



Test Report: HLG-60H-C350

70W 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

■ ESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																											
1	CONSTANT CURRENT REGION	100V~200V	I/P : 230VAC O/P : CV MODE : 100V-199V Ta : 25°C	TEST : OK																																																																																																																											
2	CURRENT RIPPLE	5.0% max. @rated current	I/P : 230VAC O/P : LED LOAD : 198V Ta : 25°C	2.52 %																																																																																																																											
3	CURRENT ACCURACY	± 5%	I/P : 230VAC O/P : CV MODE : 100V-200V Ta : 25°C	± 3 %																																																																																																																											
4	OUTPUT CURRENT ADJUST RANGE	CH1 : 210mA~ 350mA	I/P : 230VAC I/P : 115 VAC O/P : CV MODE : 198V Ta : 25°C	0.196 A~ 0.394 A/ 230VAC 0.196 A~ 0.394 A/ 115 VAC																																																																																																																											
5	SET UP TIME	230 VAC : 500 ms (Max) 115VAC : 750 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230 VAC/ 377.5 ms 115 VAC/ 395.5 ms																																																																																																																											
6	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %																																																																																																																											
7	DIMMING TEST	<p>※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-.</p> <p>※ Please DO NOT connect "DIM-" to "-V".</p> <p>※Reference resistance value for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Resistance value</td> <td>10K</td> <td>20K</td> <td>30K</td> <td>40K</td> <td>50K</td> <td>60K</td> <td>70K</td> <td>80K</td> <td>90K</td> <td>100K</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>*1 ~ 10V dimming function for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Dimming value</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>*10V PWM signal for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Duty value</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>TEST RESULT: I/P : 230 VAC ; Ta : 25°C</p> <table border="1"> <tr> <td rowspan="3">1</td> <td>Resistance value</td> <td>10K</td> <td>20K</td> <td>30K</td> <td>40K</td> <td>50K</td> <td>60K</td> <td>70K</td> <td>80K</td> <td>90K</td> <td>100K</td> </tr> <tr> <td>Output current</td> <td>0.030A</td> <td>0.073A</td> <td>0.104A</td> <td>0.141A</td> <td>0.186A</td> <td>0.215A</td> <td>0.249A</td> <td>0.286A</td> <td>0.326A</td> <td>0.352A</td> </tr> <tr> <td>%</td> <td>8.57%</td> <td>20.86%</td> <td>29.71%</td> <td>40.29%</td> <td>53.14%</td> <td>61.43%</td> <td>71.14%</td> <td>81.71%</td> <td>93.14%</td> <td>100.57%</td> </tr> <tr> <td rowspan="2">2</td> <td>Dimming value</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> </tr> <tr> <td>Output current</td> <td>0.030A</td> <td>0.066A</td> <td>0.102A</td> <td>0.138A</td> <td>0.174A</td> <td>0.210A</td> <td>0.245A</td> <td>0.282A</td> <td>0.318A</td> <td>0.351A</td> </tr> </table>			Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Output current	0.030A	0.073A	0.104A	0.141A	0.186A	0.215A	0.249A	0.286A	0.326A	0.352A	%	8.57%	20.86%	29.71%	40.29%	53.14%	61.43%	71.14%	81.71%	93.14%	100.57%	2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output current	0.030A	0.066A	0.102A	0.138A	0.174A	0.210A	0.245A	0.282A	0.318A	0.351A
Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K																																																																																																																					
Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%																																																																																																																					
Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V																																																																																																																					
Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%																																																																																																																					
Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%																																																																																																																					
Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%																																																																																																																					
1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K																																																																																																																				
	Output current	0.030A	0.073A	0.104A	0.141A	0.186A	0.215A	0.249A	0.286A	0.326A	0.352A																																																																																																																				
	%	8.57%	20.86%	29.71%	40.29%	53.14%	61.43%	71.14%	81.71%	93.14%	100.57%																																																																																																																				
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V																																																																																																																				
	Output current	0.030A	0.066A	0.102A	0.138A	0.174A	0.210A	0.245A	0.282A	0.318A	0.351A																																																																																																																				

3	%	8.57%	18.86%	29.14%	39.43%	49.71%	60.00%	70.00%	80.57%	90.86%	100.29%
	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.034A	0.069A	0.105A	0.140A	0.176A	0.211A	0.247A	0.282A	0.317A	0.352A
	%	9.71%	19.71%	30.00%	40.00%	50.29%	60.29%	70.57%	80.57%	90.57%	100.57%

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 I/P : LOW-LINE-3V=87V HIGH-LINE+10V=315V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	67.7 V-305V TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P : 90VAC ~ 305VAC O/P : FULL -MIN LOAD Ta : 25°C	TEST : OK
3	POWER FACTOR	0.98 / 115VAC(TYP) 0.96 /230 VAC(TYP) 0.94 /277 VAC(TYP)	I/P : 115VAC I/P : 230VAC I/P : 277VAC O/P : FULL LOAD Ta : 25°C	PF= 0.998 / 115VAC PF= 0.981 / 230VAC PF= 0.963 / 277VAC
4	EFFICIENCY	91 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	92.09 %
5	INPUT CURRENT	277V/ 0.29 A (TYP) 230V/ 0.35 A (TYP) 115V/ 0.69 A (TYP)	I/P : 277 VAC I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.285 A/ 277 VAC I = 0.338 A/ 230 VAC I = 0.68 A/ 115 VAC
6	INRUSH CURRENT	230V/ 60 A (TYP) (twidth=275us measured at 50% Ipeak) COLD START	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	I = 48 A/ 230VAC T50= 270 us
7	LEAKAGE CURRENT	< 0.75 mA/ 277 VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.38 mA N-FG : 0.30 mA
8	TOTAL HARMONIC DISTORTION	THD< 20% when output loading ≥ 60% at 115VAC/230VAC input and output loading ≥ 75% at 277VAC input	I/P : 115 VAC I/P : 230 VAC O/P : 60% LOAD I/P : 277 VAC O/P : 75%LOAD Ta : 25°C	THD : 9.08 /115VAC THD : 16.88 /230VAC THD : 18.53 /277VAC

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1 : 230 V ~ 250 V	I/P : 115 VAC I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	242.38 V/ 115VAC 242.58 V/ 230 VAC Shut down o/p voltage with auto-recovery or re-power on to recovery
2	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	O.T.P. Active Shut down o/p voltage, re-power on to recovery
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 305 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup mode, 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	Q3 Rated : 8A/900V	I/P : High-Line +3V = 308V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 812 V (2) 552 V (3) 800 V
2	Diode Peak Voltage	D100 Rated : 3A/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) 576 V (2) 464 V (3) 552 V
3	Input Capacitor Voltage	C5 Rated : 47u/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) 450 V (2) 428 V (3) 440 V
4	Control IC Voltage Test	U1 Rated : 11V~30V	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) 26 V (2) 27.6 V (3) 24.4 V
6	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 10A/600V	I/P : High-Line +3V = 308V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 460 V (2) 454 V (3) 450 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 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 : 1.8KVAC/min Ta : 25°C	I/P-O/P : 3.23 mA I/P-FG : 2.454 mA O/P-FG : 2.124 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	14 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P: 230 /347VAC/60HZ VAC/60HZ O/P:100%/60%ELECTRONIC LOAD O/P:100% LED LOAD Ta:25°C	PASS
2	CONDUCTION	EN55015 CLASS B	I/P: 230VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P: 230/230 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:230/230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230/230 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: 230/230 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.			

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 : -45°C~ +55°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-60H-C700:SUPPOSE C105 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) 54364HRS (2) 63782 HRS (3) 90397 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 878.1K hrs min. Telcordia SR-332 (Bellcore) ; 338K hrs min. MIL-HDBK-217F (25°C)	
11	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