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SPECIFICATION

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FSP650-80EGN

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(GOLD)

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1.0 GENERAL REQUIREMENTS

This specification describes a 650 watts power supply. With 8 output, and remote ON/OFF control for ATX-12V system and a “Power factor correction (active PFC)” circuit at 100V-240Vac.

2.0 INPUT REQUIREMENTS

The AC mains steady-state input voltage shall be 100 to 240 Vrms
The power supply shall operate from 90 to 264 Vrms.
The power supply shall operate from an AC mains frequency of 47-63Hz.
The AC mains steady-state RMS input current shall be:
10 Amp (maximum) at 100-127Vrms/ 60 Hz
5Amp (maximum) at 200-240 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**	**12A**	**26/6A**	**±5%**	**±1%**	**50mV P-P**
+5V	**0.2A**	**12A**	**12.8/26A**	**±5%**	**±1%**	**50mV P-P**
+12V1	**0.1A**	**8A**	**18A**	**±5%**	**±1%**	**120mV P-P**
+12V2	**0A**	**8A**	**18A**	**±5%**	**±1%**	**120mV P-P**
+12V3	**0A**	**8A**	**18A**	**±5%**	**±1%**	**120mV P-P**
+12V4	**0A**	**8A**	**18A**	**±5%**	**±1%**	**120mV P-P**
-12V	**0A**	**0.25A**	**0.5A**	**±10%**	**±2%**	**200mV P-P**
+5Vsb	**0A**	**1.5A**	**3.5A**	**±5%**	**±1%**	**50mV P-P**

+12V1,2,3,4 Peak current is 20A(less then 10mS).

+5Vsb peak current is 4A(less then 0.5S).

(1) **+3.3V** & **+5V** total output not exceed 150W.
When **+5V** is load to 26A, the **+3.3V** maximum load is 6A.
When **+3.3V** is load to 26A, the **+5V** maximum load is 12.8A.

(2) **+12V1** & **+12V2 & +12V3** & **+12V4** total output not exceed 600W(50A).

(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.

LOAD REGULATION CHARACTERISTICS

NO.	LOAD CONDITION	OUTPUT LOAD							
		+3.3V	+5V	+12V1	+12V2	+12V3	+12V4	-12V	+5Vsb
1	**COND.1**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**4A**
2	**COND.2**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**3.5A**
3	**COND.3**	**0.1A**	**0.2A**	**0.1A**	**0A**	**0A**	**0A**	**0A**	**0A**
4	**COND.4**	**26A**	**1A**	**2A**	**2A**	**2A**	**2A**	**0.1A**	**0.1A**
5	**COND.5**	**0.1A**	**26A**	**3A**	**3A**	**3A**	**2A**	**0.1A**	**0.1A**
6	**COND.6**	**2A**	**5A**	**12A**	**12A**	**12A**	**12A**	**0.1A**	**0.1A**
7	**COND.7**	**3.6A**	**3.6A**	**2.6A**	**2.4A**	**2.4A**	**2.4A**	**0.1A**	**0.2A**
8	**COND.8**	**9A**	**9A**	**6.5A**	**6A**	**6A**	**6A**	**0.25A**	**0.5A**
9	**COND.9**	**12A**	**14A**	**10A**	**10A**	**12A**	**12A**	**0.5A**	**0.05A**
10	**COND.10**	**15.19A**	**15.19A**	**10.5A**	**10.5A**	**10.5A**	**10.5A**	**0.42A**	**2.94A**
11	**COND.11**	**16A**	**16A**	**12A**	**12A**	**12A**	**12A**	**0.5A**	**2A**

Cond. 11 at 115Vac/60Hz and less then 0.5S

Cond. 1 at 115Vac/60Hz 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

17.0 mS minimum : at 115V / 60 Hz. (100%LOAD,COND 10)

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 : **6.7V** (maximum)

+3.3V : **4.3V** (maximum)

+12V : **15.6V** (maximum)

3.5.2 Under-voltage protection

In the event of an under-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 : **4.2V** (minimum)

+3.3V : **2.6V** (minimum)

+12V : **10.0V** (minimum)

3.5.3 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 from full load.

Over-current test values:

Output Voltage	3.3V	5V	$12V_{1,2,3,4}$
Protecting trigger condition	< 60A	< 48A	19~26A

3.5.4 Short-Circuit 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.

3.5.5 Over-Temperature Protection

The power supply must protect itself by Over Temperatur Protection, no any components damaged.

3.5.6 Over-Power Protection

The power supply must protect itself by Over Power Protection, no any components damaged.

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.10)

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

The test condition: 115Vac/60Hz

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

3.8 EFFICIENCY requirement of main output

The PSU should be a minimum of 87% efficiency under 100% of full load and minimum of 90% efficiency under 50% of full load, and minimum of 87% efficiency under 20% of full load.That should be tested at nominal Input voltage is 115V/60Hz and load conditions defined in below Table.

loading	**+12V1**	**+12V2**	**+12V3**	**+12V4**	**+5V**	**+3.3V**	**-12V**	**+5Vsb**
100%	**10.5A**	**10.5A**	**10.5A**	**10.5A**	**15.19A**	**15.19A**	**0.42A**	**2.94A**
50%	**5.25A**	**5.25A**	**5.25A**	**5.25A**	**7.59A**	**7.59A**	**0.21A**	**1.47A**
20%	**2.1A**	**2.1A**	**2.1A**	**2.1A**	**3.04A**	**3.04A**	**0.08A**	**0.59A**

(230Vac input/ minimum of 90% efficiency under 50% of full load)

3.9 EFFICIENCY requirement of standby output(230V/50Hz)

The +5Vsb supply efficiency should be greater then 50% with a minimun loading of 100mA and input voltage is set up at 230Vac/50HZ when main O/P off (PS_ON# high state).

3.10 POWER GOOD SIGNAL Time sequence

Measure condition :115V/60Hz (FULL LOAD)

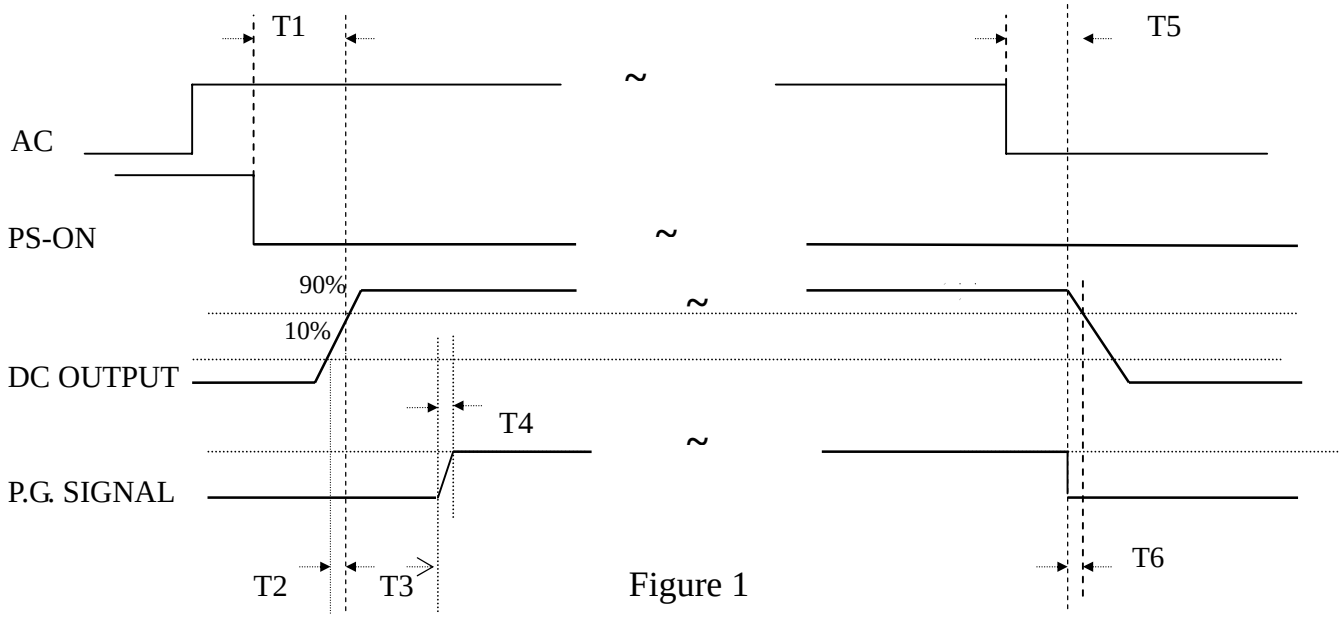

Figure 1

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＞17mS

T6: Power Fail Delay Time＞1mS

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
+12V	6A
+5 V	4A
+3.3 V	4A
-12 V	0.1A
+5 VSB	0.25A

(Adding external capactor of Section 3.12)

Output voltages should remain within the regulation limits of Section 3.1, 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
- AC input range per Section 2.0

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	ATX12V Capacitive load (uF)
+12 V	10000
+5 V	6000
+3.3 V	6000
-12 V	350
+5 VSB	6000

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.

4.0 Physical Environment

4.1 Temperature

4.1.1 Operating Ambient: +0 to 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

-CB REPORT

-TUV EN 60950

-ULOR CUL

-BSMI

-CCC

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 4dB 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℃.

7.0 Revision History:

Rev	Description	Date
1	Initial released	2010/06/23
2	CHANGE LOAD REGULATION CHARACTERISTICS.	2010/08/06
3	CHANGE 12V OCP SPEC.& EFFICIENCY TABLE	2010/10/26
4	TYPO ERROR	2011/07/21