



Test Report: PSPA-1000-12

1000W with PFC and Parallel 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

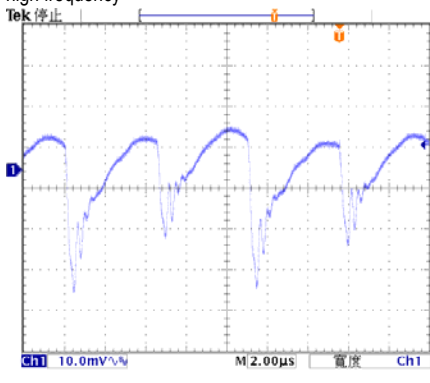
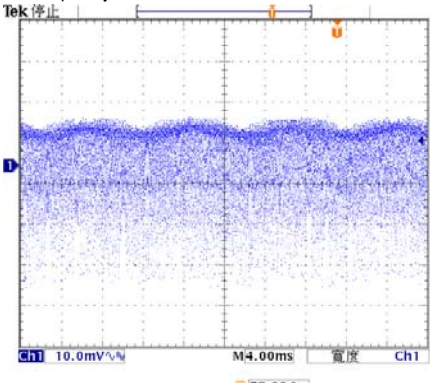
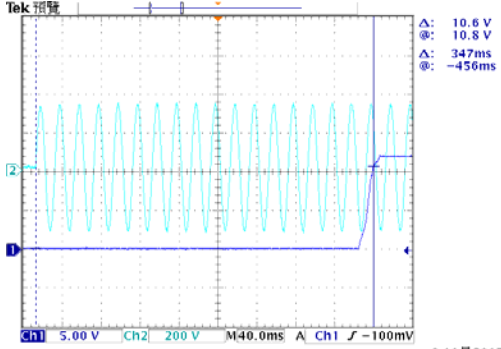
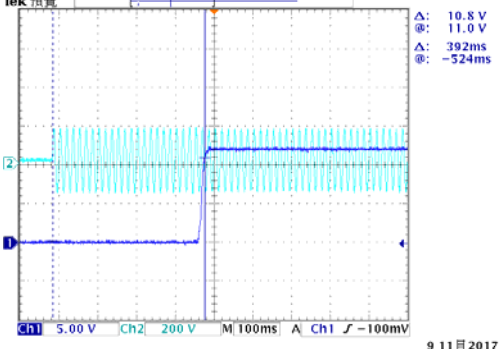
E.M.C. Test

■ RELIABILITY TEST

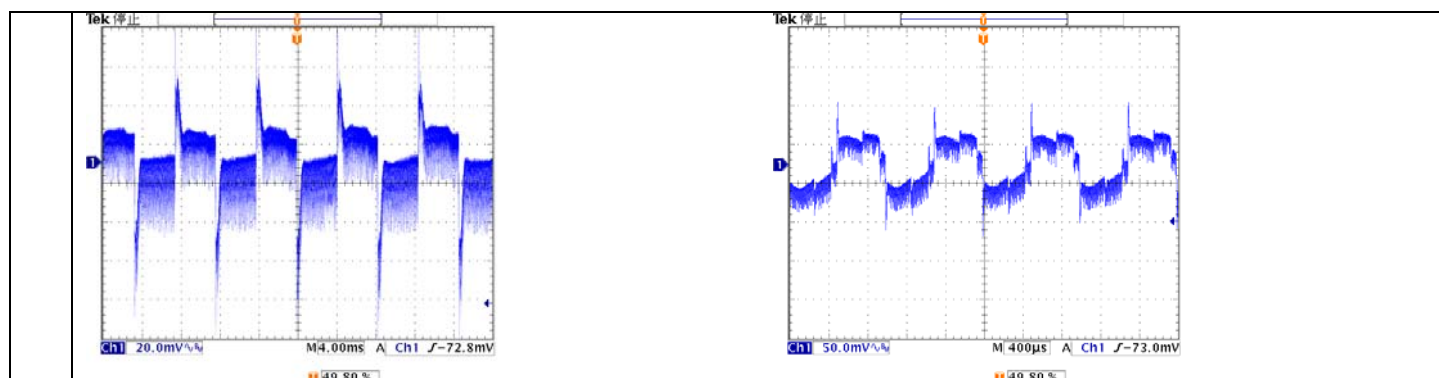
ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 11V~ 14V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	10.571V~14.458V/230VAC 10.569V~14.458V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 2%~ -2%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.83%~ 0%
3	LINE REGULATION (Max)	V1: 0.5%~ -0.5%	I/P: 90VAC~264VAC O/P:FULL LOAD Ta:25°C	V1: 0.166 %~ -0.083%
4	LOAD REGULATION(Max)	V1: 2%~ -2%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.249%~ -0.166%
5	OVER/UNDERSHOOT TEST	< ±15%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	< 15%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 42.2mVp-p
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>high frequency :</p>  </div> <div style="text-align: center;"> <p>low frequency :</p>  </div> </div>				
7	SET UP TIME(Max)	230VAC/1000ms 115VAC/1000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 347ms 115VAC/ 392ms
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  </div> <div style="text-align: center;"> <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  </div> </div>				

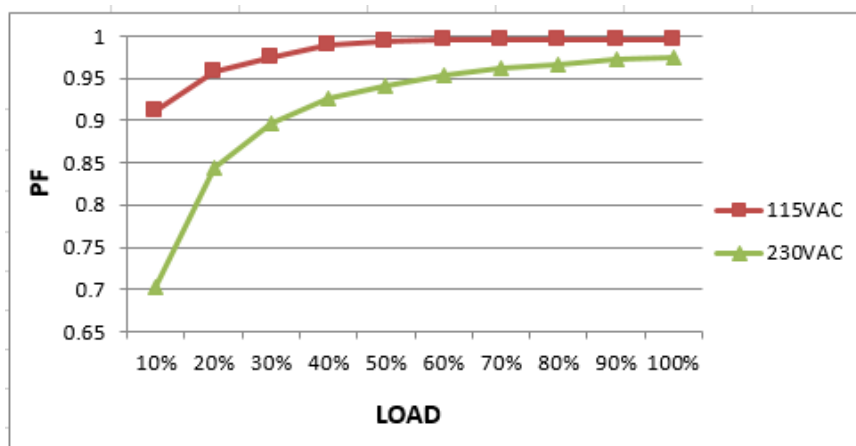
8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 13 ms 115VAC/ 14 ms
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/20ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 18.4 ms 115VAC/ 22.4ms
10	DYNAMIC LOAD	V1: 1200mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	178mVp-p 172mVp-p

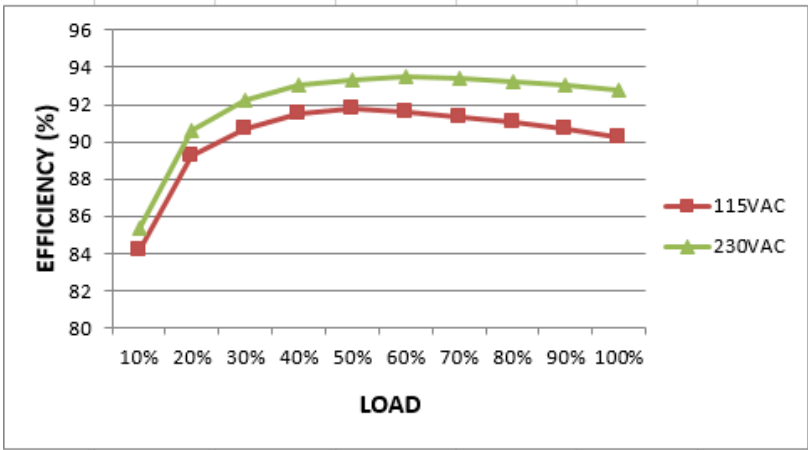
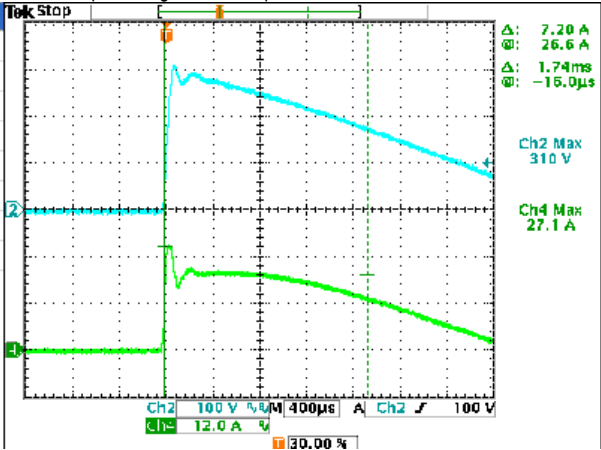
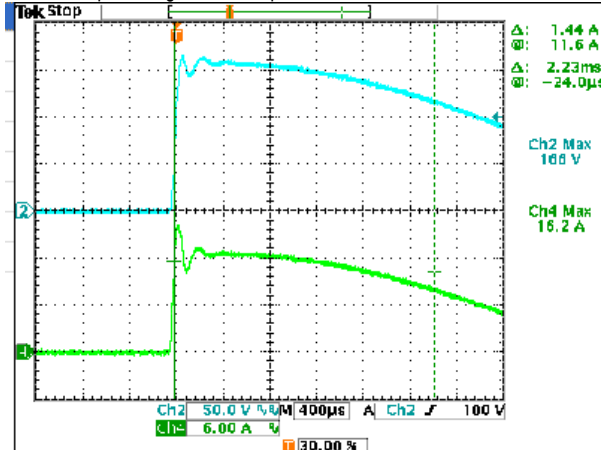


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	58 V~264V
			I/P: LOW-LINE-3V=87 V HIGH-LINE+15%=300 V O/P: FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 90VAC ~264 VAC O/P: FULL~MIN LOAD Ta: 25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 5A 115V/ 8.5A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 4.66A/ 230VAC I = 7.89A/ 115VAC
4	LEAKAGE CURRENT	< 0.5 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.39 mA N-FG : 0.39 mA
5	POWER FACTOR (Typ.)	0.95/ 230VAC 0.99/115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF=0.974/230VAC PF=0.997/115VAC

P.F vs LOAD



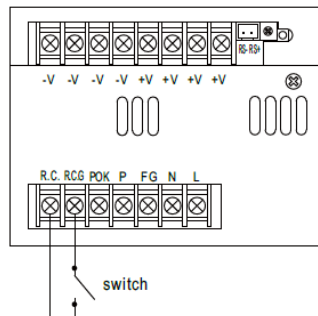
6	EFFICIENCY(Typ.)	92%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	92.45%
EFFICIENCY vs LOAD 				
7	INRUSH CURRENT(Typ.)	230V/40A 115V/20A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =27.1A/ 230VAC I =16.2A/ 115VAC T50:1740us/230V
<div> <div> INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current  </div> <div> INPUT=115VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current  </div> </div>				

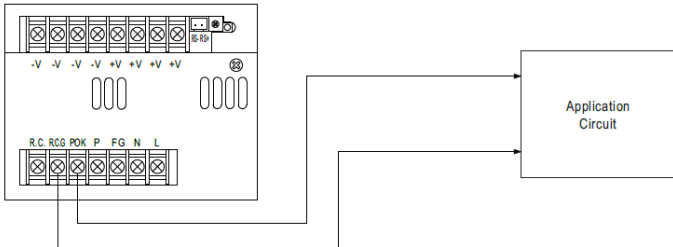
PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 135% Protection type : Constant current limiting, recovers automatically after fault condition is removed	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	118.85%/ 264VAC 118.79%/ 230VAC 118.86%/115VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	14.5V~16.5V Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	15.390V/ 264VAC 15.391V/ 230VAC 15.344V/ 90VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover

3	OVER TEMPERATURE PROTECTION	Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD	O.T.P. Active Protection type : OK Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE PROTECTION TYPE : OK Constant current limiting, recovers automatically after fault condition is removed

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT						
1	CURRENT SHARING	< 10%	I/P : 230 VAC O/P : 90%/50% LOAD Ta : 25°C	O/P : 90% PSU1 : 74.11A PSU2 : 72.73 A PSU3 : 72.5A PSU4 : 73.64A O/P : 50% PSU1 : 41.08 A PSU2 : 41.08 A PSU3 : 38.79A PSU4 : 41.4A						
2	REMOTE SENSE	S+ / S- >0.5V	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	> 0.5V						
3	REMOTE ON-OFF CONTROL	<div>※ The power supply can be turned ON-OFF individually or along with other units by using the "Remote ON-OFF" function.</div> <div></div> <div><table><tr><th>Between R.C. and R.C.G</th><th>Power Supply Status</th></tr><tr><td>Switch Short</td><td>ON</td></tr><tr><td>Switch Open</td><td>OFF</td></tr></table></div> <div>I/P: 230 VAC O/P:NO LOAD Ta:25°C TEST RESULT :OK</div>			Between R.C. and R.C.G	Power Supply Status	Switch Short	ON	Switch Open	OFF
Between R.C. and R.C.G	Power Supply Status									
Switch Short	ON									
Switch Open	OFF									

4	POK SIGNAL	<p>The TTL signal out, PSU turn on = 2.4 ~ 5V ; PSU turn off = 0 ~ 0.4V. Please refer to the Function Manual.</p> <p>※ POK signal indicates the output status of the power supply. It can operate in two ways : One is sinking current from external TTL signal ; the other is sending out a TTL voltage signal.</p> <p>◎ Sinking current from external TTL signal: The maximum sink current is 10mA and the maximum external voltage is 5.6V.</p>  <p>I/P: 230 VAC O/P: FULL LOAD Ta: 25°C</p> <p>TEST RESULT :</p> <table border="1"> <tr> <td></td><td>PSU TURN ON</td><td>PSU TURN OFF</td></tr> <tr> <td>P OK</td><td>4.34V</td><td>0.04V</td></tr> </table>		PSU TURN ON	PSU TURN OFF	P OK	4.34V	0.04V
	PSU TURN ON	PSU TURN OFF						
P OK	4.34V	0.04V						

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q911 Rated : 26A / 600V	I/P: High-Line +3V = 303V I/P: Low-Line -3V = 197V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7) 0%→400% Load. Ta: 25°C	303V VDS: (1) 519V (2) 511V (3) 434 V (4) 503V (5) 503V (6) 498 V (7) 465V	197V VDS: (1) 432 V (2) 428V (3) 380V (4) 380V (5) 380V (6) 380 V (7) 432V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated: 34A / 650V	I/P: High-Line +3V = 303 V I/P: Low-Line -3V = 197V AC ON/OFF O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7) 0%→400% Load. Ta: 25°C	303V VDS: (1) 430V (2) 430V (3) 430V (4) 430V (5) 434V (6) 437V (7) 430V	197V VDS: (1) 438V (2) 418V (3) 418V / (4) 422V (5) 422V (6) 418V (7) 422V

3	P.F.C DIODE	D6 Rated: 6A / 600V	I/P:High-Line +3V =303 V I/P:Low-Line -3V = 197V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	303V (1) 369V (2) 373V (3) 370V (4) 378V	197V (1) 386V (2) 386V (3) 382V (4) 386V	
4	Diode Peak Voltage	Q503 Rated: 100A / 40V Q507 Rated: 100A / 40V	I/P:High-Line +3V =303 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD	Q503: VDS: (1)33.1V (2)17.5V (3)32.7V (4)33.5V (5)33.5V (6)36.3V (7)31.5V (8)31.5V	Q507: VDS: (1)33.9V (2)14.6V (3)31.5V (4)31.9V (5)31.1V (6)31.1 V (7)31.5V (8)31.5V	
5	Control IC Voltage Test	PWM IC U900 8.85 V ~ 16 V PFC IC U1 : 12.9 V ~ 25 V O/P SR U502 Rated: 8V~ 24V	I/P:High-Line +3V =303 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRMIN (LOW LINE) Ta:25°C	U900 (1) 13.6V (2) 13.6V (3) 13.6V (4) 13.6V (5) 13.4V	U1 (1) 15.3V (2) 15.7V (3) 15.5V (4) 15V (5) 14.8V	U502 (1)12.3V (2)12.3V (3)12.2V (4)12.3V (5)12V
6	TOP SWITCHING STAND BY POWER	U971 Rated : 1.8 A / 700V	I/P:High-Line +3V =303 V I/P:Low-Line -3V =197 V AC ON/OFF O/P: (1)Full Load (2)Remote On/Off Ta:25°C	303V (1) 512V (2) 524V	197V (1) 463 V (2) 483V	

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P:6.28mA I/P-FG:5.26mA O/P-FG:5.13m A 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: 7.87GΩ I/P-FG: 8.37GΩ O/P-FG: 18.7GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	15mΩ

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°C	PASS
2	CONDUCTION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 <u>INDUSTRY</u> AIR: 8KV / Contact: 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 <u>INDUSTRY</u> INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 <u>INDUSTRY</u> L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : PSPA-1000-12 1. ROOM AMBIENT BURN-IN : 14HRS I/P : 230VAC O/P : FULL LOAD 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD		

		NO	Position	ROOM AMBIENT Ta= 25°C		HIGH AMBIENT Ta= 50°C	
		1	BD1		64.3°C		88.6°C
		2	R5		43.7°C		67.7°C
		3	Q1		46.4°C		72.9°C
		4	D6		61.3°C		86.1°C
		5	C5		41.1°C		64.3°C
		6	U971		46.1°C		72.1°C
		7	RY1		46.3°C		70.8°C
		8	Q405		39.7°C		64.7°C
		9	C406		28.3°C		54.1°C
		10	TSW4		38.3°C		63.6°C
		11	RTH3		38.8°C		63.9°C
		12	L1		51.0°C		73.1°C
		13	T951		39.4°C		64.5°C
		14	C1		33.3°C		59.5°C
		15	LF2		37.7°C		63.9°C
		16	C2		33.3°C		58.5°C
		17	LF3		39.5°C		64.0°C
		18	T1-1		73.7°C		100.4°C
		19	T1-2		71.2°C		99.0°C
		20	T2-1		61.6°C		88.6°C
		21	T2-2		63.4°C		91.6°C
		22	L900		59.8°C		83.1°C
		23	Q910		51.6°C		78.9°C
		24	C933		48.1°C		72.4°C
		25	C935		46.2°C		70.4°C
		26	Q911		59.5°C		88.5°C
		27	C910		40.7°C		65.7°C
		28	C106		46.4°C		72.2°C
		29	C116		39.9°C		65.3°C
		30	C906		39.0°C		62.8°C
		31	C112		50.3°C		76.3°C
		32	U551		54.7°C		79.9°C
		33	U501		75.0°C		103.2°C
		34	Q505		83.7°C		114.5°C
		35	Q501		66.1°C		92.8°C
		36	U503		60.4°C		108.9°C
		37	Q503		72.7°C		100.9°C
		38	Q507		84.5°C		114.1°C
		39	U1		40.6°C		66.0°C
		40	C11		40.2°C		64.8°C
		41	D981		47.4°C		72.7°C
		42	U900		43.5°C		69.0°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P : 230 VAC O/P : 121 % LOAD Ta : 25°C		TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 264VAC/200VAC O/P : 100 % LOAD Ta= -25°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 : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0 %/°C (0~50°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C ~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC		OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°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		OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK
9	CAPACITOR LIFE CYCLE	PSPA-1000-12 SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= °C LIFE TIME		(1) 350803HRS (2) 58648HRS (3) 182594HRS (4) 471820HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 94.4K hrs min. MIL-HDBK-217F (25°C)		
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50,000 hours @ TA 50°C		

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

12.10.30 A50-F031