



**HIGH POWER ELECTRONIC CO., LTD**

**Part Name:**

**Model No: HPM-650GD-F14C**

**Document Version: A0**

## PRODUCT SPECIFICATION

*Release Date:2014/03/13*

<b>Approved by :</b>	<b>Checked by :</b>	<b>Prepared by :</b>

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# ***HIGH POWER ELECTRONIC CO., LTD***

## **Switching Power Supply Specifications**

### **Subject: Change History of Specification**

日期	版本	修訂 頁面	變 更 內 容	REF NO.
2013/03/13	A0	--	initial	---



## Table of Contents

### **1 General**

- 1.1 Scope

### **2 Input Characteristics**

- 2.1 Input Voltage
- 2.2 Input Frequency
- 2.3 Max. Input AC Current
- 2.4 Inrush Current
- 2.5 Efficiency

### **3 Output characteristics**

- 3.1 Nominal Operation Output
- 3.2 Remote On/Off controlled mode
- 3.3 Regulation
- 3.4 Rise Time
- 3.5 Hold-up Time
- 3.6 5 VSB
- 3.7 PG-OK
- 3.8 3.3V Sense
- 3.9 Capacitive Load

### **4 Protection**

- 4.1 Input Protection
- 4.2 Output Protection

### **5 Start Stability**

- 5.1 No Load Start
- 5.2 Cold Start

### **6 Environments**

- 6.1 Temperature and Humidity
- 6.2 Altitude
- 6.3 Vibration and Shock



## **7 Conducted EMI**

## **8 Product Safety**

- 8.1 Safety Requirement
- 8.2 Leakage Current
- 8.3 Insulation Resistance
- 8.4 Dielectric Voltage Withstand

## **9 Power Good Signal**

## **10 MTBF**

## **11 Burn-In**

- 11.1 Input Voltage
- 11.2 Test Condition

## **12 Harmonics**

## **13 Power Factor**

## **14 Mechanical Specification**

- 14.1 Outline Dimension
- 14.2 Weight
- 14.3 Pin Assignment



# Switching Power Supply Specifications

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## 1. General

### 1.1 Scope

This specification defines the performance characteristics of a single phase 650watts, 5 output power supply. This specification also defines worldwide safety and electromagnetic compatibility requirements for the power supply which is intended for use in computer products.

## 2. Input Characteristics

### 2.1 Input Voltage

Nominal Voltage	Voltage Variation Range
----- 100-240 Vrms	----- 90 - 264 Vrms

### 2.2 Input Frequency

Nominal Frequency	Frequency Variation Range
----- 50-60 Hz	----- 47 Hz to 63 Hz

\* The power supply must operate at above frequency with 90-264 VACrms input voltage range.

### 2.3 Max. Input AC Current

Max. Input Current	Measuring Range
----- 10A	----- 90 - 264 Vrms

### 2.4 Inrush Current

The power supply must meet inrush requirements for any rated AC voltage, during turn on at any phase of AC voltage, during a single cycle AC dropout condition, during repetitive ON/OFF cycling of AC, and over the specified temperature range. The peak inrush current shall be less than the ratings of its critical components (including input fuse, bulk rectifiers, and surge limiting device).

### 2.5 Efficiency

HPM-650GD-F14C provides an efficiency of **87%** minimum when measured at full load under 115V/60Hz and 230V/50Hz condition.



## Switching Power Supply Specifications

### 3. Output characteristics

#### 3.1 Normal Operation Output

Output Voltage	Load MIN	Range MAX	Regulation	Ripple & Noise P-P Max.
1. +5V	0.0A	22A	±5%	50mV
2. +12V	0.0A	54.2A	±5%	120mV
4. -12V	0.0A	0.3A	±10%	120mV
5. +5Vs	0.0A	3.0A	±5%	50mV
6. +3.3V	0.0A	22.0A	±5%	50mV

- Maximum continuous total DC output power should not exceed 650W.
- Maximum continuous combined load on +3.3VDC and +5VDC outputs shall not exceed 120W.
- Maximum combined load on +12V outputs shall not exceed 650W.

#### NOTE:

Noise test should be measured with 20 MHz bandwidth frequency oscilloscope. The output terminal shall add a tantalum capacitor of 10uF in parallel with a ceramic capacitor of 0.1uF.

#### 3.2 Remote On/Off Controlled mode

The PSON# signal is required to remotely turn on/off the power supply, PSON# is an active low signal that turns on the output power rails. When this is not pulled low by the system, or left open, the outputs (except the +5VSB) turn off. This signal is pulled to a standby voltage by a pull-up resistor internal to the power supply.

TTL level "H" 2.0 V - 5.25 V  
"L" 0.0 V - 1.0 V

#### 3.3 Regulation

The cross regulation defined as follows, the output regulation should be within the specified range.

Load	+5V	+3.3V	+12V	-12V	+5Vsb
Light Load.	2.38A	2.38A	8.93A	0.05A	0.49A
Typical Load	5.96A	5.96A	22.32A	0.12A	1.24A
Full Load	11.92A	11.92A	44.65A	0.25A	2.47A

#### 3.4 Rise Time

DC output rise time is less than 20 mS at nominal line and full load.

#### 3.5 Hold-up Time

DC +5V output maintains at least 16mS after power off which hold within full load under 230V/50Hz condition.



## Switching Power Supply Specifications

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### 3.6 5VSB

5VSB is required for the implementation of PS-ON described above. 5VSB is a standby voltage that may be used to power circuits that require power input during the powered-down state of all power rails. The 5 VSB pin should deliver  $5V \pm 5\%$  at a minimum of 3.0 A for PC board circuits to operate. Conversely, PC board should draw no more than 3.0A maximum from this pin. This power may be used to operate circuits such as soft power control.

### 3.7 PG-OK

PG-OK is a power good signal and should be asserted high by power supply to indicate that the +5 VDC and +3.3 VDC outputs are above the under-voltage thresholds of the power supply. When this signal is asserted high, there should be sufficient mains energy stored by the converter to guarantee continuous power operation within specification. Conversely, when either the +5VDC or the +3.3VDC output voltage falls below the under-voltage threshold, or when mains power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PG-OK should be deasserted to a low state. See Figure 1 for a representation of the timing characteristics of the PG-OK,PS-ON, and germane power rail signals.

### 3.8 3.3V Sense

A default 3.3V sense line should be implemented pin 13 of the connector.

### 3.9 Capacitive Load

The power supply should be able to power up and operate normally with the following capacitances simultaneously present on the DC outputs.

Output	Capacitive load (uF)
+5V	6,000
+12V	8,000
+3.3V	6,000
-12V	350
+5VS	350

## 4. Protection

### 4.1 Input Protection

In primary circuit of the power supply, a protected fuse is inserted. Only internal fault of the power supply will cause the fuse blown. Any overload or short circuit at DC output will keep from fuse brown or fire hazard.



## **Switching Power Supply Specifications**

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### **4.2 Output Protection**

#### **4.2.1 Under voltage protection**

The +5V/+12V/+3.3V DC output are protected against the under voltage condition . range value can't be exceed 3.3~3.7V at 5V terminal and 8.5~9.5V at 12V, 2.0~2.4V at 3.3V.

#### **4.2.2 Over Voltage Protection**

The +12V/ DC output are protected against the over voltage condition . Maximum value can't be over 15.5V at 12V.

#### **4.2.3 Over Power Protection**

The power supply can be used electronic circuit to limit the output current against exceeding 10%-60% of surge output power or protected against excessive power delivery since short circuit of any output or over total power at high line.

#### **4.2.4 Short Circuit Protection**

Short circuit placed on +5V,+12V,+3.3V,-12V will latch off. +5VSB will auto-recovery.

#### **4.2.5 Over-Current Protection**

Current protection should be designed to limit the current to operate within safe operating conditions. Over current protection schemes where only the voltage output that experiences the over current event is shut off may be adequate to maintain safe operation of the power supply and the system; however, damage to the motherboard or other system components may occur. The recommended over current protection scheme is for the power supply to latch into the shutdown state. The setting of over current protection for each output rail is as following.

#### **4.2.6 Over-Temperature Protection**

This power supply includes an over-temperature protection sensor, which can trip and shut down the power supply at 110°C

## **5. Start Stability**

### **5.1 No Load Start**

When power is applied to HPM-650GD-F14C with no load connected or under minimum load connected, neither damage to power supply nor hazards to users will occur.

### **5.2 Cold Start**

The power supply shall operate properly when first applied at normal input voltage and or so maximum load after 4 hours storage in 0°C environment.





**Switching Power Supply Specifications**

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**6. Environments**

**6.1 Temperature and Humidity**

**6.1.1 Operating**

Temperature 0 to 40 °C (See Figure 2)  
Relative Humidity 20 to 90 %

**6.1.2 Storage**

Temperature -40 to 70 °C  
Relative Humidity 20 to 95 % noncondensing

**6.2 Altitude**

The power supply can operate normally at any altitude between 0 to 10000 feet.

**6.3 Vibration and Shock**

**Sweep and resonance search for each of X,Y,Z, axis at the sweep.**  
RATE of 1/OCTAVE/Min.

Frequency	Duration	Amplitude
5-55-10 Hz	30 minutes	0.35 mm

**7. Conducted EMI**

CE,FCC

**8. Product Safety**

**8.1 Safety Requirement**

cTUVus, CB,TUV

**8.2 Leakage Current**

The AC leakage current is less than 3.5mA when the power supply connect to 264Vac/50Hz .

**8.3 Insulation Resistance**

The insulation resistance should be not less than 30M ohm after applying of 500VDC for 1 minute.

**8.4 Dielectric Voltage Withstand**

The power supply shall withstand for 1 minute without breakdown the application of a 60Hz 1500V AC voltage applied between both input line and chassis (20mA DC cut-off current). Main transformer shall similarly withstand 3000Vac applied between both primary and secondary windings for a minimum of one minute.



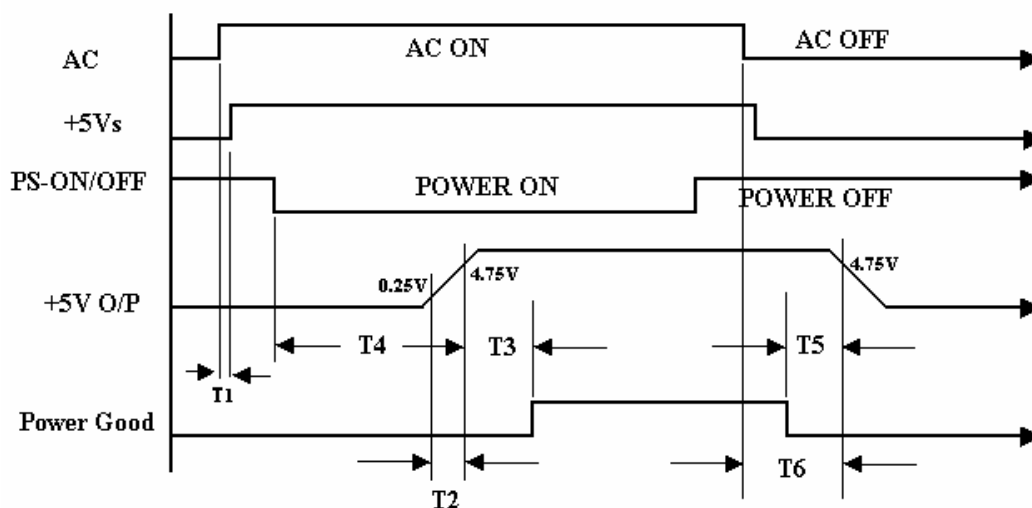
## Switching Power Supply Specifications

### 9. Power Good Signal

A TTL compatible signal for the purpose of initiating an orderly start-up procedure under normal input operating conditions. During power up, this signal is asserted ( low ) until +5V is under regulation and AC reaches min. line specification range. After all voltage are going appropriate level, the system may have a turn on delay of 100mS, but no greater than 500mS. During power off the signal should go to low level before +5V is out of regulation. The low level is 0 to 0.8V and high level is 4.75 to 5.25V. The " Power Good "signal can drive up to 6 standard TTL loads.

Time Diagram

Figure 1



- \* T1 : Turn on time ( 2 sec. Max.)
- \* T2 : Rise time (  $\leq$  20mS Max.)
- \* T3 : Power good turn on delay time (  $100 < T3 < 500$  mS )
- \* T4 : Switch on time (0.5 sec. Max.)
- \* T5 : Power good turn off delay time ( 1.0 mS Min.) PS-ON/OFF
- \* T6 : Power hold-on time ( 16 mS Min.)
- \* Power on-off cycle :

When the power supply is turned off for a minimum of 2.0 sec. and turn on again, the power good signal will be asserted.



## **Switching Power Supply Specifications**

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### **10. MTBF**

The MTBF of the power should be 100,000 hours min.

### **11. Burn-In**

#### **11.1 Input Voltage**

Applying 220Vac for 230V model.

#### **11.2 Test Condition**

Applying 75% loads for the power supply in 45 (+/-5) °C chamber for 4 hours.

### **12. Harmonics**

The product shall meet requirement for EN61000-3-2 & EN61000-3-3 :1995 standard of class D, test at 230Vac 50Hz.

### **13. Power Factor**

The power supply with active power factor correction, and meet the EN61000-3-2 standards, The power factor is greater than 0.9 at 230V/50Hz, Max. load.

### **14. Mechanical Specification**

#### **14.1 Outline Dimension**

Please refer the mechanical drawing of HPM-650GD-F14C

#### **14.2 Weight**

Maximum weight is 1.9 Kgs.

#### **14.3 Pin Designation :**

##### **14.3.1 DC CONNECTOR REQUIREMENTS**

List or recognized component appliance wiring material(AVLV2) , CN , rated min 85°C , 300VAC shall be used for all output wiring.



## Switching Power Supply Specifications

### 14.3.2 BASEBOARD CONNECTOR

PA

Connector : MOLEX 39-01-2200 or Approved Equivalent

18 AWG Wire	Signal	Pin	Pin	Signal	18 AWG Wire
Orange(18AWG)	+3.3 VDC	13	1	+3.3 VDC	Orange (18AWG)
Brown (22AWG)	+3.3V (SENSE)		2	+3.3 VDC	Orange (18AWG)
Blue	-12 VDC	14	3	COM	Black
Black	COM	15	4	+5 VDC	Red
Green (22AWG)	PS-ON	16	5	COM	Black
Black	COM	17	6	+5 VDC	Red
Black	COM	18	7	COM	Black
Black	COM	19	8	PWR_OK	Gray (22 AWG)
Red	+5 VDC	20	9	+5 Vsb	Purple (18AWG)
Red	+5 VDC	21	10	+12V1 DC	YELLOW
		22			

PA1

Red	+5 VDC	23	11	+12V1DC	Yellow
Black	COM	24	12	+3.3 VDC	Orange

### 14.3.3 Peripheral Connectors

PD1-4

PE

Connector : AMP 1-480424-9 or MOLEX 8981-04P or approved equivalent

Connector : AMP 171822-4 or approved equivalent

Contacts : AMP 61314-1 terminals or equivalent

Pin	Signal	20 AWG Wire	Pin	Signal	22 AWG Wire
1	+12 V DC	Yellow	1	+5 VDC	Red
2	COM	Black	2	COM	Black
3	COM	Black	3	COM	Black
4	+5 VDC	Red	4	+12 V DC	Yellow

### 14.3.4 Serial ATA Power Connector

PD1-4(A)

Connector : MOLEX 88751 or equivalent

Pin	Signal	18 AWG Wire
1	+3.3VDC	Orange
2	COM	Black
3	+5 VDC	Red
4	COM	Black
5	+12VDC	Yellow



**Switching Power Supply Specifications**

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**14.3.5 +12V Power Connector**

PB Connector : Molex 39-01-3085 or equivalent

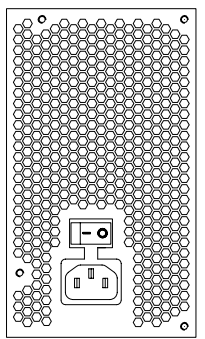
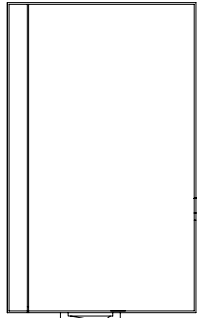
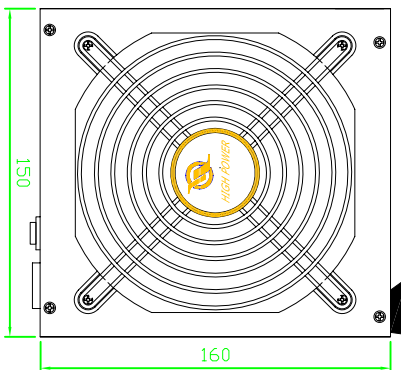
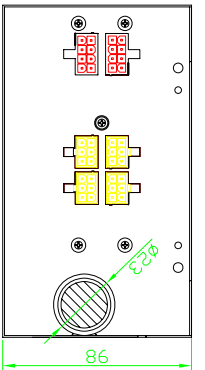
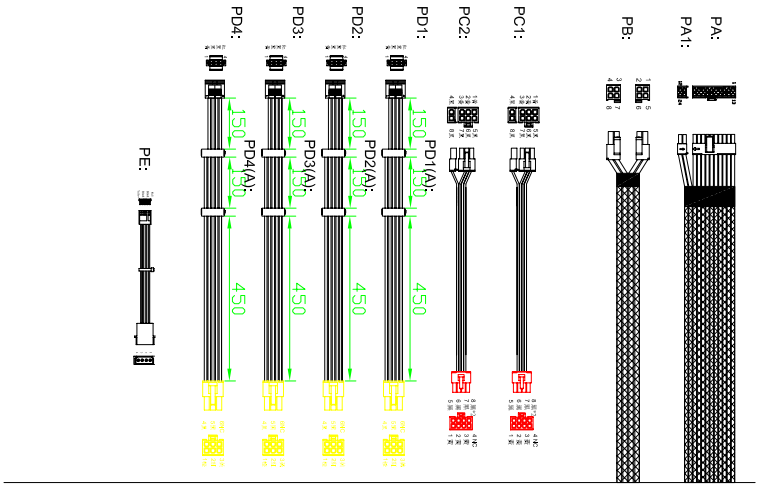
Pin	Signal	18 AWG Wire
1	COM	Black
2	COM	Black
3	COM	Black
4	COM	Black
5	+12 V2 DC	Yellow
6	+12 V2 DC	Yellow
7	+12 V2 DC	Yellow
8	+12 V2 DC	Yellow

**14.3.6 +12V Power Connector**

PC/PC1/PD/PD1 Connector : Molex 39-01-3085 or equivalent

Pin	Signal	18 AWG Wire
1	+12 V1 DC	Yellow
2	+12 V1 DC	Yellow
3	+12 V1 DC	Yellow
4	COM	Black
5	COM	Black
6	COM	Black
7	COM	Black
8	COM	Black

DIM.	
PA:	600+30MM
	-0MM
PA1:	605+30MM
	-0MM
PB:	600+30MM
	-0MM
PC1-2:	500+30MM
	-0MM
PC1-4:	500+30MM
	-0MM
PD1-4(A):	500+30MM
	-0MM
PE:	150+30MM
	-0MM



REF. ID.	PIN NO.	COLOR	V
PA	1	ORANGE	+3.3V
	2	ORANGE	+3.3V
	3	BLACK	COM
	4	RED	+5V
	5	BLACK	COM
	6	RED	+5V
	7	BLACK	COM
	8	GRAY	PWR_OK
	9	PURPLE	+5VSB
	10	YELLOW	+12V1
	13	ORANGE	+3.3V
	14	BROWN	+3.3V (SENSE)
PA1	15	BLUE	+12V
	16	BLACK	COM
	17	GREEN	PS_ON#
	18	BLACK	COM
	19	BLACK	COM
	20	BLACK	COM
	21	RED	+5V
	22	RED	+5V (SENSE)
	11	YELLOW	+12V1
	12	ORANGE	+3.3V
	23	RED	+5V
24	BLACK	COM	

REF. ID.	PIN NO.	COLOR	V
PB	1	BLACK	COM
	2	BLACK	COM
	3	BLACK	COM
	4	BLACK	COM
	5	YELLOW	+12V2
	6	YELLOW	+12V2
	7	YELLOW	+12V2
	8	YELLOW	+12V1
PC1-2	1	YELLOW	+12V1
	2	YELLOW	+12V1
	3	YELLOW	+12V1
	4	BLACK	COM
PD1-4	1	BLACK	COM
	2	BLACK	COM
	3	BLACK	COM
	4	RED	+5V
	1	RED	+5V
	2	BLACK	COM
	3	BLACK	COM
	4	YELLOW	+12V
PE	1	ORANGE	+3.3V
	2	BLACK	COM
	3	RED	+5V
	4	BLACK	COM
	5	YELLOW	+12V

修改日期	修改内容	NO	尺寸	蜂巢 (Pos)	彩盒 (PCS)
		A0		下接板	
		版本		上接板	

SHEET METAL TOLERANCE (UNLESS OTHERWISE SPECIFIED)			
DIMENSION	PIERCING	BENDING	ANGULAR
x < 8	±0.1	±0.15	±0.3°
8 < x < 25	±0.1	±0.2	±0.5°
25 < x < 100	±0.15	±0.25	±0.5°
100 < x < 300	±0.2	±0.3	±0.1°
300 < x < 800	±0.3	±0.5	±1.5°

DATE	APPROVED	CHECKED	DESIGNED
			曹坤
			2014.01.23

**HIGH POWER ELECTRONIC CO., LTD.**

REV: A0  
 1:1  
 01.025

MODEL NAME

500-650W