

MODEL NO. ENP7600 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
Iin(400W)		6-----3		
Iin(500W)		7-----3.5		
Iin(600W)		8-----4		

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	±10%	-10.8	-12.0	-13.2	Volts
+5VSb	±5%	+4.75	+5.0	+5.25	Volts

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**.

2.3 Output Ripple

2.3.1 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

2.3.2 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.

2.3.3 Ripple voltage test circuit

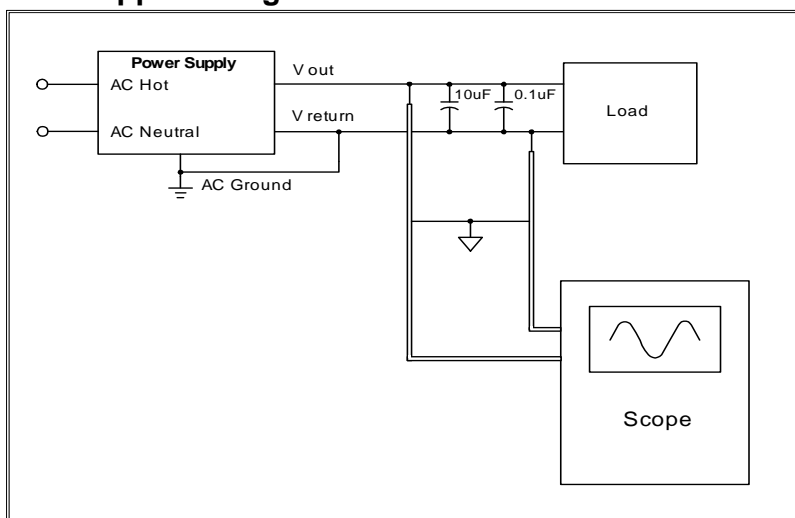


Figure 1. Ripple voltage test circuit

2.4 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.

2.5 Efficiency

At 115Vac

load	Efficiency
10%	
20%	90%
50%	92%
100%	89%

2.6 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.

☞ 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 (Iout limit)
+12V(400W)	35A minimum; 55A maximum
+12V(500W)	43A minimum; 63A maximum
+12V(600W)	52A minimum; 70A 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 specific 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 110~130% 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

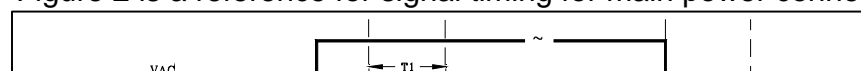
3.7 No load operation

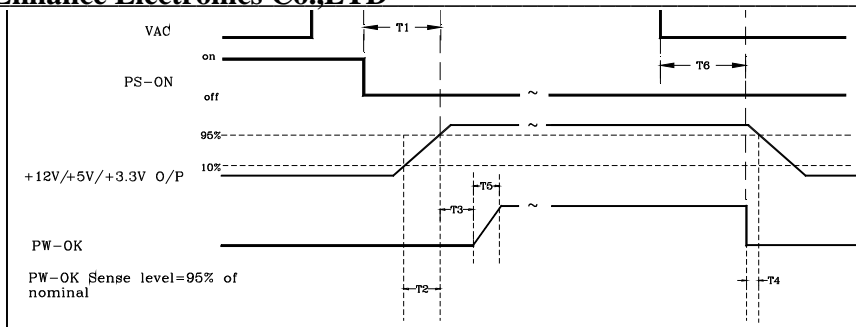
No damage or hazardous condition should occur with all the DC output connectors disconnected from the load.The power supply may latch into the shutdown state.

4.0 TIMING

4.1 Signal timing drawing

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





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

4.2 Hold up time

When the power loss its input power, it shall maintain **16ms** in regulation limit at normal input voltage and **75%** load (AC:115V/60Hz or 230V/50Hz)

5.0 ENVIRONMENT

5.1 Operation

Temperature	0 to 40 °C
Relative Humidity	to 85%,on-condensing

5.2 Shipping and Storage

Temperature	-20 to 90°C
Relative Humidity	to 95%,non-condensing

5.3 Altitude

Operating	2000m
Storage	3000m

6.0 SAFETY

6.1 Underwriters Laboratory (UL) recognition.

The power supply designed to meet UL 60950.

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 22).
- 7.11 ANSI C63.4-2009 / FCC Part 15 Subpart B / ICES-003 Issue 5 Class B 115VAC operation.

☞ 8.0 MTBF

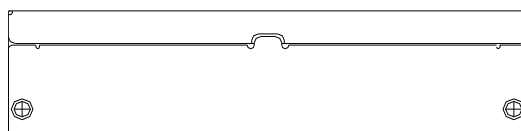
8.1 MTBF (mean time between failures) calculation

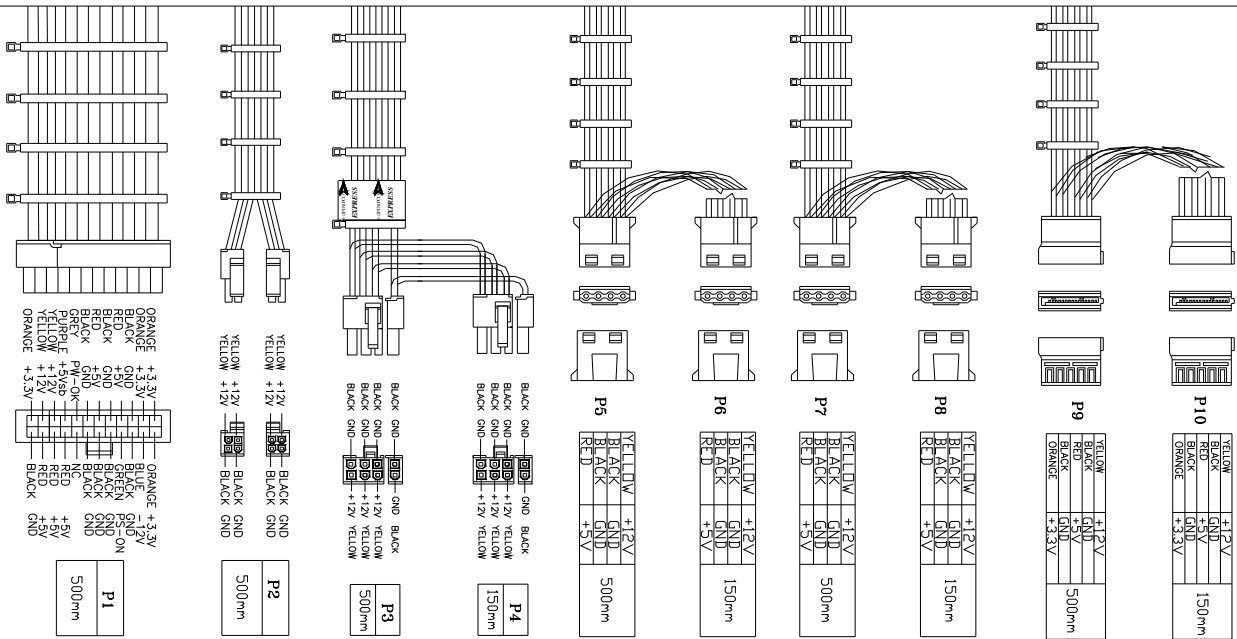
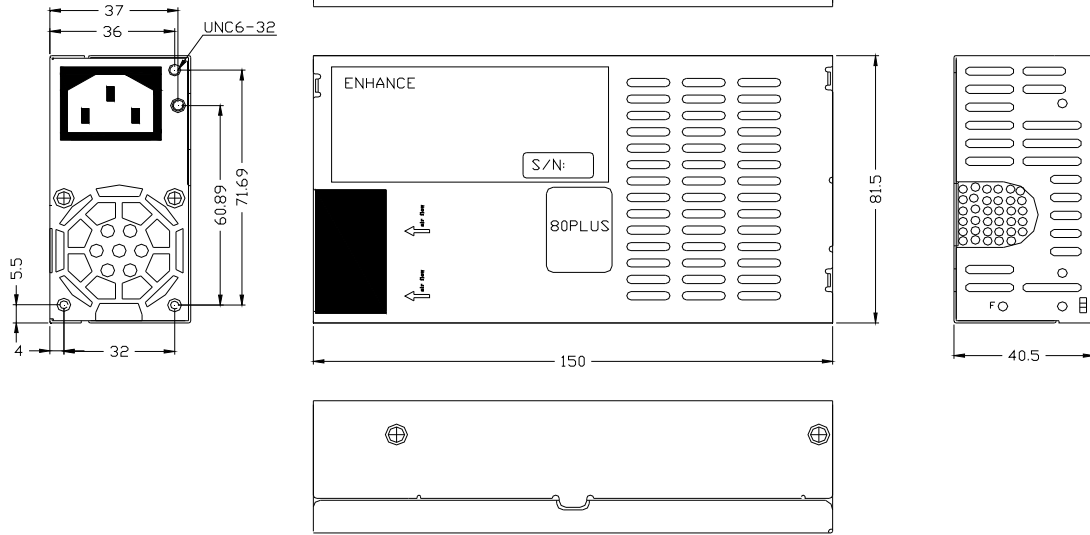
The demonstrated MTBF shall be 100,000 hours of continuous operation at 25°C, full load and 120V AC input. The MTBF of the power supply shall be calculated in accordance with MIL-HDBK-217F. The DC FAN is not included.

☞ 9.0 MECHANICAL REQUIREMENTS

9.1 Physical dimension : L150mm*W82mm*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)

P1 Connector (Molex C4202H02-A20P or equivalent)

18AWG wire	Signal	Pin	Pin	Signal	18AWG wire
Orange	+3.3V	11	1	+3.3V	Orange
Orange (22AWG)	+3.3V				

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

P2 Connector (Molex P4-I42002K3B-B) or equivalent)

18 AWG wire	Signal	Pin	Pin	Signal	18AWG wire
Black	GND	1	1	GND	Black
Black	GND	2	2	GND	Black
Yellow	+12V	3	3	+12V	Yellow
Yellow	+12V	4	4	+12V	Yellow

P3,P4 (AMP P6-I42002K21 or or equivalent)

18AWG wire	Signal	Pin	Pin	Signal	22AWG wire
Yellow	+12V	1	4	COM	Black
Yellow	+12V	2	5	COM	Black
Yellow	+12V	3	6	COM	Black
Black	COM	1	2	COM	Black

P5,P6,P7,P8 大4PIN Power Connector (Molex*C5082 H02-4P or equivalent)

18 AWG wire	Signal	Pin
Yellow	+12V	1
Black	GND	2
Black	GND	3

Red	+5V	4
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P9,P10 SATA Power Connector (Molex* A3811H00-5P or equivalent)

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

☞ 10. FAN SPEED CONTROL

Fan voltage varies with the ambient temperature or output power.