



Test Report: HVGC-65-500

65W 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 : 13V-130V Ta : 25°C	-0.26 %~ 0.26 %
2	CONSTANT CURRENT REGION	13V ~ 130V	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	O/P=13V : 0.501A O/P=129V : 0.502 A
3	OUTPUT CURRENT ADJUST RANGE	CH1 : 300mA~ 500mA	I/P : 480 VAC I/P : 347 VAC O/P : LED :129V Ta : 25°C	0.1788 A~ 0.5694 A/ 480 VAC 0.1797 A~ 0.5701 A/ 347 VAC
4	CURRENT RIPPLE	5.0% max. @rated current	I/P : 230VAC O/P : LED : 65V-129V Ta : 25°C	LED=65V 2.8 % LED=129V 3.3 %
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/ 278 ms 347VAC/ 290 ms 230VAC/ 310 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:</p> <p>※Built-in 3 in 1 dimming function, IP67 rated. Output constant current level can be adjusted through output cable by connecting a resistance or</p> <p>0 ~ 10Vdc or 10V PWM signal between DIM+ and DIM-.</p> <p>※Please DO NOT connect "DIM-" to "-V".</p> <p>※Reference resistance value for output current adjustment (Typical)</p>												
	Resistance value	Short	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
	Output current	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%~108%
	*1 ~ 10V dimming function for output current adjustment (Typical)												
	Dimming value	Short	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output current	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%~108%
	*10V PWM signal for output current adjustment (Typical) : Frequency range :100Hz ~ 3KHz												
	Duty value	Short	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	Output current	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	95%~108%
	TEST RESULT: I/P : 230 VAC ;Ta : 25°C												
1	Resistance value	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
	Output current	0.001A	0.054A	0.103A	0.151A	0.199A	0.248A	0.296A	0.344A	0.391A	0.440A	0.485A	0.519A
	%	0.18%	10.86%	20.52%	30.14%	39.86%	49.58%	59.14%	68.88%	78.28%	87.92%	96.90%	103.70%
2	Dimming value	SHORT	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output current	0.001A	0.055A	0.104A	0.153A	0.201A	0.256A	0.303A	0.355A	0.401A	0.455A	0.500A	0.519A
	%	0.18%	11.02%	20.80%	30.62%	40.20%	51.16%	60.66%	71.02%	80.24%	90.94%	100.04%	103.70%
3	Duty value	SHORT	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	Output current	0.001A	0.054A	0.103A	0.153A	0.203A	0.253A	0.304A	0.354A	0.404A	0.454A	0.505A	0.519A
	%	0.20%	10.80%	20.68%	30.60%	40.62%	50.68%	60.74%	70.76%	80.80%	90.86%	100.92%	103.70%

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	168 V~528V
			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)	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)	I/P : 230VAC	PF= 0.992 / 230 VAC
		0.97 / 277VAC(TYP)	I/P : 277VAC	PF= 0.991 / 277 VAC
		0.95 /347 VAC(TYP)	I/P : 347VAC	PF= 0.978 / 347VAC
		0.93 / 480VAC(TYP)	I/P : 480VAC O/P : FULL LOAD Ta : 25°C	PF= 0.973 / 480VAC
4	EFFICIENCY	90.5 % (TYP)	I/P : 347 VAC O/P : FULL LOAD Ta : 25°C	91.3 %
5	INPUT CURRENT	347V/ 0.22 A (TYP)	I/P : 347 VAC	I = 0.21 A/ 347 VAC
		480V/ 0.18 A (TYP)	I/P : 480 VAC O/P : FULL LOAD Ta : 25°C	I = 0.154 A/ 480 VAC
6	INRUSH CURRENT	230V/ 25 A (TYP) (twidth=420us measured at 50% Ipeak) COLD START	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	I = 20 A/ 230VAC T50= 406 us
7	LEAKAGE CURRENT	< 0.75 mA / 480 VAC	I/P : 480 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.26 mA N-FG : 0.29 mA
8	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 60% or higher at 230VAC / 277VAC / 347VAC	I/P : 230VAC I/P : 277VAC I/P : 347VAC O/P : 60% LOAD Ta : 25°C	THD : 7.78 % THD : 12.6 % THD : 13.69 %
		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 : 16.56 %

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1 : 137 V ~ 150 V	I/P : 480 VAC I/P : 347 VAC O/P : MIN LOAD Ta : 25°C	141.4V/ 480VAC 142 V/ 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 : 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 : 9A/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) 732 V (2) 288 V (3) 596 V
2	Diode Peak Voltage	D101 Rated : 3A/600V	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) 422 V (2) 292 V (3) 392 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) 442 V (2) 434 V (3) 440 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) 19 V (2) 19 V (3) 19 V (4) 16 (5) 16 (6) 16.2
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 9A/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) 908 V (2) 845 V (3) 840 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 : 3.18 mA I/P-FG : 2.958 mA O/P-FG : 1.724 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 : 6.56 GΩ I/P-FG : 3.17 GΩ O/P-FG : 3.30 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	23 mΩ

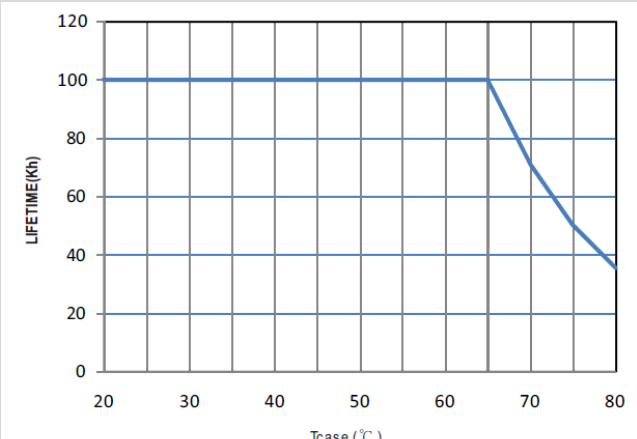
E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P:230VAC/380VAC/50HZ/60HZ O/P:100/60%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 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-65-700 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 347VAC O/P : FULL LOAD Ta= 34.2℃ 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 347VAC O/P : FULL LOAD Ta= 58.9℃	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 34.2 °C</th> <th>HIGH AMBIENT Ta= 58.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>51.5℃</td><td>75.7℃</td></tr> <tr><td>2</td><td>Q1</td><td>57.6℃</td><td>80.9℃</td></tr> <tr><td>3</td><td>Q3</td><td>58.8℃</td><td>81.8℃</td></tr> <tr><td>4</td><td>T1</td><td>61.5℃</td><td>84.2℃</td></tr> <tr><td>5</td><td>C5</td><td>49.9℃</td><td>78.4℃</td></tr> <tr><td>6</td><td>RTH2</td><td>53.5℃</td><td>76.9℃</td></tr> <tr><td>7</td><td>C102</td><td>56.8℃</td><td>80.1℃</td></tr> <tr><td>8</td><td>U2</td><td>54.1℃</td><td>77.6℃</td></tr> <tr><td>9</td><td>D101</td><td>59.5℃</td><td>82.7℃</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 34.2 °C	HIGH AMBIENT Ta= 58.9 °C	1	BD1	51.5℃	75.7℃	2	Q1	57.6℃	80.9℃	3	Q3	58.8℃	81.8℃	4	T1	61.5℃	84.2℃	5	C5	49.9℃	78.4℃	6	RTH2	53.5℃	76.9℃	7	C102	56.8℃	80.1℃	8	U2	54.1℃	77.6℃	9	D101	59.5℃	82.7℃	
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 528VAC/180VAC O/P : 100 % LOAD Ta= -40 °C	TEST : OK																																								
3	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 °C HUMIDITY= 95 %R.H	TEST : OK																																								
4	TEMPERATURE COEFFICIENT	±0.03%(0-50℃)	I/P : 347 VAC O/P : FULL LOAD	± 0%(0-50℃)																																								
5	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																																								
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -40℃~ +65℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 347VAC/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℃		TEST : OK																																								

8	CAPACITOR LIFE CYCLE	HVGC-65-700 :SUPPOSE C102 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) 634558 HRS (2) 61853 HRS (3) 74012 HRS (4) 89337 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 611K hrs min. Telcordia SR-332 (Bellcore) ; 202.7K hrs min. MIL-HDBK-217F (25°C)	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50,000 hours @ Tcase 75 °C 	

RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

12.10.30 A50-F031