



# Test Report: HRP-200-5

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200W 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 : 90 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 36 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 4.3V ~ 5.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.084 V~ 5.978 V/ 230 VAC 4.083 V~ 5.977 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 2%~ -2% (Max)	I/P : 100 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.4%~ -0.4%	P
4	LINE REGULATION	V1 : 0.5%~ -0.5% (Max)	I/P : 100VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.12%~ -0.12%	P
5	LOAD REGULATION	V1 : 1%~ -1% (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.3%~ -0.3%	P
6	SET UP TIME	230VAC : 1000 ms (Max) 115VAC : 2500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 160 ms 115VAC/ 320 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/ 32 ms 115VAC/ 29 ms	P
8	HOLD UP TIME	230VAC : 16 ms (TYP) 115VAC : 16 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 51 ms 115VAC/ 51 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 : 1000 mVp-p	I/P : 230 VAC O/P : FULL /Min LOAD 90%DUTY/ 1KHZ Ta : 25°C	450 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  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 )	69 V~264V  TEST : OK	P
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) 0.99 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.959 / 230 VAC PF= 0.996 / 115 VAC	P
4	EFFICIENCY	84 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	85 %	P
5	INPUT CURRENT	230V/ 1.1 A (TYP) 115V/ 2.2 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.91 A/ 230 VAC I = 1.79 A/ 115 VAC	P
6	INRUSH CURRENT	230V/ 70 A (TYP) 115V/ 35 A (TYP) COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 68 A/ 230 VAC I = 34 A/ 115 VAC	P
7	LEAKAGE CURRENT	< 1 mA / 240 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.56 mA N-FG : 0.32 mA	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	124 %/ 230 VAC 124 %/ 115 VAC Constant current limiting, Recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 6 V~ 7 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	6.22 V/ 230 VAC 6.22 V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION (optional)	SPEC : TSW1 : 95 ± 5°C O.T.P. TSW1 : detect on heatsink 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 Sense	>0.5V	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	> 0.5 V	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 : 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) 430 V (2) 420 V (3) 422 V	P
2	Diode Peak Voltage	Q101 Rated : STP85N3LH5 80A/30V	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) 28 V (2) 29 V (3) 27.6 V	P
3	Input Capacitor Voltage	C5 Rated : 100u/400V 105°C KMG	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) 372.4 V (2) 380.4 V (3) 382.3 V	P
4	Control IC Voltage Test	U1 Rated : FAN4801NY 10V~30V	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) 16.01 V (2) 16.24 V (3) 16.23 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : IRFP460A 20A/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) 489 V (2) 388 V (3) 398 V	P

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

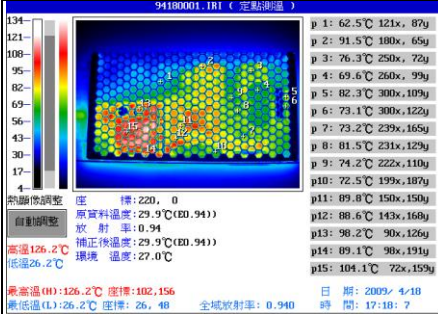
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1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min I/P-FG : 2 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 3.6 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 4.54 mA I/P-FG : 3.62 mA O/P-FG : 3.64 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P : 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 : 21.8 GΩ I/P-FG : 15.3 GΩ O/P-FG : 23.9 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 : R50176763 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 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:HRPG-200-5 TEST CONDITION: 100VAC FULL LOAD ROOM AMBIENT = 27°C		<table border="1"> <thead> <tr> <th>Position</th> <th>Temp</th> <th>VERDICT</th> </tr> </thead> <tbody> <tr><td>P1</td><td>LF2</td><td>62.5</td><td>PASS</td></tr> <tr><td>P2</td><td>BD1</td><td>91.5</td><td>PASS</td></tr> <tr><td>P3</td><td>L3</td><td>76.3</td><td>PASS</td></tr> <tr><td>P4</td><td>C5</td><td>69.6</td><td>PASS</td></tr> <tr><td>P5</td><td>Q1</td><td>82.3</td><td>PASS</td></tr> <tr><td>P6</td><td>D1</td><td>73.1</td><td>PASS</td></tr> <tr><td>P7</td><td>T2</td><td>73.2</td><td>PASS</td></tr> <tr><td>P8</td><td>U1</td><td>81.5</td><td>PASS</td></tr> <tr><td>P9</td><td>C61</td><td>74.2</td><td>PASS</td></tr> <tr><td>P10</td><td>D71</td><td>72.5</td><td>PASS</td></tr> <tr><td>P11</td><td>T1coil</td><td>89.8</td><td>PASS</td></tr> <tr><td>P12</td><td>T1core</td><td>88.6</td><td>PASS</td></tr> <tr><td>P13</td><td>C105</td><td>98.2</td><td>PASS</td></tr> <tr><td>P14</td><td>Q104</td><td>89.1</td><td>PASS</td></tr> <tr><td>P15</td><td>L100</td><td>104.1</td><td>PASS</td></tr> </tbody> </table>	Position	Temp	VERDICT	P1	LF2	62.5	PASS	P2	BD1	91.5	PASS	P3	L3	76.3	PASS	P4	C5	69.6	PASS	P5	Q1	82.3	PASS	P6	D1	73.1	PASS	P7	T2	73.2	PASS	P8	U1	81.5	PASS	P9	C61	74.2	PASS	P10	D71	72.5	PASS	P11	T1coil	89.8	PASS	P12	T1core	88.6	PASS	P13	C105	98.2	PASS	P14	Q104	89.1	PASS	P15	L100	104.1	PASS	P																																														
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2	TEMPERATURE RISE TEST	MODEL : HRPG-200-5 1. ROOM AMBIENT BURN-IN : 3 HRS I/P : 230VAC O/P : FULL LOAD Ta= 26.3 °C 2. HIGH AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 43.8 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta= 26.3 °C</th> <th>HIGH AMBIENT Ta= 43.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF2</td><td>TR548-R2</td><td>57.1°C</td><td>74.0°C</td></tr> <tr><td>2</td><td>BD1</td><td>6A/800V SILICON GBU608</td><td>74.9°C</td><td>91.2°C</td></tr> <tr><td>3</td><td>L3</td><td>TR872 CS234125E14</td><td>70.8°C</td><td>87.5°C</td></tr> <tr><td>4</td><td>Q1</td><td>IRFP460A 20A/500V TO247</td><td>65.4°C</td><td>82.8°C</td></tr> <tr><td>5</td><td>C5</td><td>100u/400V 105°C 18*25 KMG</td><td>66.0°C</td><td>82.6°C</td></tr> <tr><td>6</td><td>Q3</td><td>2SK4106 12A/500V TO220F</td><td>76.7°C</td><td>95.4°C</td></tr> <tr><td>7</td><td>T2</td><td>TR435-R4 R13x7x5A MA070</td><td>67.0°C</td><td>81.4°C</td></tr> <tr><td>8</td><td>T1</td><td>TF2029 EER-35</td><td>84.7°C</td><td>101.1°C</td></tr> <tr><td>9</td><td>C150</td><td>100u/25V L5Kh 6.3*11 KY</td><td>74.5°C</td><td>90.6°C</td></tr> <tr><td>10</td><td>C61</td><td>100u/25V L5Kh 6.3*11 KY</td><td>70.9°C</td><td>89.3°C</td></tr> <tr><td>11</td><td>D1</td><td>BYC8-600 8A/600V TO220</td><td>67.0°C</td><td>84.5°C</td></tr> <tr><td>12</td><td>Q101</td><td>STP85N3LH5 80A/30V TO220</td><td>76.1°C</td><td>93.8°C</td></tr> <tr><td>13</td><td>L100</td><td>TR874 Ku090125-2*2</td><td>93.3°C</td><td>111.5°C</td></tr> <tr><td>14</td><td>C105</td><td>3900u/10V UL10Kh 12.5*25 ZLH</td><td>77.1°C</td><td>97.3°C</td></tr> <tr><td>15</td><td>T900</td><td>TF1593-R2</td><td>91.8°C</td><td>109.7°C</td></tr> <tr><td>16</td><td>ZD900</td><td>ST02D-200 AX078</td><td>84.2°C</td><td>103.8°C</td></tr> <tr><td>17</td><td>U900</td><td>TNY275PN DIP-8C</td><td>84.7°C</td><td>104.8°C</td></tr> <tr><td>18</td><td>C911</td><td>22u/50V UL10Kh 5*11 YXM</td><td>81.3°C</td><td>98.3°C</td></tr> <tr><td>19</td><td>C956</td><td>47u/50V L5Kh 6.3*11 YXF</td><td>79.7°C</td><td>96.5°C</td></tr> <tr><td>20</td><td>TSW1</td><td>ST-22W-R0 170mm</td><td>88.0°C</td><td>105.2°C</td></tr> <tr><td>21</td><td>TSW2</td><td>ST-22W-R0 170mm</td><td>84.8°C</td><td>102.8°C</td></tr> </tbody> </table>	NO	Position	P/N	ROOM AMBIENT Ta= 26.3 °C	HIGH AMBIENT Ta= 43.8 °C	1	LF2	TR548-R2	57.1°C	74.0°C	2	BD1	6A/800V SILICON GBU608	74.9°C	91.2°C	3	L3	TR872 CS234125E14	70.8°C	87.5°C	4	Q1	IRFP460A 20A/500V TO247	65.4°C	82.8°C	5	C5	100u/400V 105°C 18*25 KMG	66.0°C	82.6°C	6	Q3	2SK4106 12A/500V TO220F	76.7°C	95.4°C	7	T2	TR435-R4 R13x7x5A MA070	67.0°C	81.4°C	8	T1	TF2029 EER-35	84.7°C	101.1°C	9	C150	100u/25V L5Kh 6.3*11 KY	74.5°C	90.6°C	10	C61	100u/25V L5Kh 6.3*11 KY	70.9°C	89.3°C	11	D1	BYC8-600 8A/600V TO220	67.0°C	84.5°C	12	Q101	STP85N3LH5 80A/30V TO220	76.1°C	93.8°C	13	L100	TR874 Ku090125-2*2	93.3°C	111.5°C	14	C105	3900u/10V UL10Kh 12.5*25 ZLH	77.1°C	97.3°C	15	T900	TF1593-R2	91.8°C	109.7°C	16	ZD900	ST02D-200 AX078	84.2°C	103.8°C	17	U900	TNY275PN DIP-8C	84.7°C	104.8°C	18	C911	22u/50V UL10Kh 5*11 YXM	81.3°C	98.3°C	19	C956	47u/50V L5Kh 6.3*11 YXF	79.7°C	96.5°C	20	TSW1	ST-22W-R0 170mm	88.0°C	105.2°C	21	TSW2	ST-22W-R0 170mm	84.8°C	102.8°C	P
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 125 % 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 : 10min/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	HRPG-200-5 :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) 86373.7HRS (2) 25330.2HRS (3) 76218.8HRS	P
11	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 209.4K HRS			P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2009/12/1	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2009/12/18	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2010/3/30	W1003A69	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023