



# Test Report: HVGC-1000-H

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1000W Constant Power 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

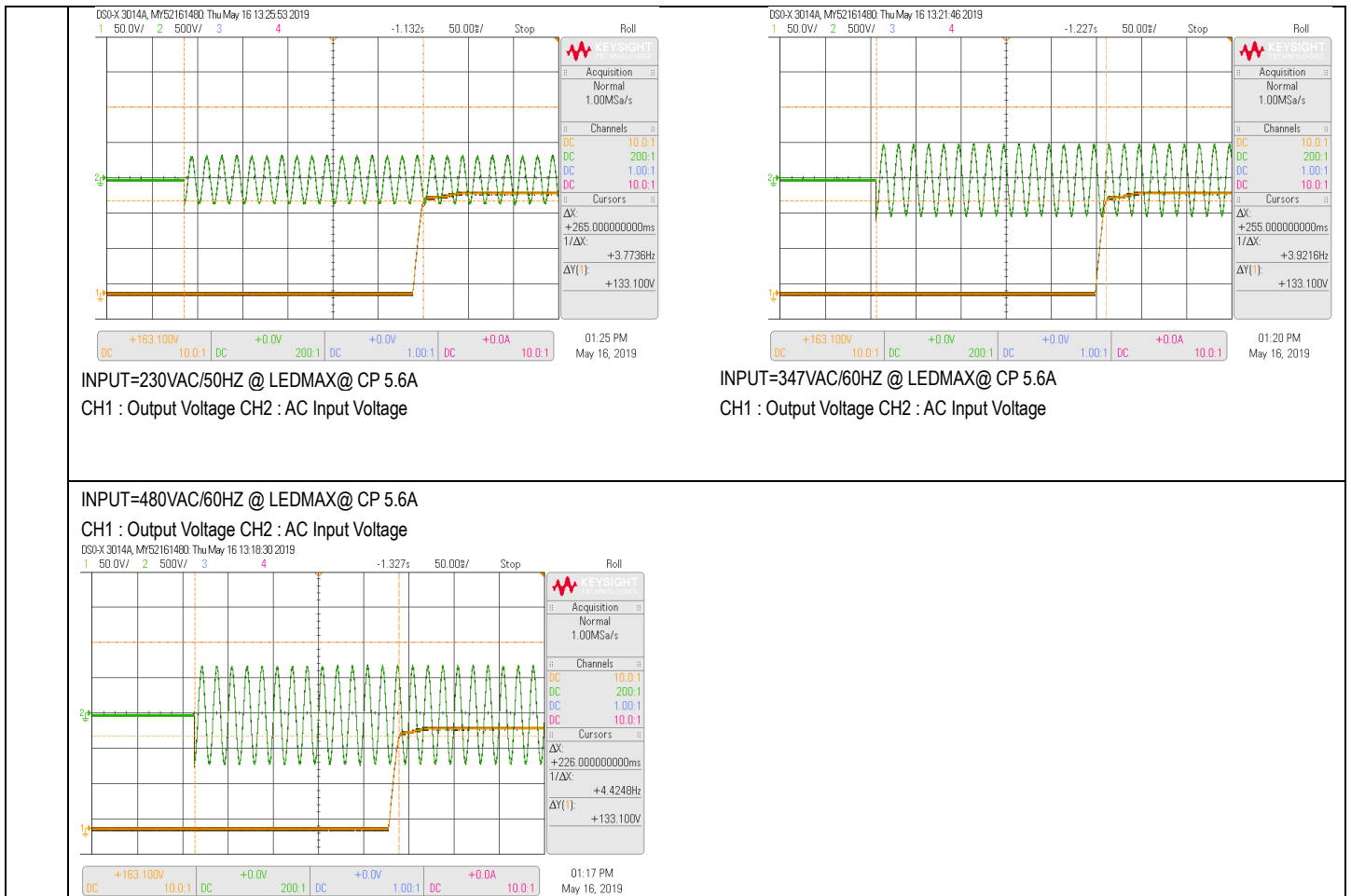
## ■ RELIABILITY TEST

ENVIRONMENT TEST

## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CURRENT TOLERANCE	±5%	I/P: 347VAC I/P: 480VAC O/P: LEDMAX CP: 5.6A & 7A Ta: 25°C	CP 5.6A: 5.613A/347VAC@LED MAX-1V 5.693A/347VAC@LED MIN 5.612A/480VAC@LED MAX-1V 5.692A/480VAC@LED MIN 1.66% CP 7A: 7.021A/347VAC@LED MAX-1V 7.044A/347VAC@LED MIN 7.026A/480VAC@LED MAX-1V 7.044A/480VAC@LED MIN 0.628%
2	FULL POWER CURRENT RANGE	5600~7000mA	I/P: 347VAC O/P: LEDMAX CP: 5.6A & 7A Ta: 25°C	182.4V/5.6A/347VAC 146.4V/7A/347VAC
3	OPEN CIRCUIT VOLTAGE (max)	190V	I/P: 347VAC O/P: NO LOAD CP: OPEN Ta: 25°C	182.4V
4	CONSTANT CURRENT REGION	CP 5.6A: CH1: 90V~180V  CP 7A: CH1: 70V~144V	I/P: 347VAC O/P: LEDMAX CP: 5.6A & 7A Ta: 25°C	CP 5.6A: 0.204V~V/347VAC  CP 7A: 0.24V~144V/347VAC
5	CURRENT ADJ. RANGE	CH1: 2800mA~7000mA	I/P: 347VAC I/P: 480VAC O/P: CV MIN & CV MAX-1V CP: 5.6A & 7A Ta: 25°C	2.383mA~7.065mA/347VAC@CV MAX-1V 2.405mA~7.1mA/347VAC@CV MIN 2.382mA~7.065mA/480VAC@CV MAX-1V 2.405mA~7.1mA/480VAC@CV MIN
6	CURRENT RIPPLE	3.0% max. @rated current	I/P: 347VAC O/P: LED MIN / LEDMAX CP: 5.6A & 7A Ta: 25°C	CP 5.6A: 2.72% @ LEDMAX 2.31% @ LED MIN  CP 7A: 2.6% @ LEDMAX 2.33% @ LED MIN
7	AUXILIARY POWER	Nominal 12V (Tolerance: ±10%, R&N: 150mVp-p)@500mA for HVGC-1000A only	I/P: 347VAC O/P: LED MIN / LEDMAX CP: 5.6A Ta: 25°C	CP 5.6A: 11.92V / 85mv
8	SET UP TIME	230VAC/ 500 ms (Max) 347VAC/ 500 ms (Max) 480VAC/ 500 ms (Max)	I/P: 230VAC I/P: 347VAC I/P: 480VAC O/P: LEDMAX CP 5.6A Ta: 25°C	230VAC/265ms 347VAC/ 255ms 480VAC/226ms

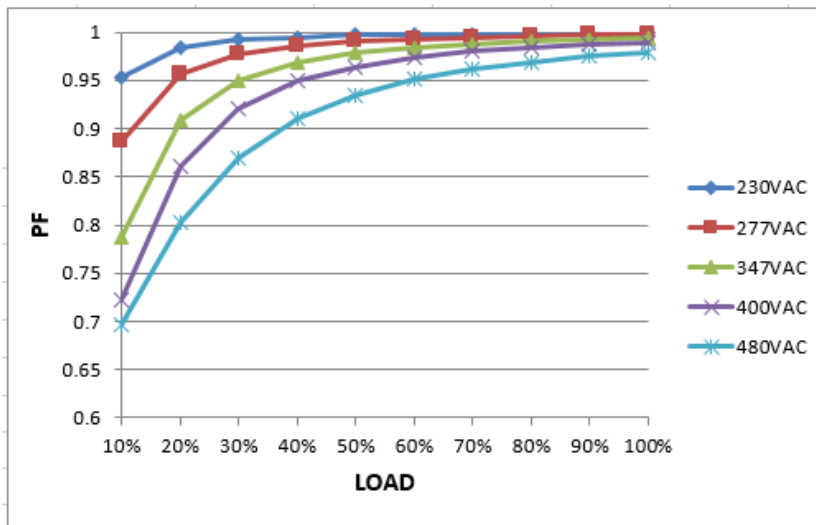


## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P: TESTING O/P: LEDMAX CP 5.6A Ta: 25°C	154V~528 V
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=538 V O/P: FULL/MIN LOAD CP 5.6A (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	(1).TEST:OK (2).TEST :OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 180 VAC ~528VAC O/P: LEDmax ~ LEDmin CP 5.6A Ta: 25°C	TEST:OK
3	INPUT CURRENT (TYP)	347VAC/ 3.15 A 480VAC/ 2.28A	I/P: 347VAC/480VAC O/P: LEDMAX CP 5.6A Ta: 25°C	I = 3.007A/ 347VAC I = 2.208A/480VAC
4	LEAKAGE CURRENT	EN61347-1 < 0.75mA / 480VAC	I/P: 480 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.3mA N-FG: 0.28mA

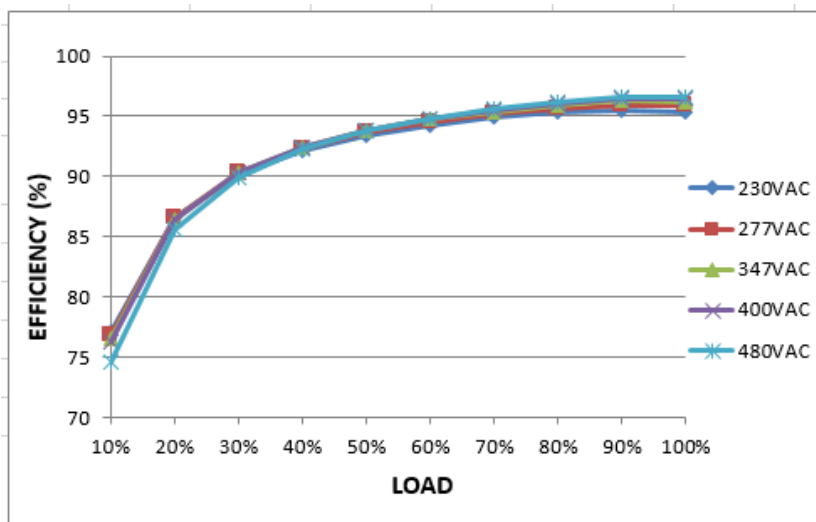
5	STANDBY POWER CONSUMPTION	Standby power consumption <2W for AB-Type(Dimming OFF)	I/P: 347VAC O/P:LEDMAX. CP 5.6A Dimming OFF Ta:25°C	1.07W
6	POWER FACTOR(TYP)	0.97/347VAC LEDMAX 0.95/480VAC LEDMAX 0.98/277 VAC LEDMAX 0.98/230 VAC LEDMAX 0.96/400 VAC LEDMAX	I/P: 347VAC/480VAC/277VAC/230VAC/400VAC O/P:LEDMAX CP 5.6A Ta:25°C	PF=0.992/347V/100%LOAD PF= 0.973/480V/100%LOAD PF=0.997/277V/100%LOAD PF=0.999/230V/100%LOAD PF=0.989/400V/100%LOAD

P.F vs LOAD

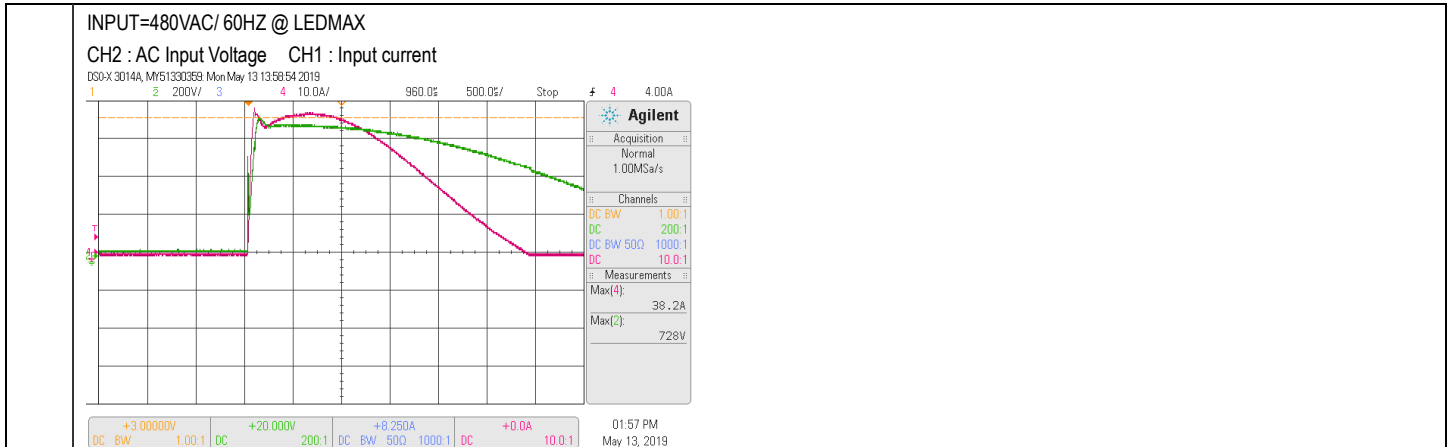


7	EFFICIENCY (TYP)	96%	I/P: 347VAC O/P:LEDMAX. CP 5.6A Ta:25°C	96.05%
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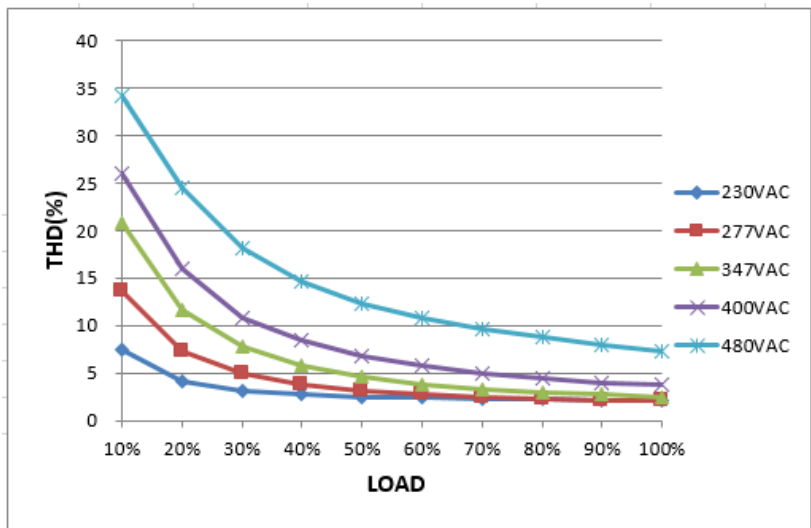
EFFICIENCY vs LOAD



8	INRUSH CURRENT (TYP)	480V/ 40A COLD START  (twid=1852 usmeasured at 50% lpeak) COLD START	I/P: 480VAC O/P:LEDMAX CP 5.6A Ta:25°C	I =38.2A /480VAC  T50= 1840 μS
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9	TOTAL HARMONIC DISTORTION	THD < 10% @ 347VAC > 80% loading	I/P : 347VVAC O/P : LEDmax 80% LOAD CP 5.6A Ta : 25°C	THD : 3.67 %347V 80% THD : 2.88 %347V 100%
	THD vs LOAD			



## ROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	V1: 190V~205V PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 528VAC I/P: 347VAC I/P: 180VAC CP 5.6A  O/P: MIN LOAD Ta: 25°C	199V / 528VAC 197V / 347VAC 199V / 180VAC PROTECTION TYPE : Shut down output voltage, re-power on to recovery
2	OVER TEMPERATURE PROTECTION	PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 528 VAC I/P: 180 VAC O/P: LEDMAX CP 5.6A Ta: 25°C	O.T.P. Active PROTECTION TYPE : Shut down output voltage, re-power on to recovery

3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed	I/P: 528VAC I/P: 180 VAC O/P: LEDMAX CP: 5.6A &7A Ta:25°C	CP: 5.6A NO DAMAGE PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed CP: 7A NO DAMAGE PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
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## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) <b>Peak Voltage</b>	Q11 Rated: 18.4A/1200V	I/P:High-Line +3V =531v AC ON/OFF <b>CP: 5.6A&amp;7A</b> VDS: O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short I/P:Low-Line -3V = 177V O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short Ta:25°C	<b>CP: 5.6A</b> <b>CP: 7A</b>  Q11                              Q11 VDS:                            VDS: (1) 831V                        (1)823 V (2) 798V                        (2) 806V (3) 831V                        (3) 831V (4) 798V                        (4) 815V (5) 839V                        (5)831 V  VDS:                            VDS: (1) 831V                        (1) 839V (2) 806V                        (2) 806V (3) 831V                        (3) 847V (4) 798V                        (4) 806V (5) 798V                        (5) 839V
2	P.F.C Transistor ( D to S) or (C to E) <b>Peak Voltage</b>	Q1 Rated: 18.4A/1200V VGS: ±25V	I/P:High-Line +3V =531V AC ON/OFF <b>CP: 5.6A</b> VDS: O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short I/P:Low-Line -3V = 177V O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short Ta:25°C	<b>CP: 5.6A</b> Q1  VDS: (1) 831V (2) 839V (3) 855V (4) 823V (5) 823V VDS: (1) 831V (2) 911V (3) 839V (4) 855V (5) 975V
3	P.F.C DIODE	D8 Rated: 15A/1200V	I/P:High-Line +3V =531 V AC ON/OFF <b>CP: 5.6A</b> O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short	<b>CP: 5.6A</b>  (1) 823V (2)806 V (3) 823V (4) 806V (5) 806V

			<p>I/P:Low-Line -3V = 177V  O/P: (1)LEDmax  (2) LEDmax continue  (3) LEDmin  (4) LEDmin continue  (5) Output Short  Ta:25°C</p>	<p>(1) 782V  (2) 863V  (3) 823V  (4) 815V  (5) 790V</p>	
4	Diode Peak Voltage	<p>Q100 Rated: 18A/600V</p> <p>Q101 Rated: 18A/600V</p> <p>Q130 Rated: 18A/600V</p> <p>Q131 Rated: 18A/600V</p> <p>D571 Rated: 1A/200V</p>	<p>I/P:High-Line +3V =531 V  VDS:  AC ON/OFF  <b>CP: 5.6A &amp; 7A</b>  VDS:  O/P: (1)LEDmax  (2) LEDmax continue  (3) LEDmin  (4) LEDmin continue  (5) Output Short  (6) burst mode  Ta:25°C</p>	<p><b>CP: 5.6A</b>  <b>Q100</b>  VDS:  (1)371 V  (2) 375V  (3) 182V  (4) 182V  (5) 372V  (6) 383V  <b>Q101</b>  VDS:  (1) 371V  (2) 371V  (3) 182V  (4) 182V  (5) 370V  (6) 411V  <b>Q130</b>  VDS:  (1) 371V  (2) 375V  (3) 182V  (4) 186V  (5) 375V  (6)391V  <b>Q131</b>  VDS:  (1) 375V  (2) 375V  (3) 182V  (4) 182V  (5) 379V  (6)371V  <b>D571</b>  (1) 66.5V  (2) 63.6V  (3) 67.3V  (4) 63.2V  (5) 62.8V  (6) 66.5V</p>	<p><b>CP:7A.</b>  <b>Q100</b>  VDS:  (1) 295V  (2) 300V  (3) 147V  (4) 149V  (5) 312V  (6) 306V  <b>Q101</b>  VDS:  (1) 306V  (2) 296V  (3) 149V  (4) 147V  (5) 308V  (6) 302V  <b>Q130</b>  VDS:  (1) 306V  (2) 304V  (3) 145V  (4) 147V  (5) 312V  (6) 306V  <b>Q131</b>  VDS:  (1) 302V  (2) 304V  (3) 145V  (4) 147V  (5) 312V  (6) 306V</p>
5	Input Capacitor Voltage	<p>C5+C6 Rated: : 220u/450V*2</p>	<p>I/P:High-Line +3V =531V  <b>CP 5.6A</b>  O/P: (1)LEDmax input on/off  (2) Min load input on /Off  (3)LEDmax /Min load Change  (4)LEDmax continue  Ta:25°C</p>	<p><b>CP: 5.6A</b>  (1)806 V  (2) 823V  (3) 831V  (4) 806V</p>	
6	Control IC Voltage Test	<p>PFC IC U1 Rated 21V~11.5V(MIN.)</p> <p>PWM IC U2 Rated</p>	<p>I/P:High-Line +3V =531 V  AC ON/OFF  <b>CP: 5.6A</b>  O/P: (1)LEDmax</p>	<p><b>CP: 5.6A</b>  U1  (1) 13.51V  (2) 13.59V</p> <p>U500  (1) 20.7V  (2) 20.3V  (3) 19.9V</p>	

		16V~ 8.85V(MIN.)  AUX IC U500 Rated 9V~35 V(MIN.)	(2) LEDmin (3) Output Short (4) NO LOAD VRmin.LOW LINE Ta:25°C	(3) 13.19V (4) 12.94V U2 (1) 13.03V (2) 12.86V (3) 12.06V (4) 11.98V	(4) 18.7V
7	STAND BY POWER PWM Transistor (D to S) or (C to E) <b>Peak Voltage</b>	Q501 Rated 2.5A/1500V VGS : ±30V	I/P:High-Line +3V =531v AC ON/OFF <b>CP: 5.6A</b> VDS: O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short  I/P:Low-Line -3V = 177V O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short Ta:25°C	<b>CP: 5.6A</b> Q501 VDS: (1) 1172V (2) 1108V (3) 1124V (4) 1108V (5) 1140V  VDS: (1) 1172V (2) 1108V (3) 1108V (4) 1092V (5) 1100V	

## SAFETY & EMC TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	EN61347-1 I/P-O/P: 3KVAC/min I/P-FG: 2 KVAC/min<4.5mA O/P-FG:1.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 1.8 KVAC/min Ta:25°C	I/P-O/P: 3.24mA I/P-FG: 2.49mA O/P-FG: 3.77mA 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	I/P-O/P: 6.85GΩ I/P-FG: .1.85G Ω O/P-FG:6.51 G Ω NO DAMAGE
3	GROUNDING CONTINUITY	EN61347-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	21mΩ

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	FCC PART 15	I/P:347VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
2	RADIATION	FCC PART 15	I/P: 347VAC (50HZ) O/P:LEDMAX	PASS Test by certified Lab



			Ta:25°C	
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 347VAC (50HZ) O/P:LEDMAX Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 347VAC (50HZ) O/P:LEDMAX Ta:25°C	CRITERIA A
5	SURGE	IEC61000-4-5 light industry L-N :4KV L,N-PE:8KV	I/P: 347VAC (50HZ) O/P:LEDMAX Ta:25°C	CRITERIA A
6	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-1000-H 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 347VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 1.5 HRS I/P : 347VAC O/P : FULL LOAD Ta= 50°C		

		NO	Position	ROOM AMBIENT Ta= 25°C	HIGH AMBIENT Ta= 50°C
		1	BD1	71.6°C	93.8°C
		2	ZNR4	65.7°C	87.9°C
		3	LF2	67.3°C	90.0°C
		4	LF1	63.3°C	85.6°C
		5	C2	63.9°C	86.3°C
		6	C935	76.0°C	100.1°C
		7	C11	68.3°C	91.3°C
		8	Q10	86.6°C	107.0°C
		9	Q11	76.8°C	100.9°C
		10	D8	71.5°C	94.6°C
		11	Q1	68.6°C	91.2°C
		12	L3	87.0°C	112.1°C
		13	TSW1	66.6°C	89.1°C
		14	TSW2	70.4°C	93.9°C
		15	L2	74.1°C	97.5°C
		16	C94	71.3°C	94.2°C
		17	T1	78.9°C	101.5°C
		18	T2	81.7°C	104.8°C
		19	C110	62.6°C	84.8°C
		20	Q101	69.7°C	92.3°C
		21	C105	64.5°C	86.8°C
		22	T1 core	79.9°C	102.9°C
		23	T2 core	77.2°C	99.9°C
		24	U1	64.0°C	86.1°C
		25	Q511	65.6°C	88.2°C
		26	C521	68.6°C	91.3°C
		27	Q501	78.5°C	101.8°C
		28	D501	72.8°C	95.7°C
		29	T500	74.8°C	97.7°C
		30	U500	68.1°C	90.5°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 347 VAC O/P : short Ta : 25°C	TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 528VAC/180VAC O/P : 100 % LOAD Ta= -45 °C	TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 538 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	
5	TEMPERATURE COEFFICIENT	± 0.03 %(0°C~50°C)	I/P : 347 VAC O/P : FULL LOAD	± 0 %(0~50°C)	
6	STORAGE TEMPERATURE TEST	-40~85°C	1. Thermal shock Temperature : -50°C~ +125°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 200CYCLE 5. Input/Output condition : STATIC		



7	THERMAL SHOCK TEST	-40~50°C	1. Thermal shock Temperature : -45°C~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test
8	VIBRATION TEST	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 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) 63033HRS (2) 64757HRS (3) 64192HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 682.8K hrs min. Telcordia SR-332 (Bellcore) ; 68.4K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 50,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT ZENG

2018.4.30 GP-A50-F010