



Test Report: RSP-2000-24

2000W Front End Power Supply

■ 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	VERDICT
1	RIPPLE & NOISE	V1: 200 mVp-p (Max)	I/P: 230VAC O/P:FULL LOAD Ta:25°C	V1: 49.8 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21 V~ 28 V	I/P: 230 VAC I/P: 115 VAC O/P:MIN LOAD Ta:25°C	20.25 V~ 28.77 V/ 230 VAC 20.24 V~ 28.77 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1: 1%~ -1 % (Max)	I/P: 180VAC / 264 VAC O/P:FULL/ MIN LOAD Ta:25°C	V1: 0.05 %~ -0.05 %	P
4	LINE REGULATION	V1:0.5 %~ -0.5% (Max)	I/P:180 VAC ~ 264 VAC O/P:FULL LOAD Ta:25°C	V1: 0.03 %~ -0.03 %	P
5	LOAD REGULATION	V1: 0.5 %~ -0.5 % (Max)	I/P: 230 VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.05 %~ -0.05 %	P
6	SET UP TIME	230VAC: 1500 ms (Max) 115 VAC: 1500 ms (Max)	I/P: 230 VAC @ full load I/P: 115 VAC @ 80% load Ta:25°C	230VAC/ 1160 ms 115VAC/ 1072 ms	P
7	RISE TIME	230VAC: 60 ms (Max) 115VAC: 60 ms (Max)	I/P: 230 VAC @ full load I/P: 115 VAC @ 80% load Ta:25°C	230VAC/ 36 ms 115VAC/ 35 ms	P
8	HOLD UP TIME	230VAC: 10 ms (TYP) 230VAC: 16 ms (TYP)	I/P: 230 VAC @ full load I/P: 230 VAC @ 75% load Ta:25°C	230VAC/ 16 ms 230VAC/ 21 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	TEST: <5 %	P
10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 230 VAC O/P:FULL /Min LOAD 90%DUTY/1KHZ Ta:25°C	418 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	180VAC~264 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	143V~264V	P
			I/P: LOW-LINE-3V= 177V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST: OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P: 180 VAC ~ 264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK	P
3	POWER FACTOR	0.98 / 230 VAC(TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	PF= 0.986 / 230 VAC	P
4	EFFICIENCY	90.5% (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	90.69%	P
5	INPUT CURRENT	230V/ 10 A (TYP) 115V/ 16 A (TYP)	I/P: 230 VAC @ full load I/P: 115 VAC @ 80% load Ta:25°C	I = 9.51 A/ 230 VAC I = 15.1 A/ 115 VAC	P
6	INRUSH CURRENT	230V/ 50 A (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	I = 31.4 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P:Min LOAD Ta:25°C	L-FG: 0.72 mA N-FG: 0.68 mA	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 %~ 125 %	I/P: 230 VAC I/P: 115 VAC O/P:TESTING Ta:25°C	116.6%/ 230 VAC 112.6%/ 115 VAC Constant Current Limiting, unit will shut down o/p voltage after 5 sec ,re-power on to recover.	P
2	OVER VOLTAGE PROTECTION	CH1:29.5 V~ 35V	I/P: 230 VAC I/P: 115 VAC O/P:MIN LOAD Ta:25°C	32.045V/ 230 VAC 31.777V/ 115 VAC Shunt down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC: TSW1: 80 ± 5°C O.T.P. TSW2: 75 ± 5°C O.T.P. NO DAMAGE	I/P: 230 VAC O/P:FULL LOAD	O.T.P. Active Shut down o/p voltage , recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264 VAC O/P:FULL LOAD Ta:25°C	NO DAMAGE Constant Current Limiting, unit will shut down o/p voltage after 5 sec ,re-power on to recover.	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																		
1	AUXILIARY POWER (AUX)	5V @ 0.3A (4.5V~ 5.5V) 12V @ 0.8A (10.6V~13.2V)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	5.021V 11.152V	P																		
2	REMOTE ON/OFF	ON/OFF/+5V-AUX SHORT : POWER OFF ON/OFF/+5V-AUX OPEN : POWER ON	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	SHORT : POWER OFF OPEN : POWER ON	P																		
3	REMOTE SENSE	Compensate voltage drop on the load wiring up to 0.5V	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	> 0.5 V	P																		
4	DC OK Signal	HIGH:VOUT ≤ 80±5%Vout LOW:VOUT ≥ 80±5%Vout	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	HIGH : <u>4.996 V</u> VO ≤ <u>78.75</u> %Vout LOW: <u>0 V</u> VO ≥ <u>82.5</u> %Vout	P																		
5	Output voltage TRIM	DC<0.4V Vo/p=100%±3% (0~100% load) DC=1V Vo/p=40%±3% (0~100% load) DC=2V Vo/p=60%±3% (0~100% load) DC=3V Vo/p=80%±3% (0~100% load) DC=4V Vo/p=100%±3% (0~100% load) DC=4.7V Vo/p=115%±3% (0~85.7% load)	I/P: 230 VAC PV < 0.4V 1V 2V 3V 4V 4.7V 48V 100% 41.6% 58.7% 77.81% 100% 115.6%		P																		
6	OVER TEMP WARNING	T-ALARM TSW1 & TSW2 short(0~0.5V) TSW1 or TSW2 open(4.5V~5.5V)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	TSW1 & TSW2 short : 0V TSW1 or TSW2 open : 5.130V	P																		
7	FAN SPEED CONTROL	<table border="1"> <thead> <tr> <th>Fan Speed</th> <th>Load</th> <th>PWM Duty</th> </tr> </thead> <tbody> <tr> <td>LOW</td> <td>0%</td> <td>10%±5%</td> </tr> <tr> <td>HIGH</td> <td>100%</td> <td>90%±5%</td> </tr> </tbody> </table>	Fan Speed	Load	PWM Duty	LOW	0%	10%±5%	HIGH	100%	90%±5%	I/P: 230 VAC O/P:TESTING Ta:25°C	<table border="1"> <thead> <tr> <th>Fan Speed</th> <th>Load</th> <th>PWM Duty</th> </tr> </thead> <tbody> <tr> <td>LOW</td> <td>0%</td> <td>9.695%</td> </tr> <tr> <td>HIGH</td> <td>100%</td> <td>90.15%</td> </tr> </tbody> </table>	Fan Speed	Load	PWM Duty	LOW	0%	9.695%	HIGH	100%	90.15%	P
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8	CURRENT SHARING	PSU1-PSU2 < 10%	I/P : 230 VAC O/P : 100%/50% LOAD Ta : 25°C	O/P : 100% LOAD PSU1 : 80A PSU2 : 79A PSU3 : 81A PSU4 : 79A O/P : 50% LOAD PSU1 : 38.5A PSU2 : 40A PSU3 : 41A PSU4 : 38A	P																		

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT		
1	TEMPERATURE RISE TEST	MODEL : RSP-2000-24 1. ROOM AMBIENT BURN-IN : 3.5HRS I/P: 230VAC O/P: FULL LOAD Ta=33.3 °C 2. HIGH AMBIENT BURN-IN : 3HRS I/P: 230VAC O/P: FULL LOAD Ta=52.4 °C				P	
		NO	Position	P/N	ROOM AMBIENT Ta= 33.3°C		HIGH AMBIENT Ta= 52.4°C
		1	BD1	30A/800V SILICON US30KB80R	56.2°C		76.0°C
		2	Q603	STP30N65M5 22A/650V TO220	45.1°C		62.3°C
		3	L1	TR931	41.5°C		58.5°C
		4	C5	330u/400V 105°C 30*30 VXH	42.9°C		61.2°C
		5	U1	TOP256EN	43.8°C		63.0°C
		6	Q903	FCP22N60N 22A/600V TO220	50.9°C		71.9°C
		7	T1	TF2093-R1	55.0°C		73.4°C
		8	T2	TF2094-R1	67.5°C		87.0°C
		9	U2	UCC28220D SOIC-16	49.4°C		69.5°C
		10	Q101	FDP090N10 75A/100V TO220	52.4°C		71.5°C
		11	Q105	FDP090N10 75A/100V TO220	63.1°C		83.1°C
		12	D110	M6060C 60A/60V TO220	61.1°C		80.7°C
		13	Q533	PSMN2R6-40YS 100A/40V LFAK	58.2°C		78.4°C
		14	C73	47u/25V L5Kh 5*11 KY	44.7°C		63.6°C
		15	T3	TF2100-R1	48.8°C		71.7°C
		16	C320	470u/25V UL7Kh 8*20 KY	48.0°C		67.0°C
		17	RG300	YS065W WS-AP017	47.3°C		66.3°C
		18	C325	100u/25V L5Kh 6.3*11 KY	49.0°C		68.4°C
		19	C301	1500u/16V UL10Kh 10*20 ZLH	46.3°C		65.4°C
		20	L100	TF2098-R3	58.4°C		79.1°C
		21	C110	1500u/35V UL10Kh 12.5*30 ZLH	57.0°C		77.0°C
		22	C115	1500u/35V UL10Kh 12.5*30 ZLH	52.6°C		72.4°C
		23	TSW8	ST-22W-R0 80°C 100mm HH(H110)	54.4°C		73.7°C
24	TSW9	ST-22W-R0 80°C 55mm HH(H110)	51.5°C	68.6°C			
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 230 VAC O/P: 108 % LOAD Ta:25°C	TEST : OK	P		
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 230 VAC O/P: 100% LOAD Ta= -35°C	TEST : OK	P		
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	P		
5	TEMPERATURE COEFFICIENT	± 0.03 % (0~50°C)	I/P: 230 VAC O/P:FULL LOAD	± 0.003 % (0~50°C)	P		

6	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency:10~500Hz (3) Sweep Time:10min/sweep cycle (4) Acceleration:2G (5) Test Time:1 hour in each axis (X.Y.Z) (6) Ta:25°C	TEST : OK	P
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SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P: 3 KVAC/min I/P-FG: 1.5 KVAC/min O/P-FG: 0.5 KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 1.8 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25°C	I/P-O/P: 9.23 mA I/P-FG: 7.41 mA O/P-FG: 7.08 mA NO DAMAGE	P
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: 14.9 GΩ I/P-FG: 14.8 GΩ O/P-FG: 20.2 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	6 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS D	I/P: 220/230/240 VAC/60HZ O/P:100%75%50%25% LOAD Ta:25°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS A	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 INDUSTRY AIR:8KV / Contact:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

M.T.B.F & LIFE CYCLE CALCULATION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	RSP-2000-24 : SUPPOSE C110 IS THE MOST CRITICAL COMPONENT I/P: 230VAC O/P:FULL LOAD Ta= 25 °C LIFE TIME= 595726 HRS I/P: 230VAC O/P:FULL LOAD Ta= 50 °C LIFE TIME=98887 HRS I/P: 230VAC O/P:75% LOAD Ta= 50 °C LIFE TIME= 173473 HRS I/P: 230VAC O/P:50% LOAD Ta= 50 °C LIFE TIME= 259367 HRS			P
2	MTBF	Conducted by Parts Stress Analysis Prediction 487.7K hrs min. Telcordia SR-332 (Bellcore) ; 42.9K hrs min. MIL-HDBK-217F (25°C)			P
3	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure : Above 30,000 hours @ TA 50°C			P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q900 Rated FCP22N60N 22A/600V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 418 V (2) 408 V (3) 408 V	P
2	Diode Peak Voltage	Q100 Rated FDP090N10 75A/100V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 78.4 V (2) 69.6 V (3) 76 V	P
		Q103 Rated FDP090N10 75A/100V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 74.8 V (2) 73.3 V (3) 74 V	P
3	Input Capacitor Voltage	C5 Rated 330u/400V 105°C 30*30 VXH	I/P:High-Line +3V = 267 V O/P: (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta:25°C	(1) 398 V (2) 390 V (3) 398 V	P
4	Control IC Voltage Test	U2 Rated PWM UCC28220D 8.4V~14.5V	I/P:High-Line +3V = 267 V O/P: (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta:25°C	(1) 13.4 V (2) 13.2 V (3) 13.4 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q603 Rated S1P30N65M5 22A/650V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 396 V (2) 394 V (3) 402 V	P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
	RD SAMPLE	PASS		VINCENT TSENG
	PRODUCT SAMPLE	PASS		VINCENT TSENG
	PRODUCT SAMPLE	PASS		VINCENT TSENG

2003/12/12 A50-F023