



# Test Report: HSP-250-3.6

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250W 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 : 100 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 50 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 3.24 V ~ 3.96 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	3.091 V ~ 4.106 V / 230 VAC 3.091 V ~ 4.106 V / 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : -2 % ~ +2 % (Max)	I/P : VAC / 264 VAC O/P : FULL / MIN LOAD Ta : 25°C	V1 : -0.31 % ~ 0.31 %	P
4	LINE REGULATION	V1 : -0.5 % ~ 0.5 % (Max)	I/P : VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 % ~ 0 %	P
5	LOAD REGULATION	V1 : -1 % ~ 1 % (Max)	I/P : 230 VAC O/P : FULL ~ MIN LOAD Ta : 25°C	V1 : -0.31 % ~ 0.31 %	P
6	SET UP TIME	230VAC : 3000 ms (Max) 115VAC : 3000 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC / 2225 ms 115VAC / 2225 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 / 24 ms 115VAC / 26 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 / 20 ms 115VAC / 19 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 : 720 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) . 450 mVp-p (2). 520 mVp-p	P

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	100VAC~264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C  I/P : LOW-LINE-3V= 97 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	70 V~264V  TEST : OK	P
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 100 VAC ~ 264 VAC O/P : FULL -MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.95 / 230 VAC(TYP) 0.98 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.95 / 230 VAC PF= 0.99 / 115 VAC	P
4	EFFICIENCY	83 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	83.44 %	P
5	INPUT CURRENT	230V/ 1 A (TYP) 115V/ 2 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.98 A/ 230 VAC I = 1.91 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 = 56 A/ 230 VAC I = 28 A/ 115 VAC	P
7	LEAKAGE CURRENT	< 1.2 mA / 240 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.44 mA N-FG : 0.44 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	121 %/ 230 VAC 120 %/ 115 VAC Hiccup Mode	P
2	OVER VOLTAGE PROTECTION	CH1 : 4.14V ~ 4.86 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.43 V/ 230 VAC 4.43 V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC : TSW1 : 80± 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 Hiccup Mode	P

## CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	FAN ON/OFF CONTROL	RTH3 60±10 °C FAN ON 40±10 °C FAN OFF	I/P : 230 VAC O/P : FULL LOAD	52.3 °C FAN ON 39 °C FAN OFF	P
2	REMOTE SENSE	>0.3V	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	>0.3V	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 : IRFB20N50K 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) 426 V (2) 434 V (3) 414 V	P
2	Diode Peak Voltage	Q100 Rated : AP98T03GP 200A/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) 17.6 V (2) 13.8 V (3) 11.6 V	P
3	Input Capacitor Voltage	C5 Rated : 120u/420V 5Kh 105°C CXW	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) 395 V (2) 380 V (3) 395 V	P
4	Control IC Voltage Test	U70 Rated : L6599AD 8.85V-16V	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) 12.9 V (2) 11.9 V (3) 12.9 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated : STW25NM50N 22A/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) 440 V (2) 430 V (3) 426 V	P

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

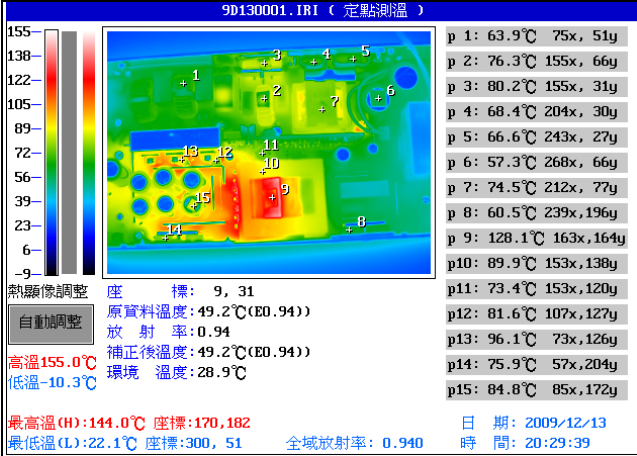
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1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min I/P-FG : 1.5 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 3.6 KVAC/min I/P-FG : 1.8 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 3.74 mA I/P-FG : 3.66 mA O/P-FG : 3.63 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	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 : 10 GΩ I/P-FG : 10 GΩ O/P-FG : 10 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	14 mΩ	P
4	APPROVAL	TUV : Certificate NO : R50188280 UL : File NO : E183223			P

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS D	I/P : 230 V/240V/220V/50HZ O/P : 100/75/50/25% LOAD Ta : 25°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ)/110V60HZ O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS B	I/P : 230 VAC (50HZ)/110V60HZ O/P : FULL/50% 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: HSP-250-5 TEST CONDITION: 230 VAC FULL LOAD ROOM AMBIENT = 28.9 °C		 <table border="1" data-bbox="1117 542 1372 1070"> <thead> <tr> <th></th> <th>Position</th> <th>Temp</th> </tr> </thead> <tbody> <tr><td>P1</td><td>LF2</td><td>63.9</td></tr> <tr><td>P2</td><td>L2</td><td>76.3</td></tr> <tr><td>P3</td><td>BD1</td><td>80.2</td></tr> <tr><td>P4</td><td>D2</td><td>68.4</td></tr> <tr><td>P5</td><td>Q1</td><td>66.6</td></tr> <tr><td>P6</td><td>C5</td><td>57.3</td></tr> <tr><td>P7</td><td>L1 core</td><td>74.5</td></tr> <tr><td>P8</td><td>Q4</td><td>60.5</td></tr> <tr><td>P9</td><td>T1 Coil</td><td>128.1</td></tr> <tr><td>P10</td><td>T1 Core</td><td>89.9</td></tr> <tr><td>P11</td><td>C201</td><td>73.4</td></tr> <tr><td>P12</td><td>RG1</td><td>81.6</td></tr> <tr><td>P13</td><td>Q100</td><td>96.1</td></tr> <tr><td>P14</td><td>Q102</td><td>75.9</td></tr> <tr><td>P15</td><td>C105</td><td>84.8</td></tr> </tbody> </table>		Position	Temp	P1	LF2	63.9	P2	L2	76.3	P3	BD1	80.2	P4	D2	68.4	P5	Q1	66.6	P6	C5	57.3	P7	L1 core	74.5	P8	Q4	60.5	P9	T1 Coil	128.1	P10	T1 Core	89.9	P11	C201	73.4	P12	RG1	81.6	P13	Q100	96.1	P14	Q102	75.9	P15	C105	84.8	P																																
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2	TEMPERATURE RISE TEST	MODEL : HSP-250-5 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 28.4 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 52 °C		<table border="1" data-bbox="502 1249 1340 1848"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta= 28.4 °C</th> <th>HIGH AMBIENT Ta= 52 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>10A/800V SILICON US10KB80R</td><td>42.7°C</td><td>64.1°C</td></tr> <tr><td>2</td><td>Q1</td><td>STW25NM50N 22A/500V</td><td>41.0°C</td><td>62.5°C</td></tr> <tr><td>3</td><td>C6</td><td>120u/420V 5Kh 105°C CXW</td><td>38.8°C</td><td>60.5°C</td></tr> <tr><td>4</td><td>C35</td><td>330u/50V UL7Kh 10*20 KY</td><td>50.3°C</td><td>72.3°C</td></tr> <tr><td>5</td><td>C201</td><td>100u/50V UL7Kh 8*11.5 KY</td><td>54.0°C</td><td>76.0°C</td></tr> <tr><td>6</td><td>C202</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>57.4°C</td><td>78.0°C</td></tr> <tr><td>7</td><td>RTH3</td><td>NTC 5KΩ TTC3A502F39HEY 1%</td><td>58.0°C</td><td>78.6°C</td></tr> <tr><td>8</td><td>Q3</td><td>IRFB20N50K 20A/500V TO220</td><td>41.4°C</td><td>63.1°C</td></tr> <tr><td>9</td><td>U70</td><td>L6599AD SO-16N</td><td>50.5°C</td><td>72.7°C</td></tr> <tr><td>10</td><td>Q100</td><td>AP98T03GP 200A/30V TO220</td><td>51.9°C</td><td>74.3°C</td></tr> <tr><td>11</td><td>C105</td><td>4700u/10V UL10Kh</td><td>54.7°C</td><td>77.0°C</td></tr> <tr><td>12</td><td>T1</td><td>TF2181</td><td>60.5°C</td><td>82.0°C</td></tr> <tr><td>13</td><td>TSW1</td><td>ST-22W-R0 80°C 130mm</td><td>50.9°C</td><td>73.6°C</td></tr> <tr><td>14</td><td>TSW2</td><td>ST-22W-R2 80°C 90mm H</td><td>40.6°C</td><td>62.6°C</td></tr> <tr><td>15</td><td>C37</td><td>220u/35V UL7Kh 8*15 KY</td><td>49.6°C</td><td>71.3°C</td></tr> </tbody> </table>	NO	Position	P/N	ROOM AMBIENT Ta= 28.4 °C	HIGH AMBIENT Ta= 52 °C	1	BD1	10A/800V SILICON US10KB80R	42.7°C	64.1°C	2	Q1	STW25NM50N 22A/500V	41.0°C	62.5°C	3	C6	120u/420V 5Kh 105°C CXW	38.8°C	60.5°C	4	C35	330u/50V UL7Kh 10*20 KY	50.3°C	72.3°C	5	C201	100u/50V UL7Kh 8*11.5 KY	54.0°C	76.0°C	6	C202	47u/50V UL10Kh 6.3*11 YXM	57.4°C	78.0°C	7	RTH3	NTC 5KΩ TTC3A502F39HEY 1%	58.0°C	78.6°C	8	Q3	IRFB20N50K 20A/500V TO220	41.4°C	63.1°C	9	U70	L6599AD SO-16N	50.5°C	72.7°C	10	Q100	AP98T03GP 200A/30V TO220	51.9°C	74.3°C	11	C105	4700u/10V UL10Kh	54.7°C	77.0°C	12	T1	TF2181	60.5°C	82.0°C	13	TSW1	ST-22W-R0 80°C 130mm	50.9°C	73.6°C	14	TSW2	ST-22W-R2 80°C 90mm H	40.6°C	62.6°C	15	C37	220u/35V UL7Kh 8*15 KY	49.6°C	71.3°C	P
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3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 104 % LOAD Ta : 25°C	TEST : OK	P																																																																																
4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230VAC/100VAC O/P : 100 % LOAD Ta= -30 °C	TEST : OK	P																																																																																

5	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
6	TEMPERATURE COEFFICIENT	± 0.03 % (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 : -35°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
9	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
10	CAPACITOR LIFE CYCLE	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= 50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50°C LIFE TIME		(1) 502937.6 HRS (2) 97280 HRS (3) 174131.2 HRS	P
11	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 179.7 KHRS			P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/7/1	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2010/8/9	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023