SPECIFICATION FOR APPROVAL

CUSTOMER:

DESCRIPTION: SWITCHING POWER SUPPLY

MODEL NO. : LP-8867 250W

DATA : May-05-2009

SUPPLIER APPROVAL COLUMN				*CLIENT APPROVAL COLUMN*		
Approved	**Checked**	**Drawer**		**Approved**	**Checked**	**Drawer**

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1.0 Electrical

The following electrical requirements must be met over the environmental ranges as defined in Section 7。

1.1 AC Input

Table 1 lists AC input voltage and frequency requirements for continuous operation. The power supply shall be capable of supplying full-rated output power over two input voltage ranges rated 100-127 VAC and 200-240 VAC RMS nominal. The correct input range for use in a given environment may be either switch-selectable or auto-ranging. The power supply shall automatically recover from AC power loss. The power supply must be able to start up under peak loading at 190 VAC。

Table 1. AC Input Line Requirements

	Minimum	Nominal	Maximum	Units
Vin(115Vac)	100	100~127	132	Vac
Vin (230Vac)	190	200~240	264	Vac
Vin (Frequency)	47	-	63	Hz

1.1.1 Input Over Current Protection

The PSU shall incorporate primary fusing for input over current protection.

1.1.2 Range Switching

Switch Selectable, Single Phase.

1.1.3 AC Input Current

Table 2. AC Input Current

AC Input	Maximum	Units
115Vac	7	Amps
230Vac	4	Amps

1.1.4Inrush Current

Maximum inrush current from power-on (with power on at any point on the AC sine) and including, but not limited to, three line cycles, shall be limited to a level below the surge rating of the input line cord, AC switch if present, bridge rectifier, fuse, and EMI filter components. Repetitive ON/OFF cycling of the AC input voltage should not damage the power supply or cause the input fuse to blow.

1.2 Line Voltage Surge and Sag

1.2.1 Surge

The line voltage is switched to the surge voltages indicated below:

Surge conditions $T_{operating}$ = 25ºC

Condition	Load	Pass/Fail Criteria
140 Vac to 155 Vac for 500 msec back to 140 Vac At 60 Hz	80% of Full Load	The PSU shall survive repeated applications of the line surge with no component damage. Loss of function is allowed with self recovery.
264 Vac to 293 Vac for 500 msec back to 264 Vac At 50 Hz	80% of Full Load	Same criteria as above.

1.2.2 Sag

The line voltage is switched to the sag voltages indicated below.

Sag Performance $T_{operating}$ = 25ºC

Condition	Load	Pass/Fail Criteria
115 Vac to 100 Vac for 500 msec back to 115 Vac At 60 Hz	80% of full Load	Voltages and logic signals shall remain within the specified limits during and after these line transients
230 Vac to 200 Vac for 500 msec back to 230 Vac At 50 Hz	80% of full Load	Same criteria as above

1.3 ON/OFF Power Cycling

For this test, it is important to use a low impedance power line source that will provide the needed peak current required by the PSU at each turn-on cycle.

ON/OFF Power Cycling Performance <ambient Temp=0~40℃>

Condition	Load	Pass/Fail Criteria
The following AC power cycling is repeatedly applied. The ON/OFF cycling may be performed either by an external switching device or the product on/off switch 4 cycles of 1 sec (0.5 sec ON, 0.5 sec OFF) 4 cycles of 2 sec (1 sec ON, 1 sec OFF) 4 cycles of 4 sec (2 second ON 2 second OFF) 4 cycles of 8 sec (4 second ON, 4 second OFF) 4 cycles of 16 sec (8 second ON, 8 second OFF) 4 cycles of 32 sec (16 second ON, 16 second OFF) 4 cycles of 64 sec (32 second ON, 32 second OFF	Full Load	The PSU shall survive repeated applications of ON/OFF cycling. The Power Good signal shall always indicate the proper status.

1.4 DC Output

1.4.1 DC Voltage Regulation

Table 3. DC Voltage Regulation

Output	Range	Minimum	Nominal	Maximum	Unit
+12VDC*	±5%	+11.40	+12.00	+12.60	Volts
+5VDC	±5%	+4.75	+5.00	+5.25	Volts
+3.3VDC	±5%	+3.14	+3.30	+3.47	Volts
-12VDC	±10%	-10.80	-12.00	-13.20	Volts
+5Vsb	±5%	+4.75	+5.00	+5.25	Volts

*At +12 VDC peak loading, regulation at the +12 VDC output can go to ± 10%.

1.4.2 DC Output load current ranges

Combined Line and Cross-Load Regulations Over any combination of line voltage specified in Section 1.1 and the cross-load condition shown Table below. The output voltage must be as shown in the following

Table 4. DC Output load current ranges

Output#	Output	I min	I max.	I peak
1	+12 V	0.5A	12A	
2	+5 V	0.5A	12A	
3	+3.3 V	0.5A	11A	
4	-12 V	0.0A	0.5A	
5	+5 VSB	0.2A	2A	
+5V & +3.3V combined load	95W			
+5V & +3.3V &+12V combined load			240W	
Total power rating			250W	

*+5VSB is a SELV standby voltage that is always present when AC mains voltage is present.

1.4.3 Output Ripple/Noise

Ripple and noise are defined as periodic or random signals over a frequency band of 10 Hz to 20 MHz. Measurements shall be made with an oscilloscope with 20 MHz bandwidth. Outputs should be bypassed at the connector with a 0.1uF ceramic disk capacitor and a 10uF electrolytic capacitor to simulate system loading.

Table 5. DC Output Ripple/Noise

Output	Maximum Ripple and Noise
+12V1DC	120mV
+12V2DC	120mV
+5VDC	50mV
+3.3VDC	50mV
-12VDC	120mV
+5Vsb	50mV

1.4.4 Dynamic Load Response

Step loading shall be from increasing from min-load to decreasing from max-load. The additional output capacitance of 10μf (Tantalum) in parallel with 0.1μf (ceramic) shall be used in performance of test measurement.
The PSU outputs shall not undershoot or overshoot beyond the specified voltage limits after applying following load changes with a 0.1A/μsec slew rate on the output being measured. The square wave shall have a period of 10 mS with a 50 percent duty cycle.
Repetition rate and duty cycle of the load variations should be selected to identify the worst case conditions.

Transinet Response Limits

Outputs	Output Range	Load Step 25% of max	Regulations
+5V	0.5 – 12A	2.5A	±5%
+12V	0.5 – 12A	2.5A	±5%
+3.3V	0.5 – 11A	2.5A	±5%
-12V	0 – 0.5A	0.075A	±10%
+5Vsb	0.2 - 2A	0.5A	±5%

Note:

Audible noise shall not increase during applied transient.In the words,as a unit audible noise can not be heard during operation of power supply.

1.4.5 Capacitive Load

The power supply should be able to power up and operate with the following capacitances simultaneously present on the DC outputs.

Table 6. Output Capacitive Load

Output	Capacitive load (uF)
+12V1	5,000
+12V2	3,000
+5V	6,000
+3.3V	6,000
-12V	350
+5Vsb	350

1.4.6 +5VDC / +3.3VDC Power / Sequencing

The +5VDC output level is equal to or greater than the +3.3VDC output at all times during power-up and normal operation. The time between the +5VDC output reaching its minimum in-regulation level and 3.3VDC reaching its minimum in-regulation level shall be less than or equal to 20ms.

2.0 Timing / Housekeeping / Control

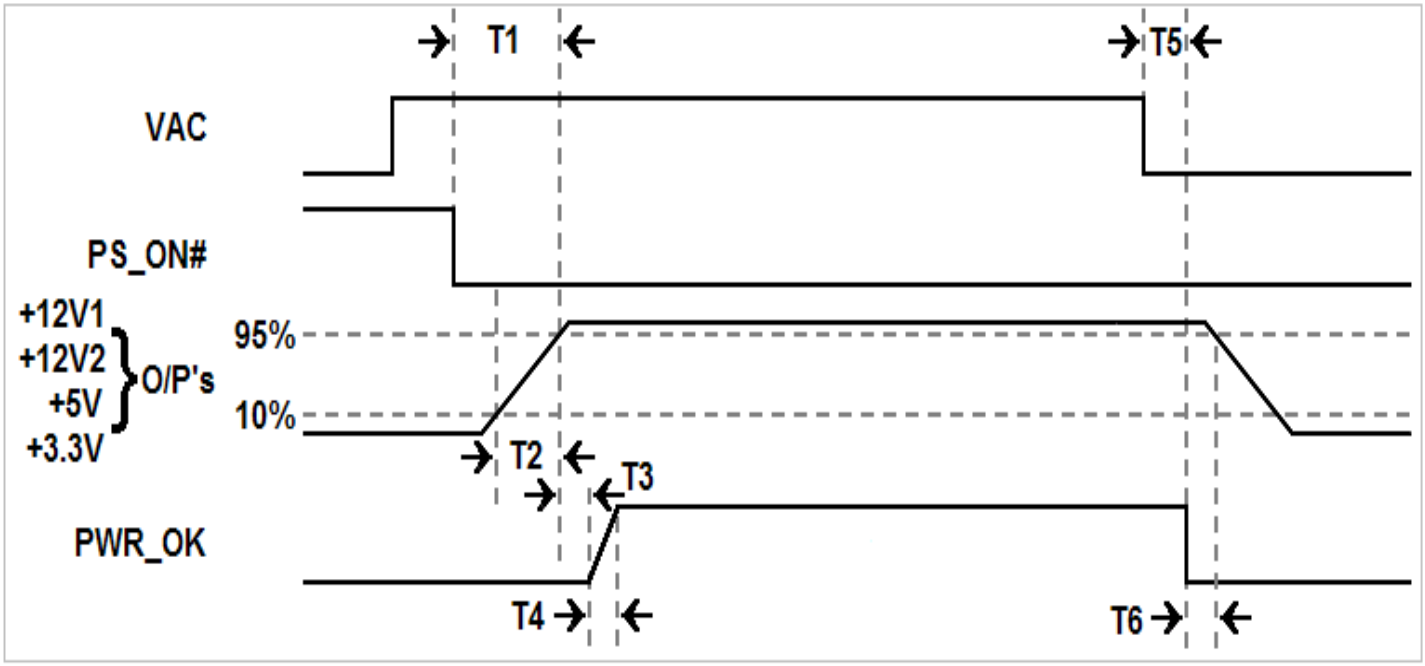


Figure 1. Power Supply Timing

2.1 Power Good signal (PWR-OK)

The power good signal (TTL compatible) shall be provided to indicate normal operating conditions of the power supply. The power good signal will be asserted (low state) during power up until the +5VDC outputs are within the regulation range defined in Section 1.4.1 The electrical and timing characteristics of the power good signal, are shown in Table 7 and Figure1: Power Supply Timing.

Table 7. PWR_OK Signal Characteristics

Signal Type	+5 V TTL compatible
Logic level low	< 0.4 V while sinking 4 mA
Logic level high	Between 2.4 V and 5 V output while sourcing 200 μA
High-state output impedance	1 kΩ from output to common
PWR_OK delay	100 ms < T3 < 500 ms
PWR_OK rise time	T4 ≦ 10 ms
AC loss to PWR_OK hold-up time	T5 ≧12 ms
Power-down warning	T6＞1 ms

2.2 PS_ON#

PS_ON# is an active-low, TTL-compatible signal that allows a motherboard to remotely control the power supply in conjunction with features such as soft on/off, Wake on LAN, or wake-on-modem. When PS_ON# is pulled to TTL low, the power supply should turn on the five main DC output rails: +12V1DC, +12V2DC, +5VDC, +3.3VDC, and -12VDC. When PS_ON# is pulled to TTL high or open-circuited, the DC output rails should not deliver current and should be held at zero potential with respect to ground. PS_ON# has no effect on the +5VSB output, which is always enabled whenever the AC power is present.

Table 8. PS_ON# Signal Characteristics

	Min.	Max.
V_{IL}, Input Low Voltage	0.0 V	0.8 V
I_{IL}, Input Low Current (Vin = 0.4 V)		-1.6 mA
V_{IH}, Input High Voltage (Iin = -200 µA)	2.0 V	
V_{IH} open circuit, Iin = 0		5.25 V

2.3 +5VSB

+5 VSB is a standby supply output that is active whenever the AC power is present. It provides a power source for circuits that must remain operational when the five main DC output rails are in a disabled state. Example uses include soft power control, Wake on LAN, wake-on-modem, intrusion detection, or suspend state activities.

The +5 VSB output should be capable of delivering a minimum of 2.0 A at +5 V ± 5% to external circuits. The power supply must be able to provide the required power during a "wake up" event. If an external USB device generates the event, there may be peak currents as high as 2.5A lasting no more than 500mS. Overcurrent protection is required on the +5 VSB output regardless of the output current rating. This ensures the power supply will not be damaged if external circuits draw more current than the supply can provide.

2.4 Power-on Time

The power-on time is defined as the time from when PS_ON# is pulled low to when the +12 V, +5 VDC, and +3.3 VDC outputs are within the regulation ranges specified in Section 1.4.1. The power-on time shall be less than 500 ms (T1 < 500 ms).+5 VSB shall have a power-on time of two seconds maximum after application of valid AC voltages.

2.5 Risetime

The output voltages shall rise from≦10% of nominal to within 0.1 ms to 20 ms (0.1 ms≦T2≦20 ms).

2.6 HOLD-UP TIME

Upon the loss of AC input power, the output shall remain within at nominal input voltage for minimum of 16 ms after the last current pulse drawn from the line.

2.7 Overshoot at Turn-on / Turn-off

The output voltage overshoot upon the application or removal of the input voltage, or the assertion/ deassertion of PS_ON#, under the conditions specified in Section 1.1, shall be less than 10% above the nominal voltage. No voltage of opposite polarity shall be present on any output during turn-on or turn-off.

2.8 Efficiency and Energy Star Performance

2.8.1 Overall

Efficiency of the power supply shall be no less than 68% at low and high rate nominal voltage given in Table 1. Testing is at maximum load and 50% load given within this spec..

2.8.2 Standby Efficiency

The power supply shall draw less than 5 watts of true input power at 230 VAC in stand-by mode with a 0.5 A load on the 5 V aux output.

3.0 Output Protection

3.1 Short-circuit Protection

A short circuit placed between DC return and output (approximately 0.1 ohm) shall Cause no damage and the main output shall shutdown and latch off, but only the +5VSB shall recover automatically

3.2 Over Voltage Protection

When the DC output (+5V,+12V,and +3.3V) have over voltage condition , the power supply shall provide latch mode over voltage protection.

Table 9. Over Voltage Protection

Output	Minimum	Nominal	Maximum	Unit
+12V	13.4	15	15.6	Volts
+5V	5.74	6.3	7.0	Volts
+3.3V	3.76	4.2	4.3	Volts

3.3 Over Power Protection

The power supply shall be shut down and latch off, if the wattage of the power supply is higher from 280W to 330W.

3.4 Reset after Shutdown

If the power supply latches into a shutdown state because of a fault condition on its outputs, the power supply shall return to normal operation only after the fault has been removed and the PS_ON# has been cycled OFF/ON with a minimum OFF time of 1 second.

3.5 Power limits

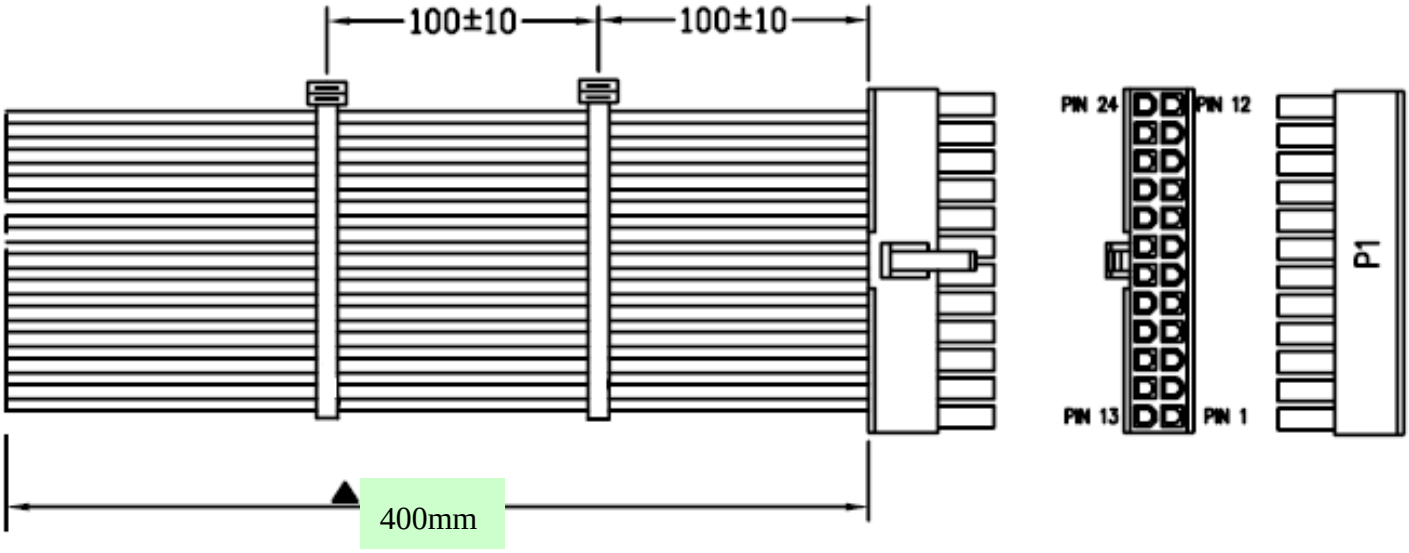
No output shall exceed 240VA under any loading conditions, including single fault conditions.

3.6 Catastrophic Failure Protection

The primary circuit design and the components specified in the same shall be such that should a component failure occur, the power supply does not exhibit any of the following :

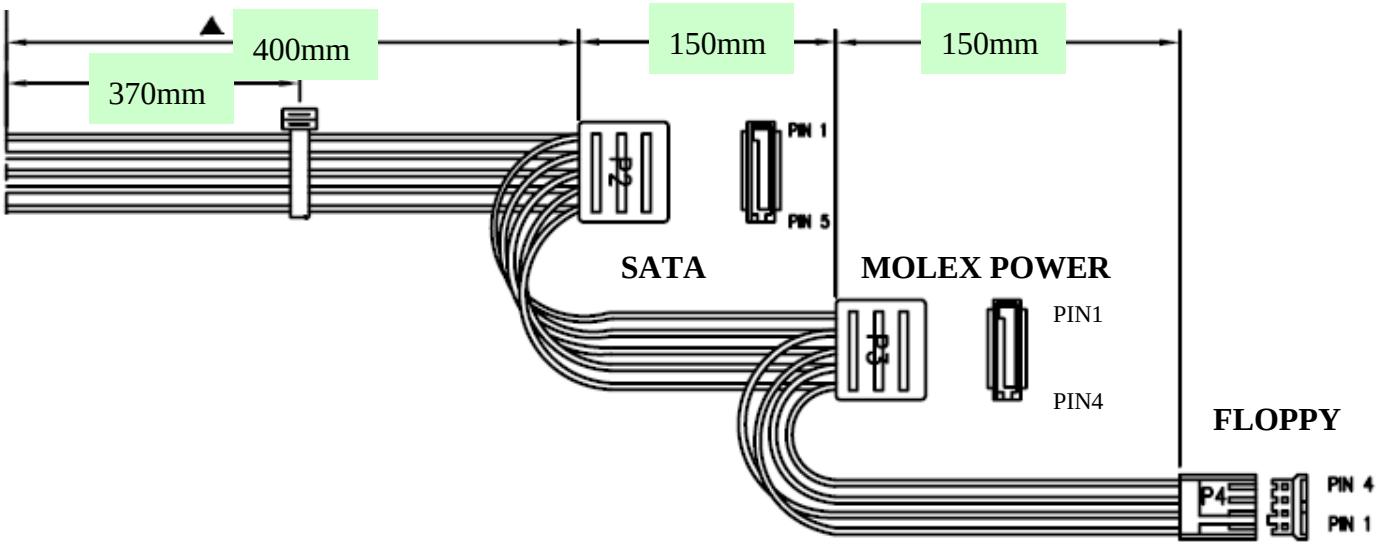
. Startling noise
. Flame
. Excessive smoke
. Charred PCB
. Fused PCB conductor

4.3.1 ATX Main Power Connector



Pin	Signal	Color	Pin	Signal	Color
1	+3.3VDC	Orange	13	+3.3VDC [+3.3V default sense]	Orange [Brown]
2	+3.3VDC	Orange	14	-12VDC	Blue
3	COM	Black	15	COM	Black
4	+5VDC	Red	16	PS_ON#	Green
5	COM	Black	17	COM	Black
6	+5VDC	Red	18	COM	Black
7	COM	Black	19	COM	Black
8	PWR_OK	Gray	20	Reserved	N/C
9	+5VSB	Purple	21	+5VDC	Red
10	+12V1DC	Yellow	22	+5VDC	Red
11	+12V1DC	Yellow	23	+5VDC	Red
12	+3.3VDC	Orange	24	COM	Black

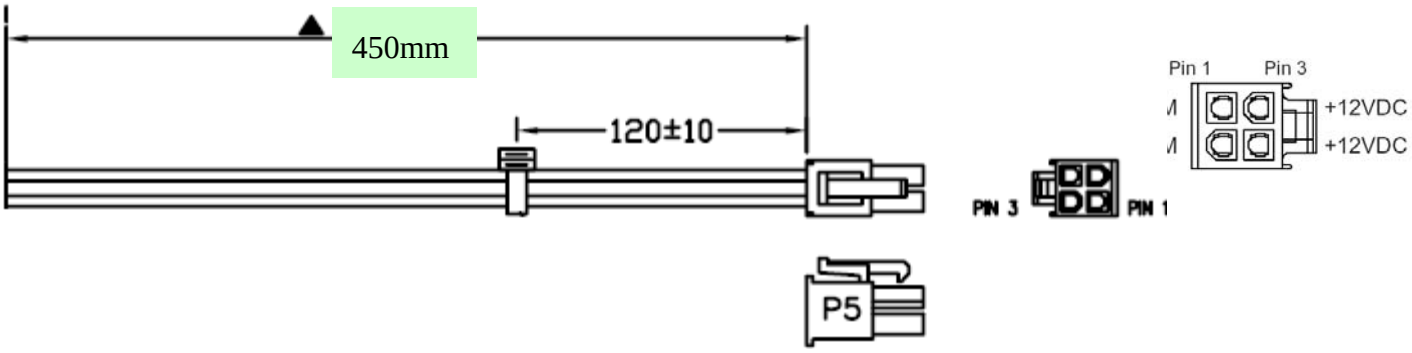
4.3.2 SATA , Molex Power AND Floppy Drive Connector



Wire	Signal	Color
1	+3.3VDC	Orange
2	COM	Black
3	+5VDC	Red
4	COM	Black
5	+12V1DC	Yellow

Pin	Signal	Color
1	+5VDC	Red
2	COM	Black
3	COM	Black
4	+12V1DC	Yellow

4.3.3 +12 V Power Connector



Pin	Signal	Color	Pin	Signal	Color
1	COM	Black	3	+12V2DC	Yellow
2	COM	Black	4	+12V2DC	Yellow

5.0 Environment

5.1 Temperature

Operating ambient :0℃ ~ +40℃

Non-operating ambient: -20℃ ~ +70℃

5.2 Humidity

Operating:5% to 90% relative humidity(non-condensing)

Non-operating:5% to 95% relative humidity(non-condensing)

5.3 Altitude

Operate properly at any altitude between 0 to 10,000 feet

5.4 Mechanical shock

Non-operating:50g,trapezoidal input; velocity change≧170 in/s three drops on each of six faces are applied to each sample.

5.5 Vibration

Non-operating:0.01 g²/Hz at 5 Hz, sloping to 0.02 g²/Hz at 20 Hz, and maintaining 0.02 g²/Hz from 20 Hz to 500 Hz. The area under the PSD curve is 3.13 gRMS. The duration shall be 10 minutes per axis for all three axes on all samples.

6.0 HI-POT TEST

Production Line Hipot Test

One hundred percent (100%) of the power supply assemblies shall comply with the minimum Production Line Hipot (High Potential) Test as noted below. The test shall be applied between the PRIMARY (AC LINE and NEUTRAL) to EARTH GROUND (CHASSIS/INPUT RECEPTACLE GROUND TERMINAL):

PARAMETERS	SETTING
Voltage	1000 VAC minimum
Voltage Ramp Time	500 V/second ramp minimum
Dwell Time	6 second minimum
leak current	10 milliampere maximum

7.0 Mean Time Between Failures (MTBF)

The calculated MTBF shall be greater than 50,000 hours.

While tempered at 25 ℃ ambient, 230Vac input line voltage and maximum load.