Test Report: HLG-185H-48

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℃	V1: 47.2 mVp-p (Max)
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43V~53 V	I/P: 230 VAC I/P:115VAC O/P:MIN LOAD Ta:25℃	41.89 V~54.15 V /230VAC 41.89 V~54.15V/115VAC
3	CURRENT ADJ RANGE	1.95A~3.9A	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	1.612 A~ 4.270 A
4	CONSTANT CURRENT REGION	24V~48V	I/P: 230 VAC O/P:CV MODE Ta:25℃	O/P=24V: 4.151 A O/P=47V: 41.48 A
5	OUTPUT VOLTAGE TOLERANCE	V1: -1 % ~ 1 % (Max)	I/P: 100 VAC /305VAC O/P:FULL/ 0 % LOAD Ta:25℃	V1: -0.04 %~0.04 %
6	LINE REGULATION	V1: - 0.5% ~ 0.5 % (Max)	I/P:100 VAC ~305 VAC O/P:FULL LOAD Ta:25℃	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℃	V1: -0.04 %~ 0.04 %
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℃	230VAC/ 342 ms 115 VAC/ 706 ms
9	RISE TIME	230VAC/ 200 ms (Max) 115VAC/ 200 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/ 6 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℃	230VAC/ 21 ms 115 VAC/ 21 ms
11	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	TEST:< 5 %
12	DYNAMIC LOAD	V1: 4800 mVp-p	I/P: 230 VAC O/P:(1)FULL /Min LOAD 90%DUTY/1KHZ (2)FULL /Min LOAD 90%DUTY/120HZ Ta:25℃	460 mVp-p 1910 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℃

1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output current	0.480A	0.874A	1.252A	1.671A	2.030A	2.435A	2.792A	3.196A	3.594A	3.978A
	%	**12.31%**	**22.41%**	**32.10%**	**42.85%**	**52.05%**	**62.44%**	**71.59%**	**81.95%**	**92.15%**	**102.00%**
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.480A	0.874A	1.252A	1.671A	2.030A	2.435A	2.792A	3.162A	3.542A	3.931A
	%	**12.31%**	**22.41%**	**32.10%**	**42.85%**	**52.05%**	**62.44%**	**71.59%**	**81.08%**	**90.82%**	**100.79%**
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.513A	0.902A	1.284A	1.666A	2.048A	2.431A	2.815A	3.198A	3.582A	3.962A
	%	**13.15%**	**23.13%**	**32.92%**	**42.72%**	**52.51%**	**62.33%**	**72.18%**	**82.00%**	**91.85%**	**101.59%**

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℃	82 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℃	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℃	PF=0.968 /230V/100%LOAD PF= 0.998 /115V/100%LOAD PF= 0.935 /277V/100%LOAD
4	EFFICIENCY	94% (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	94.03 %
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℃	I = 0.67 A/ 277VAC I = 0.79 A/ 230VAC I = 1.56 A/ 115VAC
6	INRUSH CURRENT	230 V/ 65A (Typ) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	I = 56 A/ 230VAC
7	TOTAL HARMONIC DISTORTION	THD< 20% when output loading ≧ 50% at 115VAC/230VAC input and output loading≧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℃	THD： 8.93 /115VAC THD： 16.13 /230VAC THD： 15.01 /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℃	106 %/305VAC 106 %/ 230VAC 106 %//100VAC Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 54V~60V	I/P: 305VAC I/P: 230 VAC I/P: 90 VAC O/P:MIN LOAD Ta:25℃	55.29 V/ 305VAC 55.31V/ 230VAC 55.30 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, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta:25℃	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℃	(1) 466 V (2) 446 V (3) 450 V
2	Diode Peak Voltage	Q101 Rated 30A/150V	I/P：High-Line +3V =308V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 111 V (2) 12.8 V (3) 109 V
		Q102 Rated 30A/150V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 111 V (2) 11.5 V (3) 109 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℃	(1) 435.8 V (2) 436.1 V (3) 436 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 Ta：25℃	(1) 12.652 V (2) 12.582 V (3) 12.582 V
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℃	(1) 486 V (2) 452 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: 1.8KVAC/min Ta:25℃	I/P-O/P: 2.589 mA I/P-FG: 2.297 mA O/P-FG: 3.41 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℃	I/P-O/P: 30 GΩ I/P-FG: 30 G Ω O/P-FG: 30 G Ω NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	9 mΩ
4	LEAKAGE CURRENT	IEC60950-1 < 0.75 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25℃	L-FG: 0.2 mA N-FG: 0.2 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 C	I/P: 230VAC/50HZ LOAD:LED/ELECTRONIC LOAD O/P:100% LOAD Ta:25℃	PASS
2	CONDUCTION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
3	RADIATION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25℃	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℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	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℃	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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：HLG-185H-24
1. ROOM AMBIENT BURN-IN：15.5 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 29 ℃
2. HIGH AMBIENT BURN-IN： 7 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 61.1 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 29 ℃</th><th>HIGH AMBIENT Ta= 61.1 ℃</th></tr>
<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℃</td><td>81.6℃</td></tr>
<tr><td>7</td><td>Q1</td><td>64.6℃</td><td>85.9℃</td></tr>
<tr><td>8</td><td>L2</td><td>66.5℃</td><td>87.4℃</td></tr>
<tr><td>9</td><td>Q5</td><td>67.3℃</td><td>87.7℃</td></tr>
<tr><td>10</td><td>D2</td><td>70.1℃</td><td>89.7℃</td></tr>
<tr><td>11</td><td>RTH2</td><td>61.9℃</td><td>83.0℃</td></tr>
<tr><td>12</td><td>T1</td><td>74.9℃</td><td>94.8℃</td></tr>
<tr><td>13</td><td>Q101</td><td>65.8℃</td><td>87.9℃</td></tr>
<tr><td>14</td><td>D9</td><td>64.3℃</td><td>84.9℃</td></tr>
<tr><td>15</td><td>C102</td><td>60.7℃</td><td>83.3℃</td></tr>
<tr><td>16</td><td>C201</td><td>61.1℃</td><td>83.5℃</td></tr>
<tr><td>17</td><td>C16</td><td>63.0℃</td><td>84.3℃</td></tr>
<tr><td>18</td><td>C106</td><td>55.3℃</td><td>78.9℃</td></tr>
<tr><td>19</td><td>C38</td><td>66.5℃</td><td>87.0℃</td></tr>
<tr><td>20</td><td>LF100</td><td>57.6℃</td><td>80.8℃</td></tr>
<tr><td>21</td><td>U900</td><td>62.1℃</td><td>83.4℃</td></tr>
<tr><td>22</td><td>U1</td><td>60.8℃</td><td>83.7℃</td></tr>
<tr><td>23</td><td>C5</td><td>46.4℃</td><td>78.5℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 305 VAC
O/P：O/P SHORT TEST
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 305 VAC/100VAC
O/P：95% LOAD
Ta= -40 ℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 60 ℃
NO DAMAGE</td><td>I/P： 305 VAC
O/P：95% LOAD
Ta= 60 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.012 %(0~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE
TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：5 CYCLE
5. Input/Output condition： STATIC</td><td>OK</td></tr>
</table>

7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -35℃~ +65℃ 2. Temperature change rate ：25℃ / 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℃	TEST：OK
9	CAPACITOR LIFE CYCLE	HLG-185H-24:SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Tc= 75 ℃ LIFE TIME (2) I/P： 230VAC O/P：75% LOAD Tc= 75 ℃ LIFE TIME (3) I/P： 230VAC O/P：50% LOAD Tc= 75 ℃ LIFE TIME	(1) 69856 HRS (2) 83288 HRS (3) 91859 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 192.2K hrs min. MIL-HDBK-217F (25℃)	OK
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 62,000 hours	

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

2003/12/12 A50-F023