Test Report: HB-120-48

120W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Other Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1: 200 mVp-p (Max)	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	V1: 40.8 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43V~53 V	I/P: 230 VAC I/P:115VAC O/P:MIN LOAD Ta:25℃	41.68 V~ 54.24 V /230VAC 41.68 V~ 51.24 V/115VAC	P
3	CURRENT ADJ RANGE	1.2A~2.5A	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	1.03 A~ 2.987 A	P
4	CONSTANT CURRENT REGION	24V~48V	I/P: 230 VAC O/P:CV MODE Ta:25℃	O/P=24V: 2.598 A O/P=47V: 2.60 A	P
5	OUTPUT VOLTAGE TOLERANCE	V1: -1 % ~ 1 % (Max)	I/P: 100 VAC /305VAC O/P:FULL/ 0 % LOAD Ta:25℃	V1: -0.02 %~ 0.02 %	P
6	LINE REGULATION	V1: - 0.5% ~ 0.5 % (Max)	I/P:100 VAC ~305 VAC O/P:FULL LOAD Ta:25℃	V1: 0 %~ 0 %	P
7	LOAD REGULATION	V1: - 0.5% ~ 0.5 % (Max)	I/P: 230 VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.02 %~ 0.02 %	P
8	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℃	230VAC/ 880 ms 115 VAC/ 1760 ms	P
9	RISE TIME	230VAC/ 50 ms (Max) 115VAC/ 50 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/ 9.7 ms 115 VAC/ 9.7 ms	P
10	HOLD UP TIME	230VAC/ 12 ms (Typ) 115VAC/ 12 ms (Typ)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/ 24 ms 115 VAC/ 26 ms	P
11	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	TEST:< 5 %	P
12	DYNAMIC LOAD	V1: 4800 mVp-p	I/P: 230 VAC O/P:(1)FULL /Min LOAD 90%DUTY/1KHZ (2)FULL /Min LOAD 90%DUTY/120HZ Ta:25℃	368 mVp-p 2280 mVp-p	P

13 DIMMER TEST (B Type only)

SPEC:

*Reference resistance value for output current adjustment (Typical)

Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
Output current	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**

*1 ~ 10V dimming function for output current adjustment (Typical)

Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
Output current	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**

*10V PWM signal for output current adjustment (Typical)

Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Output current	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**

TEST RESULT: I/P： 230 VAC ;Ta：25℃

1	Resistance value	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K
	Output current	0.318A	0.574A	0.824A	1.072A	1.325A	1.578A	1.807A	2.025A	2.298A	2.540A
	%	**12.72%**	**22.96%**	**32.96%**	**42.88%**	**53.00%**	**63.12%**	**72.28%**	**81.00%**	**91.92%**	**101.60%**
2	Dimming value	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V
	Output current	0.313A	0.559A	0.804A	1.047A	1.298A	1.536A	1.785A	2.025A	2.273A	2.519A
	%	**12.52%**	**22.36%**	**32.16%**	**41.88%**	**51.92%**	**61.44%**	**71.40%**	**81.00%**	**90.92%**	**100.76%**
3	Duty value	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	Output current	0.336A	0.581A	0.826A	1.072A	1.317A	1.562A	1.807A	2.053A	2.299A	2.544A
	%	**13.44%**	**23.24%**	**33.04%**	**42.88%**	**52.68%**	**62.48%**	**72.28%**	**82.12%**	**91.96%**	**101.76%**

P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~305 VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	79 V~305V	P
			I/P: (1)LOW-LINE-3V=87 V (2)HIGH-LINE=305 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: 100 VAC ~305VAC O/P:FULL~MIN LOAD Ta:25℃	OK	P
3	POWER FACTOR	0.95/ 230 VAC FULL LOAD (TYP) 0.98/ 115 VAC FULL LOAD (TYP) 0.93/ 277 VAC FULL LOAD (TYP)	I/P: 230 VAC I/P: 115 VAC I/P: 277 VAC O/P:FULL LOAD Ta:25℃	PF=0.9627/230V/100%LOAD PF=0.9946 /115V/100%LOAD PF=0.94 /277V/100%LOAD	P
4	EFFICIENCY	93.5% (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	93.64 %	P
5	INPUT CURRENT	277V/ 0.55 A 230 V/ 0.6 A 115 V/ 1.4 A	I/P: 277 VAC I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	I =0.493 A/ 277VAC I = 0.57 A/ 230VAC I = 1.13 A/ 115VAC	P
6	INRUSH CURRENT	230 V/ 75A (Typ) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	I = 46 A/ 230VAC	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	95 %~108 %	I/P: 305VAC I/P: 230 VAC I/P: 100 VAC O/P:TESTING Ta:25℃	106 %/305VAC 106 %/ 230VAC 106 %//100VAC Constant current limiting, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	V1: 54V~60V	I/P: 305VAC I/P: 230 VAC I/P: 90 VAC O/P:MIN LOAD Ta:25℃	57.04 V/ 305VAC 57.04 V/ 230VAC 57.04V/ 100VAC Shut down o/p voltage with auto recovery or re-power on to recovery	P
3	OVER TEMPERATURE PROTECTION	SPEC: RTH2: 85±10℃ O.T.P. NO DAMAGE	I/P: 230 VAC O/P:FULL LOAD	O.T.P. Active Shut down o/p voltage with auto recovery or re-power on to recovery	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE Hiccup Mode	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q5 Rated STF13NM50N 12A/500V	I/P：High-Line +3V = 308V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 474 V (2) 456 V (3) 456 V	P
2	Diode Peak Voltage	Q101 Rated YA868C15RSC 30A/150V	I/P：High-Line +3V =308V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 112 V (2) 10.8 V (3) 108 V	P
		Q102 Rated YA868C15RSC 30A/150V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 114 V (2) 11.8 V (3) 110 V	
3	Input Capacitor Voltage	C5 Rated: 82u/450V 105℃ KXG	I/P：High-Line +3V = 308V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 436.8 V (2) 437.7 V (3) 437.2 V	P
4	Control IC Voltage Test	U 900 Rated L6599AD 8.85V~16V	I/P：High-Line +3V = 308V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 12.652 V (2) 12.563 V (3) 12.366 V	P
5	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Ratedl STP21NM60N 17A/600V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 502 V (2) 460 V (3) 458 V	P

SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	IEC60950-1 I/P-O/P: 3.75KVAC/min<10mA I/P-FG:1.88 KVAC/min<10mA O/P-FG:1.5KVAC/min<10mA	I/P-O/P: 4 KVAC/min I/P-FG: 2.256KVAC/min O/P-FG: 1.8 KVAC/min Ta:25℃	I/P-O/P: 2.723 mA I/P-FG: 2.452 mA O/P-FG:3.67 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℃	I/P-O/P: 30 GΩ I/P-FG: 30 GΩ O/P-FG: 30 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	11 mΩ	P
4	LEAKAGE CURRENT	IEC60950-1 < 0.75 mA / 240VAC	I/P: 240 VAC O/P:Min LOAD Ta:25℃	L-FG: 0.22 mA N-FG:0.22 mA	P
5	APPROVAL	TUV: Certificate NO ： E334940 UL: File NO ：R50185176			P

E.M.C TEST

NO	TEST ITEM	SPECICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS C CLASS D	I/P: 240VAC/50HZ LOAD:LED/ELECTRONIC LOAD O/P:100%/50% LOAD Ta:25℃	PASS	P
2	CONDUCTION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab	P
3	RADIATION	EN55022 EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25℃	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℃	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	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℃	CRITERIA A	P

Reliability Test

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th><th>VERDICT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：HB-120-48
1. ROOM AMBIENT BURN-IN：2.5 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 27.6 ℃
2. HIGH AMBIENT BURN-IN： 5.5HRS
I/P： 230VAC O/P： FULL LOAD Ta= 54.8 ℃
<table>
<tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 27.6 ℃</th><th>HIGH AMBIENT Ta= 54.8 ℃</th></tr>
<tr><td>1</td><td>BD1</td><td>4A/800V GLASS GBU408</td><td>50.1℃</td><td>70.3℃</td></tr>
<tr><td>2</td><td>Q1</td><td>IRFB20N50K 20A/500V</td><td>51.2℃</td><td>71.2℃</td></tr>
<tr><td>3</td><td>L2</td><td>TF2072</td><td>52.2℃</td><td>72.0℃</td></tr>
<tr><td>4</td><td>Q5</td><td>STF13NM50N 12A/500V</td><td>51.7℃</td><td>71.6℃</td></tr>
<tr><td>5</td><td>D2</td><td>BYV29X-600 7A/600V</td><td>52.6℃</td><td>72.3℃</td></tr>
<tr><td>6</td><td>RTH2</td><td>1/2W 200KΩ 1%</td><td>49.6℃</td><td>69.6℃</td></tr>
<tr><td>7</td><td>C5</td><td>82u/450V 10Kh 105℃ 18*30 KXG</td><td>49.0℃</td><td>68.8℃</td></tr>
<tr><td>8</td><td>T1</td><td>TF2073</td><td>54.2℃</td><td>73.4℃</td></tr>
<tr><td>9</td><td>Q101</td><td>IRFB3607PBF 80A/75V</td><td>51.1℃</td><td>71.1℃</td></tr>
<tr><td>10</td><td>D9</td><td>BYV26EGP 1A/1KV</td><td>50.4℃</td><td>70.4℃</td></tr>
<tr><td>11</td><td>C102</td><td>680u/35V UL10Kh 10*23 ZLH</td><td>48.3℃</td><td>68.5℃</td></tr>
<tr><td>12</td><td>C201</td><td>47u/50V UL10Kh 6.3*11 YXM</td><td>49.9℃</td><td>69.9℃</td></tr>
<tr><td>13</td><td>C38</td><td>100u/25V UL10Kh 6.3*11 YXM</td><td>51.6℃</td><td>71.5℃</td></tr>
<tr><td>14</td><td>U900</td><td>PWM L6599AD</td><td>50.1℃</td><td>70.3℃</td></tr>
<tr><td>15</td><td>U1</td><td>NCP1608B</td><td>51.6℃</td><td>71.9℃</td></tr>
</table></td><td>P</td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 305 VAC
O/P：O/P SHORT TEST
Ta：25℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 305VAC/230 VAC/100VAC
O/P：95% LOAD
Ta= -40 ℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 60 ℃
NO DAMAGE</td><td>I/P： 305 VAC
O/P：95%
Ta= 60 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.002 %(0~50℃)</td><td>P</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：5 CYCLE
5. Input/Output condition： STATIC</td><td>OK</td><td>P</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -35℃~ +65℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：10 CYCLE
5. Input/Output condition： 230VAC/Full Load TURN ON/58 ‘SEC.;TURN OFF/2SEC.</td><td>OK</td><td>P</td></tr>
</table>

8	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：72min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
9	CAPACITOR LIFE CYCLE	HLG-120H-24:SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 60 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 60 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 60 ℃ LIFE TIME	(1) 749931 HRS (2) 107625 HRS (3) 124599 HRS (4) 142065HRS	P
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE： 192.2K HRS	OK	P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 75℃	**OK**	P