



Test Report: HLG-40H-24

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	7.2V-12V	I/P : 230VAC O/P : CV=7.2V-11V Ta : 25°C	TEST : OK
2	RIPPLE & NOISE	V1 : 200 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 25.6 mVp-p (Max)
3	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 22 V ~ 27 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	21.496 V ~ 28.117 V / 230 VAC 21.496 V ~ 28.119 V / 115 VAC
4	CURRENT ADJUST RANGE	CH1 : 1A ~ 1.67A	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	0.879 A ~ 1.787 A / 230 VAC 0.879 A ~ 1.787 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 : 0.11 % ~ -0.11 %
6	LINE REGULATION	V1 : 0.5 % ~ -0.5 % (Max)	I/P : 100VAC ~ 305VAC 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 : 0.11 % ~ -0.11 %
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 / 20 ms 115VAC / 20 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 / 69 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 : 2400 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)212 mVp-p (2)2260 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	0.135A	0.305A	0.477A	0.647A	0.820A	0.988A	1.158A	1.313A	1.509A	1.671A
%	8.11%		18.23%	28.57%	38.74%	49.11%	59.17%	69.36%	78.61%	90.33%	100.05%		
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V		
	Output current	0.138A	0.312A	0.485A	0.663A	0.840A	1.009A	1.188A	1.359A	1.536A	1.670A		
	%	8.27%	18.66%	29.04%	39.69%	50.32%	60.41%	71.16%	81.38%	91.98%	100.02%		
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
	Output current	0.184A	0.375A	0.553A	0.726A	0.892A	1.053A	1.208A	1.361A	1.513A	1.669A		
	%	11.02%	22.46%	33.11%	43.47%	53.41%	63.05%	72.34%	81.50%	90.60%	99.94%		

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	70.4 V~305V
			I/P : LOW-LINE-3V= 87 V 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 : 90 VAC ~ 305 VAC O/P : FULL -MIN LOAD Ta : 25°C	TEST : OK
3	POWER FACTOR	0.95 / 230 VAC(TYP) 0.98 / 115 VAC(TYP) 0.92 / 277 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.964 / 230 VAC PF= 1 / 115 VAC PF= 0.935 / 277 VAC
4	EFFICIENCY	88 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	88.26 %
5	INPUT CURRENT	277V/ 0.23 A (TYP) 230V/ 0.24 A (TYP) 115V/ 0.43 A (TYP)	I/P : 277 VAC I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.17 A/ 277 VAC I = 0.2 A/ 230 VAC I = 0.407 A/ 115 VAC
6	INRUSH CURRENT	230V/ 50 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 48 A/ 230 VAC
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 : 0.22 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 : 8.66 /115VAC THD : 17.2 /230VAC THD : 18.66 /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 : 28 V ~ 35 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	30.716 V/ 230 VAC 30.611 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	Q1 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) 510 V (2) 480 V (3) 468 V
2	Diode Peak Voltage	D101 Rated : 20A/150V	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) 116 V (2) 116 V (3) 107 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) 598 V (2) 600 V
4	Input Capacitor Voltage	C5 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) 429.22 V (2) 433.06 V (3) 436.14 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) 21.622 V (2) 21.656 V (3) 21.668 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) 664 V (2) 528 V (3) 656 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 : 1.5 KVAC/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 : 1.916 mA I/P-FG : 2.416 mA O/P-FG : 0.48 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	18 mΩ

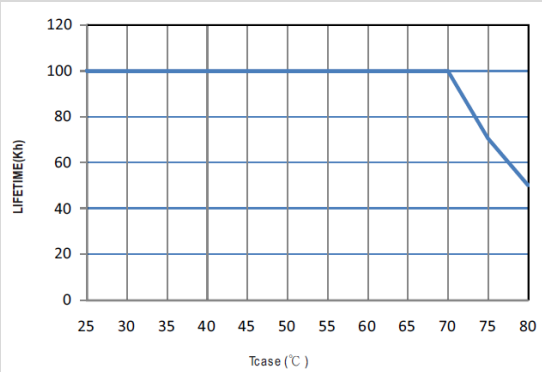
E.M.C TEST

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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