



# Test Report: HLG-185-12

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185W Single Output Switching Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Other Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1: 150 mVp-p (Max)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	V1: 23 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.8V~13.5 V	I/P: 230 VAC I/P:115VAC O/P:MIN LOAD Ta:25°C	10.47 V~13.78 V /230VAC 10.47 V~13.78 V/115VAC	P
3	CURRENT ADJ RANGE	6.5A~13A	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	4.41 A~14.37 A	P
4	CONSTANT CURRENT REGION	6V~12V	I/P: 230 VAC O/P:CV MODE Ta:25°C	O/P=6V: 13.79 A O/P=11V: 13.84 A	P
5	OUTPUT VOLTAGE TOLERANCE	V1: -2.5% ~ 2.5% (Max)	I/P: 100 VAC /264VAC O/P:FULL/ 0% LOAD Ta:25°C	V1: -0.7% ~ 0.7%	P
6	LINE REGULATION	V1: -0.5% ~ 0.5% (Max)	I/P:100 VAC ~264V VAC O/P:FULL LOAD Ta:25°C	V1: 0% ~ 0%	P
7	LOAD REGULATION	V1: -2% ~ 2% (Max)	I/P: 230 VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.6% ~ 0.6%	P
8	SET UP TIME	230VAC/ 2500 ms (Max) 115VAC/ 2500 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 884 ms 115 VAC/ 1768 ms	P
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/ 11 ms 115 VAC/ 11 ms	P
10	HOLD UP TIME	230VAC/ 16 ms (Typ) 115VAC/ 16 ms (Typ)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 21 ms 115 VAC/ 21 ms	P
11	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	TEST:< 5%	P
12	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 230 VAC O/P:(1)FULL /Min LOAD 90%DUTY/1KHZ (2)FULL /Min LOAD 90%DUTY/120HZ Ta:25°C	1040 mVp-p 1150 mVp-p	P

13	DIMMER TEST (B Type only)	SPEC:											
		*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	100K
			Output current	1.739A	2.965A	4.191A	5.050A	6.635A	7.872A	9.092A	10.326A	11.540A	12.775A
%	13.38%		22.81%	32.24%	38.85%	51.04%	60.55%	69.94%	79.43%	88.77%	98.27%		
2	Dimming value		1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	
	Output current		1.778A	3.016A	4.265A	5.510A	6.743A	8.001A	9.247A	10.499A	11.750A	12.990A	
	%		13.68%	23.20%	32.81%	42.38%	51.87%	61.55%	71.13%	80.76%	90.38%	99.92%	
3	Duty value		10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
	Output current		1.759A	2.999A	4.242A	5.487A	6.735A	7.985A	9.233A	10.479A	11.725A	12.848A	
	%		13.53%	23.07%	32.63%	42.21%	51.81%	61.42%	71.02%	80.61%	90.19%	98.83%	

P

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~264V VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	68 V~264V	P
			I/P: (1)LOW-LINE-3V=87 V (2)HIGH-LINE=264V V 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: 100 VAC ~264VAC O/P:FULL~MIN LOAD Ta:25°C	OK	P
3	POWER FACTOR	0.95/ 230 VAC FULL LOAD (TYP) 0.98/ 115 VAC FULL LOAD (TYP)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	PF=0.968 /230V/100%LOAD PF= 0.998 /115V/100%LOAD	P
4	EFFICIENCY	92% (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	92.09 %	P
5	INPUT CURRENT	230 V/ 0.8 A 115 V/ 1.8 A	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	I = 0.75 A/ 230VAC I = 1.5 A/ 115VAC	P
6	INRUSH CURRENT	230 V/ 65A (Typ) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	I = 58 A/ 230VAC	P

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 %~108 %	I/P: 264VAC I/P: 230 VAC I/P: 100 VAC O/P:TESTING Ta:25°C	106 %/264VAC 106 %/ 230VAC 106 %//100VAC Constant current limiting, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	V1: 14V~ 17V	I/P: 264VAC I/P: 230 VAC I/P: 90 VAC O/P:MIN LOAD Ta:25°C	15.29 V/ 264VAC 15.29 V/ 230VAC 15.29 V/ 100VAC Shut down o/p voltage with auto recovery or re-power on to recovery	P
3	OVER TEMPERATURE PROTECTION	SPEC: RTH2: 100±10°C O.T.P. NO DAMAGE	I/P: 230 VAC O/P:FULL LOAD	O.T.P. Active Shut down o/p voltage with auto recovery or re-power on to recovery	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE Hiccup Mode	P

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q5 Rated 12A/500V	I/P : High-Line +3V = 267V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 482 V (2) 462 V (3) 464 V	P
2	Diode Peak Voltage	Q101 Rated 202A/40V	I/P : High-Line +3V =267V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 38.8 V (2) 13.8 V (3) 35.8 V	P
		Q102 Rated 202A/40V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 39.8 V (2) 14.6 V (3) 36.4 V	
3	Input Capacitor Voltage	C5 Rated: 120u/450V 105°C CXW	I/P : High-Line +3V = 267V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 435.3 V (2) 436 V (3) 450 V	P
4	Control IC Voltage Test	U 900 Rated L6599AD 8.85V~16V	I/P : High-Line +3V = 267V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 12.52 V (2) 12.33 V (3) 12.52 V	P
5	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated STP21NM60N 17A/600V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 486 V (2) 466 V (3) 466 V	P

## SAFETY & EMC TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	IEC60950-1 I/P-O/P: 3.75KVAC/min I/P-FG:2 KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 4 KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 1.8KVAC/min Ta:25°C	I/P-O/P: 2.619 mA I/P-FG: 2.35 mA O/P-FG: 3.41 mA NO DAMAGE	P
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	I/P-O/P: 23.9 GΩ I/P-FG: 25.5 GΩ O/P-FG: 3.6 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	9 mΩ	P
4	LEAKAGE CURRENT	IEC60950-1 < 0.75 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25°C	L-FG: 0.24 mA N-FG: 0.24 mA	P
5	APPROVAL	TUV: Certificate NO : E334940 UL: File NO : R50185176			P

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS C	I/P: 240VAC/50HZ LOAD:LED/ELECTRONIC LOAD O/P:100%/50% LOAD Ta:25°C	PASS	P
2	CONDUCTION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab	P
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	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	P
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	P

# Reliability Test

## ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																															
1	TEMPERATURE RISE TEST	MODEL : HLG-185H-12 1. ROOM AMBIENT BURN-IN : 15.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 29 °C 2. HIGH AMBIENT BURN-IN : 7 HRS I/P : 230VAC O/P : FULL LOAD Ta=61.1 °C																																																																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta= 29 °C</th> <th>HIGH AMBIENT Ta= 61.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>4A/800V GLASS GBU408</td><td>60.0°C</td><td>86.1°C</td></tr> <tr><td>2</td><td>Q1</td><td>STP21NM60N 17A/600V TO220</td><td>62.2°C</td><td>87.9°C</td></tr> <tr><td>3</td><td>L2</td><td>CK TF1991</td><td>63.8°C</td><td>89.8°C</td></tr> <tr><td>4</td><td>Q5</td><td>STF13NM50N 12A/500V TO220F</td><td>64.3°C</td><td>90.1°C</td></tr> <tr><td>5</td><td>D2</td><td>YG971S6R 8A/600V TO220F</td><td>68.1°C</td><td>92.5°C</td></tr> <tr><td>6</td><td>RTH2</td><td>NTC 330KΩ 3Φ TTC3A334F4573EY 1%</td><td>62.6°C</td><td>88.1°C</td></tr> <tr><td>7</td><td>T1</td><td>TF2062</td><td>70.0°C</td><td>95.7°C</td></tr> <tr><td>8</td><td>Q101</td><td>IRF1404PbF 202A/40V TO220</td><td>69.1°C</td><td>96.1°C</td></tr> <tr><td>9</td><td>D9</td><td>BYV26EGP 1A/1KV DO-204AC</td><td>62.7°C</td><td>88.3°C</td></tr> <tr><td>10</td><td>C102</td><td>2200u/16V UL10Kh 12.5*20 ZLH</td><td>63.5°C</td><td>90.6°C</td></tr> <tr><td>11</td><td>C201</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>64.6°C</td><td>91.0°C</td></tr> <tr><td>12</td><td>C16</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>61.6°C</td><td>87.3°C</td></tr> <tr><td>13</td><td>C106</td><td>470u/16V UL8Kh 8*11.5 ZLH</td><td>58.6°C</td><td>85.7°C</td></tr> <tr><td>14</td><td>C38</td><td>100u/25V UL10Kh 6.3*11 YXM</td><td>63.2°C</td><td>89.0°C</td></tr> <tr><td>15</td><td>LF100</td><td>TR891-R1</td><td>62.7°C</td><td>89.8°C</td></tr> <tr><td>16</td><td>U900</td><td>L6599AD SO-16N</td><td>62.0°C</td><td>87.6°C</td></tr> <tr><td>17</td><td>U1</td><td>NCP1608B SOIC-8</td><td>63.8°C</td><td>89.7°C</td></tr> <tr><td>19</td><td>C5</td><td>100u/450V 5Kh 105°C 18*35 KXG</td><td>48.2°C</td><td>80.3°C</td></tr> </tbody> </table>	NO	Position	P/N	ROOM AMBIENT Ta= 29 °C	HIGH AMBIENT Ta= 61.1 °C	1	BD1	4A/800V GLASS GBU408	60.0°C	86.1°C	2	Q1	STP21NM60N 17A/600V TO220	62.2°C	87.9°C	3	L2	CK TF1991	63.8°C	89.8°C	4	Q5	STF13NM50N 12A/500V TO220F	64.3°C	90.1°C	5	D2	YG971S6R 8A/600V TO220F	68.1°C	92.5°C	6	RTH2	NTC 330KΩ 3Φ TTC3A334F4573EY 1%	62.6°C	88.1°C	7	T1	TF2062	70.0°C	95.7°C	8	Q101	IRF1404PbF 202A/40V TO220	69.1°C	96.1°C	9	D9	BYV26EGP 1A/1KV DO-204AC	62.7°C	88.3°C	10	C102	2200u/16V UL10Kh 12.5*20 ZLH	63.5°C	90.6°C	11	C201	47u/50V UL10Kh 6.3*11 YXM	64.6°C	91.0°C	12	C16	47u/50V UL10Kh 6.3*11 YXM	61.6°C	87.3°C	13	C106	470u/16V UL8Kh 8*11.5 ZLH	58.6°C	85.7°C	14	C38	100u/25V UL10Kh 6.3*11 YXM	63.2°C	89.0°C	15	LF100	TR891-R1	62.7°C	89.8°C	16	U900	L6599AD SO-16N	62.0°C	87.6°C	17	U1	NCP1608B SOIC-8	63.8°C	89.7°C	19	C5	100u/450V 5Kh 105°C 18*35 KXG	48.2°C	80.3°C	P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 264V VAC O/P : O/P SHORT TEST Ta : 25°C	TEST : OK	P																																																																																															
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264V VAC/100VAC O/P : 95% LOAD Ta= -40 °C	TEST : OK	P																																																																																															
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C NO DAMAGE	I/P : 264V VAC O/P : 95% LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																															
5	TEMPERATURE COEFFICIENT	± 0.03 % (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.063% (0~50°C)	P																																																																																															



6	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	P
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°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 TURN ON/58 SEC;TURN OFF/2 SEC.	OK	P
8	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	P
9	CAPACITOR LIFE CYCLE	HLG-185H-12:SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 60 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 60 °C LIFE TIME	(1) 286549 HRS (2) 35834 HRS (3) 58949 HRS (4) 84020 HRS	P
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 192.2K HRS	OK	P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 75°C	OK	P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/3/3	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2010/5/10	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2003/12/12 A50-F023