



# Test Report: RCP-2000-48

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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 : 300 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 165 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 42 V ~56 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	39.49 V ~ 57.86 V / 230 VAC 39.49 V ~ 57.87 V / 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 1% ~ -1% (Max)	I/P : 180 VAC / 264 VAC O/P : FULL / MIN LOAD Ta : 25°C	V1 : 0.02 % ~ -0.02 %	P
4	LINE REGULATION	V1 : 0.5% ~ -0.5% (Max)	I/P : 180VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 % ~ 0 %	P
5	LOAD REGULATION	V1 : 0.5% ~ -0.5% (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.02 % ~ -0.02 %	P
6	SET UP TIME	230VAC : 1500 ms (Max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC / 1161 ms	P
7	RISE TIME	230VAC : 60 ms (Max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC / 40 ms	P
8	HOLD UP TIME	230VAC : 10 ms (TYP) 230VAC : 16 ms (TYP)	I/P : 230 VAC(100% LOAD) I/P : 230 VAC(75% LOAD) Ta : 25°C	230VAC / 20 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 : 4800 mVp-p	I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1).1200 mVp-p (2).1210 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  I/P : LOW-LINE-3V= 177 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	154 V~264V  TEST : OK	P
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	EFFICIENCY	92 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	92.06 %	P
4	INPUT CURRENT	230V/ 10 A (TYP) 115V/ 16 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 9.75 A/ 230 VAC I = 15.85 A/ 115 VAC	P
5	INRUSH CURRENT	230V/ 50 A (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 43 A/ 230 VAC	P
6	LEAKAGE CURRENT	< 1.1 mA / 230 VAC	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.7 mA N-FG : 0.7 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 : 180VAC O/P : TESTING Ta : 25°C	111.9 %/ 230 VAC 109.5%/ 180 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 : 57.6 V ~ 67.2 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	62.8 V/ 230 VAC 62.8V/ 115 VAC Shut down o/p voltage re-power on to recover.	P
3	OVER TEMPERATURE PROTECTION	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	FAN FAIL SIGNAL	FAN FAIL	I/P: 230 VAC O/P:FULL LOAD	0 V FAN OK 5.321 V FAN NG	P
2	FAN SPEED CONTROL	100% load=90%±5% 0%load=10%±5%	I/P: 230 VAC O/P:FULL /0%LOAD Ta:25°C	100% LOAD <u>89.8 % DUTY</u> 0% LOAD <u>10.15% DUTY</u>	P
3	REMOTE CONTROL	Rc+ / Rc- ON/OFF&+5V-AUX SHORT POWER ON ON/OFF&+5V-AUXOPEN POWER OFF	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	SHORT POWER ON OPEN POWER OFF	P
4	REMOTE SENSE	S+ / S- >0.5V	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	> 0.5 V	P
5	DC OK SIGNAL DC NG SIGNAL	HIGH:VOUT ≤ 75%Vout LOW:VOUT ≥ 85%Vout	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	HIGH 0 V LOW 5.33 V	P
6	AC OK SIGNAL	AC ≥ 87V	I/P: ≤ 87VAC O/P:60% LOAD Ta:25°C	AC ≥ 87V : 0 V AC ≤ 75V : 5.31 V	P
7	AUXILIARY POWER (AUX)	<u>5V/0.3A</u> (4.5-5.5V) <u>12V/0.8A</u> (10.8~13.2V)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	5.162 V /0.3A 11.18 V /0.8A	P

8	TEMP ALARM	TSW SHORT 0V~0.5V TSW OPEN 4.5V~5.5V	I/P: 230 VAC O/P:FULL LOAD Ta:TEST	0 V 5.32 V	P
9	LED LIGHT	GREEN:Vo ≥ 85%(DC OK=LOW) RED:Vo ≤ 75% (DC OK=HIGH) O.V.P,O.T.P,O.L.P.,FAN LOCK RED FLASH:OTP WARNING (LM35=60°C~70°C)	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	GREEN: 39.1 V RED: 37.6 V RED FLASH: OK	P
10	OUTPUT VOLTAGE PROGRAMMABLE	DC=1.5V Vo=90%±2% DC=3V Vo=100%±2% DC=4.5V Vo=110%±2%	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	Vo= 90 % Vo= 100.7% Vo= 110.2%	P

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q 901 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) 454 V (2) 452 V (3) 442 V	P
2	Diode Peak Voltage	Q100 Rated : IRFB4227PbF 65A/200V	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) 153 V (2) 125 V (3) 147 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) 377 V (2) 378 V (3) 388 V	P
4	Control IC Voltage Test	U2Rated : PWM UCC28220D 8.4V~15V	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) 13.3 V (2) 12.1 V (3) 13.3 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q600 Rated : STP30N65M5 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) 430 V (2) 414 V (3) 418 V	P

**■ SAFETY & E.M.C. TEST**
**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min I/P-FG : 2 KVAC/min O/P-FG : 0.7 KVDC/min	I/P-O/P : 3.6 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 0.84 KVDC/min Ta : 25°C	I/P-O/P : 10.86 mA I/P-FG : 8.18 mA O/P-FG : 7.54 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 /70%RH	I/P-O/P : 30 GΩ I/P-FG : 30 GΩ O/P-FG : 30 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	9 mΩ	P
4	APPROVAL	TUV : Certificate NO : R50205882 UL : File NO :			P

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A	I/P: 230 VAC (50HZ) O/P:FULL 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 B	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				

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL : RCP-2000-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.5 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 55.1°C			P
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 110 % LOAD Ta : 25°C	TEST : OK	P
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -40 °C / -25°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	± 0.008 % (0-50°C)	P

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 : 5 CYCLE 5. Input/Output condition : STATIC	OK	P
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +55°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 : 230VAC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec	OK	P
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	P
9	CAPACITOR LIFE CYCLE	RCP-2000-24:SUPPOSE C110 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	(1) 1094816 HRS (2) 220824 HRS (3) 279520 HRS	P
10	MTBF	Conducted by Parts Stress Analysis Prediction 145.1K hrs min. Telcordia SR-332 (Bellcore) ; 37.4K hrs min. MIL-HDBK-217F (25°C)		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/12/16	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2011/2/17	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023