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SPECIFICATION

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FSP150-60EGA

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1.0 GENERAL REQUIREMENTS

This specification describes a 150 watts power supply. With +5V stand-by, second 12V rail and remote ON/OFF control for ATX-12V system and a “Power factor collector (PFC)” circuit to meet EPA requirement of input range with in 230V/50Hz.

2.0 INPUT REQUIREMENTS

The AC mains steady-state input voltage shall be 200 to 240 Vrms
The power supply shall operate from 180 to 264 Vrms.
The power supply shall operate from an AC mains frequency of 47-53Hz.
The AC mains steady-state RMS input current shall be:
2.0 Amp (maximum) at 230 Vrms/ 50 Hz.
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3.0 OUTPUT REQUIREMENTS

3.1 OUTPUT VOLTAGE AND CURRENT

	MINIMUM LOAD	NORMAL LOAD	MAXIMUM LOAD	LOAD REG.	LINE REG.	RIPPLE & NOISE
+3.3V	0.1A	5A	11/4.74A	±5%	±1%	50mV P-P
+5V	0.2A	4A	4.54/9A	±5%	±1%	50mV P-P
+12V1	0.3A	5A	10A	±5%	±1%	120mV P-P
+12V2	0.3A	5A	10A	±5%	±1%	120mV P-P
-12V	0A	0.2A	0.3A	±10%	±2%	200mV P-P
+5Vsb	0A	2A	3.0A	±5%	±1%	50mV P-P

(1) +3.3V & +5V total output not exceed 60W.
When +5V is load to 9A, the +3.3V maximum load is 4.54A.
When +3.3V is load to 11A, the +5V maximum load is 4.74A.

(2) **+12V1** & **+12V2** total output not exceed 144W(12A).

(3) All outputs shall be safety-isolated from the AC mains and share a common return. This common return must be connected to supply chassis.

(4) Voltages and ripple are measured at the load side of mating connectors with a 0.1uF monolithic ceramic capacitor paralleled by a 10uF electrolytic capacitor across the measuring terminals.

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LOAD REGULATION CHARACTERISTICS

NO.	LOAD CONDITION	OUTPUT LOAD					
		+3.3V	+5V	+12V1	+12V2	-12V	+5Vsb
1	COND.1	X	X	X	X	X	3.5A
2	COND.2	X	X	X	X	X	3A
3	COND.3	0.1A	0.2A	0.3A	0.3A	0.05A	0A
4	COND.4	11A	1A	2.0A	2.0A	0.1A	0.2A
5	COND.5	1A	9A	2.0A	2.0A	0.1A	0.2A
6	COND.6	1A	1A	6A	6A	0.3A	0.3A
7	COND.7	1.09A	0.9A	0.81A	0.81A	0.04A	0.40A
8	COND.8	2.74A	2.24A	2.02A	2.02A	0.10A	1.01A
9	COND.9	5.47A	4.48A	4.04A	4.04A	0.20A	2.02A
10	COND.10	6A	5A	4.5A	4.5A	0.3A	3A

Cond. 10 only at 230Vac/50Hz and less then 1 S

Cond. 1 only at 230Vac/50Hz and less then 100 mS

3.2 REMOTE ON/OFF CONTROL

The power supply shall accept a logic open collector level which will disable/ enable all the output voltage (exclude + 5V standby).

As logic level is low, outputs voltage were enabled.

As logic level is high, outputs voltage were disabled.

Note: 1. Logic high level: 2.0-5.25V while sourcing 0.2mA maximum.

2. Logic low level: 0-0.5V while sinking 1.6mA maximum.

3. Rise Time: 15ms maximum (10%-90%).

3.3 OUTPUT VOLTAGE HOLD-UP TIME

16.0 mS minimum : at 230V / 50 Hz. (FULL LOAD COND.9)

3.4 OPERATION AT NO LOAD

The power supply shall be capable of being operated with no load on any or all outputs without damage. For no load on +3.3V & +5V, the output shall not exceed +4.3V & +6.5Vdc and the power supply may shutdown and require by remote-control or remove AC power restart.

3.5 PROTECTION

3.5.1 Over-voltage protection

In the event of an over-voltage condition on +3.3 & +5Vdc &+12V the power supply shall shutdown and require remote control or remove the AC mains input to reset the system.

+5V : 6.5V (maximum)

+3.3V : 4.3V (maximum)

+12V : 15.5V (maximum)

3.5.2 OVER- CURRENT PROTECTION

There shall be protection from an output over-current event. The PSU may shutdown form such an event and require power-on restart.
The overload currents should be ramped at a minimum rate of 10 A/s starting .

Over-current test values:

	3.3V	5V	$12V_{1,2}$
Load condition (3.3V P.P.)	<60A	1A	1A
Load condition (5V P.P.)	1A	< 45A	1A
Load condition (12V P.P.)	1A	1A	<22A
Load condition (12V P.P.)	1A	1A	1A

3.5.3 Short-Current Protection

An O/P short circuit is defined as any O/P impedance of less then 0.1 ohms. The power supply shall shutdown and latch off for shorting +3.3V, +5V or +12V rail to return or any other rail. and +5VSB shall not cause any damage to the power supply. The power supply shall either shutdown and latch off or fold back for shorting negative rail. +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 withstanding a continuous short-circuit to the O/P without damage or overstress to the unit (for example to components, PCB traces, connectors) under the I/P conditions specified.

3.6 OUTPUT RISETIME

The cold-start enable main output voltage rise-time of all outputs shall be measured with maximum load on all outputs. (with COND.9)

Rise time: +3.3V 20mS (maximum)
(10-90%) +5V 20mS (maximum)
+12 V1 20mS (maximum)
+12 V2 20mS (maximum)
-12 V 20mS (maximum)

The test condition: 230Vac/50Hz

3.7 OUTPUT OVERSHOOT/UNDERSHOOT

No output voltage shall overshoot / undershoot or generate spikes at turn-on or turn-off, during momentary power loss, output short, or realistic input voltage or output load changes, Overshoot/undershoot is defined as any output that exceeds the voltage tolerance plus or minus an additional 5%. All outputs shall be measured with minimum load (COND.3)

	Overshoot	Undershoot
+3.3V	3.63V	2.97V
+5V	5.5V	4.5V
+12V	13.2V	10.8V
-12V	-13.8V	-10.2V
+5VSB	5.5V	4.5V

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3.8 EFFICIENCY requirement of main output

That should be tested at nominal Input voltage is 230V/50Hz and load conditions defined in below Table.

loading	5V	12V1	12V2	3.3V	-12V	+5Vsb	Pout	PF	Eff
100%	4.48A	4.04A	4.04A	5.47A	0.20A	2.02A	150W	0.9	90%
50%	2.24A	2.02A	2.02A	2.74A	0.10A	1.01A	75W	0.9	90%
	0.35A	0.5A	0.5A	0.35A	0A	0.1A		0.8	76%

3.9 EFFICIENCY requirement of standby output

Input power has to be under 0.5W when output current is set up at 50mA and input voltage is set up at 230Vac/50Hz both condition (Remote off: PS_ON# high state).

3.10 POWER GOOD SIGNAL Time sequence

Measure condition :230V (FULL LOAD CON.9)

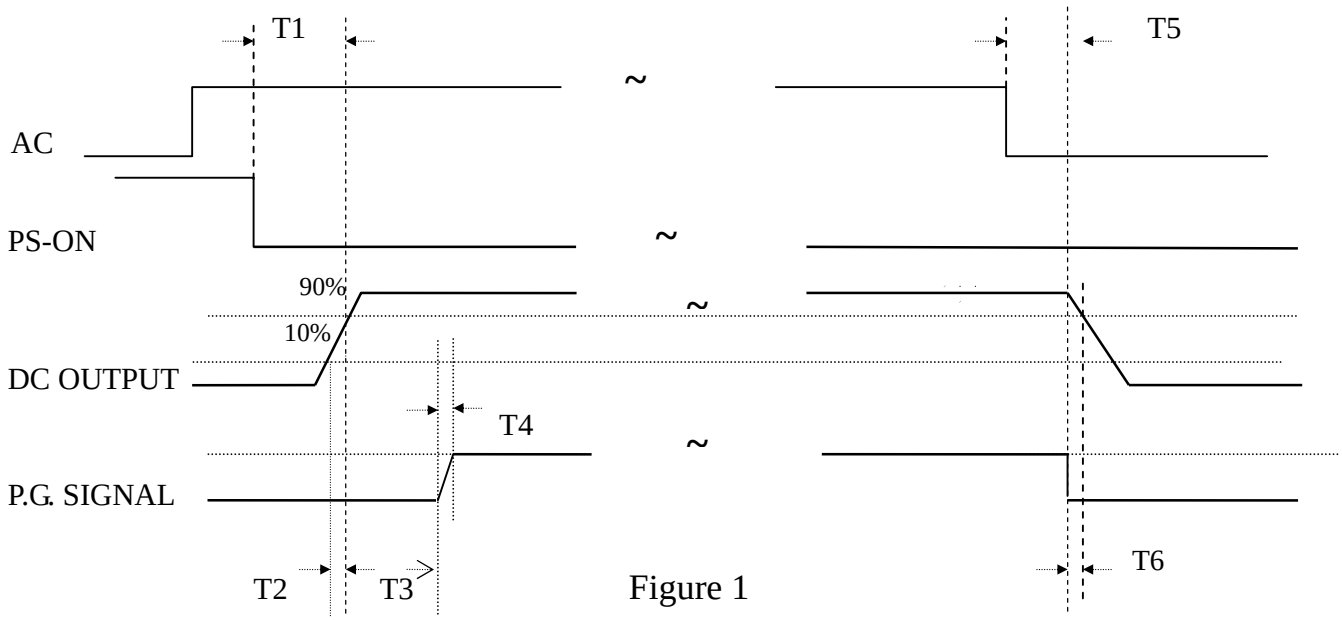

Figure 1

T1: PS_ON -- DC O/P within Spec.＜500mS

T2: RISETIME < 20mS

T3: Power Good Delay Time 100mS-500mS

T4: Power Good Rise-time＜10mS

T5: AC fail hold-up time＞16mS

T6: Power Fail Delay Time＞1mS

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3.11 Output Transient Response

Expected output transient step sizes for each output. The transient load slew rate is = 1.0 A/μs.

Table of DC Output Transient Step Sizes

Output	Max. step size (% of rated output amps per Sec 3.1)
+12V	9.0A (10000uF)
+5V	4.5A (10000uF)
+3.3V	5.7A (10000uF)
-12V	0.1A (330uF)
+5VSB	0.5A (10000uF)

(Adding external capactor)

Output voltages should remain within the regulation limits of Section 4.1, and the power supply should be stable when subjected to load transients per above table from any steady state load, including any or all of the following conditions:

• Load-changing repetition rate of 50 Hz to 10 kHz

3.12 Capacitive Load

The power supply should be able to power up and operate normally with the following capacitances simultaneously present on the DC outputs. This capacitive loading should be used to check all of function test, but without hold-up time.

Output	Capacitive load (uF)
+12 V	10000
+5 V	10000
+3.3 V	10000
-12 V	330
+5 VSB	10000

3.13 Closed-loop Stability

The power supply shall be unconditionally stable under all line/load/transient load conditions including capacitive loads specified in Section 3.13. A minimum of 45 degrees phase margin and 10 dB gain margin is recommended at both the maximum and minimum loads.

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4.0 Physical Environment

4.1 Temperature

4.1.1 Operating Ambient: +0 to 40℃

The power supply shall be capable of continuous operation and meet all electrical specification. The maximum continuous power rating of supply is : 150W at 40℃.

4.1.2 Non-Operating Ambient(Storage): －40℃ to +70℃

4.2 Humidity

4.2.1 Operating: To 85% relative humidity (non-condensing)

4.2.2 Non-Operating: To 95% relative humidity (non-condensing)

Note: 95%RH is achieved with a dry bulb temperature of 55℃ and a wet bulb temperature of 54℃.

4.3 Altitude

4.3.1 Operating: To 10,000ft

4.3.2 Non-Operating: To 50,000ft

5.0 Regulatory Compliance

5.1 Safety Requirements

-IEC 950

-TUV EN 60950

-NEMKO + CB REPOR

-CUL

5.2 Dielectric Strength

Primary to Frame Ground: 1800 Vac for 1 sec.

Primary to Secondary: 1800 Vac for 1 sec.

5.3 Insulation Resistance

Primary to Secondary: 20 Meg. ohms minimum.

Primary to FRAME GROUND: 20 Meg. ohms minimum.

5.4 Ground Leakage Current

The power supply ground leakage current shall be less than 3.5mA.

5.5 Emission Requirements

The power supply shall comply with CISPR 22, Class B, for both conducted and radiated emissions with a 3dB margin..

6.0 Other Requirements

6.1 Input Connections

Refer to Mechanical Specifications for placement.

The AC mains input are through a three-circuit IEC type connector mounted on the rear of the power supply chassis.

6.2 Reliability

The power supply reliability, when calculated by "Bellcore" latest revision are exceed 100,000 hours with all output at maximum load and an ambient temperature of 25℃.

The special requirement is for cooling fan that MTTF be guarantee over 26,280 hours at 35℃ ambient temperature.

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7.0 Revision History:

Rev	Description	Date
1	**Initial released**	2013/7/10
2	CHANGE GENERAL REQUIREMENTS	2014/3/6

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