



# Test Report: HLN-40H-54

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40W Single Output Switching Power Supply

## ■ 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	RIPPLE & NOISE	V1 : 300 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 27 mVp-p (Max)
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 49 V ~ 58 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	47.84 V ~ 59.88 V / 230 VAC 47.84 V ~ 59.89 V / 115 VAC
3	CURRENT ADJUST RANGE	CH1 : 0.45A ~ 0.75A	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	0.377 A ~ 0.798 A / 230 VAC 0.377 A ~ 0.798 A / 115 VAC
4	OUTPUT VOLTAGE TOLERANCE	V1 : 1 % ~ -1 % (Max)	I/P : 100 VAC / 305VAC O/P : FULL / MIN LOAD Ta : 25°C	V1 : 0.4 % ~ -0.4 %
5	LINE REGULATION	V1 : 0.5 % ~ -0.5 % (Max)	I/P : 100VAC ~ 305VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.2 % ~ -0.2 %
6	LOAD REGULATION	V1 : 0.5 % ~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~ MIN LOAD Ta : 25°C	V1 : 0.4 % ~ -0.4 %
7	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
8	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 / 40 ms 115VAC / 41 ms
9	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 / 73 ms 115VAC / 40 ms
10	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %
11	DYNAMIC LOAD	V1 : 5400 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)96 mVp-p (2)854 mVp-p

12	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
Output current	0.072A		0.151A	0.226A	0.302A	0.747A	0.456A	0.533A	0.602A	0.691A	0.746A	
%	9.61%		20.07%	30.09%	40.29%	99.56%	60.83%	71.03%	80.31%	92.13%	99.44%	
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	
	Output current	0.073A	0.151A	0.227A	0.304A	0.381A	0.458A	0.535A	0.612A	0.689A	0.750A	
	%	9.76%	20.11%	30.28%	40.53%	50.77%	61.12%	71.37%	81.57%	91.88%	100.03%	
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	
	Output current	0.091A	0.170A	0.247A	0.323A	0.396A	0.468A	0.539A	0.609A	0.679A	0.750A	
	%	12.12%	22.63%	32.97%	43.08%	52.80%	62.40%	71.84%	81.21%	90.53%	100.00%	

**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	70.7 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 I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.961 / 230 VAC PF= 0.996 / 115 VAC PF= 0.934 / 277VAC
4	EFFICIENCY	89 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	89.57 %
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 = 0.134 A/ 277 VAC I = 0.20 A/ 230 VAC I = 0.39 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 : 0.2 mA N-FG : 0.2 mA

**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 : 59 V ~ 68 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	64.76 V/ 230 VAC 64.32 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

## 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) 550 V (2) 478 V (3) 472 V
2	Diode Peak Voltage	D101 Rated : 20A/300V	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) 258 V (2) 252 V (3) 235 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) 608 V (2) 608 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) 435.72 V (2) 435.43 V (3) 434.95 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) 21.624 V (2) 21.695 V (3) 21.672 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) 668 V (2) 636 V (3) 660 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 : 1.8 KVAC/min Ta : 25°C	I/P-O/P : 2.210 mA I/P-FG : 2.401 mA O/P-FG : 0.489 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 A CLASS C	I/P: 230VAC/50HZ O/P:100/90/80/70/60% ELECTRONICLOAD O/P:100%LED LOAD Ta:25°C	PASS
2	CONDUCTION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/60% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55022 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 : HLN-40H-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : 95% LOAD Ta= 29.4 °C 2. HIGH AMBIENT BURN-IN : 15 HRS I/P : 230VAC O/P : 95% LOAD Ta= 41.1 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 29.4 °C</th> <th>HIGH AMBIENT Ta= 41.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF2</td><td>65.4°C</td><td>74.9°C</td></tr> <tr><td>2</td><td>BDI</td><td>55.1°C</td><td>64.9°C</td></tr> <tr><td>3</td><td>Q1</td><td>66.7°C</td><td>76.2°C</td></tr> <tr><td>4</td><td>Q3</td><td>70.8°C</td><td>80.3°C</td></tr> <tr><td>5</td><td>U1</td><td>63.8°C</td><td>73.3°C</td></tr> <tr><td>6</td><td>RTH2</td><td>55.2°C</td><td>65.0°C</td></tr> <tr><td>7</td><td>D2</td><td>76.2°C</td><td>85.6°C</td></tr> <tr><td>8</td><td>C5</td><td>59.5°C</td><td>69.1°C</td></tr> <tr><td>9</td><td>C16</td><td>57.3°C</td><td>67.1°C</td></tr> <tr><td>10</td><td>T1</td><td>76.4°C</td><td>85.5°C</td></tr> <tr><td>11</td><td>D101</td><td>81.2°C</td><td>90.9°C</td></tr> <tr><td>12</td><td>C106</td><td>61.9°C</td><td>71.5°C</td></tr> <tr><td>13</td><td>LF100</td><td>56.9°C</td><td>66.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 29.4 °C	HIGH AMBIENT Ta= 41.1 °C	1	LF2	65.4°C	74.9°C	2	BDI	55.1°C	64.9°C	3	Q1	66.7°C	76.2°C	4	Q3	70.8°C	80.3°C	5	U1	63.8°C	73.3°C	6	RTH2	55.2°C	65.0°C	7	D2	76.2°C	85.6°C	8	C5	59.5°C	69.1°C	9	C16	57.3°C	67.1°C	10	T1	76.4°C	85.5°C	11	D101	81.2°C	90.9°C	12	C106	61.9°C	71.5°C	13	LF100	56.9°C	66.7°C	
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13	LF100	56.9°C	66.7°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 40 °C NO DAMAGE	I/P : 305 VAC O/P : 95% LOAD Ta= 40 °C HUMIDITY= 95 %R.H	TEST : OK																																																								
4	TEMPERATURE COEFFICIENT	± 0.03 % (0~40°C)	I/P : 230 VAC O/P : 95% LOAD	± 0.00 % (0~40°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 : -45°C~ +45°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																																																								





7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 72min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
8	CAPACITOR LIFE CYCLE	HLN-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=40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40 °C LIFE TIME	(1) 159711 HRS (2) 65285 HRS (3) 87363 HRS (4) 80419 HRS
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 336.5K HRS	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 30,000 hours @ Tcase 70°C, 50,000 hours @ Tcase 60°C	

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2011/5/2	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023