



# Test Report: HLG-40H-36

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40W Constant Voltage + Constant Current 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	CONSTANT CURRENT REGION	18V~30V	I/P : 230VAC O/P : CV=18V~29V Ta : 25°C	TEST : OK
2	RIPPLE & NOISE	V1 : 200 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 18.4 mVp-p (Max)
3	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 33 V ~ 40 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	32.135 V ~ 41.053 V / 230 VAC 32.135 V ~ 41.055 V / 115 VAC
4	CURRENT ADJUST RANGE	CH1 : 0.67A ~ 1.12A	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	0.610 A ~ 1.257 A / 230 VAC 0.610 A ~ 1.257 A / 115 VAC
5	OUTPUT VOLTAGE TOLERANCE	V1 : 1 %~ -1 % (Max)	I/P : 100 VAC / 305VAC O/P : FULL / MIN LOAD Ta : 25°C	V1 : 0.1 %~ -0.1 %
6	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 100VAC ~ 305VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.05 %~ -0.05 %
7	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.1 %~ -0.1 %
8	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC / 356 ms 115VAC / 303 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 / 29 ms 115VAC / 29 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 / 72 ms 115VAC / 37 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 (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1)124 mVp-p (2)845 mVp-p

13	DIMMER TEST (for 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	0.100A	0.216A	0.333A	0.448A	0.565A	0.678A	0.793A	0.897A	1.027A	1.123A
%	8.94%		19.24%	29.71%	40.01%	50.46%	60.49%	70.80%	80.06%	91.71%	100.25%		
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V		
	Output current	0.099A	0.214A	0.328A	0.447A	0.563A	0.678A	0.787A	0.904A	1.019A	1.120A		
	%	8.83%	19.14%	29.27%	39.87%	50.30%	60.54%	70.29%	80.71%	90.96%	99.99%		
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
	Output current	0.129A	0.254A	0.375A	0.491A	0.602A	0.708A	0.812A	0.914A	1.016A	1.124A		
	%	11.52%	22.68%	33.48%	43.84%	53.75%	63.21%	72.50%	81.61%	90.71%	100.36%		

**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	72.6 V~305V
			I/P : LOW-LINE -3V= 87 V HIGH-LINE+15%=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 : 90 VAC ~ 305 VAC O/P : FULL -MIN LOAD Ta : 25°C	TEST : OK
3	POWER FACTOR	0.95 / 230 VAC(TYP)	I/P : 230 VAC	PF= 0.971 / 230 VAC
		0.98 / 115 VAC(TYP)	I/P : 115 VAC	PF= 0.996 / 115 VAC
		0.92 / 277VAC(TYP)	I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.936 / 277VAC
4	EFFICIENCY	88.5 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	88.86 %
5	INPUT CURRENT	277V/ 0.23 A (TYP)	I/P : 277 VAC	I = 0.175 A/ 277 VAC
		230V/ 0.24 A (TYP)	I/P : 230 VAC	I = 0.206 A/ 230 VAC
		115V/ 0.43 A (TYP)	I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.4 A/ 115 VAC
6	INRUSH CURRENT	230V/ 50 A (TYP)	I/P : 230 VAC	I = 48 A/ 230 VAC
		COLD START	O/P : FULL LOAD Ta : 25°C	
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.22 mA N-FG : 0.20 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	THD : 8.4 /115VAC
			I/P : 230 VAC O/P : 60% LOAD	THD : 16.57 /230VAC
			I/P : 277 VAC O/P : 75%LOAD Ta : 25°C	THD : 17.82 /277VAC

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 % ~ 108 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	105 %/ 230 VAC 105 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH1 : 41 V ~ 49 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	44.441V/ 230 VAC 44.279 V/ 115 VAC Shut down o/p voltage, re-power on to recover
3	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 recover
4	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	Q 1 Rated : 10A/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) 530 V (2) 456 V (3) 456 V
2	Diode Peak Voltage	D101 Rated : 20A/200V	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) 169 V (2) 176 V (3) 154 V
3	Clamp Diode Peak Voltage	D2 Rated : 2A/800V	I/P : High-Line +3V = 308 V O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1) 597 V (2) 600 V
4	Input Capacitor Voltage	C 5 Rated : 33u/450V	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) 428.99 V (2) 431.62 V (3) 431.77 V
5	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) 21.442 V (2) 21.443 V (3) 21.450 V
6	Power Transistor ( D to S) or (C to E) Peak Voltage	Q3 Rated : 7.5A/700V	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) 648 V (2) 564 V (3) 636 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 : 2KVAC/min<4.5mA O/P-FG : 1.5KVAC/min	I/P-O/P : 4 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 1.8 KVAC/min Ta : 25°C	I/P-O/P : 1.798 mA I/P-FG : 2.343 mA O/P-FG : 0.461 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 : 9.47 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	18 mΩ

**E.M.C TEST**

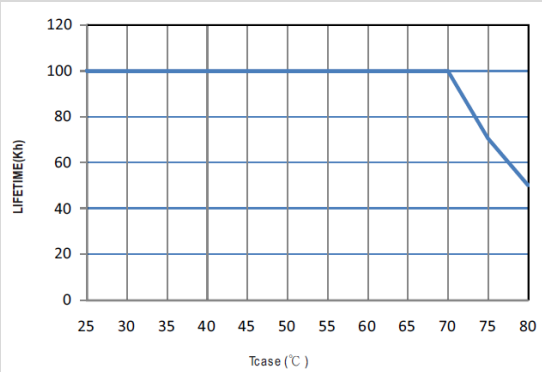
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P: 230VA50HZ O/P:100% ELECTRONIC LOAD O/P:100%LED LOAD Ta:25°C	PASS
2	CONDUCTION	EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL 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

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																				
1	TEMPERATURE RISE TEST	MODEL : HLG-40H-24 1. ROOM AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : 95% LOAD Ta= 28.4 °C 2. HIGH AMBIENT BURN-IN : 23.5 HRS I/P : 230VAC O/P : 95% LOAD Ta= 68 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25.1 °C</th> <th>HIGH AMBIENT Ta= 63.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF2</td><td>43.3°C</td><td>79.7°C</td></tr> <tr><td>2</td><td>Q1</td><td>45.2°C</td><td>81.5°C</td></tr> <tr><td>3</td><td>Q3</td><td>50.2°C</td><td>86.8°C</td></tr> <tr><td>4</td><td>U1</td><td>47.6°C</td><td>84.2°C</td></tr> <tr><td>5</td><td>RTH2</td><td>43.2°C</td><td>79.4°C</td></tr> <tr><td>6</td><td>D2</td><td>49.8°C</td><td>86.7°C</td></tr> <tr><td>7</td><td>C5</td><td>43.8°C</td><td>80.1°C</td></tr> <tr><td>8</td><td>C16</td><td>43.7°C</td><td>79.7°C</td></tr> <tr><td>9</td><td>T1</td><td>49.7°C</td><td>85.5°C</td></tr> <tr><td>10</td><td>D101</td><td>50.3°C</td><td>86.4°C</td></tr> <tr><td>11</td><td>C106</td><td>45.4°C</td><td>81.4°C</td></tr> <tr><td>12</td><td>LF100</td><td>44.7°C</td><td>80.8°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25.1 °C	HIGH AMBIENT Ta= 63.8 °C	1	LF2	43.3°C	79.7°C	2	Q1	45.2°C	81.5°C	3	Q3	50.2°C	86.8°C	4	U1	47.6°C	84.2°C	5	RTH2	43.2°C	79.4°C	6	D2	49.8°C	86.7°C	7	C5	43.8°C	80.1°C	8	C16	43.7°C	79.7°C	9	T1	49.7°C	85.5°C	10	D101	50.3°C	86.4°C	11	C106	45.4°C	81.4°C	12	LF100	44.7°C	80.8°C	
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11	C106	45.4°C	81.4°C																																																					
12	LF100	44.7°C	80.8°C																																																					
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 95% LOAD Ta= -40°C / -25°C	TEST : OK																																																				
3	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																																																				
4	TEMPERATURE COEFFICIENT	± 0.03 % (0-50°C)	I/P : 230 VAC O/P : 95% LOAD	± 0.001 % (0-50°C)																																																				
5	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																																																				
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -40°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/Fu11 Load AC ON/OFF TEST turn on 58sec ; turn off 2sec		OK																																																				



7	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
8	CAPACITOR LIFE CYCLE	HLG-40H-24 :SUPPOSE C106 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) 770489 HRS (2) 87424 HRS (3) 100349HRS (4) 119922HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 1131.9K hrs min. Telcordia SR-332 (Bellcore) ; 336.5K hrs min. MIL-HDBK-217F (25°C)	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 62,000 hours @ Tcase 75°C 	

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

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