e-Front runners

FH2000U1R (Reverse air flow)
12V 2000Watt 1U AC-DC FRONT END POWER SUPPLY

Special Features

- ◆80 Plus Gold
- ◆Reverse Air Flow
- ◆Up to 21W/Inch³ Power Density
- ◆Hot Swap N+1 Redundancy
- ◆Active Current Sharing (Single Wire)
- ◆I²C Serial Bus and PSMI Compliant
- ◆LED Indicators on Front Panel
- ◆Over Voltage, Over current and Under Voltage Protection
- ◆Over Temperature Protection
- ◆Remote ON/OFF , Remote Sense
- ◆Power Factor& Harmonic Corrected
- ◆UL60950-1, CSA60950-1, IEC60950-1 and EN60950-1
- ◆6-RoHS Compliant
- ◆Front Panel AC Access via IEC60320 C20 Inlet

Input Specifications

Specification	Notes	Min.	Typ.	Max.	Units
Operating Voltage Range					
1200W operation		90	-	132	Vac
2000 W operation		180	-	264	Vac
Input Frequency		47	50/60	63	Hz
Wave Distortion				10	%
Inrush current limitation	Cold-start inrush current measured at 200Vac, 60Hz input line with the output fully loaded except inrush current to X capacitor	-	-	35	ApK
Input Current					
1200W operation	Measured at 90Vac, Vout=12.12V, Load=99A	-	-	14.7	A
2000 W operation	Measured at 180Vac, Vout=12.12V, Load=165A	-	-	12.8	A
Power Factor	at 100% load, 230VAC	-	98	-	%
Input Leakage Current	240VAC,60Hz	-	-	0.75	mA
Hold-up Time	Single Unit Operation, at 67% load	20	-	-	ms
Efficiency 2000 W operation	Measured at 230Vac, Vout=12V, Load=50% load (80 Plus Gold)	92	-	-	%
Input protection	Time delay Internal fuse	-	20	-	A

Output Specifications

Specification	Notes	Min.	Typ.	Max.	Units
Output Voltage Set Point	Factory Set	-	12.12	-	Vdc
Voltage Regulation	AC Line variatios,load variations,temperature variations, aging drift,tolrrance max remote sence drops are included .	-3	-	+3	%
Output Power	100Vac to 120Vac	-	-	1200	W
	200Vac to 240Vac	-	-	2000	W
Output Current	100Vac to 120Vac	0	-	99	A
	200Vac to 240Vac	0	-	165	A
Transient Response	Overshoot & Undershoot@Hot-Swap,Turn On/Off	-5	-	+5	%
	Dynamic Characteristics ; Change in output voltage within 3ms after a 75% <=>100% load step change			3	%
Ripple / Noise	With load capacitance , 0.1uF of Ceramic Cap. & 220uF of Electrolytic Cap	-	-	240/240	mVp-p
Load Sharing	@ full load	-5	-	+5	%

Rev.B

Auxiliary Output

Specificfation	Notes	Min.	Typ.	Max.	Units
Stand-by output Voltage		-	5	-	Vdc
Voltage Regulation		-5		+5	%
Stand-by output Current		0	-	5	A
Load capacitance		0	-	6800	uF
Ripple & Noise	0.1uF of Ceramic Cap. & 10uF of Electrolytic Cap	-	-	50	mVp-p
Transient Response	Overshoot & Undershoot@Hot-Swap,Turn On/Off	-5	-	+5	%
	Dynamic Characteristics ; Change in output voltage within 3ms after a 75% <=>100% load step change			3	%
Stand-by output over voltage	Shutdown	120	-	150	%
Stand-by output under voltage		-	-	-	Vdc
Stand-by output over current	Between 100% and 150% are droop , if output continues 10 sec by 2.5V or less and then shut off	100	-	150	%

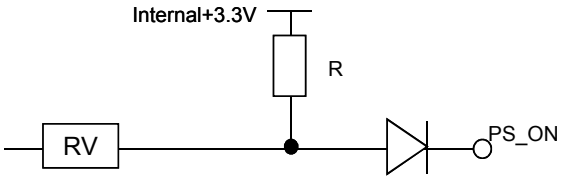
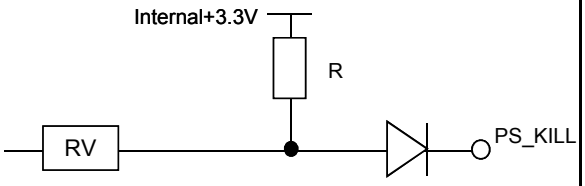
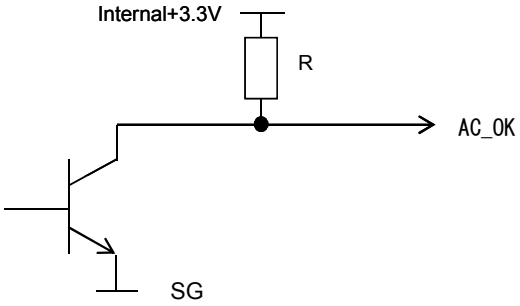
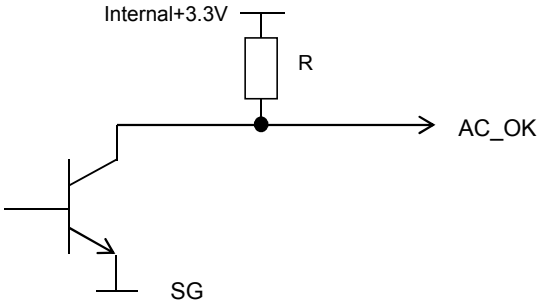
Protections

Specificfation	Notes	Min.	Typ.	Max.	Units
Input Under Voltage	Shutdown if input voltage <160V for more than 1 sec	-	160	-	Vac
Output Over Voltage	Shutdown	14.4	-	16.8	Vdc
Output Under Voltage	Shutdown	3.6	-	9.6	Vdc
Output Over Current	The output is operating during 2.5sec that this output is in case of under voltage(3.6V-9.6V) or more	110	-	150	%
Over Temperature	Output shuts off no-restart	95	100	105	℃

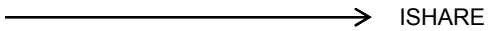
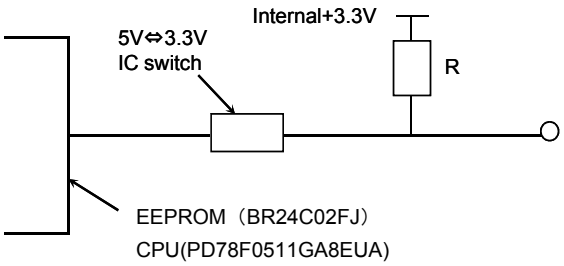
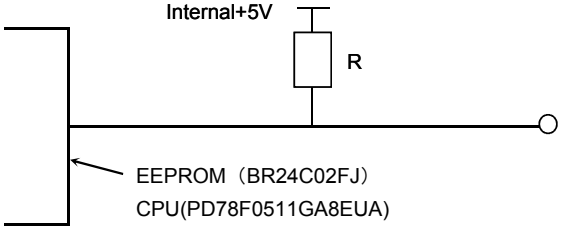
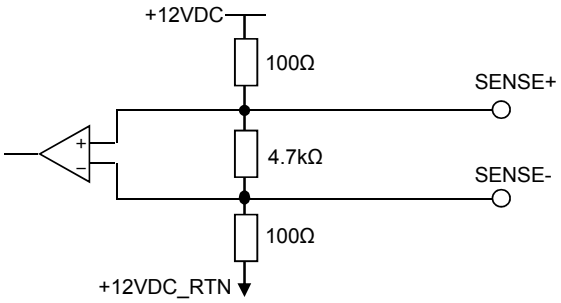
Serial Communications

Communications	Signal
Signals	SENSE+ PS_KILL SENSE- I_SHARE PS_ON FRU(I2C_CLOK, I2C_DATA, I2C_ADR0, I2C_ADR1, I2C_ADR2) AC_OK P_GOOD PS_PRESENT
LED Signals	Refer to LED Indicators on Page 7
I2C Communication BUS	Based on Fuji Standard Design

Signal Condition

#	Signal Type	Circuit Condition	Electrical Condition
1	*PS_ON Input Signal		12VDC turn ON/OFF signal Low active (Sink current : over 2mA) High turn OFF
2	PS_KILL Input Signal		Power supply force shut off signal for hotswapping Low (below 1V) : Power on High (above 2V) : Power off
3	AC_OK Output Signal		Input voltage monitor signal "Low" AC Fail (below 0.4V at 4mA,max 20mA) "High" Active
4	P_GOOD Output Signal		Output status signal "High" active "Low" shows abnormal output (below 0.4V at 4mA,max 20mA)
5	*PS_PRES Output Siganl		Power supply present signal Low = Present (below 0.4V at 4mA,max 20mA) High = Not - present

Signal Condition

#	Signal Type	Circuit Condition	Electrical Condition
6	ISHARE Analog Signal		12VDC current balance signal
7	Serial Communication ・I2C_CLOCK ・I2C_DATA		Refer to PSMI spec for details Physical condition _Depends on the I2C bus condition
8	Adress Siganal ・I2C_ADR0 ・I2C_ADR1 ・I2C_ADR2 Input Siganal		Refer to PSMI spec for details Physical condition _Depends on the I2C bus condition
9	Remote SENSE+ SENSE- Input Signal		Remote Sense (12V Output)

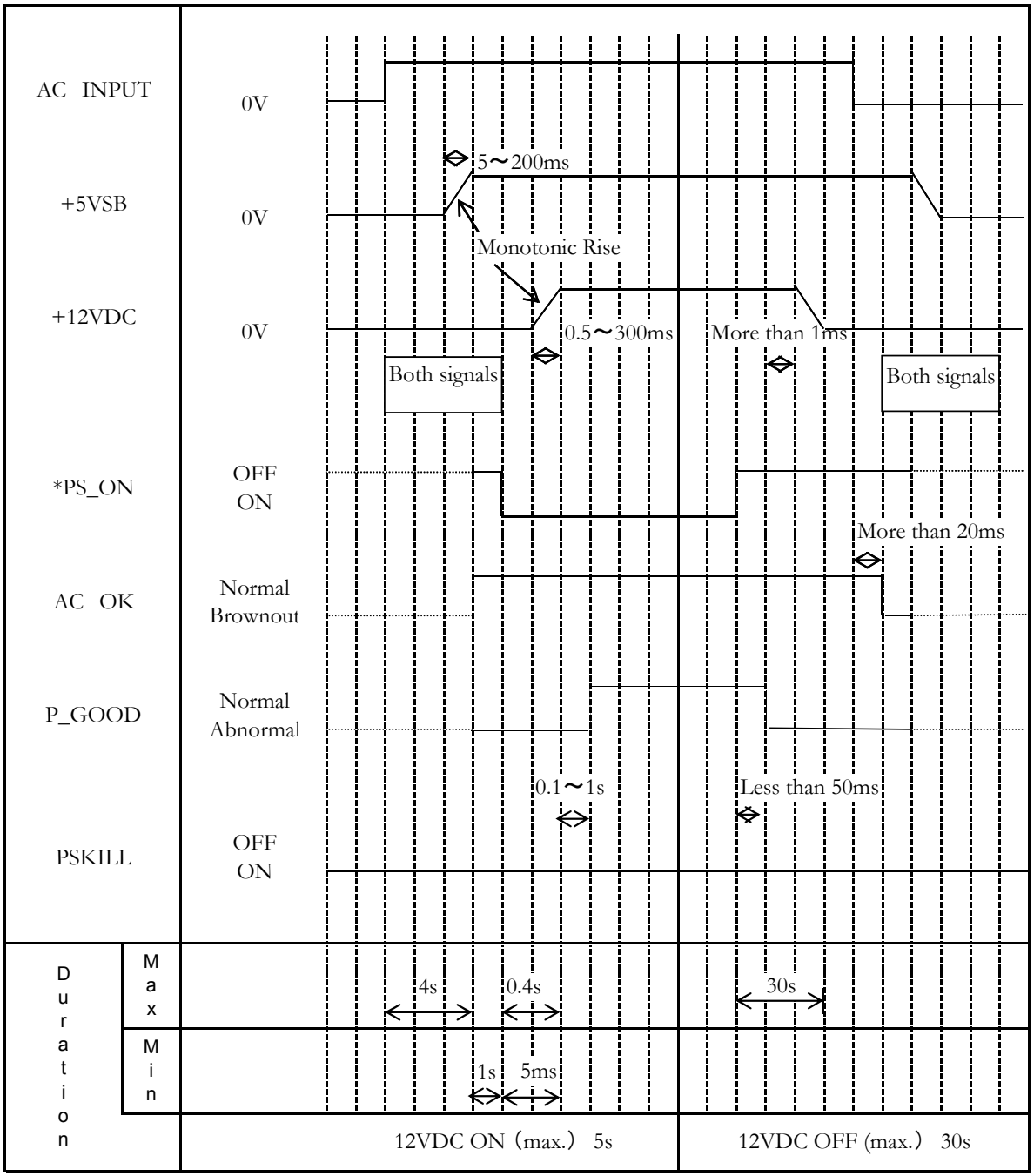
Note: Filter circuit needed to absord noise that may emerge on the output signals

Power Supply ON / OFF/KILL Operation

PSKILL (ON / KILL)	REMOTE (ON / OFF)	OUTPUT	5VSB OUTPUT	FAN STATE
ON	ON	ON	ON	ON
ON	OFF	OFF	ON	ON
KILL	ON	OFF	OFF	OFF
KILL	OFF	OFF	OFF	OFF

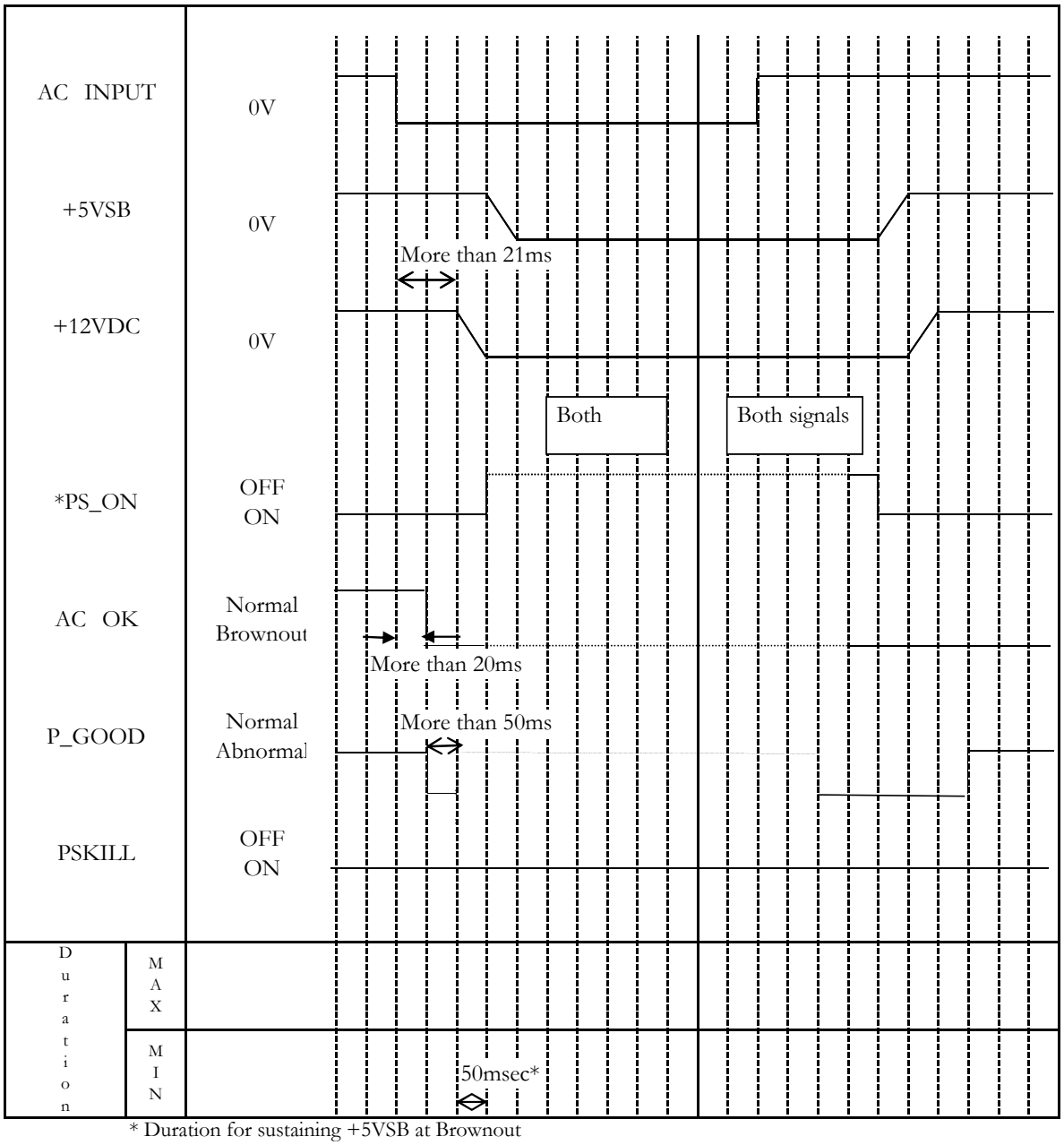
Timing Chart

PS ON/OFF Cycle Timing



Timing Chart

AC ON/OFF Cycle Timing



* Duration for sustaining +5VSB at Brownout

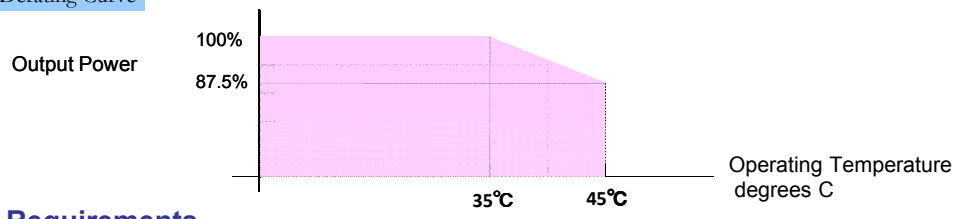
LED Indicators

	Power Supply LED	
Power Supply Condition	POWER	FAIL
LED Color	Green	Amber
No AC power to all PSU	OFF	OFF
No AC power to this PSU but provided to other units	OFF	OFF
AC present, PS_ON Off, Standby Output On	Blinking	OFF
Power supply DC outputs On and Okay	ON	OFF
Power supply failure (12V output failure, Fan failure)	OFF	ON
Power supply failure (5VSB output)	OFF	Blinking

Environmental & Reliability Specifications

Specificfation	Notes	Min.	Typ.	Max.	Units
Operating Temperature Range	Full Load mode (Low line and High line)	0	-	+35	°C
	87.5% Load mode (Low line and High line)	0	-	+45	°C
Storage Temperature		-40	-	+70	°C
Humidity	Relative Humidity, non-condensing	-20	-	+85	% RH
Altitude	For operation above 8000; maximum temperature is derated 2 degree per 1000	-200	-	+8000	Ft
Fan Speed	Automatically adjusted based on load and ambient temperature				
Acoustic Noise	Single unit operation, 100% load	-	-	70	dBA
MTBF	Calculated @ 25°C ambient temperature.	500K	-	-	Hours

Thermal Derating Curve



General Requirements

Specification	Notes	Min.	Typ.	Max.	Units
Shock	Non-Operating and no-packaging : Three times shock on each of the 6 faces , 2 inch drop				
Vibration	Operating : 0.5G , 5-400Hz, along three orthogonal axes , 30min.				
Electrostatic Discharge	Conditions: Contact and Air No components being damaged and work normally	10	-	-	KV
Input Line Surges	Line to Ground	-	-	2	KV
	Line to Line	-	-	1	KV
Fast Transient / Bursts		-	-	1	KV
Conductive Emissions	EN55022 & FCC Class A 6dB margin				
Radiated EMI	EN55022 & FCC Class A (with the Customer's system)				

Safety Specifications

Specificfation	Notes and Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Isolation Voltage Input to Output	-	3000	-	Vac
	Isolation Voltage Output to Chassis	-	1500	-	Vac
Safety Agency Approvals	C-US,CSA,TUV-EN60950,CB				
Safety Standards	IEC60950-1(Ed.2)				
	UL60950-1(Ed.2)				
	CSA60950-1(Ed.2)				

Input / Output Connections

◆ AC Input Connector

Circuit name and purpose		Terminal type
AC INPUT	L	Power Inlet (IEC60320 C-20)
	N	
	FG	

◆ DC Output Connector : Multi Beam 6450832-4 10P+24S (Tyco) or equivalent
Vertical Receptacle : 6450852-3 (Tyco) or equivalent
Right angle Receptacle : 6450872-1(Tyco) or equivalent

Pin Assignment

Single Pins						
	1	2	3	4	5	6
D	5VSB	5VSB	GND	GND	AC_OK	P_GOOD
C	5VSB	5VSB	GND	GND	NC	NC
B	ISHARE	I²C_AD0	I²C_AD1	I²C_ADR2	NC	PS_PRESENT
A	PSKILL*	SENSE+	SENSE-	I²C_DATA	I²C_CLOCK	PS_ON
Power Blades						
P1,P3, P5, P7, P9			P2, P4, P6, P8, P10			
12V			12V RTN			

PSKILL* : Pin A1 is a short pin
NC:Unconnected (Impossible to connect from outside)

I2C Communication

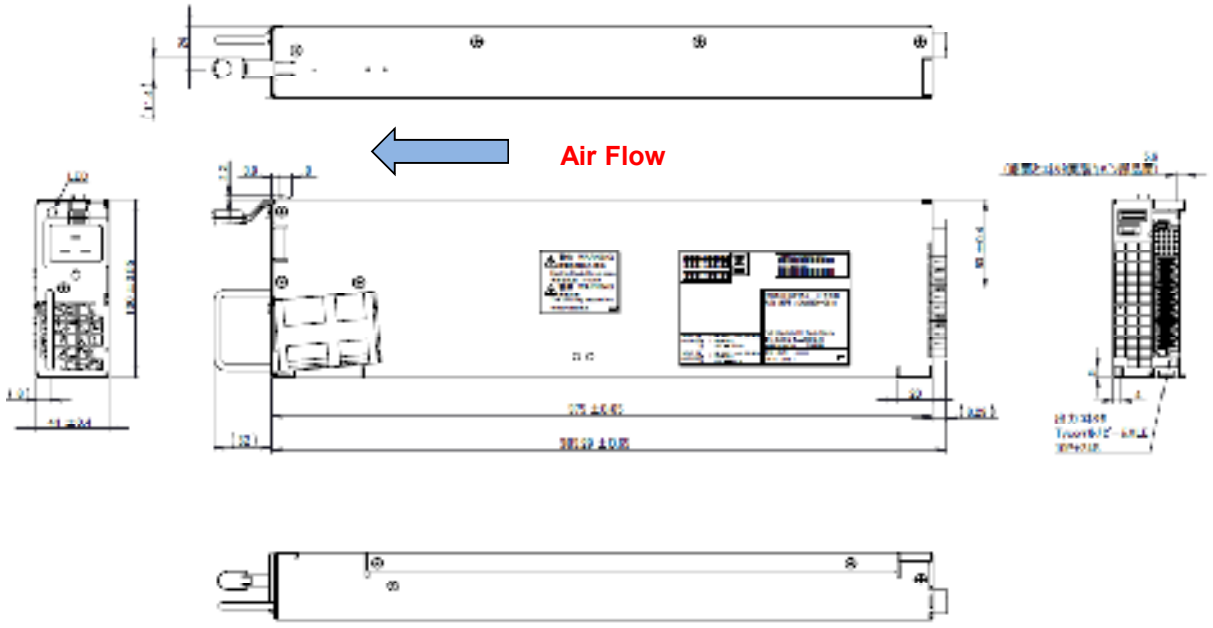
PSMI Compliant

1. Input Voltage / Current / Power
2. Output Voltage / Current / Power
3. Fan Speed Monitoring
4. Temperature Monitoring

Physical Specification

- Depth : 100 mm (3.94")
- Width : 375 mm (14.76")
- High : 41.0 mm (1.61")
- Weight : 2.5kg (5.5lbs) less or equal

Dimensional Drawings



Parts Derating

	Voltages	Amperes	Temperature
Capacitors			
Aluminum	97.5%	90%	90%
Ceramic,Multi Purpose	90%	90%	90%
Ceramic,Layer	90%	90%	90%
Film	90%	80%	80%
Semiconductors			
Diode, General Purpose	90%	90%	90%
Diode, Switching, <0.1A	90%	90%	90%
Diode, Power, Fast Recovery	90%	90%	90%
Diode, Power, Schottky	90%	90%	90%
Diode, Zener	90%	90%	90%
Diode, LED	90%	90%	90%
Diode, Optical Coupler	90%	90%	90%
Transistor, Bipolar	90%	90%	90%
Transistor, MOSFET	90% (100% : if it uses	90%	90%
Magnetics			
Inductor	NA	NA	refer to IEC60950
Transformer	NA	NA	refer to IEC60950

Cooling

Fan Operation

Operation mode	FAN operation
Standby (5VSB on)	Low speed
Normal operation	Normal speed *[8]

Fan Speed : Based on load, ambient temperature, and internal PSU temperature, Fan speed changes

Airflow direction

Reverse Airflow
-From Output connector to Fan side
-Refer to dimensional drawings of page 9

Others

Warranty
1 years warranty from the date of delivery to the customer