Test Report: HVGC-65-350

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 : 18V~185V Ta：25℃	-0.28 %~ 0 %
2	CONSTANT CURRENT REGION	18V ~ 186V	I/P： 347 VAC O/P：FULL LOAD Ta：25℃	O/P=18V ：0.352A O/P=185V ：0.352A
3	OUTPUT CURRENT ADJUST RANGE	CH1 ：210mA~ 350m A	I/P： 480 VAC I/P： 347 VAC O/P：LED : 185V Ta：25℃	0.1491 A~ 0.3906 A/ 480 VAC 0.1496 A~ 0.3910 A/ 347 VAC
4	CURRENT RIPPLE	5.0% max. @rated current	I/P： 230VAC O/P：LED： 93V~185V Ta：25℃	LED=93V 2.3 % LED=185V 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℃	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℃	TEST： <5 %

7 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)

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℃

1	Resistance value	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
	Output current	0.001A	0.036A	0.070A	0.104A	0.139A	0.174A	0.209A	0.244A	0.279A	0.315A	0.348A	0.366A
	%	0.26%	10.17%	19.91%	29.63%	39.69%	49.66%	59.60%	69.83%	79.71%	89.94%	99.51%	104.54%
2	Dimming value	SHORT	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	Output current	0.001A	0.036A	0.071A	0.111A	0.140A	0.175A	0.210A	0.245A	0.280A	0.315A	0.350A	0.366A
	%	0.26%	10.37%	20.23%	31.71%	40.00%	50.00%	60.00%	69.94%	80.00%	90.06%	100.09%	104.54%
3	Duty value	SHORT	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	Output current	0.001A	0.036A	0.071A	0.106A	0.141A	0.176A	0.211A	0.246A	0.282A	0.318A	0.354A	0.366A
	%	0.29%	10.40%	20.29%	30.40%	40.20%	50.29%	60.29%	70.29%	80.57%	90.86%	101.14%	104.54%

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℃	156V~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℃	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℃	PF= 0.995 / 230 VAC PF= 0.991 / 277 VAC PF= 0.982 / 347VAC PF= 0.967 / 480VAC

4	EFFICIENCY	90 % (TYP)	I/P： 347 VAC O/P：FULL LOAD Ta：25℃	91.75 %
5	INPUT CURRENT	347V/ 0.22 A (TYP) 480V/ 0.18 A (TYP)	I/P： 347 VAC I/P： 480 VAC O/P：FULL LOAD Ta：25℃	I = 0.207 A/ 347 VAC I = 0.154 A/ 480 VAC
6	INRUSH CURRENT	480V/ 25 A (TYP) (t_{width}=420us measured at 50% I_{peak}) COLD START	I/P： 230VAC O/P：FULL LOAD Ta：25℃	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℃	L-FG： 0.18 mA N-FG： 0.19 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℃	THD： 8.39 % THD： 10.35 % THD： 16.83 %
		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℃	THD： 16.47 %

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	CH1：195 V ~ 210 V	I/P： 480 VAC I/P： 347 VAC O/P：MIN LOAD Ta：25℃	200.79 V/ 480VAC 201.61 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℃	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℃	(1) 860 V (2) 324 V (3) 692 V
2	Diode Peak Voltage	D101 Rated： 3A/600V	I/P：High-Line +3V = 531 V	(1) 560 V

			O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(2) (3)	370 520	V 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℃	(1) (2) (3)	422 420 428	V V 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℃	(1) (2) (3) (4) (5) (6)	19 19 19 16.2 16.4 16.4	V V V
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℃	(1) (2) (3)	892 816 816	V V 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℃	I/P-O/P： 3.18 mA I/P-FG： 2.942 mA O/P-FG： 1.735 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℃/70%RH	I/P-O/P： 2.85 GΩ I/P-FG： 1.25 GΩ O/P-FG： 2.14 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ / 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℃	PASS
2	CONDUCTION	EN55015 CLASS B FCC Part 15 Subpart B	I/P: 230VAC/380VAC/50HZ/60HZ O/P:FULL/50% LOAD Ta:25℃	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℃	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℃	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℃	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℃	CRITERIA A
7	Test by certified Lab ＆ Test Report Prepare. Any contradictions of the test results, please refer to the latest EMC test report.			

■ 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℃		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 528VAC/180VAC O/P： 100 % LOAD Ta= -40 ℃	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 ℃ HUMIDITY= 95 %R.H	TEST：OK
4	TEMPERATURE COEFFICIENT	±0.03%(0~50℃)	I/P： 347 VAC O/P：FULL LOAD	± 0 %(0~50℃)

NO	Position	ROOM AMBIENT Ta= 34.2 ℃	HIGH AMBIENT Ta= 58.9 ℃
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℃

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/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℃	TEST：OK
8	CAPACITOR LIFE CYCLE	HVGC-65-700 :SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P： 347VAC O/P：FULL LOAD Tc= 75 ℃ LIFE TIME (2) I/P： 347VAC O/P：FULL LOAD Tc= 75 ℃ LIFE TIME (3) I/P： 347VAC O/P：75% LOAD Tc= 75 ℃ LIFE TIME	 (1) 54492 HRS (2) 58093 HRS (3) 63558 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 611K hrs min. Telcordia SR-332 (Bellcore) ; 202.7K hrs min. MIL-HDBK-217F (25℃)	
10	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 50,000 hours	

RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

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