



Test Report: HVG-100-30

100W 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	RIPPLE & NOISE	V1 : 200 mVp-p (Max)	I/P : 347VAC O/P : FULL LOAD Ta : 25°C	V1 : 23.4 mVp-p (Max)
2	CONSTANT CURRENT REGION	15V ~ 30V	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	O/P=15V : 3.21A O/P=29V : 3.21 A
3	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 27V ~ 33 V	I/P : 480 VAC I/P : 347 VAC O/P : MIN LOAD Ta : 25°C	25.990 V ~ 33.739 V/ 480 VAC 25.988 V ~ 33.740 V/ 347 VAC
4	OUTPUT CURRENT ADJUST RANGE	CH1 : 1.76A~3.2A	I/P : 480 VAC I/P : 347 VAC O/P : CV MODE Ta : 25°C	1.572 A~ 3.654 A/ 480 VAC 1.570 A~ 3.653 A/ 347 VAC
5	OUTPUT VOLTAGE TOLERANCE	V1 : 1%~ -1 % (Max)	I/P : 180 VAC / 528 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.13 %~ -0.13 %
6	LINE REGULATION	V1 : 0.5 %~ -0.5% (Max)	I/P : 180 VAC ~ 528 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %
7	LOAD REGULATION	V1 : 0.5 %~-0.5% (Max)	I/P : 347 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.13 %~ -0.13 %
8	SET UP TIME	480VAC : 500 ms (Max) 347VAC : 500 ms(Max) 230VAC : 500 ms(Max)	I/P : 480VAC I/P : 347 VAC I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	480 VAC/ 355 ms 347VAC/ 384 ms 230VAC/ 402 ms
9	RISE TIME	480 VAC : 80 ms (Max) 347VAC : 80 ms (Max) 230VAC : 80 ms (Max)	I/P : 480 VAC I/P : 347 VAC I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	480 VAC/ 20 ms 347VAC/ 18 ms 230VAC/ 18 ms
10	HOLD UP TIME	480 VAC : 30 ms (TYP) 347VAC : 30 ms (TYP)	I/P : 480 VAC I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	480 VAC/ 46 ms 347VAC/ 45 ms
11	OVER/UNDERSHOOT TEST	< ±5%	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %

12	DYNAMIC LOAD	V1 : 3000 mVp-p	I/P : 347 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25℃							(1)272 mVp-p (2)558 mVp-p			
13	DIMMER TEST (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℃													
1	Resistance value	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
	Output current	0.000A	0.335A	0.642A	0.966A	1.290A	1.611A	1.933A	2.219A	2.531A	2.873A	3.188A	3.355A
	%	0.00%	10.47%	20.06%	30.19%	40.31%	50.34%	60.41%	69.34%	79.09%	89.78%	99.63%	104.84%
2	Dimming value	SHORT	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output current	0.000A	0.336A	0.655A	0.975A	1.295A	1.621A	1.939A	2.251A	2.573A	2.890A	3.207A	3.355A
	%	0.00%	10.50%	20.47%	30.47%	40.47%	50.66%	60.59%	70.34%	80.41%	90.31%	100.22%	104.84%
3	Duty value	SHORT	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	Output current	0.000A	0.357A	0.674A	0.995A	1.312A	1.631A	1.951A	2.268A	2.587A	2.906A	3.226A	3.355A
	%	0.00%	11.16%	21.06%	31.09%	41.00%	50.97%	60.97%	70.88%	80.84%	90.81%	100.81%	104.84%

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	156 V~528V
			I/P : LOW-LINE-3V=177V HIGH-LINE+3V=531 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 : 180VAC ~ 528 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK
3	POWER FACTOR	0.98 / 230 VAC(TYP) 0.98 / 277VAC(TYP) 0.97 /347 VAC(TYP) 0.93 / 480 VAC(TYP)	I/P : 230VAC I/P : 277VAC I/P : 347VAC I/P : 480VAC O/P : FULL LOAD Ta : 25°C	PF= 0.994 / 230 VAC PF= 0.991 / 277 VAC PF= 0.985 / 347VAC PF= 0.945 / 480VAC
4	EFFICIENCY	91 % (TYP)	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	91.77 %
5	INPUT CURRENT	347V/ 0.38 A (TYP) 480V/ 0.28 A (TYP)	I/P : 347 VAC I/P : 480 VAC O/P : FULL LOAD Ta : 25°C	I = 0.31 A/ 347 VAC I = 0.25 A/ 480 VAC
6	INRUSH CURRENT	480V/ 25 A (TYP) twidth=900μ s measured at 50% Ipeak	I/P : 480VAC O/P : FULL LOAD Ta : 25°C	I = 34 A/ 480VAC T50= 378 us
7	LEAKAGE CURRENT	< 0.75 mA / 480 VAC	I/P : 480 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.32 mA N-FG : 0.30 mA
8	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 50% or higher at 230VAC / 277VAC / 347VAC	I/P : 230VAC I/P : 277VAC I/P : 347VAC O/P : 50% LOAD Ta : 25°C	THD : 12.7 THD : 14 THD : 17.5
		Total harmonic distortion will be lower than 20% when output loading is 75% or higher at 480VAC	I/P : 480VAC O/P : 75% LOAD Ta : 25°C	THD : 18

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER CURRENT	95% ~ 108%	I/P : 480 VAC I/P : 347 VAC O/P : TESTING Ta : 25°C	105 %/ 480 VAC 105 %/ 347 VAC Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH1 : 34V ~ 38 V	I/P : 480 VAC I/P : 347 VAC O/P : MIN LOAD Ta : 25°C	36.19 V/ 480VAC 36.21 V/ 347 VAC Shut down o/p voltage with auto-recovery or re-power on to recovery
3	OVER TEMPERATURE PROTECTION	SPEC : NO DAMAGE	I/P : 347 VAC O/P : FULL LOAD	O.T.P. Active Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	NO DAMAGE	I/P : 528 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	Q3 Rated : 950V/9A	I/P : High-Line +3V = 531 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 477 V (2) 477 V (3) 475 V
2	Diode Peak Voltage	Q101 Rated : 120V/30A	I/P : High-Line +3V = 531 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 90 V (2) 91 V (3) 90 V
3	Input Capacitor Voltage	C5 Rated : 56u/450V	I/P : High-Line +3V = 531 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) 406 V (2) 418 V (3) 406 V
4	Control IC Voltage Test	U1 Rated : 10.3V~22.5V	I/P : High-Line +3V = 531 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) 14.15 V (2) 14.150 V (3) 14.164 V
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 950V/9A	I/P : High-Line +3V = 531 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 597 V (2) 790 V (3) 597 V

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
	WITHSTAND VOLTAGE	I/P-O/P : 3.75 KVAC/min I/P-FG : 2 KVAC/min 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 : 3.16 mA I/P-FG : 2.109 mA O/P-FG : 3.24 mA NO DAMAGE
	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	13 mΩ

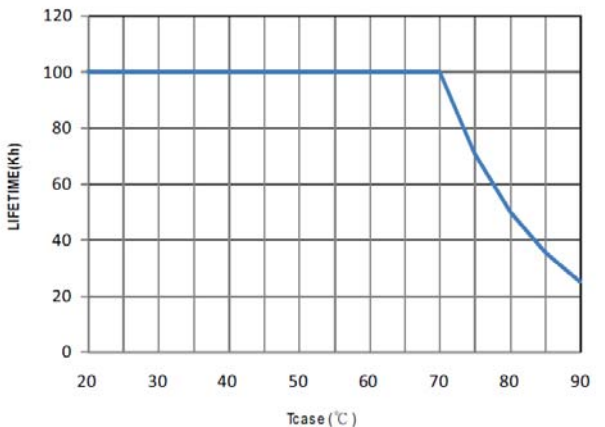
E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:230VAC/60HZ O/P:100/60%ELECTRONIC LOAD O/P:100%LED LOAD Ta:25°C	PASS
2	CONDUCTION	EN55015 CLASS B	I/P: 230/347VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P: 230/347 VAC (50HZ) O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P:230/347 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P: 230/347 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: 230/347 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	<div>MODEL : HVG-100-24</div> <div>1. ROOM AMBIENT BURN-IN : 1.5 HRS</div> <div>I/P : 347VAC O/P : FULL LOAD Ta= 31 ℃</div> <div>2. HIGH AMBIENT BURN-IN : 1.5 HRS</div> <div>I/P : 347VAC O/P : FULL LOAD Ta= 64.6 ℃</div> <table><thead><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 31 ℃</th><th>HIGH AMBIENT Ta= 64.6 ℃</th></tr></thead><tbody><tr><td>1</td><td>LF2</td><td>52.2℃</td><td>79.3℃</td></tr><tr><td>2</td><td>BD1</td><td>51.2℃</td><td>78.1℃</td></tr><tr><td>3</td><td>C48</td><td>52.3℃</td><td>79.5℃</td></tr><tr><td>4</td><td>L1</td><td>52.7℃</td><td>79.8℃</td></tr><tr><td>5</td><td>D2</td><td>60.0℃</td><td>90.3℃</td></tr><tr><td>6</td><td>C5</td><td>55.7℃</td><td>82.7℃</td></tr><tr><td>7</td><td>Q1</td><td>54.9℃</td><td>81.9℃</td></tr><tr><td>8</td><td>Q3</td><td>55.2℃</td><td>83.0℃</td></tr><tr><td>9</td><td>T3</td><td>56.4℃</td><td>84.0℃</td></tr><tr><td>10</td><td>T1</td><td>60.4℃</td><td>86.3℃</td></tr><tr><td>11</td><td>C203</td><td>57.1℃</td><td>84.0℃</td></tr><tr><td>12</td><td>RTH2</td><td>53.0℃</td><td>80.5℃</td></tr><tr><td>13</td><td>C85</td><td>53.1℃</td><td>79.9℃</td></tr><tr><td>14</td><td>U2</td><td>54.2℃</td><td>80.9℃</td></tr><tr><td>15</td><td>C103</td><td>54.1℃</td><td>81.3℃</td></tr><tr><td>16</td><td>C106</td><td>50.9℃</td><td>78.5℃</td></tr><tr><td>17</td><td>LF100</td><td>51.7℃</td><td>79.1℃</td></tr><tr><td>18</td><td>Q101</td><td>57.8℃</td><td>85.0℃</td></tr></tbody></table>			NO	Position	ROOM AMBIENT Ta= 31 ℃	HIGH AMBIENT Ta= 64.6 ℃	1	LF2	52.2℃	79.3℃	2	BD1	51.2℃	78.1℃	3	C48	52.3℃	79.5℃	4	L1	52.7℃	79.8℃	5	D2	60.0℃	90.3℃	6	C5	55.7℃	82.7℃	7	Q1	54.9℃	81.9℃	8	Q3	55.2℃	83.0℃	9	T3	56.4℃	84.0℃	10	T1	60.4℃	86.3℃	11	C203	57.1℃	84.0℃	12	RTH2	53.0℃	80.5℃	13	C85	53.1℃	79.9℃	14	U2	54.2℃	80.9℃	15	C103	54.1℃	81.3℃	16	C106	50.9℃	78.5℃	17	LF100	51.7℃	79.1℃	18	Q101	57.8℃	85.0℃
NO	Position	ROOM AMBIENT Ta= 31 ℃	HIGH AMBIENT Ta= 64.6 ℃																																																																													
1	LF2	52.2℃	79.3℃																																																																													
2	BD1	51.2℃	78.1℃																																																																													
3	C48	52.3℃	79.5℃																																																																													
4	L1	52.7℃	79.8℃																																																																													
5	D2	60.0℃	90.3℃																																																																													
6	C5	55.7℃	82.7℃																																																																													
7	Q1	54.9℃	81.9℃																																																																													
8	Q3	55.2℃	83.0℃																																																																													
9	T3	56.4℃	84.0℃																																																																													
10	T1	60.4℃	86.3℃																																																																													
11	C203	57.1℃	84.0℃																																																																													
12	RTH2	53.0℃	80.5℃																																																																													
13	C85	53.1℃	79.9℃																																																																													
14	U2	54.2℃	80.9℃																																																																													
15	C103	54.1℃	81.3℃																																																																													
16	C106	50.9℃	78.5℃																																																																													
17	LF100	51.7℃	79.1℃																																																																													
18	Q101	57.8℃	85.0℃																																																																													
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 347 VAC O/P : 103 % LOAD Ta : 25℃	TEST : OK																																																																												
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 528VAC/200VAC O/P : 100 % LOAD Ta= -40 ℃	TEST : OK																																																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60℃ NO DAMAGE	I/P : 531 VAC O/P : FULL LOAD Ta= 60 ℃ HUMIDITY= 95 %R.H	TEST : OK																																																																												
5	TEMPERATURE COEFFICIENT	± 0.03%(0~50℃)	I/P : 347 VAC O/P : FULL LOAD	± 0.002 %(0~50℃)																																																																												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 2. Temperature change rate : 25℃ / 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 : $-45^{\circ}\text{C} \sim +65^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 347VAC/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	HVG-100-24:SUPPOSE C103 IS THE MOST CRITICAL COMPONENT (1) I/P : 347VAC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 347VAC O/P : FULL LOAD Ta= 60°C LIFE TIME (3) I/P : 347VAC O/P : 75% LOAD Ta= 60°C LIFE TIME (4) I/P : 347VAC O/P : 50% LOAD Ta= 60°C LIFE TIME	(1) 521979HRS (2) 71882HRS (3) 101724HRS (4) 137017HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 174.9K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 80°C 	

RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

12.10.30 A50-F031