



# Test Report: HRP-100-48

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100W 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 TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1 : 240 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 88 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 45.6V ~ 55.2V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	39.89 V~ 59.1 V/ 230 VAC 39.89 V~ 59.1 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 1.5 %~ -1.5 % (Max)	I/P : 100 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.13 %~ -0.13 %	P
4	LINE REGULATION	V1 : 0.2 %~ -0.2 % (Max)	I/P : VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.02 %~ -0.02 %	P
5	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.12 %~ -0.12 %	P
6	SET UP TIME	230VAC : 2500 ms (Max) 115VAC : 2500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 748 ms 115VAC/ 1496 ms	P
7	RISE TIME	230VAC : 50 ms (Max) 115VAC : 50 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 21 ms 115VAC/ 20 ms	P
8	HOLD UP TIME	230VAC : 50 ms (TYP) 115VAC : 20 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 63 ms 115VAC/ 25 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 O/P : FULL /Min LOAD 90%DUTY/ 1KHZ Ta : 25°C	217 mVp-p	P

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	85VAC~264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	80 V~264V	P
			I/P : LOW-LINE-3V= 82 V 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 : 85 VAC ~ 264 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.95 / 230 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.97 / 230 VAC	P
		0.98 / 115 VAC(TYP)		PF= 1 / 115 VAC	
4	EFFICIENCY	90 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	90.39 %	P
5	INPUT CURRENT	230V/ 0.6 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.52 A/ 230 VAC	P
		115V/ 1.2 A (TYP)		I = 1.04 A/ 115 VAC	
6	INRUSH CURRENT	230V/ 65 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 31 A/ 230 VAC	P
		115V/ 35 A(TYP) COLD START		I = 16 A/ 115 VAC	
7	LEAKAGE CURRENT	< 1 mA / 240 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.39 mA N-FG : 0.24 mA	P
8	NO LOAD POWER CONSUMPTION	<0.5W	I/P : 240 VAC O/P : NO LOAD Ta : 25°C	0.38W	P

## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 %~ 135 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	122 %/ 230 VAC 122 %/ 115 VAC Constant current limiting for Vo=50 ~ 100% of rated voltage, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 57.6 V~ 67.2V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	62.21 V/ 230 VAC 62.2 V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION (optional)	SPEC : TSW1 : 85 ± 5°C O.T.P. TSW1 : detect on heatsink Q101 of power transistor 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 Hiccup Mode	P

## CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	REMOTE CONTROL	Rc+ / Rc- 0 V~ 0.8 V POWER ON 4 V~ 10V POWER OFF	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	0 V~1.8 V POWER ON 1.9 V~10 V POWER OFF	P

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q3 Rated : 2SK3673-01MR 10A/700V	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) 684 V (2) 668 V (3) 660 V	P
2	Diode Peak Voltage	Q101 Rated : STTH2003CT 20A/300V	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) 240 V (2) 228 V (3) 236 V	P
3	Clamp Diode Peak Voltage	D2 Rated : 3A/600V 1N5406	I/P : High-Line +3V = 267 V O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1) 550 V (2) 550 V	P
4	Input Capacitor Voltage	C5 Rated : 100u/400V 105°C	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) 380 V (2) 382 V (3) 398.8 V	P
5	Control IC Voltage Test	U1 Rated : PFC FAN6921MR 30V(max) 7.8V(min)  U101 Rated : TEA1761T 38V(max) 8.35V(min)	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) 24.62 V (2) 19.11 V (3) 24.9 V  (1) 25.88 V (2) 20.02 V (3) 25.88 V	P
6	Power Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : 2SK4106 12A/500V	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) 442 V (2) 396 V (3) 458 V	P

## ■ SAFETY & E.M.C. TEST

### SAFETY TEST

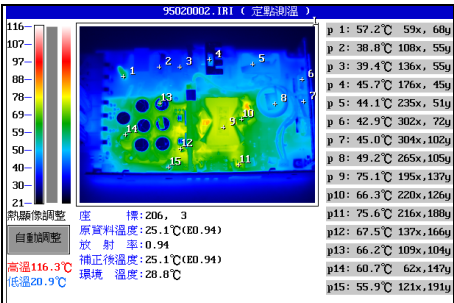
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min I/P-FG : 2 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 3.6 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 3.85 mA I/P-FG : 2.892 mA O/P-FG : 2.155 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	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	12 mΩ	P
4	APPROVAL	TUV : Certificate NO : R50171849 UL : File NO : E183223			P

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2,-3 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.	THERMO TRACER TEST (ROOM AMBIENT)	MODEL:HRP-100-5 		<table border="1"> <thead> <tr> <th>Position</th> <th>Temp</th> <th>VERDICT</th> </tr> </thead> <tbody> <tr><td>P1</td><td>Rth1</td><td>57.2°C</td><td>PASS</td></tr> <tr><td>P2</td><td>LF1</td><td>38.8°C</td><td>PASS</td></tr> <tr><td>P3</td><td>LF2</td><td>39.4°C</td><td>PASS</td></tr> <tr><td>P4</td><td>BD</td><td>45.7°C</td><td>PASS</td></tr> <tr><td>P5</td><td>L3-CORE</td><td>44.1°C</td><td>PASS</td></tr> <tr><td>P6</td><td>D1</td><td>42.9°C</td><td>PASS</td></tr> <tr><td>P7</td><td>Q1</td><td>45°C</td><td>PASS</td></tr> <tr><td>P8</td><td>C5</td><td>49.2°C</td><td>PASS</td></tr> <tr><td>P9</td><td>T1-COIL</td><td>75.1°C</td><td>PASS</td></tr> <tr><td>P10</td><td>D2</td><td>66.3°C</td><td>PASS</td></tr> <tr><td>P11</td><td>Cap-Vcc</td><td>75.6°C</td><td>PASS</td></tr> <tr><td>P12</td><td>Q101</td><td>67.5°C</td><td>PASS</td></tr> <tr><td>P13</td><td>C105</td><td>66.2°C</td><td>PASS</td></tr> <tr><td>P14</td><td>L100</td><td>60.7°C</td><td>PASS</td></tr> <tr><td>P15</td><td>Cap-Vb</td><td>55.9°C</td><td>PASS</td></tr> </tbody> </table>	Position	Temp	VERDICT	P1	Rth1	57.2°C	PASS	P2	LF1	38.8°C	PASS	P3	LF2	39.4°C	PASS	P4	BD	45.7°C	PASS	P5	L3-CORE	44.1°C	PASS	P6	D1	42.9°C	PASS	P7	Q1	45°C	PASS	P8	C5	49.2°C	PASS	P9	T1-COIL	75.1°C	PASS	P10	D2	66.3°C	PASS	P11	Cap-Vcc	75.6°C	PASS	P12	Q101	67.5°C	PASS	P13	C105	66.2°C	PASS	P14	L100	60.7°C	PASS	P15	Cap-Vb	55.9°C	PASS	P																																									
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2	TEMPERATURE RISE TEST	MODEL : HRP-100-24 1. ROOM AMBIENT BURN-IN : 3 HRS I/P : 230VAC O/P : FULL LOAD Ta= 27.1 °C 2. HIGH AMBIENT BURN-IN : 5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 43.1 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta= 27.1 °C</th> <th>HIGH AMBIENT Ta= 43.1 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>D2</td><td>3A/600V 1N5406 DO-201</td><td>92.0°C</td><td>106.0°C</td></tr> <tr><td>2</td><td>D30</td><td>1A/1KV 1N4007</td><td>135.0°C</td><td>149.1°C</td></tr> <tr><td>3</td><td>D150</td><td>1A/1KV 1N4007</td><td>64.3°C</td><td>79.3°C</td></tr> <tr><td>4</td><td>LF2</td><td>TR653-R2</td><td>53.4°C</td><td>68.9°C</td></tr> <tr><td>5</td><td>BD1</td><td>6A/800V US6KB80R-7000</td><td>61.6°C</td><td>76.6°C</td></tr> <tr><td>6</td><td>L1</td><td>TR654-R4</td><td>62.0°C</td><td>76.7°C</td></tr> <tr><td>7</td><td>L3</td><td>TF1965</td><td>55.5°C</td><td>70.8°C</td></tr> <tr><td>8</td><td>C11</td><td>474/450V 10% P=10 MMX</td><td>58.0°C</td><td>73.3°C</td></tr> <tr><td>9</td><td>D1</td><td>BYV29X-600 7A/600V</td><td>52.0°C</td><td>66.8°C</td></tr> <tr><td>10</td><td>Q1</td><td>2SK4106 12A/500V</td><td>53.2°C</td><td>68.2°C</td></tr> <tr><td>11</td><td>Q3</td><td>2SK3673-01MR 10A/700V</td><td>57.7°C</td><td>73.6°C</td></tr> <tr><td>12</td><td>C5</td><td>100u/400V 105°C 18*25 KMG</td><td>66.5°C</td><td>80.8°C</td></tr> <tr><td>13</td><td>T1</td><td>TF1958</td><td>102.0°C</td><td>118.1°C</td></tr> <tr><td>14</td><td>C18</td><td>47u/50V 6.3*11 YXF</td><td>89.5°C</td><td>103.7°C</td></tr> <tr><td>15</td><td>C61</td><td>47u/50V 6.3*11 KY</td><td>69.6°C</td><td>83.6°C</td></tr> <tr><td>16</td><td>C150</td><td>47u/50V 6.3*11 YXF</td><td>51.8°C</td><td>67.8°C</td></tr> <tr><td>17</td><td>C105</td><td>470u/35V UL7Kh 10*20 KY</td><td>55.7°C</td><td>70.3°C</td></tr> <tr><td>18</td><td>C108</td><td>470u/35V UL7Kh 10*20 KY</td><td>53.2°C</td><td>69.3°C</td></tr> <tr><td>19</td><td>Q101</td><td>IRF3415 43A/150V</td><td>70.9°C</td><td>84.7°C</td></tr> <tr><td>20</td><td>TSW1</td><td>ST-22W-R3 85°C 90mm</td><td>62.7°C</td><td>77.4°C</td></tr> </tbody> </table>	NO	Position	P/N	ROOM AMBIENT Ta= 27.1 °C	HIGH AMBIENT Ta= 43.1 °C	1	D2	3A/600V 1N5406 DO-201	92.0°C	106.0°C	2	D30	1A/1KV 1N4007	135.0°C	149.1°C	3	D150	1A/1KV 1N4007	64.3°C	79.3°C	4	LF2	TR653-R2	53.4°C	68.9°C	5	BD1	6A/800V US6KB80R-7000	61.6°C	76.6°C	6	L1	TR654-R4	62.0°C	76.7°C	7	L3	TF1965	55.5°C	70.8°C	8	C11	474/450V 10% P=10 MMX	58.0°C	73.3°C	9	D1	BYV29X-600 7A/600V	52.0°C	66.8°C	10	Q1	2SK4106 12A/500V	53.2°C	68.2°C	11	Q3	2SK3673-01MR 10A/700V	57.7°C	73.6°C	12	C5	100u/400V 105°C 18*25 KMG	66.5°C	80.8°C	13	T1	TF1958	102.0°C	118.1°C	14	C18	47u/50V 6.3*11 YXF	89.5°C	103.7°C	15	C61	47u/50V 6.3*11 KY	69.6°C	83.6°C	16	C150	47u/50V 6.3*11 YXF	51.8°C	67.8°C	17	C105	470u/35V UL7Kh 10*20 KY	55.7°C	70.3°C	18	C108	470u/35V UL7Kh 10*20 KY	53.2°C	69.3°C	19	Q101	IRF3415 43A/150V	70.9°C	84.7°C	20	TSW1	ST-22W-R3 85°C 90mm	62.7°C	77.4°C	P
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 123 % LOAD Ta : 25°C	TEST : OK	P																																																																																																								

4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -40 °C	TEST : OK	P
5	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40°C HUMIDITY= 95 %R.H	TEST : OK	P
6	TEMPERATURE COEFFICIENT	± 0.04 %(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0 %(0~50°C)	P
7	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
8.	THERMAL SHOCK TEST	1. Thermal shock Temperature : -40°C~+45°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		OK	P
9	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 5G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK	P
10	CAPACITOR LIFE CYCLE	HRP-100-24:SUPPOSE C105 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= 40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME		(1) 303588.6HRS (2) 118301.4HRS (3) 167292.3HRS	P
11	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 295.7K HRS			P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2009/11/4	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2009/11/27	RD SAMPLE(2)	PASS	SANFORD SU	VINCENT TSENG
2010/1/15	PRODUCT SAMPLE W0912D11	PASS	SANFORD SU	VINCENT TSENG

2003/12/12 A50-F023