MODEL NO. ENR1155
(1+1 Redundant Power Supply module)

This specification defines the performance characteristics of a single-phase (3-wire) 550 watt power supply with wide range input AC capability (100-240VAC/50-60Hz) under operation temperature 50 degree C.The power supply shall be designed for parallel operation. In the event of a power supply failure, the redundant power supply continues topower the system.The number of power supplies per system will be limited to a maximum of two.
The power supply shall be designed for "hot swap" exchange and contain the OR-ing isolation MOSFETs.

☞1. Input Requirement

1.1 AC input requirements

The Power supply must be having a universal power input with active power correction to reduce the line harmonics in accordance with the EN61000-3-2 standard.
The power supply must be capable of operating with the following Conditions

Table 1 AC Input Rating

Parameter	Min	Nom.		Max	Unit
Vin	90	**100**	**240**	264	VACrms
Vin Frequency	47	**60**	**50**	63	Hz
Iin		**7.1**	**3.4**		A
THD	< 10% THD				

1.2 Power Factor

Energy star for computer sever 2.0 is necessary.

Output power	10% load	20% load	50% load	100% load
Power factor	>0.65	>0.8	>0.9	>0.95

Power factor test must meet the test conditions specified in Energy start for computer server 2.0.
Test confition,115V/60Hz and 230V/50Hz ,Load condition please reference the above tabel 2.

1.3 Inrush current regulation

When input power is applied to the power supply and any initial inrush current surge or spike of 1ms or less shall not exceed 60A peak per module. Any additional inrush current surges or spikes in the form of AC cycles or multiple AC cycles greater than 5ms shall not exceed 50A peak per module. Inrush caused by x- or y-caps are not considered. The PS shall meet inrush requirements for any rated AC voltage, during turn on at any phase of AC voltage, during any AC dropout condition, and during AC power cycling. The AC power cycling test condition is defined as cycling the AC power off and back on after the power supply has been operating at maximum load and has reached thermal stability. The period between the AC power cycles could be anywhere between 20 ms to 10 seconds. The inrush shall be less than the ratings of the critical components. Any inrush current of the AC line shall not cause damage to the power supply.

1.4 Efficiency

1) 80 Plus gold level standard is necessary.
Module:
82%,85%,82% (20%;50%;100% load) 230VAC/50Hz
Power supply must meet climate saver gold level standard, the certification is necessary.
2) Energy star for computer server 2.0 is necessary:
Without Fan

3)12VSB current is 0A in standby mode at 230Vac/50Hz;
Input power< 4.7 W, Fan run at a minimum RPM.

1.5 AC line dropout

AC line dropout is the condition when AC input drops to 0VAC at any phase of the AC line for any length of time. During an AC dropout of 12mS or less the power supply shall meet dynamic voltage regulation (Table 3) over the rated load. An AC line dropout of 12mS or less shall not cause malfunction of control signals or protection circuit trip. If the AC dropout lasts longer than 12mS the power supply shall recover and meet all turn on requirements. The power supply shall meet the AC dropout requirement over rated AC input voltages, frequencies, and output loading conditions. Any dropout of the AC line shall not cause damage to the power supply.

1.6 Brownout

Power supply shall contain protection circuitry such that the application of an input voltage below the minimum specified in table 1 shall not cause damage to the power supply unit nor cause failure of the input fuse and overstress to any other component. In the event of shutdown due to extended brownout, the power supply shall automatically restart after the AC input is within specified limits. The voltage level between shutdown and recovery shall have a minimum of 5 VAC of voltage hysteresis, so that the power supply will not oscillate on and off due to voltage change condition. The power supply shall meet dynamic voltage regulations (Table 3) and all turn on requirements or turn off requirements while shutdown or recovery.

1.7 AC Turn on Requirements

1.7.1 AC Turn on Requirements

Power supply shall return to normal power up state after a slow recovery condition. While the power supply is operating at full rated DC load,, the AC line voltage shall be increased from 0VAC to 90VAC/60Hz at a constant rate over a period of 30 minutes. Power supply shall turn up at the AC voltage 84V±5V.

1.7.2 AC Turn off Requirements

Power supply shall go to power off state after a slow brownout condition. While the power supply is operating at full rated DC load, the AC line voltage shall be reduced from 90VAC/60Hz to 0VAC at a constant rate over a period of 30 minutes. Power supply shall shutdown at the AC voltage 75±5V.

1.8 Line Surge or Sag

Surge and Sag				
Duration	**Surge/sag**	**Operating AC Voltage**	**Line Frequency**	**Performance Criteria**
500ms	**10%**	**220/110VAC**	**20/60Hz**	**NO loss of function or performance**
0 to 1/2 cycle	**30%**	**220/110VAC**	**20/60Hz**	**NO loss of function or performance**
=1/2 AC cycles	**30%**	**220/110VAC**	**20/60Hz**	**NO loss of function or performance**
>1/2 AC cycles	**30%/>30%**	**220/110VAC**	**20/60Hz**	**Loss of function acceptable,Power supply can starts up automatically**

1.9 Input leakage current & Hi-Pot

<1.5mA at 240V RMS/50Hz, and <0.75mA at 120VRMS/60Hz
Hi-Pot Test condition: 1800Vac or 2121Vdc

☞2. Output Requirements

2.1 Output regulation Requirements

All outputs must maintain their regulation with the below limits when measured at the output connector point or across the remote sense (if applicable) in any load condition defined in section 2.2

Output	Minimum	Nominal	Maximum	Unit
+12V	11.40	12.20	12.60	Vdc
+5V	4.75	5.0	5.25	Vdc
+3.3V	3.14	3.3	3.47	Vdc
-12V	10.80	12.0	13.2	Vdc
+5Vsb	4.75	5.0	5.25	Vdc

2.2 Output Current Requirements

All outputs must maintain their regulation as per section 2.1 when loaded to the following loading combination:

Output	Minimum	Maximum	Unit
+12V	0.5	**45**	A
+5V	0.5	**26**	A
+3.3V	0.5	**26**	A
-12V	0	**0.3**	A
+5Vsb	0.1	**3.0**	A

Maximum continuous combined load on +3.3VDC and +5VDC outputs shall not exceed 150W.
The total output power can not exceed 550W continuously. During load changes from minimum to maximum or maximum to minimum the unit must not shut down.

2.3 Output Ripple and Noise

The following output ripple/noise requirements will be met throughout the load ranges specified in Section 3.2 and under all input voltage conditions specified in Section 3.1. Ripple and noise are defined as periodic or random signals over the frequency band of 10Hz to 20MHz.
Measurements will be made with an oscilloscope set to 20MHz bandwidth limit.
Measurement is done by using 10uF Tantalum in parallel with a 0.1uf ceramic capacitor, measured directly at the output connector side.

Output	Maximum	Unit
+12V	120	mV
+5V	50	mV
+3.3V	50	mV
-12V	120	mV
+5Vsb	50	mV

2.4 Output Dynamic Loading

The output voltages shall remain within the limits specified in 3.4 for the step loading and within the limits specified in 3.4 for the capacitive loading. The load transient repetition rate shall be tested between 50Hz and 5kHz at duty cycles ranging from 10%-90%. The load transient repetition rate is only a test specification. The Δ step load may occur anywhere within the MIN load to the MAX load shown in 2.2

Transient Load Requirements

Output	Δ Step Load Size	Load Slew Rate	Capacitive Load
+3.3V	30% of max load	0.5 A/μs	1000μF
+5V	30% of max load	0.5 A/μs	1000μF
+12V	65% of max load	0.5 A/μs	2200μF
+5Vsb	25% of max load	0.5 A/μs	350μF

2.5 Capacitive Loading

The power supply shall be stable and meet all requirements, except dynamic loading requirements, with the following capacitive loading ranges.

Capacitve Loading Conditions

Output	MIN	MAX	Units
+3.3V	10	12000	μF
+5V	10	12000	μF
+3.3V	10	11000	μF
-12V	1	350	μF
+5Vsb	1	350	μF

2.6 No load

The power supply turn on in no load condition shall not cause damage to the power supply. The power supply shall be able to turn up in no load condition.

2.7 Residual Voltage in Standby mode

Residual voltage at the power supply outputs for no load condition shall not exceed 100mV when AC voltage is applied and the PSON# signal is de-asserted.

2.8 Redundant and hot swap

Hot swapping a power supply is the process of inserting and extracting a power supply module from an operating power system both stead and dynamic conditions with power cord as well as without power cord. In general, a failed (off by internal latch or external control) supply module may be removed, and replaced with a good power supply module.However, hot swap needs to work with operational as well as failed power supply module. The power supply shall meet following requirements while hot remove or insert the module to the cage：

a) The output voltage shall stay within the limits shown in Table 3.

b) DC signal, such as PG, PS-ON, present and other signals shall not oscillate or change,

c) Current Sharing bus shall not oscillate,

d) LED color shall not change,

e) Power supply shall not be overload and other protection,

f) The newly inserted power supply may get turned on by plugging AC into the external and meet the turn on requirements, including the voltage shown in table 3 and timing shown in table 4.

g) The two modules shall be synchronous while the power supply turn on, turn off, dropout and brownout. Any oscillation of voltage waveform due to the nonsynchronous is not acceptable.

2.9 Forced Load Sharing

+12V output current from each power supply shall be within (+10%, -10%) of Iload / (no,of PS) when supplying total output load current of 0.2I max. < I load < I max. where, Imax. = 10A for 2 power supplies connected in parallel. The error shall be calculated by:(M1-M2)/M1,or(M1-M2)/M2. For example M1=10A，M2= 9.1-11A When 2 Power supplies connected in parallel,the minimum load must to 2A.

2.10 Remote sense

Remote sense is necessary at 12V and return sense. The remote sense should be able to regulate out voltage drop of 300mV minimum on 12V rail as well as return. There are the values of resistor connecting between the remote sense and the out voltages internal to power supply.

2.11 Return

All DC Returns (GND) are internally connected to frame ground.

2.12 Output isolation

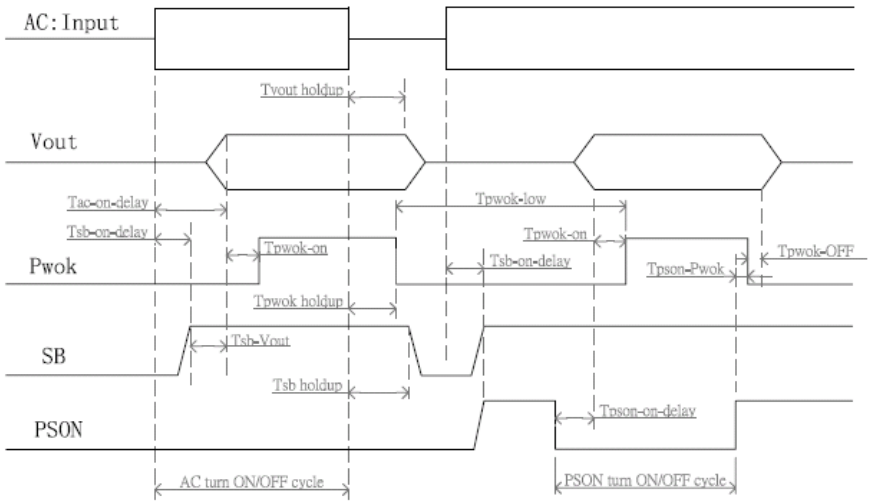
The power supply shall have the isolate device to isolate the power supply from the system power during the hot swap or power supply failure. This isolate device may be O'ring Mosfet or equivalent functional circuits.

☞3. Controls and Signal

3.1 Timing Requirements

Figure 1 is a reference for signal timing for main power connector signals and rails.

Figure 1 Timing diagram



These are the timing requirements for power supply operation including alone module outputs and multi model outputs. All outputs shall rise and fall monotonically.

12VSB rise waveform shall soft-start from the time when 12VSB (or another input voltage for DC to DC converter) goes to regulation limit.

However, PS timing must meet the requirement of mother board. PS supplier must evaluate and verify the timing characteristics when in design stage and system test stage.

The criteria in below table is recommended.

Item	Description	MIN	MAX	Units
Tsb_on_delay	Delay from AC being applied to 5 VSB being within regulation.		1500	ms
T ac_on_delay	Delay from AC being applied to all output voltages being within regulation.		**3500**	ms
Tvout_holdup	Time all output voltages stay within regulation after loss of AC.	16		ms
Tpwok_holdup	Delay from loss of AC to deassertion of PWOK	15		ms
Tpson_on_delay	Delay from PSON# active to output voltages within regulation limits.	5	**500**	ms
T pson_pwok	Delay from PSON# deactive to PWOK being deasserted.		50	ms
Tpwok_on	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	1000	ms
T pwok_off	Delay from PWOK deasserted to output voltages (3.3 V, 5 V, 12 V, -12 V) dropping out of regulation limits.	1		ms
Tpwok_low	Duration of PWOK being in the deasserted state during an off/on cycle using AC or the PSON# signal.	100		ms
Tsb_vout	Delay from 5 VSB being in regulation to O/Ps being in regulation at AC turn on.	50	**3000**	ms
Tsb_holdup	Time 5VSB output voltage stays within regulation after loss of AC.	70		ms

Figure 2. PS-OK Timing Sequence

(1)T1:Power on delay time (5~400ms)

(2)T2:Each main output voltage rise time (0.1ms~70ms)

(3)T3: PW- OK signal turn on delay time (100ms~500ms)

(4)T4: PW- OK signal turn off delay time (1ms min)

(5)T5: PW- OK rise time (10ms max)

3.2 Hold up time

1) Hold up time PG>=15mS, Hold up time Vout>=16mS.

2) Hold up time +12VSB>=25mS for full load.

3.3 PG signal (PWOK)

The power supply shall provide TTL compatible PWOK signal to the system. The combined PWOK signal from two power supply modules shall use logic “OR”; The low pass filter (104 capacitor is recommended) shall be added into the PWOK signal to suppress the high frequency noise to keep the high level absolutely. However, this low pass filter shall be used in PSU or motherboard PWOK circuit. Therefore, supplier must be subject to add this low pass filter in the PWOK input circuit of motherboard if it can not be added in PSU circuit due to the re-layout difficulty.

PWOK TTL Characteristics	
Signal type	+3.3VDC,TTL compatible
Logical low voltage	<0.4V
Logical high voltage	2.4VDC-3.47VDC,2mA source currnet
Sink current, PWOK=low	=<4mA
Source current,PWOK=high	=<2mA
PWOK rise and fall time	=<100us
High-state output impedance	3.3Vsb

3.4 PS-ON signal

PSON# signal is required to remotely turn on/off the power supply module. PSON# is an active low signal that turns on the +12V power rail. When this signal is not pulled low by the system, or left open, all the outputs (except for 12VSB) shall be turned off. This signal is pulled to a 3.3Vsb voltage by a pull-up resistor. Refer to Figure 1 On/Off Timing for timing diagram.

PS_ON TTL CHARACTERISTICS	
Signal type	+3.3VDC,TTL compatible
Logical low voltage (Vi_L)	0.0-1.0V
Logical high voltage (Vi_H;lin=-200uA)	=>2V
li_L(Vin=0.4V時)	=<-4mA
Open status(lin=0)	=<3.47V
Power-on status	PS_ON= 0
Power-off status	PS_ON= 1 or open state
Rise & Fall time	0us---100us

3.5 SMBAlert# Signal

To meet the Nod manager 2.0,SMB Alert shall drop to 0v in below conditions, and must be recovery by system by PMBUS command:

A, Hotspot OT warning occurs

B, OP warning occurs,

SMBALERT#SIGNAL CHARACTERISTICS

Signal Type(Active Low)	+3.3VDC,TTL compatible	
Alert# =High	OK	
Alert# =Low	Alert to system	
	MIN	MAX
Logic level low voltage,lsink=4 mA	0V	0.4V
Logic level high voltage,lsource=50 uA		3.47V
Sink current,Alert# =low		4mA
Source current,Alert# =high		50uA
Alert# rise and fall time		100us

3.6 Power supply LED indicator

One indicator LED in power supply module next to the inlet socket.

This LED shall have 5 kind of status as below:

A. Standby /CR state ---green blinking at 1Hz

B. Normal work---green color

C. Module fault/protection ----amber continuously

D. Warning----amber blinking at 1Hz(psu can operate normally but high temperature without protection, fan speed slow down , voltage lower, high power, high currentetc.)

E. Power cord unplugged, green blinking at 0.5Hz,

LED INDICATOR STATES

Power Supply Condition	LED State
Normal work	GREEN
No AC power to all power supplies	OFF
AC present / Only 12VSB on (PS off) or PS in CR state.	1Hz Blink GREEN
AC cord unplugged;with a second power supply in parallel still with AC input power.	0.5Hz Blink GREEN
Power supply warning events where the power supply continues to operate;high temp,high power,high current,slow fan,voltage lower	1Hz Blink Amber
Power supply critical event causing a shutdown; failure,OCP,OVP,Fail	AMBER

3.7 Mute signal

Mute function output signal,the output voltage when the normal state, this signal pull high to +12V, when power fault the signal pull low to 0V.

☞4. Protection Circuits

4.1 Power supply Turn on after protection

Power supply shall shut down and latch-off by fault or protection. Protection circuits inside the power supply shall only cause the power supply's main outputs to shut down. When this fault or protection is removed, Power supply must be able to turn up through toggling PS ON/OFF or AC ON/OFF re-cycle. The toggling time is <=1S by PSON turn on mode, and <=15S by AC on mode. The 12VSB protection mode is auto restart once the fault or protection is removed. The power supply output voltages shall not be greater than the max limits shown in Table 7 when OCP or short protection circuit is triggered.

4.2 Over Current Protection

The power supply shall have current limit to prevent the +3.3V, +5V, and +12V outputs from exceeding the values shown in Table 4. If the current limits are exceeded, the power supply shall shutdown and latch off. The latch will be cleared by toggling the PSON# signal or by an AC power interruption. The power supply shall not be damaged from repeated power cycling in this condition. –12V and 5VSB shall be protected under over current or shorted conditions so that no damage can occur to the power supply. All outputs shall be protected so that no damage occurs to the power supply under a shorted output condition.

Over Current Protection

Voltage	Over Current Limit (Iout limit)
+3.3V	110% minimum; 150% maximum
+5V	110% minimum; 150% maximum
+12V	120% minimum; 150% maximum

4.3 Over Voltage Protection

The power supply over voltage protection shall be locally sensed. The power supply shall shutdown and latch off after an over voltage condition occurs. This latch shall be cleared by toggling the PSON# signal or by an AC power interruption. Table 5 contains the over voltage limits. The values are measured at the output of the power supply's connectors. The voltage shall never exceed the maximum levels when measured at the power pins of the power supply connector during any single point of fail. The voltage shall never trip any lower than the minimum levels when measured at the power pins of the power supply connector.

Over Voltage Limits

Output Voltage	MIN (V)	MAX (V)
+3.3V	3.9	5.0
+5V	5.7	7.0
+12V	13.3	14.5
-12V	-13.3	-16.5
+5VSB	5.7	7.0

4.4 Short circuit protection

The power supply shall shut down and latch off when any output is short circuit(impedance less than 0.1ohm) with any other outputs, whatever the outputs is shorten when power supply is running as well as before turn on.

1) The power supply shall be no physical damage when +12V,12VSB output is shorted to its DC return or other outputs.
2) 12VSB shall be Auto Restart when short condition is removed.

4.5 Over temperature protection

The power supply shall be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature, which could cause internal part/s failures. In an over temperature condition the PS shall shutdown. The Standby output shall not shutdown during an OTP condition. When the temperature drops to within safe operating limit for internal parts, the power supply shall restore power automatically. The OTP circuit shall incorporate built in hysteretic(>5°C) such that the power supply does not oscillate on and off due to temperature recovering condition.

OT sense should contain to hotspot point.

4.6 Immunity voltage from system at main output rail

The Power supply shall be immune to any residual voltage placed on its outputs (Typically a leakage voltage through the system from standby output) up to 1V. There shall be no additional heat generated, stress of any internal components, nor protection circuit trip during turn on with this voltage applied to any individual output.

4.7 Immunity voltage at 12VSB rail

Add 1V voltage at 12VSB output rail when AC is not applied, then apply AC to PSU, PSU shall be able to turn up, and meet all turn on requirements.

☞5. Environmental Requirements

5.1 Normal Operating Ambient(at sea level):

Temperature	**0 to 50 °C**
Relative Humidity	5 to 90%,on-condensing

5.2 Shipping and Storage

Temperature	-40 to 70°C
Relative Humidity	5 to 95%,non-condensing

5.3 Altitude

Operating	10,000FT max.
Storage	50,000FT max.

5.4 Cold start

The power supple shall be able to turn up at 0 degree centigrade. Supplier must provide the report on cold start

☞6. SAFETY

UL60950-1 /CSA 60950(USA / Canada)

EN60950-1 (Europe)

IEC60950-1 (International)

CB Certificate & Report, IEC60950 (report to include all country national deviations)

CCC- CNCA Certification (China)

CE-low voltage directive 2006/95/EC(Europe)

Power Supply Supplier requires providing copy of each certification and CB report.

☞7. ELECTROMAGNETIC COMPATIBILITY (EMC)

7.1 ELECTROSTATIC DISCHARGE (ESD) - IEC 61000 – 4 - 2：2008

Power supply shall comply with IEC 61000-4-2, Electrostatic Discharge standard, up to 4KV and 6KV with contact, 6KV and 10kV with air mode.

7.2 ELECTRICAL FAST TRANSIENT / BURST (EFT/B) – IEC 61000 – 4 - 4：2012

Transients as defined in IEC 61000-4-4, Electrical Fast Transients standard, up to 1KV at AC line.

7.3 SURGE – IEC 61000 – 4 - 5：2005

Transients as defined in IEC 61000-4-5, Electrical Surge standard. Up to and including ±2 kV limits and phases 0 degrees, 90 degrees, 180 degrees, 270 degrees.

Surge should meet the criteria in following table as well.

	Unidirectional	Ring Wave
AC Leads	**2.0kV**	**2.0kV**
I/O Leads	**1.0kV**	**1.0kV**
DC Leads	**0.5kV**	**0.5kV**

7.4 POWER FREQUENCY MAGNETIC FIELD – IEC 61000 – 4 - 8：2009

7.5 VOLTAGE DIPS – IEC 61000 – 4 - 11：2004

7.6 RADIATED SUSCEPTIBILTY – IEC 61000 – 4 – 3：2006+A1：2007+A2：2010

7.7 CONDUCTED SUSCEPTIBILTY – IEC 61000 – 4 - 6：2008

7.8 VOLTAGE FLUCTATION - EN 61000 – 3 – 3：2008

The power supply shall comply with the applicable limits for voltage fluctuations flickers IEC 61000-3-3.

7.9 EN61000-3-2 harmonic current emissions.

The power supply shall meet the requirements of IEC 61000-3-2 Class A and the Guidelines for the Suppression of Harmonics in Appliances and General Use Equipment Class A for harmonic line current content at all conditions of output power.

7.10 EN55022 Class A Radio interference (CISPR 22).

7.11 FCC Part 15, Subpart J class B 115VAC operation.

FCC /ICES-003 - Emissions (USA/Canada) Verification Class A-3dB

CISPR 22 – Emissions (International) Class A-3dB

EN55022 - Emissions (Europe) Class A-3dB

GB 9254-98 class A -3dB.

CE – EMC Directive 2004/108/EC (Europe)

GB 9254 – (EMC) Certification (China)

GB 17625.1 - (Harmonics) CNCA Certification (China)

GB/T17618-1998

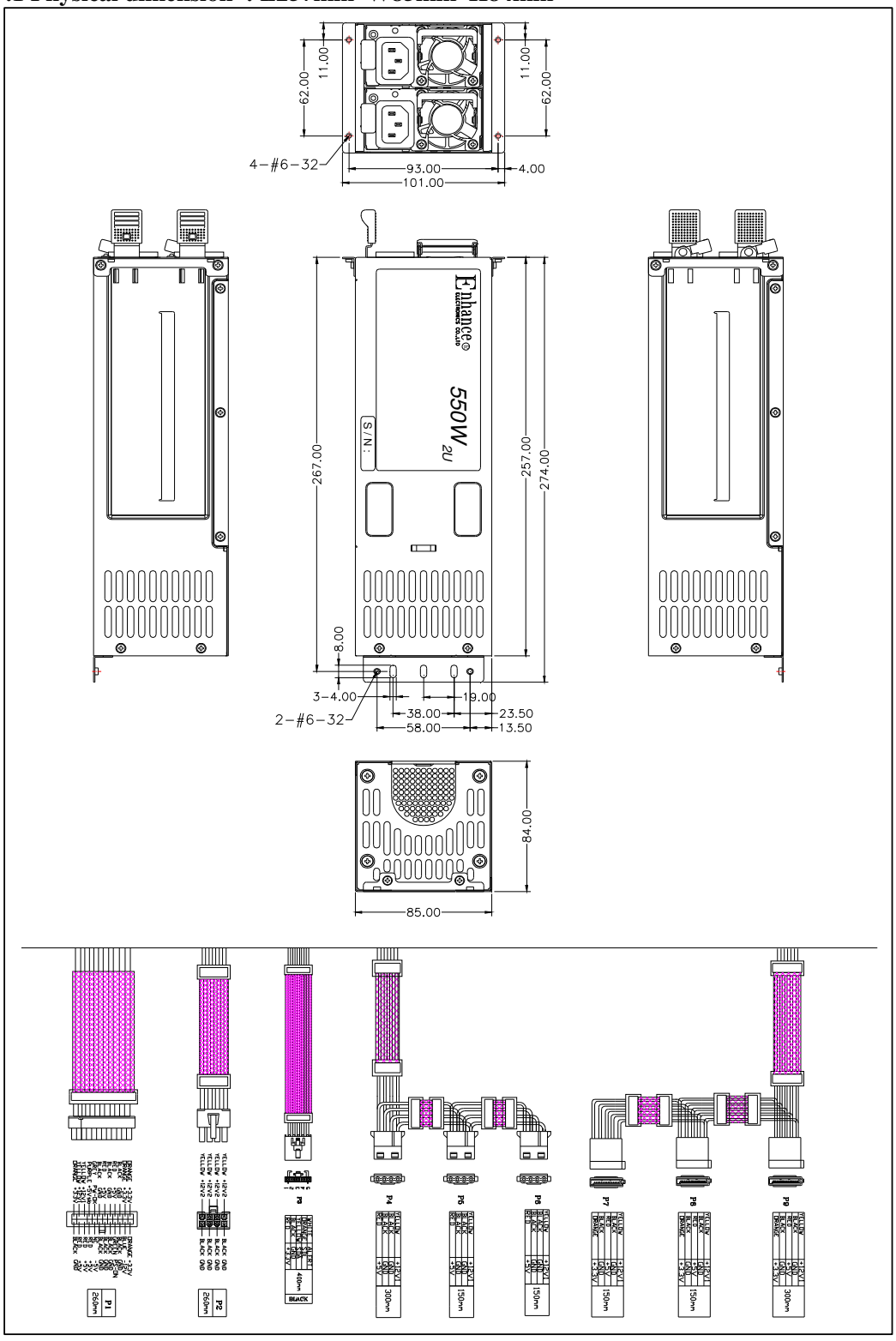
☞8. MTBF

8.1 MTBF (mean time between failures) calculation

The demonstrated MTBF shall be 100,000 hours of continuous operation at 25°C, full load and 115V AC input.The MTBF of the power supply shall be calculated in accordance with MIL-HDBK-217F. The DC FAN is not included.

☞9. MECHANICAL REQUIREMENTS

9.1 Physical dimension : L257mm*W85mm*H84mm



9.2 Connectors (INTEL approved or equivalent)

P1 (Motherboard 20+4Pin) Power Connector

16AWG wire	Signal	Pin	Pin	Signal	16AWG wire
Orange	+3.3V	11	1	+3.3V	Orange
Orange(22AWG)	3.3V sense				
Blue(20AWG)	-12VDC	12	2	+3.3V	Orange
Black	COM	13	3	COM	Black
Black(22AWG)	COM sense				
Green(20AWG)	PS-ON	14	4	+5VDC	Red
Black	COM	15	5	COM	Black
Black	COM	16	6	+5VDC	Red
Black	COM	17	7	COM	Black
Black(22AWG)	COM sense				
White	NC	18	8	POK	Grey(20AWG)
Red	+5VDC	19	9	+5VSB	Purple
Red(22AWG)	+5Vsense		10	+12VDC	Yellow
Red	+5VDC	20		+12Vsense	Yellow(22AWG)
Red	+5VDC	B3	B1	+12VDC	Yellow
Black	COM	B4	B2	+3.3VDC	Orange

P2 CPU (4+4)PIN

18AWG wire	Signal	Pin	Pin	Signal	16AWG wire
Yellow	+12V	5	1	GND	Black
Yellow	+12V	6	2	GND	Black
Yellow	+12V	7	3	GND	Black
Yellow	+12V	8	4	GND	Black

P3 GPU 8PIN

18AWG wire	Signal	Pin	Pin	Signal	16AWG wire
Yellow	+12V	5	1	GND	Black
Yellow	+12V	6	2	GND	Black
Yellow	+12V	7	3	GND	Black
Yellow	+12V	8	4	GND	Black

P4 CPU(6+2)PIN

18AWG wire	Signal	Pin	Pin	Signal	16AWG wire
Yellow	+12V	4	1	GND	Black
Yellow	+12V	5	2	GND	Black
Yellow	+12V	6	3	GND	Black
Black	GND	B2	B1	GND	Black

P5(5Pin) communicate to external Connector

24AWG wire	Signal	Pin
RED	+3.3V	1
Black	GND	2
Yellow	SDA	3
Orange	SDL	4
White	ALERT	5

P6,P7,P8,P9,P10,P11,P12,P13大4PIN(AMP 1-480424-0 or Molex 8981-04P or equivalent)

16 AWG wire	Signal	Pin	Pin	Signal	22AWG wire
Yellow	+12V	1	1	+12V	Yellow
Black	COM	2	2	COM	Black
Black	COM	3	3	COM	Black
Red	+5VDC	4	4	+5V	Red

P14,P15 SATA Power Connector (Molex* 88751 or equivalent)(optional)

18AWG wire	Signal	Pin
Yellow	+3.3V	1
Black	COM	2
Red	+5V	3
Black	COM	4
Orange	+12V	5

☞10. ACOUSTIC AND FAN SPEED CONTROL (optional)

10.1 Acoustic (measured according to ECMA 74)

a) <=TBD.the distance which from power to measure point is 1m.
Test condition: 100% load, Surrounding temperature >45°C

b) <=TBD.the distance which from power to measure point is 1m.
Test condition: 60% load, Surrounding temperature >40°C

c) <=TBD.the distance which from power to measure point is 1m.
Test condition:40% load, Surrounding temperature >35°C

Abnormal audible noise from power supply shall be unacceptable, such as low frequency noise and so on.

10.2 Fan speed control

The power supply shall contain fan speed circuits to vary the fan speed to ensure that the critical component do not exceed the safe operating levels.

The power supply design shall employ the PWM control to vary the fan speed.

10.3 In standby mode

Fan voltage is powered from 12v and 12VSB. The fan will run by the 12V voltage while power supply turn on, and it shall run in low speed by 12VSB voltage in standby mode.

10.4 Airflow requirement

The power supply shall meet the system airflow impedance.

☞11. PMBUS

11.1 Electrical Layer

The PMBus electrical driving levels shall comply with high power DC specifications given in Section 3.1.3. of SMBus Specification version 2.0.

11.2 FRU Data Format

For identification of the power supply an internal 256x8 bit EEPROM with PMBus interface is used. The information in the EEPROM follows the IPMI (Platform Management FRU Information Storage Definition) guidelines Document Revision 1.1 from November 15, 1999 and Siemens Norm SN77250.
The PSU's FRU Data is specified as the contents attached in the end.

11.3 FRU Signals

Four pins will be allocated for the FRU information on the Power Supply connector. One pin is the serial clock (SCL). The second pin is used for serial data (SDA). Two pins are for address lines A0 to indicate to the power supply's EEPROM which position the power supply is located in the system. The SCL and SDA signals are pulled up by system, the address lines are also pulled up by system.

Table18 FRU Signals

A0	EEPROM	μP	PSU
0	A0	B0	1
1	A2	B2	2

11.4 PMBus Command Set

Via the PMBus the computer system can communicate with the power supply to access currents, voltages, fan control and speed and temperatures. The communication follows the Power System Management Protocol Specification. As soon as AC Power is connected to the PSU the PMBus functionality must be available. Following Table shows mandatory PMBus commands to be supported by the PSU.

Table 19 Supported PMBus Command Set

Command Code	Command Name	Read/Write	Number of Data Bytes	Comment
00h	PAGE	R	1	00
03h	Clear_Fault	Send Byte	0	
20h	VOUT_MODE	R/W	1	17h (n=-9)
3Ah	FAN_CONFIG_1_2	R/W	1	
3Bh	FAN_COMMAND_1	R/W	2	
4Ah	IOUT_OC_WARN_LIMIT	R/W	2	
51h	OT_WARN_LIMIT	R/W	2	
5Dh	IIN_OC_WARN_LIMIT	R/W	2	Low line / High line
6Ah	POUT_OP_WARN_LIMIT	R/W	2	
6Bh	PIN_OP_WARN_LIMIT	R/W	2	Low line / High line
79H	STATUS_WORD	R/W	2	
(Low)6	OFF			
5	VOUT_OV_FAULT			
4	IOUT_OC			
3	VIN_UV			
2	TEMPERATURE			
1	CML			
0	NON OF THE ABOVE			
(High)7	VOUT			
6	IOUT/POUT			
5	INPUT			
3	POWER_GOOD#			
2	FANS			
7Ah	STATUS_VOUT	R/W	1	
7	VOUT_OV_FAULT			
4	VOUT_UV_FAULT			
7Bh	STATUS_IOUT	R/W	1	
7	Iout OC fault			
5	Iout OC warning			
1	Pout OP fault			
0	Pout OP warning			
7Ch	STATUS_INPUT	R/W	1	

5	Vin UV warning			
4	Vin UV fault			
3	Unit off for insufficient input			
7Dh	STATUS_TEMPERATURE	R/W	1	
7	OT fault			
6	OT warning			
7Eh	STATUS_CML	R/W	1	
81h	STATUS_FANS_1_2	R/W	1	
7	Fan 1 fault			
5	Fan1 warning			
88h	READ_VIN	R	2	
89h	READ_IIN	R	2	
8Bh	READ_VOUT	R	2	
8Ch	READ_IOUT	R	2	
8Dh	READ_TEMPERATURE_1	R	2	Hotspot
8Eh	READ_TEMPERATURE_2	R	2	Hotspot
90h	READ_FAN_SPEED_1	R	2	In rpm
96h	READ_POUT	R	2	
97h	READ_PIN	R	2	
98h	PMBUS_REVISION	R	1	
99h	MFR_ID	R/W	Variable	
9Ah	MFR_MODEL	R/W	Variable	
9Bh	MFR_REVISION	R/W	Variable	
A0h	MFR_VIN_MIN	R	2	
A1h	MFR_VIN_MAX	R	2	
A2h	MFR_IIN_MAX	R	2	Low line / High line
A3h	MFR_PIN_MAX	R	2	Low line / High line
A4h	MFR_VOUT_MIN	R	2	
A5h	MFR_VOUT_MAX	R	2	
A6h	MFR_IOUT_MAX	R	2	
A7h	MFR_POUT_MAX	R	2	
A8h	MFR_TAMBIENT_MAX	R	2	
AAh	MFR_EFFICIENCY_LL	R/W	14	At 20%/50%/100% load
ABh	MFR_EFFICIENCY_HL	R/W	14	At 20%/50%/100% load
D0h	SMART_ON_CONFIG	R/W	1	

11.5 PMBus Temperature Read Commands

The following temperature read commands as documented by the PMBus specification Part II version 1.2 should be supported.

READ_TEMPERATURE_1 and _2, should provide the temperature of hotspot in the PSU.

11.6 PMBus Commands Preciseness and Data Format

The sensor commands shall meet the following accuracy requirements. The accuracies shall be met over the specified ambient temperature and the full range of rated input voltage.

- READ_VIN
- READ_IIN
- READ_VOUT
- READ_IOUT
- READ_POUT
- READ_PIN

Output Loading	<10%	10% - 100%
READ_VIN	±5%	
READ_IIN	NA	±5% or ±0.3A
READ_PIN	NA	±5W or ±5%
READ_VOUT	±5%	
READ_IOUT	NA	±5%
READ_POUT	NA	±5%

Preferred data format is the “Linear Data Format” as specified by PMBus specification Part II version 1.2.

☞12. CR MODE

Redundant power supplies in a system shall power ON or OFF depending upon loading state. Power supplies that or OFF (in the CR Standby state) shall power on quickly to maintain full redundancy in the system.

☞13. MECHANICAL

Shock	Operating :Half-sine 5 G, 11 ms pulse ,3 times in each direction. None operating: Half-sine 140 G, 2 ms pulse,3times in each direction
Shock packaged	Test height is based on the weight of the package (see below table). Test requirement: 6 face,3 drops per face;2 corner(the weakest corner and the weakest corner’s corresponding diagonal corner),1drops;the related 3 edge to the weakest corner, 1 drop per edge.

Product Weight（kg）	Non-palletized Free Fall Height(m)	Palletized (Single product) Free Fall Height(m)
0-5	1.1	N/A
5-15	1	N/A
15-30	0.8	N/A
30-50	0.65	0.46
50-120	0.5	0.3

Random Vibration

Non-operating

Sine sweep:

5Hz to 500Hz @ 0.5g RMS at 0.5 octaves per minute; dwell 15 min at each of 3 resonant points;

Random profile:

5Hz @ 0.01g²/Hz to 20Hz @ 0.02g²/Hz (slope up); 20Hz to 500Hz @ 0.02g²/Hz (flat);

Input acceleration = 3.13gRMS; 10 min. per axis for 3 axis on all samples

☞14. PACKAGE

Power supply module package shall be the Anti-ESD bag to avoid power supply damage in shipment.

☞15. CERTIFICATION OVERVIEW

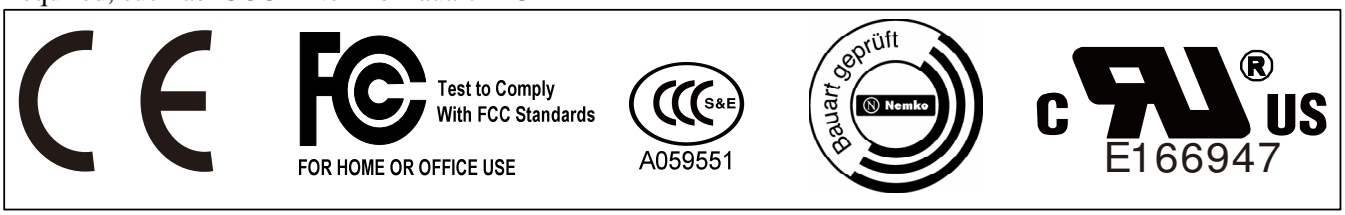
1) The safety , EMC/EMI and deviations certification must ensure the psu product can sell to below countries, So the power supply must get any specific certification of these countries.

USA
Canada
UK
France
Germany
Italy
China

2) All of certifications shall be latest version in the early 2011'

☞16. Regulatory Marks on Power Supplies

The below marks are necessary. Supplier must get all the certifications for below marks.
Other safety mark is issued by notified body in item 16.1-item 16.3 should also be required, such as CCC、Nemko Bauart 、UL。



☞17. Other certification

Supplier should get below certifications,:
EPEAT GOLD standard
Energy start for computer server 2.0
80 plus gold or platinum–Certification is necessary
China Environment Labeling 10 years cycle(need mark)
Climate saver gold level –or platinum--certification is necessary

☞18. Component Regulation Requirements

1. All Fans shall have the minimum certifications: UL and TUV or VDE
2. All current limiting devices shall have UL and TUV or VDE certifications and shall be suitable rated for the application where the device in its application complies with IEC60950.
3. All printed wiring boards shall be rated UL94V-0 and be sourced from a UL approved printed wiring board manufacturer
4. All connectors shall be UL recognized and have a UL flame rating of UL94V-0
5. All wiring harnesses shall be sourced from a UL approved wiring harness manufacturer. SELV Cable to be rated minimum 80V, 130C
6. Product safety label must be printed on UL approved label stock and printer ribbon. Alternatively labels can be purchased from a UL approved label manufacturer.
7. The product must be marked with the correct regulatory markings to support the certifications that are specified in this document.