# Desktop PC Power Supply mPCSA-500P-X2S


| Model | Description | Stock |
|---|---|---|
| mPCSA-500P-X2S | ——— | Standard stock |

■Model Name Coding

**mPCSA - 500 P - X 2 S**

① ② ③ ④ ⑤ ⑥

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

## Features

- Medical standard IEC60601-1 2nd and 3rd (MOPP) certified
- CCC certified.
- Completely independent voltage-stabilizing circuit is mounted for all outputs. Min. load current is 0A for all outputs.Driving stably with brand new high performance CPU.
- High capacity peak output: 500W
- 74ms output hold-up time at instantaneous blackout with 200W. Reliable in a poor power condition place.
- 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.
- Fan can be replaced.
- Designed to last 10 years min. with continuous rated operation at 45°C.
- 99% of power factor at 100VAC achieved with active filter (PFC) equipped.

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* | *+12V* | *-12V* | *+5VSB* |
|---|---|---|---|---|---|
| *Max. current / max. power (continuous)* | 20A | 22A | 22A | 0.5A | 2A |
| | Total 160W | | | | |
| | Total 285W | | | | |
| | Total 301W | | | | |
| *Peak current / peak power (5 sec max.)* | 30A | 33A | 30A | 0.5A | 2.5A |
| | Total 200W | | | | |
| | Total 482W | | | | |
| | Total 500.5W | | | | |
| *Min. current* | 0A | 0A | 0A | 0A | 0A |

## Dimensions

| | |
|---|---|
| W×H×D (mm) | 150×86×140 (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.97 “Detachable Output Harness” for details


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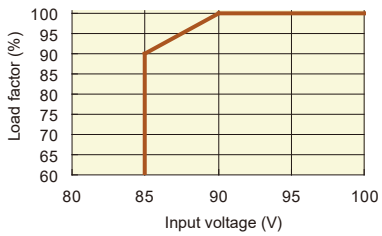
# General Specification Condition: at normal temperature and humidity unless otherwise specified

| | Items | | Specification | | | | | Measurement conditions, etc. |
|---|---|---|---|---|---|---|---|---|
| AC Input | Rated Voltage | | 100 - 240 VAC (85* - 264 V) | | | | | Worldwide range, *Refer to Fig.1 |
| | Input Frequency | | 50 / 60Hz | | | | | 47 - 63Hz |
| | Efficiency | | 73% typ. (100 VAC), 77% typ. (240 VAC) *Characteristic data: Fig.4 | | | | | At rated input/output |
| | Power Factor | | 99% typ. (100 VAC), 94% typ. (240 VAC) *Characteristic data: Fig.5 | | | | | |
| | Inrush Current | | 31A peak (100 VAC), 75A peak (240 VAC) *Characteristic data: Fig.6 | | | | | At rated input/output at cold start (25°C) |
| | Input VA | | 436VA max. (100 VAC), 435VA max. (240 VAC) *Characteristic data: Fig.5 | | | | | At rated input and max. output |
| | | | 754VA max. (100 VAC), 714VA max. (240 VAC) | | | | | At rated input and peak output |
| Output | Rated Voltage | | +3.3V | +5V | +12V | -12V | +5VSB | |
| | Rated Current | | 10A | 12A | 16A | 0.5A | 2A | Total rated output power: 301W |
| | Max. Current / Power | | 20A | 22A | 22A | 0.5A | 2A | Max. output power: 301W |
| | | | 160W max. | | | | | |
| | | | 285W max. | | | | | |
| | Peak Current / Power | | 30A | 33A | 30A | 0.5A | 2.5A | Peak output power: 500.5W<br>Time: 5 sec or less<br>Duty ratio of repetitive load: 10% or less<br>*Refer to Fig.2 |
| | | | 200W max. | | | | | |
| | | | 482W max. | | | | | |
| | Min. Current | | 0A | 0A | 0A | 0A | 0A | |
| | Total Voltage Accuracy (%) | | ±4 max. | ±4 max. | ±5 max. | ±5 max. | ±5 max. | Total accuracy of temperature, input, and load fluctuations |
| | 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. 10μF electrolytic capacitor and 0.1μF ceramic capacitor are placed on it and it is measured. *Characteristic data: Fig.17 |
| | Max. Spike Voltage (mVp-p) | | 100 max. | 100 max. | 170 max. | 170 max. | 100 max. | |
| Protection | Overcurrent Protection | OCP Point (A) | 31 min. | 34 min. | 31 min. | 105% min. of peak current | | All other outputs are at rated input/output |
| | | Method | All outputs except for +5VSB shutdown | | | Fold back current limiting | Same as +3.3V, +5V, +12V | |
| | | 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 | - | - | |
| | | Method | All outputs except for +5VSB shutdown | | | - | - | |
| | | Recovery | Reclosing AC input, or switching PS_ON# signal from 'H' to 'L' | | | - | - | |
| Environment | Operating Temp. / Humidity | | 0 to 60°C* / 10 to 90% | | | | | No condensation *Refer to Fig.3 |
| | Storage Temp. / Humidity | | -25 to 70°C / 10 - 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 - FG/DC output: 1500 VAC for 1 minute | | | | | It is having a 4kV dielectric strength between AC input to DC output. However, for finished product, 1.5kV shall be applied to prevent excess voltage to basic insulation part. |
| | Insulation Resistance | | AC input - FG/DC output: 50MΩ min. | | | | | |
| | Leakage Current | | 0.12mA max. (100 VAC) / 0.3mA 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 each) | | | | | Measured by INS-410<br>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-B、FCC-B、EN55022-B 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 | | | | | At rated input/output |
| Others | Safety Standards | | UL60601-1, CSA C22.2 No.601.1 ANSI/AAMI ES60601-1<br>UL60950-1, CSA C22.2 No.60950-1, CCC, CE Marking (IEC62368-1) | | | | | |
| | 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 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 | | 93,000 H min. | | | | | Based on EIAJ RCR-9102 |
| | Weight | | 1.8 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 |

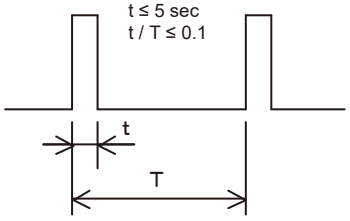
### Fig.1 Derating for Low Input Voltage

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.



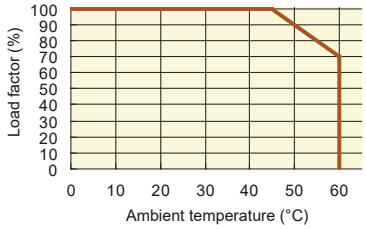

### Fig.2 Duty Ratio

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 45°C, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.

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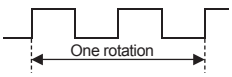
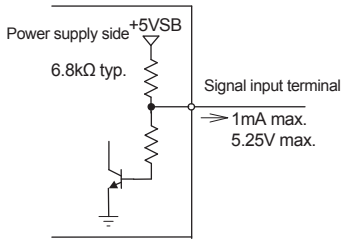
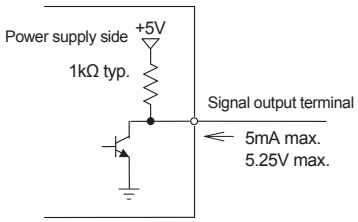
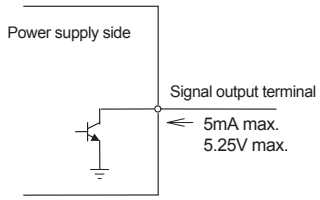
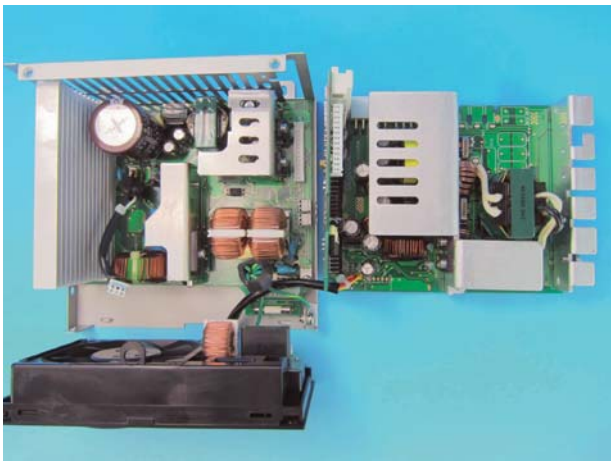
## Signal Input / Output Specification Condition: at normal temperature and humidity unless otherwise specified

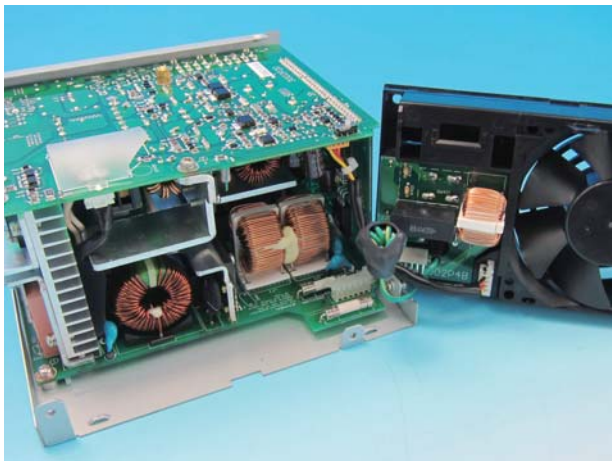
| | Items | Specification | Note |
|---|---|---|---|
| Input Signal | Output ON / OFF Control Signal (PS_ON#) | +3.3V, +5V, +12V, and -12V outputs shutdown with 'H' or 'OPEN' input. | The pin 16 of MAIN connector and the pin 6 of SIG connector |
| Input Signal | +3.3V SENSE | The input terminal to detect 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 MAIN connector and the pin 8 of SIG connector |
| Output Signal | Normal Output Signal (PWR_OK) | 'H'signal is delivered at normal output (detection delay time: 100 - 500ms). | The pin 8 of MAIN connector |
| Output Signal | Fan Monitor Signal (FAN M) | Two cycle pulses per one rotation of the fan motor are delivered. | The pin 5 of SIG connector   |

**Signal Circuit**

| Input Signal Circuit | *(PS_ON#)* | Input Signal Circuit | *(PWR_OK)* | *(FAN M)* |
|---|---|---|---|---|
| |   ('L'≤0.8V, 2.0V≤'H') | |   ('L'<0.4V) |   ('L'<0.4V) |

## Internal Structure



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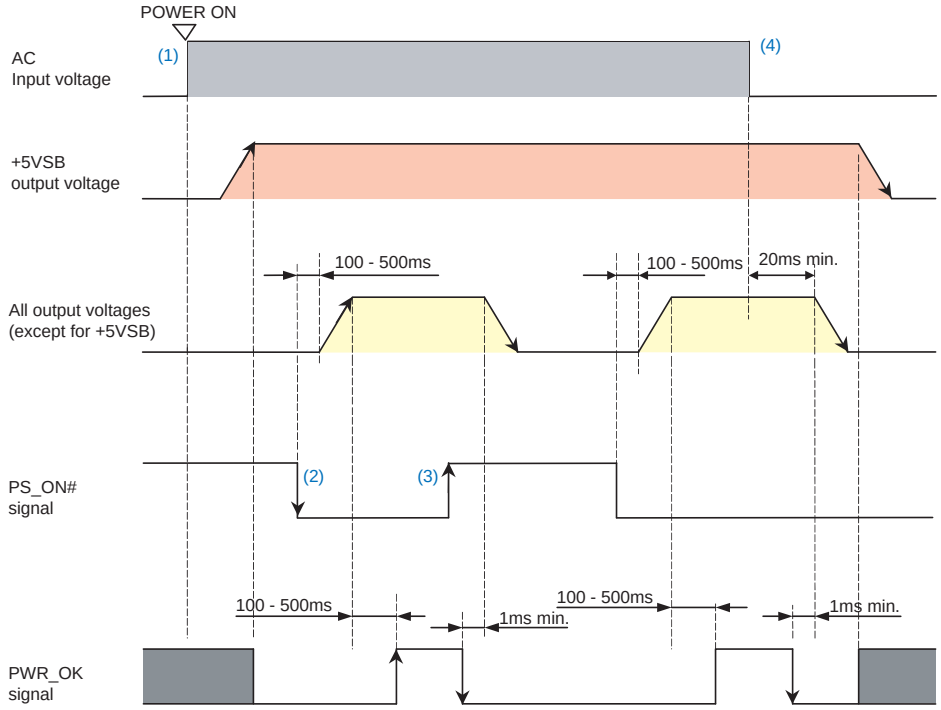
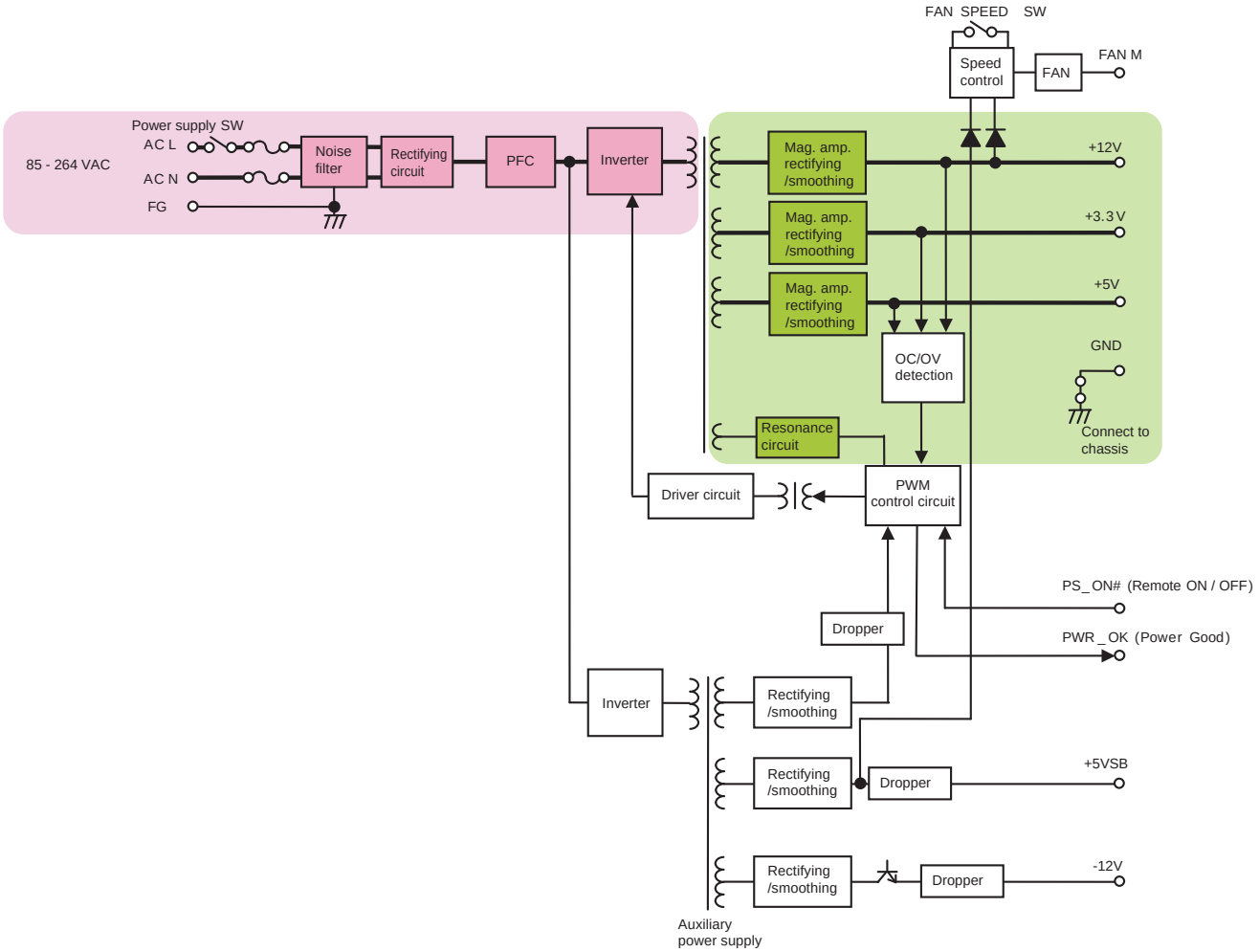
## Sequence Diagram



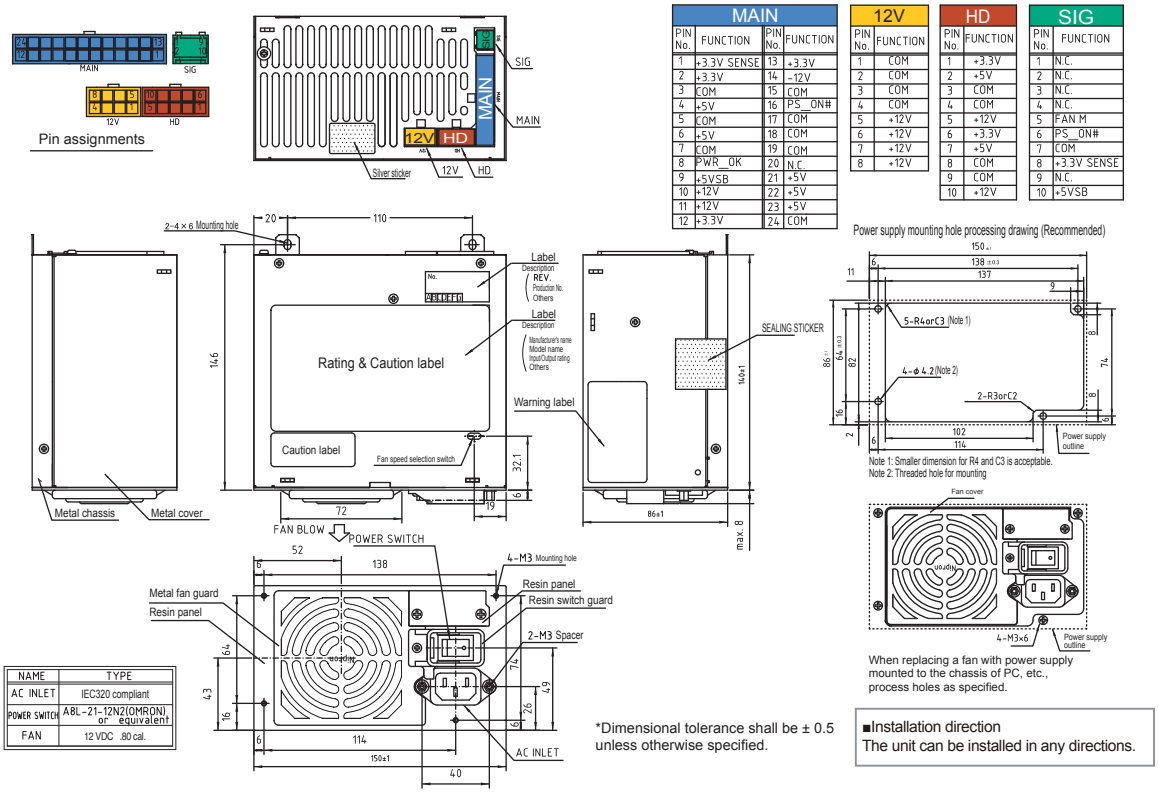

(1) With PS_ON# 'H (OPEN)', only +5VSB output starts up at AC input.
(2) All outputs start up at PS_ON# 'L' input. Also, PWR_OK goes to 'H' at 100 - 500ms after the +5V output has risen.
(3) At PS_ON# 'H (OPEN)' input, outputs except for +5VSB shut down.
(4) All outputs except for +5VSB shut down after 20ms or longer from blackout Before 1ms or longer than this event, PWR_OK turns to 'L'.

Undefined

## Block Diagram



# Outline Drawing




| MAIN | | | |
|---|---|---|---|
| PIN No. | FUNCTION | PIN No. | FUNCTION |
| 1 | +3.3V SENSE | 13 | +3.3V |
| 2 | +3.3V | 14 | -12V |
| 3 | COM | 15 | COM |
| 4 | +5V | 16 | PS_ON# |
| 5 | COM | 17 | COM |
| 6 | +5V | 18 | COM |
| 7 | COM | 19 | COM |
| 8 | PWR_OK | 20 | N.C. |
| 9 | +5VSB | 21 | +5V |
| 10 | +12V | 22 | +5V |
| 11 | +12V | 23 | +5V |
| 12 | +3.3V | 24 | COM |

| 12V | |
|---|---|
| PIN No. | FUNCTION |
| 1 | COM |
| 2 | COM |
| 3 | COM |
| 4 | COM |
| 5 | +12V |
| 6 | +12V |
| 7 | +12V |
| 8 | +12V |

| HD | |
|---|---|
| PIN No. | FUNCTION |
| 1 | +3.3V |
| 2 | +5V |
| 3 | COM |
| 4 | COM |
| 5 | +12V |
| 6 | +3.3V |
| 7 | +5V |
| 8 | COM |
| 9 | COM |
| 10 | +12V |

| SIG | |
|---|---|
| PIN No. | FUNCTION |
| 1 | N.C. |
| 2 | N.C. |
| 3 | N.C. |
| 4 | N.C. |
| 5 | FAN M |
| 6 | PS_ON# |
| 7 | COM |
| 8 | +3.3V SENSE |
| 9 | N.C. |
| 10 | +5VSB |

| NAME | TYPE |
|---|---|
| AC INLET | IEC320 compliant |
| POWER SWITCH | A8L-21-12N2(OMRON) or equivalent |
| FAN | 12 VDC .80 cal. |

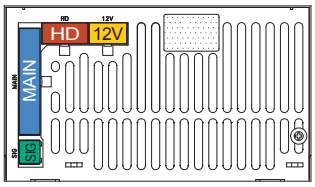
*Dimensional tolerance shall be ± 0.5 unless otherwise specified.

■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 500±10 → 12V 8-pin; 12V 8-pin | |
| WH-VG208-500-02 | 12V 500±10 → 12V 8-pin; PCI-E 6-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 → S-ATA; 850±15 | |
| *SIG cable* SIG | | |
| WH-S0610-500 | SIG 500±15 → SIG-1 | |
| WH-S0610-500-01 | SIG 500±15 → SIG-2 | |
| WH-S0310-500 | SIG 500±15 → SIG-3 | |
| *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) | |




Acceptable cable(s)

| MAIN | 12V | HD | SIG |
|---|---|---|---|
| 1 model | 1 model | 1 model | 1 model |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# Optional Components Sold Separately

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



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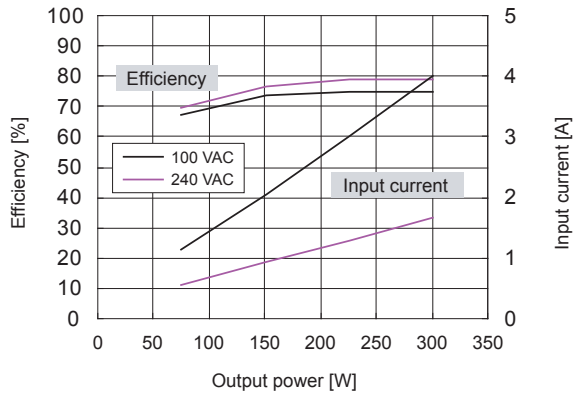
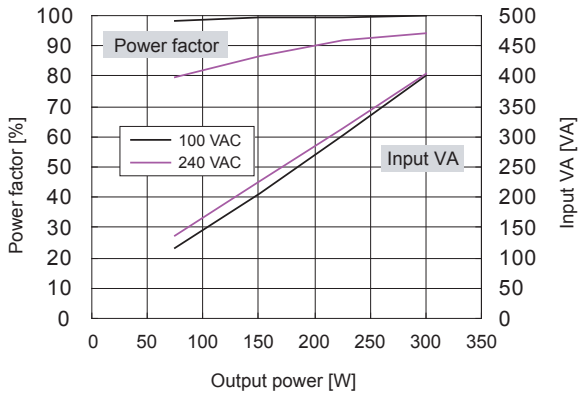
# Characteristics Data (Examples of actual measurement)

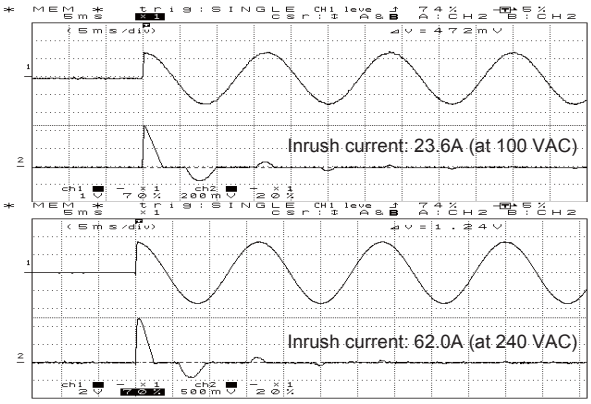
● Fig.4 Efficiency / Input Current vs. Output Power




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




● Fig.6 Inrush Current




● Fig.7 Leakage Current

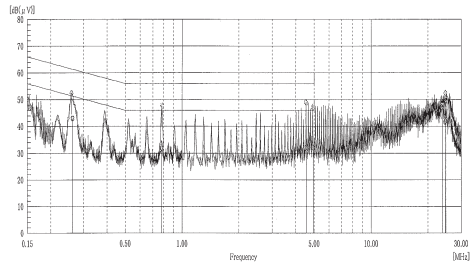
Input: 100 / 264 VAC
Load: Rated and min. load

| | Rated load | Min. load |
|---|---|---|
| 100 VAC | 0.08mA | 0.10mA |
| 264 VAC | 0.22mA | 0.22mA |

● Fig.8 Conducted Emission at 100 VAC

Input: 100 VAC
Load: Rated
Mode: Peak

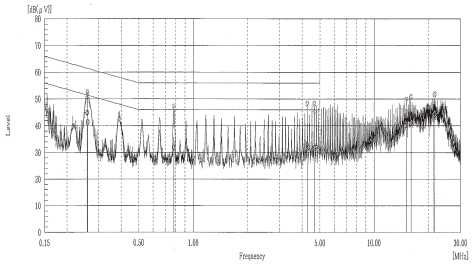
VCCI Class B



● Fig.9 Conducted Emission at 240 VAC

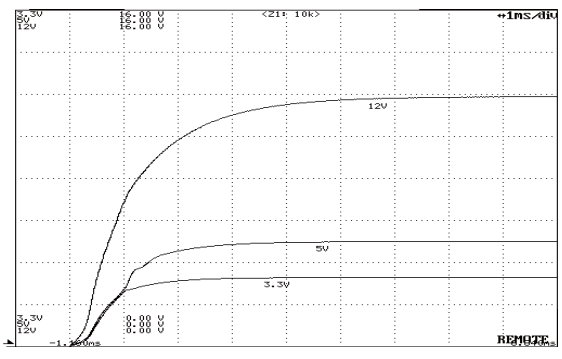
Input: 240 VAC
Load: Rated
Mode: Peak

VCCI Class B



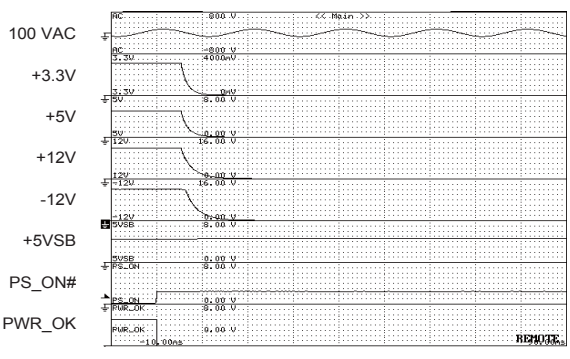
● Fig.10 Rising Characteristics at 100 VAC

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




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

Input: 100 VAC
Load: Rated
Time axis: 20ms/DIV





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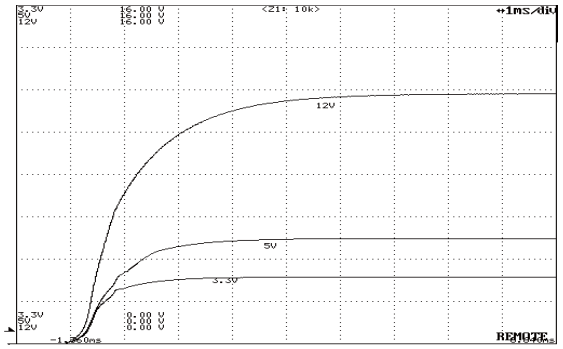
# Characteristics Data (Examples of actual measurement)

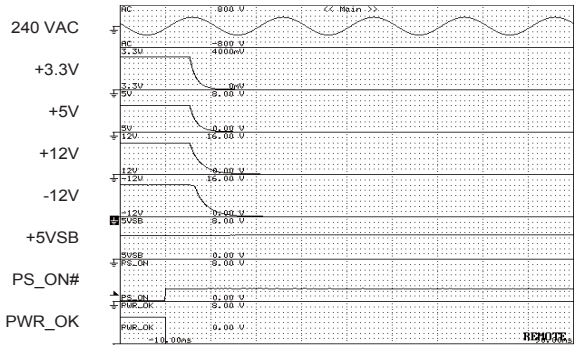
## ● Fig.12 Rising Characteristics at 240 VAC

Input: 240 VAC
Load: Rated
Time axis: 1ms/DIV



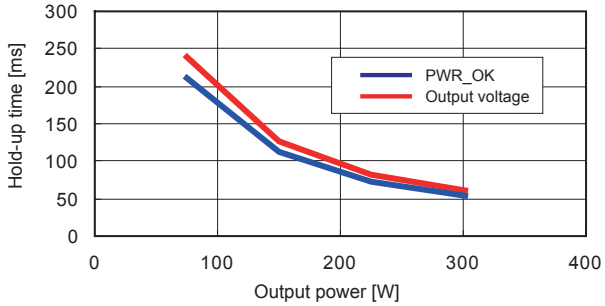

## ● Fig.13 Falling Characteristics at 240 VAC when REMOTE goes Off

Input: 240 VAC
Load: Rated
Time axis: 20ms/DIV



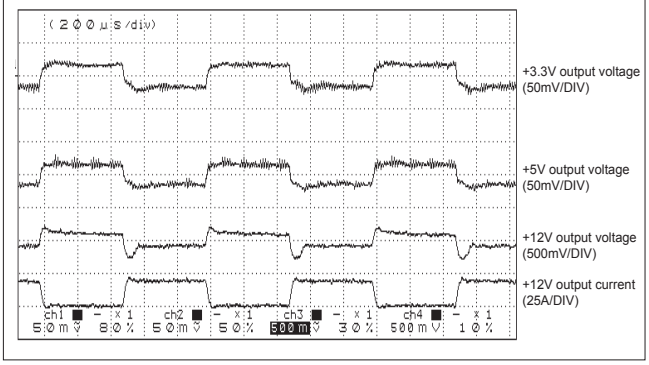

## ● Fig.14 Output Hold-up Time vs. Output Power

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



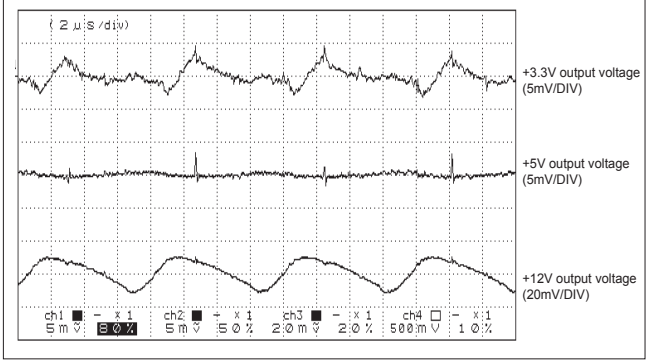

## ● Fig.16 Output Voltage Regulation

| Output | Min. load | Rated load | Peak load |
|---|---|---|---|
| +12V output | 0A | 16A | 30A |
| +5V output | 0A | 12A | 33A |
| +3.3V output | 0A | 10A | 30A |

| AC input voltage | 85 VAC | 100 VAC | 132 VAC | 176 VAC | 240 VAC | 264 VAC |
|---|---|---|---|---|---|---|
| +3.3V output (min. load) | 3.411 V | 3.411 V | 3.411 V | 3.411 V | 3.412 V | 3.411 V |
| +3.3V output (rated load) | 3.297 V | 3.297 V | 3.297 V | 3.297 V | 3.297 V | 3.297 V |
| +3.3V output (peak load) | 3.183 V | 3.185 V | 3.185 V | 3.185 V | 3.186 V | 3.186 V |
| +5V output (min. load) | 5.160 V | 5.160 V | 5.160 V | 5.160 V | 5.160 V | 5.160 V |
| +5V output (rated load) | 5.022 V | 5.022 V | 5.021 V | 5.021 V | 5.021 V | 5.021 V |
| +5V output (peak load) | 4.870 V | 4.873 V | 4.872 V | 4.873 V | 4.874 V | 4.874 V |
| +12V output (min. load) | 12.098 V | 12.098 V | 12.098 V | 12.098 V | 12.098 V | 12.098 V |
| +12V output (rated load) | 11.957 V | 11.956 V | 11.956 V | 11.955 V | 11.954 V | 11.954 V |
| +12V output (peak load) | 11.865 V | 11.869 V | 11.868 V | 11.870 V | 11.870 V | 11.870 V |

## ● Fig.17 Ripple and Spike Voltage

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




## ● Fig.18 Ambient Temperature vs. Expected Service Life

■ Electrolytic capacitors

Input: 100 VAC
Load: Rated
Operating time: 24 consecutive hours

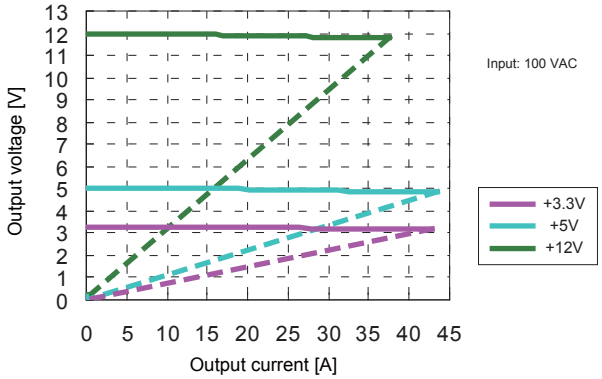
| Intake air temp. | 20°C | 30°C | 40°C | 45°C |
|---|---|---|---|---|
| Expected service life (yr) | approx. 121 | approx. 60 | approx. 30 | approx. 21 |

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

■ Fan

| Ambient temp. | 20°C | 30°C | 40°C | 45°C |
|---|---|---|---|---|
| Expected service life (yr) | approx. 13 | approx. 8.7 | approx. 5.8 | approx. 3.9 |

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

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