TEST REPORT: GSM220A20

220W AC-DC Reliable Green Medical Adaptor

■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Component Stress Test

■ SAFETY & E.M.C. TEST

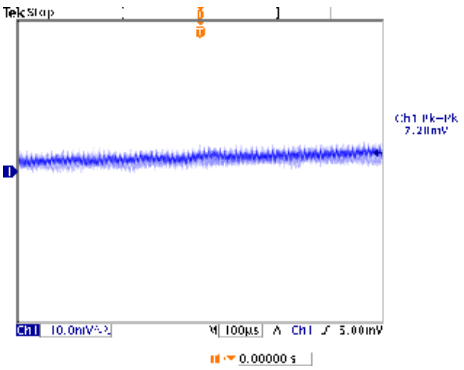
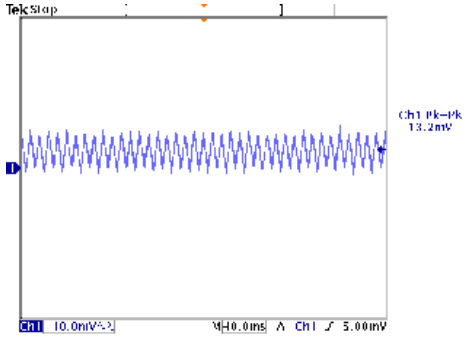
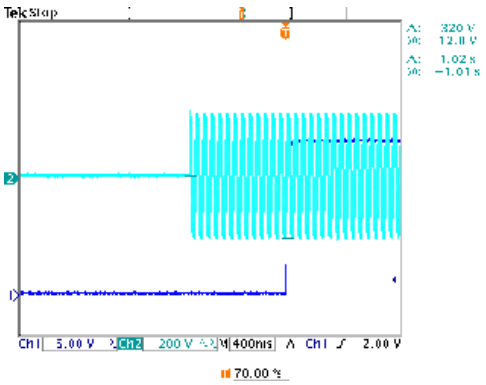
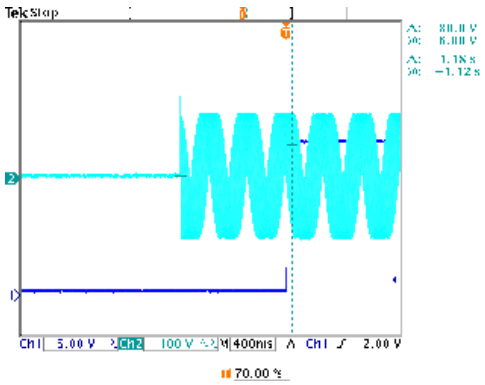
- Safety Test
- E.M.C. Test

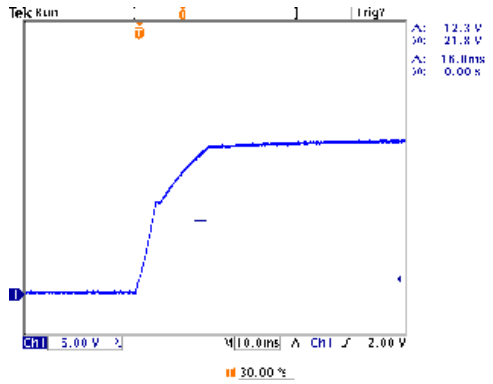
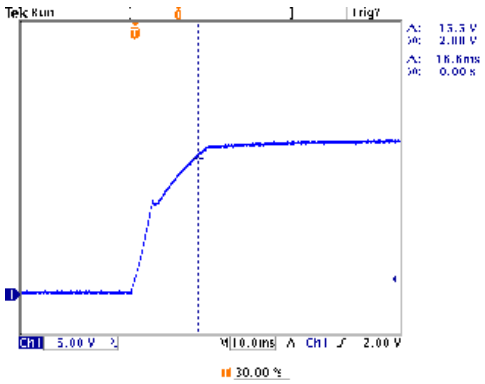
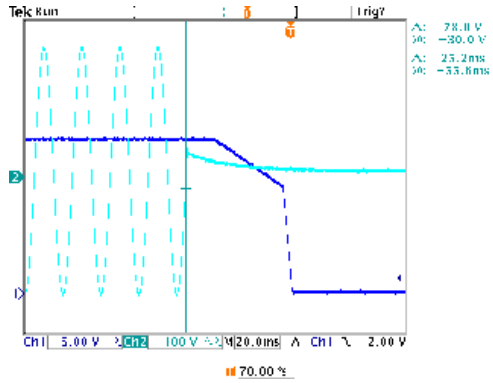
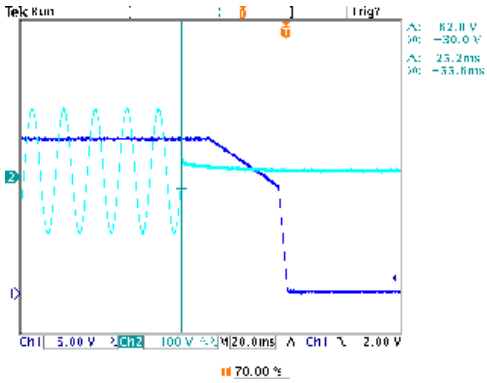
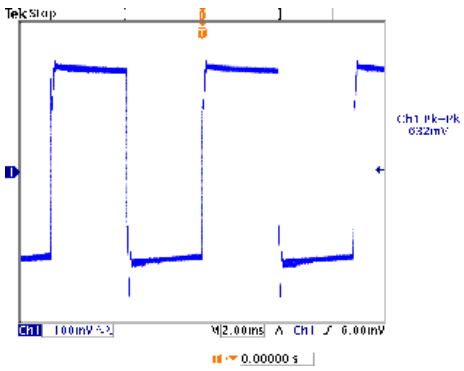
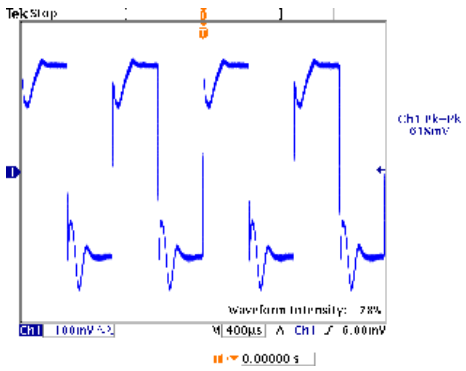
■ RELIABILITY TEST

- ENVIRONMENT TEST

■ DESIGN VERIFY TEST

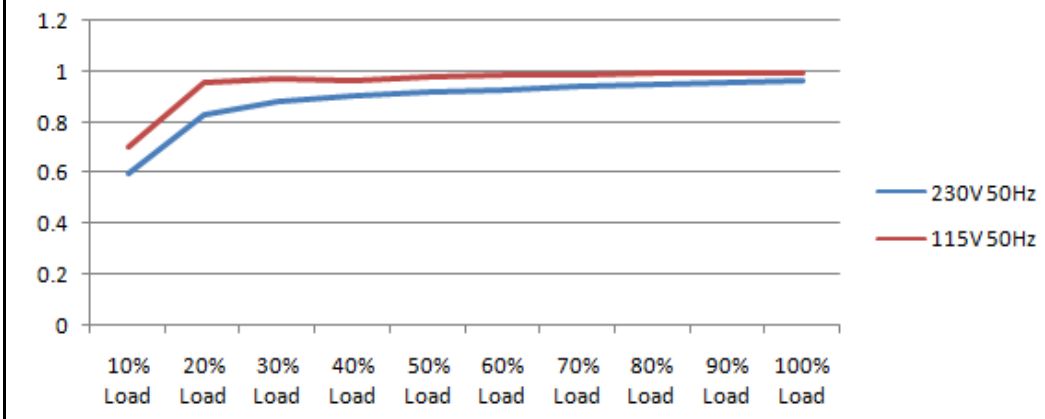
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 4.0% ~ -4.0%	I/P : 95VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.85% ~ -1.20%
2	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 95VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.00% ~ 0.00%
3	LOAD REGULATION (MAX.)	V1 : 4.0% ~ -4.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 1.36% ~ -0.70%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 1.5 %
5	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 13.2 mVp-p
	high frequency :  low frequency : 			
6	SET UP TIME (MAX.)	230VAC : 2000ms 115VAC : 2000ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 1024ms 115VAC : 1176ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 			
	RISE TIME (MAX.)	230VAC : 50ms 115VAC : 50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 16.0ms 115VAC : 16.6ms

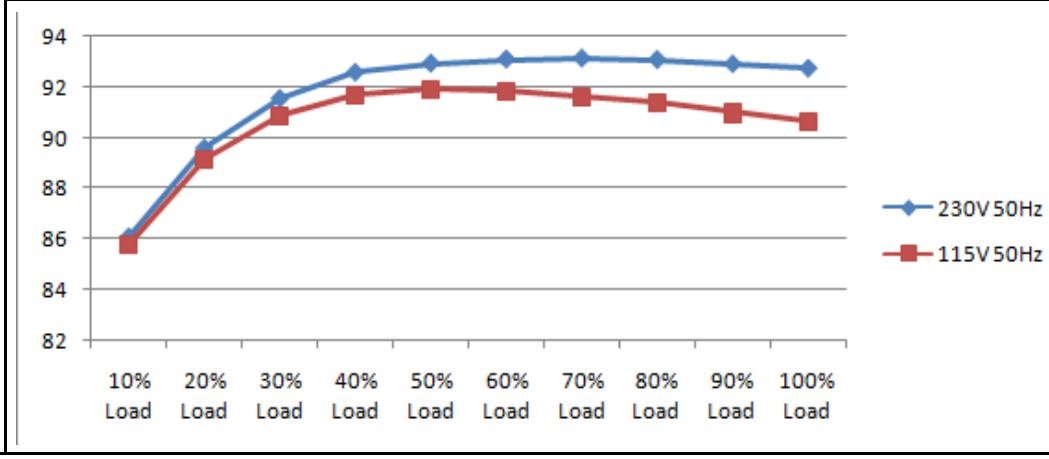
7	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
8	HOLD UP TIME (TYP.)	230VAC : 20ms 115VAC : 20ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 25.2ms 115VAC : 25.2ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
9	DYNAMIC LOAD	V1 : 2000 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: 632mv 618mv
	FULL /Min LOAD 50%DUTY / 120HZ 		FULL /Min LOAD 50%DUTY / 1KHZ 	

INPUT FUNCTION TEST

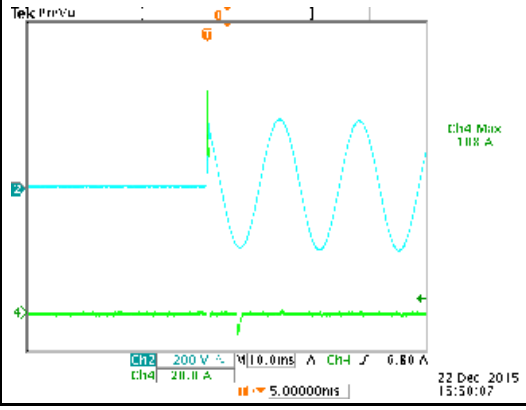
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25℃	63.0VAC ~ 264VAC
			I/P : LOW-LINE = 92VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 95VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	2.0A / 230VAC 4.0A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 1.0536A / 230VAC I= 2.0690A / 115VAC
4	LEAKAGE CURRENT	<115uA for earth leakage <100uA for touch leakage	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-FG: 65 uA N-FG: 65 uA L-V-: 52 uA N-V-: 49 uA
5	NO LOAD POWER CONSUMPTION	< 0.15W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.1099 W
6	POWER FACTOR (TYP.)	0.91 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	PF= 0.9648 / 230VAC PF= 0.9944 / 115VAC

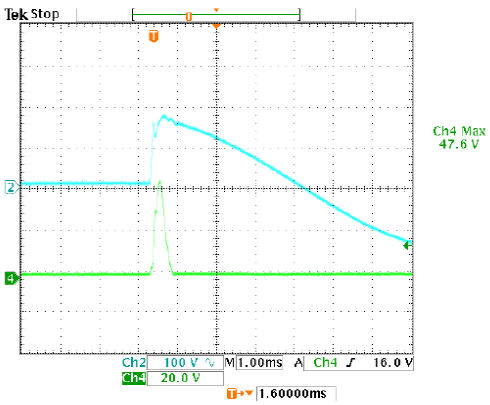


NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
7	EFFICIENCY (TYP.)	92.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	92.247 %



8	INRUSH CURRENT (TYP.)	110A / 230VAC 90A / 115VAC COLD START	I/P : 230VAC/115VAC O/P: FULL LOAD TA : 25℃	I= 108.0A / 230VAC I= 47.6A / 115VAC				
	INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage		INPUT=115VAC/60HZ @ 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	105% ~ 135%	I/P: 264VAC I/P: 230VAC I/P: 95VAC O/P: TESTING TA : 25℃	111% 264VAC 111% 230VAC 111% 95VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	21.00V ~ 27.00V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25℃	25.20V 264VAC 25.20V 230VAC 25.20V 80VAC 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: 80VAC 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: 80VAC O/P: FULL LOAD Ta: 25℃	NO DAMAGE Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q5 Rated： 600V 18.0A Q6 Rated： 600V 18.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	Q5 Q6 VIN: 267VAC 267VAC (1). 518.00V 528.00V (2). 510.00V 528.00V (3). 458.00V 458.00V
2	O/P Diode (MOSFET)	Q101 Rated： 75V 80A Q102 Rated： 75V 80A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue (4)Burst mode Ta： 25℃	Q101 Q102 VDS： VDS： (1). 49.60V 48.20V (2). 17.60V 11.00V (3). 49.60V 48.20V (4). 48.00V 48.00V
3	Input Capacitor	C5 Rated： 220uf 450V	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℃	C5 (1). 443.00V (2). 430.00V (3). 424.00V

4	Control IC	U1	Rated：	38V	(max)	I/P：	267VAC		U1	U101
				-0.4V	(min)	O/P：	(1)Full Load	(1).	25.80V	12.70V
							(2)Output Short	(2).	20.30V	0.78V
							(3)O.L.P	(3).	23.80V	11.70V
		U101	Rated：	26V	(max)		(4)O.V.P	(4).	32.00V	19.20V
				-0.3V	(min)		(5)Low Line No Load Vo(min)	(5).	25.40V	14.40V
						Ta：	25℃			
5	PFC Power Transistor	Q1	Rated：	600V	15.8A	I/P：	267VAC		Q1	Q2
						VDS：		VIN:	267VAC	267VAC
						O/P：	(1)Full Load Turn on	(1).	530.00V	530.00V
							(2) Output Short	(2).	530.00V	528.00V
							(3)Fulll load continue	(3).	492.00V	498.00V
		Q2	Rated：	600V	15.8A	Ta：	25℃			
6	PFC Diode	D2	Rated：	600V	15.0A	I/P：	267VAC		D2	
						O/P：	(1)Full Load Turn on	(1).	478.00V	
							(2) Output Short	(2).	466.00V	
							(3)Dynamic Load Full/Min Load 90%Duty/5KHz	(3).	462.00V	
							(4)Dynamic Load Full/Min Load 50%Duty/120Hz	(4).	462.00V	
						Ta：	25℃			

■SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION			TEST CONDITION			RESULT		
1	WITHSTAND VOLTAGE	I/P-O/P：	4.000KVAC	/min	I/P-O/P:	4.400KVAC	/min		I/P-O/P:	1.50mA
		I/P-FG：	2.000KVAC	/min	I/P-FG:	2.400KVAC	/min		I/P-FG:	1.03mA
		O/P-FG：	0.500KVAC	/min	O/P-FG:	0.600KVAC	/min		O/P-FG:	2.00mA
					Ta：	25℃		NO DAMAGE		
2	ISOLATION RESISTANCE	I/P-O/P：	500VDC>100MΩ		I/P-O/P:	600VDC			I/P-O/P:	9999MΩ
					Ta：	25℃/70%RH		NO DAMAGE		

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	EN55011 CLASS B	I/P： 230VAC /50HZ O/P： FULL LOAD / 50% LOAD Ta： 25℃	PASS Test by certified Lab
3	RADIATION	EN55011 CLASS B	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR：15KV / Contact：8KV	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INPUT： 2KV	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A
6	SURGE	EN61000-4-5 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>MODEL： GSM220A24-R7B
1. ROOM AMBIENT BURN-IN： 1.0hrs
IP: 230VAC O/P: 100% LOAD TA= 21.2℃
2. HIGH AMBIENT BURN-IN： 1.0hrs
IP: 230VAC O/P: 100% LOAD TA= 39.6℃
<table>
<tr><th>NO.</th><th>Position</th><th>ROOM AMBIENT 21.2℃</th><th>HIGH AMBIENT Ta： 39.6℃</th></tr>
<tr><td>1</td><td>LF1</td><td>55.3℃</td><td>72.2℃</td></tr>
<tr><td>2</td><td>LF2</td><td>56.5℃</td><td>73.5℃</td></tr>
<tr><td>3</td><td>L2</td><td>59.5℃</td><td>76.2℃</td></tr>
<tr><td>4</td><td>BD1</td><td>60.0℃</td><td>76.7℃</td></tr>
<tr><td>5</td><td>L1</td><td>63.4℃</td><td>79.9℃</td></tr>
<tr><td>6</td><td>Q1</td><td>58.7℃</td><td>75.5℃</td></tr>
<tr><td>7</td><td>Q2</td><td>59.7℃</td><td>76.4℃</td></tr>
<tr><td>8</td><td>D2</td><td>61.2℃</td><td>77.9℃</td></tr>
<tr><td>9</td><td>C5</td><td>63.1℃</td><td>79.3℃</td></tr>
<tr><td>10</td><td>TSW1</td><td>56.6℃</td><td>73.2℃</td></tr>
<tr><td>11</td><td>C83</td><td>64.1℃</td><td>80.5℃</td></tr>
<tr><td>12</td><td>RTH2</td><td>60.4℃</td><td>77.2℃</td></tr>
<tr><td>13</td><td>T1 COIL</td><td>75.0℃</td><td>91.3℃</td></tr>
<tr><td>14</td><td>C109</td><td>65.7℃</td><td>82.6℃</td></tr>
<tr><td>15</td><td>Q102</td><td>68.9℃</td><td>86.1℃</td></tr>
<tr><td>16</td><td>Q101</td><td>68.3℃</td><td>85.4℃</td></tr>
<tr><td>17</td><td>Q5</td><td>61.7℃</td><td>78.7℃</td></tr>
<tr><td>18</td><td>Q6</td><td>61.6℃</td><td>78.7℃</td></tr>
<tr><td>19</td><td>U1</td><td>68.1℃</td><td>84.6℃</td></tr>
<tr><td>20</td><td>D3</td><td>59.1℃</td><td>75.8℃</td></tr>
</table></td><td></td><td></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： 114.13% 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 / 95VAC
O/P： FULL LOAD
Ta： -30.0℃</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 40℃
NO DAMAGE</td><td>I/P： 272VAC
O/P： FULL LOAD
Ta： 40℃
HUMIDITY= 95.0% RH</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE COEFFICIENT</td><td>±0.03% /(0℃~50℃)</td><td>I/P： 230VAC
O/P： FULL LOAD</td><td>±0.0069% /(0℃~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td>1. Thermal shock Temperature： -40℃ ~ +85℃
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</td><td></td><td>TEST：OK</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td>1. Thermal shock Temperature： -35℃ ~ +45℃
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：
230VAC Full Load AC ON/OFF test turn on 58sec；turn off 2sec</td><td></td><td>TEST：OK</td></tr>
<tr><td>8</td><td>VIBRATION TEST</td><td>1 Carton & 1 Set
(1) Waveform： Sine Wave
(2) Frequency：10~500Hz
(4) Acceleration： 2G
(5) Test Time： 60 min in each axis (X.Y.Z)
(6) Ta：25℃</td><td></td><td>TEST：OK</td></tr>
<tr><td>9</td><td>CAPACITOR LIFE CYCLE</td><td>:SUPPOSE C109 IS THE MOST CRITICAL COMPONENT
(1) I/P： 230VAC O/P：FULL LOAD Ta= 25.0℃ LIFE TIME
(2) I/P： 230VAC O/P：FULL LOAD Ta= 40.0℃ LIFE TIME
(3) I/P： 230VAC O/P：75% LOAD Ta= 40.0℃ LIFE TIME
(4) I/P： 230VAC O/P：50% LOAD Ta= 40.0℃ LIFE TIME</td><td></td><td>(1). 146140.8 HRS
(2). 57283.2 HRS
(3). 145530 HRS
(4). 215745 HRS</td></tr>
</table>

10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE： 210.79 KHRS
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 40℃

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ