# Rack Mount Power Supply cNSP-250-D4S


| Model | Description | Stock |
|---|---|---|
| cNSP-250-D4S | —— | Contact us |

■Model Name Coding

**cNSP - 250 - D 4 S**
① ② ③ ④ ⑤

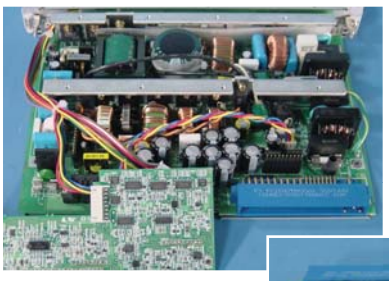
1. Series name
2. Output power
3. With D-sub terminal
4. DC input voltage (battery voltage) 48V type
5. Standard

**Features**

- With redundant operation and backup function with DC input, this unit enables no power failure and completely uninterruptible operation.
- Both simultaneous input of AC+DC and single input of AC or DC are available.
- Capacity can be maximized by connecting multiple units in parallel. The unit has a complete load balance, and it is hotswappable.
- Nonstop power supply for 6U/8HP size compact PCI

Since DC input terminals are isolated, one external battery (lead) can operate multiple units (long-term continuous operation is possible)

## Internal Structure



Refer to “Product Page Guideline” on p.13

| 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

**Automatic shutdown compliant OS**

This model OS can be automatically shut down but +5VSB does not stop after the shutdown.

*For automatic shutdown, shutdown software or UPS services is required

**Input**

| | |
|---|---|
| *AC input* | 90 - 264V (worldwide range) |
| *DC input* | 40 - 59V<br>*Battery package can be connected, DC startup available |
| *Battery package is optional (sold separately) | |

**Output**

| *Output voltage* | *+3.3V* | *+5V* | *+12V* | *-12V* | *+5VSB* |
|---|---|---|---|---|---|
| *Max. current/ max. power (continuous)* | 10A | 30A | 4A | 2A | 1A |
| | Total 173W | | | | |
| | Total 250W | | | | |
| *Min. current* | 0A | 2A | 0A | 0A | 0A |

**Dimensions**

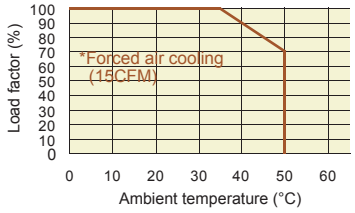
| | |
|---|---|
| W×H×D (mm) | 40.3×268×171 |

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

| | Items | | Specification | | | | | Measurement conditions, etc. |
|---|---|---|---|---|---|---|---|---|
| AC Input | Rated Voltage | | 100 - 240 VAC (90 - 264 VAC) | | | | | Worldwide range |
| | Input Frequency | | 50 / 60Hz | | | | | 47 - 63Hz |
| | Efficiency | | 68% typ. (100 VAC), 70% typ. (240 VAC) *Characteristic data: Fig.2 | | | | | At 60% output and fully-charged battery |
| | Power Factor | | 98% typ. (100 VAC), 97% typ. (240 VAC) *Characteristic data: Fig.3 | | | | | At rated input/output |
| | Inrush Current | | 50A peak (240 VAC) *Characteristic data: Fig.4 | | | | | Input reclosing interval: 10 sec min. |
| | Input VA | | 419VA max. (100 VAC) *Characteristic data: Fig.3 | | | | | At rated input and max. output |
| DC Input | Rated Voltage | | 48 VDC (40 - 59 VDC) | | | | | DC startup available |
| | Battery Discharge Cut-off Voltage | | 34±1.5V max. (shutdown of battery circuit) | | | | | |
| | Efficiency (at Battery Operation) | | 72% typ. | | | | | At 60% output |
| Output | Rated Voltage | | +3.3V | +5V | +12V | -12V | +5VSB | |
| | Rated Current | | 10A | 28A | 4A | 2A | 1A | |
| | Max. Current / Power | | 10A | 30A | 4A | 2A | 1A | Max. output power: 250W<br>Airflow into the power supply shall be 15CFM min. |
| | | | 173W max. | | | | | |
| | Min. Current | | 0A | 2A | 0A | 0A | 0A | |
| | Total Voltage Accuracy (%) | | ±4 max. | ±4 max. | ±4 max. | ±5 max. | ±5 max. | Total accuracy of temperature, input, and load fluctuations |
| | Max. Ripple Voltage (mVp-p) | | 50 max. | 50 max. | 100 max. | 100 max. | 50 max. | Two wires are coming out from the output connector. 47μF capacitor is placed on it and it is measured. *Characteristic data: Fig.15 |
| | Max. Spike Voltage (mVp-p) | | 100 max. | 100 max. | 200 max. | 200 max. | 100 max. | |
| | Current Balance Circuit | | Equipped | | | N/A | | Up to two units can be connected in parallel |
| Protection | Overcurrent Protection | OCP Point (A) | Total current of +3.3V and +5V: 42A min. | | 105% min. of rated output current | | | All other outputs are at rated input/output |
| | | Method | All outputs except for +5VSB shutdown | | | | All outputs shutdown | |
| | Recovery (Overcurrent) | At AC Operation | Reclosing input | | | | | |
| | | At DC Operation | Reclosing input | | | | | |
| | Overvoltage Protection | OVP Point (V) | 3.8 - 4.8 | 6.0 - 7.3 | - | - | - | |
| | | Method | All outputs except for +5VSB shutdown | | - | - | - | |
| | Recovery (Overvoltage) | At AC Operation | Reclosing input | | - | - | - | |
| | | At DC Operation | Reclosing input | | - | - | - | |
| Charge | Charge Voltage | | 54.6V typ. (at 25°C with fully-charged battery) | | | | | |
| | Charge Current | | 0.5±0.2A (at 48V battery voltage) | | | | | |
| Environment | Operating Temp. / Humidity | | 0 to 50°C* / 10 to 90% | | | | | *Refer to Fig.1<br>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-0040-1999 |
| | Mechanical Shock | | Lift one bottom edge up to 50mm and let it fall. Number of bumps: 3 each of 4 edges | | | | | JIS-C-0043-1995 |
| Insulation | Dielectric Strength | | AC input - DC output/FG/DC input: 1500 VAC for 1 minute | | | | | |
| | Insulation Resistance | | AC input - DC output/FG/DC input: 50MΩ min. | | | | | At 500 VDC |
| | Leakage Current | | 0.5mA max. (100 VAC) / 1mA max. (240 VAC) *Characteristic data: Fig.5 | | | | | YEW. TYPE3226 (1kΩ) or equivalent |
| EMC | Line Noise Immunity | | ± 2000V (pulse width: 100/800ns, repetitive cycle: 10-50ms) | | | | | It shall follow the DC output specification<br>No 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 | | | | | Measured by single unit |
| | Harmonic Current Regulation | | IEC61000-3-2 Class A, EN61000-3-2 Class A compliant *Characteristic data: Fig.6 and 7 | | | | | At rated input/output |
| Others | Safety Standard | | UL60950, CSA C22.2 No.60950 (c-UL) compliant | | | | | |
| | Cooling System | | Forced air cooling (external fan) | | | | | |
| | Output Grounding | | Capacitor grounding | | | | | |
| | Output Hold-up Time | | *Characteristic data: Fig.12 | | | | | At rated output |
| | Reliability Grade | | FA (industrial equipment grade, double-sided through hole PCB) | | | | | Follow our standard |
| | MTBF | | 97,000H min. | | | | | Based on EIAJ RCR-9102 |
| | Weight | | 1.8kg 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 |

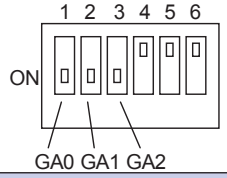
*Fig.3 Temperature Derating*

When the ambient temperature (near the airflow inlet) exceeds 35°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 | Startup (EN#) | Output is shut down with 'H' or 'OPEN' input. At INH#'L' input, output is shut down regardless of 'H' or 'L' of EN#. | The pin 27 of P2 connector |
| | Restraint (INH#) | At 'L' input, output is shut down regardless of 'H' or 'L' of EN#. At 'H' or 'OPEN' input, output is controlled with EN# signal. | The pin 39 of P2 connector |
| | +3.3V current balance (+3.3V SHARE) | When using multiple power supplies, connecting a current balance terminal between the power supplies distributes the load current to each power supply. | The pin 41 of P2 connector |
| | +5V current balance (+5V SHARE) | | The pin 35 of P2 connector |
| | +12V current balance (+12V SHARE) | | The pin 44 of P2 connector |
| | +3.3V remote sense (+3.3V SENSE) | By connecting the terminal to output load terminal, it compensates the voltage line drop of the load terminal. | The pin 33 of P2 connector |
| | +5V remote sense (+5V SENSE) | | The pin 30 of P2 connector |
| | +12V remote sense (+12V SENSE) | | The pin 36 of P2 connector |
| | +3.3V external voltage adjusting (+3.3V Adj) | Output voltage can be adjusted within ±10% range by connecting a 1kΩ variable resistor between +3.3V and +3.3V adj, 10kΩ between +3.3V adj and RTN, and using a 10kΩ variable resistor (Rt). | The pin 32 of P2 connector |
| | +5V external voltage adjusting (+5V Adj) | Output voltage can be adjusted within ±10% range by connecting a 1kΩ variable resistor between +5V and +5V adj, 10kΩ between +5V adj and RTN, and using a 10kΩ variable resistor (Rt). | The pin 36 of P2 connector |
| | Battery shutdown (SHUT DOWN_T) | With 'L' (connector P1) input, DC input or battery connection is shut down (Available only during DC operation or battery operation). | The pin 4 of P1 connector |
| | Battery shutdown (SHUT DOWN_R) | With 'positive (+2.4V min)' (D-Sub) input, DC input or battery connection is shut down (Available only during DC operation or battery operation). | The pin 4 of RS232C connector |
| | Operation shifting control (BATT CHECK) | At 'L' input, AC inverter is forcibly shut down and it will be switched to DC operation to make a pseudo blackout. | The pin 5 of P1 connector |
| Output Signal | Abnormal signal (DEG#) | 'L' is delivered when the internal temperature becomes abnormal (high temp.) (open collector output). | The pin 38 of P2 connector |
| | Malfunction signal (FAL#) | When +3.3V, +5V, +12V, and -12V outputs are normal, 'H' signal is delivered; 'L' is delivered if the outputs decreases (detection delay time for 'H': 200 - 350ms). | The pin 42 of P2 connector |
| | Blackout detection signal (AC FAIL_T) | The signal becomes 'OPEN' at low AC input voltage and blackout detection (open collector output) (detection voltage: 80V typical, detection delay time: 20 - 40ms after AC failure). | The pin 3 of P1 connector |
| | Blackout detection signal (AC FAIL_R) | 'Negative (-10V typ.)' (D-Sub) signal is delivered at low AC input voltage and blackout detection (detection voltage: 80V typical, detection delay time: 20 - 40ms after AC failure) | The pin 8 of RS232C connector |
| | Low battery voltage signal (BATT LOW_T) | When DC input or battery terminal voltage decreases to 38.6±1.0V, the signal becomes 'OPEN' (connector P1) (open collector output). (However, 'H' signal is not delivered if the charge switch is on while DC input or the battery is not connected.)* | The pin 8 of P1 connector<br>*At the starting up with minimum DC input (40-42 VDC), BATT LOW remains 'H' (connector P1).This condition is released by setting the input voltage 42V or higher. |
| | Low battery voltage signal (BATT LOW_R) | 'Negative (-10V typ.)' (D-Sub) is delivered when DC input or battery terminal voltage decreases to 38.6±1.0V. (However, 'L signal is not delivered if the charge switch is on while DC input or the battery is not connected)* | The pin 1 of RS232C connector<br>*At the starting up with minimum DC input (40-42 VDC), BATT LOW remains 'negative (-10V typ.)' (D-Sub). This condition is released by setting the input voltage 42V or higher. |
| | Address bus 1(GA0) | The signals show the slot number to which the power supply is inserted. The number can be set with dip switches, 1(GA0), 2(GA1), and 3(GA2), on the connector side of the power supply. ON shall be Lo, and OFF shall be Hi. | The pin 25 of P2 connector |
| | Address bus 2(GA1) | | The pin 28 of P2 connector |
| | Address bus 3(GA2) | | The pin 31 of P2 connector |



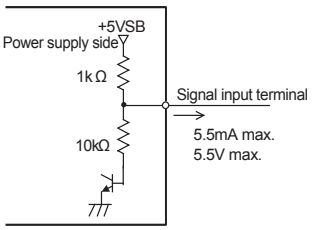

| Slot # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| GA0 | ON | OFF | ON | OFF | ON | OFF | ON | OFF |
| GA1 | ON | ON | OFF | OFF | ON | ON | OFF | OFF |
| GA2 | ON | ON | ON | ON | OFF | OFF | OFF | OFF |

Turn the dip switches 4,5,6 to OFF.

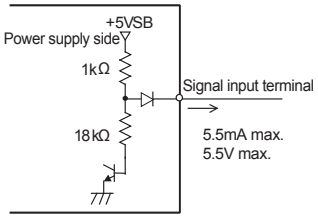
## Signal Circuit

### Input Signal Circuit

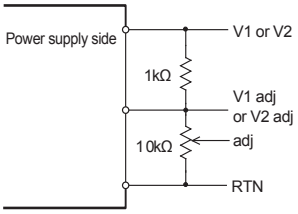
(EN#), (SHUT DOWN), (BATT CHECK)



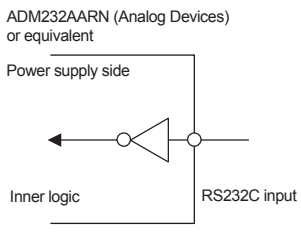

(INH#)




*(V1 / V2)*

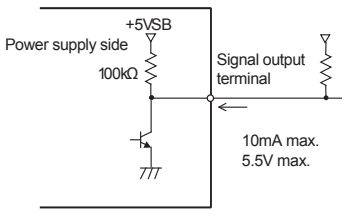



*(SHUT DOWN_R)*

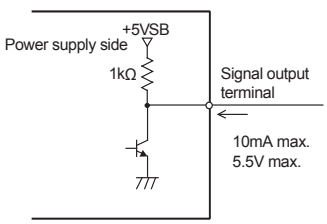



### Output Signal Circuit

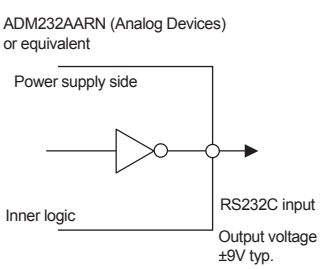
(AC FAIL_T), (BATT LOW_T), (DEG#)



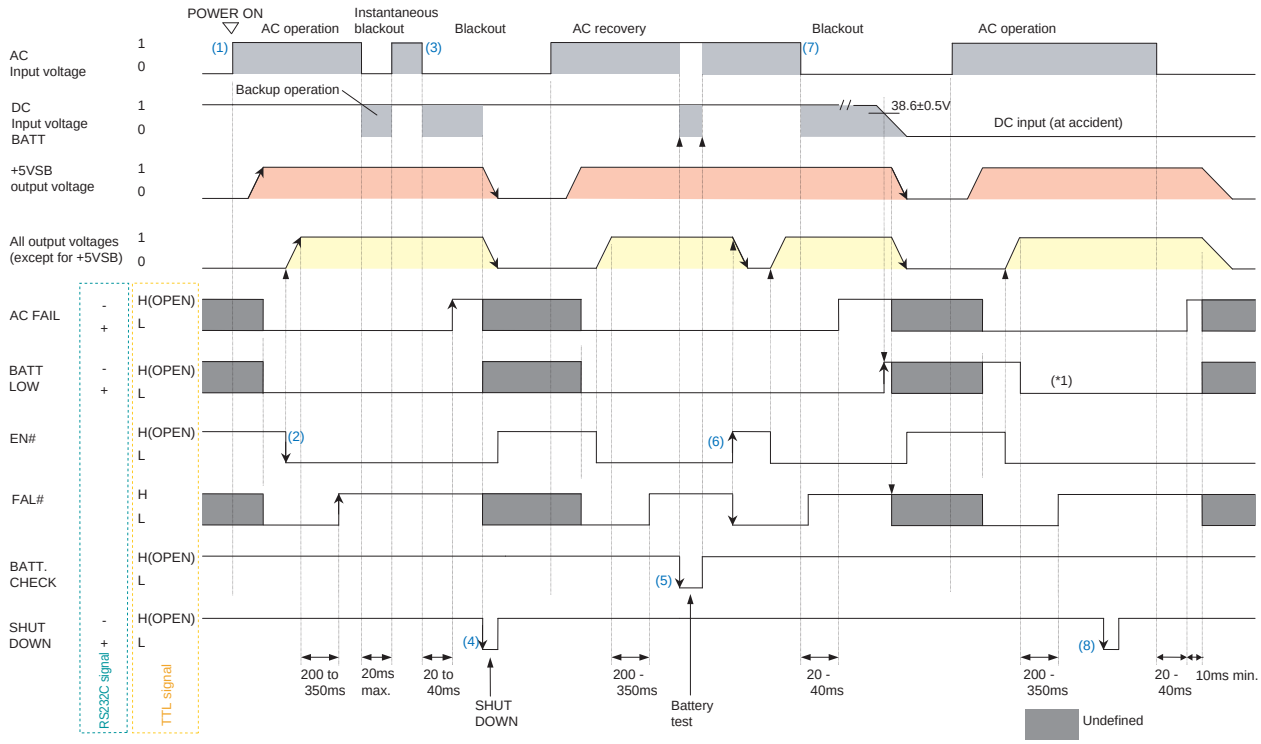

(FAL#)




(AC FAIL_R), (BATT LOW_R)



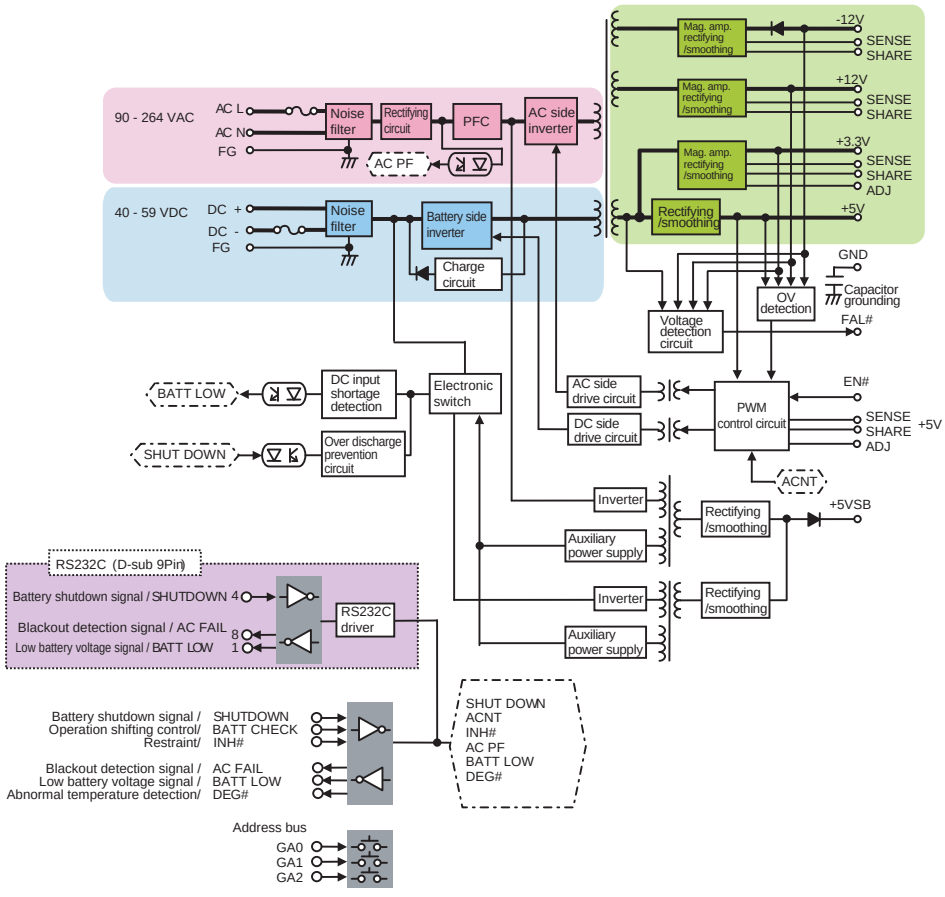
# Sequence Diagram



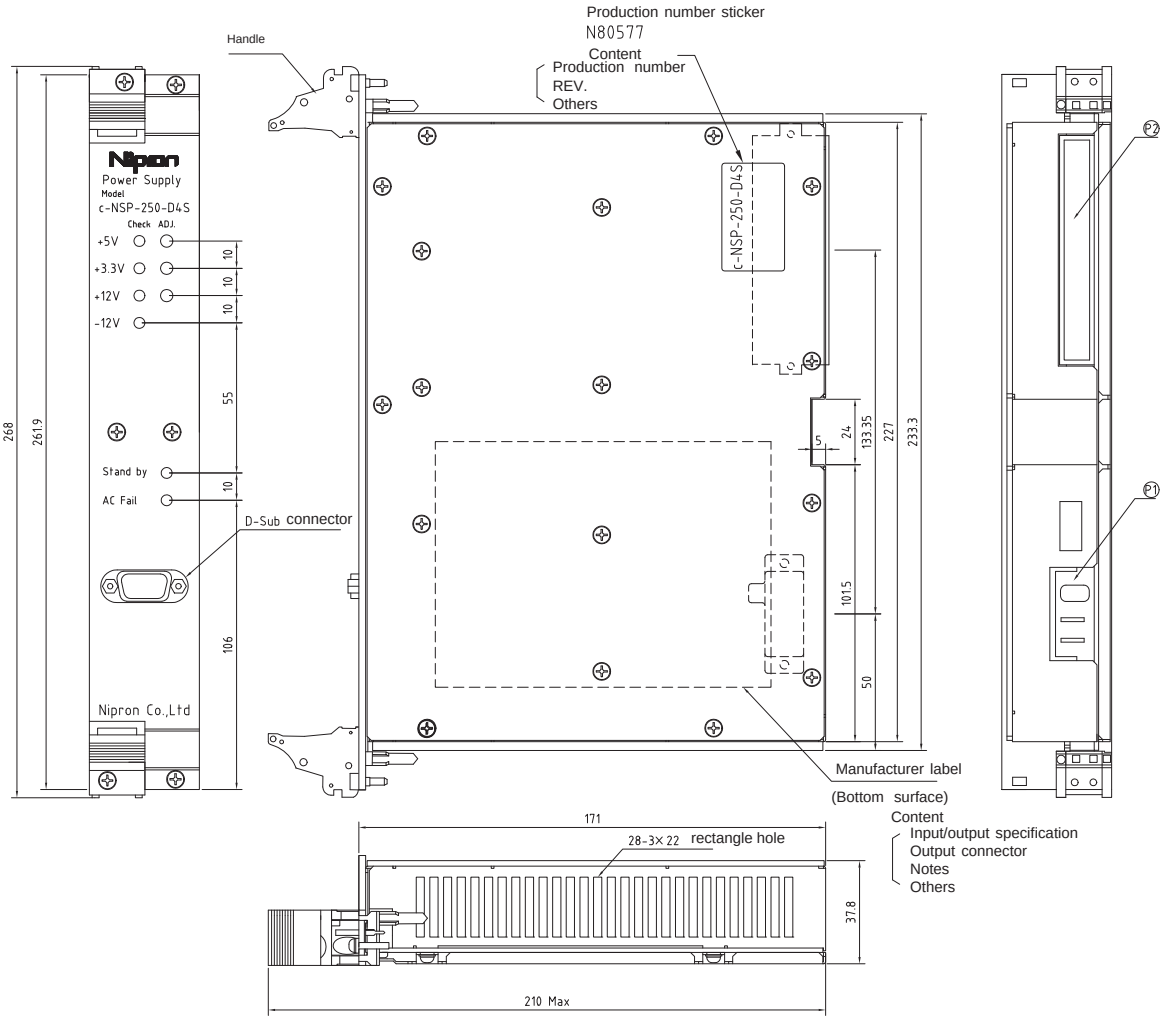

(*1)
When the charge switch is ON, BATT.LOW is not delivered due to the charger's output.

(1) With AC input, only +5VSB starts up.
(2) With EN# 'L' input, all outputs start up. After 200 - 350ms, FAL# 'H' is delivered.
(3) AC FAIL 'negative(RS232C)' or 'H(OPEN) (TTL)' is delivered 20 - 40ms after blackout.
(4) At blackout, all outputs including +5VSB shut down with SHUT DOWN 'positive (RS232C)' or 'L(OPEN)' input.
(5) At BATT CHECK 'L' input, AC side circuit is shut down (it will be switched to battery operation).
(6) When all outputs, including +5VSB start up at AC input, all outputs except for +5VSB shut down with EN# 'H(OPEN)' input.
(7) When the battery voltage decreases to 38.6±0.5V or less at backup operation, BATT LOW 'negative(RS232C)' or 'H(OPEN) (TTL)' is delivered. After it decreases to 34±1.5V or less, all outputs, including +5VSB shut down.
(8) At AC input, the output does not change even SHUT DOWN 'positive (RS232C)' or 'L (TTL)' input.

# Block Diagram



# Outline Drawing




## Pin-out configurations

| | Signal | Content |
|---|---|---|
| 42 | FAL # | Fail Signal |
| 39 | INH # | Inhibit Signal |
| 36 | +12V SENSE | |
| 33 | +3.3V SENSE | |
| 30 | +5V SENSE | |
| 27 | EN # | Enable Signal |
| 24 | GND | |
| 21 | -12V | |

| | Signal | Content |
|---|---|---|
| 46 | AC NEUTRAL | |
| | | |
| 43 | RSVD | RESERVED |
| 40 | RSVD | RESERVED |
| 37 | RSVD | RESERVED |
| 34 | GND SENSE | |
| 31 | GA2 | Address bus |
| 28 | GA1 | Address bus |
| 25 | GA0 | Address bus |
| 22 | GND | |
| 19 | GND | |
| 17 | +3.3V | |
| 15 | +3.3V | |
| 13 | +3.3V | |
| 11 | GND | |
| 9 | GND | |
| 7 | GND | |
| 5 | GND | |
| 3 | +5V | |
| 1 | +5V | |

P2

| | Signal | Content |
|---|---|---|
| 47 | AC LINE | |
| 45 | FG | |
| 44 | +12V SHARE | |
| 41 | +3.3V SHARE | |
| 38 | DEG# | Degrade signal |
| 35 | +5V SHARE | |
| 32 | +3.3V Adj | |
| 29 | +5V Adj | |
| 26 | RSVD | RESERVED |
| 23 | RSVD | RESERVED |
| 20 | +12V | |
| 18 | +3.3V | |
| 16 | +3.3V | |
| 14 | +3.3V | |
| 12 | GND | |
| 10 | GND | |
| 8 | GND | |
| 6 | GND | |
| 4 | +5V | |
| 2 | +5V | |

| | Signal | Content |
|---|---|---|
| 6 | GND | |
| 3 | AC FAIL | |

| | Signal | Content |
|---|---|---|
| 7 | 5VSB | 5V Standby |
| 4 | Shut Down | |
| 2 | DC-IN | |
| 1 | DC+IN | |

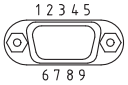
P1

| | Signal | Content |
|---|---|---|
| 8 | BATT LOW | |
| 5 | BATT CHECK | |

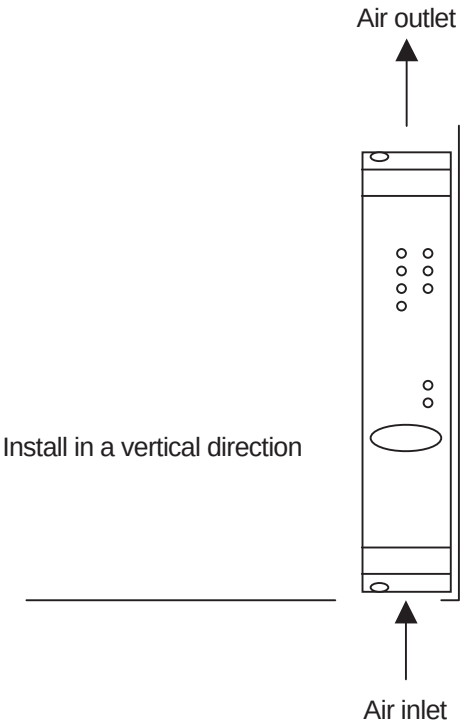
*P1 connector specification is subject to change.

| | Signal | Content |
|---|---|---|
| 1 | BATT LOW | |
| 2 | Not used | |
| 3 | Not used | |
| 4 | Shut Down | |
| 5 | Not used | |
| 6 | Not used | |
| 7 | Not used | |
| 8 | AC FAIL | |
| 9 | Not used | |

D-Sub

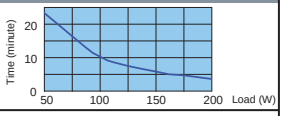
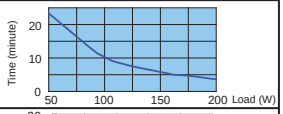
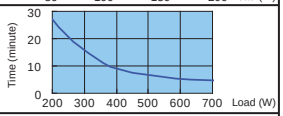



## Installation condition



# Optional Components Sold Separately

**Battery Package**

| Page | Picture | Model | Type | Shape (size) | Backup Time |
|---|---|---|---|---|---|
| P.401 |  | BS05A-P24/2.2L(K) | Lead | 5-inch bay fixed type (W×D×H=146×190×37mm) |   |
| P.403 |  | RBS01A-P24/2.2L(K) | Lead | 5-inch bay fixed, removable type (W×D×H=146×245×42mm) |   |
| - |  | BS19A-P48/5.0L | Lead | Width 4U, height 3U size fixed type (W×D×H=164×235×128mm) |   |
| - |  | PS2866 | Ni-MH | 6U10HP size VME rack storage type (W×D×H=50.4×169.7×261.9mm) | 100W load: approx. 10 minutes |

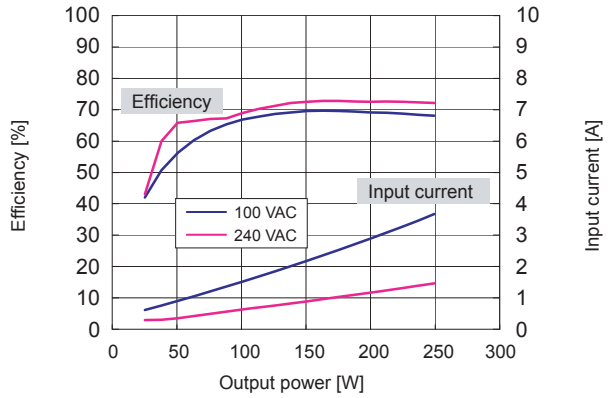
*The backup time is a reference value at initial use; it is not a guaranteed value.
*Connector part needs to be processed to connect a battery package.
*For PS2866, a backplane board needs to be produced additionally.
*Two units are needed for BS05A-P24/2.2L and RBS01A-P24/2.2L (serial connection).

**Parts / Unit**

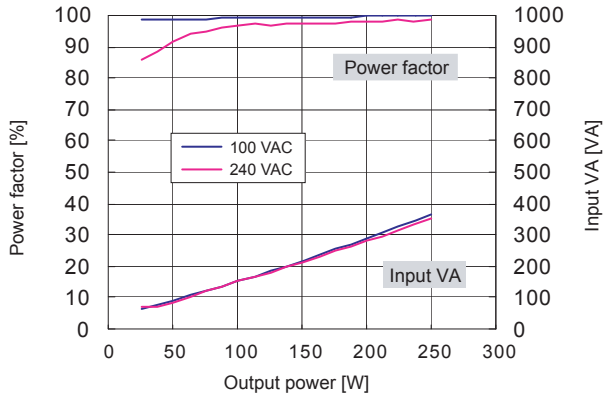
| Picture | Model | Type | Description |
|---|---|---|---|
|  | ACC2677 | Backplane board | A backplane board for cNSP-250-D4S.<br>ORing diode embedded<br>*Backplane board for redundant power supply can be made as well. |

# Characteristics Data (Examples of actual measurement)

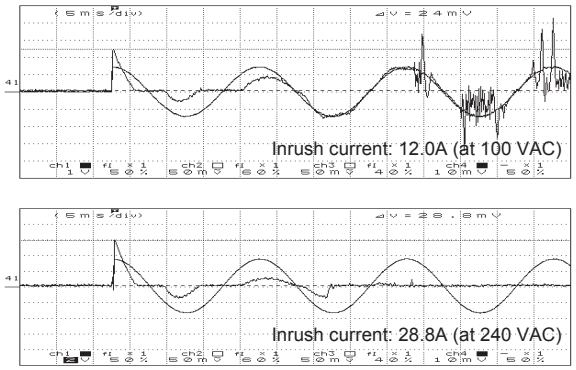
## ● Fig.2 Efficiency / Input Current vs. Output Power




## ● Fig.3 Power Factor / Input VA vs. Output Power




## ● Fig.4 Inrush Current



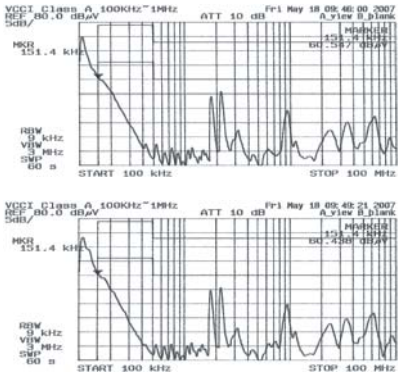

## ● Fig.5 Leakage Current

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

| | Rated load | Min. load |
|---|---|---|
| 100 VAC | 0.39mA | 0.32mA |
| 240 VAC | 0.88mA | 0.87mA |

## ● Fig.6 Conducted Emission at 100 VAC

Input: 100 VAC
Load: Rated
Mode: QP



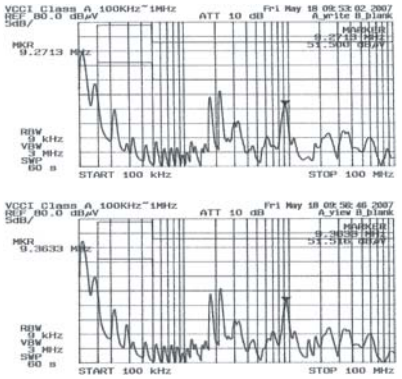
Measuring point: L-FG

Measuring point: N-FG

In-house measurement data

## ● Fig.7 Conducted Emission at 240 VAC

Input: 240 VAC
Load: Rated
Mode: QP



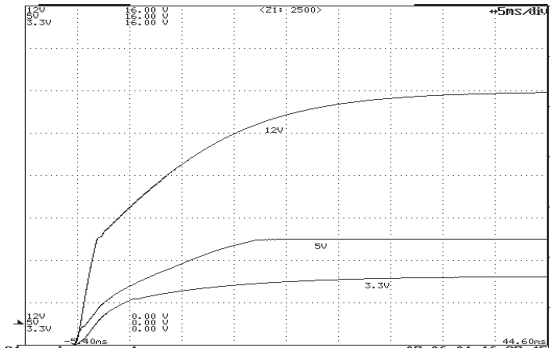
Measuring point: L-FG

Measuring point: N-FG

In-house measurement data

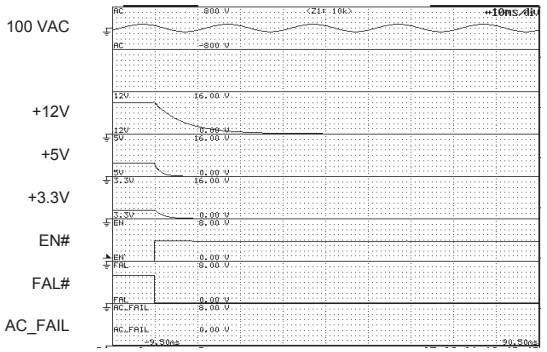
## ● Fig.8 Rising Characteristics at 100 VAC

Input: 100 VAC
Load: Rated
Time axis: 5ms/DIV




## ● Fig.9 Falling Characteristics at 100 VAC when REMOTE goes Off

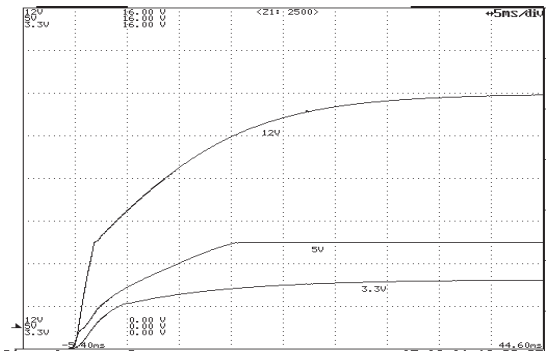
Input: 100 VAC
Load: Rated
Time axis: 10ms/DIV



# Characteristics Data (Examples of actual measurement)

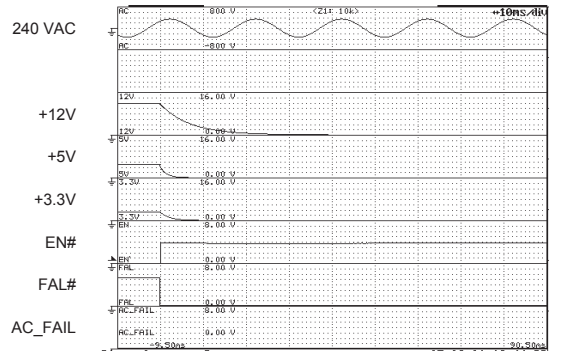
## ● Fig.10 Rising Characteristics at 240 VAC

Input: 240 VAC
Load: Rated
Time axis: 5ms/DIV



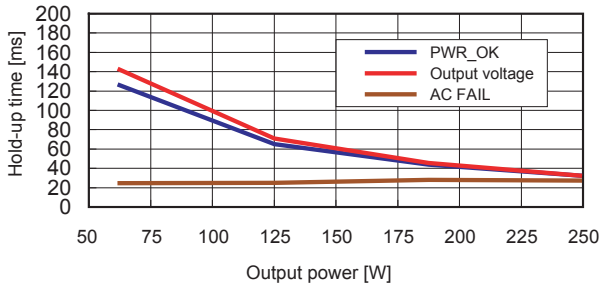

## ● Fig.11 Falling Characteristics at 240 VAC when REMOTE goes Off

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



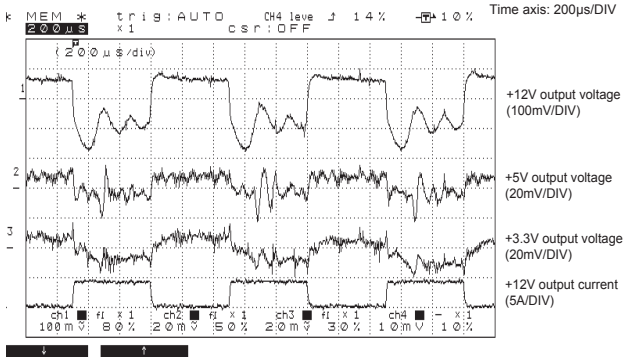

## ● Fig.12 Output Hold-up Time vs. Output Power

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




## ● Fig.13 Dynamic Load Fluctuation Characteristics at 1kHz

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



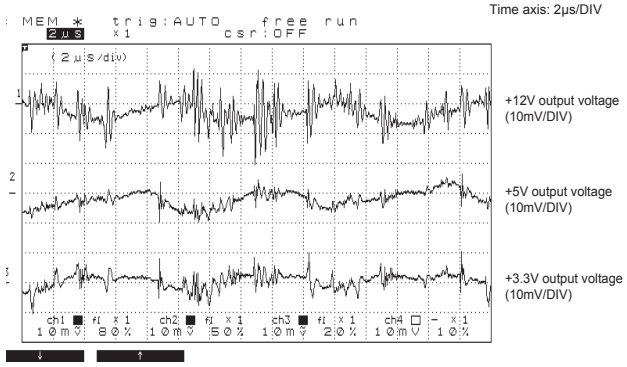

## ● Fig.14 Output Voltage Regulation

| Output | Min. load | Rated load |
|---|---|---|
| +12V output | 0A | 4A |
| +5V output | 2A | 28A |
| +3.3V output | 0A | 10A |

| AC input voltage | 90 VAC | 100 VAC | 132 VAC | 176 VAC | 240 VAC | 264 VAC |
|---|---|---|---|---|---|---|
| +12V output (min. load) | 12.013 V | 12.014 V | 12.013 V | 12.015 V | 12.014 V | 12.014 V |
| +12V output (rated load) | 11.984 V | 11.987 V | 11.988 V | 11.989 V | 11.990 V | 11.990 V |
| +5V output (min. load) | 5.104 V | 5.104 V | 5.103 V | 5.104 V | 5.102 V | 5.102 V |
| +5V output (rated load) | 4.997 V | 5.000 V | 5.002 V | 5.003 V | 5.001 V | 5.001 V |
| +3.3V output (min. load) | 3.348 V | 3.350 V | 3.350 V | 3.351 V | 3.351 V | 3.352 V |
| +3.3V output (rated load) | 3.246 V | 3.247 V | 3.248 V | 3.248 V | 3.248 V | 3.247 V |

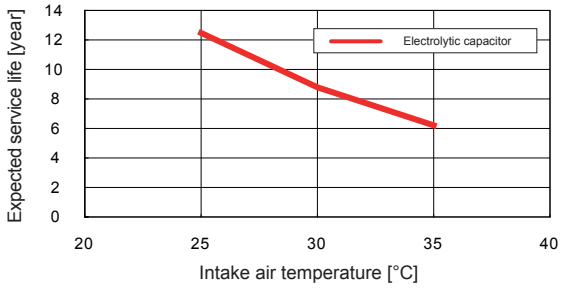
## ● Fig.15 Ripple and Spike Voltage

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




## ● Fig.16 Ambient Temperature vs. Expected Service Life

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




*Life span for electrolytic capacitor shall be 15 years max. considering the degradation of the sealing plate.

## ● Fig.17 Over Current Protection (V-I Characteristic)

Input: 100 VAC