



# Test Report: HLG-320H-36

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320W Single Output Switching Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

ENVIRONMENT TEST

## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RIPPLE & NOISE	V1 : 250 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 23 mVp-p (Max)
2	CONSTANT CURRENT REGION	18V ~36V	I/P: 230 VAC O/P:CV MODE Ta:25°C	O/P=18V : 8.93 A O/P=35V: 8.91 A
3	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 32V ~ 39 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	30.451 V ~ 40.007 V/ 230 VAC 30.463 V ~ 40.007 V/ 115 VAC
4	OUTPUT CURRENT ADJUST RANGE	CH1 : 4.45A ~ 8.9A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	4.327 A~ 9.785 A/ 230 VAC 4.324 A~ 9.783 A/ 115 VAC
5	OUTPUT VOLTAGE TOLERANCE	V1 : 1 %~ -1 % (Max)	I/P : 100 VAC / 305 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.13 %~ -0.13 %
6	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 100 VAC ~ 305 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.02 %~ -0.02 %
7	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.12 %~ -0.12 %
8	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 2500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 384 ms 115VAC/ 780 ms
9	RISE TIME	230VAC : 80 ms (Max) 115VAC : 80 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 19 ms 115VAC/ 19 ms
10	HOLD UP TIME	230VAC : 15 ms (TYP) 115VAC : 15 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 23 ms 115VAC/ 23 ms
11	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %
12	DYNAMIC LOAD	V1 : 3600 mVp-p	I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1) 329 mVp-p (2) 1277 mVp-p

13	DIMMER TEST (B Type only)	SPEC:										
		* IP67 rated. Output constant current level can be adjusted through output cable by connecting a resistor or 1 ~ 10Vdc or 10V PWM signal between DIM+ and DIM-										
		*Reference resistance value for output current adjustment (Typical)										
		Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
		Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
		*1 ~ 10V dimming function for output current adjustment (Typical)										
		Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
		Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
		*10V PWM signal for output current adjustment (Typical)										
		Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
		Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
		TEST RESULT: I/P : 230 VAC ;Ta : 25°C										
		1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K
Output current	0.996A		1.816A	2.678A	3.537A	4.403A	5.251A	6.056A	6.971A	7.817A	8.654A	
%	11.19%		20.40%	30.09%	39.74%	49.47%	59.00%	68.04%	78.33%	87.83%	97.24%	
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	
	Output current	0.986A	1.883A	2.780A	3.663A	4.543A	5.439A	6.318A	7.235A	8.011A	8.909A	
	%	11.08%	21.16%	31.24%	41.16%	51.04%	61.11%	70.99%	81.29%	90.01%	100.10%	
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
	Output current	1.037A	1.930A	2.810A	3.691A	4.568A	5.447A	6.323A	7.198A	8.074A	8.941A	
	%	11.65%	21.69%	31.57%	41.47%	51.33%	61.20%	71.04%	80.88%	90.72%	100.46%	

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	59 V~305V
			I/P : LOW-LINE-3V= 97 V HIGH-LINE+10V=315V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P : 100VAC ~ 305 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK
3	POWER FACTOR	0.95/ 230 VAC FULL LOAD (TYP) 0.98/ 115 VAC FULL LOAD (TYP) 0.94/ 277 VAC FULL LOAD (TYP)	I/P : 230 VAC I/P : 115 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF=0.975 /230V/100%LOAD PF=0.998 /115V/100%LOAD PF=0.95 / 277V/100%LOAD
4	EFFICIENCY	94.5 % (TYP) 95 % (TYP)	I/P : 230 VAC I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	94.5 % 95.397 %
5	INPUT CURRENT	277V/ 1.45 A (TYP) 230V/ 1.65 A (TYP) 115V/ 3.5 A (TYP)	I/P : 277 VAC I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 1.2831 A/ 277VAC I = 1.5127 A/ 230 VAC I = 3.114 A/ 115 VAC
6	INRUSH CURRENT	230V/ 70 A (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 59 A/ 230 VAC
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P : 305 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.2 mA N-FG : 0.2 mA
8	TOTAL HARMONIC DISTORTION	THD< 20% when output loading $\geq$ 50% at 115VAC/230VAC input and output loading $\geq$ 75% at 277VAC input	I/P : 115 VAC I/P : 230 VAC O/P : 50% LOAD  I/P : 277 VAC O/P : 75%LOAD Ta : 25°C	THD : 5.17 /115VAC THD : 10.58 /230VAC  THD : 10.87 /277VAC

## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	105.10%/ 230 VAC 105.05%/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH1 : 40V ~ 46 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	41.715V/ 230 VAC 41.699V/ 115 VAC Shut down and latch off o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	O.T.P. Active Shut down and latch off o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 305 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup Mode

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor ( D to S) or (G to E) Peak Voltage	Q5 Rated : 20A/600V	I/P : High-Line +3V = 308 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 472 V (2) 470 V (3) 232 V
2	Diode Peak Voltage	Q101 Rated : 75A/100V Q102 Rated : 75A/100	I/P : High-Line +3V = 308 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 86 V (2) 8 V (3) 82.8 V (1) 88 V (2) 10 V (3) 85 V
3	Input Capacitor Voltage	C5 Rated : 220u/450V	I/P : High-Line +3V = 308 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 430 V (2) 440 V (3) 441 V
4	Control IC Voltage Test	U900 Rated : 8.85V~16V	I/P : High-Line +3V = 308 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 13.9 V (2) 13.9 V (3) 13.88 V
5	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : 20A/600V	I/P : High-Line +3V = 308 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 592 V (2) 472 V (3) 552 V

## ■ SAFETY & E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.75KVAC/min I/P-FG : 2 KVAC/min<4.5mA O/P-FG : 1.5 KVAC/min	I/P-O/P : 4 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 1.8 KVAC/min Ta : 25°C	I/P-O/P : 2.498 mA I/P-FG : 2.022 mA O/P-FG : 2.7 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ I/P-FG : 500VDC>100MΩ O/P-FG : 500VDC>100MΩ	I/P-O/P : 500 VDC I/P-FG : 500 VDC O/P-FG : 500 VDC Ta : 25°C/70%RH	I/P-O/P : 30 GΩ I/P-FG : 30 GΩ O/P-FG : 30 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	20 mΩ

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A CLASS C	I/P:230 / 50HZ O/P:100%ELECTRONIC LOAD O/P:100% LED LOAD Ta:25°C	PASS
2	CONDUCTION	EN55022; EN55015 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 ;EN55015 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare. Any contradictions of the test results, please refer to the latest EMC test report.			

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																
1	TEMPERATURE RISE TEST	MODEL : HLG-320H-24 1. ROOM AMBIENT BURN-IN : 13 HRS I/P : 230VAC O/P : FULL LOAD Ta=30.6 °C 2. HIGH AMBIENT BURN-IN : 16.5 HRS I/P : 230VAC O/P : FULL LOAD Ta=67.8 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 30.6 °C</th> <th>HIGH AMBIENT Ta=67.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>60.3°C</td><td>91.5°C</td></tr> <tr><td>2</td><td>L2</td><td>64.9°C</td><td>95.7°C</td></tr> <tr><td>3</td><td>C11</td><td>66.8°C</td><td>97.7°C</td></tr> <tr><td>4</td><td>BD1</td><td>67.0°C</td><td>97.9°C</td></tr> <tr><td>5</td><td>Q1</td><td>66.7°C</td><td>97.3°C</td></tr> <tr><td>6</td><td>C5</td><td>66.1°C</td><td>96.5°C</td></tr> <tr><td>7</td><td>L1</td><td>68.5°C</td><td>98.5°C</td></tr> <tr><td>8</td><td>D2</td><td>67.7°C</td><td>98.5°C</td></tr> <tr><td>9</td><td>C13</td><td>65.9°C</td><td>96.7°C</td></tr> <tr><td>10</td><td>C902</td><td>65.5°C</td><td>96.4°C</td></tr> <tr><td>11</td><td>C40</td><td>67.0°C</td><td>97.6°C</td></tr> <tr><td>12</td><td>D3</td><td>70.7°C</td><td>100.9°C</td></tr> <tr><td>13</td><td>D41</td><td>65.4°C</td><td>95.8°C</td></tr> <tr><td>14</td><td>C906</td><td>63.6°C</td><td>94.7°C</td></tr> <tr><td>15</td><td>C205</td><td>64.7°C</td><td>96.2°C</td></tr> <tr><td>16</td><td>T1</td><td>68.8°C</td><td>100.7°C</td></tr> <tr><td>17</td><td>C102</td><td>62.3°C</td><td>94.1°C</td></tr> <tr><td>18</td><td>C106</td><td>62.6°C</td><td>94.5°C</td></tr> <tr><td>19</td><td>Q101</td><td>65.2°C</td><td>96.5°C</td></tr> <tr><td>20</td><td>C104</td><td>61.6°C</td><td>93.2°C</td></tr> <tr><td>21</td><td>U900</td><td>62.7°C</td><td>93.8°C</td></tr> <tr><td>22</td><td>RTH2</td><td>62.4°C</td><td>93.8°C</td></tr> <tr><td>23</td><td>LF100</td><td>62.5°C</td><td>94.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 30.6 °C	HIGH AMBIENT Ta=67.8 °C	1	LF1	60.3°C	91.5°C	2	L2	64.9°C	95.7°C	3	C11	66.8°C	97.7°C	4	BD1	67.0°C	97.9°C	5	Q1	66.7°C	97.3°C	6	C5	66.1°C	96.5°C	7	L1	68.5°C	98.5°C	8	D2	67.7°C	98.5°C	9	C13	65.9°C	96.7°C	10	C902	65.5°C	96.4°C	11	C40	67.0°C	97.6°C	12	D3	70.7°C	100.9°C	13	D41	65.4°C	95.8°C	14	C906	63.6°C	94.7°C	15	C205	64.7°C	96.2°C	16	T1	68.8°C	100.7°C	17	C102	62.3°C	94.1°C	18	C106	62.6°C	94.5°C	19	Q101	65.2°C	96.5°C	20	C104	61.6°C	93.2°C	21	U900	62.7°C	93.8°C	22	RTH2	62.4°C	93.8°C	23	LF100	62.5°C	94.8°C	
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 100 % LOAD Ta= -40 °C	TEST : OK																																																																																																
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C NO DAMAGE	I/P : 305 VAC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																
4	TEMPERATURE COEFFICIENT	±0.03 %(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.003 %(0~50°C)																																																																																																
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK																																																																																																





# 320W Single Output Switching Power Supply

# HLG-320H series

6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +65°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 230VAC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec	OK
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 5G (5) Test Time : 72min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
8	CAPACITOR LIFE CYCLE	HLG-320H-24:SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Tc= 75 °C LIFE TIME (2) I/P : 230VAC O/P : 75% LOAD Tc= 75 °C LIFE TIME (3) I/P : 230VAC O/P : 50% LOAD Tc= 75 °C LIFE TIME	(1) 78859HRS (2) 89035HRS (3) 95653HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 157.1K hrs min. MIL-HDBK-217F (25°C)	
10	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 62,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023