

# SPECIFICATION





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# SPECIFICATION

## HG750

9PA7503700



**Main Feature:**  
**High Efficiency**  
**Active PFC Circuit**  
**Full Range Input**  
**LLC Resonant**

**JUL 24, 2015**  
**REV : 000**



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**MODEL: HG750**

**Revision History**

<u>Rev</u>	<u>Description</u>	<u>Date</u>	<u>Author</u>
000-1		2015/04/08	Robertjohn
000-2	1. 變更第 7 頁 5vsb DYNAMIC & CAP LOAD	2015/06/25	Robertjohn
000-3	1. 變更第 8 頁 5.1 PWR_OK & 5.1.1 Hold-up Time	2015/07/24	Robertjohn

## 1. General Description Scope

This is the specification of Model HG750; AC-line powered switching power supply with active PFC (Power Factor Correction) circuit meets EN61000-3-2 and has full range input features.

The specification below is intended to describe the functions and performance of the proposal power supply. Any comments or additional requirements to the specification from our customers will be highly appreciated and treated as new target for us to reach.

## 2. Reference Documents

The proposal power supply will meet the EMI requirements and obtain main safety approval as follows:

### 2.1 EMI Regulatory

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

### 2.2 Safety

- NEMKO EN 60950
- TUV EN60950 OR VDE EN60950
- CSA-C22.2 NO. 60950
- IEC 60950
- UL 60950
- CE :  
EN 55022:1998+A1: 2000, Class B  
EN 61000-3-2: 2000  
EN 61000-3-3: 1995+A1: 2001  
CISPR22: 1997+A1: 2000, Class B  
AS/NZS CISPR 22: 2002, Class B

### 2.3 Input Line Current Harmonic Content

For sales in EU (European Union) or Japan the power supply shall meet the requirements of EN61000-3-2 Class D and the Guidelines for the Suppression of Harmonics in Appliances and General Use Equipment Class D for harmonic line current content at full rated power. See the following table for the harmonic limits.

Harmonic Order n	Per: EN 61000-3-2	Per: JEIDA MITI
	Maximum permissible Harmonic current at 230 VAC / 50 Hz in Amps	Maximum permissible Harmonic current at 100VAC / 50 Hz in Amps
	Odd harmonics	
3	2.3	5.29
5	1.14	2.622
7	0.77	1.771
9	0.4	0.92
11	0.33	0.759
13	0.21	0.483
15 ≤ n ≤ 39	0.15 x (15/n)	0.345 x (15/n)

### 3. Input Electrical Specifications

#### 3.1 AC Input

Parameter	Min	Nominal <sup>(1)</sup>	Max	Unit
$V_{IN}$ (115V <sub>AC</sub> )	90	115	135	V <sub>AC(RMS)</sub>
$V_{IN}$ (230V <sub>AC</sub> )	180	230	264	V <sub>AC(RMS)</sub>
$V_{IN}$ Frequency	47	-	63	Hz

◆ Nominal voltage 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 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.

For Denmark and Switzerland international safety requirements, if the internal over-current protective devices exceed 8A for Denmark and 10A for Switzerland, then the power supply must pass international safety testing to EN60950 using a maximum 16A over-current protected branch circuit, and this 16A (time delay fuse) branch circuit protector must not open during power supply abnormal operation (output short circuit and component fault) testing.

#### 3.3 Input Line Current

115V <sub>AC</sub>	9A – Max rms
230V <sub>AC</sub>	5A – Max rms

#### 3.4 Power Factor Requirement

Under the load conditions defined in Table 3.4.1, the power factor in different AC input voltage should meet the requirements showing in Table 3.4.2.

Table 3.4.1. Loading Table for Power Factor Measurements

Loading	+3.3V	+5V	+12V	-12V	+5Vsb
100%	14.68A	14.68A	50.76A	0.41A	2.84A

Table 3.4.2. Minimum Power factor V.S. Load

Loading	100%
115V <sub>AC</sub> / 60Hz	$\geq 0.99$
230V <sub>AC</sub> / 50Hz	$\geq 0.96$

#### 3.5 Efficiency

##### 3.5.1 General

Under the load conditions defined in Table 3.5.1, the testing efficiency in different AC input

voltage should meet the requirements showing in Table 3.5.2.

Table 3.5.1. Loading Table for 80PLUS Efficiency Measurements

Loading	+3.3V	+5V	+12V	-12V	+5Vsb
100%	14.68A	14.68A	50.76A	0.41A	2.84A
50%	7.34A	7.34A	25.36A	0.20A	1.42A
20%	2.94A	2.94A	10.16A	0.08A	0.57A

Table 3.5.2. Minimum Efficiency V.S. Load

Loading	100%	50%	20%
115V <sub>AC</sub> Required Minimum Efficiency	87%	90%	87%
230V <sub>AC</sub> Required Minimum Efficiency	87%	90%	87%

### 3.5.2 5V STBY Efficiency Requirements at Power OFF Mode

5Vsb efficiency is greater than 50% at power off mode (PS\_ON input at high state) in requirement (2), which is comply with Eup Lot 6 year 2013 requirement. 5Vsb output efficiency requirements at remote off are as follows:

Load Condition	2013 Efficiency Requirement
45mA	≥ 45%
550mA	≥ 55%
1A	≥ 70%
3.5A	≥ 70%

### 3.5 Mechanical Specifications

The proposal power supply is cooled by a self-contained 135×135mm fan on top side of case. Please refer to mechanical drawing of the proposal power supply which indicates the external form, location of the mounting holes, shapes of connectors, and other physical specifications.

## 4. DC Output Electrical Requirements

### 4.1 Output Voltage and Current Rating

Table 4.1.1 The voltage regulation of 10% load to 100% load

Output	Load Range	Voltage Range	Min.	Normal	Max.	Ripple & Noise
+3.3V	2.5A~25A	±3%	3.26V	3.36V	3.46V	40mV <sub>P-P</sub>
+5V	2.5A~25A	±3%	4.93V	5.09V	5.24V	40mV <sub>P-P</sub>
+12V	6A~62.5A	±1%	12.03V	12.15V	12.27V	60mV <sub>P-P</sub>
-12V	0A~0.5A	±10%	-10.80V	-12.00V	-13.20V	120mV <sub>P-P</sub>
+5Vsb	0.35A~3.5A	±3%	4.93V	5.09V	5.24V	40mV <sub>P-P</sub>

Table 4.1.2 The voltage regulation of 0% load to 10% load

Output	Load Range	Voltage Range	Min.	Normal	Max.	Ripple & Noise
+3.3V	0A~2.49A	±5%	3.14V	3.30V	3.47V	40mV <sub>P-P</sub>
+5V	0.1A~2.49A	±5%	4.75V	5.00V	5.25V	40mV <sub>P-P</sub>
+12V	0.2A~5.99A	±5%	11.40V	12.00V	12.60V	60mV <sub>P-P</sub>
-12V	0A~0.5A	±10%	-10.80V	-12.00V	-13.20V	120mV <sub>P-P</sub>
+5Vsb	0A~0.34A	±5%	4.75V	5.00V	5.25V	40mV <sub>P-P</sub>

Table 4.1.3 The Min and Max current rating

Output	Min Current	Normal Current	Max Current	Peak Current
+3.3V	0A	12A	25A	
+5V	0.1A	12A	25A	
+12V	0.2A	31A	62.5A	75A
-12V	0A	0.2A	0.5A	
+5Vsb	0A	1.5A	3.5A	

- (1) +3.3V & +5V total output not exceed 150W.
- (2) Maximum combined current for the 12V outputs shall be 62.50A.
- (3) Total output power for the proposal power supply is 750 watts.
- (4) The allowed peak power for 20ms is 900 watts.

Ripple and noise are defined as periodic random signals over a frequency band of 10Hz to 20MHz. Measurements shall be made with an oscilloscope with 20MHz bandwidth outputs should be bypassed at the connector with a 0.1uF ceramic disk capacitor and a 47uF electrolytic capacitor to simulate system loading.

#### 4.1.1 Remote Sensing

The +3.3V output should have provisions to compensate remotely for excessive cable drops. The default sense should be connected to pin 13 of the main power connector. The power supply should draw no more than 10mA through the remote sense line to keep DC offset voltages to minimum one.

## 4.2 Load Capacity Specifications

Load conditions of cross regulation are defined as follows. The voltage regulation and ripple noise should meet the table 4.1.2.

Item	Load	+3.3V	+5V	+12V	-12V	+5Vsb
(1)	CR1	0A	0A	62.0A	0A	2.0A
(2)	CR2	0A	0A	61.50A	0A	3.50A
(3)	CR3	0A	25.0A	50.50A	0.50A	3.50A
(4)	CR4	25.0A	0A	54.0A	0.50A	3.50A
(5)	CR5	20.0A	17.0A	49.50A	0A	2.0A
(6)	CR6	12.0A	12.0A	66.0A	0A	1.0A
(7)	CR7	13.0A	13.0A	54.0A	0A	0A
(8)	CR8	2.94A	2.94A	10.16A	0.08A	0.57A
(9)	CR9	0A	0.10A	0.20A	0A	3.50A
(10)	CR10	0A	0.10A	0.20A	0A	0A

## 4.3 Output Transient Response

### 4.3.1 Output Voltage Range

Output	Voltage Range	Min.	Normal	Max.
+3.3V	±5%	3.14	3.30	3.47
+5V	±5%	4.75	5.00	5.25
+12V	±5%	11.4	12.00	12.6
-12V	±10%	-10.80	-12.00	-13.20
+5Vsb	±5%	4.75	5.00	5.25

### 4.3.2 Dynamic Loading

Summarizes expected output transient step sizes for each output. The transient load slew rate is 1.0A/us.

#### *Transient Load Requirements*

Output	ΔStep Load Size	Load Slew Rate	Add Capacitor
+3.3V	50% of max load	1.0 A/μs	10000μF
+5V	50% of max load	1.0 A/μs	10000μF
+12V	35% of max load	1.0 A/μs	10000μF
-12V	0.1A	1.0 A/μs	350μF
+5Vsb	0.5A	1.0 A/μs	350μF

### 4.3.2 Capacitive Loading

#### *Capacitive Loading Conditions*

Output	Max
+3.3V	10000μF
+5V	10000μF
+12V	10000μF
-12V	350μF
+5Vsb	350μF



## 5. Timing

### 5.1 PWR\_OK

PWR\_OK is a “power good” signal. It should be asserted high by the power supply to indicate that the +12V<sub>DC</sub>, +5V<sub>DC</sub>, and +3.3V<sub>DC</sub> output are above the under-voltage thresholds listed in voltage table .Conversely, PWR\_OK should be de-asserted to a low state when any of the +12V<sub>DC</sub>, +5V<sub>DC</sub>, and +3.3V<sub>DC</sub> output voltages falls below its under-voltage threshold. Moreover, when main power has been removed for a long and sufficient time, the power supply operation cannot be guaranteed beyond the power down warning time.

#### PWR\_OK Signal Characteristics

Signal Type	+5 V TTL compatible
Logic level low	< 0.4 V while sinking 4 mA
Logic level high	Between 2.4 V and 5 V output while sourcing 200 $\mu$ A
High-state output impedance	1 k $\Omega$ from output to common
PWR_OK delay	100 ms < T <sub>3</sub> < 500 ms
PWR_OK risetime	T <sub>4</sub> $\leq$ 10 ms
AC loss to PWR_OK hold-up time	T <sub>5</sub> $\geq$ 16 ms
Power-down warning	T <sub>6</sub> $\geq$ 1 ms

Note: T3~T6 defined above refer to the timing diagram of 5.1.5.

#### Power Signal

Power Good @ 115/230V <sub>AC</sub> , Full Load	100 ~ 500 ms
Power Fail @115/230V <sub>AC</sub> , 80% Load Voltage regulation should follow Table 4.1.2)	1ms Min

#### 5.1.1 Hold-up Time (@ 80% Load, Voltage regulation should follow Table 4.1.2)

115V<sub>AC</sub> / 60Hz : 20ms Min.

230V<sub>AC</sub> / 50Hz : 20ms Min.

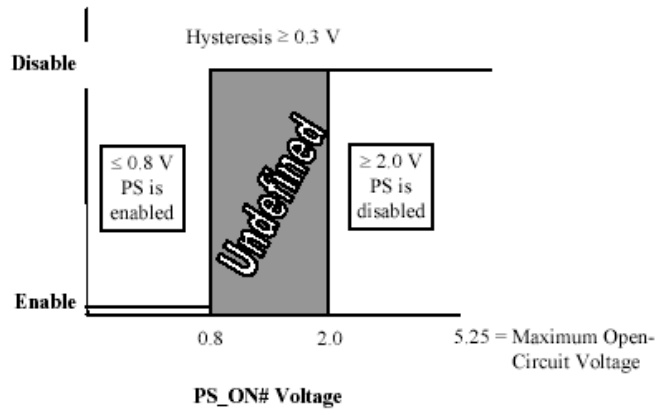
+3.3V	+5V	+12V	-12V	+5Vsb
14.68A	14.68A	38.26A	0.41A	2.84A

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.

### 5.1.2 PS\_ON

#### PS\_ON# Signal Characteristics

	Min.	Max.
V <sub>IL</sub> , Input Low Voltage	0.0 V	0.8 V
I <sub>IL</sub> , Input Low Current (V <sub>in</sub> = 0.4 V)		-1.6 mA
V <sub>IH</sub> , Input High Voltage (I <sub>in</sub> = -200 $\mu$ A)	2.0 V	
V <sub>IH</sub> open circuit, I <sub>in</sub> = 0		5.25 V



### PS\_ON# Signal Characteristics

#### 5.1.3 Output Rise Time

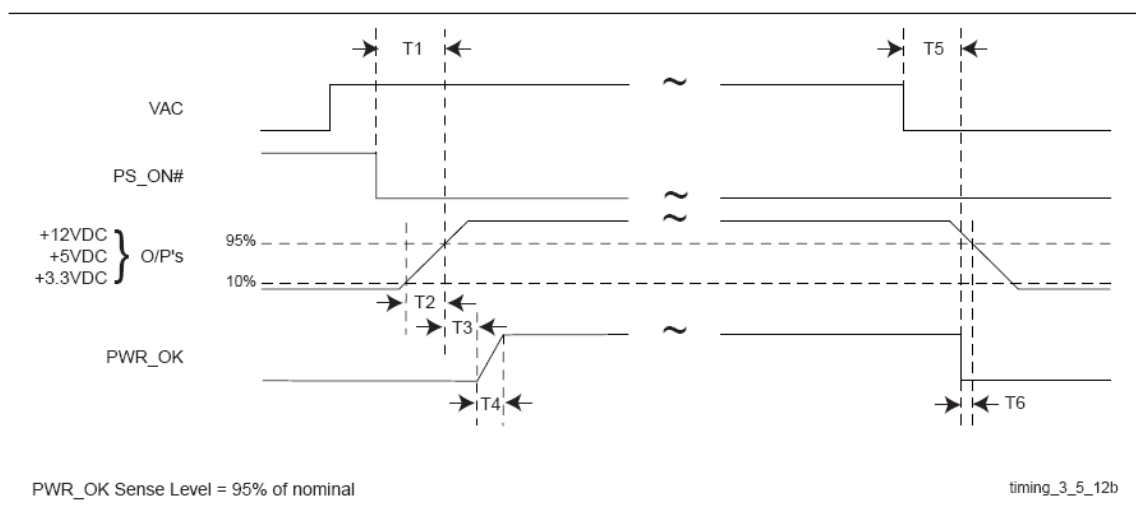
10% to 90% of final output value, @ Full Load

115Vrms or 230Vrms	+5V <sub>DC</sub> & +3.3V <sub>DC</sub> : within 0.1ms to 20ms
115Vrms or 230Vrms	+12V <sub>DC</sub> : within 0.1ms to 20ms
115Vrms or 230Vrms	+5Vsb : within 0.1ms to 20ms
115Vrms or 230Vrms	-12V <sub>DC</sub> : within 0.1ms to 20ms

#### 5.1.4 Overshoot at Turn-on/Turn-off

The output voltage overshoot upon the application or removal of the input voltage, or the assertion/de-assertion of PS\_ON, under the conditions specified in voltage table, shall be less than 10% above the nominal voltage. No voltage of opposite polarity shall be present on any output during turn-on or turn-off.

#### 5.1.5 Power supply timing



## 5.2 Output Protection

### 5.2.1 Over Voltage Protection

Voltage Source	Protection Point
+3.3V	$\leq 4.7V$
+5V	$\leq 6.5V$
+12V	$\leq 14.5V$

### 5.2.2 Over Current Protection

Output Voltage	Over Current Protection Range
+3.3V	35A ~ 50A
+5V	35A ~ 50A
+12V	75A ~ 94A

### 5.2.3 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, and +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. In the event of an output short circuit condition on -12V output, the power supply will not be damaged. The power supply shall return to normal operation as soon as the short circuit has been removed and the power switch has been turned off for no more than 2 seconds.

### 5.2.4 No-load Operation

No damage or hazardous condition should occur with all the DC output connectors disconnected from the load. The power supply may latch into the shutdown state.

### 5.2.5 Over-temperature Protection

The power supply may include an over-temperature protection sensor, which can trip and shut down the power supply at a preset temperature point (ambient 55 ~ 80°C). Such an overheated condition is typically the result of internal current overloading or a cooling fan failure. If the protection circuit is non-latching, then it should have the hysteresis function built in to avoid intermittent tripping.

REMARK: OTP SENSOR—NTCS701----attached on HS6

### 5.2.6 Reset after shutdown

If the power supply latches into a shutdown state because of a fault condition on its outputs, the power supply shall return to normal operation only after the fault has been removed and the PS\_ON (or AC input) has been OFF/ON with a minimum OFF time of 1 second.

## 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	0 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

The subject power supply will withstand the following imposed conditions without experiencing non-recoverable failure or deviation from specified output characteristics.

Vibration Operation, 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.

### 6.4 Ground Leakage Current

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

### 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: 1800VAC for 3 sec.

Primary to Secondary: 3000VAC for 3 sec

### 6.7 Insulation Resistance

Primary to Frame Ground: 20 Mega ohms Minimum

Primary to Secondary: 20 Mega ohms Minimum

## **7. Labeling**

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.