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SPECIFICATION

FSP350-60GHC(85)

With -5V Output

9PA350AP01

**Main Feature:
Meet 80 plus Bronze
Meet 2013 ErP
Active PFC Circuit
Full Range Input
ATX2.4 Version**

Apr. 8, 2014

REV : 1.01



MODEL: FSP350-60GHC(85)

Revision History

<u>Rev</u>	<u>Description</u>	<u>Date</u>	<u>Author</u>
1.00		2013/11/12	
1.01	Revise 4.1. OUTPUT VOLTAGE AND CURRENT RATING 4.2. LOAD CAPACITY SPECIFICATIONS 6.3. VIBRATION	2014/04/08	

1. GENERAL DESCRIPTION AND SCOPE

This is the specification of Model FSP350-60GHC(85); AC-line powered switching power supply with active PFC (Power Factor Correction) circuit, meet EN61000-3-2 and with Full Range Input features. Also, +5Vsb power is less than $0.5W_{input}$ at power off mode (PS_ON input at high state) which is comply with ErP Lot 6 year 2013 requirement.

The specification below is intended to describe as detailedly as possible the functions and performance of the subject power supply. Any comment or additional requirements to this specification from our customers will be highly appreciated and treated as a new target for us to approach.

2. REFERENCE DOCUMENTS

The subject power supply will meet the EMI requirements and obtain main safety approvals as following:

2.1. EMI REGULATORY

- FCC Part 15 Subpart J, Class 'B' 115 Vac operation.
- CISPR 22 Class 'B' 230 Vac operation.

2.2. SAFETY

- NEMKO EN 60950-1: 2001; A11
- TUV EN 60950-1
- CSA EN 60950-1-03
- IEC EN 60950-1
- UL EN 60950-1, First Edition
- FCC CISPR22/1997(Class B Limit)
- CE :
EN 55022/2006(CISPR 22/2005)
EN 55024/1998+A1/2001+A2/2003
EN 61000-3-2/2006
EN 61000-3-3/1995+A1/2001+A2/2005
EN 61204-3/2000

3. INPUT ELECTRICAL SPECIFICATIONS

3.1. AC INPUT

Parameter	Min.	Nom. ⁽¹⁾	Max.	Unit
V _{in} (115VAC)	90	115	135	VAC _{rms}
V _{in} (230VAC)	180	230	264	VAC _{rms}
V _{in} Frequency	47	--	63	HZ

◆ Nominal voltages for test purposes are considered to be within $\pm 1.0V$ of nominal.

3.2. INRUSH CURRENT

Maximum inrush current from power-on (with power on at any point on the AC sine) and including, but not limited to, three line cycles, shall be limited to a level below the surge rating of the input line cord, AC switch if present, bridge rectifier, fuse, and EMI filter components. Repetitive ON/OFF cycling of the AC input voltage should not damage the power supply or cause the input fuse to blow.

3.3. INPUT LINE CURRENT & POWER FACTOR (P.F.)

(At Full load)

AC input	Input line current	P.F.@ Full Load	P.F.@ Pin=75W
115V	< 4.0Amps – rms	> 0.95	> 0.8
230V	< 2.0Amps – rms	> 0.9	> 0.65

3.4. EFFICIENCY

3.4.1. General

Under the load conditions defined in Table 1 and Table 2. The loading condition for testing efficiency shown in Table 1 represents a fully loaded system. A ~ 50% (typical) loaded system. And a ~ 20% (light) loaded system.

Table 1. Loading Table for Efficiency Measurements

350W(loading shown in Amps)						
Loading	+12V1	+12V2	+5V	+3.3V	-12V	+5Vsb
FULL	10.66	10.66	9.45	9.92	0.38	1.90
TYPICAL	5.33	5.33	4.72	4.96	0.19	0.95
LIGHT	2.13	2.13	1.89	1.98	0.08	0.38

Table 2. Minimum Efficiency Vs Load

Loading	Voltage	FULL	TYPICAL	LIGHT
Required Minimum Efficiency	115V	82%	85%	82%
Required Minimum Efficiency	230V	82%	85%	82%

3.4.2 Standby Power Consumption (+5Vsb):

Input Power < 0.5W @ 5Vsb/45mA & 230Vac input

PS_ON input signal @ High State

4. OUTPUT ELECTRICAL REQUIREMENTS**4.1. OUTPUT VOLTAGE AND CURRENT RATING**

Output	MINIMUM LOAD	NORMAL LOAD	MAXIMUM LOAD	PEAK LOAD	LOAD REG.	LINE REG.	Ripple & Noise
+3.3V	0.1A	10.5A	21A		±5%	±1%	50mV P-P
+5V	0.2A	10A	20A		±5%	±1%	50mV P-P
+12V1	1A	7.5A	15A		±5%	±1%	120mV P-P
+12V2	0.05A	7.5A	15A	18A	±5%	±1%	120mV P-P
-5V	0A	0.15A	0.3A		±10%	±1%	120mV P-P
-12V	0A	0.25A	0.5A		±10%	±1%	120mV P-P
+5VSB	0A	1.25A	2.5A	3.5A	±5%	±1%	50mV P-P

(1) +3.3V & +5V total output not exceed 105W.

(2) Maximum combined current for the +12V outputs shall be 28A .

(3) +12V2 Peak current is 18A (less then 10m Sec.) , minimum voltage during peak is >11.0Vdc.

(4) +5Vsb Peak current is 3.5A(less then 500m Sec.) , minimum voltage during peak is > 4.5Vdc.

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

4.2. LOAD CAPACITY SPECIFICATIONS

The cross regulation defined as follows, the voltage regulation limits DC include DC Output ripple & noise.

LOAD	+3.3V	+5V	+12V1	+12V2	-5V	-12V	+5VSB
Condition_1	X	X	X	X	X	X	2.5A
Condition_2	0.2A	0.2A	1A	0.05A	0A	0A	0A
Condition_3	0.3A	0.2A	1A	1A	0A	0.5A	0.1A
Condition_4	0.5A	3A	15A	12.5A	0A	0A	0.5A
Condition_5	0.1A	15A	2A	2A	0.3A	0A	0.5A
Condition_6	1A	20A	10A	9A	0A	0.5A	2.5A
Condition_7	10A	10A	6A	15A	0.2A	0.25A	2A
Condition_8	18A	2A	2A	2A	0A	0A	1A
Condition_9	21A	7.1A	9.8A	9A	0.1A	0.5A	2.5A
Condition_10	8.5A	8A	10A	8A	0.1A	0.5A	2.5A

4.3. HOLD-UP TIME (@Condition_10)

115V / 60Hz : 17 mSec. Minimum.

230V / 50Hz : 17 mSec. Minimum.

The output voltage will remain within specification, in the event that the input power is removed or interrupted, for the duration of one cycle of the input frequency. The interruption may occur at any point in the AC voltage cycle. The power good signal shall remain high during this test.

4.4. OUTPUT RISE TIME

(10% TO 90% OF FINAL OUTPUT VALUE, @ FULL LOAD)

115V-rms or 230V-rms

+ 3.3Vdc : 20ms Maximum

+ 5Vdc : 20ms Maximum

+ 12Vdc : 20ms Maximum

+ 5Vsb : 20ms Maximum

-5Vdc : 20ms Maximum

- 12Vdc : 20ms Maximum

4.5. OVER VOLTAGE PROTECTION

Voltage Source	Protection Point
+3.3V	3.76V-4.8V
+5V	5.6V-7.0V
+12V	13.0V-16.5V

4.6. OVER CURRENT PROTECTION

Output Voltage	Max. over current limit
+3.3V	60A
+5V	48A
+12V1	30A
+12V2	30A

4.7. SHORT CIRCUIT PROTECTION

Output short circuit is defined to be a short circuit load of less than 0.1 ohm.

In the event of an output short circuit condition on +3.3V, +5V, +12V or -12V output, the power supply will shutdown and latch off without damage to the power supply. The power supply shall return to normal operation after the short circuit has been removed and the power switch has been turned off for no more than 2 seconds.

4.8. POWER SIGNAL

POWER GOOD @ 115/230V, FULL LOAD	100 –500mSec.
POWER FAIL @ 115/230V, FULL LOAD	1 mSec. minimum

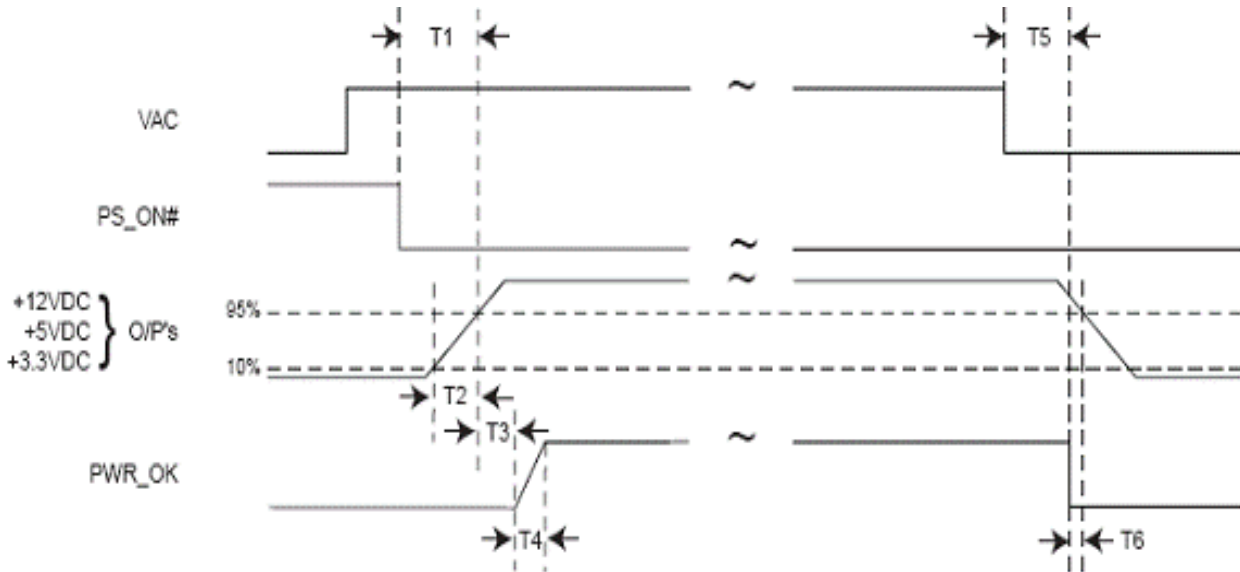


Figure:

T1: Power-on time shall be less than 500 ms ($T1 < 500 \text{ ms}$).

T2: Rise time : 0.1 ms to 20 ms ($0.1 \text{ ms} \leq T2 \leq 20 \text{ ms}$).

T3: Power-ok delay time: $100 \text{ ms} < T3 < 500 \text{ ms}$

T4: Power-ok rise time: $T4 \leq 1 \text{ ms}$

T5 + T6: AC loss to PWR_OK hold-up time : $T5 + T6 \geq 17 \text{ ms}$

5. FAN NOISE REQUIREMENTS

5.1. The subject power supply is cooled by a self-contained, 80mm, 12VDC fan.

6. ENVIRONMENTAL REQUIREMENTS

The power supply will be compliant with each item in this specification for the following Environmental conditions.

6.1. TEMPERATURE RANGE

Operating	+10 to +50 deg. C
Storage	-20 to +80 deg. C

6.2. HUMIDITY

Operating	5 –95% RH, Non-condensing
Storage	5 –95% RH, Non-condensing

6.3. VIBRATION

Random Vibration

0.01g²/ Hz at 5 Hz, sloping to 0.02g²/ Hz at 20 Hz, and maintaining 0.02g²/ Hz from 20Hz to 500Hz. The area under the PSD curve is 3.13gRMS.

The duration shall be 20 minutes per axis for all three axes on all samples.

6.4. GROUND LEAKAGE CURRENT

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

6.5. RELIABILITY

The power supply reliability, when calculated by MIL-HDBK-217; latest revision, are exceed 100,000 hours with all output at maximum load and an ambient temperature of 25°C.

6.6. DIELECTRIC STRENGTH

Primary to Frame Ground : 1800 Vac for 1 sec.

Primary to Secondary : 1800Vac for 1 sec

6.7. INSULATION RESISTANCE

Primary to Frame Ground : 20 Meg.ohms Minimum

Primary to Secondary : 20 Meg.ohms Minimum

7. LABELLING

Label marking will be permanent, legible and complied with all agency requirements.

7.1. MODEL NUMBER LABEL

Labels will be affixed to the sides of the power supply showing the following:

- Manufacturer's name and logo.
- Model no., serial no., revision level, location of manufacturer.
- The total power output and the maximum load for each output.
- AC input rating.

8. MECHANICAL SPECIFICATIONS

The mechanical drawing of the subject power supply, which indicate the form factor, location of the mounting holes, location, the length of the connectors, and other physical specifications of the subject power supply. Please refer to the attachment drawing.