

# SPECIFICATION



ESD14050298

FSP400-70MPD

Released Date:2015/09/08-09:41:13



全漢企業股份有限公司  
FSP TECHNOLOGY INC.

# SPECIFICATION

## **FSP400-70MPD**

**Main Feature:  
Active PFC Circuit  
Full Range Input**

**JUL 22 , 2015  
REV: 1.5**



全漢企業股份有限公司  
FSP TECHNOLOGY INC.

**MODEL: FSP400-70MPD**

**Revision History**

<u>Rev</u>	<u>Description</u>	<u>Date</u>	<u>Author</u>
1.1	Update 5.3. VIBRATION & 5.4. SHOCK	10.6.2014	Karl
1.2	增加 115V Internal Non-Redundant	10.29.2014	Kelly
1.3	+12V2 minimum load → 0.05A	12.24.2014	Winnie (Karl)
1.4	7.1. RADIATED EMI add EMC Performance	6.18.2015	Joanna (Karl)
1.5	針對醫療類SPEC 調整及修正	7.22.2015	Joanna (Karl)

## 1. GENERAL DESCRIPTION

This series of AC/DC switching power supplies in a standard ATX form factor 140 x 150 x 86 mm are capable of delivering 400 watts continuous power. The special features are:

- Medical safety standard IEC 60601-1 compliance
- High efficiency meet 80PLUS GOLD requirement
- +12V2 minimum load comply with Intel HASWELL platform requirement
- Hi-Pot 1500Vac between output and Protect Earth.
- High altitude 5000 meters operation

## 2. INPUT ELECTRICAL SPECIFICATIONS

### 2.1 VOLTAGE RANGE

<b>INPUT VOLTAGE</b>	90 ~ 264 Vac
----------------------	--------------

### 2.2 INPUT FREQUENCY

<b>INPUT FREQUENCY</b>	47 ~ 63 Hz
------------------------	------------

### 2.3 INRUSH CURRENT

50A maxi.	115Vac cold start and 25°C
100A maxi.	230Vac cold start and 25°C

### 2.4 INPUT LINE CURRENT

115V	6.0 Amps – rms maximum
230V	3.0 Amps – rms maximum

**2.5 Power Factor Correction:** Active PFC 0.98 minimum at 264Vac input

### 2.6 EFFICIENCY

Efficiency meet 80PLUS GOLD requirement.

<b>INPUT VOLTAGE</b>	<b>100% LOAD</b>	<b>50% LOAD</b>	<b>20% LOAD</b>
115VAC	87%	90% / PFC .90	87%

Loading table for efficiency test.

<b>LOADING</b>	<b>+12V1</b>	<b>+12V2</b>	<b>+5V</b>	<b>+3.3V</b>	<b>-12V</b>	<b>+5Vsb</b>
<b>Full (100%)</b>	11.77	11.77	11.01	12.85	0.48	2.85
<b>Typical (50%)</b>	5.89	5.89	5.51	6.42	0.24	1.43

<b>Light (20%)</b>	2.35	2.35	2.2	2.57	0.1	0.57
--------------------	------	------	-----	------	-----	------

## 2.7 PS\_ON#

PS\_ON# is an active-low, TTL-compatible signal. When PS\_ON# is pulled to TTL low, the power supply should turn on the five main DC output rails (+12V, +5V, +3.3V, -5V and -12V). When PS\_ON# is pulled to TTL high or open-circuited, the DC output rails should not deliver current and should be held at zero potential with respect to ground. An internal pull-up resistor & de-bounce circuitry is provided on PS\_ON# to prevent it from oscillating on/off at startup when activated by a mechanical switch.

### PS\_ON# Signal Characteristics

PS_ON# Signal	Min.	Max.
V <sub>IL</sub> , Input Low Voltage	0.0V	0.8V
I <sub>IL</sub> , Input Low Current (V <sub>in</sub> = 0.4V)		-1.6mA
V <sub>IH</sub> , Input High Voltage (I <sub>in</sub> = -200 μA)	2.0V	
V <sub>IH</sub> Open Circuit (I <sub>in</sub> = 0)		5.25V

## 3. OUTPUT ELECTRICAL SPECIFICATIONS

### 3.1 OUTPUT RATING

Outputs Rating	Mini. Load	Maxi. Load	Load Regulation	Ripple & Noise (2)
+3.3 V	0.1 A	21 A	±5%	50 mV <sub>P-P</sub>
+ 5 V	0.1 A	18 A	±5%	50 mV <sub>P-P</sub>
+12 V1	0.2 A	18 A	±5%	120 mV <sub>P-P</sub>
+12 V2	0.05A	18 A	±5%	120 mV <sub>P-P</sub>
- 5 V (1)	0 A	0.2 A	±5%	50 mV <sub>P-P</sub>
-12 V	0 A	0.5 A	±5%	120 mV <sub>P-P</sub>
+5 Vsb	0 A	3 A	±5%	50 mV <sub>P-P</sub>
+3.3 V & +5 V Combine Output Power			120W Maxi.	
+12V Total Output Current			29A Maxi.	
Total Output Power			400W	

#### Note:

- (1) Optional -5V output is upon request but not for standard model.
- (2) Ripple and noise measurements shall be made under all specified load conditions through a single pole low pass filter with 20MHz cutoff frequency. Outputs shall be bypassed at the connector with a 0.1uF ceramic disk capacitor and a 10uF electrolytic capacitor to simulate system loading.

**CROSS REGULATION LOADING TABLE**

Condition	+12V1	+12V2	+5V	+3.3V	-12V	+5Vsb	-5V
1	11.77A	11.77A	11.01A	12.85A	0.48A	2.85A	0A
2	1A	1A	2A	21.0A	0.5A	3.0A	0.2A
3	18.0A	11.0A	8A	0.1A	0.1A	2A	0A
4	2A	2A	18.0A	0.1A	0.1A	0A	0A
5	5.89A	5.89A	5.51A	6.42A	0.24A	1.43A	0A
6	18.0A	0.05A	3A	0.1A	0.2A	0.1A	0.2A
7	0.2A	18.0A	3A	0.1A	0.1A	0.1A	0A
8	0.2A	0.05A	0.1A	0.1A	0.3A	0A	0A
9	2.35A	2.35A	2.2A	2.57A	0.1A	0.57A	0A

**3.2 HOLD-UP TIME**

115V / 60Hz : 12 mSec. Minimum at 100% load.

230V / 50Hz : 17 mSec. Minimum at 100% load

**3.3 OUTPUT RISE TIME**

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

115V-rms or 230V-rms      + 5Vdc : 20ms Maximum  
    +3.3Vdc : 20ms Maximum  
    +12Vdc : 20ms Maximum  
    -12Vdc : 20ms Maximum

**3.4 PROTECTION****3.4.1 OVER VOLTAGE PROTECTION**

The Over voltage protection (OVP) will active if an internal fault occurs in PSU. The PSU will shut down and **latch off** when output voltage achieved as bellow table.

Output Rail	Limited Output Voltage
+ 3.3 V	3.7V ~ 4.8V
+5V	5.7V ~ 7.0V
+12V <sub>1</sub> & +12V <sub>2</sub>	13.4V ~ 16.0V

**3.4.2 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, -12V and -5V output, the PSU will shut down and **latch off** without damage. The PSU shall return to normal operation after the short circuit has been removed and require remove the AC mains input or the power switch has been turned off and on.

### 3.4.3 OVER CURRENT PROTECTION

Over current protection (OCP) is happened if output current is achieved at following output rails. PSU is shut down and **latch off** without damage if OCP happened. The PSU shall return to normal operation when the over current is removed and require remove the AC mains input or the power switch has been turned off and on to reset the PSU.

Output Rail	Limited Output Current
+5V	25A ~ 40A
+3.3V	30A ~ 45A
+12V <sub>1</sub> & +12V <sub>2</sub>	20A ~ 30A

### 3.4.4 OVER TEMPERATURE PROTECTION

PSU is shut down and **latch off** without damage if over temperature happened. The PSU shall return to normal operation when the power supply is cooled down and require remove the AC mains input or the power switch has been turned off and on to reset the PSU.

## 3.5 POWER GOOD SIGNAL

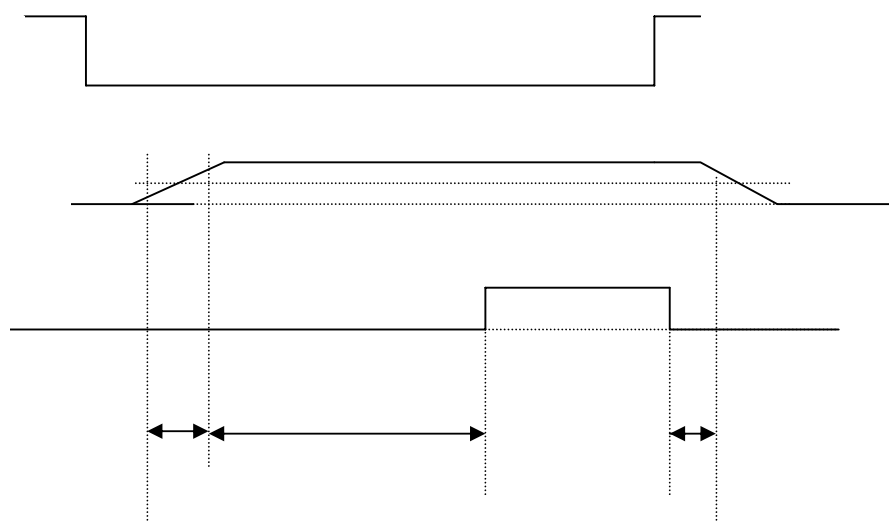
The power good signal is a TTL compatible signal for the purpose of initiating an orderly star-up procedure under normal input operating conditions. This signal is asserted (low) until +5Vdc has reached 4.75 volts during power up. Characteristics:

TTL signal asserted (low state) : less than 0.5V while sinking 10mA.

TTL signal asserted (high state): greater than 4.75V while sourcing 500uA.

High state output impedance: less or equal to 1K ohm from output to common.

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

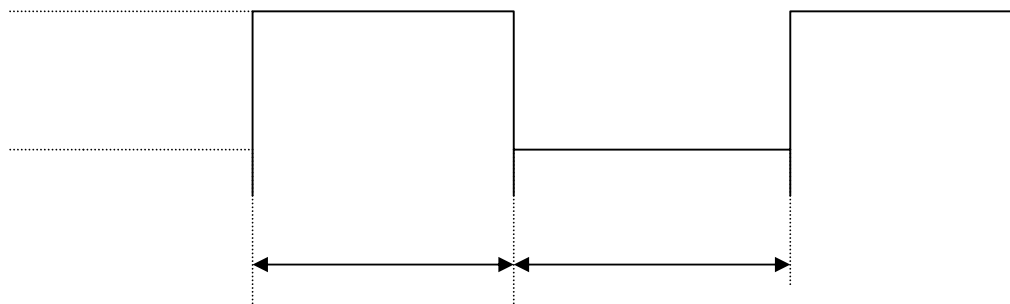


## 3.6 OUTPUT TRANSIENT LOAD RESPONSE

+5V and +12V must be within specification for a step change in current as specified below. The outputs will be tested one section at a time with all other sections at maximum load. The test transition will be from IA to IB and IB to IA. The step current will have a nominal transition time of 0.5 Amp per microsecond for +5V and 0.1 Amp per microsecond for +12V.

**Transient Load Requirement**

Output	△Step Load Size	Load Slew Rate	Capacitive Load
+3.3V	30% of max load	0.5 A/μs	6000 μF
+5V	30% of max load	0.5 A/μs	6000 μF
+12V1,V2	30% of max load	1.0 A/μs	4700 μF



**+5Vdc:**

- IA: 18.0 amps
- IB: 12.6 amps
- Volts variation: 400 mV max (p-p)
- Setting time: 10 ms max
- +12V1/3A,+12V2/3A,,+3.3V/0.1A,+5VSB/0.1A,-12V/0.1A

**+12V1dc, +12V2dc**

- IA: 18.0 amps
- IB: 12.6 amps
- Volts variation: 550 mV max (p-p)
- Setting time: 10 ms max
- +5V/4A,+5VSB/0.1A,-12V/0.1A

**+3.3Vdc:**

- IA: 21.0 amps
- IB: 14.7 amps
- Volts variation: 400 mV max (p-p)



Setting time: 10 ms max  
+12V1/1A,+12V2/1A,+5VSB/0.1A,-12V/0.1

#### 4. SAFETY

##### 4.1 CERTIFICATE

CB IEC 60601-1  
UL, cUL ANSI/AAMI ES 60601-1  
TUV EN 60601-1  
CE

##### 4.2 LEAKAGE CURRENT

Earth leakage current 250uA maximum at 264Vac, 63Hz input.

##### 4.3 HIGH-POT VOLTAGE

Input to output: 4KV (2 MOPP)  
Input to PE 1.5KV (1 MOPP)  
Output to PE 1.5KV

#### 5. ELECTROMAGNETIC COMPATIBILITY (IEC60601-1-2)

##### 5.1 CONDUCTED EMI

EN55011:/EN55022 Class B conducted, Class B radiated  
FCC/VCCI: Class B conducted, Class B radiated

##### 5.2 RADIATED EMI

EN61000-3-2: Harmonic distortion, Class D  
EN61000-3-3: Line flicker  
EN61000-4-2: ESD,  $\pm 8$  KV air and  $\pm 6$  KV contact  
EN61000-4-3: Radiated immunity, 3V/m  
EN61000-4-4: Fast transient/burst,  $\pm 2$  KV  
EN61000-4-5: Surge,  $\pm 1$  KV diff.,  $\pm 2$  KV com.  
EN61000-4-6: Conducted immunity, 3 Vrms  
EN61000-4-8: Magnetic field immunity, 3A/m  
EN61000-4-11: Voltage dip immunity, 30% reduction for 500 mS, 60% reduction for 100 mS, and >95% reduction for 10 ms.

## 6. ENVIRONMENTAL SPECIFICATION

### 6.1 TEMPERATURE

<b>OPERATING</b>	0 to +50 °C
<b>STORAGE</b>	-40 to +80 °C

### 6.2 HUMIDITY

<b>OPERATING</b>	5 ~85% RH, non-condensing
<b>STORAGE</b>	5 ~95% RH, non-condensing

### 6.3 VIBRATION

The subject power supply will withstand along three mutually perpendicular axes as the following imposed conditions without experiencing non-recoverable failure or deviation from specified output characteristics.

**0.01g<sup>2</sup>/Hz at 5 Hz sloping to 0.02g<sup>2</sup>/Hz at 20 Hz, and maintaining 0.02g<sup>2</sup>/Hz from 20 Hz to 500 Hz. The area under the PSD curve is 3.13gRMS. The duration shall be 20 minutes per axis for all three axes on all samples.**

## 7. MECHANICAL SPECIFICATION

### 7.1 MECHANICAL DRAWING

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.

### 7.2 LABELLING

Label marking will be permanent, legible and complied with all agency requirements. Please refer to label drawing for the details.

**7.3 FAN ACOUSTIC NOISE:** 40 dB maximum at 100% load & rated input voltage.

**7.4 WEIGHT:** 1.8 Kg typical

## 8. RELIABILITY

The power supply have a minimum predicted MTBF (MIL-HDBK-217) of 200,000 hours of continuous operation at 25°C, maximum-output load, and nominal AC input voltage.