TEST REPORT: RPS-400-48

400W Single Output With PFC Function

■ **DESIGN VERIFY TEST**

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

■ **SAFETY & E.M.C. TEST**

- Safety Test
- E.M.C. Test

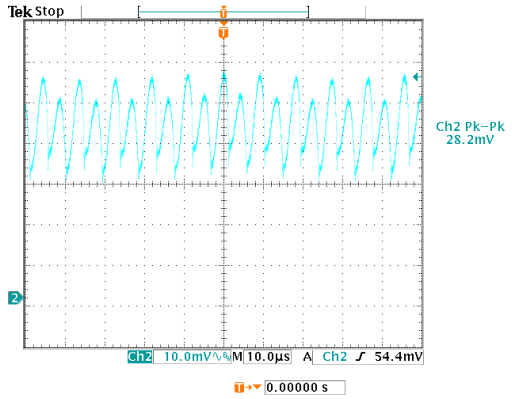
■ **RELIABILITY TEST**

- ENVIRONMENT TEST

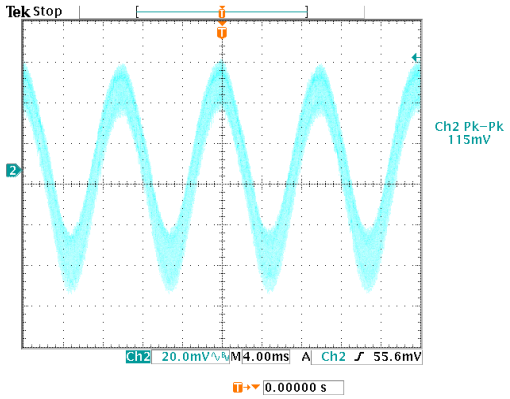
■ DESIGN VERIFY TEST
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 45.60V ~ 50.40V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 43.52V ~ 51.82V	PASS
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 115VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.27% ~ 0.10%	PASS
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 115VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.00% ~ -0.02%	PASS
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 0.08% ~ -0.06%	PASS
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 2.1 %	PASS
6	RIPPLE & NOISE(Max)	V1 : 200 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 115 mVp-p	PASS

high frequency:

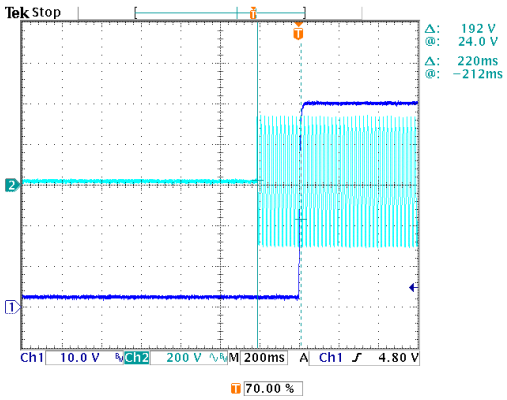


low frequency:

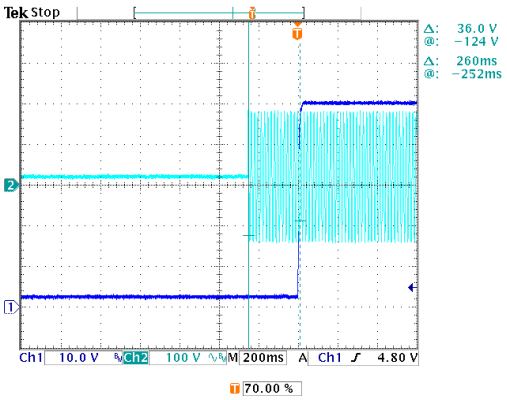


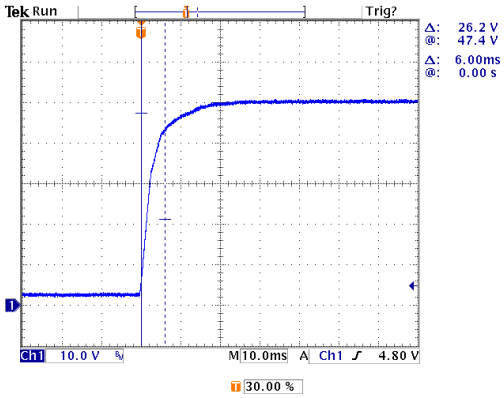
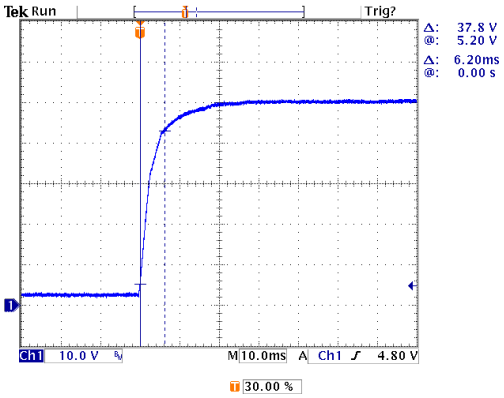
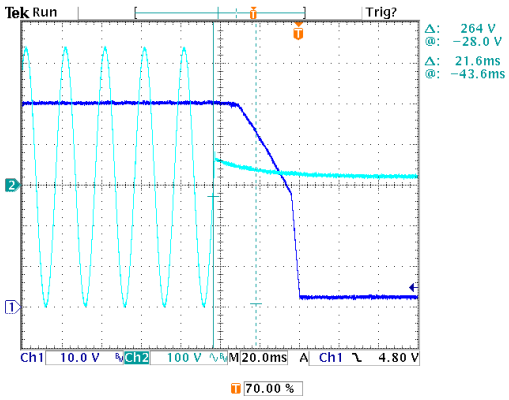
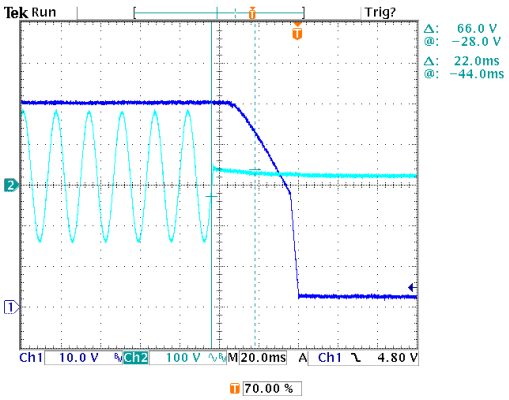
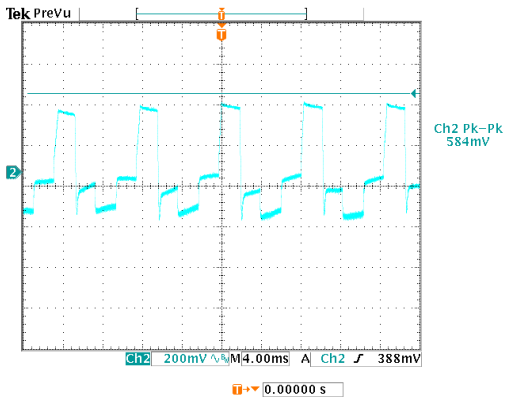
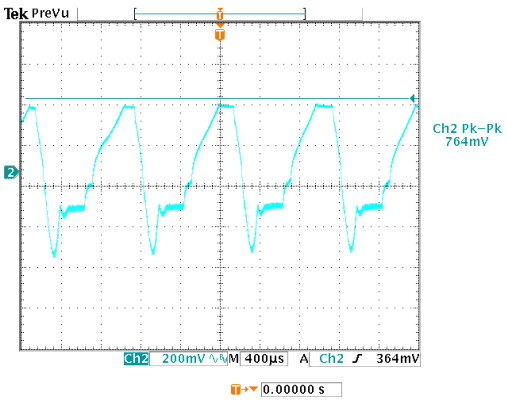
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
7	SET UP TIME (MAX.)	230VAC : 1000ms 115VAC : 1500ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 220ms 115VAC : 260ms	PASS

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



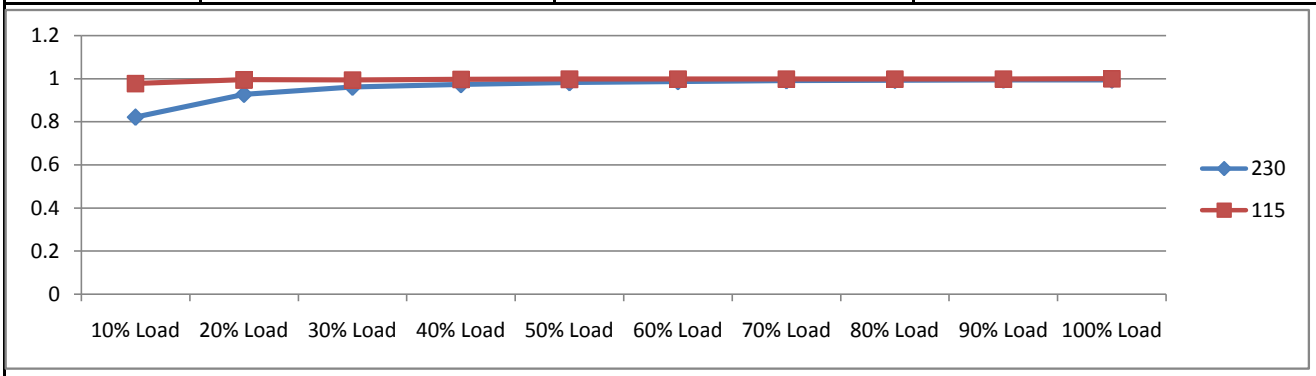
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



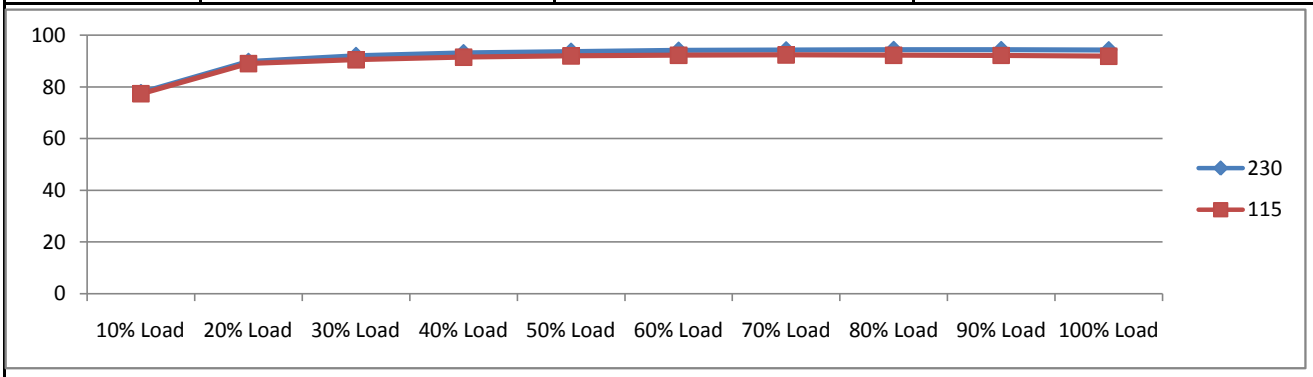
8	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 6.0ms 115VAC : 6.2ms	PASS
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage		
					
9	HOLD UP TIME (TYP.)	230VAC : 16ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 21.6ms 115VAC : 22.0ms	PASS
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		
					
10	DYNAMIC LOAD	V1 : 4800 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: 584mv 764mv	PASS
	FULL /MIN LOAD 50%DUTY / 120HZ		FULL /MIN% LOAD 50%DUTY / 1KHZ		
					

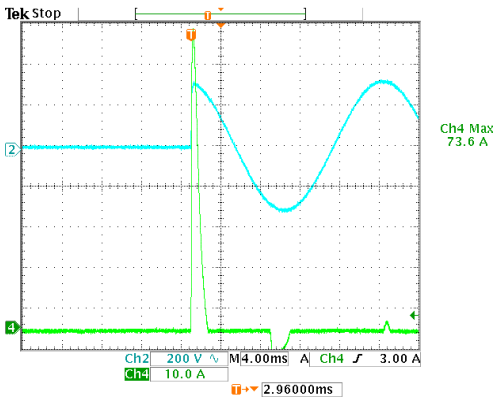
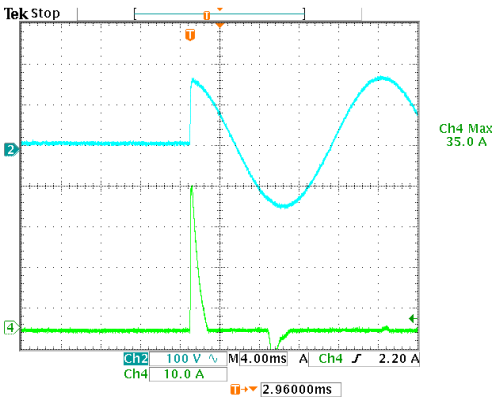
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25℃	66.0VAC ~ 264VAC	PASS
			I/P : LOW-LINE = 112VAC 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 : 115VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK	PASS
3	INPUT CURRENT (TYP.)	2.10A / 230VAC 4.20A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 1.86A / 230VAC I= 3.76A / 115VAC	PASS
4	LEAKAGE CURRENT	< 200uA Earth leakage current	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-FG 21 uA N-FG 37 uA	PASS
		< 70uA Touch leakage current	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-V-: 22 uA N-V- 24 uA	
5	NO LOAD POWER CONSUMPTION	< 0.50W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.4109 W	PASS
6	POWER FACTOR (TYP.)	0.94 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	PF= 0.993 / 230VAC PF= 0.999 / 115VAC	PASS



7	EFFICIENCY (TYP.)	94.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	94.3 %	PASS



8	INRUSH CURRENT (TYP.)	80A / 230VAC 40A / 115VAC COLD START	I/P : 230VAC I/P : 115VAC TA : 25℃	I= 73.6A / 230VAC I= 35.0A / 115VAC	PASS
	INPUT=230VAC/50HZ @ FULL LOAD		INPUT=115VAC/50HZ @ FULL LOAD		
	CH2 : AC Input Voltage CH4 : Input current (1V=1A)		CH2 : AC Input Voltage CH4 : Input current (1V=1A)		
					

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105% ~ 135%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING TA : 25℃	117.69% 264VAC 117.69% 230VAC 117.72% 115VAC Hiccup Mode	PASS
2	OVER VOLTAGE PROTECTION	52.80V ~ 62.40V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25℃	58.00V 264VAC 58.00V 230VAC 58.00V 80VAC Shut down Re- power ON	PASS
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD	O.T.P. Active Shut down Re- power ON	PASS
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	PASS

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	PS-ON INPUT SIGNAL	Power on: PS-ON = "Hi" or " > 2 ~ 5V" ; Power off: PS-ON = "Low" or " < 0 ~ 0.5V"	I/P: 230VAC O/P: FULL LOAD TA : 25℃	OK	PASS
2	5V STANDBY	5V / 1.0A ripple & noise: 120 mv Tolerance: 2%	I/P: 230VAC O/P: FULL LOAD TA : 25℃	4.9313 V/ 0.9919 A ripple & noise: 56.4 mv Tolerance: 1.374 %	PASS
3	FAN SUPPLY	12V / 0.5A ripple & noise: * mv Tolerance: 10%	I/P: 230VAC O/P: FULL LOAD TA : 25℃	11.965 V/ 0.4933 A ripple & noise: * mv Tolerance: 0.291 %	PASS
4	POWER GOOD/ POWER FAIL	> 1ms 10ms< PG < 500ms	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25℃	96.8ms 10.6ms /230VAC 94.4ms 9.8ms /115VAC	PASS

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	PWM Power Transistor	Q5 Rated： 600V 30.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	VIN: 267VAC VDS: (1). 392.00V (2). 428.00V (3). 392.00V	PASS
1	PWM Power Transistor	Q6 Rated： 600V 30.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	VIN: 267VAC VDS: (1). 400.00V (2). 444.00V (3). 386.00V	PASS
1	PWM Power Transistor	U900 Rated： 725V 0.7A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	VIN: 267VAC VDS: (1). 488.00V (2). 510.00V (3). 488.00V	PASS
2	O/P MOSFET	Q101 Rated： 150V 50.0A Q102 Rated： 150V 50.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	Q101 Q102 VDS： VDS： (1). 108.00V 107.00V (2). 8.88V 8.02V (3). 108.00V 107.00V	PASS
3	Input Capacitor	C5 Rated： 270uf 400V	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). 384.00V (2). 382.00V (3). 398.00V	PASS
4	Control IC	U2 Rated： 26V (max) -0.3V (min) U1 Rated： 16V (max) -0.3V (min)	I/P： 267VAC O/P： (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta： 25℃	U2 U1 (1). 16.10V 13.80V (2). 15.60V 13.90V (3). 15.70V 13.80V (4). 15.40V 13.80V (5). 15.90V 13.90V	PASS
4	Control IC	U101 Rated： 24V (max) -0.3V (min)	I/P： 267VAC O/P： (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta： 25℃	U101 (1). 11.50V (2). 1.25V (3). 11.30V (4). 11.30V (5). 11.30V	PASS
5	PFC Power Transistor	Q1 Rated： 600V 35.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	VIN: 267VAC VDS: (1). 466.00V (2). 528.00V (3). 450.00V	PASS
6	PFC Diode	D10 Rated： 600V 6.0A	I/P： 267VAC 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 50%Duty/120Hz Ta： 25℃	267VAC (1). 392.00V (2). 394.00V (3). 392.00V (4). 392.00V	PASS

■SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 4.000KVAC /min I/P-FG： 2.000KVAC /min O/P-FG： 1.500KVAC /min	I/P-O/P: 4.400KVAC /min I/P-FG: 2.400KVAC /min O/P-FG: 1.800KVAC /min Ta： 25℃	I/P-O/P: 1.42mA I/P-FG: 1.65mA O/P-FG: 0.53mA NO DAMAGE	PASS
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: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE	PASS

E.M.C. TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A Shut down Re- power ON	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	
3	RADIATION	EN55022 CLASS B	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	PASS Test by certified Lab	
4	E.S.D	EN61000-4-2 INDUSTRY AIR：8KV / Contact：4KV	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A	
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A	
6	SURGE	IEC61000-4-5 INDUSTRY L-N：2KV;L/N-PE：4KV	I/P： 230VAC /50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A	

■RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL： EPP-400-24 1. ROOM AMBIENT BURN-IN： 1.0hrs IP: 230VAC O/P: 250W TA= 25.5℃ 2. HIGH AMBIENT BURN-IN： 1.0hrs IP: 230VAC O/P: 250W TA= 42.1℃			PASS

NO.	Position	ROOM AMBIENT 25.5℃	HIGH AMBIENT Ta： 42.1℃
1	BD1	62.0℃	78.6℃
2	LF1	41.7℃	58.8℃
3	LF2	43.0℃	59.4℃
4	Q5	75.3℃	91.8℃
5	Q6	71.0℃	86.7℃
6	L1	81.2℃	97.8℃
7	D10	70.7℃	86.2℃
8	Q1	74.1℃	89.2℃
9	C33	58.1℃	76.3℃
10	C5	69.0℃	82.7℃
11	T1COIL	69.3℃	83.1℃
12	T1COIL	65.8℃	81.1℃
13	L2	74.6℃	87.7℃
14	Q101	53.5℃	70.0℃
15	Q102	59.5℃	74.8℃
16	TSW1	66.5℃	81.4℃
17	C106	48.1℃	64.1℃
18	C105	51.3℃	66.6℃
19	U900	74.7℃	89.3℃
20	U1	69.8℃	84.4℃
21	U2	73.7℃	90.1℃
22	T900	62.5℃	78.5℃
23	LF3	37.8℃	55.1℃
24	C1	37.3℃	54.3℃
25	C2	39.1℃	55.7℃
26	D911	69.1℃	84.0℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 123.00% LOAD Ta : 25℃	TEST : OK	PASS
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 115VAC O/P : FULL LOAD Ta : -30.0℃	TEST : OK	PASS
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45℃ NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 45℃ HUMIDITY= 95.0% RH	TEST : OK	PASS
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~50℃)	I/P : 230VAC O/P : FULL LOAD	±0.0000% /(0℃~50℃)	PASS
6	STORAGE TEMPERATURE TEST	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		TEST : OK	PASS
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35℃ ~ +50℃ 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		TEST : OK	PASS
8	VIBRATION TEST	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℃		TEST : OK	PASS
9	CAPACITOR LIFE CYCLE	:SUPPOSE C106 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= 45.0℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45.0℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45.0℃ LIFE TIME		(1). 505637 HRS (2). 131777.8 HRS (3). 219984.4 HRS (4). 321245.6 HRS	PASS
10	MTBF	Conducted by Parts Stress Analysis Prediction 194.1K hrs min. MIL-HDBK-217F (25℃)			PASS
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 45℃ O/P : FULL LOAD			PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	frank	GESG	WANGDZ

12.10.30 A50-F031