal short 20-pin harness

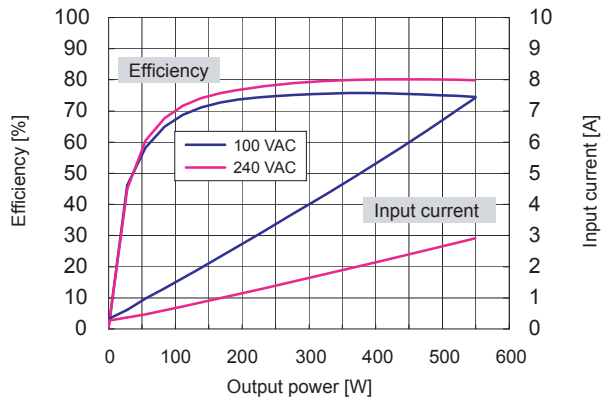
Internal Structure



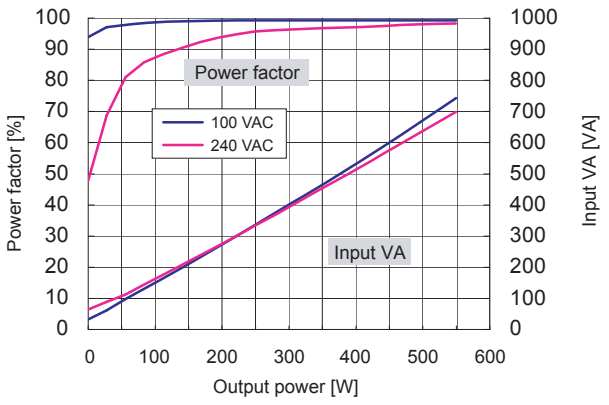


Characteristics Data (Examples of actual measurement)

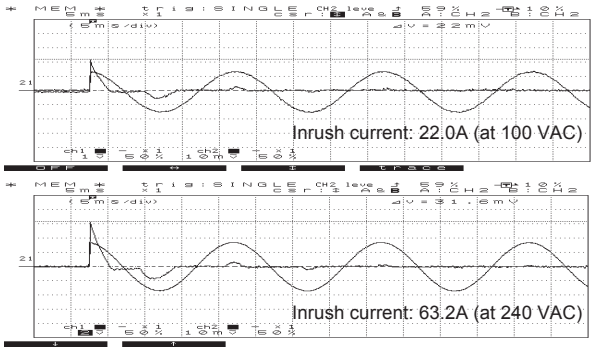
● Fig.4 Efficiency / Input Current vs. Output Power



● Fig.5 Power Factor / Input VA vs. Output Power



● Fig.6 Inrush Current



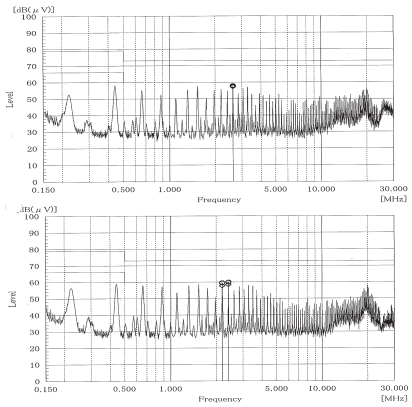
● Fig.7 Leakage Current

Input: 100 / 240 VAC
Load: Rated and min. load

	Rated load	Min. load
100 VAC	0.41mA	0.33mA
240 VAC	0.69mA	0.68mA

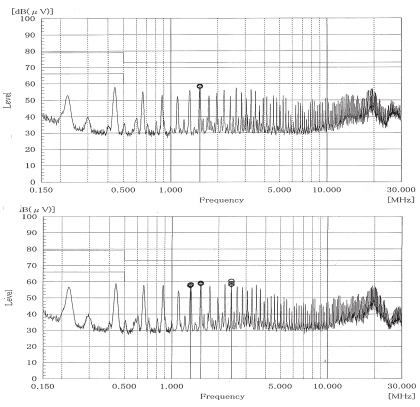
● Fig.8 Conducted Emission at 100 VAC

Input: 100 VAC
Load: Rated
Mode: Peak



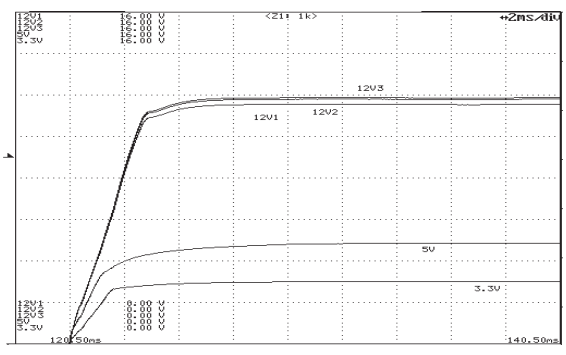
● Fig.9 Conducted Emission at 230 VAC

Input: 230 VAC
Load: Rated
Mode: Peak



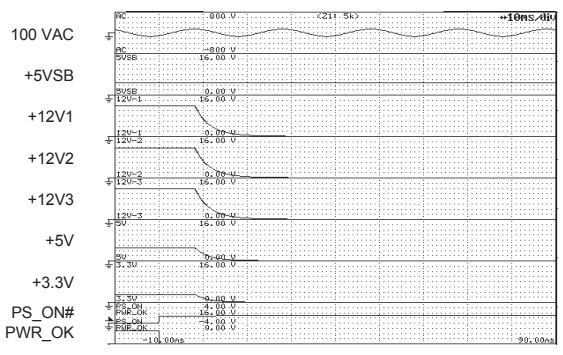
● Fig.10 Rising Characteristics at 100 VAC

Input: 100 VAC
Load: Rated
Time axis: 2ms/DIV



● Fig.11 Falling Characteristics at 100 VAC when REMOTE goes Off

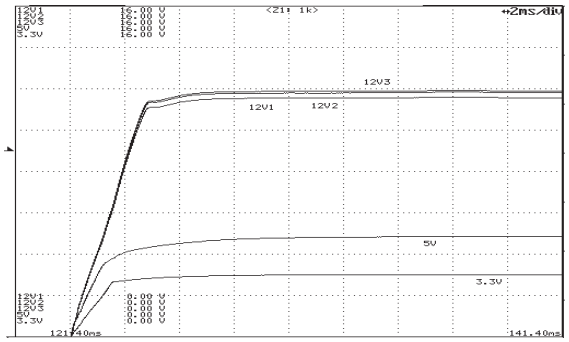
Input: 100 VAC
Load: Rated
Time axis: 10ms/DIV



Characteristics Data (Examples of actual measurement)

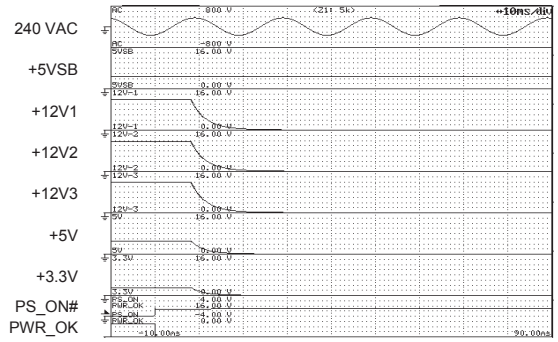
● Fig.12 Rising Characteristics at 240 VAC

Input: 240 VAC
Load: Rated
Time axis: 2ms/DIV



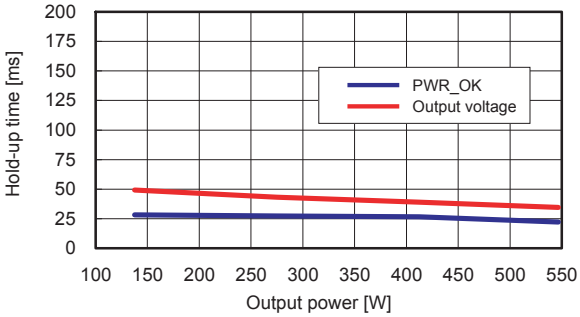
● Fig.13 Falling Characteristics at 240 VAC when REMOTE goes Off

Input: 240 VAC
Load: Rated
Time axis: 10ms/DIV



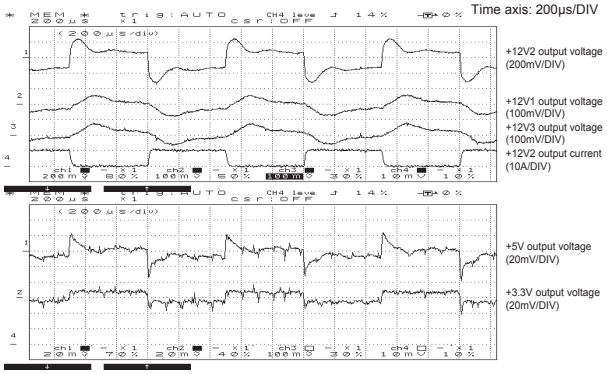
● Fig.14 Output Hold-up Time vs. Output Power

PWR_OK: the point that PWR_OK signal goes to "L"
Output voltage: the point any output voltage decreases to 95% except +5VSB



● Fig.15 Dynamic Load Fluctuation Characteristics at 1kHz

Input: 100 VAC
Load: Rated
Time axis: 200μs/DIV



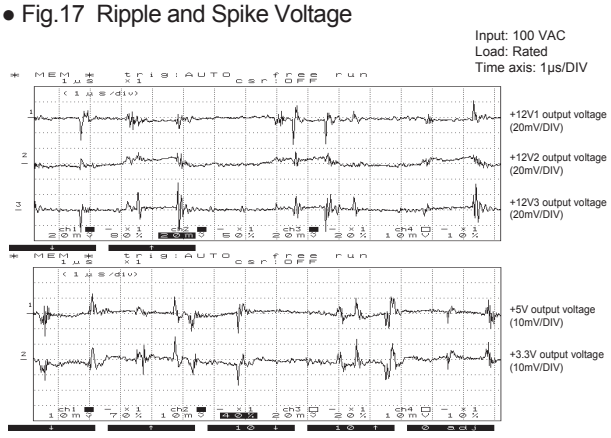
● Fig.16 Output Voltage Regulation

Output	Min. load	Rated load	Peak load
+12V1 output	0A	15A	22A
+12V2 output	0A	10A	16A
+12V3 output	0A	10A	16A
+5V output	0A	15A	24A
+3.3V output	0A	11A	24A

AC input voltage	85 VAC	100 VAC	132 VAC	176 VAC	240 VAC	264 VAC
+12V1 output (min. load)	12.186 V	12.185 V	12.185 V	12.185 V	12.185 V	12.185 V
+12V1 output (rated load)	11.929 V	11.926 V	11.926 V	11.927 V	11.928 V	11.926 V
+12V1 output (peak load)	11.795 V	11.794 V	11.793 V	11.793 V	11.794 V	11.793 V
+12V2 output (min. load)	12.180 V	12.178 V	12.178 V	12.178 V	12.178 V	12.177 V
+12V2 output (rated load)	11.983 V	11.982 V	11.982 V	11.982 V	11.982 V	11.981 V
+12V2 output (peak load)	11.866 V	11.866 V	11.865 V	11.865 V	11.865 V	11.865 V
+12V3 output (min. load)	12.180 V	12.178 V	12.178 V	12.177 V	12.178 V	12.177 V
+12V3 output (rated load)	12.069 V	12.067 V	12.066 V	12.066 V	12.067 V	12.066 V
+12V3 output (peak load)	12.009 V	12.008 V	12.007 V	12.007 V	12.008 V	12.008 V
+5V output (min. load)	5.119 V	5.122 V	5.120 V	5.118 V	5.116 V	5.121 V
+5V output (rated load)	4.993 V	5.002 V	4.996 V	4.992 V	4.987 V	4.996 V
+5V output (peak load)	4.957 V	4.962 V	4.957 V	4.955 V	4.951 V	4.957 V
+3.3V output (min. load)	3.379 V	3.379 V	3.379 V	3.379 V	3.379 V	3.379 V
+3.3V output (rated load)	3.282 V	3.282 V	3.282 V	3.282 V	3.282 V	3.282 V
+3.3V output (peak load)	3.222 V	3.221 V	3.221 V	3.222 V	3.221 V	3.221 V

● Fig.17 Ripple and Spike Voltage

Input: 100 VAC
Load: Rated
Time axis: 1μs/DIV



● Fig.18 Ambient Temperature vs. Expected Service Life

■ Electrolytic capacitors

Input: 90 VAC
Load: Rated
Operating time: 24 consecutive hours

Intake air temp.	20°C	30°C	40°C
Expected service life (yr)	approx. 15	approx. 7.6	approx. 3.8

※ Lifetime shall be 15 years at longest due to deterioration of sealing plates.

■ Fan

Ambient temp.	20°C	30°C	40°C	50°C
Expected service life (yr)	approx. 13	approx. 8.7	approx. 5.8	approx. 3.9

● Fig.19 Over Current Protection (V-I Characteristic)

Input: 100 VAC