



Test Report: PSPA-1000-48

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

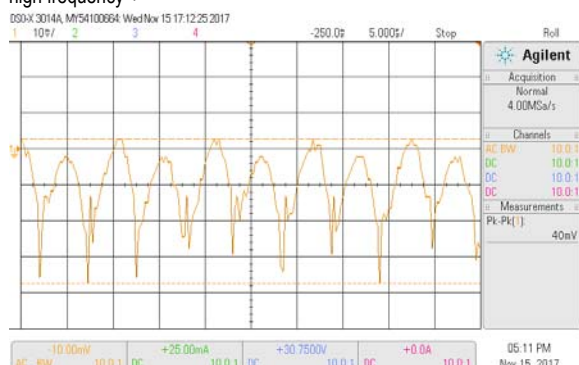
ENVIRONMENT TEST

DESIGN VERIFY TEST

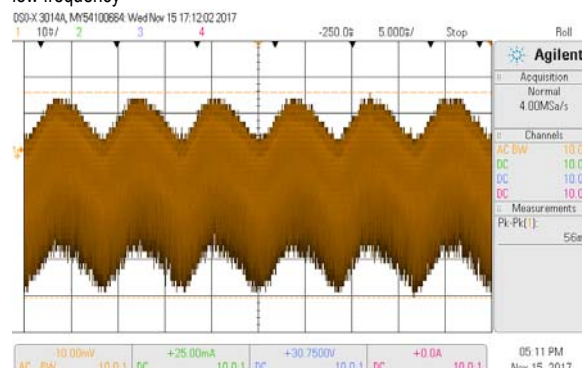
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 46V~ 56V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	43.28~57.43V/230VAC 43.27~57.43V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1.0%~ -1.0%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.375%~ -0.042%
3	LINE REGULATION (Max)	V1: 0.5%~ -0.5%	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0%
4	LOAD REGULATION(Max)	V1: 0.5%~ -0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.021%~ -0%
5	OVER/UNDERSHOOT TEST	< ±15%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<15%
6	RIPPLE & NOISE(Max)	V1: 250mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 56mVp-p

high frequency :



low frequency :



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/ 357.08ms 115VAC/ 405.74ms
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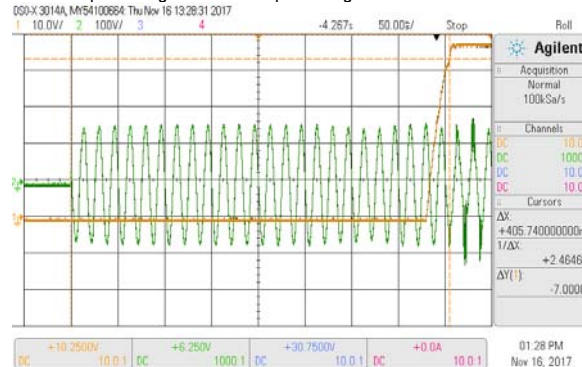
INPUT=230VAC/50HZ @ FULL LOAD

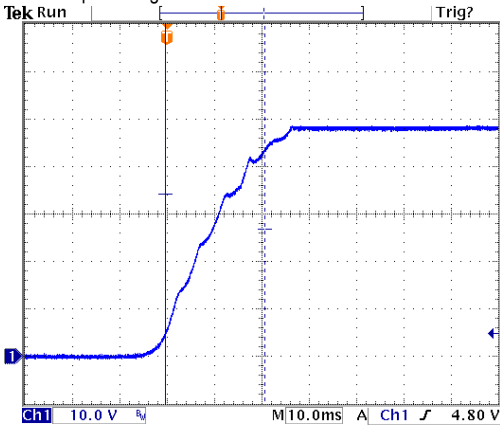
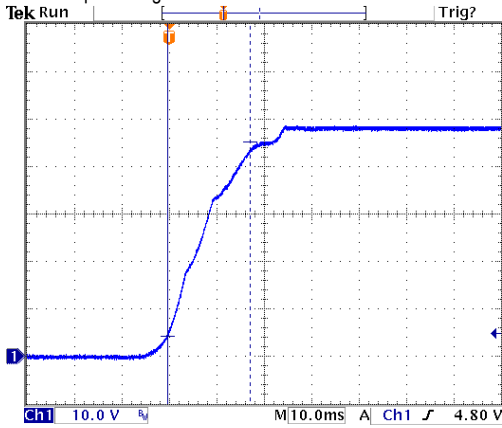
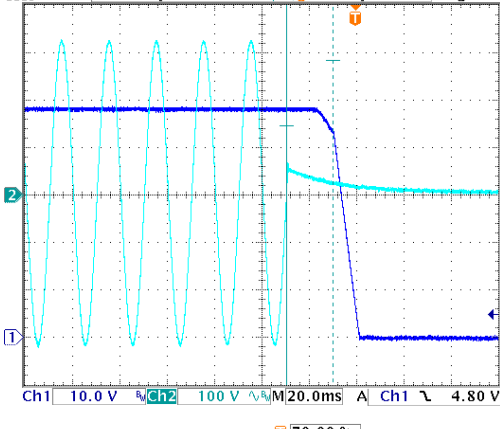
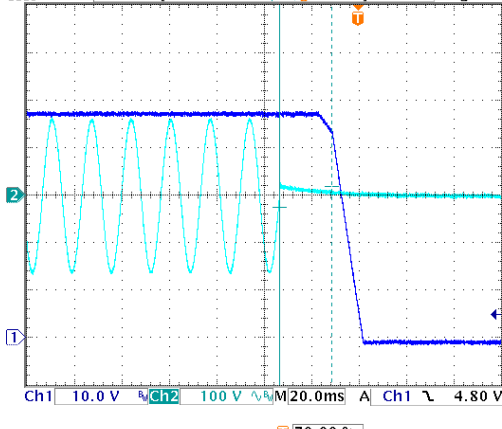
CH1 : Output Voltage CH2 : AC Input Voltage

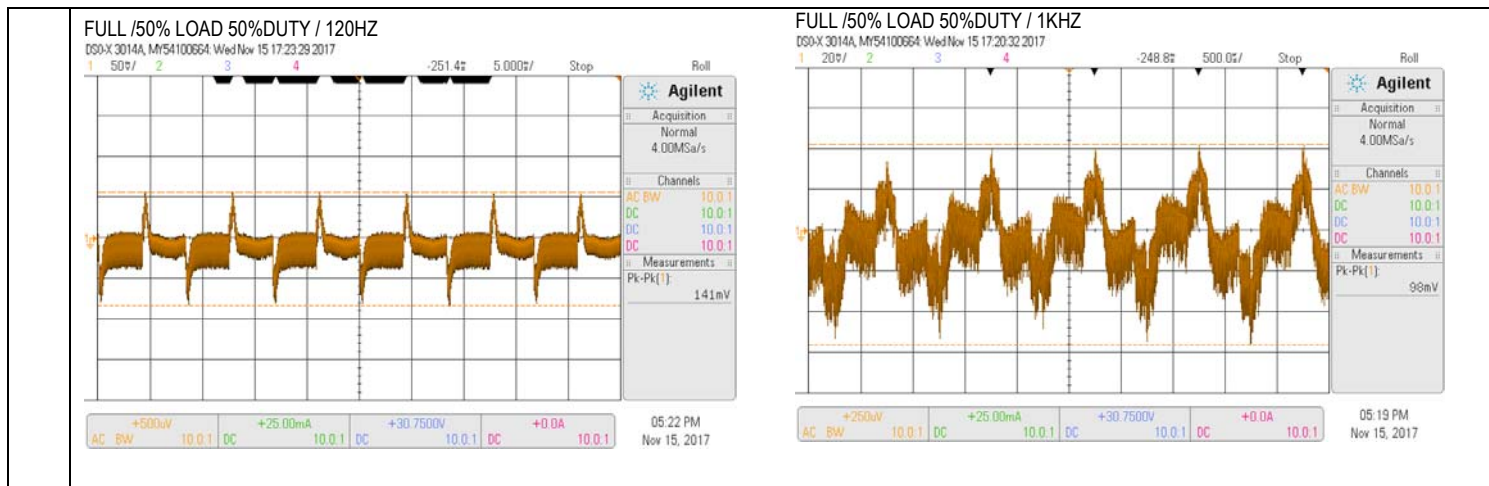


INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

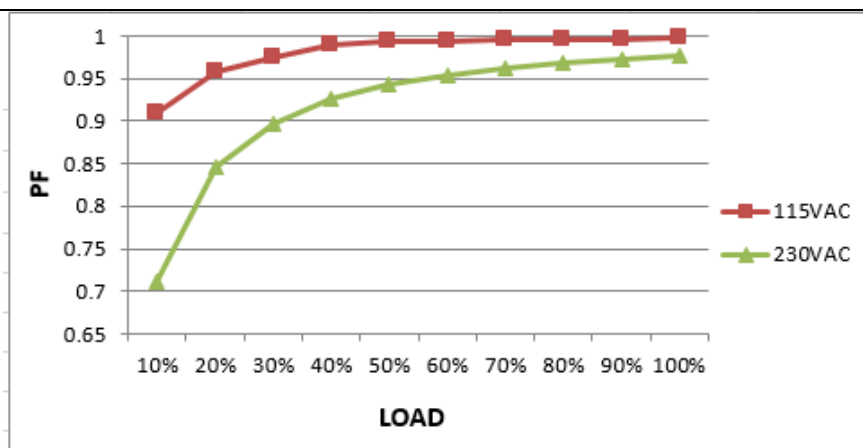


8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 21 ms 115VAC/ 17.4 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage  Δ: 7.40 V @: 34.2 V Δ: 21.0ms @: -400μs Ch1 10.0 V M10.0ms A Ch1 4.80 V INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage  Δ: 41.0 V @: 4.20 V Δ: 17.4ms @: -400μs Ch1 10.0 V M10.0ms A Ch1 4.80 V			
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/ 19.6 ms 115VAC/ 22ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  Δ: 138 V @: 146 V Δ: 19.6ms @: -29.6ms Ch1 10.0 V Ch2 100 V M20.0ms A Ch1 4.80 V INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  Δ: 44.0 V @: -26.0 V Δ: 22.0ms @: -33.6ms Ch1 10.0 V Ch2 100 V M20.0ms A Ch1 4.80 V			
10	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	141mVp-p 98mVp-p



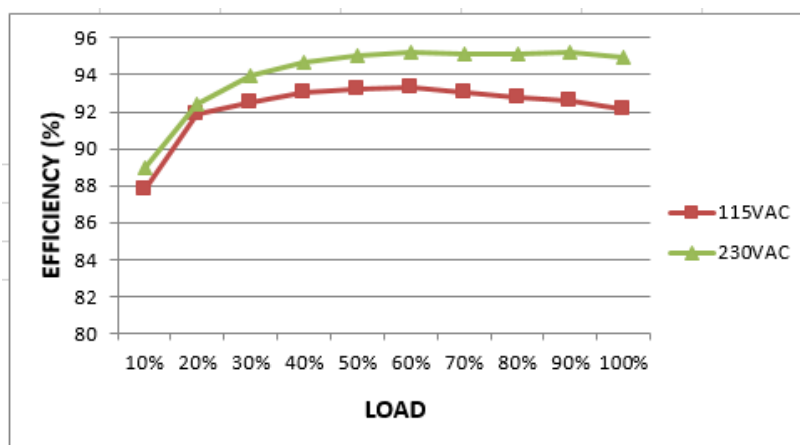
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~264VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	72V~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: 90 VAC ~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 =4.76A/ 230VAC I =8.175A/ 115VAC
4	LEAKAGE CURRENT	< 0.5mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.36 mA N-FG : 0.34 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=0.977/230VAC PF=0.996/115VAC
	P.F vs LOAD			



6	EFFICIENCY(Typ.)	94%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	94.82 %
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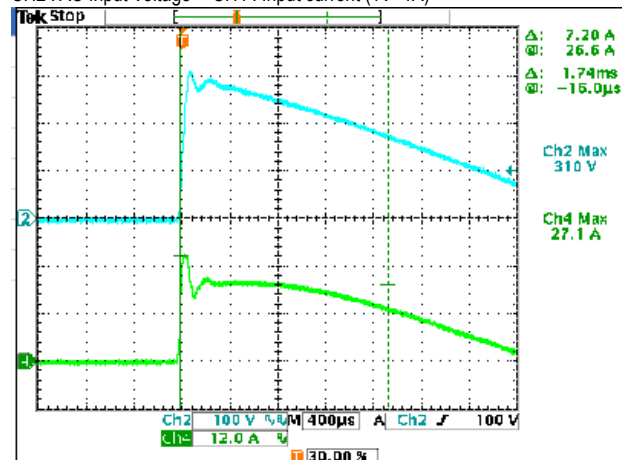
EFFICIENCY vs LOAD



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
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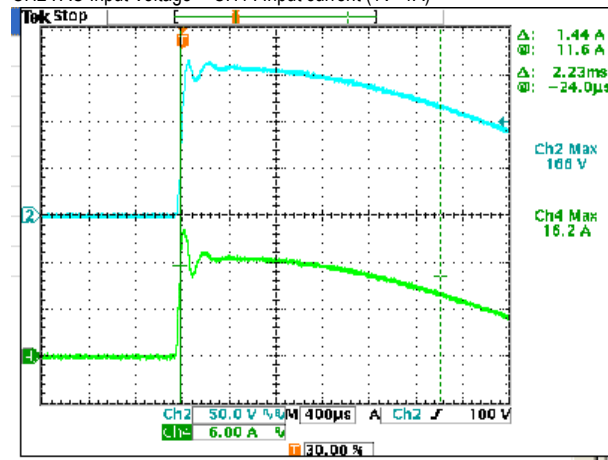
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current (1V=1A)



INPUT=115VAC/ 60HZ @ FULL LOAD

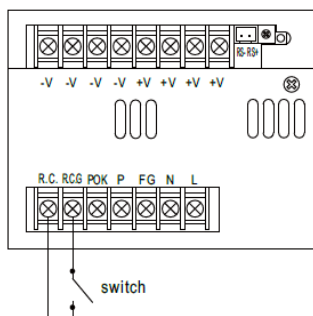
CH2 : AC Input Voltage CH4 : Input current (1V=1A)

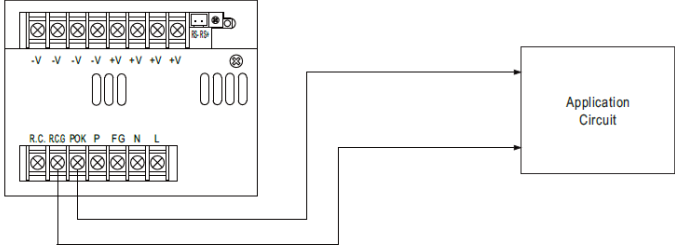


PROTECTION FUNCTION TEST

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: 200VAC O/P: TESTING Ta:25℃	115.86%/ 264VAC 115.71%/ 230VAC 115.76%/200AC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	58V~65V 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℃	61.2V/ 264VAC 61.2V/ 230VAC 60.9V/ 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 : 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℃	NO DAMAGE PROTECTION TYPE : 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 : FULL/50% LOAD Ta : 25℃	O/P : 100% PSU1 : 19.26 A PSU2 : 19.44A PSU3 : 19.26A PSU4 : 19.71A O/P : 50% PSU1 : 10.8A PSU2 : 10.7A PSU3 : 11.1A PSU4 : 10.9A						
2	REMOTE SENSE	S+ / S- >0.5V	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	> 0.5 V						
3	REMOTE ON/OFF CONTROL	※ The power supply can be turned ON-OFF individually or along with other units by using the "Remote ON-OFF" function.								
		 I/P: 230 VAC O/P:NO LOAD Ta:25℃ <table><thead><tr><th>Between R.C. and R.C.G</th><th>Power Supply Status</th></tr></thead><tbody><tr><td>Switch Short</td><td>ON</td></tr><tr><td>Switch Open</td><td>OFF</td></tr></tbody></table>			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									

		TEST RESULT : OK						
4	POK SIGNAL	The TTL signal out, PSU turn on = 2.4 ~ 5V ; PSU turn off = 0 ~ 0.4V. Please refer to the Function Manual. ※ 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. ◎ Sinking current from external TTL signal: The maximum sink current is 10mA and the maximum external voltage is 5.6V.  I/P: 230 VAC O/P:FULL LOAD Ta:25°C TEST RESULT : <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 : 26A / 600 V	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.	303V VDS: (1)448V (2)454V (3)454V (4)448V (5)452V (6)448V (7)442V	197V VDS: (1)410V (2)410V (3)418V (4)416V (5)416V (6)414V (7)418V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 : 34A / 650V	I/P:High-Line +3V =303V 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.	303V VDS: (1) 436V (2) 432V (3) 434V (4) 436V (5) 432V (6) 436V (7) 438V	197V VDS: (1) 456V (2) 422 V (3) 454V (4) 456V (5) 460V (6) 446V (7) 436V

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) 392V (2) 392V (3) 394V (4) 396V	197V (1) 404V (2) 394V (3) 404V (4) 406V
4	SR MOSFET Peak Voltage	Q503 Rated: 150V / 76A Q507 Rated: 150V / 76A	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)117V (2)10.8V (3)120V (4)119V (5)119V (6)122V (7) 120V (8)113V	Q507: VDS: (1)120V (2)11.5V (3)120V (4)121V (5)122V (6)125V (7)124V (8)115V
5	Bulk Capacitor Test	C5 150μF / 400V 105°C PEAK VOLTAGE: 460V@30S	I/P:High-Line +3V =303V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25°C	(1)436V (2)442V (3)436V (4)434V	
6	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) 14.4V (2) 14.2V (3) 14.4V (4) 14.6V (5) 12.6V	U1 (1) 15.7V (2) 15.6V (3) 15.8V (4) 15.8 V (5)13.9V U502 (1)12.2V (2)12.3V (3)12.4V (4)12.4V (5)10.8V
7	STAND BY POWER	U971 Rated: 1.8 A / 700V	I/P:High-Line +3V =303 V I/P:Low-Line -3V =197V AC ON/OFF O/P: (1)Full Load (2)Remote On/Off	303V (1) 524V (2)544V	197V (1) 484V (2) 498V

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:5.9mA I/P-FG:4.92mA O/P-FG:4.03m 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	I/P-O/P: 13.6GΩ I/P-FG: 11.1GΩ O/P-FG: 29.6GΩ

			Ta:25℃	NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	16mΩ

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	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P : 230 VAC (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 : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT : ± 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N : ±2KV L,N-PE : ±4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	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-1000-48 1. ROOM AMBIENT BURN-IN : 1HRS I/P : 230VAC O/P : FULL LOAD 2. HIGH AMBIENT BURN-IN : 1.5HRS I/P : 230VAC O/P : FULL LOAD		

			NO	Position	ROOM AMBIENT Ta= 25°C	HIGH AMBIENT Ta= 50°C
			1	BD1	60.5°C	93.9°C
			2	R5	40.3°C	74.7°C
			3	Q1	43.3°C	78.1°C
			4	D6	50.6°C	85.9°C
			5	C5	35.0°C	69.2°C
			6	U971	45.8°C	79.7°C
			7	RY1	40.5°C	75.7°C
			8	Q405	39.1°C	71.1°C
			9	C406	30.4°C	65.0°C
			10	TSW4	34.7°C	69.7°C
			11	RTH3	34.8°C	69.4°C
			12	L1	45.3°C	79.5°C
			13	T951	38.5°C	73.0°C
			14	C1	31.9°C	67.2°C
			15	LF2	34.8°C	70.1°C
			16	C2	30.3°C	64.8°C
			17	LF3	36.5°C	70.9°C
			18	T1-1	48.2°C	82.1°C
			19	T1-2	51.2°C	83.4°C
			20	T2-1	53.1°C	87.7°C
			21	T2-2	56.2°C	91.1°C
			22	L900	52.2°C	85.6°C
			23	Q910	46.7°C	83.7°C
			24	C933	40.7°C	75.6°C
			25	C935	38.9°C	73.2°C
			26	Q911	52.0°C	89.6°C
			27	C910	36.5°C	70.9°C
			28	C106	29.5°C	63.7°C
			29	C116	28.0°C	83.0°C
			30	C906	33.0°C	68.0°C
			31	C117	27.9°C	62.2°C
			32	U551	34.0°C	68.8°C
			33	U501	44.4°C	78.8°C
			34	Q505	50.2°C	86.1°C
			35	Q501	43.3°C	78.6°C
			36	U503	45.1°C	79.9°C
			37	Q503	44.4°C	80.0°C
			38	Q507	47.5°C	83.0°C
			39	U1	39.1°C	73.3°C
			40	C11	35.5°C	69.8°C
			41	D981	45.9°C	79.4°C
			42	U900	38.4°C	73.8°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 115 % 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	± 0.003 %/°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-1000-48 SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50°C LIFE TIME		(1) 2503664HRS (2) 467867HRS (3) 529437HRS (4) 578476HRS
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