



# Test Report: HVGC-1000-M

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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

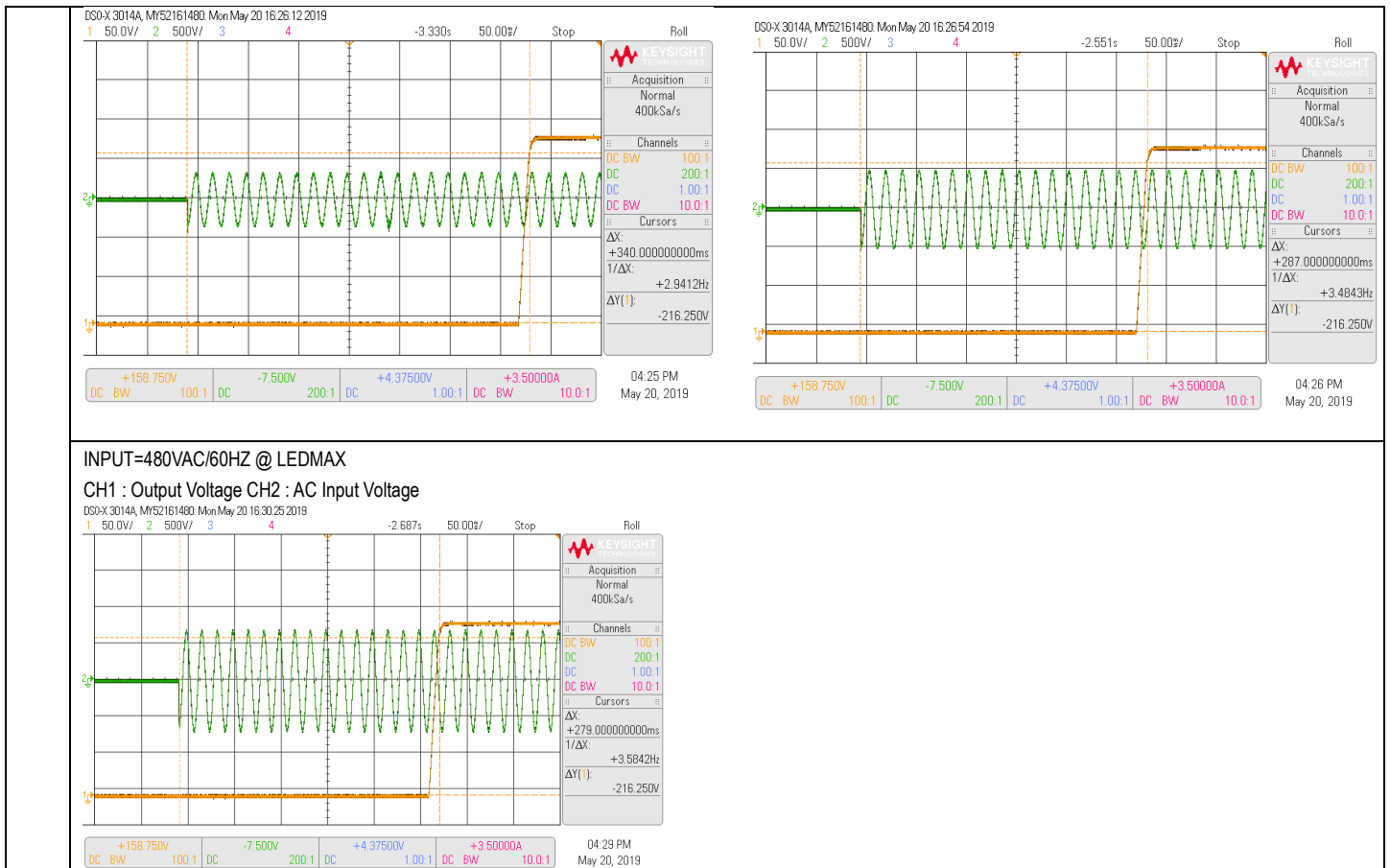
## ■ RELIABILITY TEST

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: 4.2A & 5.25A Ta: 25°C	CP 4.2A: 4.198A/347VAC@LEDMAX-1V 4.205A/347VAC@LED MIN 4.196A/480VAC@LEDMAX-1V 4.204A/480VAC@LED MIN 0.119% CP 5.25A: 5.26A/347VAC@LEDMAX-1V 5.265A/347VAC@LED MIN 5.259A/480VAC@LED MAX-1V 5.265A/480VAC@LED MIN 0.285%
2	FULL POWER CURRENT RANGE	4200~5250mA	I/P: 347VAC O/P: LEDmax CP: 4.2A & 5.25A Ta: 25°C	247.65V/4.2A/347VAC 196.58V/5.25A/347VAC
3	OPEN CIRCUIT VOLTAGE (max)	250V	I/P: 347VAC O/P: NO LOAD CP: OPEN Ta: 25°C	247.65V
4	CONSTANT CURRENT REGION	CP 4.2A: CH1: 120V~240V  CP 5.25A: CH1: 95V~192V	I/P: 347VAC O/P: LEDmax CP: 4.2A & 5.25A Ta: 25°C	CP 4.2A: 0.408V~240V/347VAC  CP 5.25A: 0.192V~192V/347VAC
5	CURRENT ADJ. RANGE	CH1: 2100mA~5250mA	I/P: 347VAC I/P: 480VAC O/P: CV MIN & CV MAX-1V CP: 4.2A & 5.25A Ta: 25°C	1.75mA~5.26mA/347VAC@LED MAX-1V 1.75mA~5.26mA/347VAC@LED MIN 1.75mA~5.26mA/480VAC@LED MAX-1V 1.75mA~5.26mA/480VAC@LED MIN
6	CURRENT RIPPLE	3.0% max. @rated current	I/P: 347VAC O/P: 50% LOAD CP: 4.2A & 5.25A Ta: 25°C	CP 4.2A: 1.08%  CP 5.25A: 1.15%
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: 4.2A Ta: 25°C	CP 4.2A: 11.87v/80mv
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 4.2A Ta: 25°C	230VAC/340ms 347VAC/ 287ms 480VAC/279ms
INPUT=230VAC/50HZ @ LEDMAX CH1 : Output Voltage CH2 : AC Input Voltage			INPUT=347VAC/60HZ @ LEDMAX CH1 : Output Voltage CH2 : AC Input Voltage	

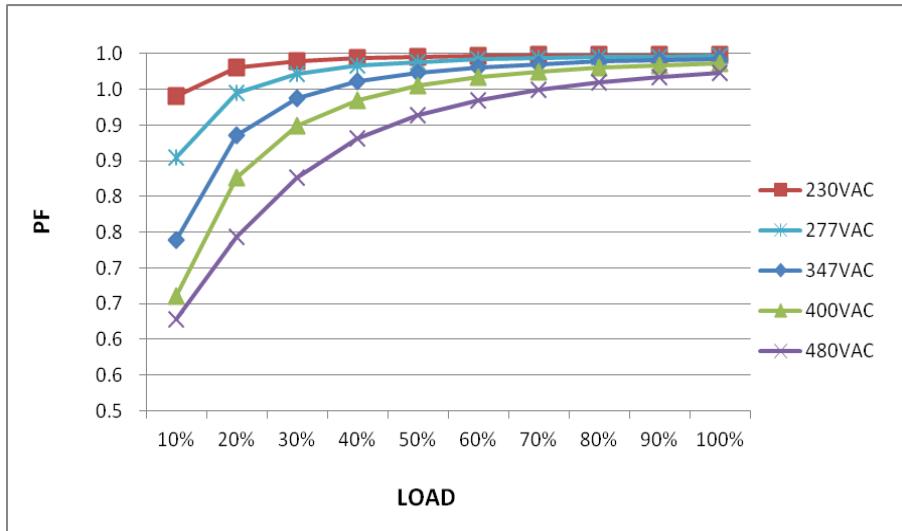


## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P:TESTING O/P:LEDmax CP 4.2A Ta:25°C	157V~528 V
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=538 V O/P:FULL/MIN LOAD CP 4.2A (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:FULL~MIN LOAD CP 4.2A Ta:25°C	TEST:OK
3	INPUT CURRENT (TYP)	347VAC/ 3.15 A 480VAC/ 2.28A	I/P: 347VAC/480VAC O/P:LEDmax CP 4.2A Ta:25°C	I =3.079A/ 347VAC I =2.21A/480VAC
4	LEAKAGE CURRENT	EN61347-1 < 0.75mA / 480VAC	I/P: 480 VAC O/P:Min LOAD Ta:25°C	L-FG: 0.4mA N-FG: 0.4mA
5	STANDBY POWER CONSUMPTION	Standby power consumption <2W for AB-Type(Dimming)	I/P: 347VAC O/P:LEDMAX.	1.06W

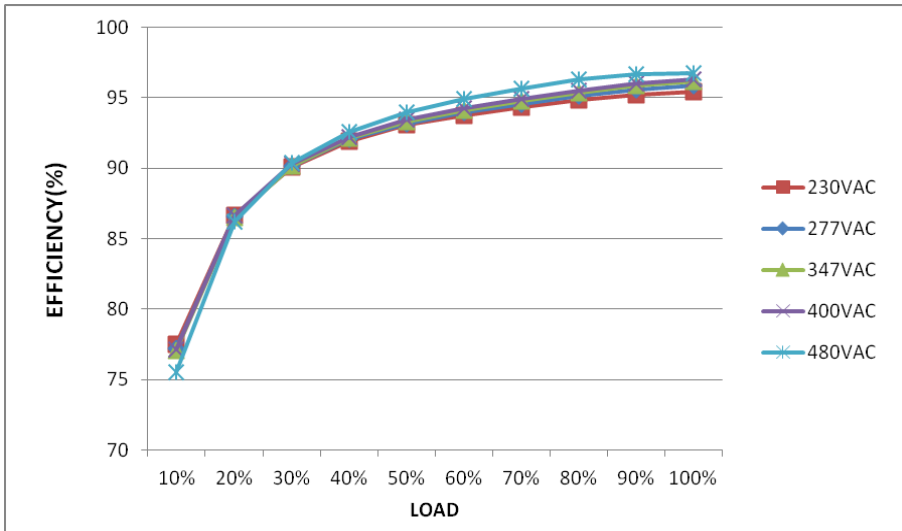
		OFF)	CP 4.2A Dimming OFF Ta:25°C	
6	POWER FACTOR(TYP)	0.97/347VAC LEDMAX 0.95/480VAC LEDMAX 0.98/277 VAC LEDMAX 0.98/230 VAC LEDMAX 0.96/400 VAC LEDMAX	I/P: 347VAC/480VAC/277VAC/230VAC/400VAC O/P:LEDmax CP 4.2A Ta:25°C	PF=0.992/347V/100%LOAD PF= 0.973/480V/100%LOAD PF=0.997/277V/100%LOAD PF=0.998/230V/100%LOAD PF=0.989/400V/100%LOAD

P.F vs LOAD



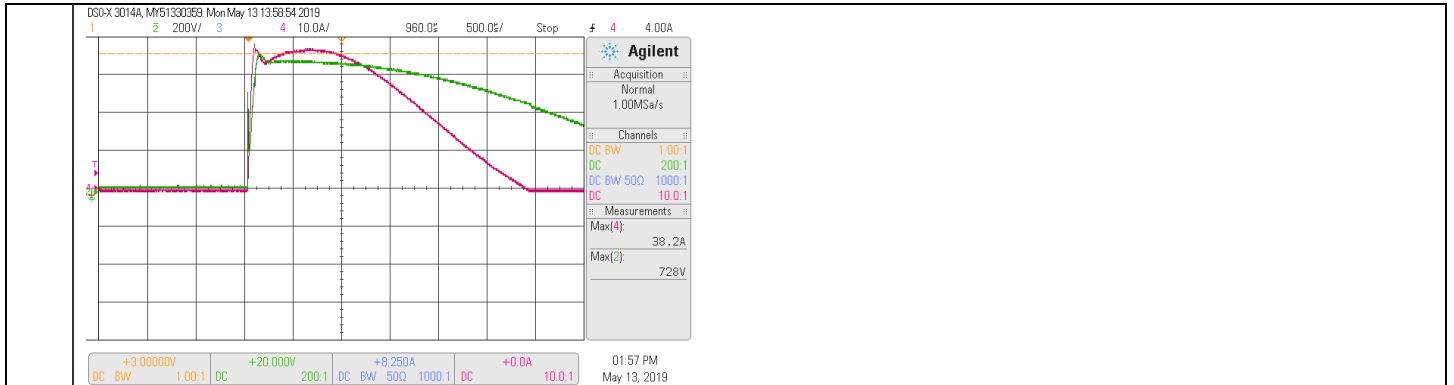
7	EFFICIENCY (TYP)	96%	I/P: 347VAC O/P:LEDmax. CP 4.2A Ta:25°C	96.01%
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EFFICIENCY vs LOAD

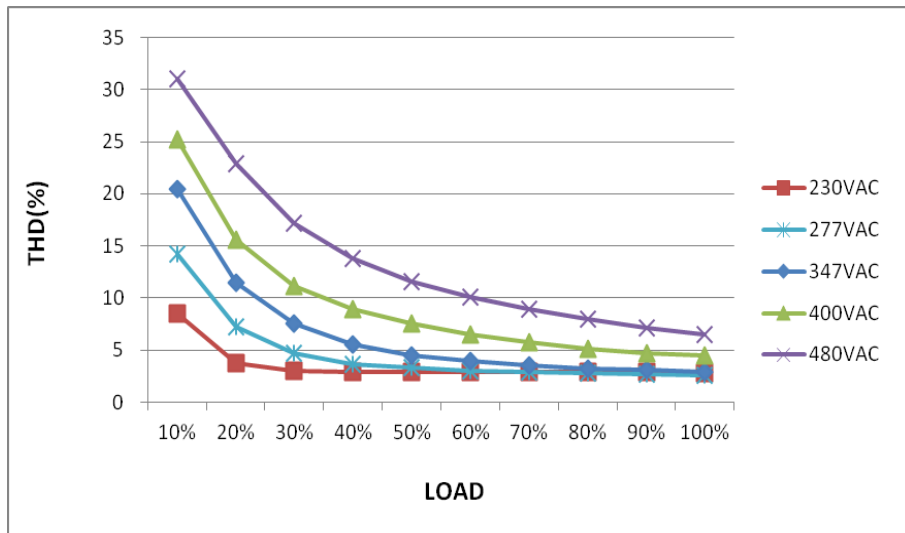


8	INRUSH CURRENT (TYP)	480V/ 40A COLD START  (twidth=1850 usmeasured at 50% Ipeak) COLD START	I/P: 480VAC O/P:LEDmax CP 4.2A Ta:25°C	I =38.2A /480VAC  T50= 1840 uS
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INPUT=480VAC/ 60HZ @ LEDMAX  
CH2 : AC Input Voltage CH1 : Input current



9	TOTAL HARMONIC DISTORTION	THD < 10% @ 347VAC > 80% loading	I/P : 480VVAC O/P : LEDmax 80% LOAD CP 4.2A Ta : 25°C	THD : 3.27 % THD : 2.95 %	347V 80% 347V 100%
	THD vs LOAD				



## ROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	V1: 250V~270V PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 528VAC I/P: 347VAC I/P: 180VAC CP 4.2A O/P: MIN LOAD Ta: 25°C	259V / 528VAC 259V/ 347VAC 259V/ 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 4.2A 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: 4.2A & 5.25A Ta:25°C	CP: 4.2A NO DAMAGE PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed CP: 5.25A 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: 4.2A&amp;5.25A</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	Q11 VDS: (1) 908V (2) 804V (3) 900V (4) 804V (5) 868V VDS: (1) 900V (2) 804V (3) 876V (4) 804 V (5) 884V
2	P.F.C Transistor ( D to S) or (C to E) <b>Peak Voltage</b>	Q1 Rated: 18.4A /1200V	I/P:High-Line +3V =531V AC ON/OFF <b>CP: 4.2A</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: 4.2A</b> Q1 VDS: (1) 926V (2) 838V (3) 910V (4) 814V (5) 838V VDS: (1) 967V (2) 951V (3) 902V (4) 854V (5) 814V
3	P.F.C DIODE	D8 Rated: 15A/1200V	I/P:High-Line +3V =531 V AC ON/OFF <b>CP: 4.2A</b> 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	<b>CP: 4.2A</b> (1) 894V (2) 806V (3) 870V (4) 806V (5) 822V (1) 926V (2) 862V (3) 862 V

			(2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short Ta: 25°C	(4) 822V (5) 814V	
4	Diode Peak Voltage	Q100 Rated: 18A/600V  Q101 Rated: 18A/600V  Q130 Rated: 18A/600V  Q131 Rated: 18A/600V  D571 Rated: 1A/200V	I/P:High-Line +3V =531 V VDS: AC ON/OFF <b>CP: 4.2A &amp; 5.25A</b> VDS: O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short  Ta:25°C	<b>CP: 4.2A</b> <b>Q100</b> VDS: (1) 500V (2) 492V (3) 254V (4) 250V (5) 499V (6) 507V <b>Q101</b> VDS: (1) 499V (2) 487V (3) 242V (4) 246V (5) 499V (6) 495V <b>Q130</b> VDS: (1) 511V (2) 499V (3) 254V (4) 250V (5) 503V (6) 503V <b>Q131</b> VDS: (1) 507 V (2) 499V (3) 254V (4) 250V (5) 499V (6) 499V <b>D571</b> (1) 64.5 V (2) 61.3V (3) 64.5V (4) 61.3V (5) 66.1V	<b>CP:5.25A</b> <b>Q100</b> VDS: (1) 403V (2) 403V (3) 198V (4) 194V (5) 415V (6) 399V <b>Q101</b> VDS: (1) 399V (2) 399V (3) 198V (4) 190V (5) 415V (6) 399V <b>Q130</b> VDS: (1) 407V (2) 403V (3) 202V (4) 198V (5) 419V (6) 403V <b>Q131</b> VDS:. (1) 403V (2) 399V (3) 194V (4) 194V (5) 419V (6) 403V
5	Input Capacitor Voltage	C5 Rated: : 220 $\mu$ /450 V*2	I/P:High-Line +3V =531V CP 4.2A O/P: (1)LEDmax input on/off (2) Min load input on /Off (3)LEDmax /Min load Change (4)LEDmax continue  Ta:25°C	<b>CP: 4.2A</b> (1) 894V (2) 830V (3) 838V (4) 806V	
6	Control IC Voltage Test	PFC IC U1 Rated 21V~11.5V(MIN.)  PWM IC U2 Rated 16V~ 8.85V(MIN.) AUX IC U500 Rated 9V~35 V(MIN.)	I/P:High-Line +3V =531 V AC ON/OFF <b>CP: 4.2A</b> O/P: (1)LEDmax (2) LEDmin (3) Output Short (4) NO LOAD VRmin.LOW LINE	<b>CP: 4.2A</b> <b>U1</b> (1) 13.61V (2) 13.69V (3) 13.93V (4) 12.8V	

			Ta:25°C	U2 (1) 14.49V (2) 13.69V (3) 13.77V (4) 12.8V
7	STAND BY POWER PWM Transistor (D to S) or (C to E) <b>Peak Voltage</b>	Q501 Rated 2.5A/1500V	I/P:High-Line +3V =531v AC ON/OFF <b>CP: 4.2A</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: 4.2A</b> Q501 VDS: (1) 1202V (2) 1114V (3) 1170V (4) 1114V (5) 1146V Q501 VDS: (1) 1178V (2) 1114V (3) 1170V (4) 1114V (5) 1178V

## 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: 3.52mA I/P-FG: 1.73mA O/P-FG: 3.08mA 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: 4.1GΩ I/P-FG: 7.89G Ω O/P-FG: 12.9G 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/PLEDmax Ta:25°C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 347VAC (50HZ) O/PLEDmax Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 347VAC (50HZ) O/PLEDmax Ta:25°C	CRITERIA A



5	SURGE	IEC61000-4-5 light industry L-N :4KV L,N-PE:8KV	I/P: 347VAC (50HZ) O/PLEDmax 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-M 1. ROOM AMBIENT BURN-IN : 2.5 HRS I/P : 347VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 3 HRS I/P : 347VAC O/P : FULL LOAD Ta= 50°C																																																																																																																																		
			<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25°C</th> <th>HIGH AMBIENT Ta= 50°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>71.8°C</td><td>93.3°C</td></tr> <tr><td>2</td><td>ZNR4</td><td>65.8°C</td><td>87.5°C</td></tr> <tr><td>3</td><td>LF2</td><td>65.8°C</td><td>87.8°C</td></tr> <tr><td>4</td><td>LF1</td><td>61.7°C</td><td>83.8°C</td></tr> <tr><td>5</td><td>C2</td><td>63.2°C</td><td>85.1°C</td></tr> <tr><td>6</td><td>C6</td><td>67.0°C</td><td>90.0°C</td></tr> <tr><td>7</td><td>C935</td><td>75.2°C</td><td>99.1°C</td></tr> <tr><td>8</td><td>C11</td><td>68.2°C</td><td>90.8°C</td></tr> <tr><td>9</td><td>Q10</td><td>77.5°C</td><td>101.7°C</td></tr> <tr><td>10</td><td>Q11</td><td>76.2°C</td><td>100.0°C</td></tr> <tr><td>11</td><td>D8</td><td>71.9°C</td><td>94.6°C</td></tr> <tr><td>12</td><td>Q1</td><td>68.7°C</td><td>90.7°C</td></tr> <tr><td>13</td><td>L3</td><td>87.9°C</td><td>112.1°C</td></tr> <tr><td>14</td><td>TSW1</td><td>67.0°C</td><td>89.4°C</td></tr> <tr><td>15</td><td>TSW2</td><td>69.5°C</td><td>93.0°C</td></tr> <tr><td>16</td><td>L2</td><td>75.4°C</td><td>98.9°C</td></tr> <tr><td>17</td><td>C94</td><td>71.9°C</td><td>94.8°C</td></tr> <tr><td>18</td><td>T1</td><td>79.0°C</td><td>103.6°C</td></tr> <tr><td>19</td><td>T2</td><td>82.1°C</td><td>107.3°C</td></tr> <tr><td>20</td><td>C110</td><td>59.9°C</td><td>82.7°C</td></tr> <tr><td>21</td><td>Q101</td><td>66.0°C</td><td>89.3°C</td></tr> <tr><td>22</td><td>C105</td><td>62.0°C</td><td>84.9°C</td></tr> <tr><td>23</td><td>T1 core</td><td>73.6°C</td><td>97.9°C</td></tr> <tr><td>24</td><td>T2 core</td><td>79.5°C</td><td>104.6°C</td></tr> <tr><td>25</td><td>U1</td><td>63.4°C</td><td>85.6°C</td></tr> <tr><td>26</td><td>Q511</td><td>64.1°C</td><td>86.5°C</td></tr> <tr><td>27</td><td>C521</td><td>67.4°C</td><td>90.0°C</td></tr> <tr><td>28</td><td>Q501</td><td>76.6°C</td><td>99.3°C</td></tr> <tr><td>29</td><td>D501</td><td>74.4°C</td><td>96.8°C</td></tr> <tr><td>30</td><td>T500</td><td>76.2°C</td><td>99.1°C</td></tr> <tr><td>31</td><td>U500</td><td>68.9°C</td><td>90.9°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25°C	HIGH AMBIENT Ta= 50°C	1	BD1	71.8°C	93.3°C	2	ZNR4	65.8°C	87.5°C	3	LF2	65.8°C	87.8°C	4	LF1	61.7°C	83.8°C	5	C2	63.2°C	85.1°C	6	C6	67.0°C	90.0°C	7	C935	75.2°C	99.1°C	8	C11	68.2°C	90.8°C	9	Q10	77.5°C	101.7°C	10	Q11	76.2°C	100.0°C	11	D8	71.9°C	94.6°C	12	Q1	68.7°C	90.7°C	13	L3	87.9°C	112.1°C	14	TSW1	67.0°C	89.4°C	15	TSW2	69.5°C	93.0°C	16	L2	75.4°C	98.9°C	17	C94	71.9°C	94.8°C	18	T1	79.0°C	103.6°C	19	T2	82.1°C	107.3°C	20	C110	59.9°C	82.7°C	21	Q101	66.0°C	89.3°C	22	C105	62.0°C	84.9°C	23	T1 core	73.6°C	97.9°C	24	T2 core	79.5°C	104.6°C	25	U1	63.4°C	85.6°C	26	Q511	64.1°C	86.5°C	27	C521	67.4°C	90.0°C	28	Q501	76.6°C	99.3°C	29	D501	74.4°C	96.8°C	30	T500	76.2°C	99.1°C	31	U500	68.9°C	90.9°C	
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27	C521	67.4°C	90.0°C																																																																																																																																	
28	Q501	76.6°C	99.3°C																																																																																																																																	
29	D501	74.4°C	96.8°C																																																																																																																																	
30	T500	76.2°C	99.1°C																																																																																																																																	
31	U500	68.9°C	90.9°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	± 0.008 %(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) 56417HRS (2) 55974HRS (3) 52962HRS
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