



Test Report: HVGC-150-1050

150W Constant Current Mode 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

■ **ESIGN VERIFY TEST**

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CURRENT TOLERANCE	± 5%	I/P : 347VAC O/P : LED MODE : 15V-143V Ta : 25°C	-0.5 %- -0.59 %
2	OUTPUT VOLTAGE RANGE	15V ~ 143V	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	O/P=15V : 1.05 A O/P=142V : 1.05 A
3	OUTPUT CURRENT ADJUST RANGE	CH1 : 630mA-1050m A	I/P : 480 VAC I/P : 347 VAC O/P : LED : 142V Ta : 25°C	0.5458 A~ 1.149 A/ 480 VAC 0.5454 A~ 1.149 A/ 347 VAC
4	CURRENT RIPPLE	8.0% max. @rated current	I/P : 347VAC O/P : LED MODE : 15V-143V Ta : 25°C	LED=15V 4.75 % LED=142V 2.83 %
5	SET UP TIME	480 VAC : 400 ms (Max) 347VAC : 400 ms(Max) 230VAC : 500 ms(Max)	I/P : 480 VAC I/P : 347 VAC I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	480 VAC/ 201 ms 347VAC/ 257 ms 230VAC/ 377 ms
6	OVER/UNDERSHOOT TEST	< ±5%	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	TEST : < 5 %

7	<p>DIMMER TEST (B Type only) SPEC: ※Built-in 3 in 1 dimming function, IP67 rated. Output constant current level can be adjusted through output cable by connecting a resistance or 0 ~ 10Vdc or 10V PWM signal between DIM+ and DIM-. ※Please DO NOT connect "DIM-" to "-V". ※Reference resistance value for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Resistance value</td> <td>10K</td> <td>20K</td> <td>30K</td> <td>40K</td> <td>50K</td> <td>60K</td> <td>70K</td> <td>80K</td> <td>90K</td> <td>100K</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>*1 ~ 10V dimming function for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Dimming value</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>*10V PWM signal for output current adjustment (Typical)</p> <table border="1"> <tr> <td>Duty value</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> <tr> <td>Output current</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> </tr> </table> <p>TEST RESULT: I/P : 230 VAC ;Ta : 25°C</p> <table border="1"> <tr> <td rowspan="3">1</td> <td>Resistance value</td> <td>SHORT</td> <td>10K</td> <td>20K</td> <td>30K</td> <td>40K</td> <td>50K</td> <td>60K</td> <td>70K</td> <td>80K</td> <td>90K</td> <td>100K</td> <td>OPEN</td> </tr> <tr> <td>Output current</td> <td>0.000A</td> <td>0.127A</td> <td>0.229A</td> <td>0.331A</td> <td>0.433A</td> <td>0.540A</td> <td>0.640A</td> <td>0.738A</td> <td>0.831A</td> <td>0.950A</td> <td>1.053A</td> <td>1.0805A</td> </tr> <tr> <td>%</td> <td>0.00%</td> <td>12.11%</td> <td>21.81%</td> <td>31.56%</td> <td>41.26%</td> <td>51.46%</td> <td>60.97%</td> <td>70.30%</td> <td>79.13%</td> <td>90.46%</td> <td>100.31%</td> <td>102.90%</td> </tr> <tr> <td rowspan="3">2</td> <td>Dimming value</td> <td>SHORT</td> <td>1V</td> <td>2V</td> <td>3V</td> <td>4V</td> <td>5V</td> <td>6V</td> <td>7V</td> <td>8V</td> <td>9V</td> <td>10V</td> <td>OPEN</td> </tr> <tr> <td>Output current</td> <td>0.000A</td> <td>0.131A</td> <td>0.232A</td> <td>0.335A</td> <td>0.439A</td> <td>0.536A</td> <td>0.647A</td> <td>0.743A</td> <td>0.845A</td> <td>0.954A</td> <td>1.056A</td> <td>1.0805A</td> </tr> <tr> <td>%</td> <td>0.00%</td> <td>12.49%</td> <td>22.07%</td> <td>31.94%</td> <td>41.78%</td> <td>51.05%</td> <td>61.62%</td> <td>70.79%</td> <td>80.50%</td> <td>90.82%</td> <td>100.53%</td> <td>102.90%</td> </tr> <tr> <td rowspan="3">3</td> <td>Duty value</td> <td>SHORT</td> <td>10%</td> <td>20%</td> <td>30%</td> <td>40%</td> <td>50%</td> <td>60%</td> <td>70%</td> <td>80%</td> <td>90%</td> <td>100%</td> <td>OPEN</td> </tr> <tr> <td>Output current</td> <td>0.000A</td> <td>0.130A</td> <td>0.233A</td> <td>0.336A</td> <td>0.439A</td> <td>0.542A</td> <td>0.644A</td> <td>0.747A</td> <td>0.850A</td> <td>0.953A</td> <td>1.057A</td> <td>1.0805A</td> </tr> <tr> <td>%</td> <td>0.00%</td> <td>12.42%</td> <td>22.20%</td> <td>32.00%</td> <td>41.79%</td> <td>51.57%</td> <td>61.36%</td> <td>71.11%</td> <td>80.94%</td> <td>90.78%</td> <td>100.65%</td> <td>102.90%</td> </tr> </table>	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	Output current	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	1	Resistance value	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN	Output current	0.000A	0.127A	0.229A	0.331A	0.433A	0.540A	0.640A	0.738A	0.831A	0.950A	1.053A	1.0805A	%	0.00%	12.11%	21.81%	31.56%	41.26%	51.46%	60.97%	70.30%	79.13%	90.46%	100.31%	102.90%	2	Dimming value	SHORT	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN	Output current	0.000A	0.131A	0.232A	0.335A	0.439A	0.536A	0.647A	0.743A	0.845A	0.954A	1.056A	1.0805A	%	0.00%	12.49%	22.07%	31.94%	41.78%	51.05%	61.62%	70.79%	80.50%	90.82%	100.53%	102.90%	3	Duty value	SHORT	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN	Output current	0.000A	0.130A	0.233A	0.336A	0.439A	0.542A	0.644A	0.747A	0.850A	0.953A	1.057A	1.0805A	%	0.00%	12.42%	22.20%	32.00%	41.79%	51.57%	61.36%	71.11%	80.94%	90.78%	100.65%	102.90%
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC-528VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C I/P : LOW-LINE-3V=177V HIGH-LINE+10V=538 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	166V-528V 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) 0.97 / 277VAC(TYP) 0.95 /347 VAC(TYP) 0.93 / 480VAC(TYP)	I/P : 230VAC I/P : 277VAC I/P : 347VAC I/P : 480VAC O/P : FULL LOAD Ta : 25°C	PF= 0.9965 / 230 VAC PF= 0.9953 / 277 VAC PF= 0.9864 / 347VAC PF= 0.9613 / 480VAC

4	EFFICIENCY	90 % (TYP)	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	92.332 %
5	INPUT CURRENT	347V/ 0.5 A (TYP) 480V/ 0.38 A (TYP)	I/P : 347 VAC I/P : 480 VAC O/P : FULL LOAD Ta : 25°C	I = 0.4778 A/ 347 VAC I = 0.3567 A/ 480 VAC
6	INRUSH CURRENT	480V/ 35 A (TYP) ($t_{width}=790\mu s$ measured at 50% I_{peak}) COLD START	I/P : 480VAC O/P : FULL LOAD Ta : 25°C	I = 28 A/ 480VAC T50= 780 us
7	LEAKAGE CURRENT	< 0.75 mA / 480 VAC	I/P : 480 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.35 mA N-FG : 0.35 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 : 13.6 THD : 15.6 THD : 18.3
		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 : 16.12

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1 : 151V - 165 V	I/P : 480 VAC I/P : 347 VAC O/P : MIN LOAD Ta : 25°C	158.46V/ 480VAC 158.76V/ 347 VAC Shut down o/p voltage with auto-recovery or re-power on to recovery
2	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
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 480 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 : 7A/950V	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) 752 V (2) 320 V (3) 688 V
2	Diode Peak Voltage	D100 Rated : 15A/600V	I/P : High-Line +3V = 531 V	(1) 396 V

			O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(2) 496 V (3) 380 V
3	Input Capacitor Voltage	C5 Rated : 22u/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) 432 V (2) 424 V (3) 436 V
4	Control IC Voltage Test	U1 Rated : 10.3V~22.5V U2 Rated : 11V~28V	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 (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Ta : 25°C	(1) 17.9 V (2) 18.1 V (3) 18.1 V (4) 16.6 V (5) 16.5 V (6) 16.6 V
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 7A/950V	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) 936 V (2) 840 V (3) 864 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 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 : 3.4 mA I/P-FG : 2.4 mA O/P-FG : 4.33 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 : 20.6 GΩ I/P-FG : 11 GΩ O/P-FG : 15 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	25 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:230VAC/380VAC/50HZ/60HZ O/P:100/50%ELECTRONIC LOAD O/P:100%LED LOAD Ta:25°C	PASS
2	CONDUCTION	EN55015 CLASS B FCC Part 15 Subpart B	I/P: 230VAC/380VAC/50HZ/60HZ O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B FCC Part 15 Subpart B	I/P: 230VAC/380VAC/50HZ/60HZ O/P:FULL LOAD/50% LOAD Ta:25°C	PASS Test by certified Lab

4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 230VAC/380VAC/50HZ/60HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P: 230VAC/380VAC/50HZ/60HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230VAC/380VAC/50HZ/60HZ 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 : HVGC-150-350 1. ROOM AMBIENT BURN-IN : 12 HRS I/P : 347VAC O/P : FULL LOAD Ta=26.2 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 347VAC O/P : FULL LOAD Ta=57.8 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 26.2 °C</th> <th>HIGH AMBIENT Ta=57.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C46</td><td>50.4°C</td><td>80.4°C</td></tr> <tr><td>2</td><td>LF2</td><td>48.8°C</td><td>79.1°C</td></tr> <tr><td>3</td><td>BD1</td><td>53.3°C</td><td>83.3°C</td></tr> <tr><td>4</td><td>C48</td><td>52.2°C</td><td>82.2°C</td></tr> <tr><td>5</td><td>L2</td><td>57.8°C</td><td>87.8°C</td></tr> <tr><td>6</td><td>Q1</td><td>57.0°C</td><td>87.8°C</td></tr> <tr><td>7</td><td>C5</td><td>60.5°C</td><td>88.3°C</td></tr> <tr><td>8</td><td>T1</td><td>66.4°C</td><td>94.7°C</td></tr> <tr><td>9</td><td>C15</td><td>54.7°C</td><td>84.6°C</td></tr> <tr><td>10</td><td>T3</td><td>59.6°C</td><td>88.4°C</td></tr> <tr><td>11</td><td>Q3</td><td>59.2°C</td><td>88.2°C</td></tr> <tr><td>12</td><td>D19</td><td>63.2°C</td><td>91.4°C</td></tr> <tr><td>13</td><td>C62</td><td>54.3°C</td><td>83.6°C</td></tr> <tr><td>14</td><td>RTH2</td><td>53.9°C</td><td>83.2°C</td></tr> <tr><td>15</td><td>D100</td><td>56.1°C</td><td>86.6°C</td></tr> <tr><td>16</td><td>C203</td><td>55.7°C</td><td>84.8°C</td></tr> <tr><td>17</td><td>C104</td><td>51.5°C</td><td>81.1°C</td></tr> <tr><td>18</td><td>C106</td><td>49.0°C</td><td>78.9°C</td></tr> <tr><td>19</td><td>LF100</td><td>49.7°C</td><td>79.6°C</td></tr> <tr><td>20</td><td>U1</td><td>56.1°C</td><td>85.5°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 26.2 °C	HIGH AMBIENT Ta=57.8 °C	1	C46	50.4°C	80.4°C	2	LF2	48.8°C	79.1°C	3	BD1	53.3°C	83.3°C	4	C48	52.2°C	82.2°C	5	L2	57.8°C	87.8°C	6	Q1	57.0°C	87.8°C	7	C5	60.5°C	88.3°C	8	T1	66.4°C	94.7°C	9	C15	54.7°C	84.6°C	10	T3	59.6°C	88.4°C	11	Q3	59.2°C	88.2°C	12	D19	63.2°C	91.4°C	13	C62	54.3°C	83.6°C	14	RTH2	53.9°C	83.2°C	15	D100	56.1°C	86.6°C	16	C203	55.7°C	84.8°C	17	C104	51.5°C	81.1°C	18	C106	49.0°C	78.9°C	19	LF100	49.7°C	79.6°C	20	U1	56.1°C	85.5°C	
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10	T3	59.6°C	88.4°C																																																																																					
11	Q3	59.2°C	88.2°C																																																																																					
12	D19	63.2°C	91.4°C																																																																																					
13	C62	54.3°C	83.6°C																																																																																					
14	RTH2	53.9°C	83.2°C																																																																																					
15	D100	56.1°C	86.6°C																																																																																					
16	C203	55.7°C	84.8°C																																																																																					
17	C104	51.5°C	81.1°C																																																																																					
18	C106	49.0°C	78.9°C																																																																																					
19	LF100	49.7°C	79.6°C																																																																																					
20	U1	56.1°C	85.5°C																																																																																					
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 528VAC/200VAC O/P : 100 % LOAD Ta= -45 °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 : 531 VAC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																				

4	TEMPERATURE COEFFICIENT	±0.03 %(0-50°C)	I/P : 347 VAC O/P : FULL LOAD	± 0.007 %(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 : 347VAC/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 : 5G (5) Test Time : 72min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK
8	CAPACITOR LIFE CYCLE	HVGC-150-350 :SUPPOSE C104 IS THE MOST CRITICAL COMPONENT (1) I/P : 347VAC O/P : FULL LOAD Tc= 80 °C LIFE TIME (2) I/P : 347VAC O/P : 75% LOAD Tc= 80 °C LIFE TIME (3) I/P : 347VAC O/P : 50% LOAD Tc= 80 °C LIFE TIME		(1) 44823HRS (2) 49280HRS (3) 52309HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 179.5K hrs min. MIL-HDBK-217F (25°C)		
10	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 50,000 hours		

RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

12.10.30 A50-F031