



# Test Report: HLG-185H-36

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185W Constant Voltage + Constant Current LED Driver

## ■ 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
1	RIPPLE & NOISE	V1: 200 mVp-p (Max)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	V1: 56.2 mVp-p (Max)
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 33V~40 V	I/P: 230 VAC I/P:115VAC O/P:MIN LOAD Ta:25°C	31.11 V~41.44 V /230VAC 31.12 V~41.44 V/115VAC
3	CURRENT ADJ RANGE	2.6A-5.2A	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	1.78 A~5.9 A
4	CONSTANT CURRENT REGION	18V~36V	I/P: 230 VAC O/P:CV MODE Ta:25°C	O/P=18V: 5.43 A O/P=35V: 5.41 A
5	OUTPUT VOLTAGE TOLERANCE	V1: -1% ~ 1% (Max)	I/P: 100 VAC /305VAC O/P:FULL/ 0% LOAD Ta:25°C	V1: -0.09%~0.09%
6	LINE REGULATION	V1: -0.5% ~ 0.5% (Max)	I/P:100 VAC ~305 VAC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0%
7	LOAD REGULATION	V1: -0.5% ~ 0.5% (Max)	I/P: 230 VAC O/P:FULL -MIN LOAD Ta:25°C	V1: -0.09%~ 0.09%
8	SET UP TIME	230VAC/ 500 ms (Max) 115VAC/ 1000 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 342 ms 115 VAC/ 706 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/ 7 ms 115 VAC/ 7 ms
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/ 20 ms 115 VAC/ 21 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 O/P:(1)FULL /Min LOAD 90%DUTY/1KHZ (2)FULL /Min LOAD 90%DUTY/120HZ Ta:25°C	560 mVp-p 2030 mVp-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	0.502A	1.033A	1.580A	2.221A	2.673A	3.250A	3.718A	4.262A	4.833A	5.363A
%	9.65%		19.87%	30.38%	42.71%	51.40%	62.50%	71.50%	81.96%	92.94%	103.13%		
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V		
	Output current	0.501A	1.027A	1.545A	2.073A	2.589A	3.104A	3.627A	4.139A	4.670A	5.184A		
	%	9.63%	19.75%	29.71%	39.87%	49.79%	59.69%	69.75%	79.60%	89.81%	99.69%		
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
	Output current	0.553A	1.077A	1.601A	2.120A	2.638A	3.158A	3.678A	4.199A	4.721A	5.238A		
	%	10.63%	20.71%	30.79%	40.77%	50.73%	60.73%	70.73%	80.75%	90.79%	100.73%		

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	80 V~305V
			I/P: (1)LOW-LINE-3V=87 V (2)HIGH-LINE=305 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 ~305VAC O/P:FULL-MIN LOAD Ta:25°C	OK
3	POWER FACTOR	0.95/ 230 VAC FULL LOAD (TYP) 0.98/ 115 VAC FULL LOAD (TYP) 0.92/ 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=0.968 /230V/100%LOAD PF= 0.998 /115V/100%LOAD PF= 0.935 /277V/100%LOAD
4	EFFICIENCY	93.5% (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	93.84 %
5	INPUT CURRENT	277V/ 0.8 A 230 V/ 0.9 A 115 V/ 2.1 A	I/P: 277 VAC I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	I = 0.75 A/ 277VAC I = 0.88 A/ 230VAC I = 1.74 A/ 115VAC
6	INRUSH CURRENT	230 V/ 65A (Typ) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	I = 58 A/ 230VAC
7	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 : 9.15 /115VAC THD : 16.35 /230VAC  THD : 15.15 /277VAC

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 %-108 %	I/P: 305VAC I/P: 230 VAC I/P: 100 VAC O/P: TESTING Ta:25°C	104 %/305VAC 104 %/ 230VAC 104 %//100VAC Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 41V~ 46V	I/P: 305VAC I/P: 230 VAC I/P: 90 VAC O/P: MIN LOAD Ta:25°C	43.38 V/ 305VAC 43.40 V/ 230VAC 43.44 V/ 100VAC Shut down o/p voltage with auto recovery or re-power on to recovery
3	OVER TEMPERATURE PROTECTION	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
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE Constant current limiting, recovers automatically after fault condition is removed

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q5 Rated 12A/500V	I/P : High-Line +3V = 308V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 462 V (2) 446 V (3) 454 V
2	Diode Peak Voltage	Q101 Rated 40A/100V	I/P : High-Line +3V =308V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 84.4 V (2) 23.3 V (3) 84.2 V
		Q102 Rated 40A/100V	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) 83.6 V (2) 26.8 V (3) 80.8 V
3	Input Capacitor Voltage	C5 Rated: 100u/450V	I/P : High-Line +3V = 308V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 433.2 V (2) 433.3 V (3) 433.3 V
4	Control IC Voltage Test	U 900 Rated 8.85V~16V	I/P : High-Line +3V = 308V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change	(1) 12.611 V (2) 12.533 V (3) 12.528 V

			Ta : 25°C		
5	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 17A/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) 474 V (2) 448 V (3) 458 V	

**SAFETY & EMC TEST**
**SAFETY TEST**

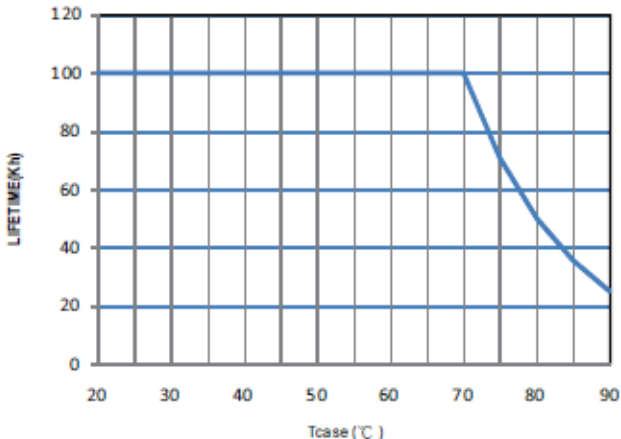
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	IEC60950-1 I/P-O/P: 3.75KVAC/min I/P-FG:2 KVAC/min<4.5mA O/P-FG:1.5KVAC/min	I/P-O/P: 4 KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 1.8 KVAC/min Ta:25°C	I/P-O/P: 2.596 mA I/P-FG: 2.342 mA O/P-FG:3.49 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ 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	I/P-O/P: 30 GΩ I/P-FG: 30 GΩ O/P-FG: 30 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	9 mΩ
4	LEAKAGE CURRENT	IEC60950-1 < 0.75 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25°C	L-FG: 0.22 mA N-FG: 0.22 mA
5	APPROVAL	TUV: Certificate NO : E334940 UL: File NO : R50185176		

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A CLASS C	I/P: 230VAC/50HZ LOAD:LED/ELECTRONIC LOAD O/P:100% 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

Reliability Test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																
1	TEMPERATURE RISE TEST	MODEL : HLG-185H-24 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>ROOM AMBIENT Ta= 29 °C</th> <th>HIGH AMBIENT Ta= 61.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>V1</td><td>24.05V</td><td>23.96V</td></tr> <tr><td>6</td><td>BD1</td><td>59.0°C</td><td>81.6°C</td></tr> <tr><td>7</td><td>Q1</td><td>64.6°C</td><td>85.9°C</td></tr> <tr><td>8</td><td>L2</td><td>66.5°C</td><td>87.4°C</td></tr> <tr><td>9</td><td>Q5</td><td>67.3°C</td><td>87.7°C</td></tr> <tr><td>10</td><td>D2</td><td>70.1°C</td><td>89.7°C</td></tr> <tr><td>11</td><td>RTH2</td><td>61.9°C</td><td>83.0°C</td></tr> <tr><td>12</td><td>T1</td><td>74.9°C</td><td>94.8°C</td></tr> <tr><td>13</td><td>Q101</td><td>65.8°C</td><td>87.9°C</td></tr> <tr><td>14</td><td>D9</td><td>64.3°C</td><td>84.9°C</td></tr> <tr><td>15</td><td>C102</td><td>60.7°C</td><td>83.3°C</td></tr> <tr><td>16</td><td>C201</td><td>61.1°C</td><td>83.5°C</td></tr> <tr><td>17</td><td>C16</td><td>63.0°C</td><td>84.3°C</td></tr> <tr><td>18</td><td>C106</td><td>55.3°C</td><td>78.9°C</td></tr> <tr><td>19</td><td>C38</td><td>66.5°C</td><td>87.0°C</td></tr> <tr><td>20</td><td>LF100</td><td>57.6°C</td><td>80.8°C</td></tr> <tr><td>21</td><td>U900</td><td>62.1°C</td><td>83.4°C</td></tr> <tr><td>22</td><td>U1</td><td>60.8°C</td><td>83.7°C</td></tr> <tr><td>23</td><td>C5</td><td>46.4°C</td><td>78.5°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 29 °C	HIGH AMBIENT Ta= 61.1 °C	1	V1	24.05V	23.96V	6	BD1	59.0°C	81.6°C	7	Q1	64.6°C	85.9°C	8	L2	66.5°C	87.4°C	9	Q5	67.3°C	87.7°C	10	D2	70.1°C	89.7°C	11	RTH2	61.9°C	83.0°C	12	T1	74.9°C	94.8°C	13	Q101	65.8°C	87.9°C	14	D9	64.3°C	84.9°C	15	C102	60.7°C	83.3°C	16	C201	61.1°C	83.5°C	17	C16	63.0°C	84.3°C	18	C106	55.3°C	78.9°C	19	C38	66.5°C	87.0°C	20	LF100	57.6°C	80.8°C	21	U900	62.1°C	83.4°C	22	U1	60.8°C	83.7°C	23	C5	46.4°C	78.5°C	
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20	LF100	57.6°C	80.8°C																																																																																	
21	U900	62.1°C	83.4°C																																																																																	
22	U1	60.8°C	83.7°C																																																																																	
23	C5	46.4°C	78.5°C																																																																																	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 305 VAC O/P : O/P SHORT TEST Ta : 25°C	TEST : OK																																																																																
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305 VAC/100VAC O/P : 95% LOAD Ta= -40 °C	TEST : OK																																																																																
4	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 : 95% LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																
5	TEMPERATURE COEFFICIENT	± 0.03 %(0-50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.012 %(0-50°C)																																																																																
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																																																																																

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 AC ON/OFF TEST turn on 58sec ; turn off 2sec	OK
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
9	CAPACITOR LIFE CYCLE	HLG-185H-24: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) 420912HRS (2) 71928HRS (3) 103147 HRS (4) 125546 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 192.2K hrs min. MIL-HDBK-217F (25°C)	OK
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 62,000 hours @ Tcase 70°C  	OK

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

2003/12/12 A50-F023