

# SPECIFICATION


Model: TP-4UR600L2E

## N+1 Hot-Swappable Redundant Power Supply Module With Active PFC 600W+300W

(P/N of TT: WSPR0021)


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01	Initial Engineering Specification for TT	Tien	5/21/2008

Sales	Design			Product Verification	
	Mechanical	Electrical	Approval	Safety	Approval


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		Document No.: ES-3300-05
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## 1.0 General

This specification describes the physical, functional and electrical characteristics of a 600+300watts redundant power supply with power factor correction and hot-swappable capabilities.

### 1.1 Parameter Specifications

Unless specified otherwise, all parameters must be met over the limits of Temperature, load and input voltage.

## 2.0 Input Characteristics

### 2.1 Input Voltage

100 to 240 VAC,  $\pm 10\%$

### 2.2 Input Waveform

The unit is capable of operating with a 10% distorted sine wave input as measured by a distortion analyzer. Its flattop-ping clipped 10% from the peak value of standard sine wave.

### 2.3 Input Frequency

47 Hz to 63 Hz

### 2.4 Input Current

12Amps –6Amp

### 2.5 Power Factor Correction

The Power Supply shall incorporate universal power input with active power factor correction, which shall reduce line harmonic current in accordance with the EN61000-3-2 and JETI MITI standards.

#### 2.5.1 Power Factor


PF  $\geq 0.95$  at 50% of rated load and nominal input voltage

#### 2.5.2 Harmonic Distortion

Meet the EN61000-3-2

### 2.6 In-Rush Current

CONDITION	LIMITS
132/264 VAC, Full load Turn off 1 sec; turn on at peak of input voltage cycle. 25°C Air Ambient cold star	No damage

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## 2.7 Line Regulation

CONDITIONS	LIMITS
Full load, 100 to 240VAC	+/-1%

## 2.8 Input Leakage Current

Input leakage current from line to ground will be less than 3.5 mA rms.

## 2.9 Isolation (Hi-pot)

1500Vrms, 50Hz for one (1) minute between each input AC line and the grounding conductor.

3000Vrms, 50Hz for one (1) Minute between the input AC lines and secondary low voltage outputs and shields.

## 3.0 Output Characteristics

### 3.1 DC Output Characteristics

There are two choices as below, to be met under all combinations of loading.

Output #	V1	V2	V3	V4	V5	V6
Voltage	+5V	+3.3V	+12V	-5V	-12V	5VSB
Max. Load	50A	40A	34A	0.5A	1A	3A
Min. Load	3A	2A	2A	0A	0A	0A
Load Reg.	±5 %	+/-5%	±5 %	±10 %	±10 %	±5%
Cross Reg.	±5 %	+/-5 %	±5 %	±10%	±10 %	±5%
Line Reg.	±1%	±1%	±1%	±1 %	±1 %	±1%
Ripple & Noise	60mV	60mV	120mV	100mV	120mV	70mV

Note 1: The +5 & +3.3 Volt total output shall not exceed 340 Watts.

Note 2: The +5, +3.3 & +12Volt total output shall not exceed 580 Watts.


Note 3: Regulation tolerance shall include temperature change, warm up drift and dynamic load.

### 3.2 Remote Sensing

The +3.3V, +5V, +12V outputs should have provision for remote sensing to compensate for 200mV of cable, connector, and PCB trace drops.

### 3.3 Overshoot

Any output overshoot at TURN-ON shall not exceed 10% of nominal voltage value.

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### 3.4 Efficiency

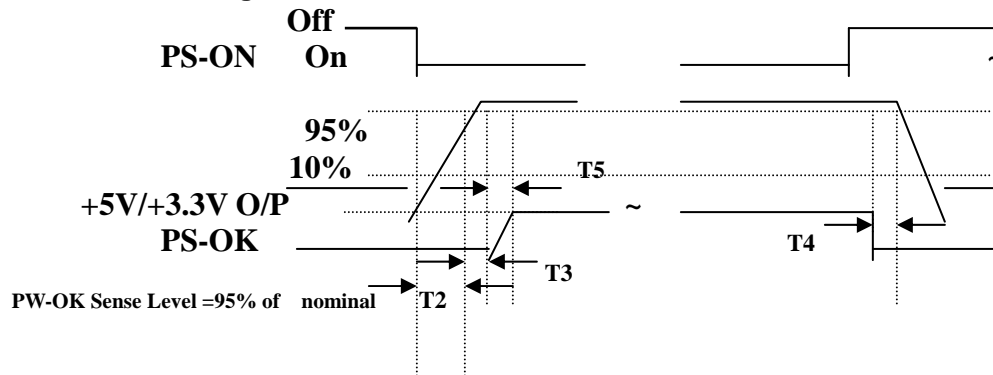
65% minimum at full load and nominal AC input.

## 4.0 Time Sequence

### 4.1 Hold-Up Time

Unit shall continue to supply regulated DC outputs and power good signal for at least 20 milliseconds at 115/230 VAC full load after a loss of AC input voltage, which shall be represented by a short circuit at the AC input.

### 4.2 Power Good Signal



**Figure 1**


**Note:**

T2: The output voltage shall rise from <10% of nominal to within the regulation specified in Section 3.1 within 0.1 to 70 ms. ( $0.1\text{ms} \leq T2 \leq 70\text{ms}$ )

T3、T4 and T5 are as following Table:

Signal Type:	+5VDC, TTL compatible
Logic level low	<0.4V while sinking 4 mA
Logic level high	Between 2.4VDC and 5VDC output while sourcing 200 $\mu$ A
High state output impedance	1K $\Omega$ from output to common
PS-OK delay	100ms < T3 < 500 ms
PS-OK rise time	T5 $\leq$ 10 ms
Power down warning	T4 > 1 ms

**Table 1.**

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#### 4.2.1 Fanout

Power Good output circuit shall consist of an active pull down component and a passive pull up resistor. Power Good output voltage to be met under recommended loading conditions.

CONDITIONS	LIMITS
IOH= 200uA Min.	VOH= 2.7V Min.
IOL= 4mA Min.	VOL= 0.4V Max.

#### 4.3 Output Rise Time

The each output current shall have a turn-on rise time of less than 70ms under all load conditions. Rise time is measured between 10% and 95%.

#### 4.4 Start-up timing

All outputs shall be stable and in regulation in less then 2.0 second under all load and line conditions. Start-up time is measured between the AC turn-on and 4.75 volts on +5V output. See Figure 1.

#### 4.5 Dynamic Load Response Time

Transient response is measured by switching the output load from 70 to 100 to 70 percent of its full value at a frequency of 100 Hz and 50% duty cycle, step load change is 0.5A/us, The magnitude Vr is less than +/- 5% of +5V, +3.3V and +12V outputs, the recovery time Tr is less than 1ms.

### 5.0 Protection

#### 5.1 Over Current Protection

This power supply shut down all DC outputs when +5 VDC, +3.3 VDC and +12 VDC outputs are overloaded to the limit. The power supply logic shall into off state and auto restart when the circumstance dispelled. The +5VSB outputs will be internally current limited.

+5 VDC


CONDITIONS	LIMITS
100/240 VAC input	when output current is over to 110% - 140%

+3.3 VDC

CONDITIONS	LIMITS
100/240 VAC input	when output current is over to 110% - 140%

+12 VDC

CONDITIONS	LIMITS
100/240 VAC input	when output current is over to 110% - 140%

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## 5.2 Over Voltage Protection

The power supply shall latch off if the +5 VDC or 3.3VDC or +12 VDC maximum voltage exceeds the limits shown. The AC must be recycled to restart.

+5 VDC

CONDITIONS

All operating

LIMITS

5.6 VDC — 6.5 VDC

+3.3 VDC

CONDITIONS

All operating

LIMITS

3.8 VDC — 4.3 VDC

+12 VDC

CONDITIONS

All operating

LIMITS

13.6 VDC — 15.6 VDC

## 5.3 Short Circuit Protection

A short circuit placed on any output shall cause no damage to this unit. The power supply shall shutdown and latch off if the short circuit shown. This latch shall be cleared by toggling the PSON signal or by an AC power interruption.

## 5.4 No Load Operation

When the primary power is applied, with no load on any output voltage, no damage or hazardous conditions shall occur. In such a case, the power supply shall power up and stabilize.

## 5.5 +5VSB (Standby)


The +5VSB output is always on (+5V Standby) when AC power is applied and power switch is turned on. The +5VSB line is capable of delivering at a maximum of 2.0A for PC board circuit to operate.

## 5.6 Over Power Protection

The power supply shall shut down all DC outputs when outputs power are overloaded to 110~150%

## 5.7 PS-ON (Remote ON/OFF)

PS-ON is an active low signal that turns on all of the main power rails including +3.3V, +5V, +12V & -12V, -5V power rails. When this signal is held by the PC board or left open circuited, outputs of the

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power rails should not deliver current and should be held at a zero potential with respect to ground. Power should only be delivered to the rails if PS-ON signal is held at ground potential. This signal should be held at +5VDC by a pull-up resistor internal to the power supply.

### 5.8 Remote Sense

A remote +3.3VDC sense line connector allow for accurate control of the +3.3VDC line directly at load. Due to potential voltage drops across the connector and traces leading to the PCB components, it may be advantageous to implement a +3.3V sense line that remotely monitors the +3.3VDC power level at the load.

### 5.9 Power Fault Signal

The Hot-Swap Redundant Power Supply shall give fault signal (TTL compatible signal) that will indicate the status of the power supply operation.

This signal detects the following conditions:

- All output voltages V1 to V5 are within regulation.
- Fan is operating normally
- Power supply internal temperature is normal

This line has an internal 1KΩ pull up resistor to +5V, and is capable of sinking 20mA, and has a breakdown of 20V.

nGood Low Power Supply Fault	$V_{ol} \leq 0.4V$ (a) $I_{ol} \leq 20mA$
nGood High Power Supply Normal	$V_{oh} \geq 3.5V$ (a) $I_{oh} \leq 250uA$


### 5.10 LED Indicator

There will be a bi-color LED to indicate power supply status. When AC is applied to the supply and standby voltages are available the LED shall turn on RED. The LED shall turn on GREEN to indicate that all outputs are available. The LED shall turn on RED to indicate that the power Supply has failed.

## 6.0 Physical Characteristics

### 6.1 Size (see appendix: mechanical drawing diagram)

W x H x D: 86 x 150 x 290mm

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## 6.2 Mounting Requirements

See attachment

## 6.3 Weight

11 pounds; (5Kg)

## 6.4 Cooling

Fans: Sanyo (109P0412B3D04) equivalent or better. Airflow from the power supply should be in exhaust direction and shall be rated at 10 CFM minimum.

# 7.0 Connections

## 7.1 AC Input Connector

The AC input receptacle shall be an IEC 320 type or equivalent. The IEC 320 C receptacle will be considered the mains disconnect.


## 7.2 DC Wire Harness and Connector Requirements

P1: ATX Motherboard Power Connector

Connector housing: 24- Pin Molex 5557 (No.39-01-2240) or Equivalent

Contact: Molex 5556T (No.44476-1111) or Equivalent

Pin	Signal	Color	Size	Pin	Signal	Color	Size
1	+3.3 VDC	Orange	16 AWG	13	+3.3 VDC 3.3VS+	Orange Brown	16 AWG 22AWG
2	+3.3 VDC	Orange	16 AWG	14	-12 VDC	Blue	18 AWG
3	COM	Black	18 AWG	15	COM	Black	18 AWG
4	+5 VDC	Red	18 AWG	16	PS_ON#	Green	22 AWG
5	COM	Black	18 AWG	17	COM	Black	18 AWG
6	+5 VDC	Red	18 AWG	18	COM	Black	18 AWG
7	COM	Black	18 AWG	19	COM	Black	18 AWG
8	PW_OK	Gray	22 AWG	20	-5VDC	White	18 AWG
9	5VSB	Purple	18 AWG	21	+5 VDC	Red	18 AWG
10	+12 VDC	Yellow	18 AWG	22	+5 VDC 5VS+	Red Red	18 AWG 22AWG
11	+12 VDC	Yellow	18 AWG	23	+5 VDC	Red	18 AWG
12	+3.3 VDC	Orange	16 AWG	24	COM	Black	18 AWG

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## P2: Processor Power Connector

Connector housing: 8- Pin Molex 5557 (39-01-2080) or Equivalent

Contact: Molex 5556T (44476-1111) or Equivalent

Pin	Signal	Color	Size	Pin	Signal	Color	Size
1	COM	Black	18 AWG	5	+12 VDC	Yellow	18 AWG
2	COM	Black	18 AWG	6	+12 VDC	Yellow	18 AWG
3	COM	Black	18 AWG	7	+12 VDC	Yellow	18 AWG
4	COM	Black	18 AWG	8	+12 VDC	Yellow	18 AWG

## 4-Pin HDD / CD-ROM Drive Power Connectors

Connector housing: 4- Pin AMP: 1-480424-0 or Molex 8981-04P or Equivalent

Contact: Amp 61314-1 or Equivalent

Pin	Signal	Color	Size
1	+12 VDC	Yellow	18 AWG
2	COM	Black	18 AWG
3	COM	Black	18 AWG
4	+5 VDC	Red	18 AWG

## Small 4-Pin: Floppy Disk Drive Power Connectors

Connector housing: 4- Pin AMP: 171822-4 or Equivalent

Pin	Signal	Color	Size
1	+5 VDC	Red	22 AWG
2	COM	Black	22 AWG
3	COM	Black	22 AWG
4	+12 VDC	Yellow	22 AWG

# 8.0 Environmental


## 8.1 Temperature

### 8.1.1 Operating

50 to 122 °F (0 to 40 °C)

### 8.1.2 Non-Operating

-4.0 to 140 °F (-20 to 60°C)

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## 8.2 Relative Humidity

### 8.2.1 Operating

20 to 90 % non-condensing at 104°F (40 °C)

### 8.2.2 Non-Operating

5 to 95 % non-condensing at 122°F (50°C)

## 8.3 Altitude

### 8.3.1 Operating

Sea level to 10,000 feet

### 8.3.2 Non-Operating

Sea level to 40,000 feet

## 8.4 Shock

### 8.4.1 Operating

The power supply shall exhibit no signs of damage or degradation of performance when subjected to a shock of 5g's for 11 ms, with a 1/2 sine wave for each of the perpendicular axes X, Y and Z.

### 8.4.2 Non-Operating

The power supply shall exhibit no signs of damage or degradation of performance when subjected to a shock of 30g's for 11 ms, with a 1/2 sine wave for each of the perpendicular axes X, Y and Z.

## 8.5 Vibration

### 8.5.1 Operating

The power supply shall be subjected to a vibration test consisting of a 10 to 500 Hz sweep at a constant acceleration of 0.5g for a duration of one (1) hour for each of the perpendicular axes X, Y and Z. The output voltages shall remain within specification.

### 8.5.2 Non-Operating


The power supply shall be subjected to a vibration test consisting of a 10 to 300 Hz sweep at a constant acceleration of 2.0g for a duration of one (1) hour for each of the perpendicular axes X, Y and Z.

The power supply shall not incur physical damage or degradation of any characteristics below the performance specifications.

## 8.6 Power Line Transient

### 8.6.1 Drop Out

With a full cycle input voltage drop-out at 50Hz, the unit shall operating within the prescribed voltages with a drop-out cycle repetition rate of 500ms.

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**CONDITIONS**  
Full load, Nom. Input AC Voltage

**LIMITS**  
Meet all requirements

**8.7 Acoustic Noise**

The power supply shall be tested in accordance with specifications. The overall sound is measured with the noise meter placed 1 meter from the nearest vertical surface of center of fan installed in power supply.

**CONDITIONS**

115 VAC Input, full load of +5V  
2A of +12V.

**LIMITS**

Acoustic noise is 50 db maximum

**9.0 Regulatory Agency Certification**

**9.1 RFI/EMI Standards**

The power supply, when installed in system, shall comply with the following radiated and conducted emissions standards:

- a) Meet FCC part 15, Subpart B, Class B computing devices.
- b) CISPR22 (EN55022) Class B

These limits shall be met with a margin of at less 3dB at all applicable frequencies.

The unit shall comply with the above limits when tested under all normal working conditions and with all interface cables connected.

**9.2 Safety Standards**

The power supply shall be certified with the following safety standards,

- a) UL 1950 (Information Processing/Business equipment).
- b) TUV Certification to IEC 950 1st edition with Amendment #1, #2, and EN60950
- c) CB Certificate & Test report.


**10.0 Reliability**

**10.1 Mean Time Between failures (MTBF)**

Using MIL217F the calculated MTBF > 100,000 hours at 25°C

**10.2 Warranty**

FIVE (5) years manufacture's warranty  
Date code indicating week and year of manufacture.

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