TEST REPORT: ENP-180-48

180W Desktop Single Output Power Supply

■ 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

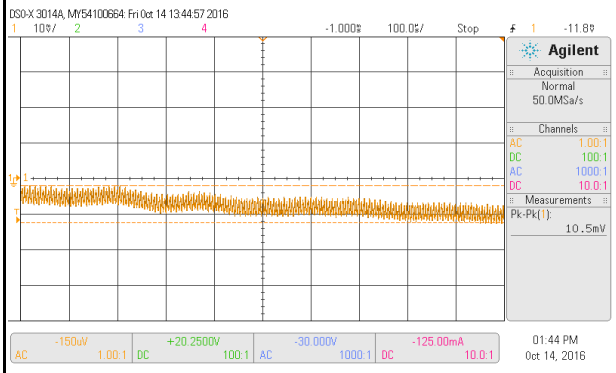
- ENVIRONMENT TEST

■ DESIGN VERIFY TEST

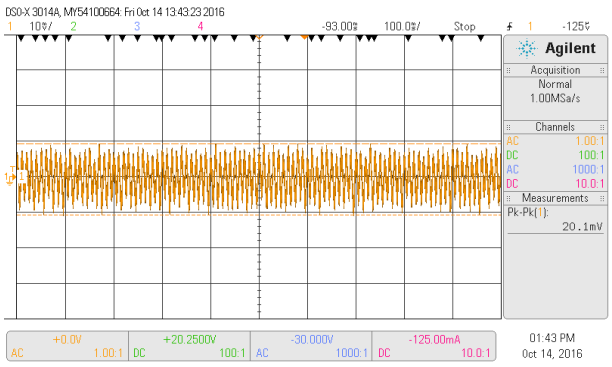
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 47.50V ~ 58.80V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 45.94V ~ 60.16V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.23% ~ 0.27%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.01% ~ -0.01%
4	LOAD REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 0.00% ~ 0.00%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 0.7 %
6	RIPPLE & NOISE(Max)	V1 : 350 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 20.1 mVp-p

high frequency :



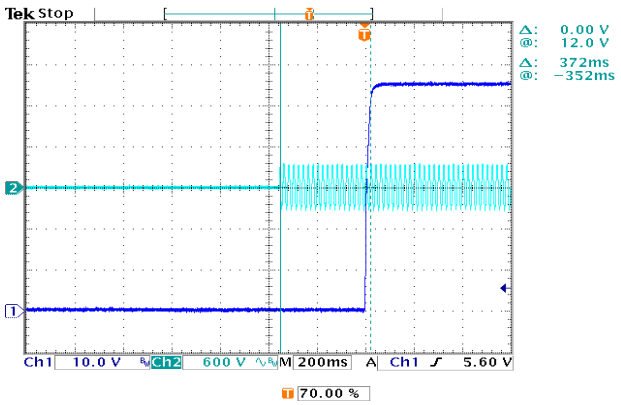
low frequency :



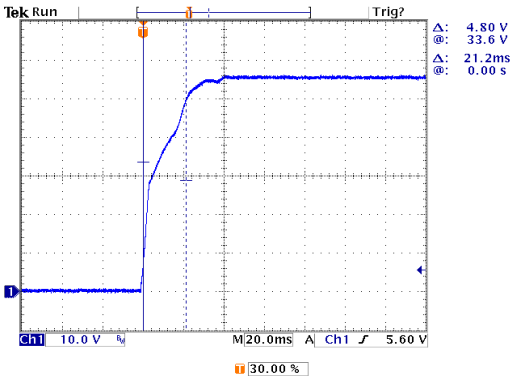
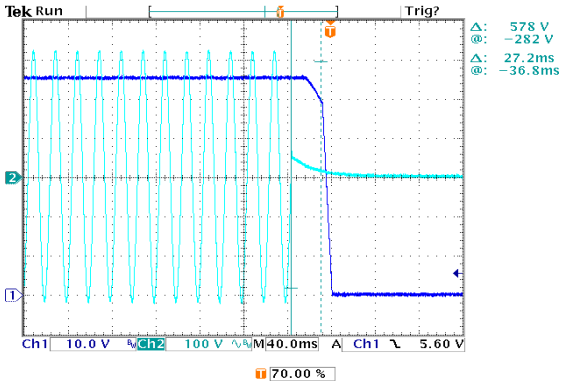
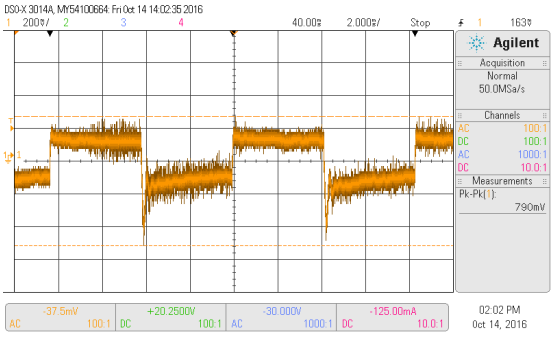
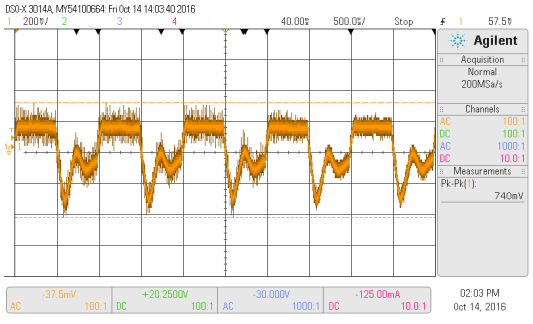
7	SET UP TIME (MAX.)	230VAC : 1000ms	I/P : 230VAC O/P: FULL LOAD TA : 25℃	230VAC : 372ms

INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

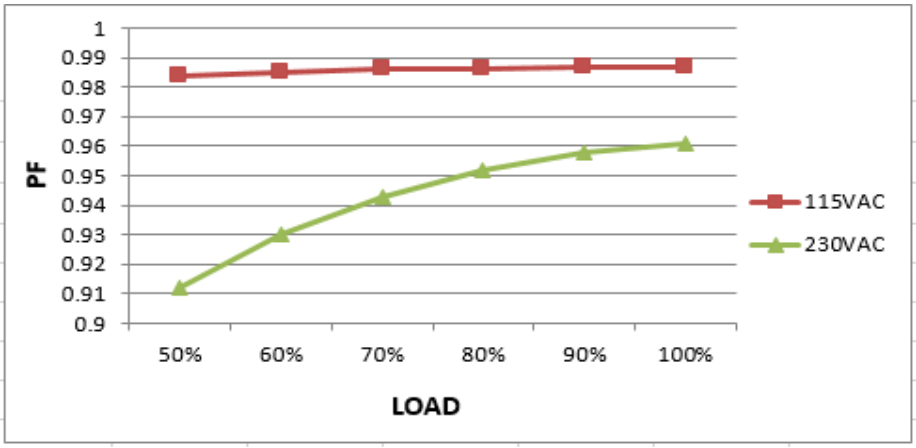
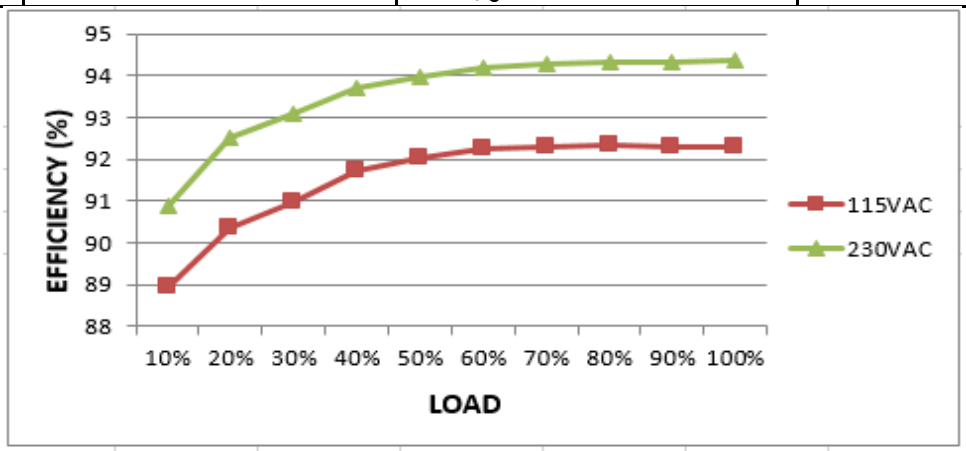


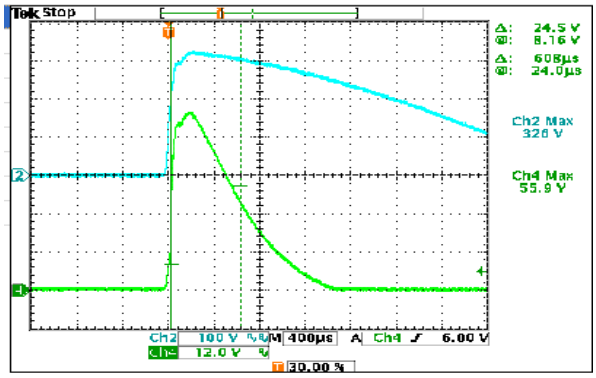
	RISE TIME (MAX.)	230VAC : 100ms	I/P : 230VAC O/P: FULL LOAD TA : 25℃	230VAC : 21.2ms

8	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 			
9	HOLD UP TIME (TYP.)	230VAC : 20ms	I/P : 230VAC O/P: FULL LOAD TA : 25℃	230VAC : 27.2ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 			
10	DYNAMIC LOAD	V1 : 5520 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA : 25℃	(1). (2). unit:mVp-p V1: 790mv 740mv
	FULL /MIN LOAD 50%DUTY / 120HZ 		FULL /MIN% LOAD 50%DUTY / 1KHZ 	

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25℃	75.0VAC ~ 264VAC
			I/P : LOW-LINE = 97VAC HIGH-LINE = 300VAC	TEST : OK

			O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 100VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	0.95 / 230VAC 1.9 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 0.86 / 230VAC I= 1.73 / 115VAC
4	LEAKAGE CURRENT	< 3.50mA	I/P : 240VAC O/P: MIN LOAD TA : 25℃	L-FG: 0.8 mA N-FG: 0.8 mA
5	NO LOAD POWER CONSUMPTION	< 0.15W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.147 W
	POWER FACTOR (TYP.)	0.95 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	PF= 0.982 / 230VAC PF= 0.996 / 115VAC
6				
	EFFICIENCY (TYP.)	94.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	94.3 %
7				
	INRUSH CURRENT (TYP.)	70A / 230VAC	I/P : 230VAC O/P: FULL LOAD TA : 25℃	I= 55.9A / 230VAC T50= 608.0us / 230VAC

8	INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage 

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	1 110% ~ 125%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING	118% 264VAC 118% 230VAC 118% 100VAC Normally works within 110 ~ 125% rated output power for more than 3 seconds and switches to constant current limiting,with auto-recovery after the peak load condition is removed
		2 > 125%	TA : 25℃	130% 264VAC 130% 230VAC 130% 100VAC Constant current limiting, if >125% rated power, with auto-recovery after the overload condition is removed
2	OVER VOLTAGE PROTECTION	62.10V ~ 72.90V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD TA : 25℃	67.11V 264VAC 67.16V 230VAC 67.20V 90VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down O/P voltage, recovers automatically after temperature goes down	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD	O.T.P. Active Shut down O/P voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 90VAC 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	PWM Power Transistor	Q901 Rated : 600V 12.0A	I/P : 267VAC I/P : 97VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load Ta : 25℃	VIN: 267VAC 97VAC VDS: ID: VDS: ID: (1). 451.00V 3.0A 460.00V 4.0A (2). 451.00V 5.1A 447.00V 4.8A (3). 460.00V 3.8A 464.00V 3.9A (4). 460.00V 3.9A 460.00V 3.9A (5). 472.00V 3.9A 464.00V 3.9A (6). 455.00V 3.9A 460.00V 4.0A (7). 439.00V 5.6A 439.00V 5.6A
		Q100 Rated : 150V 30.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short	Q100 Q101 VDS : VDS : (1). 126.10V 114.80V (2). 16.00V 13.00V

2	O/P Diode (MOSFET)	Q101	Rated：	150V	30.0A	(3)Fulll load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load (8/) NO LOAD Ta： 25℃	(3). (4). (5). (6). (7). (8).	127.40V 126.50V 126.50V 127.40V 121.90V 122.80V	114.80V 114.70V 116.30V 116.30V 12.92V 110.70V
3	Input Capacitor	C5	Rated：	150uf	420V	I/P： 267VAC 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).	419.00V 411.00V 419.00V	
4	Control IC	U1 U901	Rated： Rated：	28V 10V 20V 10V	(max) (min) (max) (min)	I/P： 267VAC O/P： (1)Full Load (2)Output Short Change (4)O.V.P (5)Low Line No Load Vo(min) Ta： 25℃	 (1). (2). (3). (4). (5).	U1 18.40V 17.90V 17.70V 15.40V 15.43V	U901 17.38V 17.38V 17.38V 15.60V 15.75V
5	PFC Power Transistor	Q1	Rated：	600V	18.0A	I/P： 267VAC I/P： 97VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continu PASS (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load Ta： 25℃	VIN: (1). (2). (3). (4). (5). (6). (7).	267VAC VDS: 516.00V 455.00V 516.00V 516.00V 516.00V 495.00V 495.00V	12.6A 4.3A 12.6A 14.2A 13.8A 7.5A 7.5A	97VAC VDS: 479.00V 423.00V 475.00V 475.00V 479.00V 471.00V 479.00V	ID: 1.2A 12.6A 12.6A 13.8A 9.8A 9.2A
6	PFC Diode	D1	Rated：	600V	8.0A	I/P： 267VAC I/P： 97VAC O/P： (1)Full Load Turn on (2) Output Short (3)Dynamic Load Full/Min Load 90%Duty/5KHz (4)Dynamic Load Full/Min Load Ta： 25℃	 (1). (2). (3). (4).	267VAC 486.00V 445.00V 454.00V 441.00V		97VAC 421.00V 429.00V 441.00V 433.00V	

■SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P： 3.750KVAC /min I/P-FG： 2.000KVAC /min O/P-FG： 0.500KVAC /min	I/P-O/P: 4.125KVAC /min I/P-FG: 2.400KVAC /min O/P-FG: 0.600KVAC /min Ta： 25℃	I/P-O/P: 8.70mA I/P-FG: 7.66mA O/P-FG: 7.99mA 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: 500VDC I/P-FG: 500VDC O/P-FG: 500VDC Ta： 25℃/70%RH	I/P-O/P: 7.3GΩ I/P-FG: 3.7GΩ O/P-FG: 30.0GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta： 25℃/70%RH	13.0mΩ

E.M.C. TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	PASS
2	CONDUCTION	EN55022 CLASS B	I/P： 230VAC /50HZ O/P： FULL LOAD / 50% LOAD Ta： 25℃	PASS Test by certified Lab
		EN55022	I/P： 230VAC /50HZ	PASS

3	CONDUCTION	CLASS B	O/P : FULL LOAD Ta : 25℃	Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N:1KV ; L/N-PE:2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A

■RELIABILITY TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL : ENP-180-24
1. ROOM AMBIENT BURN-IN : 1.5hrs
IP: 230VAC O/P: 100% LOAD TA= 25.0℃
2. HIGH AMBIENT BURN-IN : 1.5hrs
IP: 230VAC O/P: 100% LOAD TA= 50.0℃
<table>
<tr><th>CH.</th><th>Position</th><th>ROOM AMBIENT Ta= 25 ℃</th><th>HIGH AMBIENT Ta= 50℃</th></tr>
<tr><td>1</td><td>C1</td><td>43.7℃</td><td>64.8℃</td></tr>
<tr><td>2</td><td>ZR1</td><td>39.8℃</td><td>61.4℃</td></tr>
<tr><td>3</td><td>RT1</td><td>50.0℃</td><td>95.6℃</td></tr>
<tr><td>4</td><td>LF1</td><td>47.5℃</td><td>67.9℃</td></tr>
<tr><td>5</td><td>LF2</td><td>48.3℃</td><td>68.8℃</td></tr>
<tr><td>6</td><td>BD1</td><td>45.2℃</td><td>66.8℃</td></tr>
<tr><td>7</td><td>C11</td><td>46.2℃</td><td>67.1℃</td></tr>
<tr><td>8</td><td>C10</td><td>45.6℃</td><td>66.7℃</td></tr>
<tr><td>9</td><td>L2</td><td>44.8℃</td><td>66.1℃</td></tr>
<tr><td>10</td><td>L1</td><td>53.3℃</td><td>73.8℃</td></tr>
<tr><td>11</td><td>C5</td><td>49.2℃</td><td>69.8℃</td></tr>
<tr><td>12</td><td>Q1</td><td>46.2℃</td><td>68.4℃</td></tr>
<tr><td>13</td><td>D1</td><td>46.6℃</td><td>68.6℃</td></tr>
<tr><td>14</td><td>Q902</td><td>46.7℃</td><td>69.1℃</td></tr>
<tr><td>15</td><td>C90</td><td>53.9℃</td><td>74.4℃</td></tr>
<tr><td>16</td><td>RT9</td><td>56.6℃</td><td>76.4℃</td></tr>
<tr><td>17</td><td>T1-1</td><td>77.7℃</td><td>95.2℃</td></tr>
<tr><td>18</td><td>Q101</td><td>46.4℃</td><td>68.2℃</td></tr>
<tr><td>19</td><td>C107</td><td>46.0℃</td><td>67.4℃</td></tr>
<tr><td>20</td><td>U1</td><td>47.6℃</td><td>68.8℃</td></tr>
<tr><td>21</td><td>C202</td><td>45.4℃</td><td>66.8℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P : 230VAC
O/P : 117.0% LOAD
Ta : 25℃</td><td>TEST : OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE TURN ON TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P : 264VAC / 100VAC
O/P : FULL LOAD
Ta : -35.0℃</td><td>TEST : OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 50℃
NO DAMAGE</td><td>I/P : 272VAC
O/P : FULL LOAD
Ta : 50℃
HUMIDITY= 95.0% RH</td><td>TEST : OK</td></tr>
<tr><td>5</td><td>TEMPERATURE COEFFICIENT</td><td>±0.05% /℃(0~50℃)</td><td>I/P : 230VAC
O/P : FULL LOAD</td><td>0.003% /℃(0~50℃)</td></tr>
<tr><td></td><td></td><td>1. Thermal shock Temperature : -45℃~ +90℃</td><td></td><td>TEST : OK</td></tr>
</table>

6	STORAGE TEMPERATURE TEST	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	
7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -35℃ ~ 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： 230VAC Full Load AC ON/OFF test turn on 3sec；turn off 1sec @ 15cycle Full Load burn in@ 1cycle	TEST：OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (4) Acceleration： 2G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK
9	CAPACITOR LIFE CYCLE	ENP-180-24 :SUPPOSE C107 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 50℃ LIFE TIME (3) I/P： 230VAC O/P：FULL LOAD Ta= 50℃ LIFE TIME (4) I/P： 230VAC O/P：FULL LOAD Ta= 50℃ LIFE TIME	(1). 854450 HRS (2). 193900 HRS (3). 258262 HRS (4). 333113 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1600.7K hrs min. Telcordia SR-332 (Bellcore) ; 170.6K hrs min. MIL-HDBK-217F (25℃)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): 30000HRS @ TA 50℃	

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