Test Report: HVGC-1000-H

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

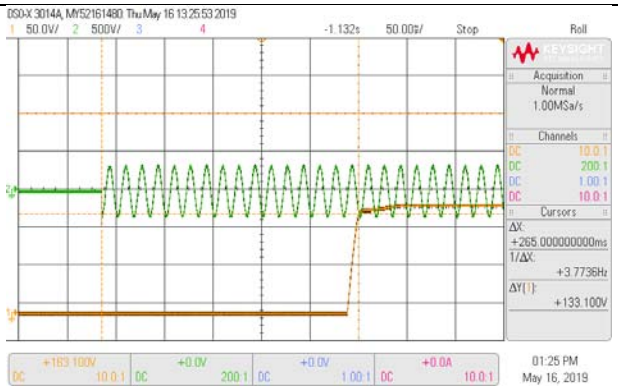
■ RELIABILITY TEST

ENVIRONMENT TEST

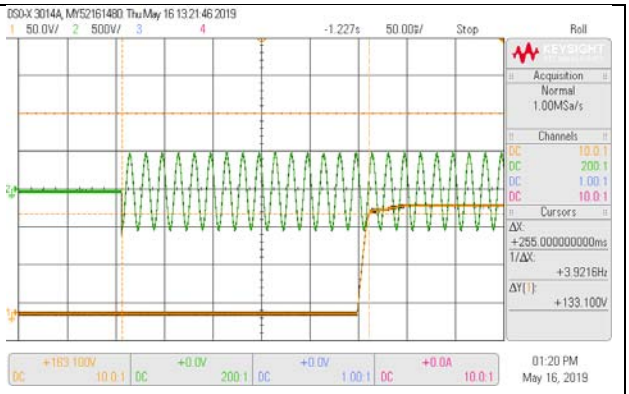
■ DESIGN VERIFY TEST

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℃	CP5.6A: 5.613A/347VAC@LEDMAX-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℃	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℃	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℃	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℃	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℃	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℃	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℃	230VAC/265ms 347VAC/ 255ms 480VAC/226ms

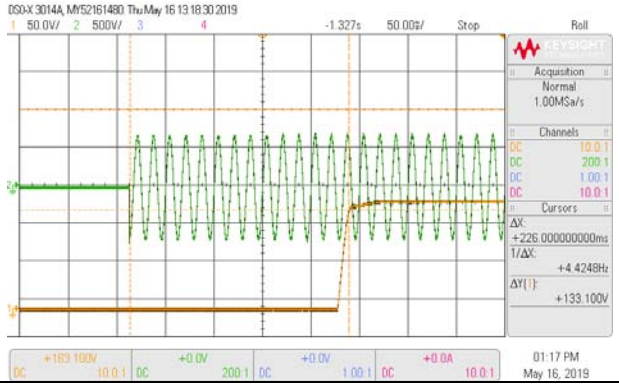


INPUT=230VAC/50HZ @ LEDMAX@ CP 5.6A
CH1 : Output Voltage CH2 : AC Input Voltage



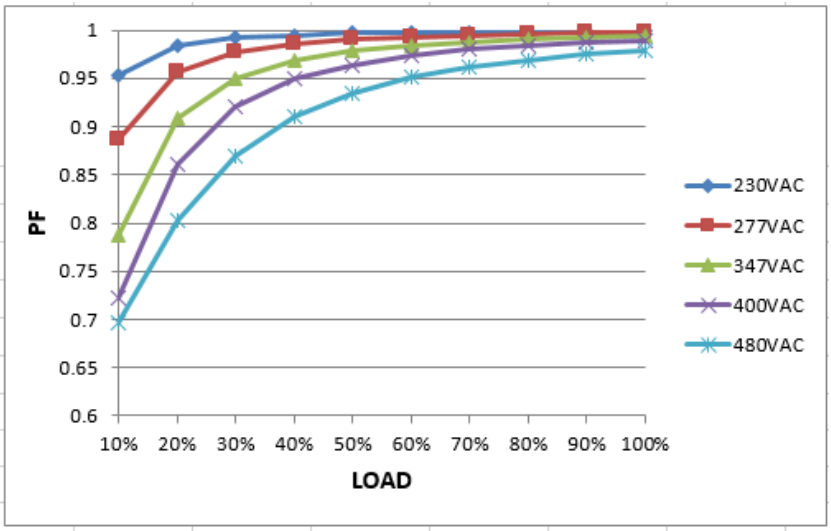
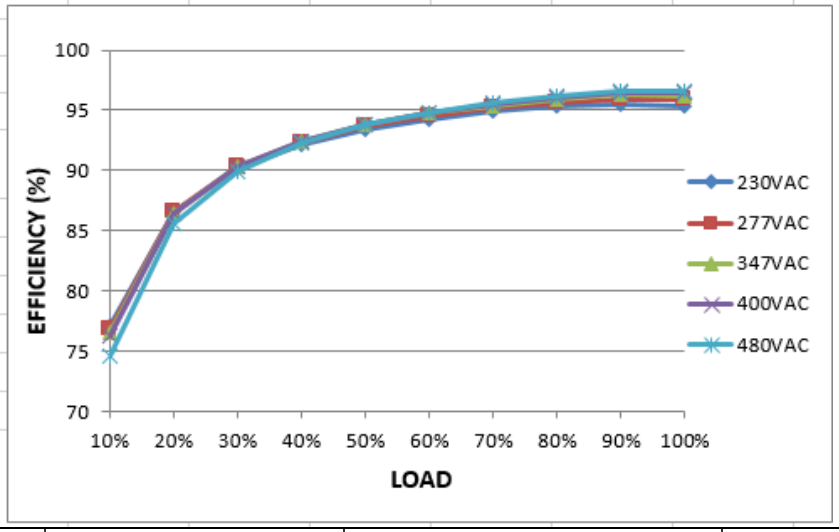
INPUT=347VAC/60HZ @ LEDMAX@ CP 5.6A
CH1 : Output Voltage CH2 : AC Input Voltage

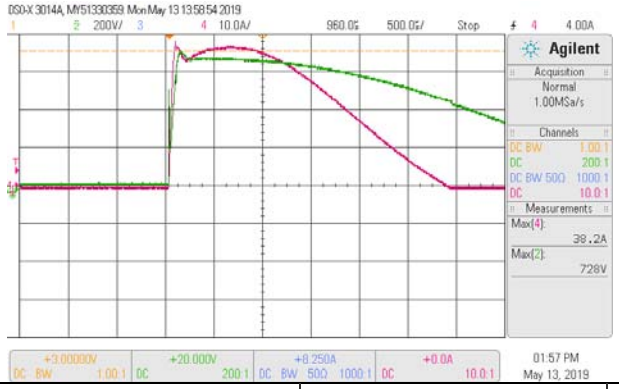
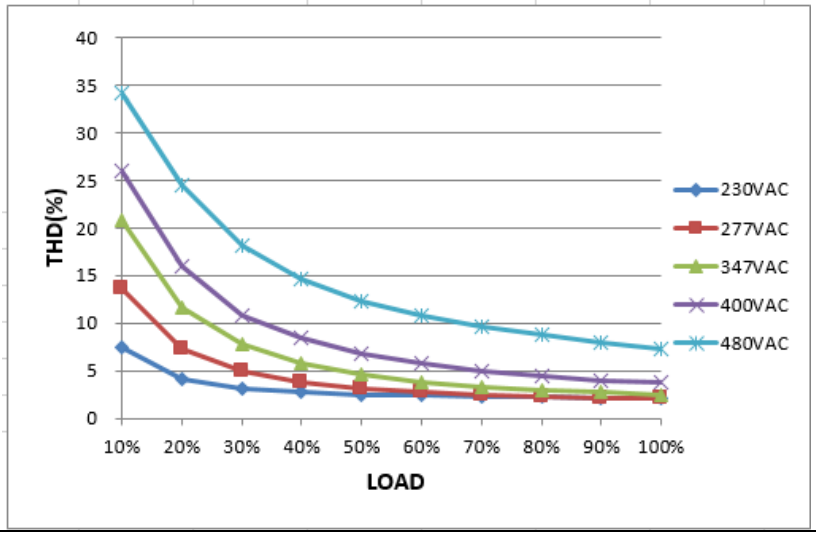
INPUT=480VAC/60HZ @ LEDMAX@ CP 5.6A
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P:TESTING O/P:LEDMAX CP 5.6A Ta:25℃	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℃	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℃	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℃	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℃	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℃	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℃	96.05%
	EFFICIENCY vs LOAD			
8	INRUSH CURRENT (TYP)	480V/ 40A COLD START (twidth=1852 usmeasured at 50% Ipeak) COLD START	I/P: 480VAC O/P:LEDMAX CP 5.6A Ta:25℃	I =38.2A /480VAC T50= 1840 μS

	INPUT=480VAC/ 60HZ @ LEDMAX CH2 : AC Input Voltage CH1 : Input current 			
9	TOTAL HARMONIC DISTORTION	THD< 10% @ 347VAC> 80% loading	I/P：347VVAC O/P：LEDmax 80% LOAD CP 5.6A Ta：25℃	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℃	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℃	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℃	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

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	PWM Transistor (D to S) or (C to E) **Peak Voltage**	Q11 Rated: 18.4A /1200V	I/P:High-Line +3V =531v AC ON/OFF **CP: 5.6A&7A** 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℃	**CP: 5.6A** Q11 VDS: (1) 831V (2) 798V (3) 831V (4) 798V (5) 839V VDS: (1) 831V (2) 806V (3) 831V (4) 798V (5) 798V	**CP: 7A** Q11 VDS: (1)823 V (2) 806V (3) 831V (4) 815V (5)831 V VDS: (1) 839V (2) 806V (3) 847V (4) 806V (5) 839V
2	P.F.C Transistor (D to S) or (C to E) **Peak Voltage**	Q1 Rated: 18.4A /1200V VGS: ±25V	I/P:High-Line +3V =531V AC ON/OFF **CP: 5.6A** 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℃	**CP: 5.6A** 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 **CP: 5.6A** O/P: (1)LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short	**CP: 5.6A** (1) 823V (2)806 V (3) 823V (4) 806V (5) 806V	

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

		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℃	(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) **Peak Voltage**	Q501 Rated 2.5A/1500V VGS：±30V	I/P:High-Line +3V =531v AC ON/OFF **CP: 5.6A** 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℃	**CP: 5.6A** 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℃	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℃	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℃	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℃	PASS Test by certified Lab
2	RADIATION	FCC PART 15	I/P: 347VAC (50HZ) O/P:LEDMAX	PASS Test by certified Lab

			Ta:25℃	
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 347VAC (50HZ) O/P:LEDMAX Ta:25℃	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 347VAC (50HZ) O/P:LEDMAX Ta:25℃	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℃	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 ℃ 2. HIGH AMBIENT BURN-IN： 1.5 HRS I/P： 347VAC O/P： FULL LOAD Ta= 50℃		

NO	Position	ROOM AMBIENT Ta= 25℃	HIGH AMBIENT Ta= 50℃
1	BD1	71.6℃	93.8℃
2	ZNR4	65.7℃	87.9℃
3	LF2	67.3℃	90.0℃
4	LF1	63.3℃	85.6℃
5	C2	63.9℃	86.3℃
6	C935	76.0℃	100.1℃
7	C11	68.3℃	91.3℃
8	Q10	86.6℃	107.0℃
9	Q11	76.8℃	100.9℃
10	D8	71.5℃	94.6℃
11	Q1	68.6℃	91.2℃
12	L3	87.0℃	112.1℃
13	TSW1	66.6℃	89.1℃
14	TSW2	70.4℃	93.9℃
15	L2	74.1℃	97.5℃
16	C94	71.3℃	94.2℃
17	T1	78.9℃	101.5℃
18	T2	81.7℃	104.8℃
19	C110	62.6℃	84.8℃
20	Q101	69.7℃	92.3℃
21	C105	64.5℃	86.8℃
22	T1 core	79.9℃	102.9℃
23	T2 core	77.2℃	99.9℃
24	U1	64.0℃	86.1℃
25	Q511	65.6℃	88.2℃
26	C521	68.6℃	91.3℃
27	Q501	78.5℃	101.8℃
28	D501	72.8℃	95.7℃
29	T500	74.8℃	97.7℃
30	U500	68.1℃	90.5℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P：347 VAC O/P：short Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 528VAC/180VAC O/P： 100 % LOAD Ta= -45 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ NO DAMAGE	I/P： 538 VAC O/P：FULL LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03 %(0℃~50℃)	I/P： 347 VAC O/P：FULL LOAD	± 0 %(0~50℃)
6	STORAGE TEMPERATURE TEST	-40~85℃	1. Thermal shock Temperature： -50℃~ +125℃ 2. Temperature change rate ：25℃ / 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℃	1. Thermal shock Temperature： -45℃~ +55℃ 2. Temperature change rate ：25℃ / 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℃	
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P： 347VAC O/P：FULL LOAD Tc= 80 ℃ LIFE TIME (2) I/P： 347VAC O/P：75% LOAD Tc= 80 ℃ LIFE TIME (3) I/P： 347VAC O/P：50% LOAD Tc= 80 ℃ LIFE TIME		(1) 63033HRS (2) 64757HRS (3) 64192HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 228.3K hrs min. Telcordia SR-332 (Bellcore) ; 68.4K hrs min. MIL-HDBK-217F (25℃)		
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ 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