# Test Report: HLG-185H-C700

200W Constant Current Mode LED Driver

## ■ 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 | CURRENT ACCURACY | ± 5% | I/P： 230VAC<br>O/P：CV MODE : 143V~286V<br>Ta：25℃ | ± 0.13 % |
| 2 | CURRENT RIPPLE | 5.0% max. @rated current | I/P： 230VAC<br>O/P：LED : 143V~286V<br>Ta：25℃ | LED=143V 3.8 %<br>LED=286V 2.8 % |
| 3 | OUTPUT CURRENT ADJUST RANGE | CH1 ：350mA~ 700m A | I/P： 230VAC<br>I/P： 115 VAC<br>O/P：CV MODE : 286V<br>Ta：25℃ | 0.3094 A~ 0.7708 A/ 230VAC<br>0.3095 A~ 0.7708 A/ 115 VAC |
| 4 | SET UP TIME | 115 VAC： 1000 ms (Max)<br>230VAC： 500 ms(Max) | I/P： 115 VAC<br>I/P： 230 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 115 VAC/ 714 ms<br>230VAC/ 365 ms |
| 5 | OVER/UNDERSHOOT TEST | < ±5% | I/P： 230 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | TEST： <5 % |

6 DIMMING TEST

※Built-in 3 in 1 dimming function, IP67 rated. Output constant current level can be adjusted through output cable by connecting a resistance or 1 ~ 10Vdc or 10V PWM signal between DIM+ and DIM-.

※ Please DO NOT connect "DIM-" to "-V".

※Reference resistance value for output current adjustment (Typical)

| Resistance value | 10K | 20K | 30K | 40K | 50K | 60K | 70K | 80K | 90K | 100K | OPEN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Output current | **10%** | **20%** | **30%** | **40%** | **50%** | **60%** | **70%** | **80%** | **90%** | **100%** | **102% ~108%** |

*1 ~ 10V dimming function for output current adjustment (Typical)

| Dimming value | 1V | 2V | 3V | 4V | 5V | 6V | 7V | 8V | 9V | 10V | OPEN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Output current | **10%** | **20%** | **30%** | **40%** | **50%** | **60%** | **70%** | **80%** | **90%** | **100%** | **102% ~108%** |

*10V PWM signal for output current adjustment (Typical) Frequency range :100Hz ~ 3KHz

| Duty value | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | OPEN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Output current | **10%** | **20%** | **30%** | **40%** | **50%** | **60%** | **70%** | **80%** | **90%** | **100%** | **102% ~108%** |

TEST RESULT: I/P： 230 VAC ;Ta：25℃

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Resistance value | 10K | 20K | 30K | 40K | 50K | 60K | 70K | 80K | 90K | 100K | OPEN |
| | Output current | 0.085A | 0.161A | 0.220A | 0.285A | 0.353A | 0.425A | 0.492A | 0.546A | 0.616A | 0.679A | 0.727A |
| | Percentage of rated current | 12.11% | 23.00% | 31.43% | 40.71% | 50.41% | 60.66% | 70.33% | 77.97% | 87.94% | 97.03% | 103.90% |
| 2 | Dimming value | 1V | 2V | 3V | 4V | 5V | 6V | 7V | 8V | 9V | 10V | OPEN |
| | Output current | 0.087A | 0.155A | 0.223A | 0.292A | 0.360A | 0.429A | 0.498A | 0.566A | 0.635A | 0.703A | 0.727A |
| | Percentage of rated current | 12.41% | 22.10% | 31.89% | 41.67% | 51.47% | 61.27% | 71.17% | 80.86% | 90.66% | 100.46% | 103.90% |
| 3 | Duty value | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% | OPEN |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output current | 0.100A | 0.168A | 0.236A | 0.304A | 0.373A | 0.441A | 0.509A | 0.578A | 0.646A | 0.714A | 0.727A |
| Percentage of rated current | 14.31% | 24.04% | 33.77% | 43.49% | 53.21% | 62.96% | 72.76% | 82.51% | 92.30% | 101.99% | 103.90% |

## INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | INPUT VOLTAGE RANGE | 90VAC~305 VAC | I/P：TESTING<br>O/P：FULL LOAD<br>Ta：25℃ | 82.3 V~305V |
| | | | I/P：<br>LOW-LINE-3V=87V<br>HIGH-LINE+10V=315V<br>O/P：FULL/MIN LOAD<br>ON： 30 Sec . OFF： 30 Sec 10MIN<br>( AC POWER ON/OFF NO DAMAGE ) | TEST： OK |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ<br>NO DAMAGE | I/P：90VAC ~ 305VAC<br>O/P：FULL~MIN LOAD<br>Ta：25℃ | TEST： OK |
| 3 | POWER FACTOR | 0.98 / 115VAC(TYP)<br>0.96 /230 VAC(TYP)<br>0.94 /277 VAC(TYP) | I/P： 115VAC<br>I/P： 230VAC<br>I/P： 277VAC<br>O/P：FULL LOAD<br>Ta：25℃ | PF= 0.997 / 115VAC<br>PF= 0.971 / 230VAC<br>PF= 0.947 / 277VAC |
| 4 | EFFICIENCY | 94 % (TYP) | I/P： 230 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | 94.43 % |
| 5 | INPUT CURRENT | 277V/ 0.85 A (TYP)<br>230V/ 1 A (TYP)<br>115V/ 2 A (TYP) | I/P： 277 VAC<br>I/P： 230 VAC<br>I/P： 115 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | I = 0.809 A/ 277 VAC<br>I = 0.93 A/ 230 VAC<br>I = 1.88 A/ 115 VAC |
| 6 | INRUSH CURRENT | 230V/ 55 A (TYP)<br>($t_{width}$=900us measured at 50% $I_{peak}$)<br>COLD START | I/P： 230VAC<br>O/P：FULL LOAD<br>Ta：25℃ | I = 49.5 A/ 230VAC<br>T50= 620 us |
| 7 | LEAKAGE CURRENT | < 0.75 mA / 277 VAC | I/P： 277 VAC<br>O/P：Min LOAD<br>Ta：25℃ | L-FG： 0.26 mA<br>N-FG： 0.26 mA |
| 8 | TOTAL HARMONIC DISTORTION | THD< 20% when output loading ≧ 50% at 115VAC/230VAC input and output loading≧75% at 277VAC input | I/P： 115 VAC<br>I/P： 230 VAC<br>O/P：50% LOAD<br><br>I/P： 277 VAC<br>O/P：75%LOAD<br>Ta：25℃ | THD： 11.09 /115VAC<br>THD： 17.54 /230VAC<br><br>THD： 16.73 /277VAC |

## PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | OVER VOLTAGE PROTECTION | CH1：320V ~ 340 V | I/P： 115 VAC<br>I/P： 230 VAC<br>O/P：MIN LOAD<br>Ta：25℃ | 334.34 V/ 115VAC<br>334.42 V/ 230 VAC<br>Shut down o/p voltage with auto-recovery or re-power on to recovery |
| 2 | OVER TEMPERATURE PROTECTION | NO DAMAGE | I/P： 230 VAC<br>O/P：FULL LOAD | O.T.P. Active<br>Shut down o/p voltage，recovers automatically after temperature goes down |
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P： 305 VAC<br>O/P：FULL LOAD<br>Ta：25℃ | NO DAMAGE<br>Constant Current Limiting |

## COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | Power Transistor<br>( D to S) or (C to E) Peak Voltage | Q5 Rated<br>11A/600V | I/P：High-Line +3V = 308V<br>O/P： (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta：25℃ | (1) 480 V<br>(2) 454 V<br>(3) 456 V |
| 2 | Diode Peak Voltage | D101 Rated<br>3A/400V | I/P：High-Line +3V =308V<br>O/P： (1)Full Load Turn on<br>(2)Output Short<br>(3)Full load continue<br>Ta：25℃ | (1) 304 V<br>(2) 2.4 V<br>(3) 300 V |
| | | D103 Rated<br>3A/400V | I/P：High-Line +3V = 308 V<br>O/P： (1)Full Load Turn on<br>(2)Output Short<br>(3)Full load continue<br>Ta：25℃ | (1) 306 V<br>(2) 3.40 V<br>(3) 302 V |
| 3 | Input Capacitor Voltage | C5 Rated:<br>100u/450V | I/P：High-Line +3V = 308V<br>O/P： (1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load Change<br>Ta：25℃ | (1) 478 V<br>(2) 474 V<br>(3) 474 V |
| 4 | Control IC Voltage Test | U 900 Rated:<br>8.85V~16V | I/P：High-Line +3V = 308V<br>O/P： (1)Full Load Turn on /Off<br>(2) Min load Turn on /Off<br>(3)Full Load /Min load Change<br>Ta：25℃ | (1) 14.3 V<br>(2) 14.1 V<br>(3) 14.1 V |
| 5 | P.F.C Transistor<br>( D to S) or (C to E) Peak Voltage | Q1 Rated: 20A/600V | I/P：High-Line +3V = 308 V<br>O/P： (1)Full Load Turn on<br>(2)Output Short<br>(3)Full load continue<br>Ta：25℃ | (1) 590 V<br>(2) 472 V<br>(3) 538 V |

## ■ SAFETY & E.M.C. TEST

### SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | WITHSTAND VOLTAGE | I/P-O/P： 3.75 KVAC/min<br>I/P-FG： 2 KVAC/min<4.5mA<br>O/P-FG： 1.5 KVAC/min | I/P-O/P： 4.2 KVAC/min<br>I/P-FG： 2.4 KVAC/min<br>O/P-FG：1.8KVAC/min<br>Ta：25℃ | I/P-O/P： 3.59 mA<br>I/P-FG： 2.813 mA<br>O/P-FG： 2.043 mA<br>NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P：500VDC>100MΩ<br>I/P-FG： 500VDC>100MΩ<br>O/P-FG：500VDC>100MΩ | I/P-O/P： 500 VDC<br>I/P-FG： 500 VDC<br>O/P-FG： 500 VDC<br>Ta：25℃/70%RH | I/P-O/P： 30 GΩ<br>I/P-FG： 24.5 GΩ<br>O/P-FG： 30 GΩ<br>NO DAMAGE |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS<br>OR TRACE < 100 mΩ | 40 A / 2min<br>Ta：25℃ / 70%RH | 28 mΩ |

### E.M.C TEST

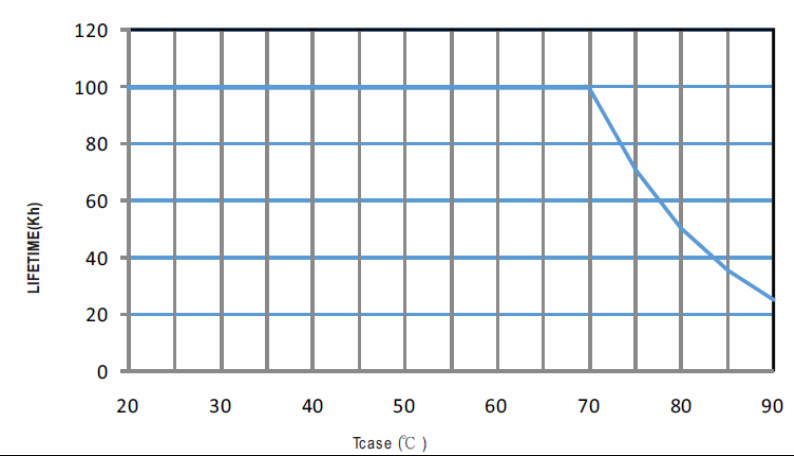
| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|---|---|---|---|---|
| 1 | HARMONIC | EN61000-3-2<br>CLASS C | I/P: 230/347VAC/60HZ<br>O/P:100/60%ELECTRONIC LOAD<br>O/P:100% LED LOAD<br>Ta:25℃ | PASS |
| 2 | CONDUCTION | EN55015<br>CLASS B | I/P: 230VAC (50HZ)<br>O/P:FULL/50% LOAD<br>Ta:25℃ | PASS<br>Test by certified Lab |
| 3 | RADIATION | EN55015<br>CLASS B | I/P: 230/230 VAC (50HZ)<br>O/P:FULL LOAD<br>Ta:25℃ | PASS<br>Test by certified Lab |
| 4 | E.S.D | EN61000-4-2<br>INDUSTRY<br>AIR:8KV / Contact:4KV | I/P:230/230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25℃ | CRITERIA A |
| 5 | E.F.T | EN61000-4-4<br>INDUSTRY<br>INPUT: 2KV | I/P: 230/230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25℃ | CRITERIA A |
| 6 | SURGE | IEC61000-4-5<br>INDUSTRY<br>L-N :2KV<br>L,N-PE:4KV | I/P: 230/230 VAC/50HZ<br>O/P:FULL LOAD<br>Ta:25℃ | CRITERIA A |

## ■ RELIABILITY TEST

### ENVIRONMENT 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-C500<br>1. ROOM AMBIENT BURN-IN：6.5 HRS<br>I/P： 230VAC O/P： FULL LOAD Ta=30.7 ℃<br>2. HIGH AMBIENT BURN-IN：4.5 HRS<br>I/P： 230VAC O/P： FULL LOAD Ta=58.4℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 30.7 ℃</th><th>HIGH AMBIENT Ta= 58.4 ℃</th></tr>
<tr><td>1</td><td>BD1</td><td>60.1℃</td><td>85.6℃</td></tr>
<tr><td>2</td><td>L1</td><td>58.2℃</td><td>83.8℃</td></tr>
<tr><td>3</td><td>D3</td><td>61.5℃</td><td>87.0℃</td></tr>
<tr><td>4</td><td>Q1</td><td>61.3℃</td><td>86.3℃</td></tr>
<tr><td>5</td><td>C5</td><td>58.1℃</td><td>83.3℃</td></tr>
<tr><td>6</td><td>D2</td><td>69.2℃</td><td>93.3℃</td></tr>
<tr><td>7</td><td>Q5</td><td>61.5℃</td><td>87.7℃</td></tr>
<tr><td>8</td><td>RTH2</td><td>60.0℃</td><td>85.8℃</td></tr>
<tr><td>9</td><td>T1</td><td>70.0℃</td><td>96.2℃</td></tr>
<tr><td>10</td><td>LF100</td><td>54.7℃</td><td>80.5℃</td></tr>
<tr><td>11</td><td>C111</td><td>56.8℃</td><td>82.7℃</td></tr>
<tr><td>12</td><td>U1</td><td>58.9℃</td><td>84.5℃</td></tr>
<tr><td>13</td><td>U900</td><td>57.4℃</td><td>83.1℃</td></tr>
<tr><td>14</td><td>L2</td><td>60.5℃</td><td>86.4℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>LOW TEMPERATURE<br>TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 305VAC/100VAC<br>O/P： 100 % LOAD<br>Ta= -25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE<br>TURN ON TEST</td><td>AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 60℃<br>NO DAMAGE</td><td>I/P： 305 VAC<br>O/P：FULL LOAD<br>Ta= 60 ℃<br>HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>TEMPERATURE<br>COEFFICIENT</td><td>± 0.03%(0~50℃)</td><td>I/P： 230 VAC<br>O/P：FULL LOAD</td><td>± 0.004 %(0~50℃)</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃<br>2. Temperature change rate ：25℃ / MIN<br>3. Dwell time low and high temperature ： 30 MIN/EACH<br>4. Total test cycle：5 CYCLE<br>5. Input/Output condition： STATIC</td><td>OK</td></tr>
<tr><td>6</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -30℃~ +65℃<br>2. Temperature change rate ：25℃ / MIN<br>3. Dwell time low and high temperature ： 30 MIN/EACH<br>4. Total test cycle：10 CYCLE<br>5. Input/Output condition： 230VAC/Full Load AC ON/OFF TEST<br>turn on 58sec；turn off 2sec</td><td>OK</td></tr>
</table>

| | | | |
|---|---|---|---|
| 7 | VIBRATION TEST | 1 Carton & 1 Set<br>(1) Waveform： Sine Wave<br>(2) Frequency：10~500Hz<br>(3) Sweep Time：12min/sweep cycle<br>(4) Acceleration：5G<br>(5) Test Time：72min in each axis (X.Y.Z)<br>(6) Ta：25℃ | TEST：OK |
| 8 | CAPACITOR<br>LIFE CYCLE | HLG-185H-C500 :SUPPOSE C111 IS THE MOST CRITICAL COMPONENT<br>(1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME<br>(2) I/P： 230VAC O/P：FULL LOAD Ta= 60 ℃ LIFE TIME<br>(3) I/P： 230VAC O/P：75% LOAD Ta= 60 ℃ LIFE TIME<br>(4) I/P： 230VAC O/P：50% LOAD Ta= 60 ℃ LIFE TIME | (1) 620144 HRS<br>(2) 62118 HRS<br>(3) 89216 HRS<br>(4) 125546 HRS |
| 9 | MTBF | Conducted by Parts Stress Analysis Prediction<br>651.1K hrs min. Telcordia SR-332 (Bellcore) ; 191.9K hrs min. MIL-HDBK-217F (25℃) | |
| 10 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure (Expected Life): Above 62,000 hours @ Tcase 75 ℃ | |




| RESULT | TESTER | REVIEW | APPROVAL |
|---|---|---|---|
| PASS | DANIEL GAO | SANFORD SU | VINCENT TSENG |

■ 12.10.30 A50-F031