

# Product Specification

Model <b>PCFL-180P-F2S</b>	Date October 28, 2005
	Created by Namba Technical Center

## Scope

This specification applies to embedded type DC stabilized power supply, PCFL-180P-F2S.  
All items in the specification shall be provided at normal temperature (20 ± 5°C) and humidity unless otherwise specified.

## General Specification

Items	Specification/ Standard	Measurement conditions, etc.	Test	
Input	Rated voltage/current	AC100 to 240V/2.10 to 0.82A (shown in the rating label)	Input current at 150W load with forced air cooling.	
	Voltage range	85 (Note 1) to 264V		
	Rated frequency	50 and 60 Hz	Frequency range: 47 to 63Hz.	
	Inrush current	Refer to Note 2 below		
	Input VA at standby mode	30VA typical at 100V input/ 60VA typical at 40V input. 10VA typical at 100V input; 40VA typical at 240V input.	At PS_ON signal 'H' or 'OPEN' with 5VSB rated load. At PS_ON signal 'H' or 'OPEN' with 5VSB no load.	Type
	Efficiency	75% or more (77% typical)		
	Power factor	90% or more	At rated input and output.	
Environment	Operating temperature/ humidity	0 to 60°C (Note 1) / 10 to 90% RH (there shall be no condensation).		
	Storage temperature/ humidity	-20 to 70°C / 10 to 95% RH (there shall be no condensation).		
	Vibration	To endure a vibration acceleration of 2g <sub>r</sub> with a vibration frequency of 10 to 55Hz for 10 sweep cycles in the X-, Y-, and Z-directions.	JIS C 60068-2-6 compliant. At no operation.	Type
	Mechanical shock (Surface dropping)	Lift one bottom edge of the unit up to 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat three times for each of four bottom edges, and no malfunction shall be observed.	JIS C 60068-2-31 compliant. At no operation.	
Others	Insulation resistance	50MΩ or more between input and chassis/output.	With DC 500V Megger at normal temperature and humidity.	All
	Dielectric strength	AC 1.5KV for one minute between input and chassis/output.	1 second at production line. Cut-off current is 20mA or less at normal temperature and humidity.	
	Leakage current	0.5mA max at 100V input/ 1mA max at 200V input.	At normal temperature and humidity	
	Line noise immunity test	Apply ±2000V with pulse width of 100/1000ns, cycle period of 30 to 100Hz, normal/common mode with positive/negative polarity for one minute each.	To be measured with INS-410. There shall be no DC-component voltage fluctuation or malfunction.	
	Surge immunity test	IEC61000-4-5 Installation Environment Class 3 compliant (five times each of positive and negative polarities).	No malfunction or breakdown at AC100/240V input.	Type
	Electrostatic discharge immunity test	IEC61000-4-2 Test Level 3 compliant (10 times of contact discharge on chassis).	No malfunction or breakdown at AC100/240V input.	
	Conducted emission	VCCI/FCC part 15/CISPR 22/EN55022 Class A compliant.	To be measured on power supply single body.	
	Safety standard	UL60950-1, CSA60950-1 (c-UL), and EN60950-1 (NEMKO) certified.	Class I equipment, embedded type power supply.	
	Harmonic current	IEC61000-3-2 (Ver.2.1) Class D compliant.	At AC100/240V input.	
	Cooling system	Natural air-cooling or forced air-cooling by external fan. (Note 3)		
	Dimensions	93 (W) × 55 (H) × 160 (D)	Excluding projections. Refer to outline drawing.	Sampling
	Weight	0.85Kg typical		Type
	Lifetime expectancy	5 years or more with natural air-cooling and rated load. 7 years or longer with forced air-cooling and 150W output load. (Note 4)	Assuming that it is continuously operated with AC100V input at 25°C and normal humidity.	
M.T.B.F.	100,000 hours or longer	Calculation is based on EIAJ RCR-9102.		
Warranty	One year after delivery; however, if any faults belong to us, the defective unit shall be repaired or replaced at our cost.	Except for errors caused by operations not specified in the specification.		

- Note 1. Follow the derating conditions on page 6 when using at low input voltage and high temperature.  
 Note 2. In general, inrush current is defined as the peak charging current, right after input reclosing, into smoothing electrolytic capacitors; however, in using this power supply, such type of inrush current does not exist since electrolytic capacitor-less smoothing circuit is adopted. Also, 100 μs or less of charging current into X-capacitors used for input filter circuit shall not be specified.  
 Note 3. Follow the "installation conditions" on page 6 when an external fan is used for forced air cooling.  
 Note 4. For life expectancy at natural-air cooling, calculation shall be based on "installation conditions" item-2 ①; for life expectancy at forced air cooling, calculation shall be based on the installation direction of item-2 ① and fan installation condition of item-3, Figure ①.



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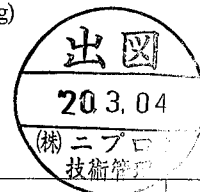
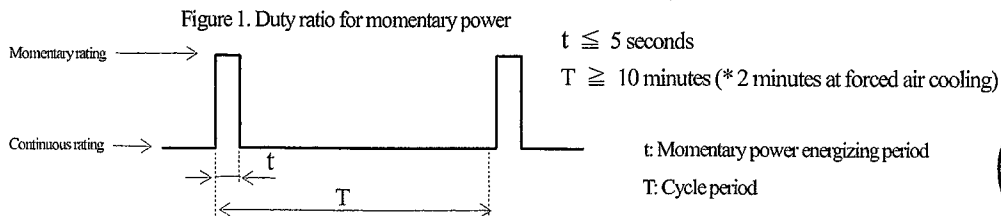
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**Output Specification** (Voltage shall be measured at output connector terminals. Voltage drop of the load side connector due to contact resistance is not included.)

Items	CH1	CH2	CH3	CH4	CH5	CH6	Measurement conditions, etc.	Test		
Output Rating	Rated voltage [V]	+3.3	+5	+12	+24 *	-12	5VSB	*Semi-regulated output (refer to "Precaution before use").	-	
	Rated current [A]	4	4	2	1	0.3	1	Continuous rating (standard value when input/output characteristics are measured). Total rated output power is 89.8W.		
	Rated power [W]	13.2	20	24	24	3.6	5			
	Maximum current 1 [A]	10	10	7.5	3.75	0.3	1.5			
	Maximum power 1 [W]	Total 60W or less		90	90	3.6	7.5	Continuous rating at natural air cooling		
	Refer to "output power cross regulation chart 1" on page 5.									
	Maximum current 2 [A]	10	10	8.5	4.25	0.3	1.5			
	Maximum power 2 [W]	Total 70W or less		102	102	3.6	7.5	Continuous rating at natural air cooling (with optional special AL-heat sink attached).		
	Refer to "output power cross regulation chart 2" on page 5.									
	Maximum current 3 [A]	10	10	10	5	0.3	1.5			
Maximum power 3 [W]	33	50	120	120	3.6	7.5	Continuous rating at forced air cooling (with an external fan).			
Refer to "Output power cross regulation chart 3" on page 5.										
Momentary peak current [A]	10	10	15	7.5	0.3	2		Momentary rating (within 5 seconds)		
Momentary power [W]	33	50	180	180	3.6	10				
Refer to Figure 1 below or "output power cross regulation chart 4" on page 5.										
Minimum current [A]	0	0	0	0	0	0	Minimum load to achieve output and timing characteristics.			
Output characteristics	Regulation accuracy 1 [%]	±5 or less	±5 or less	±5 or less	±5 or less	±10 or less	±5 or less	Accuracy against rated output voltage value when input voltage changes from min. to max. and each load changes statically within "Output power cross regulation" chart 1, 2, and 3.	All	
	Regulation accuracy 2 (at momentary rating) [%]	±5 or less	±5 or less	±5 or less	+5/-8 or less	±10 or less	±5 or less	Accuracy against rated output voltage value when input voltage changes from min. to max. and each load changes statically within "output power cross regulation" chart 4.	Type	
	Ripple voltage [mVp-p]	50 or less	50 or less	120 or less	See Note 1	120 or less	50 or less	Connect a capacitor (47 μF) on the test board to measure. The test board shall be away from load wires and within 150mm from the output terminals.	All	
	Noise voltage [mVp-p]	100 or less	100 or less	170 or less	See Note 1	170 or less	100 or less			
	Rise time [ms]	1 to 20 ms						Time that the rated output (resistance load) rises from 10 to 90%.	Type	
Protection circuit and others	OCP and short	Method	CH1 to 5 latch lock shutdown after hold-down current limiting.			Fold-back current limiting	Hold-down current limiting	All outputs shut down when CH6 is shorted (see Note 2).	All	
		OCP point [A]	10.5 or more	10.5 or more	-	-	0.32 or more	2.1 or more		At rated output current except for the measured output.
		Recovery	*Manual			Automatic		*Reclosing interval of PS_ON# signal is 10 seconds minimum.		
	OVP	Method	All outputs get latch-locked.					External overvoltage shall not be applied to CH1, 2 and 3 due to circuit characteristics. CH4 and 5 are not equipped with OVP.	Type	
		OVP point [V]	3.7 to 4.3	5.7 to 7.0	13.8 to 15.6	-	-			5.7 to 7.0
		Recovery	Manual (reclosing interval shall be 10 seconds minimum).							
Insulation between GND terminals	Each GND terminal of all outputs is connected each other.					All GND terminals are isolated from power supply chassis (FG).			Type	

- Note 1. Both ripple and noise voltage of CH4 shall be 1200mVp-p or less at 3.75A (90W output) and 2400mVp-p or less at 7.5A (180W momentary output).
- Note 2. Other outputs shut down when CH6 is completely shorted where output voltage is less than 1V. All outputs recover if the shorting of CH6 is removed. When the shorting of CH6 is incomplete where 1 to 3V of output remains at holdback current limit, however, other outputs get latch-locked and removing the incomplete short of CH6 does not recover outputs of other channels. If this is the case, reclose PS\_ON# signal or reclose input after 10 seconds minimum to recover manually.
- Note 3. OCP point of CH3 output assumes that the temperature of aluminum chassis is 25°C. (\*OCP point of CH3 decreases according to ambient temperature and temperature rise of components due to built-in overcurrent/temperature protection circuit.)



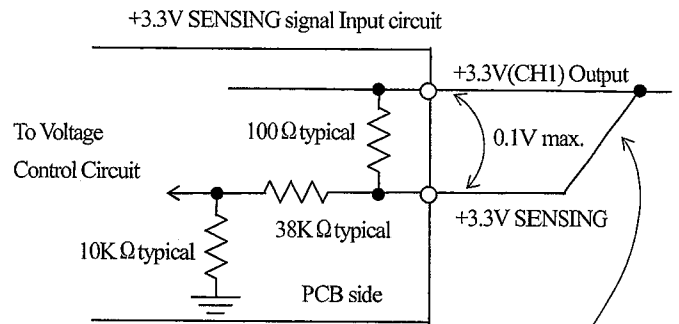
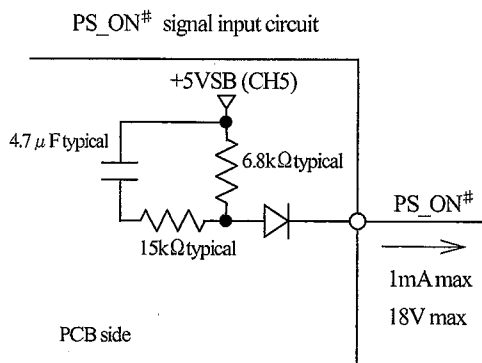
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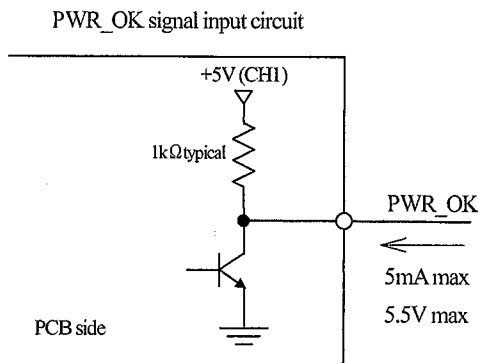
## Signal Input/Output Specification

	Items	Specification	Test
Input	PS_ON#	CH1 to 5 will be output at 'L' input. At 'H' or 'OPEN' input, CH1 to 5 shut down, and latch lock is reset when output is off due to overcurrent/voltage protection. In addition, reclosing interval between PS_ON# 'H' or 'OPEN' input (output OFF) and 'L' input (output ON) shall be 5 seconds or longer.	All
	+3.3V SENSING	Input terminal for detecting CH1 (+3.3V) output voltage. By connecting to + side of Load end, the voltage drop on + side output cable is compensated. (Compensated voltage is 0.1V max.). (Refer to "Precaution" below).	
Output	PWR_OK	'H' signal is delivered when CH2 (+5V) output is turned on.	



**! Precaution**

+3.3V SENSING is to be connected to + side of the load.  
 The voltage drop from connector to + side of the load shall be 0.1V or less.  
 Do not apply excessive voltage to the terminal as it may damage the resistor (100Ω) inside the unit.

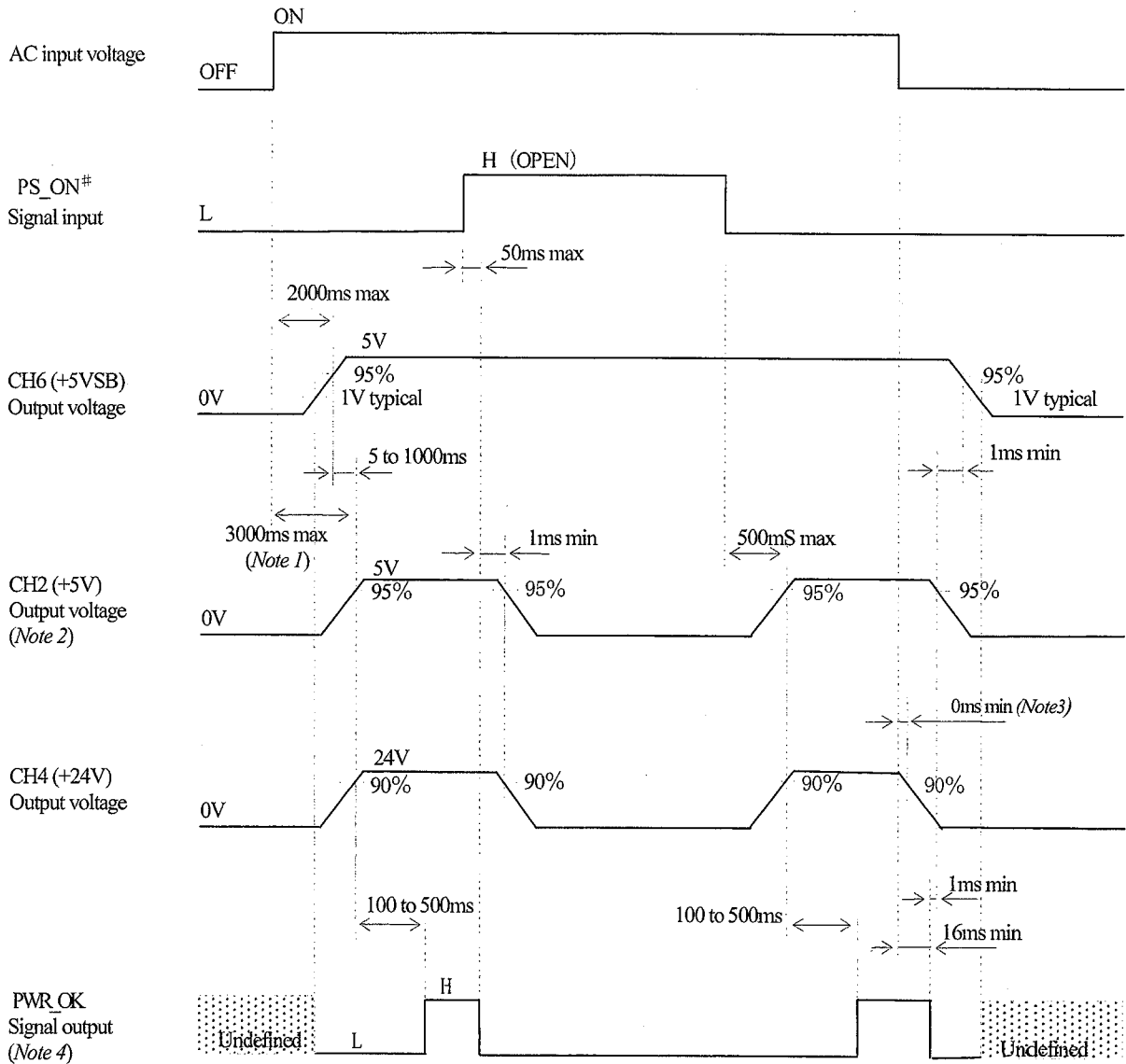


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## Power Supply Timing (Provided at rated input/output; type test)



Note 1. Input reclosing interval after AC is turned off shall be 10 seconds or longer.

Note 2. CH1(+3.3V), CH3 (+12V) and CH5 (-12V) shall follow this timing except for voltage value, and absolute value of difference from CH2(+5V) in rise time shall be 30ms or less. In addition, voltage level of CH2 (+5V) and CH3 (+12V) at startup shall be higher than that of CH1 (+3.3V). However, order and difference in voltage level of each output at falling are not specified.

Note 3. Hold-up time shall be zero for CH4 (+24V) output only.

Note 4. Rise time and fall time of PWR\_OK signal shall be 1ms or less (provided at capacitive load is not connected to PWR\_OK signal output).



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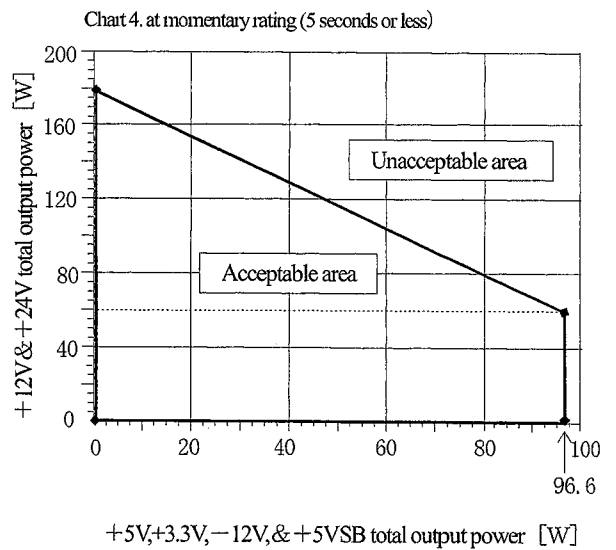
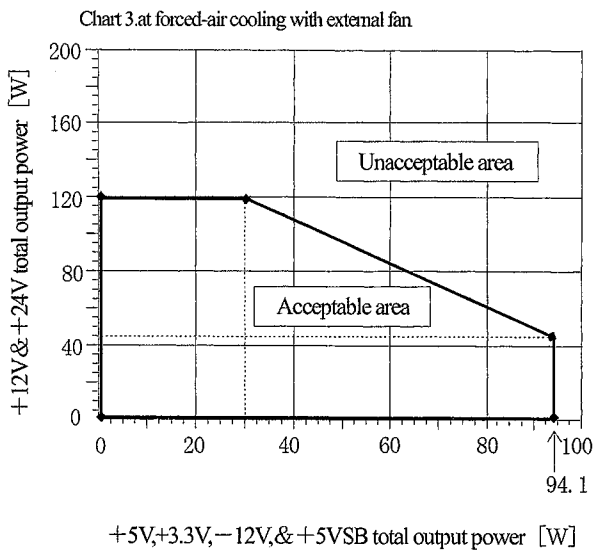
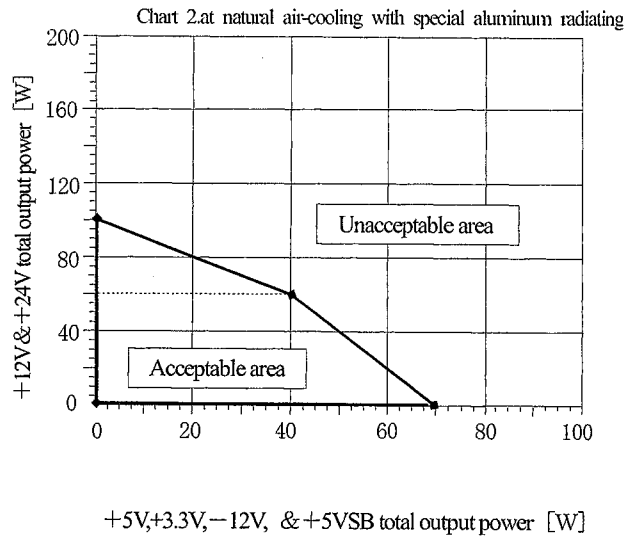
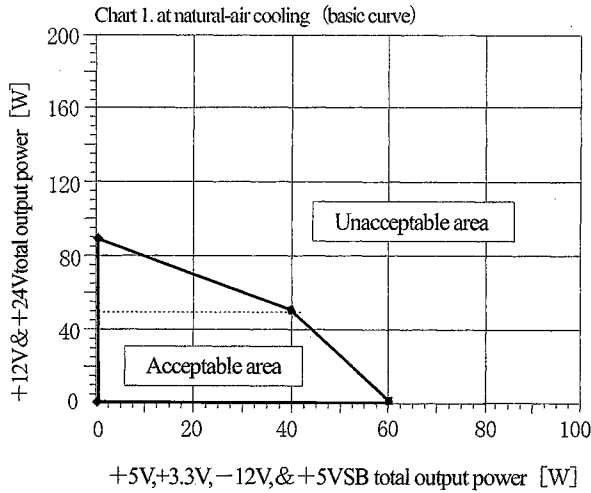
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## Output Power Cross Regulation Chart

Output current for each CH is limited by total power in this power supply. Total of power per CH (= output voltage times load current) shall follow the conditions of 1 to 4 below.

1. Max. output current/power 1 specified in the output specification shall fit within the range of bold solid line in Chart 1.
  2. Max. output current/power 2 specified in the output specification shall fit within the range of bold solid line in Chart 2.
  3. Max. output current/power 3 specified in the output specification shall fit within the range of bold solid line in Chart 3.
  4. Momentary output current/power specified in the output specification shall fit within the range of bold solid line in Chart 4.
- However, when using at high temperature or low voltage, follow the derating conditions on page 6.



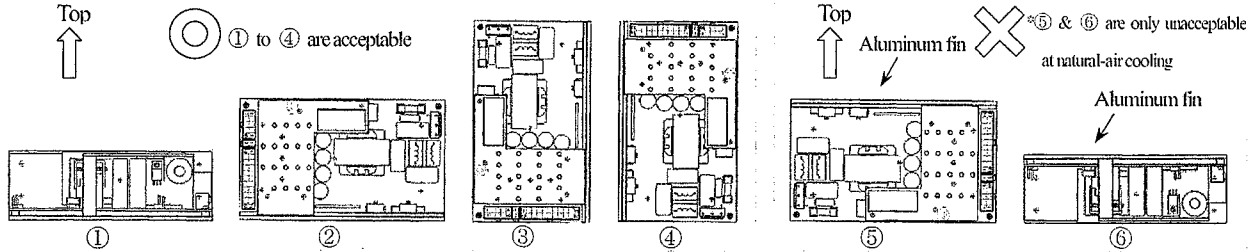
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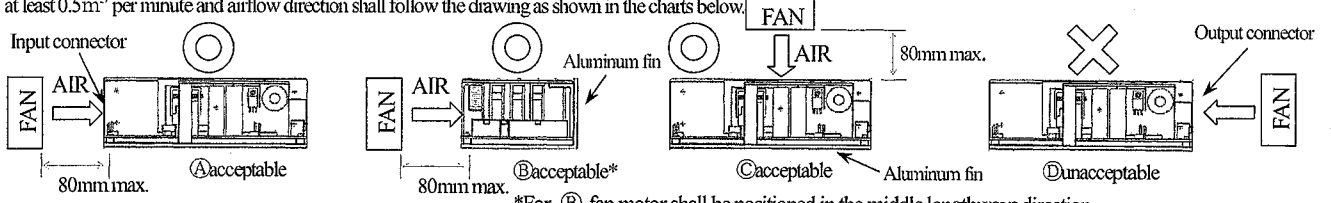
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## Installation

- When mounting the power supply into the system, keep at least 5mm away from the PCB edge and component surface of the unit to meet insulation and dielectric strength requirement.
- Keep sufficient space on top to allow natural-air cooling. The installation positions marked as "X" below are unacceptable.



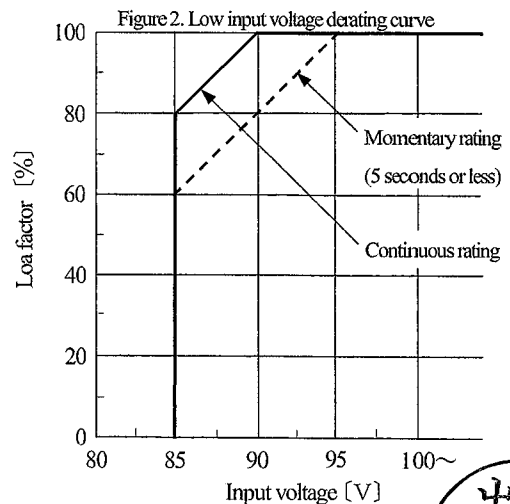
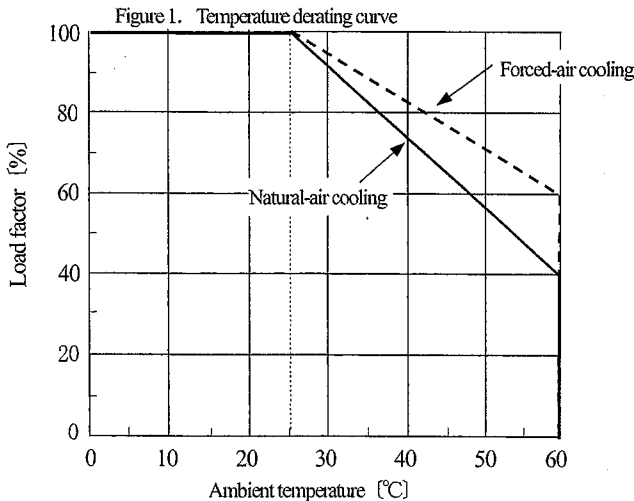
- At forced-air cooling, all of ① to ⑥ directions are acceptable; however, external fan's position to the supply shall be any of ① to ③ below but (④). Air flow of the fan shall be at least 0.5m<sup>3</sup> per minute and airflow direction shall follow the drawing as shown in the charts below.



## Derating Conditions

When using at low voltage under high temperature, follow 1 to 4 below to derate output current and power. For continuous rating, however, maximum output current value for each CH specified in the output specification shall be defined as 100% of load factor, and total maximum output power (\*Note) of CH1 to 6 shall be defined as 100% load factor. For momentary rating, in the same way, momentary output current for each CH shall be defined as 100% load factor, and total output power (\*Note) of CH1 to 6 shall be defined as 100% load factor. (\*Note) For total value of maximum output power and total value of momentary output power of CH1 to 6, refer to "Output Power Cross Regulation Chart" on page 5.

- If the ambient temperature exceeds 25°C at natural-air cooling, follow the solid line in Figure 1 for both continuous and momentary ratings.
- If the ambient temperature exceeds 25°C at forced-air cooling, follow the broken line in Figure 1 for both continuous and momentary ratings.
- When using at continuous rating at or below 90V, follow the solid line in Figure 2. When the ambient temperature exceeds 25°C, follow the calculated load factor by multiplying the load factor in Figure 2 and Figure 1 together.
- When using with momentary rating at or below 95V, follow the broken line in Figure 2. In addition, if the ambient temperature exceeds 25°C, follow the calculated load factor by multiplying the load factor in Figure 2 and Figure 1 together.



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## Current Rating Table for Load Connection Pins

The maximum current that can be drawn from the load connection pins is shown in the table below. However the total current for each output shall not exceed the maximum output current specified in the output specification.

Connector name	Pin #	Output signal name	Maximum current	Note
CN10	1	+3.3V	5.0A	
	2	+3.3V SENSING	※	* See signal input/output specification.
	3	+12V	5.0A	
	4	+5V	5.0A	
	5	+5V	5.0A	
	6	GND	5.0A	
	7	GND	5.0A	
	8	GND	5.0A	
	9	GND	5.0A	
	10	-12V	5.0A	
	11	+5VSB	5.0A	
	12	+3.3V	5.0A	
	13	+3.3V	5.0A	
	14	+12V	5.0A	
	15	+5V	5.0A	
	16	+5V	5.0A	
	17	GND	5.0A	
	18	GND	5.0A	
	19	GND	5.0A	
	20	GND	5.0A	
	21	PWR_OK	※	* See signal input/output specification.
	22	PS-ON#	※	* See signal input/output specification.
CN11	1	+3.3V	5.0A	
	2	+5V	5.0A	
	3	GND	5.0A	
	4	GND	5.0A	
	5	+12V	5.0A	
	6	+3.3V	5.0A	
	7	+5V	5.0A	
	8	GND	5.0A	
	9	GND	5.0A	
	10	+12V	5.0A	
CN12	1	+5V	5.0A	
	2	+3.3V	5.0A	
CN13	1	+24V	7.5A	
	2	COM. GND	7.5A	

## Packaging Specification

Packaging structure: One unit is wrapped in a plastic bag and packed in an individual box. 12 individual boxes are to be packed in a collective box (6×2 layers). Individual and collective boxes shall be made of cardboard.

Items	Specification	Note
Dimension/Weight	400mm (W)×400mm (D)×260mm (H)/13Kg	Standard value per one collective box containing 12 pcs.
Number of stackable piles	3 piles or less (from the bottom to the top)	One collective box is regarded as one pile.
Vibration	To endure a vibration acceleration of 0.75g <sub>r</sub> with vibration frequency of 5 to 50Hz (logarithm sweeping) in upward and downward vibrations for 40 minutes.	JIS Z 0200 compliant (less than 2,000km in a truck)
Impact from a fall	To endure free fall from 35cm high.	JIS Z 0200 compliant (distribution conditions Level III)





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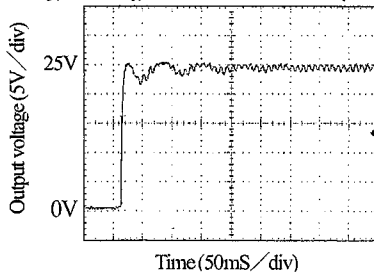
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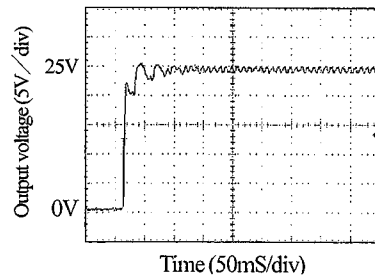
## Precautions before use

- Grounding**  *Warning*  
 This power supply is designed and produced as Class I equipment. Make sure to properly ground the chassis (L-shaped aluminum chassis) for safety operation. Please be aware that FG terminal (pin 1) of the input connector is not a safety-grounding terminal.
- Electric shock**  *Warning*  
 This power supply is designed and produced as embedded type equipment, and contains a high-voltage part. Make sure to securely install the supply into equipment to prevent electric shock.
- Momentary output current and output short circuit**  *Caution*  
 Make sure that momentary output current follows specified current, period, and repetitive condition. Operations not specified in the specification may cause damage to the device. Prevent shorting output. If output is shorted, capacitors inside the power supply rapidly discharge and may cause fire and/or sparks, resulting in a serious accident. It also shortens the lifetime of the power supply.
- Temperature rise of the chassis (L-shaped aluminum chassis)**  *Caution*  
 The chassis (L-shaped aluminum chassis) also serves as a radiator. Therefore, it heats up and may cause burns. Handle the chassis carefully, and pay much attention to the thermal effect on the device as well as safety.
- Noise at power-on and power-off**  
 Low frequency noise may be heard at input reclosing or power-on/off by PS\_ON signal; this noise is caused by low frequency vibration of chokes to regulate harmonic current. Similar low frequency noise may be heard while energized (at operation and standby). These noises, however, do not cause any damage to the function and lifespan of the power supply.
- Rising waveform of CH4 (+24V) at startup**  
 CH4 (+24V) output is semi-regulated. Therefore, it has maximum of +10%/-20% overshoots and undershoots as shown in the charts below. Make sure that the overshoots and undershoots do not cause problems before use.

① 24V typical rising waveform at AC100V input and rated load



② 24V typical rising waveform at AC240V and rated load



## Product Inspection

Product inspection is conducted in compliance with our standard and test types (type test, sampling test, and all test) specified per each specification. Inspection types in details are shown below. In addition, inspection documents will not be released in principle. If necessary, however, the documents will be sent out with compensation after consultation.

**Type test:** This test is called Technology Evaluation and Authorization Test (Type Authorization Test) which is conducted prior to the first lot of mass production or when the design has been revised. This test is conducted to all specification items specified in the test type as type/sampling/all under Evaluation Test Class A following our standard.

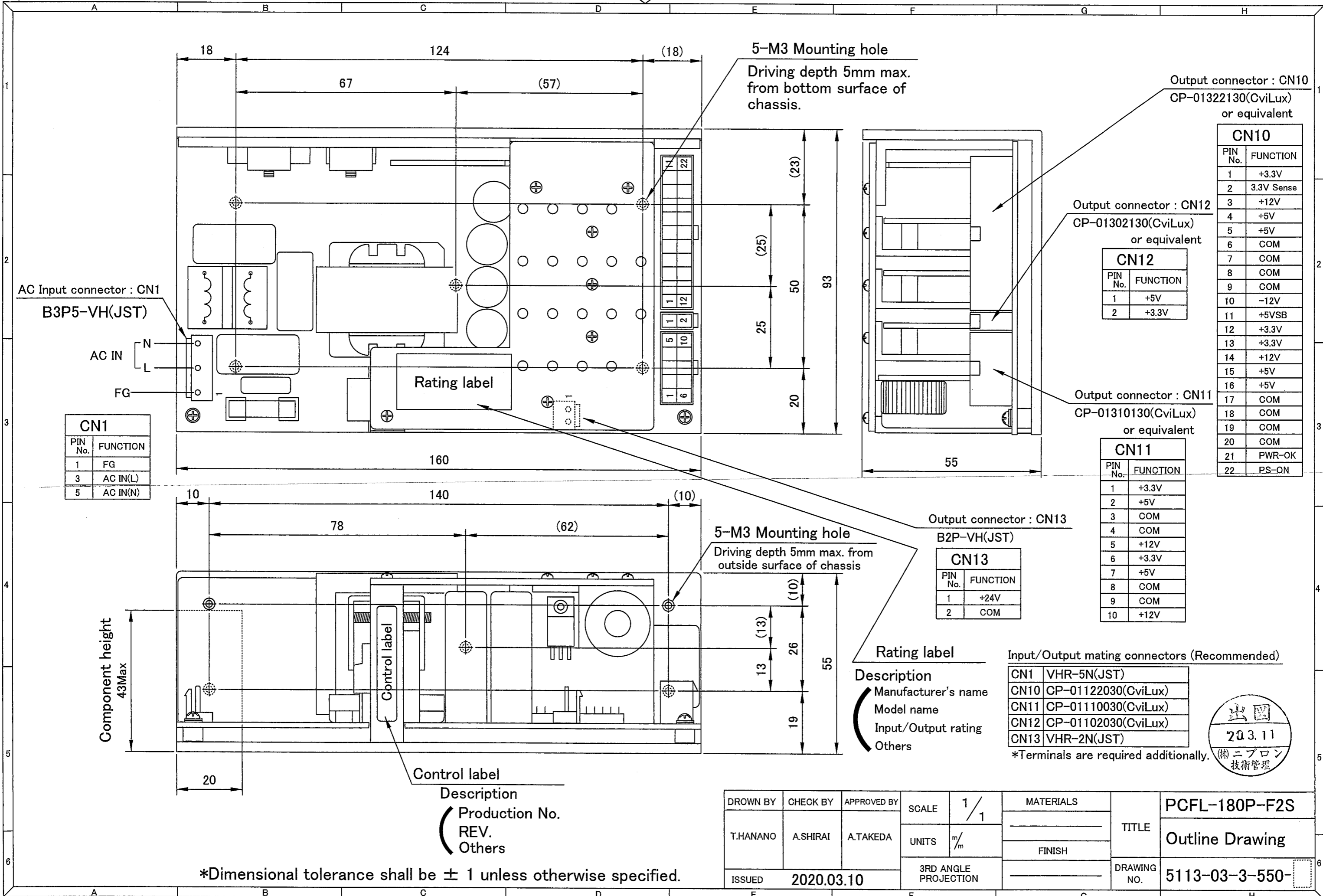
**Sampling test:** The sampling test is applied to each production lot under normal temperature and humidity. Sampling method follows JIS Z 9015 and Normal Inspection Standard 1 compliant. Samples are randomly taken once and will be inspected for all items listed as 'sampling' or 'all' in the test type section. For the outline dimension test, one product per each production lot is inspected.

**All test:** This test is applied to all products in each production lot under normal temperature and humidity. When All test is required in the test type section, all products are inspected for all items in the specification.



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AC Input connector : CN1  
B3P5-VH(JST)

CN1	
PIN No.	FUNCTION
1	FG
3	AC IN(L)
5	AC IN(N)

5-M3 Mounting hole  
Driving depth 5mm max.  
from bottom surface of  
chassis.

Output connector : CN10  
CP-01322130(CviLux)  
or equivalent

CN10	
PIN No.	FUNCTION
1	+3.3V
2	3.3V Sense
3	+12V
4	+5V
5	+5V
6	COM
7	COM
8	COM
9	COM
10	-12V
11	+5VSB
12	+3.3V
13	+3.3V
14	+12V
15	+5V
16	+5V
17	COM
18	COM
19	COM
20	COM
21	PWR-OK
22	PS-ON

Output connector : CN12  
CP-01302130(CviLux)  
or equivalent

CN12	
PIN No.	FUNCTION
1	+5V
2	+3.3V

Output connector : CN11  
CP-01310130(CviLux)  
or equivalent

CN11	
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

Output connector : CN13  
B2P-VH(JST)

CN13	
PIN No.	FUNCTION
1	+24V
2	COM

5-M3 Mounting hole  
Driving depth 5mm max.  
from outside surface of  
chassis

Component height  
43Max

Rating label

Description  
 ( ) Manufacturer's name  
 ( ) Model name  
 ( ) Input/Output rating  
 ( ) Others

Input/Output mating connectors (Recommended)

CN1	VHR-5N(JST)
CN10	CP-01122030(CviLux)
CN11	CP-01110030(CviLux)
CN12	CP-01102030(CviLux)
CN13	VHR-2N(JST)

\*Terminals are required additionally.



Description  
 ( ) Production No.  
 ( ) REV.  
 ( ) Others

DROWN BY	CHECK BY	APPROVED BY	SCALE	1/1
T.HANANO	A.SHIRAI	A.TAKEDA	UNITS	m/m
ISSUED	2020.03.10		3RD ANGLE PROJECTION	

MATERIALS	TITLE	PCFL-180P-F2S
FINISH		
DRAWING NO.	5113-03-3-550-	

\*Dimensional tolerance shall be ± 1 unless otherwise specified.