

MODEL NO. ENP7600L SERIES (ACTIVE PFC)

This specification describes the requirements of **400W,500W,600W** with full range voltage switching power supply with Flex-ATX form-factor and,+5V standby voltage, remote on/off .

☞ 1.0 AC INPUT

1.1 AC input requirements

The input voltage, current, and frequency requirements for continuous operation are stated below

Table 1 AC Input Line Requirements

Parameter	Min	Nom	Max	Unit
Vin	90	100-240	264	VACrms
Vin Frequency	47	60----50	63	Hz
lin(400W)		6.0-----3.0		
lin(500W)		7.0-----3.5		
lin(600W)		8.0-----4.0		

Power factor correction (PF)>0.9 at full load.

1.2 Inrush current regulation

The power supply must meet inrush requirements for any rated AC voltage, during turn on at any phase of AC voltage, during a single cycle AC dropout condition, during repetitive ON/OFF cycling of AC, and over the specified temperature range (Top). The peak inrush current shall be less than the ratings of its critical components (including input fuse, bulk rectifiers, and surge limiting device).

☞ 2.0 DC OUTPUT

2.1 DC voltage regulation

Parameter	Range	Min	Nom.	Max	Unit
+3.3V	±5%	+3.14	+3.3	+3.47	Volts
+5V	±5%	+4.75	+5.0	+5.25	Volts
+12V	±5%	+11.4	+12.0	+12.6	Volts
+12V(12V-2x6)	+5%/-7%	+11.2	+12.0	+12.6	Volts
-12V	±10%	-10.8	-12.0	-13.2	Volts
+5VSb	±5%	+4.75	+5.0	+5.25	Volts

2.2 Load range

2.2.1 400W Load range

Parameter	Min	Nom.	Max	Peak	Unit
+3.3V	0.1	-	15		Amps
+5V	0.2	-	15		Amps
+12V	0.5	-	33		Amps
-12V	0A	-	0.3		Amps
+5VSb	0A	-	2.5		Amps

Notes:

- (1) The maximum combined load on +3.3V and +5V outputs shall not exceed **80W**.
- (2) The +12V maximum load shall not exceed **396W**.
- (3) The maximum continuous average DC outputs power shall not exceed **400W**.

2.2.2 500W Load range

Parameter	Min	Nom.	Max	Peak	Unit
+3.3V	0.1	-	15		Amps
+5V	0.2	-	15		Amps
+12V	0.5	-	41		Amps
-12V	0A	-	0.3		Amps
+5VSb	0A	-	2.5		Amps

Notes:

- (1) The maximum combined load on +3.3V and +5V outputs shall not exceed **80W**.
- (2) The +12V maximum load shall not exceed **492W**.
- (3) The maximum continuous average DC outputs power shall not exceed **500W**.

2.2.3 600W Load range

Parameter	Min	Nom.	Max	Peak	Unit
+3.3V	0.1	-	15		Amps
+5V	0.2	-	15		Amps
+12V	0.5	-	50		Amps
-12V	0A	-	0.3		Amps
+5VSb	0A	-	2.5		Amps

Notes:

- (1) The maximum combined load on +3.3V and +5V outputs shall not exceed **80W**.
- (2) The +12V maximum load shall not exceed **600W**.
- (3) The maximum continuous average DC outputs power shall not exceed **600W**.
- (4) The 12V-2x6 Max load shall not exceed **25A(300W) (Optional)**.

2.3 Output Transient Response:

Summarizes the expected output transient step sizes for each output.

The +3.3V&+5V transient load slew rate is = 1.0 A/μs.

The +12V transient load slew rate is = 5.0 A/μs.

Parameter	Maximum Step Size (% of rated output amps)	Maximum Step Size (A)
+3.3V	30% load	
+5V	30% load	
+12V	85% load	
+12V (12V-2x6)	Steps from 100%→300% 30%→100%	
-12V		0.1A
+5VSB		0.5A

2.4 Output Ripple

2.4.1 Ripple regulation

Parameter	Ripple&Noise	Unit
+3.3V	50	mVp-p
+5V	50	mVp-p
+12V	120	mVp-p
-12V	120	mVp-p
+5VSB	50	mVp-p

2.4.2 Definition

The ripple voltage of the outputs shall be measured at the pins of the output connector when terminated in the load impedance specified in figure1. Ripple and noise are measured at the connectors with a 0.1uF ceramic capacitor and a 10uF electrolytic capacitor to simulate system loading. Ripple shall be measured under any condition of line voltage,output load,line frequency, operation temperature.

2.4.3 Ripple voltage test circuit

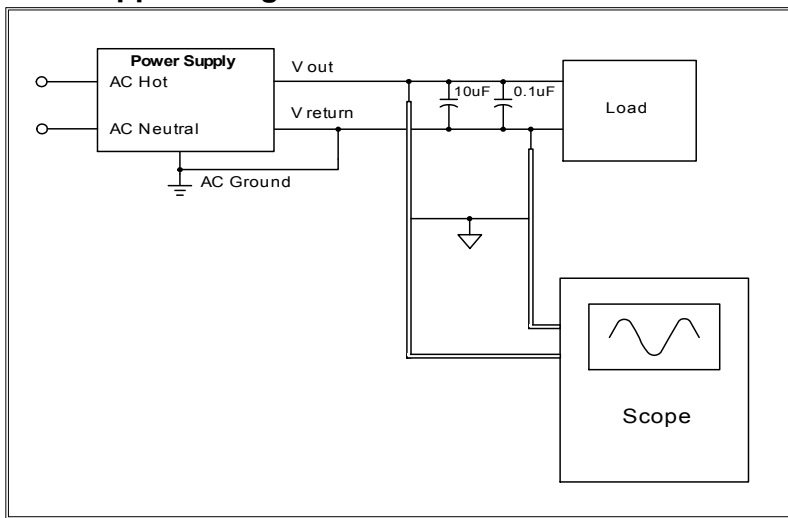


Figure 1. Ripple voltage test circuit

2.5 Overshoot

Any overshoot at turn on or turn off shall be less 10% of the nominal voltage value, all outputs shall be within the regulation limit of section 2.0 before issuing the power good signal of section 5.0.

2.6 Efficiency

2.6.1 At 115Vac

Load	Efficiency	Power Factor
2%	60%	-
20%	90%	-
50%	92%	>0.9
100%	89%	-

2.6.2 ERP 5VSB Efficiency

+5VSB LOAD	Efficiency target (both 115V and 230V input)
3A	75%
1.5A	75%
1A	75%
0.55A	75%
90mA	55%
45mA	45%

2.7 Remote on/off control

When the logic level "PS-ON" is low, the DC outputs are to be enabled.

When the logic level is high or open collector, the DC outputs are to be disabled.

2.8 Capacitance Loading

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

Capacitive Loading Conditions	
Output	Capacitive Load (μF)
+3.3V	3,300
+5V	3,300
+12V	3,300
-12V	3,30
+5VSB	3,300

3.0 PROTECTION

3.1 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 the following Table.If the current limits are exceeded the power supply shall shutdown and latch off.

Voltage	Over Current Limit (lout limit)
+12V(400W)	35A minimum; 55A maximum
+12V(500W)	43A minimum; 63A maximum
+12V(600W)	55A minimum; 75A maximum
+5V	18A minimum; 30A maximum
+3.3V	18A minimum; 30A maximum

3.2 Over Temperature Protection

The power supply will be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature.In an OTP condition the PSU will shutdown.When the power supply temperature drops to within specifide limits,the power supply shall restore power automatically.The OTP must have built in hysteresis such that the power supply will not oscillate on and off due to circuit temperature recovering condition.

3.3 Over-power protection

The power supply will be shutdown and latch off when output power within 120~160% of rated DC output.

Note: Assurance machine can work at low voltage,full load won't damage machine.

3.4 Under voltage protection.

In an under voltage fault occurs, the supply will latch all DC outputs into a shutdown state when +12V,+5V & +3.3V outputs under 85% of it's maximum value.

3.5 Over voltage protection

The over voltage sense circuitry and reference shall reside in packages that are separate and distinct from the regulator control circuitry and reference.No single point fault shall be able to cause a sustained over voltage condition on any or all outputs.The supply shall provide latch-mode over voltage protection as defined in Table.

Output	Minimum	Nominal	Maximum	Unit
+12V VDC	13	15	17	Volts
+5 VDC	5.5	6	7	Volts
+3.3 VDC	3.6	4	5	Volts

3.6 Short circuit

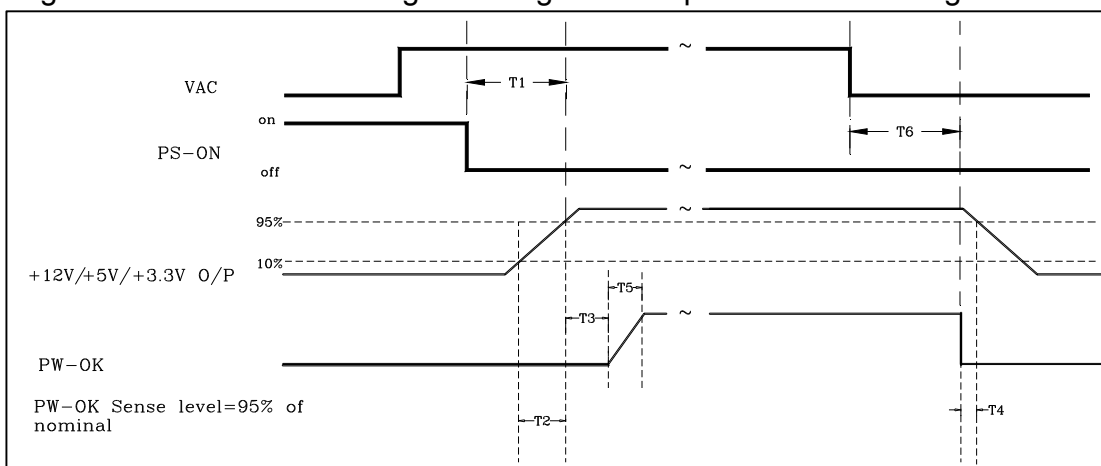
An output short circuit is defined as any output impedance of less than 0.1 ohms.The power supply shall shut down and latch off for shorting the +3.3 VDC,+5 VDC,or+12VDC rails to return or any other rail. Shorts between main output rails and +5VSB shall not cause any damage to the power supply. The power supply shall either shut down and latch off or fold back for shorting the negative rails.+5VSB must be capable of being shorted indefinitely,but when the short is removed, the power supply shall recover automatically or by cycling PS_ON#.The power supply shall be capable of withstanding a continuous short-circuit to the output without damage or overstress to the unit

3.7 No load operation

No damage or hazardous condition should occur with all the DC output connectors disconnected from the load.The power supply may latch into the shutdown state.

4.0 TIMING

Figure 2 is a reference for signal timing for main power connector signals and rails.



- (1)T2: Rise time (0.1~20ms)
- (2)T3: Power good signal turn on delay time (100ms~500ms)
- (3)T4: Power good signal turn off delay time (75%Load 1ms min)
- (4)T6: Hold up time (**75%Load 16ms Min**)

5.0 ENVIRONMENT

5.1 Operation

Temperature	0 to 50 °C
Relative Humidity	to 85%,on-condensing

5.2 Shipping and Storage

Temperature	-20 to 70°C
Relative Humidity	to 95%,non-condensing

5.3 Altitude

Operating	2000m
Storage	3000m

6.0 SAFETY

The power supply designed to meet IEC 62368-1.

7.0 ELECTROMAGNETIC COMPATIBILITY (EMC)

- 7.1 ELECTROSTATIC DISCHARGE (ESD) – IEC 61000-4-2(EN 61000-4-2).
- 7.2 RADIATED SUSCEPTIBILITY – IEC 61000-4-3(EN 61000-4-3).
- 7.3 ELECTRICAL FAST TRANSIENT / BURST (EFT/B) – IEC 61000-4 -4(EN 61000-4-4).
- 7.4 SURGE – IEC 61000-4-5(EN 61000-4-5).
- 7.5 CONDUCTED SUSCEPTIBILITY – IEC 61000-4-6(EN 61000-4-6).
- 7.6 POWER FREQUENCY MAGNETIC FIELD – IEC 61000-4-8(EN 61000-4-8).
- 7.7 VOLTAGE DIPS – IEC 61000-4-11(EN 61000-4-11).
- 7.8 VOLTAGE FLUCTUATIONS – IEC 61000-3-3 (EN 61000-3-3).
- 7.9 HARMONIC CURRENT EMISSION – IEC61000-3-2(EN 61000-3-2).
- 7.10 EN55032:Class B Radio interference (CISPR 32).
- 7.11 ANSI C63.4-2014 / FCC Part 15 Subpart B / ICES-003 Issue 6 Class B 115VAC operation.

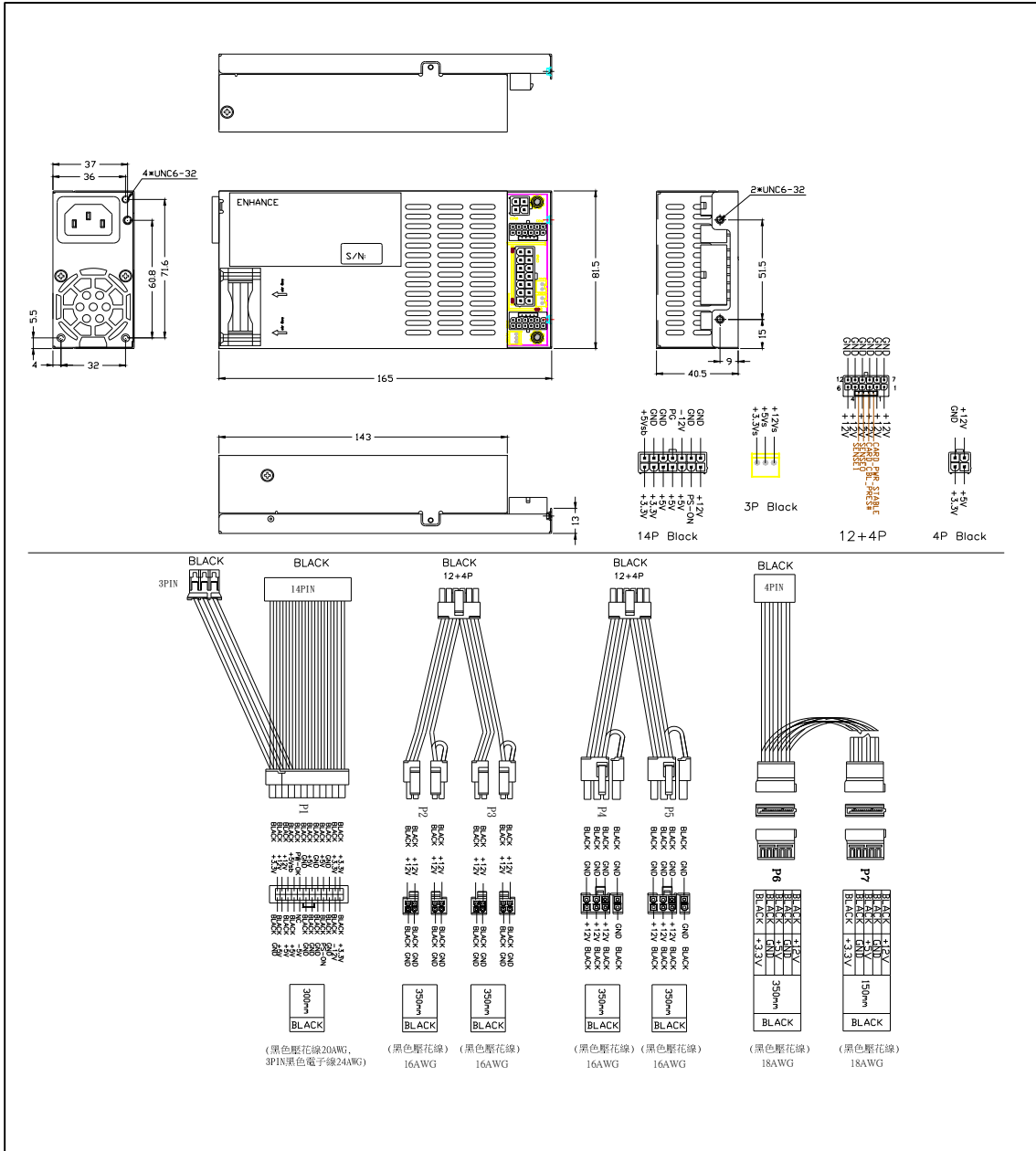
8.0 MTBF

The demonstrated MTBF shall be **100,000 hours** of continuous operation at 25°C, full load and 120V AC input. The MTBF of the power supply shall be calculated in accordance with MIL-HDBK-217F. The DC FAN is not included.

9.0 MECHANICAL REQUIREMENTS

9.1 Physical dimension : L165mm*W81.5mm*H40.5mm

(線材組合&外露長度僅供參考，可根據客戶要求更改或新增。)



9.2 Connectors (INTEL approved equivalent)

M/B 20+4PIN : (Molex C4202H02-A20P or equivalent)

20AWG wire	Signal	Pin	Pin	Signal	20AWG wire
Black	+3.3V	11	1	+3.3V	Black
Black	-12V	12	2	+3.3V	Black
				+3.3Vs	Black(24AWG)
Black	COM	13	3	COM	Black
Black	PS-ON	14	4	+5V	Black
Black	COM	15	5	COM	Black
Black	COM	16	6	+5V	Black
				+5Vs	Black(24AWG)
Black	COM	17	7	COM	Black
Black	NC	18	8	POK	Black
Black	+5V	19	9	+5VSB	Black
Black	+5V	20	10	+12V	Black
				+12Vs	Black(24AWG)
Black	+5V	B3	B1	+12V	Black
Black	COM	B4	B2	+3.3V	Black

CPU 8PIN : (Molex P4-I42002K3B-B) or equivalent)

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

PCI-e 6+2PIN : (AMP P6-I42002K21 or or equivalent)

16AWG wire	Signal	Pin	Pin	Signal	16AWG wire
Black	+12V	1	4	COM	Black
Black	+12V	2	5	COM	Black
Black	+12V	3	6	COM	Black
Black	COM	1	2	COM	Black

HDD 4PIN : (Molex*C5082 H02-4P or equivalent)

18AWG wire	Signal	Pin
Black	+12V	1
Black	COM	2
Black	COM	3
Black	+5V	4

SATA 5PIN : (Molex* A3811H00-5P or equivalent)

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

PCIe 12+4PIN : 12V-2x6 Auxiliary Power Connector Pin Assignment (Optional)

16AWG wire	Signal	Pin	Pin	Signal	16AWG wire
Black	+12V	1	7	COM	Black
Black	+12V	2	8	COM	Black
Black	+12V	3	9	COM	Black
Black	+12V	4	10	COM	Black
Black	+12V	5	11	COM	Black
Black	+12V	6	12	COM	Black
White (24AWG)	CARD_PWR_STABLE	S1	S3	SENSE0/Open	White (24AWG)
White (24AWG)	CARD_CBL_PRES#	S2	S4	SENSE1/GND	White (24AWG)

10. FAN SPEED CONTROL

Fan voltage varies with the ambient temperature or output power.