



Test Report: HLG-40H-20

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	12V~20V	I/P : 230VAC O/P : CV=12V~19V Ta : 25°C	TEST : OK
2	RIPPLE & NOISE	V1 : 150 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 22.6 mVp-p (Max)
3	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 17 V ~ 22 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	16.531 V ~ 23.186 V / 230 VAC 16.538 V ~ 23.189 V / 115 VAC
4	CURRENT ADJUST RANGE	CH1 : 1.2A ~ 2A	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	1.053 A ~ 2.181 A / 230 VAC 1.054 A ~ 2.181 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 : 0.2 %~ -0.2 %
6	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 100VAC ~ 305VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.03 %~ -0.03 %
7	LOAD REGULATION	V1 : 1 %~ -1 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.2 %~ -0.2 %
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/ 18 ms 115VAC/ 18 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/ 78 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 : 2000 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)161 mVp-p (2)582 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	0.237A	0.436A	0.637A	0.839A	1.039A	1.241A	1.431A	1.628A	1.845A	1.993A
%	11.85%		21.80%	31.85%	41.95%	51.95%	62.05%	71.55%	81.40%	92.25%	99.65%		
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V		
	Output current	0.229A	0.443A	0.637A	0.853A	1.056A	1.261A	1.471A	1.681A	1.888A	2.006A		
	%	11.45%	22.15%	31.85%	42.65%	52.80%	63.05%	73.55%	84.05%	94.40%	100.30%		
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%		
	Output current	0.264A	0.473A	0.677A	0.875A	1.067A	1.257A	1.445A	1.630A	1.861A	2.005A		
	%	13.20%	23.65%	33.85%	43.75%	53.35%	62.85%	72.25%	81.50%	93.05%	100.25%		

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	70.5 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 / 277VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.954 / 230 VAC PF= 0.995 / 115 VAC PF= 0.937 /277VAC
4	EFFICIENCY	88 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	88.28 %
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 = 0.175 A/ 277 VAC I = 0.206 A/ 230 VAC I = 0.394 A/ 115 VAC
6	INRUSH CURRENT	230V/ 50 A (TYP) COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 49 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 : 0.20 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 I/P : 230 VAC O/P : 60% LOAD I/P : 277 VAC O/P : 75%LOAD Ta : 25°C	THD : 8.32 /115VAC THD : 16.6 /230VAC THD : 18.43 /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 : 23 V ~ 30 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	24.871 V/ 230 VAC 24.736 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 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	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) 576 V (2) 492 V (3) 484 V
2	Diode Peak Voltage	D101 Rated : 20A/100V	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) 90 V (2) 77.6 V (3) 87.6 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) 626 V (2) 614 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) 429.24 V (2) 438.27 V (3) 436.32 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) 21.234 V (2) 21.014 V (3) 21.024 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)Fullll load continue Ta : 25°C	(1) 652 V (2) 528 V (3) 644 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 : 1.781 mA I/P-FG : 2.378 mA O/P-FG : 0.454 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

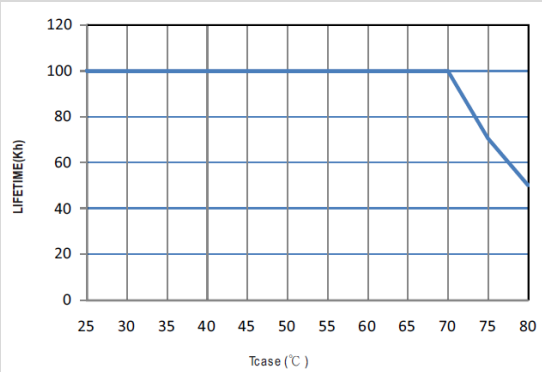
E.M.C TEST

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-12 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>BD1</td><td>45.8°C</td><td>81.6°C</td></tr> <tr><td>2</td><td>LF2</td><td>44.6°C</td><td>80.8°C</td></tr> <tr><td>3</td><td>Q1</td><td>46.8°C</td><td>82.7°C</td></tr> <tr><td>4</td><td>Q3</td><td>53.0°C</td><td>89.4°C</td></tr> <tr><td>5</td><td>U1</td><td>50.5°C</td><td>86.8°C</td></tr> <tr><td>6</td><td>RTH2</td><td>44.6°C</td><td>80.4°C</td></tr> <tr><td>7</td><td>D2</td><td>52.0°C</td><td>88.7°C</td></tr> <tr><td>8</td><td>C5</td><td>45.1°C</td><td>81.1°C</td></tr> <tr><td>9</td><td>C16</td><td>45.1°C</td><td>80.8°C</td></tr> <tr><td>10</td><td>T1</td><td>50.8°C</td><td>86.7°C</td></tr> <tr><td>11</td><td>D101</td><td>53.6°C</td><td>90.6°C</td></tr> <tr><td>12</td><td>C106</td><td>48.1°C</td><td>84.1°C</td></tr> <tr><td>13</td><td>LF100</td><td>47.1°C</td><td>83.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25.1 °C	HIGH AMBIENT Ta=63.8 °C	1	BD1	45.8°C	81.6°C	2	LF2	44.6°C	80.8°C	3	Q1	46.8°C	82.7°C	4	Q3	53.0°C	89.4°C	5	U1	50.5°C	86.8°C	6	RTH2	44.6°C	80.4°C	7	D2	52.0°C	88.7°C	8	C5	45.1°C	81.1°C	9	C16	45.1°C	80.8°C	10	T1	50.8°C	86.7°C	11	D101	53.6°C	90.6°C	12	C106	48.1°C	84.1°C	13	LF100	47.1°C	83.3°C	
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13	LF100	47.1°C	83.3°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	± 0.002 % (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-12 :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) 898425 HRS (2) 101887 HRS (3) 126362 HRS (4) 169565 HRS
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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